

KILLING FROSTS.

Table of dates of last killing frost in the Spring and the first killing frost in the Autumn.

Station.	Last killing frost in Spring.	First killing frost in Autumn.	Station.	Last killing frost in Spring.	First killing frost in Autumn.
TIDEWATER VIRGINIA.			MIDDLE VIRGINIA—Continued.		
Anland	Apr. 10	Nov. 10	Fredericksburg	Apr. 5	Oct. 18
Birdnest	Mar. 22	Oct. 18	Lynchburg	Mar. 26	Nov. 10
Cape Henry	Mar. 22	Dec. 10	Manassas	Apr. 15	Nov. 9
Doswell	Apr. 10	Nov. 10	Quantico	May 10	Nov. 7
Hampton	Mar. 17	Nov. 16	Rocky Mount	Apr. 4	Nov. 7
Newport News	Apr. 17	Nov. 16	Staunton	Apr. 12	Nov. 10
Norfolk	Mar. 22	Nov. 10	Warrenton	Apr. 10	Nov. 14
Petersburg	Apr. 26	Nov. 10	Washington	Apr. 15	Oct. 20
RICHMOND.	Apr. 5	Nov. 10	THE GREAT VALLEY.		
Richmond (near)	Apr. 26	Nov. 9	Big Stone Gap	May 11	Nov. 5
Richmond (near)	Apr. 14	Nov. 10	Blackburg	May 10	Oct. 18
Sunbeam	Apr. 29	Oct. 20	Bristol	May 14	Nov. 6
Warsaw	Apr. 15	Oct. 18	Burkes Garden	May 5	Oct. 10
West Point	Apr. 23	Nov. 10	Christiansburg	May 10	Nov. 9
Williamsburg	Nov. 23		Clifton Forge	Apr. 15	Nov. 6
MIDDLE VIRGINIA.			Dale Enterprise	Apr. 13	Oct. 17
Alexandria	Apr. 10	Oct. 18	Grahams Forge	May 15	Nov. 10
Barbooursville	May 10	Oct. 18	Hot Springs	May 20	Oct. 18
Bedford City	Apr. 9	Nov. 15	Lexington	Apr. 15	Oct. 18
Bon Air	Apr. 6	Nov. 8	Marion	May 12	Oct. 18
Buckingham	Apr. 15	Oct. 18	Meadowdale	May 10	Oct. 17
Carlville	Apr. 14	Nov. 8	Salem	Apr. 5	Nov. 9
Charlottesville	Apr. 10	Nov. 15	Staunton	May 10	Nov. 9
Columbia	Apr. 15	Oct. 18	Stephens City	Apr. 14	Oct. 18
Farmville	Apr. 14	Nov. 6	Woodstock	Apr. 5	Oct. 18
Fountainville	Apr. 5	Nov. 15	Wytheville	May 4	Oct. 18

GENERAL SUMMARY FOR THE YEAR 1900.

JANUARY temperatures were about normal, the mean for the State being 36.6°. The month opened with cold weather prevailing, which lasted until about the 5th. During this period minimums of from 8° above zero in Tidewater counties to 8° below zero in the southwest Valley section were observed. Following this the temperature rose steadily, accompanied by bright weather, until maximums of 60° were reached in the various sections. In the last decade the temperatures fell slowly, and the month ended as it had begun, with readings at and below freezing. The precipitation came mainly in the form of rain, and was about three-quarters of an inch below the normal. There were two well defined storm periods, the 10-12th and 18-20th, during which most of the precipitation recorded fell; otherwise the storms were local in nature, and generally small in amount of precipitation deposited. Decided changes of either rising or falling temperature preceded each storm.

There was a moderate rise in the James river on the 20th, but it did not attain freshet proportions.

Thunderstorms occurred at various points on the 11-12th and 20th.

Prevailing wind direction, SW.

FEBRUARY was a cold, cloudy month. The mean temperature, 34.7°, was 5.3° below the normal. There were two decided periods of maxima and minima temperatures. The first occurred on the 8th and the 13th, when readings of 60 to 70 degrees, or more, obtained, and the latter on the 1st and the 20th, during which dates the temperature reached as low as 5 to 7 degrees below zero in the western part of the State and but slightly above zero in the Tidewater section.

Precipitation occurred on twenty-five out of twenty-eight days. It was general on fourteen days and local on the remaining eleven. Perhaps the most notable feature of the month was the snow storm of the 16-17th. This storm, occurring but a few days over a year after the phenomenal one of February, 1899, and which at one time bid fair to rival it

in intensity, was the heaviest of the winter, and its severity was greatly added to by the heavy gales that prevailed during its continuance. The total snowfall for the storm ranged from 3 to 10 inches in various portions of the State, and some temporary interruption of railroad traffic occurred.

Rising water occurred in the James river consequent upon the storms of the 13-14th and the 21-22d, but in neither case was the volume sufficient to require the issuance of special flood warnings.

Thunderstorms were reported on the 4th, 8th, 21st and 22d. Fogs occurred on various dates, though they were not as frequent as in January; there were some sleet storms.

Prevailing direction of the wind, NW.

MARCH was not remarkable for either unusually warm or cold weather, but was almost constantly slightly below the normal, and this, together with the excess of cloudiness and much rain, combined to make it a most disagreeable month. In fact, it more nearly resembled the late February weather of this section than the average March. Precipitation occurred on every day of the month save one, the 22d, being either general or local in character. There were seven periods, covering thirteen days, during which it was general and well distributed. That falling as snow was about usual in amount and quite moist in each instance. There was much sleet, and all the rains were cold and chilling. While the average total amount received during the month was not far from the normal, the number of days with precipitation was so much in excess of normal conditions that it was generally considered as an unusually wet month.

As a result of the rains occurring on the 1st, flood water entered the James river and its main tributaries on the 2d, resulting in sharp freshet conditions at Richmond on the night of that date. The safe storage of all property interests liable to damage was secured by the prior issue of flood warnings by the Bureau. Thunderstorms occurred on the 13th, 20th, 29th and 30th. Fogs prevailed on the 6th and 9th. Prevailing wind direction, W.

APRIL, though having much cool weather, was, owing to a warm period during its closing days, about normal. There was much cloudiness, with raw, cold winds and cold rains. Cool weather marked the opening days, most of the minimum temperatures being recorded between the 1st and 5th. From the latter date, eliminating the usual fluctuations, the tendency was toward a rise, and the warmest weather prevailed generally on the 29-30th, when maximums of 71° to 90° were recorded in various portions of the State. Frosts were general on several dates, both light and killing, but, owing to the backward condition of vegetation, no damage resulted. There was a general impression that the month was colder than normally, which was due, no doubt, to the excess of cloudy, damp and disagreeable weather that obtained. Precipitation was ample and well distributed, except in the Appalachian portions of the Valley division and the northern and northeastern portions of the Middle division, where it was below normal. Of the sixteen days on which precipitation occurred, it was general on nine and more or less local on the remaining seven. The 18th and 19th were the days yielding the heaviest amounts. Snow fell to the amount of trace at Richmond on the 4th, Fredericksburg on the 11th and at nearly all stations in the Valley division between the 2d and 13th.

There were no freshets in the streams of the State during the month, though moderate rises in the James resulted from the rains of the 11-12th and the 18-19th.

Thunderstorms occurred on nine dates: hail on the 4th, 10th, 11th, 12th and 22d, and fogs, generally in the lowlands, on the 23d and 24th.

Prevailing wind direction, W.

[Continued on page 6a.]

MAY was rather remarkable for its ranges in temperature and its extremes. In the first decade it was cooler than normally, and the dates 4th to 10th the minimums were quite generally observed over the State, the record at a number of stations in both the Middle Virginia and Valley divisions being below freezing point, and in two cases reaching 25° and 26° respectively, which is noteworthy considering the time of year. On the other hand the maximum temperatures were high, the average for the entire State, 92°, being 3.3° above the average maximums of the three preceding years.

The 14th, 15th and 16th were the days on which the highest temperatures were generally observed. Frosts were more or less general during the coolest weather, and cases of heat prostration were reported during the warmest. The astronomical event of the year was the great solar eclipse which occurred on the 25th. Observations of this phenomenon were made by a number of the Voluntary Observers, under the instructions of the Weather Bureau.

Precipitation for the month was quite decidedly deficient, the departures ranging from below normal at stations reporting the greatest monthly amounts to as much as four inches below at stations in the droughty districts. Additionally, it was very unequally distributed as to area and date of occurrence, heavy rains falling in some localities only to be followed by a long interval of dry weather. There were four days on which rain was general, the 9th, 18th, 19th and 24th. Light local showers occurred on various other dates. The rivers were low throughout the month. Thunderstorms were frequent; hail occurred locally on 1st, 2d and 3d; light frosts on numerous dates, and killing frosts on the 2d, 4th, 5th, 10th and 11th, which did some damage to tender vegetation.

Prevailing wind direction, W.

JUNE.—Perhaps the most noteworthy feature of this month was the persistence of the cool period occurring in the last decade. Beginning with the 19th, the nocturnal temperatures were much lower than usual for June. On the night of the 20th, which was probably the coolest day, grate fires were not uncomfortable. It was also quite cool between the 4th-8th. Notwithstanding these decided deficiencies, however, a sufficient number of days warmer than normally occurred, which brought the mean temperatures for the month up to about the average. High temperatures prevailed in all portions of the State on the 11-12th, and in the Middle and Valley divisions from the 26th to 30th.

More than the normal amount of precipitation occurred in every part of the State, except in the Tidewater division; but although this was the case, a droughty period obtained that was productive of much harm to vegetation. This resulted from the rain falling heavily on a few days and but lightly, or not at all, during the rest of the month. The area of greatest precipitation comprised the northern and central portions of the Middle division and the central and southern portions of the Great Valley.

Rising water of generally moderate violence occurred in the rivers of the State on the 16-17th. There were some fogs in the Middle and Valley divisions, and thunderstorms were frequent. Hail was reported on the 8th, 11th, 21st, 26th and 30th.

Prevailing direction of the wind, SW.

JULY saw the advent of a heated period, which lasted practically without intermission into the following month. The mean temperature, 77.8°, was 1.8° above the normal for the State. Considering the maximum temperatures obtaining, there were found to be an average of 16 days on which readings of 90° or more were recorded, 8 days on which 95° or more were recorded, while on the warmest day, the 19th, there were seven stations recording temperatures of 100° or

more. Considered from the viewpoint of persistency, the hot weather was phenomenal. In ten of the hottest days of the month, five were noted as being dry and five as humid. Of the humid days there was not one without heat prostrations, and on one of them, the 6th, there were three fatal cases, while of the dry group three days were without heat casualties of any kind, and two had several prostrations and but one fatality. The rainfall of the month was below the normal over an inch. Ordinarily, this deficiency, though decided, would not have had any serious effect upon vegetation, had the distribution of the amount that was received been at all uniform. This, however, was not the case. It so happened that nearly all of the rain occurred in a series of storms in the latter part of the month, leaving the other days rainless, or nearly so, except in the Tidewater division. This resulted in a disastrous drought. Some access of water carried by the various streams of the State was noticeable from the 29th to the close of the month, but in no case was it sufficient to require the issue of flood warnings. Hail occurred on the 22d and 30th; thunderstorms were numerous and extensive.

Prevailing wind direction, SW.

AUGUST, in respect to temperature, was the most notable of any of which we have record. Indeed, the records may be searched in vain for anything approaching it in the intensity and duration of its heat. There were over twenty days during which the maximum temperatures ranged from 90 to 107 degrees. There have been other Augusts in which the highest observed readings equalled this; but, fortunately, none in which they were so continuous and prolonged. The hottest day was the 11th, and the coolest weather, which was only cool by comparison, occurred between the dates 2d and 6th. As in July, the month was decidedly deficient in rainfall. The first fifteen days were practically rainless, and though the remainder of the month was more or less showery, the amounts deposited were generally so small as to be of little value from an agricultural standpoint. Thunderstorms and fogs were frequent, and hail occurred on the 7th and 22d.

Prevailing wind direction, W.

SEPTEMBER was 3.8° warmer than normally, due to a continuation of the heated conditions of the two preceding months. There was, however, a gradual abatement of the intensely hot weather until the 14th, when it was permanently broken by the advent of a cool wave, which crossed the country in the wake of the tropical storm that caused such immense destruction at Galveston, Tex., on the 8-9th. It produced light frosts at some of the elevated stations in the Valley section, and was preceded by general rains in the State, which greatly relieved the extremely droughty conditions then prevailing. From the 15th to the close of the month moisture was ample, the total amount received being about one inch in excess of the normal. Light frost occurred on the 18th, and thunderstorms were frequent.

Prevailing wind direction, W.

OCTOBER was 3.2° warmer than the average of the three preceding Octobers. There were no unusually warm days, however, the excess noted being more the result of continued mild weather than of periods of decided heat. The maximum for the month was 93°, on the 6th, and the minimum 26°, on the 17th and 18th. In the western two-thirds of the State the precipitation occurring was quite well distributed, slightly above the normal and amply sufficient for all crop purposes; but in the Tidewater division it was deficient and poorly distributed. The first eight days of the month were showery, and on four of them, the 1st to 3d, and the 8th, general rains fell. Thereafter the month was, in the main, dry. Considerable fog prevailed in the early mornings over low lands and along river courses. Killing frosts occurred in all sections

between the 10-21st, and there were a number of thunderstorms reported.

Prevailing wind direction, NE.

NOVEMBER was mild, with much bright, sunny weather. The departure from the normal temperature was +4.1. The first and last decades gave the warmest periods and the second decade the coolest. The highest temperature recorded was 83° on the 20th and 23d, and the lowest 12° on the 16th. Generally abundant and well-distributed rains occurred. In the Valley and Tidewater divisions the amount deposited was above normal, while in the Middle division it was below normal, but not sufficiently so to be detrimental to crop growth. The first snow of the season occurred on the 8-9th, and ranged in depth from trace to 4 inches. Freshet water prevailed in the James river as a result of the rains of the 25-26th. Flood warnings covering it were issued well in advance, and no damage occurred. Thunderstorms occurred on various dates, and killing frosts were frequent.

Prevailing wind direction, W.

DECEMBER averaged 1.9 degrees colder than normally. During the first ten days the temperature was about normal;

from the 11th to 17th it was below normal from 5 to 12 degrees, and during the last fourteen days it fluctuated from slightly above to slightly below normal. There were no marked departures, and the deficiency noted resulted from an extended period of moderately cold weather. The month was bright, there being an average of 22 clear or partly cloudy days. The precipitation of the month was below normal. There were six days with general and well-distributed rains, and other days on which there were scattered showers. Snow occurred in the Middle and Valley divisions and in the western portion of the Tidewater division on the 20-21st, the amounts deposited ranging from trace to 7 inches. There were a number of foggy mornings and some foggy nights. A thunderstorm occurred on the 23d.

Prevailing wind direction, W.

REMARKS ON FRESHET TABLES.

The accompanying tables, showing flood heights and rate of flood travel in the James river, have been given in this

report in pursuance of a plan which has for its end the collection and preservation in a permanent and accessible form of all matter relating to the floods of this stream. In previous annual reports some space has been devoted to an elementary consideration of the same subject, and the data now given are only to be considered as supplementary thereto. There are many questions arising with almost every freshet that are deserving of thought and of study to a conclusion, and it is with the expectation that these tables will prove to have a value in determining these questions that they are reproduced. It is unfortunate that the importance of detailed information of each flood was not recognized many years before it appears to have been, and that when recognized a more determined effort was not made to keep it complete from year to year. Work of this nature is necessarily largely voluntary work, and hence the thoroughness of its performance depends upon the amount of personal interest each co-operating individual has. It is, doubtless, owing to the importance of the work being not understood that the record at a number of points is of so fragmentary a nature as to be well nigh useless for the purposes of reference or study.

But nevertheless it is given, not only to preserve it in whatever measure of completeness it does possess, but also in the hope that at some future day it may be added to by some more persevering mind, and thus aid in securing the object for which it was begun. The problems connected with freshets in all of our great rivers are possessed of absorbing interest: the conditions precedent particularly so.

The Weather Bureau, by the thoroughness of its methods, has solved many of these problems, and has perfected a flood warning system that is of immense value to the people in times of high water. A notable instance of this may be found in the great flood occurring in the lower Mississippi valley in the spring of 1897, when all forecasts of expected flood-heights were verified on the days named with astonishing accuracy. Truly, if the guarantee for the future lies in the progress of the past, we shall at no distant day find in this a work of noble and impressive proportions.

In the Richmond district the Chief of the Bureau has authorized the establishment of two additional special rainfall-reporting stations during the year, viz., Buena Vista and Clifton Forge.