

# MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE.

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## INTRODUCTION.

The present Summary for 1900 is based essentially upon data received from about 160 regular stations, 28 regular Canadian stations, and a number of voluntary stations whose annual summaries were received in time. A revised chart of total annual precipitation will be published in the Annual Report of the Chief of the Weather Bureau when the data from all voluntary stations have been received. The statis-

tical tables and charts have been prepared under the supervision of Prof. A. J. Henry, Chief of the Division of Meteorological Records. The tables of movements of high and low areas and the summary of flood movements have been prepared by Dr. H. C. Frankenfield, Forecast Official.

Annual summaries were not received from all West Indian stations in time for use in this report.

## FORECAST DIVISION.

Prof. E. B. GARRIOTT, in charge.

### HIGHS AND LOWS OF 1900.

The high and low data for the year 1900 have been compiled under the general plan in use since 1895, and, with the exception of an increase in the velocity of movement during the winter months, they differed very slightly in their general features from those of the preceding five years.

The tables herewith give the summary for each month of the year 1900, and likewise a summary for the six years from 1895 to 1900, inclusive.

Summary of highs and lows, 1900.

Month.	Highs.						Lows.							
	Mean first observed.		Mean last observed.		Path, average.		Hourly velocity.	Mean first observed.		Mean last observed.		Path, average.	Hourly velocity.	
	Lat. N.	Long. W.	Lat. N.	Long. W.	Length.	Duration, days.		Lat. N.	Long. W.	Lat. N.	Long. W.			Length.
Jan.....	46	110	41	72	2,884	3.6	33.2	46	108	46	71	2,266	3.6	37.0
Feb.....	48	108	41	81	2,017	3.0	29.5	43	111	45	78	2,520	3.1	37.3
Mar.....	48	107	40	81	1,790	2.5	30.4	42	108	43	67	2,574	3.3	35.6
Apr.....	42	108	44	92	1,469	2.5	26.9	43	106	47	86	2,217	3.9	23.1
May.....	43	104	39	82	1,514	2.3	28.9	44	104	45	76	1,781	2.4	30.3
June.....	43	113	42	67	2,825	4.3	37.9	46	107	44	72	2,193	4.7	22.1
July.....	38	112	46	75	2,043	3.5	33.9	48	110	47	74	2,087	3.2	29.2
Aug.....	49	100	45	71	1,619	3.2	23.0	46	100	45	71	1,581	2.6	26.0
Sept.....	49	113	46	66	2,712	4.4	35.3	40	104	48	66	2,935	5.4	24.5
Oct.....	45	112	42	67	2,790	4.6	27.0	42	106	47	83	1,639	2.8	26.5
Nov.....	47	108	40	73	2,324	3.2	29.3	45	100	43	70	1,781	2.8	27.7
Dec.....	46	103	39	73	1,882	3.1	27.3	44	110	43	64	2,799	3.7	34.1
Means..	46	108	42	75	2,147	3.4	27.7	44	106	45	73	2,198	3.4	29.0

Summary, 1895 to 1900, inclusive.

Year.	Highs.					Lows.				
	Mean first observed.		Mean last observed.		Hourly velocity.	Mean first observed.		Mean last observed.		Hourly velocity.
	Lat. N.	Long. W.	Lat. N.	Long. W.		Lat. N.	Long. W.	Lat. N.	Long. W.	
1895.....	47	110	39	80	25	45	107	45	79	28
1896.....	48	111	42	75	24	46	111	46	78	28
1897.....	48	113	38	78	24	46	110	46	78	28
1898.....	46	114	39	84	24	45	111	46	78	28
1899.....	47	114	41	72	25	44	111	46	77	27
1900.....	46	108	42	73	24	44	108	45	73	28
Mean ..	47	112	40	75	25	45	109	46	71	27

H. C. Frankenfield, Forecast Official.

## RIVER AND FLOOD SERVICE.

During the year the River and Flood Service has been steadily extended and improved. Eight new special river stations were established and one discontinued. Eleven special rainfall stations were also established and one discontinued. Twelve river gages were installed during the year and many others put in thorough repair. Telegraphic service was extended to many places along the great rivers, and numerous business interests, especially those pertaining to river navigation, now enjoy the benefits of improved service not formerly attainable. The flood service was extended into Texas by the inauguration in August of the Brazos River

Flood Service. Stations of observations are now in operation at Kopperl and Waco, Tex., and others will be added in the near future. The headquarters of this district are at Galveston, Tex.

The great floods of the year were those of February in the Atlantic States, particularly in New England and eastern New York, those of April in the east Gulf States, and the extremely disastrous ones of April and May in Texas. Detailed accounts of these floods can be found in the MONTHLY WEATHER REVIEW for those months.

It is gratifying to add that the high standard of accurate flood forecasting which has been characteristic of the service during previous years was uniformly maintained throughout the present year.

It is true that the reported losses by flood, about \$12,000,000, were enormous, but they were such as could not have been avoided, and it is equally true that the value of property saved by the warnings of the Weather Bureau amounted in the aggregate to several millions of dollars, according to the estimates received.

The highest and lowest river stages for the year at 123 selected river stations are given in Table VIII.—*H. C. Frank-enfield, Forecast Official.*

#### MONTHLY CHARACTERISTICS.

*January.*—The month for the most part was warm and dry. Low temperatures prevailed east of the Rocky Mountains from the 1st to the 5th, but from that date until the 25th a number of lows, first appearing on the weather map over the North Pacific coast and the Southwest, respectively, moved across the country in rapid succession, giving abnormally warm weather in almost all districts. From the 25th until the end of the month several moderate cold waves moved southeastward from Assiniboia carrying the line of freezing temperature to the east Gulf coast and northern Florida on the 30th of the month.

The minimum temperatures of the month were generally recorded from the 1st to the 3d and from the 26th to the 31st. No very severe cold waves occurred.

The rainfall on the California coast was light and scattered after the 8th, and the month as a whole gave less than the normal amount.

The snowfall was light in all districts and quickly disappeared. Less than an inch fell during the entire month over probably two-thirds of the total area of the United States. At the end of the month there was no snow upon the ground east of the Rocky Mountains, except in the Ohio Valley, the Lake region, New England, and a portion of the Middle States.

*February.*—A wintry month, with much boisterous weather, yet not so severe as the corresponding month a year ago. There were a number of alternating periods of fair and stormy weather, and many marked temperature changes. In New England the heavy rains of the 13th relieved a rather severe and prolonged drought and caused the rivers and small streams to pass to a flood stage within a very short time.

A cold wave of considerable severity moved southeastward from the northeastern Rocky Mountain slope on the 15th, reaching the Florida Peninsula on the morning of the 18th and Cuba and Porto Rico on the 19th and 20th. The minimum temperatures of the month in the South Atlantic and Gulf States were recorded during the progress of the cold wave.

About the average amount of snow fell, except in California and the southwestern part of the Plateau region.

*March.*—The weather of the current month east of the Rocky Mountains was for the most part cold and disagree-

able. In the Gulf States and Florida there was much rain but no abnormally low temperatures. West of the Rocky Mountains it was warmer than usual, with less than the normal amount of rain, except on the coasts of Washington and Oregon. Less than the average amount of snow fell in all districts, except the lower Lake region, the upper Missouri Valley, and northern New England. The number of thunderstorms and severe local storms was remarkably small.

*April.*—The weather for April, 1900, was abnormal in several respects. The precipitation in the Gulf States, on the Plains south of and including Nebraska, in Colorado, Wyoming, Utah, and Nevada was unusually heavy. Indeed, more rain fell in eastern Colorado in the single month of April than generally falls in twelve months. Much of the precipitation in the mountainous portions of Colorado and Wyoming was in the form of snow, which, however, largely disappeared before the end of the month.

Severe and destructive floods occurred in several of the Gulf States. In the Lake region fine weather prevailed for the most part.

The month was free from destructive storms, although minor tornadoes occurred in several States. Thunderstorms were more numerous than for the corresponding month in 1899.

Interlake navigation opened on the 18th, and boats reached the head of Lake Superior by the 22d, about a week earlier than last season. At the opening of navigation on Lake Superior there was considerable field ice at both ends of the lake. The fields in the western end had disappeared by the 30th, but broken fields still remained in the eastern portions of the lake at the end of the month. Considerable field ice also remained in the eastern portion of Lake Erie at the close of the month.

*May.*—Atmospheric pressure was considerably lower than usual over practically the whole country. High temperatures prevailed, especially in the upper Missouri Valley, where maximum values from 100° to 105° were registered. The monthly mean temperature over a very large area was much above the seasonal average. The region of abnormally high temperatures extended from the lower Lakes in a continuous line westward to near the Pacific coast and southward to about the thirty-sixth parallel of latitude. In parts of this area the rainfall was scant, and the staple crops suffered accordingly; in other portions the rainfall was sufficient for all needs. General rains fell in California during the first part of the month; during the latter half of the month there were no rains to speak of. Elsewhere on the Pacific coast the rainfall was from 1 to 2 inches above the normal.

The month was rather free from destructive local windstorms and thunderstorms.

*June.*—The chief characteristics of June weather were (1) an unusual persistence of areas of high pressure in the Lake region, giving northerly winds and cool weather; (2) heavy rains and excessively cloudy weather in the east Gulf States and Tennessee, the western part of Virginia, and the District of Columbia; (3) high temperatures west of the one hundredth meridian; and (4) absence of severe local storms and tornadoes.

*July.*—No severe storm of a general character appeared in the United States or the West Indies in July, 1900.

During the early part of the month local rains and thunderstorms occurred from the States of the Missouri Valley over the Lake region, New York, and northern New Jersey. On the 13th an extraordinary fall of rain occurred at Galveston, Tex., a depth of 14 inches being recorded in twenty-four hours, of which amount 3 inches fell in sixty minutes. Heavy rain fell in Texas on the 15th, and in the valley of Guadalupe River damage was caused by freshets. On the same day rains broke a prolonged period of drought and high

temperature in the Western and Northwestern States, and during the next few days the conditions which caused these rains extended eastward to the Atlantic coast and ended a heated term of unusual intensity and duration in the Lake region, the Ohio Valley, and Middle Atlantic States. During the 24th needed rain fell over a large area in the Central Western States.

*August.*—The month was characterized by general stagnation in the lower layers of the atmosphere. East of the Rocky Mountains and north of the Gulf States the weather was abnormally warm, the monthly mean temperature surpassing, in many instances, those registered in tropical countries. The skies were generally free from clouds, especially at night, and rainfall was deficient over large areas east of the Mississippi. In Nebraska, the Dakotas, Minnesota, northern Wisconsin, and portions of Iowa an abundance of rain fell. West of the Rocky Mountains temperature was below the seasonal average, and rainfall was also below normal. Drought prevailed in Arizona, portions of New Mexico, Colorado, and Wyoming.

There was a marked absence of violent local storms and destructive tornadoes, and the highs and lows, while following beaten paths, moved very slowly.

*September.*—Aside from the West Indian hurricane which partially destroyed Galveston, Tex., on the 8th, an account of which was given in the September REVIEW, there were few broad features of especial significance. Perhaps the most significant was the high pressure that prevailed on the middle and south Atlantic coasts and over Virginia, West Virginia, and the Ohio Valley. The weather east of the Rocky Mountains, at least, if not over the entire country, is controlled largely by the distribution of pressure over the Atlantic coast districts. When areas of high pressure persist over those districts areas of low pressure which develop in Alberta or over the northeastern Rocky Mountain slope and move southeastward into the Missouri Valley are forced to move thence a little east of north, passing over Minnesota and Lake Superior and thence eastward generally beyond the field of observation. The effect of the pressure distribution in such cases is to give heavy rains in the British Northwest, Minnesota, and the Lake Superior region, and high temperature with scant rains in the Mississippi Valley, the Lake region south of Lake Superior, and generally eastward to the Atlantic. The fall of rain in the South Atlantic States is also markedly deficient, while far to the westward in Oklahoma, Indian Territory, west Texas, and New Mexico the rainfall is abundant. These conditions prevailed, in great measure, during the current month.

The temperature was abnormally high in eastern districts until about the 12th. The rapid movement of the West Indian hurricane from Iowa to the Canadian Maritime Provinces, on the 11–12th, brought a cessation of the high temperatures that had prevailed almost continuously since the early part of August, yet the month, as a whole, will rank as a warm September.

*October.*—In many respects the weather of the month was typical of summer conditions. The circulation of the air was generally feeble, temperatures were above the seasonal averages, and the rainfall was abundant in the majority of districts. A number of areas of low pressure formed in the Plateau region or moved in from the north Pacific, only to

dissipate in the upper Mississippi and Missouri valleys. It was eminently a month of inaction on the part of the lows. Two areas of high pressure of marked character moved across the country. The first appeared over the northern Plateau region on the morning of the 6th, moved to the middle Rocky Mountain region by the morning of the 7th and to the Mississippi Valley by the morning of the 8th. The second appeared north of Montana on the morning of the 15th, moved to the upper Mississippi Valley by the morning of the 16th and to the New England coast during the next twenty-four hours. This extremely rapid movement was doubtless due in part to the sudden development of an area of low pressure over eastern New England on the 16th.

The distinguishing characteristics of the month were (1) the sluggishness of the lows; (2) the persistence of areas of high pressure over New England and the Middle Atlantic States; (3) the high temperatures east of the Rocky Mountains and the prevalence of summer weather types.

*November.*—The weather of November, 1900, was rather stormy, in marked contrast to that of October, 1900. The area of high pressure over the eastern seaboard, which has been so marked a feature in the pressure distribution of the last four months, gave way early in the month and areas of high pressure began again to move in a southeasterly direction.

The temperature was generally above normal, except in the upper Mississippi Valley and in the extreme Northwest, where the average daily negative departure was from 3° to 6°. Heavy snows occurred in the northern Rocky Mountain districts during the 20th and 21st, but the snowfall elsewhere was comparatively light.

A series of tornadoes occurred in southeastern Arkansas, northern Mississippi, and western and middle Tennessee on the 20th, a special report of which appeared in the November REVIEW.

The distinguishing characteristics of the month were (1) the breaking up of the area of high pressure over the eastern seaboard, (2) a movement of the highs southeastward, and (3) the occurrence of severe tornadoes in the middle Mississippi Valley.

*December.*—The month of December, 1900, was not marked by any severe cold waves or by unusually stormy weather. Mean pressure was in excess of the normal over the central Rocky Mountain and Plateau regions, and also in eastern Tennessee, Georgia, the Carolinas, and Virginia. There were no marked cold waves in the eastern part of the country. West of the Mississippi and north of the thirty-fifth parallel temperature was generally in excess of the normal for the season. Over this same region precipitation was markedly deficient, except on the immediate coast of Washington, where there was an excess of 3 to 5 inches. The month as a whole was drier than usual, except along the immediate Gulf coast and from southern Alabama northeastward to the Carolinas. The chief characteristics were, therefore, (1) high pressure over the central Rocky Mountain and Plateau regions, (2) drought on the Pacific coast south of Washington and a general deficiency of rainfall over the major portion of the country east of the Rocky Mountains, (3) high temperatures and a marked deficiency in snowfall throughout the entire Rocky Mountain and Plateau regions.

## GENERAL CLIMATIC CONDITIONS.

By Prof. ALFRED J. HENRY, Chief of Division of Meteorological Records.

### ATMOSPHERIC PRESSURE.

The numerical values of annual mean pressures for 1900 are given in Tables I and II. The method of reduction to sea

level in use during the year was the same as in former years, with the exception that an appropriate correction for variations in the force of gravity with latitude has been applied