GROWING SEASON WEATHER AT GENEVA, NEW YORK 1953-1967

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CONTENTS

ABSTRACT

Daily air temperature, relative humidity, vapor pressure deficit, solar radiation, precipitation, wind, and evaporation are tabulated for April 1 – September 30 for the 15-year period, 1953–1967. Soil temperatures at 4-inch and 12-inch depths are given for the 9-year period, 1959–1967. Quadratic curves, obtained from a pooled regression computer program applied to the actual data, are presented for comparison. Peak of the curve for solar radiation occurred June 28, evaporation July 8, vapor pressure deficit July 12, and air temperature July 23.

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Cover: **General view of weather station at Darrow Farm.**

GROWING SEASON WEATHER AT GENEVA, NEW YORK

1953-1967

N. H. PECK, M. T. VITTUM, and G. H. GIBBS[1]

PRECIPITATION and maximum and minimum temperatures have been recorded daily by the New York State Agricultural Experiment Station at Geneva since 1883. Records for the first 58 years, 1883–1940, are summarized in the 60th Annual Report of the Experiment Station (15), and for 1890–1963 are included in a Cornell Rurban Climate Series (7).

The Environment Sciences Service Administration (ESSA), formerly the Weather Bureau, of the U. S. Department of Commerce, publishes Geneva precipitation, air temperature, evaporation, wind, and soil temperature data monthly (1), and Geneva data are also included in a series of reference bulletins dealing with climatological factors that affect agriculture in the Northeast. These regional bulletins use information from approximately 160 locations for the 30-year period 1926–1955 (5, 6, 8, 9, 10, 11, 12). The Geneva precipitation and temperature data in the above publications were always obtained by the official cooperative weather observer from instruments located near the Experiment Station greenhouses.

As agriculture becomes more complex, there is an increasing need for more information on the physical, chemical, and biological responses and reactions of plants to their environment. Thus, starting in 1953, more detailed weather observations were initiated in conjunction with a comprehensive irrigation experiment which was located on the Darrow, or Fruit Breeding, Farm 2.4 miles due west of the Experiment Station. Daily observations at this site, latitude 42° 53′ north and longitude 77° 03′ west, were recorded during the 6 months of the growing season, April 1 – September 30, for the 15-year period 1953–1967. Solar radiation was intercepted on top of the Food Research Laboratory at the Experiment Station, latitude 42° 53′ north and longitude 77° 00′ west. Altitude at the Darrow Farm is 750 feet above sea level. The surface slopes gently to the east. Except for a low peach orchard 400 feet to the west, there were no obstacles in the direction of the prevailing northwest wind. The soil at the Darrow Farm site is classified as a Lima silt loam—a moderately well-drained soil formed from glacial till composed of a mixture of limestone and calcareous gray shale (17, 18). All instruments were located within a fenced area 40 feet x 30 feet in size. Bluegrass sod was maintained inside the fence, and for at least 20 feet in all directions outside the fence (cover photo).

[1]Associate Professor, Professor and Head of Department, and Experimentalist in Vegetable Crops respectively.

PROCEDURE

Daily observations, made in accordance with the standard procedures followed by cooperative weather observers (2), were recorded at 8:00 a.m. Eastern Standard Time except for solar radiation which was recorded on True Solar Time. Daily observations were recorded for the 24-hour period ending at observation time. Hourly temperature and relative humidity, taken from hygrothermograph charts, were recorded at the end of each hour.

Air Temperature, °F

Maximum and minimum air temperatures, expressed in degrees Fahrenheit, were measured by standard U. S. Weather Bureau maximum and minimum thermometers mounted 60 inches above the sod surface in a standard Weather Bureau instrument shelter (Fig. 1). The mean of 24 hourly air temperature readings for each day was calculated from readings taken from a continuously recording hygrothermograph located in the same shelter.

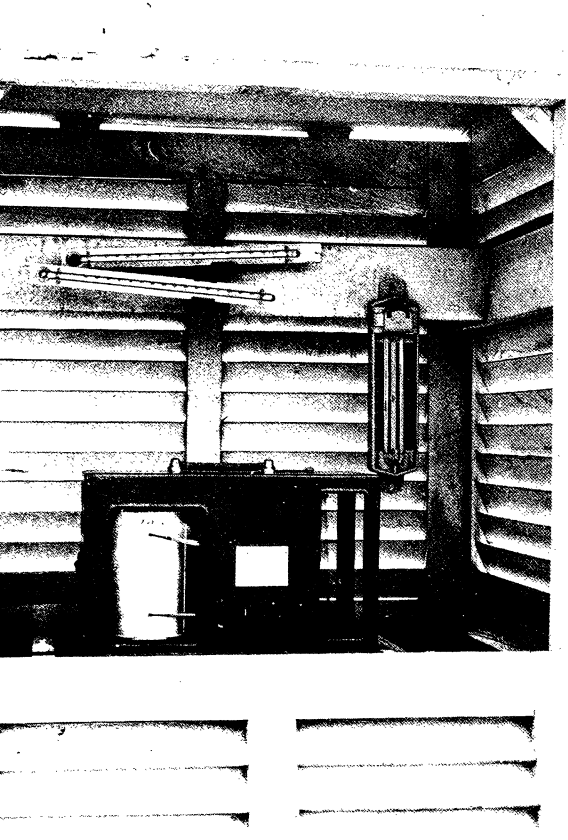


Fig. 1: **Interior of standard instrument shelter showing minimum and maximum thermometers mounted on the horizontal crosspiece (above), and hygrothermograph which continuously records relative humidity and temperature (below).**

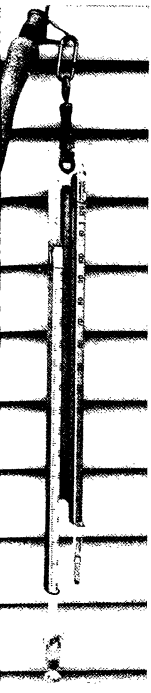
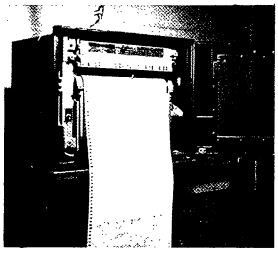


Fig. 2: **Sling psychrometer used to measure wet-bulb and dry-bulb temperatures.**



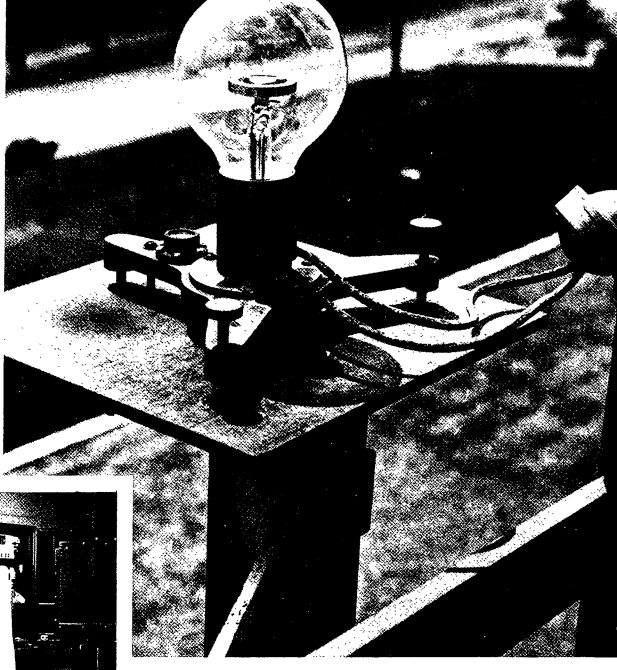


Fig. 3: **Pyrheliometer unit on top of Food Technology Laboratory.**

Relative humidity (per cent)

Relative humidity, expressed as per cent of saturation, was recorded by a continuous-chart hygrothermograph (Fig. 1). The human hair element used to measure relative humidity was checked occasionally against wet bulb-dry bulb thermometer readings with a sling psychrometer (Fig. 2).

Vapor pressure deficit (inches of Hg)

Vapor pressure deficit, expressed as inches of mercury, was calculated for each hour by multiplying the saturation vapor pressure corresponding to the observed temperature, as compiled by Marvin (13), by the difference between 100 and the observed relative humidity. Vapor pressure deficit values were calculated for each hour from the hourly temperature and relative humidity readings, and the daily vapor pressure deficit values are the averages of the 24 hourly values for each day.

Solar radiation (g cal/cm²)

Solar radiation was intercepted by an Eppley 50-junction pyrheliometer (Fig. 3), and was recorded on a continuous chart potentiometer. Solar radiation, expressed as gram calories per square centimeter per day, was obtained by adding the readings for each 20-minute period during the day, in accordance with instructions of the official "Manual of Radiation Observations" (3).

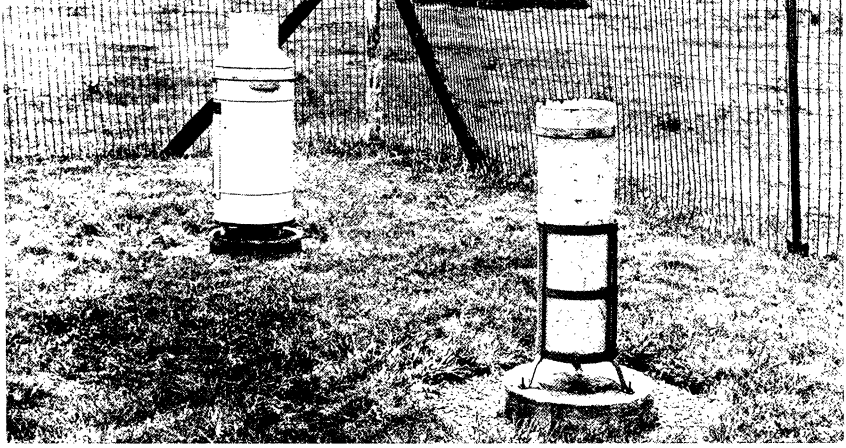


Fig. 4: **Standard rain gage on left, and recording rain gage on right.**

Day length (minutes)

Day length, expressed in minutes from sunrise to sunset for latitude 43° north, was obtained from tables in the U. S. Naval Observatory Nautical Almanac (4).

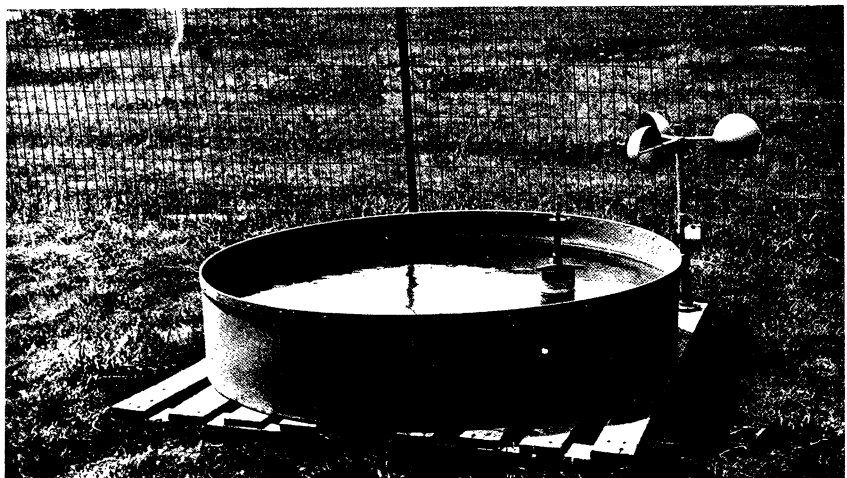
Precipitation (inches)

Precipitation, expressed as inches per day, was measured in a standard Weather Bureau rain gage with an 8-inch diameter top (Fig. 4). Charts from a recording rain gage were available for checking precipitation measurements, and for determining intensity of precipitation over short time intervals.

Wind (miles)

Wind, expressed as miles per day, was recorded by a 3-cup anemometer mounted 1.5 feet above the sod surface immediately adjacent to the evaporation pan (Fig. 5).

Fig. 5: **Standard 4-foot diameter pan for measuring evaporation with hook gage in still well, and 3-cup atometer for measuring wind.**



Evaporation (inches)

Evaporation, expressed as inches of water evaporated per day, was measured from a free water surface in a standard Weather Bureau Class A evaporation pan 4 feet in diameter (Fig. 5). Water was maintained approximately 10 inches deep within the pan, and the pan itself was mounted 4 inches above the soil surface on an open wooden frame surrounded by bluegrass. A hook gage and still well were used to make evaporation readings.

Soil temperature (°F)

Soil temperature, expressed in degrees Fahrenheit at 4-inch and 12-inch depths below the bluegrass sod surface, was recorded by a dual pen continuous chart thermograph (Fig. 6) for the 9-year period 1959–1967.

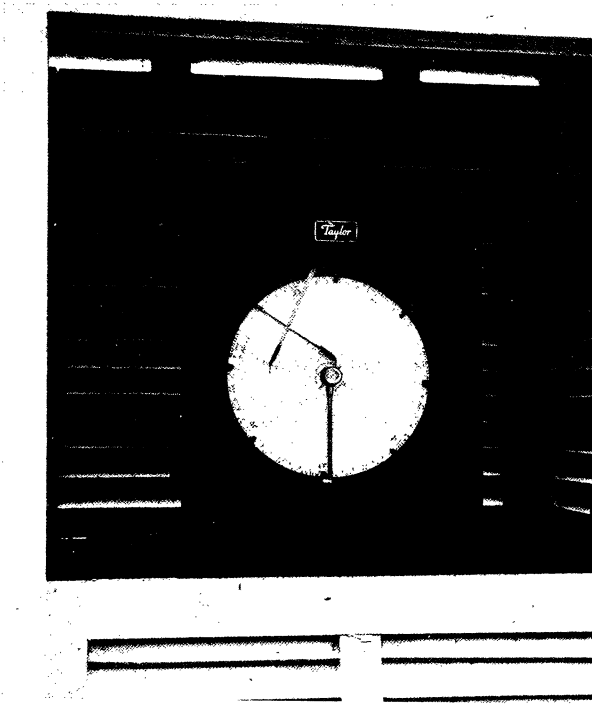


Fig. 6: **Recording thermograph for measuring soil temperature at 4-inch and 12-inch depths.**

Computations

Data for each weather factor were analyzed with a pooled regression computer program to determine the curve of best fit based on the least squares technique. These pooled quadratic curves are useful in smoothing the day-to-day and year-to-year variations which occur in the daily values of actually observed weather.

RESULTS

Average daily values for each weather factor for the growing seasons from April 1 through September 30 for the 15-year period 1953–1967 are given in Table 1. Individual daily values for all these weather factors during April 1–September 30 (1953–1967, except soil temperatures 1959–1967) are available from the Vegetable Crops Department, New York State Agricultural Experiment Station, Geneva, N. Y. Annual means of these growing season weather factors are given in Table 2. Pooled quadratic curves for these weather factors obtained from the pooled regression programs are shown in Figures 7–16.

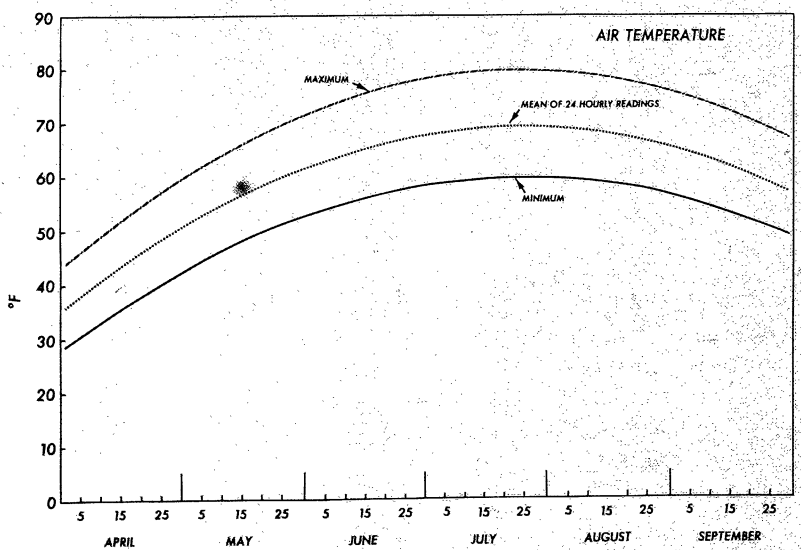
Air Temperature

The highest maximum air temperature recorded any individual day during the 15 years of growing seasons was 99°F on July 23, 1955 and the lowest was 21°F on April 4, 1954. The mean maximum air temperature for the 15 years was 71°F, with the highest annual mean of 74°F in 1955 and the lowest of 67°F in 1956 (Table 2). The curve for maximum air temperature peaks at 80°F on July 24 (Fig. 7).

The highest minimum air temperature recorded for any day during the 15 years was 78°F on August 13, 1953 and on June 29, 1959 and the lowest was 10°F on April 4, 1954. The mean minimum air temperature for the 15 years was 52°F, with the highest annual mean of 55°F in 1955 and in 1959 and the lowest of 49°F in 1963 (Table 2). The quadratic curve for minimum air temperature peaks at 60°F on July 24 (Fig. 7).

Using the mean of 24 hourly air temperature readings for each day,

Fig. 7: **Pooled quadratic curve for maximum, minimum and hourly mean air temperature.**



the highest daily mean was 84°F on September 2 and 3, 1953 and the lowest was 18°F on April 4, 1954. The mean hourly air temperature for the 15 years was 61°F, with the highest annual mean of 64°F in 1955 and the lowest of 58°F in 1956. The curve for mean air temperature peaks at 69°F on July 23 (Fig. 7). Air temperatures calculated from the mean of 24 hourly readings are almost identical to those obtained from averaging the daily maximum and minimum air temperatures (Tables 1 and 2, and Fig. 7).

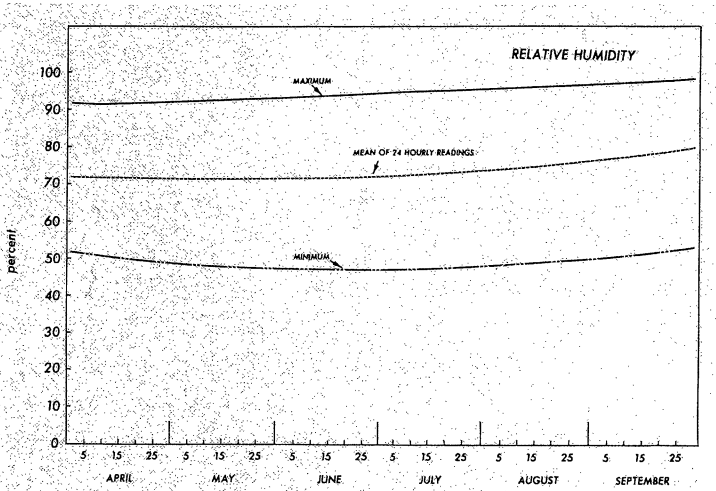


Fig. 8: **Pooled quadratic curve for maximum, minimum and hourly mean relative humidity.**

Relative Humidity

The highest maximum relative humidity of 100 per cent was recorded on many days during the 15 years, and the lowest was 45 per cent on May 17, 1967. The mean maximum relative humidity for the 15 years was 95 per cent, with the highest annual mean of 99 per cent in 1965 and the lowest of 91 per cent in 1955 (Table 2).

The highest minimum relative humidity for any day was 100 per cent on 6 different days during the 15 years and the lowest was 11 per cent on September 30, 1957. The mean minimum relative humidity for the 15 years was 49 per cent, with the highest annual mean of 57 per cent in 1965 and the lowest of 40 per cent in 1963 (Table 2).

Using the mean of 24 hourly readings of relative humidity for each day, the highest was 100 per cent on 15 days during the 15 years, and the lowest was 33 per cent on May 10, 1962. The mean hourly relative humidity for the 15 years was 74 per cent, with the highest annual mean of 83 per cent in 1965 and the lowest of 69 per cent in 1955 and 1963. The curves for maximum, minimum, and mean hourly relative humidity are shown in Figure 8.

Vapor Pressure Deficit

The highest vapor pressure deficit for any day during the 15 years was .591 inches of mercury on July 1, 1964 and the lowest was .000 inches on 15 days. The mean vapor pressure deficit for the 15 years was .173 inches, with the highest annual mean of .194 inches in 1963 and the lowest of .120 inches in 1965 (Table 2). The curve for vapor pressure deficit peaks at .220 inches on July 12 (Fig. 9).

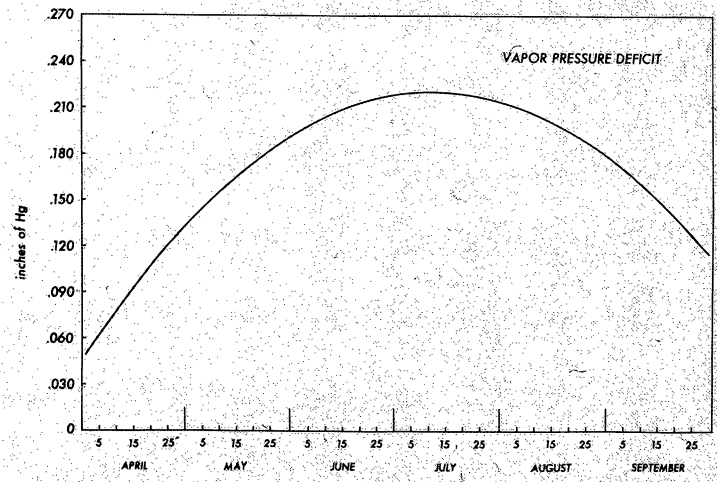


Fig. 9: **Pooled quadratic curve for vapor pressure deficit.**

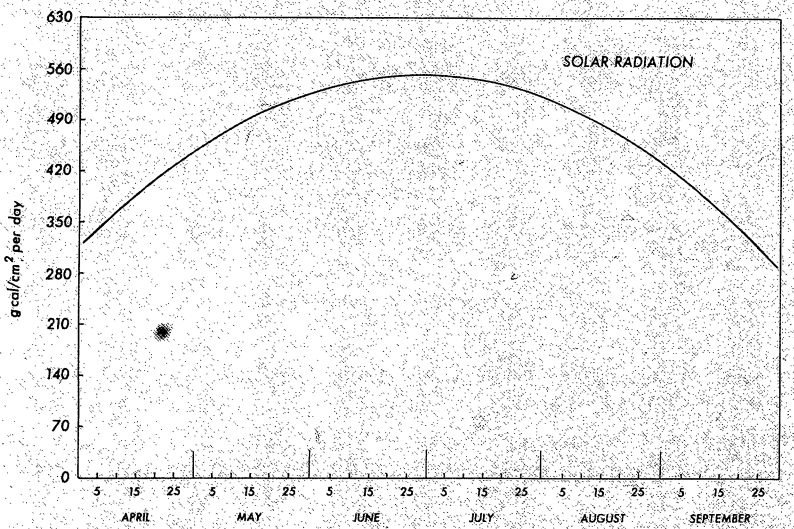


Fig. 10: **Pooled quadratic curve for solar radiation.**

Solar Radiation

The highest solar radiation for any one day each year during the 15 years averaged 791 gram calories per square centimeter, and the lowest was 30 gram calories per square centimeter on April 7, 1967. The mean solar radiation for the 15 years was 469 gram calories per square centimeter per day, with the highest annual mean of 509 gram calories per square centimeter per day in 1955 and the lowest of 424 gram calories per square centimeter per day in 1965 (Table 2). The curve for solar radiation peaks at 552 gram calories per square centimeter on June 28 (Fig. 10).

Day Length

Day length at Geneva expressed in minutes from sunrise to sunset is 763 minutes on April 1, reaches a maximum of 922 minutes about June 21, and declines to 708 minutes on September 30 (Table 1 and Fig. 11).

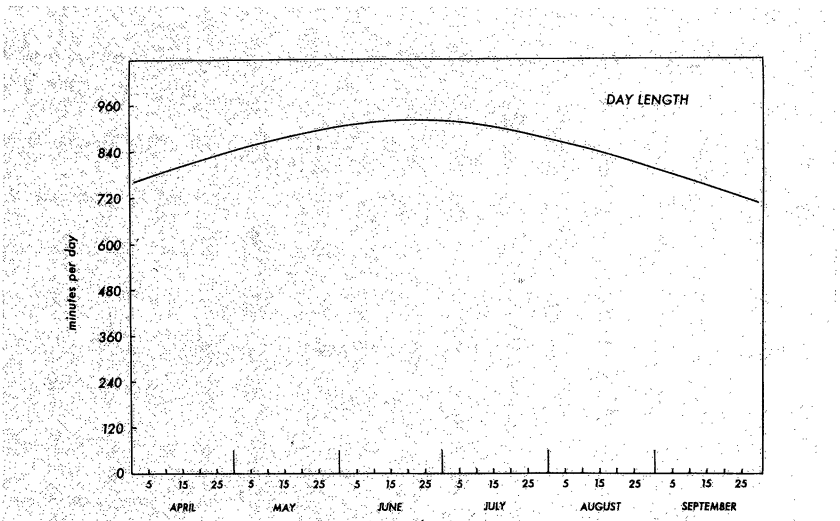


Fig. 11: **Pooled quadratic curve for day length.**

Precipitation

The highest precipitation for any day during the 15 years was 2.90 inches on August 14, 1955 and daily lows of 0.00 inches occurred on many days each year. The mean precipitation for the 15 years was .09 inches per day, with the highest annual mean of .13 inches per day in 1958 and the lowest of .07 inches per day in 1964. The curve for precipitation is shown in Fig. 12.

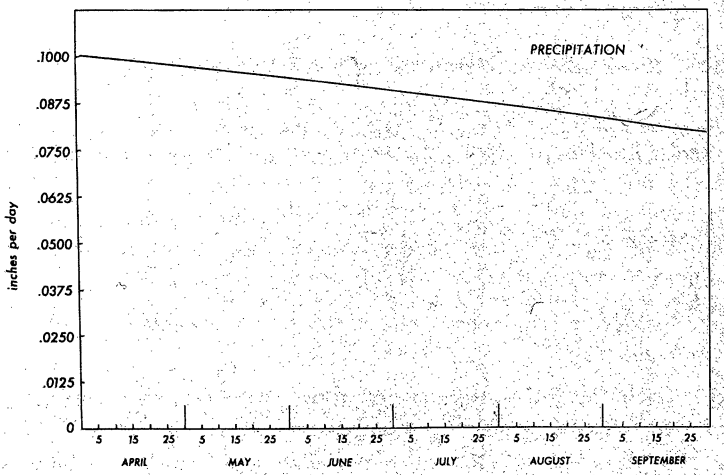
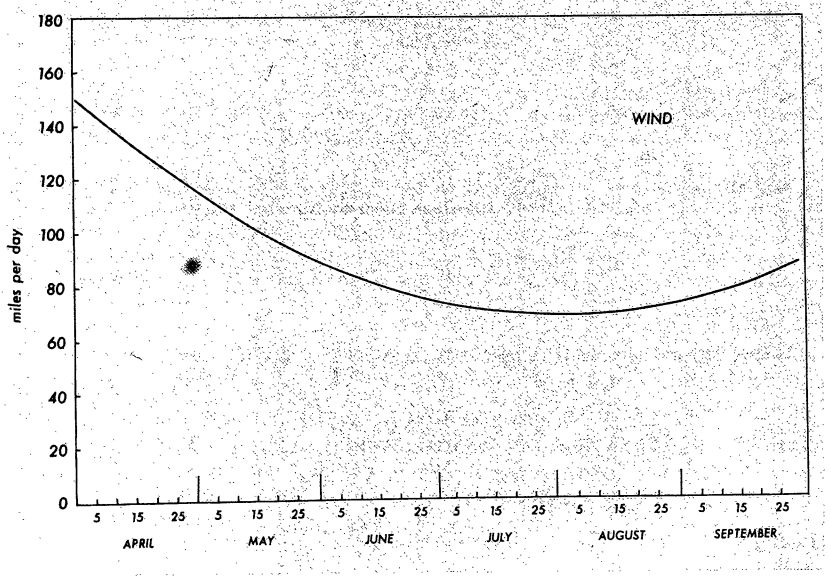


Fig. 12: **Pooled quadratic curve for precipitation.**

Wind

The highest wind for any day during the 15 years was 398 miles on April 5, 1963 and the lowest was 0 miles on August 20, 1961. The mean wind for the 15 years was 89 miles per day, with the highest annual mean of 102 miles per day in 1964 and the lowest of 78 miles per day in 1962. Wind was the only weather factor where the lowest numerical values occurred during the middle of the growing seasons (Fig. 13).

Fig. 13: **Pooled quadratic curve for wind.**



Evaporation

The highest evaporation of water from the Weather Bureau Class A evaporation pan for any day during the 15 years was .478 inches on July 4, 1966 and the lowest was .001 inches which occurred on 13 different days. The mean evaporation for the 15 years was .175 inches per day, with the highest annual mean of .198 inches per day in 1955 and the lowest of .144 inches per day in 1956 (Table 2). The curve for evaporation peaks at .222 inches per day on July 8 (Fig. 14).

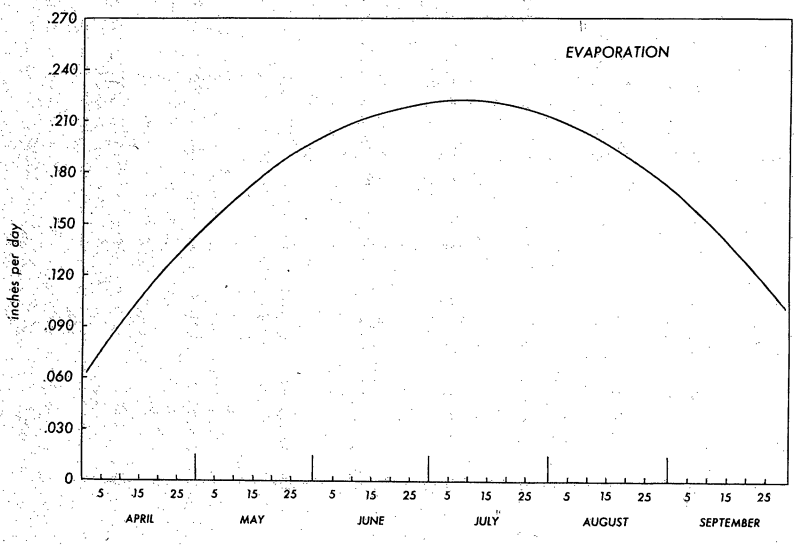


Fig. 14: **Pooled quadratic curve for evaporation.**

Soil Temperature

Maximum soil temperature at the 4-inch depth under a bluegrass sod during the 9 years of growing seasons from 1959–1967 had a mean of 65°F. The highest maximum temperature recorded for any day was 90°F on July 31, 1959 and the lowest was 32°F on April 3 and 4, 1964. The curve for maximum soil temperature at the 4-inch depth peaks at 74°F on July 27.

Minimum soil temperature at the 4-inch depth during the 9 years had a mean of 58°F. The highest minimum temperature recorded for any day was 74°F on July 30 and 31, 1959 and on July 29, 1963, and the lowest was 32°F during the first part of both April 1964 and April 1965. The curve for minimum soil temperature at the 4-inch depth peaks at 66°F on July 30.

Maximum soil temperature at the 12-inch depth under a bluegrass sod during the 9 years had a mean of 61°F. The highest maximum temperature recorded for any day was 81°F on July 31 and August 1, 1959, and a low of 32°F on April 4–8, 1965. The curve for maximum soil temperature at the 12-inch depth peaks at 70°F on August 3.

Minimum soil temperature at 12-inch depth during the 9 years had a mean of 60°F. The highest minimum temperature recorded for any day was 79°F on August 1, 1959 and the lowest of 32°F on the first part of both April 1964 and April 1965. The curve for minimum soil temperature at the 12-inch depth peaks at 68°F on August 4.

The curves for soil temperature are shown in Figure 15.

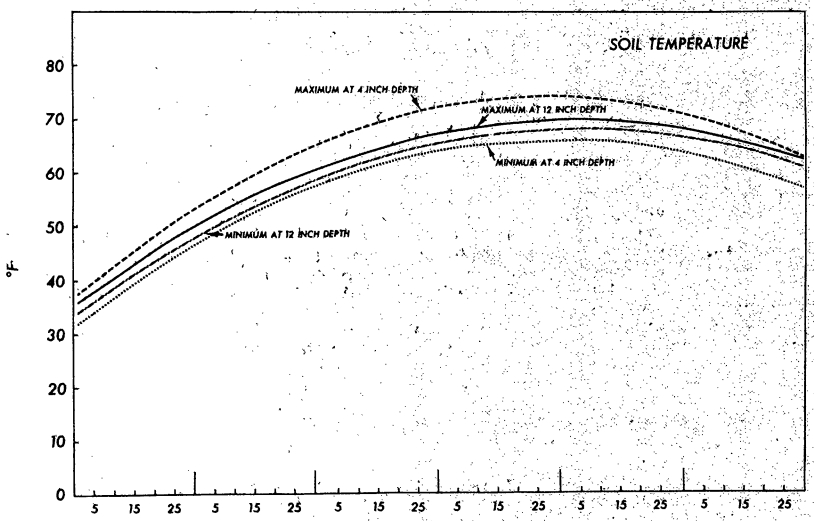


Fig. 15: **Pooled quadratic curve for soil temperature at 4-inch and 12-inch depths.**

DISCUSSION

Curves obtained from the pooled standard quadratic regression computer program are shown in Figure 16. Units have been omitted from this chart so that the slopes and the peaks of the curves may be compared on a relative basis. Note that the solar radiation curve closely follows day length, except the solar radiation curve peaks on June 28, whereas the day length curve peaks about June 21. The mean air temperature, calculated from averaging 24 hourly readings each day, lagged farthest behind day lengths. The air temperature curve peaks on July 24.

Vapor pressure deficit and evaporation curves fit very closely to each other, and have similar lags behind day length and solar radiation. The vapor pressure deficit peaks on July 12, and the evaporation curve peaks on July 8. Vapor pressure deficit and evaporation have been shown to be very closely related to evapotranspiration by vegetable crops (14 and 16).

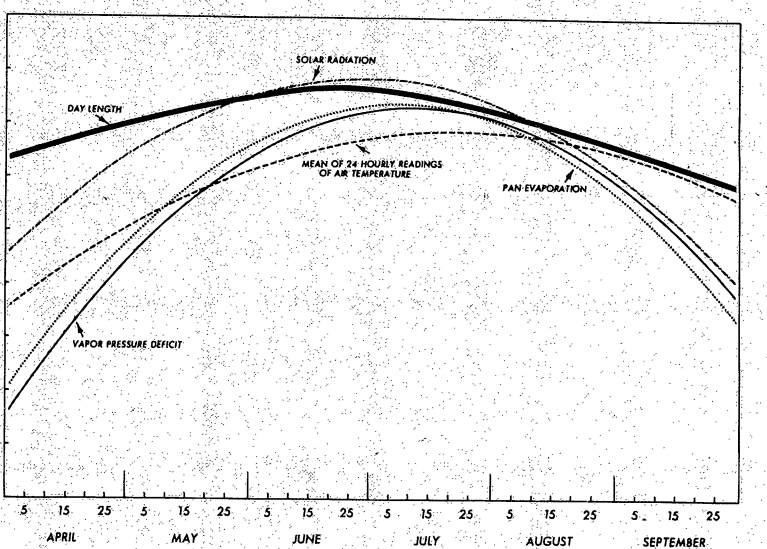


Fig. 16: **Pooled quadratic curves showing the relationship between various weather factors.**

Table 1.—Average daily growing season weather, April 1–September 30.[1]

[1]Mean of 15 years (1953–1967) for all weather factors, except soil temperature.
[2]Mean of 9 years (1959–1967) for soil temperature.
[3]Mean of 24 hourly readings.

Date	Day of Climatological Year	Air Temperature			Relative Humidity			Vapor Pressure Deficit	Solar Radiation	Day length	Precipitation	Wind	Evaporation	Soil temperature[2]			
		Max.		Hourly[3]	Max.	Min.	Hourly[3]							4 inch		12 inch	
														Max.	Min.	Max.	Min.
April		°F		°F	%	%	%	in. Hg	g cal /cm²	min.	in.	miles	in.	°F	°F	°F	°F
1.....	32	45		38	89	58	75	.071	406	763	.05	121	.075	39	35	38	36
2.....	33	48		42	92	54	74	.079	357	766	.07	128	.085	40	35	38	37
3.....	34	49		41	95	48	73	.090	378	769	.13	168	.089	41	36	39	37
4.....	35	44	30	38	91	53	71	.075	369	773	.09	166	.077	41	37	39	37
5.....	36	45	30	37	90	49	69	.072	386	775	.07	134	.081	41	36	39	38
6.....	37	52	34	43	93	44	68	.103	425	778	.12	122	.107	41	36	39	38
7.....	38	51	36	43	98	56	78	.071	277	781	.27	150	.074	41	37	39	38
8.....	39	47	33	40	99	60	81	.056	275	783	.21	154	.063	42	37	40	39
9.....	40	45	30	37	95	52	74	.064	326	786	.10	113	.076	43	38	40	39
10.....	41	47	34	41	90	53	72	.083	395	789	.05	165	.077	42	37	40	39
11.....	42	48	34	40	91	49	70	.090	406	792	.04	147	.130	42	37	41	39
12.....	43	50	35	42	90	48	68	.093	386	795	.06	126	.106	43	37	41	39
13.....	44	50	34	41	90	44	69	.091	368	798	.09	149	.107	45	38	42	40
14.....	45	50	36	43	91	52	70	.095	357	801	.08	160	.107	44	38	42	41
15.....	46	56	39	47	86	44	64	.129	419	803	.02	143	.139	47	40	43	41
16.....	47	57	39	48	90	51	71	.109	394	806	.14	144	.118	48	42	44	42
17.....	48	56	40	47	89	52	69	.124	355	808	.09	138	.124	49	42	46	43
18.....	49	57	39	48	93	46	70	.134	385	812	.11	124	.140	50	44	46	44
19.....	50	55	37	45	96	51	76	.100	333	815	.13	109	.089	47	42	45	44
20.....	51	54	38	45	94	51	78	.084	395	817	.10	113	.094	48	41	45	44

21.....	52	56	41	48	90	51	73	.110	435	820	.07	130	.129	50	42	46	44
22.....	53	62	41	51	92	51	73	.123	384	822	.17	138	.125	51	43	47	45
23.....	54	62	41	51	96	44	71	.137	477	825	.13	125	.164	53	44	48	47
24.....	55	57	39	47	95	51	74	.097	419	828	.06	128	.123	53	45	49	47
25.....	56	59	41	50	93	49	73	.116	428	831	.13	121	.140	52	46	49	47
26.....	57	58	40	49	90	52	73	.103	429	834	.11	127	.134	53	45	50	48
27.....	58	55	41	46	92	56	76	.098	346	836	.06	092	.104	50	44	49	47
28.....	59	58	40	49	93	54	75	.114	366	838	.17	122	.111	51	45	48	46
29.....	60	57	41	48	94	56	77	.096	395	841	.10	139	.118	52	46	49	47
30.....	61	62	41	51	89	45	68	.141	484	844	.14	121	.166	53	45	50	47
May																	
1.....	62	61	43	52	91	48	71	.128	457	847	.14	134	.139	53	46	50	48
2.....	63	60	41	50	92	48	70	.135	477	849	.06	104	.139	52	45	50	48
3.....	64	59	42	50	93	48	69	.120	470	851	.07	108	.128	54	46	50	48
4.....	65	60	43	51	90	49	70	.138	411	854	.10	124	.142	54	47	50	49
5.....	66	61	42	51	93	45	67	.160	505	856	.03	099	.168	56	47	51	49
6.....	67	64	42	53	88	36	59	.191	557	858	.03	082	.199	58	48	52	50
7.....	68	62	43	53	88	40	65	.171	451	861	.13	102	.165	58	49	53	51
8.....	69	61	45	53	91	51	73	.142	443	864	.16	134	.159	57	50	53	51
9.....	70	61	44	52	94	51	75	.122	418	866	.11	109	.140	56	50	53	51
10.....	71	63	44	52	91	43	69	.147	466	868	.09	128	.158	57	49	53	51
11.....	72	61	43	51	93	52	74	.112	419	870	.13	102	.127	55	49	53	51
12.....	73	62	44	53	96	51	75	.124	424	873	.16	094	.118	56	49	53	51
13.....	74	64	48	56	93	50	72	.144	501	875	.07	082	.161	56	50	53	52
14.....	75	65	46	55	93	49	73	.134	497	877	.07	093	.158	58	50	54	52
15.....	76	65	46	54	96	50	75	.130	411	879	.14	082	.134	57	50	54	52
16.....	77	66	47	56	94	46	71	.161	507	881	.06	090	.177	58	51	55	52
17.....	78	67	46	55	92	46	70	.160	522	883	.08	093	.170	59	52	55	53
18.....	79	65	49	56	90	45	69	.165	514	885	.07	095	.183	60	53	55	54
19.....	80	68	51	59	92	47	70	.175	495	887	.13	102	.171	61	53	56	54
20.....	81	68	47	58	95	51	72	.166	459	889	.14	106	.175	61	55	57	55

Table 1.—Continued

Date	Day of Climato-logical Year	Air Temperature			Relative Humidity			Vapor Pres-sure Deficit	Solar Radia-tion	Day length	Precip-itation	Wind	Evapo-ration	Soil temperature[2]			
														4 inch		12 inch	
		Max.	Min.	Hourly[3]	Max.	Min.	Hourly[3]							Max.	Min.	Max.	Min.
		°F	°F	°F	%	%	%	in. Hg	g cal /cm²	min.	in.	miles	in.	°F	°F	°F	°F
21.....	82	65	46	56	94	49	70	.161	511	891	.04	093	.181	61	55	57	55
22.....	83	69	50	59	93	46	70	.166	544	893	.08	100	.186	61	55	58	56
23.....	84	69	48	58	93	52	73	.160	463	894	.03	115	.172	61	54	57	56
24.....	85	66	48	56	93	48	71	.168	498	896	.11	091	.171	60	53	57	55
25.....	86	69	50	59	92	41	65	.204	605	898	.03	090	.217	61	54	58	56
26.....	87	69	49	59	93	43	70	.173	526	900	.11	100	.196	62	55	58	56
27.....	88	68	49	58	98	52	74	.155	503	901	.02	085	.167	63	55	59	57
28.....	89	71	51	60	95	43	67	.202	574	903	.01	119	.225	64	56	59	57
29.....	90	68	48	58	97	50	73	.156	490	905	.06	116	.198	64	57	59	58
30.....	91	66	49	57	96	53	74	.145	452	906	.10	097	.156	62	56	59	57
31.....	92	68	49	59	96	50	75	.144	530	907	.12	074	.151	63	56	59	57
June																	
1.....	93	72	53	62	95	45	71	.187	527	908	.06	082	.178	64	57	60	58
2.....	94	71	52	60	92	53	76	.146	477	910	.40	092	.174	64	57	60	58
3.....	95	66	48	57	97	50	75	.150	535	911	.08	082	.191	64	56	60	58
4.....	96	70	52	61	91	46	69	.201	660	912	.03	060	.194	66	57	61	59
5.....	97	75	55	65	92	43	66	.243	587	913	.03	077	.232	67	58	62	60
6.....	98	76	54	65	96	47	73	.210	548	914	.14	073	.202	68	59	63	61
7.....	99	75	55	65	95	51	73	.199	636	916	.03	076	.212	69	60	63	61
8.....	100	73	55	64	95	47	71	.191	589	916	.03	061	.206	69	61	63	62
9.....	101	75	54	65	96	50	76	.181	546	917	.12	054	.179	70	62	64	62
10.....	102	77	57	67	94	48	72	.223	579	917	.14	072	.213	71	63	65	63

11.....	103	76	56	66	96	54	77	.175	532	919	.06	081	.200	70	62	65	63
12.....	104	75	55	64	97	51	76	.170	540	919	.05	074	.201	71	62	65	63
13.....	105	75	57	66	98	52	77	.182	539	920	.16	084	.205	69	62	65	63
14.....	106	76	57	65	95	59	79	.156	471	920	.20	091	.196	70	62	65	63
15.....	107	71	54	62	95	57	77	.156	508	921	.09	088	.176	67	61	64	63
16.....	108	75	56	65	90	47	71	.205	587	921	.11	087	.221	68	61	64	62
17.....	109	74	57	65	88	45	67	.230	589	921	.04	094	.234	68	61	64	62
18.....	110	75	55	64	94	48	73	.193	535	922	.02	071	.194	68	61	64	63
19.....	111	74	55	64	95	46	71	.205	554	922	.05	066	.184	68	61	64	63
20.....	112	78	58	68	93	43	68	.254	632	921	.00	070	.258	71	62	65	63
21.....	113	77	59	67	90	53	71	.253	552	921	.09	085	.232	69	62	65	63
22.....	114	78	58	68	95	49	74	.208	559	922	.18	071	.214	70	62	65	64
23.....	115	78	59	68	92	44	70	.238	570	922	.03	074	.222	70	63	66	64
24.....	116	79	59	68	95	50	75	.201	551	922	.08	079	.215	72	64	66	65
25.....	117	78	58	67	93	44	70	.238	598	921	.04	087	.250	73	64	67	65
26.....	118	77	58	67	94	49	74	.206	524	921	.11	094	.217	71	63	66	65
27.....	119	79	60	70	89	45	66	.283	594	921	.16	080	.249	73	64	67	65
28.....	120	80	58	69	94	42	68	.269	651	920	.03	077	.268	75	65	68	66
29.....	121	82	61	71	92	43	67	.278	614	920	.08	084	.271	76	66	69	67
30.....	122	81	62	71	93	48	71	.261	577	919	.06	080	.239	76	67	69	68
July																	
1.....	123	82	62	71	94	46	72	.257	554	919	.04	073	.249	75	67	69	68
2.....	124	83	62	72	94	42	67	.301	597	918	.06	077	.265	76	67	70	68
3.....	125	82	61	70	93	47	71	.254	542	918	.13	098	.275	74	66	70	68
4.....	126	79	57	67	96	46	71	.235	572	916	.08	089	.245	74	65	69	67
5.....	127	76	58	66	94	48	72	.218	565	915	.13	071	.214	73	64	68	67
6.....	128	77	57	67	96	49	72	.220	556	915	.12	098	.238	72	64	68	66
7.....	129	76	57	66	97	48	73	.202	556	913	.06	055	.201	73	64	68	66
8.....	130	79	58	68	95	43	72	.226	537	912	.05	071	.214	72	64	68	66
9.....	131	78	60	68	95	46	71	.235	537	912	.06	088	.228	73	65	68	66
10.....	132	79	59	69	93	46	72	.235	573	910	.09	079	.248	74	65	69	67

Table 1.—Continued

Date	Day of Climatological Year	Air Temperature			Relative Humidity			Vapor Pressure Deficit	Solar Radiation	Day length	Precipitation	Wind	Evaporation	Soil temperature[2] 4 inch		12 inch	
		Max.	Min.	Hourly[3]	Max.	Min.	Hourly[3]							Max.	Min.	Max.	Min.
July		°F	°F	°F	%	%	%	in. Hg	g cal /cm²	min.	in.	miles	in.	°F	°F	°F	°F
11.....	133	79	60	69	91	44	69	.253	563	909	.05	067	.239	75	67	69	68
12.....	134	79	60	69	94	44	71	.245	560	907	.10	061	.220	75	67	69	68
13.....	135	80	62	70	94	49	74	.230	519	907	.18	061	.210	75	67	70	68
14.....	136	80	61	70	94	50	74	.232	515	905	.11	066	.232	75	66	70	68
15.....	137	80	59	69	96	48	73	.226	534	903	.01	083	.232	74	66	69	68
16.....	138	77	58	67	96	47	74	.203	563	902	.08	069	.228	73	65	69	67
17.....	139	79	58	68	95	45	71	.244	573	900	.00	052	.220	75	66	70	68
18.....	140	82	61	71	94	44	71	.266	576	898	.03	044	.225	75	67	70	68
19.....	141	83	63	72	95	46	72	.275	538	896	.19	076	.245	75	68	70	69
20.....	142	80	60	68	96	49	78	.184	493	896	.24	062	.246	75	67	70	68
21.....	143	78	61	68	96	52	77	.190	521	894	.10	072	.174	73	67	70	68
22.....	144	81	62	70	97	46	76	.222	551	892	.06	057	.232	75	67	70	68
23.....	145	82	64	72	96	50	78	.209	486	890	.17	061	.216	76	68	71	69
24.....	146	82	62	71	97	50	76	.214	530	888	.12	073	.221	76	68	71	69
25.....	147	79	60	69	97	50	76	.201	550	886	.09	068	.227	75	67	71	69
26.....	148	81	61	70	96	46	72	.242	595	884	.03	064	.233	76	67	71	69
27.....	149	81	61	71	95	45	72	.260	550	882	.04	077	.234	75	67	71	69
28.....	150	83	63	72	95	48	74	.245	531	880	.06	073	.225	76	68	71	69
29.....	151	82	62	71	98	50	76	.226	497	878	.05	058	.225	76	69	71	69
30.....	152	80	61	70	99	53	80	.176	456	876	.18	062	.193	75	68	71	70
31.....	153	80	59	69	98	46	75	.215	544	874	.06	073	.223	75	67	71	69

August

1.....	154	80	58	69	97	47	72	.242	504	872	.02	056	.228	75	67	71	69
2.....	155	79	59	68	97	44	73	.223	535	870	.09	068	.211	75	66	71	69
3.....	156	78	59	68	97	52	75	.206	465	867	.12	071	.205	73	66	70	69
4.....	157	79	60	68	97	47	75	.208	493	864	.18	064	.228	74	66	70	68
5.....	158	79	61	69	97	48	76	.193	478	862	.18	077	.212	74	66	70	68
6.....	159	77	59	67	99	52	78	.177	500	859	.07	059	.188	73	66	70	68
7.....	160	79	60	69	97	47	75	.213	484	857	.13	059	.206	75	66	70	68
8.....	161	82	63	71	96	45	73	.232	485	855	.08	085	.217	75	67	70	69
9.....	162	80	60	69	96	49	77	.188	468	852	.10	070	.202	74	67	70	69
10.....	163	79	60	68	97	54	78	.174	404	850	.27	074	.199	73	66	70	69
11.....	164	75	59	66	98	56	82	.136	388	848	.11	070	.150	72	66	69	68
12.....	165	78	57	66	97	47	75	.188	515	845	.04	083	.201	73	65	69	68
13.....	166	77	60	67	95	47	73	.211	503	843	.09	082	.197	73	65	70	68
14.....	167	75	58	65	98	54	80	.141	370	840	.30	084	.156	70	65	69	67
15.....	168	77	61	69	97	49	77	.199	465	838	.02	080	.181	71	64	68	67
16.....	169	80	60	69	98	46	74	.226	503	835	.08	065	.222	72	64	69	67
17.....	170	80	57	68	98	44	73	.222	537	832	.05	063	.207	74	65	69	68
18.....	171	78	58	67	95	46	73	.207	489	829	.04	070	.205	72	65	69	68
19.....	172	77	59	67	95	45	75	.191	466	827	.07	066	.180	73	65	69	68
20.....	173	77	58	67	96	50	76	.186	439	824	.08	066	.178	72	65	69	68
21.....	174	78	59	67	95	47	75	.209	457	822	.03	056	.176	72	65	69	68
22.....	175	76	58	66	99	53	80	.159	404	819	.20	057	.153	71	65	69	67
23.....	176	76	57	66	98	57	81	.141	405	816	.09	057	.141	70	64	68	67
24.....	177	76	57	66	94	49	73	.205	475	814	.02	105	.200	71	64	69	67
25.....	178	75	57	66	97	48	75	.187	483	811	.10	081	.183	71	64	68	67
26.....	179	78	58	67	98	46	75	.204	467	808	.05	077	.200	72	64	68	67
27.....	180	78	58	67	97	51	76	.193	451	805	.21	058	.189	72	65	69	67
28.....	181	77	57	67	97	51	78	.177	429	802	.06	060	.177	72	65	69	67
29.....	182	77	58	67	97	49	76	.188	422	799	.09	071	.162	71	65	69	67
30.....	183	78	61	69	94	57	80	.175	374	797	.05	066	.158	71	65	69	68
31.....	184	80	61	70	97	53	79	.191	401	794	.14	075	.176	72	65	69	68

Table 1.—Concluded

Date	Day of Climatological Year	Air Temperature			Relative Humidity			Vapor Pressure Deficit	Solar Radiation	Day length	Precipitation	Wind	Evaporation	Soil temperature[2] 4 inch		12 inch	
		Max.	Min.	Hourly[3]	Max.	Min.	Hourly[3]							Max.	Min.	Max.	Min.
September		°F	°F	°F	%	%	%	in. Hg	g cal /cm²	min.	in.	miles	in.	°F	°F	°F	°F
1.....	185	78	58	67	98	49	77	.195	427	791	.08	084	.182	72	65	69	67
2.....	186	76	57	66	97	50	76	.192	428	789	.06	077	.171	71	65	69	67
3.....	187	77	55	66	98	46	75	.192	469	786	.03	069	.194	71	64	69	67
4.....	188	78	59	68	95	48	74	.207	463	783	.04	072	.185	71	64	68	67
5.....	189	78	59	68	98	52	78	.187	380	780	.10	089	.169	70	64	68	66
6.....	190	75	55	64	98	53	77	.163	392	778	.06	079	.149	69	62	68	66
7.....	191	75	54	64	98	46	76	.175	475	775	.07	066	.174	69	62	67	66
8.....	192	76	55	64	98	46	75	.181	425	771	.06	062	.176	71	63	68	66
9.....	193	75	55	64	97	47	74	.197	413	768	.03	060	.158	72	64	68	67
10.....	194	74	56	65	98	55	78	.159	397	766	.14	085	.147	71	65	68	67
11.....	195	76	55	64	98	49	76	.186	394	763	.02	106	.180	71	64	69	67
12.....	196	69	52	59	97	55	79	.131	298	760	.02	088	.127	67	62	67	65
13.....	197	70	50	59	99	54	80	.124	378	757	.07	071	.117	67	61	66	64
14.....	198	69	52	60	96	56	78	.149	367	754	.03	077	.127	67	60	65	64
15.....	199	71	50	60	96	46	74	.161	396	752	.06	088	.162	68	59	65	64
16.....	200	68	49	57	97	52	80	.120	314	749	.09	078	.118	65	58	65	62
17.....	201	67	49	57	98	57	81	.104	346	746	.09	057	.096	66	58	64	62
18.....	202	70	51	59	99	53	80	.122	352	742	.07	067	.123	65	58	64	62
19.....	203	70	51	60	98	54	80	.128	370	739	.04	067	.120	66	59	64	62
20.....	204	74	53	62	98	51	79	.149	340	737	.12	091	.122	66	59	64	62

21.....	205	68	53	60	97	58	81	.116	314	734	.08	088	.125	65	60	64	62
22.....	206	68	51	59	98	58	81	.120	270	731	.15	083	.108	66	59	64	63
23.....	207	68	50	58	95	53	79	.129	340	728	.13	077	.118	65	60	64	63
24.....	208	70	49	58	97	48	77	.144	370	725	.08	083	.129	66	59	64	62
25.....	209	67	48	56	97	52	77	.121	318	723	.04	100	.116	64	58	64	62
26.....	210	68	48	57	98	48	76	.137	365	720	.06	082	.132	64	58	62	61
27.....	211	68	47	57	98	46	74	.149	358	717	.04	110	.144	63	57	63	61
28.....	212	66	47	55	98	54	80	.112	305	713	.19	082	.101	63	57	62	61
29.....	213	64	47	55	99	53	80	.107	309	710	.06	067	.102	62	56	61	60
30.....	214	67	48	57	97	55	80	.116	295	708	.03	089	.104	61	56	61	60

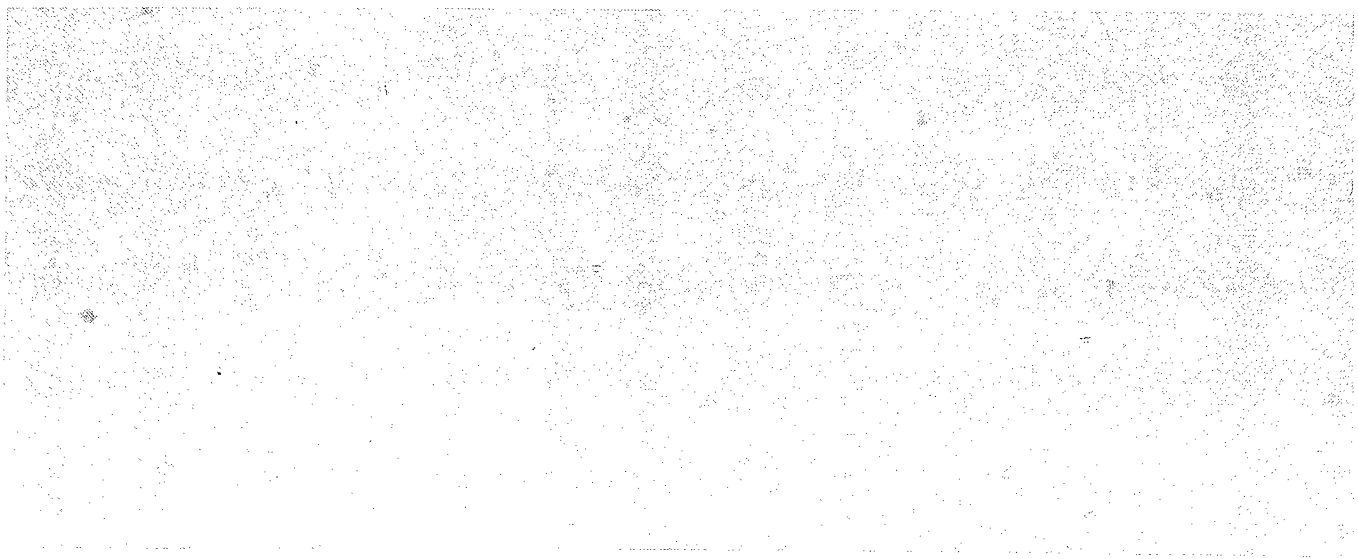


Table 2.—Annual means of growing season weather, April 1–September 30, 1953–1967.

Weather Factor	Growing Season															Mean 1953–1967
	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	
Air Temperature																
Max. °F	71	70	74	67	71	68	72	71	71	71	70	72	71	70	70	71
Min. °F	54	52	55	50	53	51	55	53	52	51	49	51	50	50	50	52
Hourly Mean °F	62	61	64	58	61	59	63	62	60	61	59	60	60	59	59	61
Relative Humidity																
Max. %	94	94	91	96	95	95	96	96	92	94	95	95	99	96	94	95
Min. %	54	48	46	52	45	50	50	51	62	46	40	44	57	43	47	49
Hourly Mean %	75	73	69	76	71	74	75	75	79	72	69	70	83	71	73	74
Vapor Pressure Deficit in. Hg	.176	.179	.227	.142	.193	.149	.178	.168	.129	.189	.194	.192	.120	.187	.168	.173
Solar Radiation g cal/cm²/day	452	473	509	473	487	474	499	479	489	486	451	445	424	439	451	469
Precipitation in./day	.09	.08	.08	.09	.09	.13	.09	.08	.10	.09	.08	.07	.08	.09	.11	09
Wind miles/day	96	96	92	87	83	90	80	86	92	78	98	102	89	85	81	89
Evaporation in./day	.174	.169	.198	.144	.179	.154	.174	.161	.181	.182	.180	.196	.180	.183	.166	.175

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