

U. S. DEPARTMENT OF AGRICULTURE  
WEATHER BUREAU

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# CLIMATOLOGICAL SERVICE

DISTRICT No. 9, COLORADO VALLEY

FREDERICK H. BRANDENBURG  
DISTRICT EDITOR

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REPORT FOR JUNE, 1912

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Prepared under direction of WILLIS L. MOORE, Chief U. S. Weather Bureau



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CLIMATOLOGICAL DATA FOR JUNE, 1912.

DISTRICT No. 9, COLORADO VALLEY.

FREDERICK H. BRANDENBURG, District Editor.  
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GENERAL SUMMARY.

For the most part the barometric pressure was low and stagnant during the month. The usual summer thunderstorms attended this condition during the latter part of the first decade, and during the second and third decades they were of frequent occurrence. The precipitation was greater than the June average over most of the district, and a notable feature was the moderately heavy snowfall in the eastern part of the Colorado area about the middle of the month. High winds and sandstorms occurred on various dates in localities in Arizona and New Mexico. Flood conditions obtained in the Colorado and its northern tributaries during the first half of the month. Considerable damage resulted along the Grand and its most important tributary, the Gunnison. Along the Colorado River, between Fort Mojave, Ariz., and Palo Verde, Cal., much damage was done. Warm weather prevailed during the first six days of the month; after the 7th the mean temperature averaged below the normal. At the more elevated stations in Arizona, in localities in northern and central New Mexico, Utah, except the southern portion; Wyoming; and Colorado, except the valley regions, frost or freezing temperature occurred on various dates, more especially between the 16th and 19th, but the damage was immaterial.

TEMPERATURE.

The mean of the 142 stations reporting was 67.9°, or 0.4° below the normal. The mean for June, 1911, was 69.1°. The highest monthly mean was 95.4° at Aztec, Ariz., while the lowest was 38.0° at Corona, Colo. Except in Wyoming and Arizona, the monthly means were below the normal. The small deficiency in the monthly mean temperature for the district as a whole was due chiefly to the warm weather that prevailed during the first week of the month. From the 7th to the close of the month, except in Wyoming, mean temperatures averaged below the normal. In the Colorado area the low temperatures were unusually pronounced from the 15th to the 19th, inclusive. In Wyoming the highest temperatures occurred during the last decade; in the remainder of the district the weather was warmest between the 3d and the 6th. Over most of the Colorado Basin the low temperatures obtained between the 15th and 19th.

Details of temperature are summarized in the following table:

Areas of States in District No. 9.	Temperature.					
	Mean.	Departure from normal.	Highest.	Station.	Lowest.	Station.
Western Wyoming.....	54.8	+2.3	90	Green River..	20	Willow Creek Cabin.
Western Colorado.....	56.5	-2.0	97	Delta.....	15	Chromo.
Eastern Utah.....	65.5	-0.4	104	Springdale...	18	Strawberry Tunnel
						(east) and Scofield.
Western New Mexico.	67.8	-1.0	104	At 4 stations.	27	Berger's Ranch.
Arizona.....	76.5	+0.4	120	Gilabend.....	23	Flagstaff No. 1.
Southeastern Nevada.	73.4	.....	112	Logan.....	38	Caliente.

PRECIPITATION.

The average for the 193 stations reporting was 0.93 inch, or 0.27 inch above the normal. The average for June, 1911, was 1.04 inches. There was a deficiency in the Wyoming and the Utah areas, but on all the drainage basins the averages were above the normal. The precipitation was largely in the form of thundershowers. In the Colorado area, however, snow fell near the Continental Divide from the 15th to the 17th, principally on the 17th. But little rain fell during the first week of the month. In Wyoming and Colorado frequent showers occurred after the 7th. In Utah, New Mexico, and Arizona the precipitation was confined chiefly to the 7th and 8th and the last decade. The greatest monthly amount was 5.66 inches at Redcliff, Colo., while none occurred at 1 station each in Utah and New Mexico, and at 5 in Arizona.

The average number of days with 0.01 inch or more precipitation was 5 in western Wyoming; 9 in western Colorado; 4 in eastern Utah; 5 in western New Mexico; 3 in Arizona; and 1 in southeastern Nevada. For the district as a whole the average was 5 days.

The average precipitation and departures from the normal on the different watersheds are given in the following table:

Watershed.													
Green.		Grand.		San Juan.		Little Colorado.		Gila.		Mimbres.		Colorado proper.	
Average.	Departure.	Average.	Departure.	Average.	Departure.	Average.	Departure.	Average.	Departure.	Average.	Departure.	Average.	Departure.
0.95	+0.06	1.75	+0.68	1.39	+0.30	0.64	+0.14	0.50	+0.22	1.39	+0.28	0.34	+0.14

MISCELLANEOUS.

There was less than the normal sunshine. At Grand Junction it was 73; Durango, 76; Phoenix, 92; and Yuma, 94 per cent of the possible.

The relative humidity was above the normal for the district. The following are the values: Grand Junction, 36; Durango, 52; Phoenix, 28; and Yuma, 40 per cent.

FLOOD IN THE COLORADO.

F. H. BRANDENBURG.

Remarkably high stages prevailed for a short time in June in several of the important tributaries of the Colorado River, and for a somewhat longer period in the trunk stream. This large volume came from the melting of snow, for the most part in the upper reaches of the streams rising in Colorado. The volume contributed by the Green from the more northerly area in Wyoming was relatively small and, fortunately, came after the crest had passed in the more southerly tributaries. The Gunnison, which had reached a very high stage during the warm spell in

the last decade of May, principally owing to the large volume contributed by the North Fork, draining a relatively low mountain region, rose again early in June, but did not reach so high a stage as in May. The warm spell that brought on this second rise began on the first of the month and lasted till the 7th. Its influence extended to the highest levels, causing a rapid melting of snow in the upper reaches of the Gunnison, the Grand, and in the White and Yampa, important tributaries of the Green in Colorado.

While the stages reached in the main tributaries were practically as high as during the freshet three years ago, they were not sustained for so long a time. That stages much out of the ordinary should have occurred is due principally to the long period of cold that kept melting in check until late in the season. In the Gunnison the maximum stage at Sapinero, 19 feet, and at Delta, 11.3 feet, occurred on the 5th, while at Grand Junction 10.5 feet was attained on the following day. In the upper reaches of the tributaries of the Grand the maximum stage at Eagle, on the Eagle, 5.3 feet, occurred on the 6th; at Carbondale, on the Roaring Fork, 6.5 feet, on the 5th. The highest stage on the Grand at New Castle was 14.2 feet, on the 9th and 10th, and at Grand Junction 11.8 feet, during the night of the 9th-10th. At Fruita, however, below the junction of the Grand and Gunnison, the highest stage, 14.4 feet, occurred on the 7th. The previous highest stage at this station was 15 feet, in June, 1909. The Green at Elgin, Utah, reached the maximum stage of the season, 14 feet, on the 9th and 12th. In June, 1909, the year of very high water, the maximum stage at Elgin was 15.1 feet. The maximum stage in the San Juan at Farmington, N. Mex., was 7.9 feet, on the

6th. In the Colorado proper, at Grand Canyon, Ariz., a stage of 64 feet occurred on several days in the beginning of the second decade. At Topock, near Needles, the highest stage was 21.1 feet, on the 16th, and at Yuma, 29 feet, on the 22d. At Hite, Utah, in Glen Canyon, above the San Juan, Mr. Hite states the Colorado on the 13th reached the highest point known at that place. The river was about 10 inches higher than the highest point reached in June, 1884.

Along the tributaries of the Colorado the damage done was principally to bridges, roads, headgates of ditches, and by erosion, and in the aggregate it was considerable. On the trunk stream the damage was widespread owing to the breaking of dikes and the flooding of farm lands, principally on the Arizona side, above Needles. On the morning of the 3d the levee, approximately 20 miles long, protecting about 200,000 acres of land north of Needles, broke, and the entire upper Mojave Valley was put at the mercy of the flood. A conservative estimate places the loss at more than \$175,000. Along the river front at Needles the damage was over \$25,000. Information from Palo Verde, Cal., is to the effect that the entire valley was inundated. The loss in live stock was considerable, but the great loss was to growing crops. Much hay and grain were swept away, and the alfalfa is dead from being under water. Many families lost all, houses included. In the country covered by the Yuma irrigation project the damage to land, crops, and prospective sale value of the land may amount to \$100,000.

Timely and accurate warnings of the high stages were sent localities likely to sustain damage. For the lower reaches of the trunk stream these warnings were issued 10 to 15 days in advance.

TABLE 1.—Climatological data for June, 1912. District No. 9, Colorado Valley.

Stations.	Counties.	Elevation, feet.	Length of record, years.	Temperature, in degrees Fahrenheit.						Precipitation, in inches.				Sky.				Prevailing wind direction.	Observers.	
				Mean.	Departure from the normal.	Highest.	Date.	Lowest.	Date.	Greatest daily range.	Total.	Departure from the normal.	Greatest in 24 hours.	Total snowfall, unmelting.	Number of rainy days, 0.01 inch or more.	Number of clear days.	Number of partly cloudy days.			Number of cloudy days.
<b>Wyoming.</b>																				
Battle Mountain	Carbon	7,300																		U. S. Forest Service.
Daniel	Uinta	6,740	13	52.8	+ 2.3	81	28	26	15	44	0.30	- 0.74	0.15	T.	2	14	15	1	nw.	J. M. Vandervoort.
Eden	Sweetwater	6,577	3	56.8		83	24†	27	16	46	0.84		0.30	T.	8	11	12	7	w.	Eden Valley L. & I. Co.
Green River	do.	6,083	7	59.7		90 <sup>a</sup>	24	25	16	45 <sup>a</sup>	0.27		0.10	0	5	7	16	7	w.	Geo. H. Maxom.
Pinedale	Fremont	7,167	6	54.2		83 <sup>b</sup>	21†	25 <sup>b</sup>	15†	50 <sup>b</sup>	0.16		0.12		4	15 <sup>b</sup>	13 <sup>b</sup>	0 <sup>b</sup>	nw.	U. S. Forest Service.
Rambler	Carbon	9,232	1																	Do.
Willow Creek Cabin	Fremont	7,509	3	50.6 <sup>1</sup>		76 <sup>1</sup>	21†	20 <sup>1</sup>	15	41 <sup>1</sup>						11 <sup>1</sup>	5 <sup>1</sup>	5 <sup>1</sup>	nw.	Do.
Big Piney	Uinta																			Ira Dodge.
<b>Colorado.</b>																				
Ashcroft	Pitkin	9,483	10	49.2	- 2.2	76	5	23	18	43	2.77	+ 1.38	1.30	13.0	16					Dan McArthur.
Breckenridge	Summit	9,536	23	46.1	- 2.2	70	6†	24	19	41	1.54	+ 0.48	0.53	T.	7	2	14	14	nw.	Mrs. J. G. Thompson.
Buford	Rio Blanca		1										0.34	0	10	14	11	5	w.	Mrs. H. Genier.
Cascade	San Juan	8,900	5								4.11		0.80	0	15	11	7	12		San Juan W. & P. Co.
Cedaredge	Delta	6,175	14	62.4	- 2.3	86	6	35	16	39	0.46	- 0.05	0.18	0	4	14	15	1		Harry A. Cobbett.
Chromo	Archuleta	7,509	6	54.8		86	4	15	3	70	1.37		0.60	0	8	16	4	10	sw.	Lawrence Nolan.
Cochetopa	Saguache	9,088	3								1.32		0.25	2.0	9	4	9	17	w.	Bessie McDonough.
Collbran	Mesa	6,000	19	60.6	- 2.0	85	6	35	16†	37	0.98	+ 0.32	0.25	0	13	14	14	2	sw.	A. A. Wood.
Columbine	Routt	8,766	2								1.05		0.30	0	6	14	13	3	sw.	Mrs. M. A. Caron.
Columbine Ranch	Delta	6,925	2								1.35		0.45	T.	0	8	15	7	sw.	George W. Wade.
Corona	Grand	11,660	5	38.0		56	26	20	16†	22	2.90		0.80	18.0	5	5			sw.	U. S. Weather Bureau.
Craig	Moffat		2																	Joseph F. Haubrich.
Crawford (near)	Montrose	6,600	2	59.2		81	5†	32	16†	34	2.22		0.53	T.	14	15	12	3		C. W. Roe.
Crested Butte	Gunnison	8,867	2	48.4		74	5†	20	18	46	2.06		0.80	10.0	10	7	12	11	w.	Charles L. Ross.
De Beque	Mesa	4,935	3	67.4 <sup>1</sup>		94 <sup>1</sup>	6	36 <sup>1</sup>	17	48 <sup>1</sup>					10 <sup>1</sup>	6 <sup>1</sup>	5 <sup>1</sup>		w.	H. M. Quigley.
Delta	Delta	4,965	22	65.6	- 2.3	97	6	34	18	51	0.26	- 0.06	0.10	0	5	15	12	3	sw.	E. M. Getts.
Dillon	Summit	8,800	2	47.4		75	6	22	19	46	1.86		0.70	T.	6	11	9	10	n.	Harry T. Hamilton.
Durango	La Plata	6,534	17	60.6	- 2.1	87	4	36	18	44	0.89	+ 0.11	0.26	0	10	9	20	1	nw.	U. S. Weather Bureau.
Eureka	San Juan	10,000	5								1.34		0.40	4.0	6	12	0	18	sw.	San Juan W. & P. Co.
Fraser	Grand	8,560	3	46.2		72	5	22	19	48	1.58		0.40	0.5	8	3	9	18	w.	L. D. C. Gaskill.
Fruita	Mesa	4,510	13	67.0	- 1.6	95	6	35	16	51	0.20	- 0.11	0.19	0	2	14	14	2	se.	J. E. Wilsea.
Glade Park	do.	7,000	1								0.28		0.13	0	4				sw.	A. F. Terrill.
Gladstone	San Juan	10,400	5																	San Juan W. & P. Co.
Glenwood Sp'gs (near)	Garfield	5,823	14	58.4	- 3.1	84	3	32	1	48	0.60	- 0.08	0.30	0	2	24	5	1	w.	E. A. O'Neil.
Grand Junction	Mesa	4,608	21	69.6	- 3.0	94	6	43	16	39	1.37	+ 0.97	1.13	0	9	12	11	7	sw.	U. S. Weather Bureau.
Grandlake	Grand	8,153	2								3.30		1.20	2.0	9	11	13	6	w.	Mrs. Belle Kauffman.
Grand Valley	Garfield	5,089	20	63.8	- 2.4	93	5†	32	18	55	0.81	+ 0.22	0.23	0	9	9	11	10		David Evans.
Gunnison	Gunnison	7,670	19																	Clarence Adams.
Hesperus (near)	La Plata	7,610	0								1.51		0.60	0	8	9	10	11		G. F. Snyder.
Horsely	Montrose	8,700	2								1.86		0.48	0.5	8	14	14	2	sw.	Lawrence J. Finch.
Ironton	Ourray	10,000	2								2.25		0.39	4.4	11	8	11	11	sw.	Mrs. Amanda E. Foley.
Lake City	Hinsdale	8,686	7	53.0		77	6	26	16	41	2.69		0.66	4.5	16	8	9	13	sw.	J. F. Maurer.
Lay	Moffat	6,190	18	57.2	- 2.2	83	24†	25	18	51	1.24	+ 0.61	0.66	0	8	11	7	12	s.	A. G. Wallihan.
Mancos	Montezuma	6,960	13	60.0	- 0.3	86	3	29	18	46	1.46	+ 0.58	0.81	0	6	12	17	1	sw.	B. M. Krumpantzky.
Marble	Gunnison	7,951	3	52.9		80	5	25	18	43	2.56		0.67	3.0	10	19	7	4	nw.	F. E. Morse.
Marshall Pass	Saguache	10,846	9								3.32		0.72	8.0	11	13	5	12		Wm. L. Williams.
Meeker (near)	Rio Blanca	6,182	20	56.6	- 2.8	81	5†	28	18	49	2.01	+ 0.98	0.65	0	12	13	12	5	sw.	T. Baker.
Montrose	Montrose	5,811	23	64.8	+ 1.0	91	4	34	16	42	1.31	+ 0.99	0.32	0	9	11	16	3		U. S. Reclamation Service.
Nast	Pitkin	7,953	2	50.0		76	5	28	18†	45	1.75		0.70	12.0	7	12	11	7	w.	Arthur Hanthorn.
Pagoda	Routt	6,500	21																	Mrs. J. W. Scott.
Pagosa Springs	Archuleta	7,108	5	56.6		88	4	24	18	59	1.46		0.47	0	8	10	17	3	sw.	E. T. Walker.
Paonia	Delta	5,694	17	63.8	- 3.1	90	5	38	18	41	0.80	- 0.39	0.42	0	3	12	17	8	sw.	M. M. Underwood.
Pitkin	Gunnison	9,500	3								1.80		1.13	8.0	0	12	10	8		Mrs. Maggie Canmann.
Pyramid	Rio Blanca	7,610	1	53.0		79	5	27	18	45	1.84		0.43	T.	9	9	20	3	w.	E. E. Ery.
Rangely	do.	5,050	13	62.6	- 1.0	95	6	34	2†	54	0.70	+ 0.17	0.40	0	3	14	8	8	w.	J. H. McGuire.
Red Cliff	Eagle	8,695	19								5.66	+ 4.55	1.30	16.3	14	10	11	9		Dorothea Greiner.
Redvale	Montrose										0.98		0.37	0	5					E. S. C. Foster.
Rico	Dolores	8,824	10																	Clinton B. Smith.
Rifle	Garfield	5,437		64.1		90	3	35	18	46	0.48		0.14	0	6	13	14	3	nw.	Hermann Eiche.
River Portal	Montrose	6,570	6	60.6		87 <sup>b</sup>	3	33 <sup>a</sup>	18	45 <sup>b</sup>	2.29		0.48	0	10	12 <sup>a</sup>	10 <sup>a</sup>	7 <sup>a</sup>	sw.	U. S. Reclamation Service.
Sapinero (near)	Gunnison	8,125	9	51.2		75	6	25	18	41	2.40		0.92	6.5	16	14	9	7	w.	W. F. Irving.
Shoshone	Garfield	6,110	2																	Central Colorado P. Co.
Silverton (near)	San Juan	9,400	5	47.5		72	3†	21	28	47	4.22		0.80	7.5	12	9	9	12	sw.	San Juan W. & P. Co.
Spruce Lodge	Grand	9,600	4								4.22		0.80	10.0	18	6	18	6	w.	H. J. Willis.
Steamboat Springs	Routt	6,683	9	52.8		80	5†	23	21	51	2.66		0.58	0	9	18	8	4		Herbert B. Gee.
Tacoma	La Plata	7,300	5								1.84		0.45	0	10	5	12	13	s.	San Juan W. & P. Co.
Telluride	San Miguel	8,756		51.0		77	3	25	16†	48	2.62		0.54	4.6	17	12	9	9	w.	Wm. T. March.
Terminal Dam	La Plata	8,300	5								2.02		0.29	0	12	16	5	9	sw.	San Juan W. & P. Co.
Uncompahgre Plateau	Montrose	8,400	2								0.86		0.30	0	4	9	21	0	sw.	Martin Esser.
Yampa (near)	Routt	8,000	3								1.99		0.53	0	11	8	17	5		Percy A. Hughes.
<b>Utah.</b>																				
Aneth	San Juan	4,800	8	73.8		96	4†	46	1†	44	0.02		0.02	0	1	24	4	2	w.	H. R. Antes.
Bluff	do.			76.1		97	5	55	2†	37	0.02		0.02	0	1	13	6	1		Mrs. H. P. Ruplee.

TABLE 1.—Climatological data for June, 1912. District No. 9—Continued.

Stations.	Counties.	Elevation, feet.	Length of record, years.	Temperature, in degrees Fahrenheit.						Precipitation, in inches.					Sky.				Prevailing wind direction.	Observers.
				Mean.	Departure from the normal.	Highest.	Date.	Lowest.	Date.	Greatest daily range.	Total.	Departure from the normal.	Greatest in 24 hours.	Total snowfall, unmelting.	Number of rainy days, 0.01 inch or more.	Number of clear days.	Number of partly cloudy days.	Number of overcast days.		
<i>Utah—Continued.</i>																				
Loa.....	Wayne.....	7,000	18																	W. S. McClellan.
Manila.....	Uinta.....	6,225																		Daniel M. Nelson.
Moab.....	Grand.....	4,000	22	71.8	- 0.3	101	6	39	17	49	0.83	+ 0.58	0.18	0	7	8	20	2		Henry Crouse.
Monticello.....	San Juan.....	7,545	3	60.6		81	6	35	16	31	1.17		0.40	0	5	8	19	3	sw.	Geo. F. Barton.
New Harmony.....	Washington.....																			Geo. F. Prince.
Orderville.....	Kane.....	6,660									0.31		0.13	0	3					F. A. Porter.
Pine Valley.....	Washington.....	6,000									1.37		0.85	0	4	22	4	4	se.	Mason Gardner.
Price.....	Carbon.....	5,557	1	66.2		91	4	33	16	46	0.14		0.14	0	1	16	13	1	w.	R. H. Thompson.
Ranch.....	Kane.....	6,700	9	56.8		85	4	30	17	45	1.37		0.07	0	4	12	11	1	nw.	J. W. Seaman.
San Rafael.....	Emery.....										0.07		0.07	0	1	18	11	1		W. C. Foy.
St. George.....	Washington.....	2,880	25	74.4	- 2.1	103	4	47	2	51	0.72	+ 0.65	0.62	0	4	12	13	5		A. B. Ballantyne.
Scoville.....	Carbon.....	7,625	2	52.4		80	6	18	18	55	0.95		0.29	0	8	17	4	9	s.	B. Newren.
Springdale.....	Washington.....	3,500	4	83.4		104	4†	55	10	37	0.00		0.00	0	0	19	3	8		Hattie Wood.
Strawberry Tunnel—East.	Utah.....		49	49.9		76	20	18	16	48	1.22		0.30	0	6	7†	9†	2†		U. S. Reclamation Service.
Sunnyside.....	Carbon.....	5,280	7																	A. Rader.
Teasdale.....	Wayne.....	7,000	2	58.6		83	3†	34	16	39	0.06		0.05	0	2	7	11	12	w.	Henry Cullum.
Thompsons.....	Grand.....	5,150	1	69.3†		93	4†	40	17	36	0.56		0.12	0	3	14†	8†	0†	sw.	A. M. Starbom.
Tropic.....	Garfield.....	7,000	15	62.6†	+ 1.1	90†	3	38†	30	44	0.21	- 0.20	0.07	0	1	10†	13†	1†	sw.	E. P. Bolton.
Trottercreek Ranger.....	Uinta.....	9,200									1.87		0.35	0	12	6	15	9	sw.	Forest Supervisor.
Vernal.....	do.....	5,050	15	63.3	- 2.6	89	2†	27	16	49	0.03	- 0.33	0.03	0	1	25	5	0		S. P. Trim.
White Rocks.....	do.....										0.48		0.17	0	8	8	5	17		C. F. Keil.
Woodside.....	Emery.....	4,645	1	68.0		95	4	36	17	50	0.38		0.30	0	2	12	13	5	s.	D. P. Adams.
<i>New Mexico.</i>																				
Alma.....	Socorro.....	5,500	15	69.2	- 0.2	98	3†	41	1†	57	2.59	+ 2.05	1.30	0	7	5	25	0	sw.	M. A. Balke.
Aragon.....	do.....		5	62.6		88	4	40	1†	45	2.00		1.15	0	6	13	15	2	sw.	John R. Milligan.
Aztec.....	San Juan.....	5,590	12								+ 0.16		0.22	0	6	13	15	2	sw.	Dr. T. J. West.
Berger's Ranch.....	McKinley.....	8,000	3	56.6		85	3†	27	18	49	1.38		0.37	0	9	15	11	4	w.	Herman Berger.
Blackrock.....	do.....	6,500	3	65.2		96	4†	39	17	44	0.56		0.30	0	8	8	7	15	w.	D. Blackwater.
Bloomfield.....	San Juan.....	5,500	17	67.2	- 0.9	96	5	37	1†	52	0.92	+ 0.47	0.51	0	3	9	20	1	sw.	Fred LeClere.
Cambrey.....	do.....	4,215	15			104	5	5			1.04	+ 0.42	0.40	0	6	7	13	10	e.	Agent So. Pac. R. R.
Cliff.....	Grant.....	4,470	12	76.6	+ 2.4	104	4	53	24		+ 0.71		1.00	0					sw.	W. C. Belden.
Columbus.....	Luna.....	4,054	3			104	5				0.10		0.10	0	1	21	3	6	sw.	Agent E. P. & S. W. R. R.
Deming.....	do.....	4,333	35	76.2		102	6	45	18	50	0.88	+ 0.28	0.88	0	1	27	2	1	w.	Agent So. Pac. R. R.
Dulce.....	Rio Arriba.....	6,756	15																	F. E. James.
Fort Bayard.....	Grant.....	6,152	37	68.8	- 2.3	92	3	49	18	39	1.80	+ 1.01	0.68	0	10	19	6	5	w.	U. S. General Hospital.
Frutland.....	San Juan.....	4,800	18	67.0	- 1.4	92	4	37	18	50	0.32	+ 0.16	0.30	0	2	17	13	0	sw.	Cyril J. Collyer.
Gage.....	Luna.....	4,486	12	72.6		102	12†	40	2†	53	0.00	- 0.61	0.00	0	0	20	1	9	w.	Agent So. Pac. R. R.
Gila Planting Station.....	Grant.....	6,475	1	67.8		92	3†	48	18†	3†	1.58		0.66	0	10	15	15	0	sw.	U. S. Forest Service.
G. O. S. Ranch.....	do.....	8,000									T.		T.	0	0	24	4	2	sw.	Victor Culberson.
Hachita.....	do.....	4,504	3			104	4†							0	0	24	4	2	sw.	Agent E. P. & S. W. R. R.
Haynes.....	Rio Arriba.....	6,600	1	61.8		87	4	33	1	51	0.38		0.13	0	5	16	12	2	nw.	Dr. John R. Haynes.
Hermans.....	Luna.....	4,451	3			100	4†				0.75		0.60	0	2	20	6	4	w.	Agent E. P. & S. W. R. R.
Lordsburg.....	Grant.....	4,245	29	75.2	- 3.4	102	4	51	10	46	0.51	+ 0.21	0.22	0	3	2	28	0	sw.	Agent So. Pac. R. R.
Luna.....	Socorro.....	7,300	7	59.9		87	5†	30	18	51	0.80		0.45	0	4	6	24	0	s.	Charles B. Martin.
Mimbres.....	Grant.....	5,007	7								2.15		0.81	0	6	19	11	0	sw.	Charles Dennis.
Pinos Altos (near).....	do.....	7,253	1					36	18		1.95		0.52	0	10	13	16	1	nw.	O. L. Scott.
Pratt.....	do.....	4,415	3								3.48		0.22	0	3	25	5	0	nw.	Agent E. P. & S. W. R. R.
Redrock.....	do.....	4,150	7								0.36		0.15	0	3	16	11	3		Robert H. Woods.
Rodeo.....	do.....	4,118	3											0	0	0	0	0		Agent E. P. & S. W. R. R.
Silver City.....	do.....	5,800	1	69.8		95	4	46	19	44	2.28		0.68	0	13	18	12	0	nw.	E. M. Brumback.
<i>Arizona.</i>																				
Allaire Ranch.....	Cochise.....	4,184	14								0.31	+ 0.04	0.19	0	3	20	7	3	s.	Thomas Allaire.
Alpine.....	Apache.....	8,500		55.0		81	4†	26	18	49†	1.60		0.50	0	5	10	8	12	sw.	U. S. Forest Service.
Aztec.....	Yuma.....	492	13	95.4	+ 5.3	117	6	70	1†	42	0.00	- 0.01	0.00	0	0	30	0	0	w.	Agent So. Pac. Ry.
Benson.....	Cochise.....	3,523	31	76.8	- 5.5	106	6	54	1†	48	T.	- 0.32	T.	0	0	13	7	10	w.	Do.
Bisbee.....	do.....	5,500	22	72.6	- 2.4	92	4†	43	9	42	0.53	+ 0.14	0.27	0	5	15	12	3	se.	Rev. J. G. Pritchard.
Blue.....	Greelee.....										1.19		0.40	0	7	29	1	0	s.	Mary A. Jones.
Bowie.....	Cochise.....	3,756	35	84.8	+ 5.0	107	4	55	10	45	0.48	- 0.08	0.30	0	2	10	18	2	sw.	Agent So. Pac. Ry.
Buckeye.....	Maricopa.....	980	20	85.8	+ 5.3	115	5	56	18	53	T.	- 0.01	T.	0	0	29	1	0	sw.	H. E. Kell.
Canille.....	Santa Cruz.....	5,225	3								0.58		0.40	0	4	7	23	0	sw.	Robt. A. Rodgers.
Casa Grande.....	Pinal.....	1,396	31								1.00	+ 0.07	1.00	0	1	13	0	17		Agent So. Pac. Ry.
Casa Grande Ruins.....	do.....	1,422	4	85.3		113	5	57	1	49	1.03		0.68	0	4	17	9	4	w.	F. Pinkley.
Cavecreek.....	Maricopa.....	1,520	4																	E. A. Howard.
Chin Lee.....	Apache.....	6,090	4	66.6		92	3†	36	1	51	0.71		0.62	0	3	3	10	17	sw.	Rev. L. Ostermann, O. F. M.
Chiarsons Mill.....	Graham.....	8,000	5	23.2		84	6	49	12†	25	2.37		1.00	0	7	8	9	13		H. R. Chlarson.
Clifton.....	Greelee.....	3,584	4	83.2		105	3†	65	3†	40	0.23	+ 0.05	0.22	0	6	17	13	0		Arizona & N. Mex. Ry. Co.
Clima.....	Gila.....	2,300	12	77.5	- 0.4	103	4	49	11	48	0.32	+ 0.14	0.28	0	2	20	10	0	sw.	W. M. Clanton.
Cochise.....	Cochise.....	4,219	14	80.0	+ 1.7	103	26	55	15	43	0.54	+ 0.38	0.54	0	1	27	0	3		Agent So. Pac. Ry.
Columbia.....	Yavapai.....	1,900	12	86.5	+ 3.8	111	5	64	9†	35	0.05	- 0.22	0.05	0	1	30	0	0	s.	M. J. Nolan.
Courtland.....	Cochise.....	4,543	3								0.37		0.21	0	4	9	21	0	w.	Agent E. P. & S. W. R. R.
Dos Cabezos.....	do.....	5,250	4	72.6		102	3†	44	10†	54	0.13		0.43	0	1	18	10	2	sw.	Neil Erickson.
Douglas.....	do.....	3,930	9	75.9		110</														

TABLE 1.—Climatological data for June, 1912. District No. 9—Continued.

Stations.	Counties.	Elevation, feet.	Length of record, years.	Temperature, in degrees Fahrenheit.						Precipitation, in inches.					Sky.			Observers.		
				Mean.	Departure from the normal.	Highest.	Date.	Lowest.	Date.	Greatest daily range.	Total.	Departure from the normal.	Greatest in 24 hours.	Total snowfall, unmelting.	Number of rainy days, 0.01 inch or more.	Number of clear days.	Number of partly cloudy days.		Number of overcast days.	Prevailing wind direction.
Arizona—Continued.																				
Intake	Gila	2,230	6									0.75	0.75	0	1	25	4	1	w.	U. S. Reclamation Service.
Jerome	Yavapai	4,743	15	75.7	- 1.0	97	3†	54	17	31	0.39	+ 0.15	0.31	0	2	14	16	0	se.	Dr. L. A. Hawkins.
Keams Canyon	Navajo	6,600	7	66.0		89	3†	40	18	43	0.34		0.15	0	5	20	10	0	w.	David E. Livesay.
Kingman	Mohave	3,326	9	77.24		102	3†	45	12	45						24	0	6	s.	Agent A. T. & S. F. Ry.
Lakeside	Navajo	6,500	7	62.6		90	3	25	11	55	0.77	+ 0.41	0.23	0	5	14	5	11	sw.	Prof. J. Peterson.
Lewis Springs	Cochise	4,029	3								0.20		0.10	0	3	12	1	17		Agent E. P. & S. W. R. R.
Maricopa	Pinal	1,186	36	87.8	- 1.5	118	5	55	19	57	0.25	+ 0.18	0.25	0	1	27	3	0	w.	Agent So. Pac. Ry.
McNeal	Cochise	4,490	2								0.45		0.43	0	2	10	20	0	sw.	Miles McNeal.
Mesa	Maricopa	1,244	17	83.2	- 0.2	110	4	58	16	45	0.10	- 0.09	0.10	0	1	18	10	2	sw.	C. L. Diehl.
Mohawk Summit	Yuma	538	12					40	13†		0.00	0.00	0.00	0	0	29	1	0	e.	Agent So. Pac. Ry.
Naco	Cochise	4,579	2								0.49		0.24	0	6	13	0	17	sw.	Agent E. P. & S. W. R. R.
Natural Bridge	Gila	4,980	23								0.43	+ 0.16	0.30	0	2	16	11	3	sw.	D. G. Goodfellow.
Oracle	Pinal	4,500	19																	J. J. Lawson.
Osborn	Cochise	4,676	3								0.48		0.24	0	3	3	18	9	w.	Agent E. P. & S. W. R. R.
Paradise	do	5,436	5	67.9		93	6	44	12	42	0.45		0.18	0	3	9	21	0	sw.	J. C. Hancock.
Parker	Yuma	345	18	87.0	+ 2.1	113	4†	64	13	47	0.50	+ 0.49	0.50	0	1	27	2	1	sw.	M. A. Israel, M. D.
Payson	Gila	5,550	4																	Mart McDonald.
Phoenix	Maricopa	1,108	17	86.0	+ 1.6	111	5	64	18	41	0.01	- 0.11	0.01	0	1	24	4	2	e.	U. S. Weather Bureau.
Phoenix (1)	do	1,092	21	84.0	+ 1.2	113	5	56	18	51	0.04	- 0.05	0.04	0	1	22	7	1	w.	Geo. Acuff.
Phoenix (2)	do	1,189	4	85.1		111	5	61	10†	43	0.00		0.00	0	0	21	1	8	sw.	Salt Riv. Val. Nurseries.
Pinal Ranch	Pinal	4,520	18								1.49	+ 1.12	0.60	0	4					Irion & Craig.
Pinto	Apache	5,660	6								0.53		0.43	0	3	21	9	0	sw.	Mrs. Celia F. Henning.
Prescott	Yavapai	5,320	45	67.4	0.0	95	5	38	18	47	0.80	+ 0.54	0.70	0	2	27	2	1	sw.	John W. Flinn, M. D.
Quartzsite	Yuma	800	5	86.8		115	4	58	1	49	0.67		0.43	0	2	22	7	1	sw.	W. E. Scott.
Redrock	Pinal	1,864	4																	W. J. Crowell.
Roosevelt	Gila	2,175	7	80.8		107	4†	64	1	38	0.02		0.02	0	1	13	17	0	w.	U. S. Reclamation Service.
Sacaton	Pinal	1,280	5	85.5		112	4†	54	18	48	0.98		0.94	0	2					E. W. Hudson.
St. Johns	Apache	6,550	7																	A. Shreeve.
St. Michaels	do	6,950	24	63.4	- 1.2	89	3†	31	18	52	0.96	+ 0.28	0.34	0	5	12	13	5	sw.	Rev. A. Weber, O. F. M.
Salome	Yuma	1,875	5	81.6		108	5	54	12†	46	0.49		0.49	0	1	18	9	3	sw.	Mrs. M. B. Swartz.
San Carlos	Gila	2,456	30																	Miss M. A. Bingham.
San Simon	Cochise	3,609	27																	Agent So. Pac. Ry.
Seligman	Yavapai	5,219	7	66.6		94	4	39	10	47	0.07		0.06	0	2	19	0	11	sw.	Librarian A. T. & S. F. Ry.
Sentinel	Maricopa	5,885	14	89.2	- 0.3	115	6	64	1	43	0.14	+ 0.14	0.14	0	1	30	0	0	sw.	Agent So. Pac. Ry.
Silverbell	Pima	2,650	7	86.3		105	3	64	29†	39	0.90		0.50	0	2	26	0	4	s.	Imperial Copper Co.
Snowflake	Navajo	5,644	6	64.8		94	7†	31	18	57	0.68		0.32	0	4	8	13	9	sw.	William J. Flake.
Springerville	Apache	6,862	2	61.4		87	4	25	18	54	1.03		0.32	0	5	18	6	6	sw.	U. S. Forest Service.
Supai	Cocconino	3,200	4	76.4		106	3	48	17	49	0.32		0.20	0	3	19	7	4		Laura B. Symons.
Tempe	Maricopa	1,165	8	85.3		115	5	58	10†	49	0.12		0.07	0	2	19	9	2	sw.	F. H. Simmons.
Thatcher	Graham	2,800	9	81.2*		111	5			55*	0.38		0.31	0	3					Prof. J. H. Larson.
Tombstone	Cochise	4,550	16	78.7	+ 1.5	106	4	56	10†	41	0.58	+ 0.17	0.24	0	5	15	15	0		F. N. Wolcott.
Truxton	Mohave	3,997	3																	G. A. Dennis.
Tuba	Cocconino	4,500	11	70.3	- 0.9	97	4	45	1†	43	0.15	- 0.10	0.08	0	3				sw.	H. P. Marble.
Tucson	Pima	2,390	31	83.0	+ 1.1	108	5†	53	2	51	0.61	+ 0.44	0.55	0	2	10	13	7	nw.	University of Arizona.
Tucson (1)	do	2,380	4	81.0		111	5			55*	0.23		0.16	0	2	12	14	4		J. M. Robe.
Tucson (2)	do	2,526	1	81.6		109	5	53	10	47	0.65		0.46	0	4	15	15	0	w.	U. S. Coast and Geod. Sur.
Vail	do	3,421	13	84.8	+ 3.5	104	3	58	1	35	0.00	- 0.08	0.00	0	0	30	0	0		Agent So. Pac. Ry.
Walnut Grove	Yavapai	3,649	21								0.77	+ 0.74	0.35	0	4					J. O. Carter.
Wickenburg	Maricopa	2,072	13	83.9	+ 5.5	110	6	50	29	53	0.02	0.00	0.02	0	1	13	13	4	sw.	Agent S. F. P. & P. Ry.
Willcox	Cochise	4,164	30	75.6	- 3.2	103	5†	46	10	46	0.50	+ 0.28	0.30	0	2	24	1	5	s.	Agent So. Pac. Ry.
Williams	Cocconino	6,750	12	61.4	- 1.9	89	3	33	9	49	0.98	+ 0.86	0.30	0	4	19	11	0		E. J. Nordyke.
Winslow	Navajo	4,853	4																	John F. Bauer.
Yarnell	Yavapai	4,700	13								0.63	+ 0.46	0.30	0	3	13	9	8	s.	E. L. Bartholomew.
Yuma	Yuma	141	31	86.0	+ 1.3	115	5	59	23	45	0.62	+ 0.62	0.62	0	1	29	0	1	w.	U. S. Weather Bureau.
Yuma (1)	do	150	5																	E. L. Crane.
Nevada.																				
Caliente	Lincoln	4,407	2	65.9		100	4	38	17	56	0.10		0.10	0	1	20	8	2	se.	Salt Lake route.
Logan	Clark	1,355	5	79.8		112	3	51	23	56	0.94		0.94	0	1	26	4	0	s.	O. W. Jarvis.

\* a, b, c, etc., indicate respectively 1, 2, 3, etc., days missing from the record.  
 \*\* Temperature extremes are from observed readings of the dry bulb; means are computed from observed readings.  
 † Also on other dates.  
 T. Precipitation is less than 0.01 inch rain or melted snow.







TABLE 2.—Daily precipitation for June, 1912. District No. 9—Continued.

Stations.	Watershed.	Day of month.																														Total.	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
Arizona—Contd.																																	
Mohawk Summit	Gila																																
Naco	San Pedro							.08	.04												.01	.08	.04							.24			
Natural Bridge	Verde				T.			T.																	.30					.13			
Oracle	San Pedro																																
Osborn	do.					T.															.19	.05	.24										
Paradise	Desert							.18																									
Parker	Colorado							T.																									
Payson	Verde																																
Phoenix	Salt							T.	.01																								
Phoenix (1)	do.							T.	.04																								
Phoenix (2)	do.																																
Pinal Ranch	Gila																																
Pinto	L. Colorado																																
Prescott	Hassayampa																																
Quartzsite	Colorado																																
Redrock	Santa Cruz																																
Roosevelt	Salt																																
Sacaton	Gila																																
St. Johns	L. Colorado																																
St. Michaels	do.				T.	T.	T.	.05																									
Salome	Colorado																																
San Carlos	Gila																																
San Simon	do.																																
Seligman	Verde																																
Sentinel	Gila							.14																									
Silverbell	Santa Cruz																																
Snowflake	L. Colorado																																
Springerville	do.					T.		.15	.30																								
Suzai	Colorado							.20	.02																								
Tempe	Salt							T.																									
Thatcher	Gila																																
Tombstone	San Pedro							.15	.05																								
Truxton	Colorado																																
Tuba	L. Colorado								.08																								
Tucson	Santa Cruz							T.	.06																								
Tucson (1)	do.																																
Tucson (2)	do.							.05	.11																								
Vail	do.																																
Walnut Grove	Hassayampa																																
Wickenburg	do.																																
Willcox	Desert								.20																								
Williams	Colorado								.20																								
Winslow	L. Colorado																																
Yarnell	Hassayampa																																
Yuma	Colorado																																
Yuma (1)	do.																																
Nevada.																																	
Caliente	Colorado																																
Logan	do.								T.																								

\* Precipitation included in that of the next measurement.  
 † Separate dates of falls not recorded.  
 ‡ Precipitation for the 24 hours ending on the morning when it is measured.  
 T. Precipitation is less than 0.01 inch rain or melted snow.

TABLE 3.—Maximum and minimum temperatures for June, 1912. District No. 9, Colorado Valley.

Date.	Wyoming.				Colorado.								Utah.								New Mexico.							
	Daniel.		Green River.		Durango.		Grand Junction.		Gunnison.		Meeker.		Steamboat Springs.		Emery.		Fort Duchesne.		Hite.		Moab.		St. George.		Bloomfield.		Fort Bayard.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1.....	70	30	74	35	79	38	80	50	.....	.....	72	33	68	29	75	36	83	40	94	55	89	44	94	52	86	37	82	51
2.....	71	31	81	38	83	40	87	52	.....	.....	80	34	78	30	80	35	89	37	96	55	96	45	99	47	89	37	84	53
3.....	68	28	79	41	87	43	92	56	.....	.....	80	35	76	32	81	37	90	40	100	59	99	49	101	48	92	41	92	54
4.....	71	31	81	37	87	45	89	50	.....	.....	80	31	75	29	85	47	89	41	100	63	98	48	103	52	95	43	90	59
5.....	75	30	85	36	82	46	91	60	.....	.....	81	35	80	29	82	40	90	38	101	59	100	51	102	56	96	47	90	61
6.....	73	30	82	47	84	47	94	60	.....	.....	81	43	80	33	77	34	85	50	100	63	101	52	96	63	93	60	88	62
7.....	76	43	80	50	83	50	77	60	.....	.....	74	48	72	39	85	52	90	70	83	52	97	71	85	61	89	37	84	53
8.....	71	45	77	49	75	47	77	57	.....	.....	72	50	69	48	83	35	83	51	94	62	89	52	91	62	82	52	83	55
9.....	69	42	74	48	77	43	85	58	.....	.....	75	44	71	39	85	39	78	52	92	67	89	51	86	50	80	56	83	58
10.....	71	40	73	40	77	37	84	50	.....	.....	71	35	73	33	86	44	81	35	91	58	91	52	89	54	86	40	82	51
11.....	68	39	81	40	72	43	78	55	.....	.....	73	37	75	31	80	41	84	43	93	59	93	65	92	52	82	49	80	56
12.....	70	42	80	42	77	39	86	55	.....	.....	73	58	76	32	81	42	83	45	92	63	92	55	90	53	84	47	81	52
13.....	55	40	66	40	75	41	76	60	.....	.....	66	44	63	33	79	45	77	48	92	69	86	59	90	53	82	47	80	53
14.....	47	32	62	39	78	42	82	59	.....	.....	66	39	60	38	81	41	78	40	94	63	89	52	90	50	85	45	82	51
15.....	75	26	57	31	75	45	70	50	.....	.....	62	38	56	36	57	40	67	45	85	65	86	59	84	62	83	54	83	54
16.....	50	27	57	25	70	39	68	43	.....	.....	58	33	53	32	61	31	63	28	77	52	74	40	81	49	77	38	83	55
17.....	65	27	64	34	66	42	66	46	.....	.....	60	34	54	30	62	33	69	31	81	56	76	39	85	52	71	50	83	58
18.....	70	28	72	31	72	36	77	46	.....	.....	66	28	63	25	77	30	75	40	88	53	82	43	93	54	79	38	80	49
19.....	71	27	79	34	75	44	83	52	.....	.....	70	30	71	25	81	37	82	35	91	61	87	46	97	57	83	44	78	50
20.....	75	32	86	36	79	39	86	53	.....	.....	77	30	78	30	82	42	90	40	97	56	93	45	97	57	88	53	81	57
21.....	73	36	85	49	81	45	90	61	.....	.....	81	40	74	23	81	46	90	48	96	63	94	52	93	62	90	50	82	53
22.....	71	35	82	49	73	50	80	65	.....	.....	80	44	78	37	85	46	78	55	91	70	90	67	91	63	84	56	81	54
23.....	75	38	85	50	76	46	83	60	.....	.....	75	40	77	39	81	51	87	53	94	69	91	56	92	51	80	53	82	52
24.....	80	40	90	49	78	45	87	60	.....	.....	76	41	77	35	82	50	90	53	93	66	91	55	88	63	88	52	81	59
25.....	76	41	87	50	74	48	88	64	.....	.....	80	44	76	43	83	51	91	50	95	65	95	58	98	51	88	54	82	52
26.....	78	40	80	44	77	47	88	62	.....	.....	77	42	76	35	82	50	91	57	99	64	97	58	99	57	90	52	84	53
27.....	80	41	85	46	82	46	87	60	.....	.....	76	41	77	37	81	45	85	49	100	67	97	56	97	60	89	56	86	53
28.....	81	43	85	46	80	50	84	63	.....	.....	79	40	78	35	82	49	83	47	98	74	91	61	95	62	83	58	81	56
29.....	75	40	81	53	76	55	83	63	.....	.....	75	47	74	41	85	51	83	53	98	71	91	64	84	59	84	55	80	51
30.....	67	37	.....	55	77	48	85	61	.....	.....	75	50	73	41	81	50	84	55	91	68	89	61	88	58	85	52	84	51
Mns.....	70.2	35.4	77.8 <sup>a</sup>	42.0	76.9	44.2	82.8	56.4	.....	.....	73.7	39.6	71.7	34.0	79.4	41.8	82.8	45.0	93.4	62.8	90.6	52.9	92.7	56.0	85.3	49.2	83.0	54.5

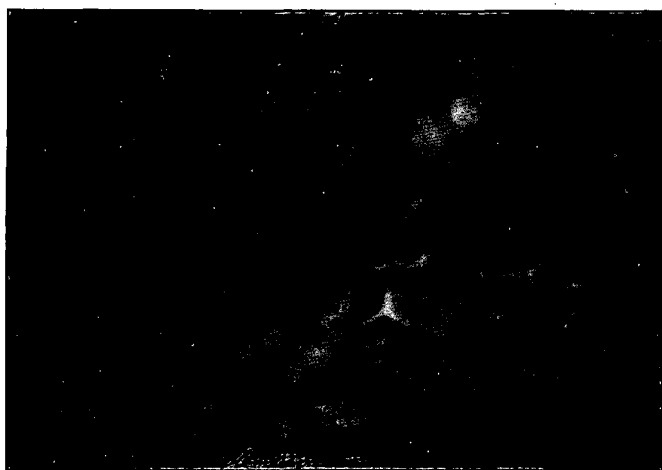
Date.	Arizona.																				Logan, Nev.	
	Bisbee.		Flagstaff.		Fort Apache.		Grand Canyon.		Parker.		Phoenix.		Prescott.		St. Michaels.		Tucson.		Yuma.		Max.	Min.
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.		
1.....	86	57	77	32	.....	42	79	43	108	.....	66	87	42	82	37	100	58	108	64	101	62	
2.....	89	60	82	36	.....	43	81	42	110	65	105	66	90	46	88	40	104	53	110	66	104	61
3.....	91	61	84	40	.....	48	80	45	112	67	109	68	93	49	89	37	105	61	113	68	112	56
4.....	92	68	83	43	.....	52	81	43	113	66	110	73	91	50	89	43	107	64	113	70	107	56
5.....	92	64	85	40	.....	48	85	42	113	72	111	75	95	51	88	44	108	66	115	74	108	67
6.....	92	64	80	45	96	48	83	40	112	82	109	80	89	54	87	45	108	74	113	79	104	67
7.....	87	64	78	51	86	63	82	43	108	80	104	79	88	60	89	55	104	84	108	79	106	65
8.....	88	57	74	46	86	50	73	39	103	67	102	77	87	49	80	45	102	75	102	67	98	62
9.....	85	43	69	46	87	50	80	44	100	70	96	67	86	45	78	47	101	60	100	67	94	58
10.....	87	53	70	32	84	44	76	40	101	70	94	66	80	41	78	38	96	55	98	67	96	56
11.....	83	57	74	34	84	43	78	38	100	70	98	65	81	43	77	40	96	58	100	65	98	61
12.....	82	58	72	36	88	47	79	39	100	65	95	67	83	47	74	37	95	58	101	62	97	59
13.....	82	61	71	49	81	53	78	38	98	64	96	67	83	53	78	54	95	64	98	70	97	60
14.....	87	68	72	42	84	46	76	40	101	68	98	68	84	50	81	54	98	61	100	67	98	61
15.....	87	62	74	44	85	47	78	38	101	68	97	68	80	53	80	53	99	65	100	66	93	64
16.....	85	61	71	35	90	45	78	38	98	65	95	70	80	46	79	41	97	63	100	67	88	58
17.....	84	60	67	29	84	48	76	36	102	73	97	68	81	48	74	42	94	63	100	70	91	64
18.....	86	59	73	42	86	39	78	38	103	74	101	64	85	38	79	31	100	60	105	65	98	57
19.....	85	58	79	35	88	49	78	36	104	72	102	67	87	43	82	40	101	68	106	65	104	58
20.....	82	60	77	36	89	53	80	38	105	60	101	71	86	52	83	44	100	66	106	69	104	58
21.....	80	59	74	43	87	54	78	38	101	72	100	76	83	53	82	52	98	73	103	76	98	57
22.....	78	57	66	46	87	57	78	38	95	71	101	73	83	52	76	54	97	68	96	68	92	62
23.....	84	58	74	40	85	51	80	38	100	71	100	70	81	51	81	45	100	70	93	59	92	51
24.....	87	59	75	53	88	58	80	36	101	71	101	72	87	50	81	48	100	67	102	63	99	60
25.....	86	60	80	40	89	55	78	36	103	72	105	73	84	54	82	46	103	68	107	66	103	61
26.....	88	61	80	44	90	55	76	38	108	71	105	77	88	53	84	47	104	72	111	74	105	61
27.....	87	61	79	44	90	56	76	36	108	72	103	78	91	59	82	47	100	77	107	75	104	65
28.....	82	60	73	57	87	53	78	38	105	75	102	78	85	57	83	50	97	72	109	78	103	63
29.....	82	60	74	46	89	54	80	34	100	72	97	74	78	49								

## MAMMATO-CUMULUS CLOUDS.

By W. J. HUMPHREYS, Professor of Meteorological Physics, U. S. Weather Bureau.

The accompanying illustrations, from photographs taken at Bartlesville, Okla., June 15, 1912, at 6.30 p. m., by Mr. Loran C. Twyford, show an admirable example of that unusual cloud formation commonly known as the mammato-cumulus.

Mr. Twyford writes that possibly 45 minutes before the clouds were seen a cyclone did great damage about 20 miles away, and in the direction from which the clouds came. Similar clouds were observed by Prof. H. C. Frankenfield<sup>1</sup> at St. Louis in connection with and just preceding the tornado of May 27, 1896, that did much damage in that city. They have also been noted occasionally by many other observers and in various parts of the world but usually in the neighborhood of tornadoes, squalls, or other violent atmospheric disturbances.

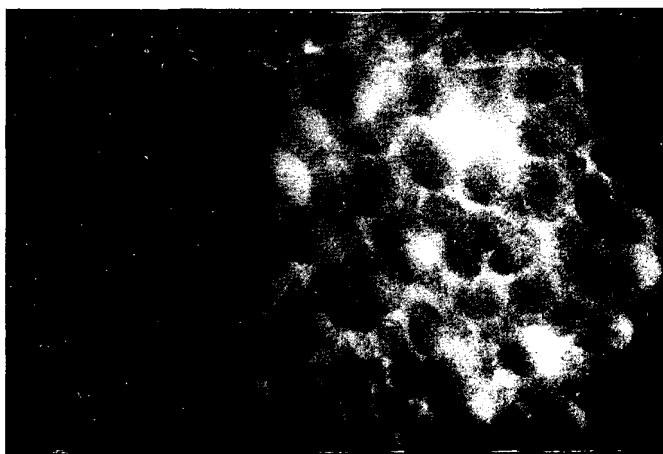


rushes, or cataracts, of cold air, the general process conceivably being as follows:

1. A violent up rush, under cyclonic conditions, of the lower atmosphere, and consequent projection, by virtue of acquired momentum, to elevations beyond the equilibrium level, where it is dynamically cooled to temperatures below that of the surrounding air.

2. A rapid horizontal spreading, under the influence of the cyclonic whirl, of the overlying cooled atmosphere at a considerable elevation, and therefore often above a stratus cloud of some type.

3. A descent in numerous places of the abnormally cold and consequently unstable air upon and through the underlying cloud stratum; thereby in each such place forcing the cloud below its wonted level and at the same



Osthoff<sup>2</sup> in his report on 67 occurrences of the mammato-cumulus which he observed during the course of 21 years, 1885-1905, says that they are tenfold more frequent during summer than in winter, and nearly as many fold more frequent of afternoons than of mornings. He also finds that this particular formation occurs at various levels and especially as a modification of the strato-cumulus and other sheet clouds.

Presumably, then, the formation of mammato-cumuli is dependent upon certain unusual conditions incident to hot weather and that are often productive of severe local storms. Just exactly how they are formed, however, is not certain, but apparently they are due to local down

time, through counter convection, raising its intermediate portions above their former position, and thus accentuating the whole phenomenon of pendulous formation.

The actual process, whether in general as above suggested, or some other not so obvious, seems to require an existing cloud to render it visible, and to be such as to convert a stratus of whatever type into a group of festooned, pendulous, pocket or mammato-cumulus clouds, as run some of its numerous names.

Apparently this type of cloud has very rarely been photographed, and therefore it is earnestly hoped that Mr. Twyford and many others may secure additional records for the further study of this interesting, unusual, and, because of its frequent close relation to tornadoes, perhaps even ominous phenomenon.

<sup>1</sup> Monthly Weather Review, vol. 24, p. 77, 1896.

<sup>2</sup> Met. Zeit., vol. 23, p. 401, 1906.

# Total Precipitation, June, 1912.



Departure of the Mean Temperature from the Normal, June, 1912.

