

Table showing for the month of November, &c.—Continued.

States and stations.	Rainfall of 10 inches, or more, per month.		Rainfall of 2.50 inches, or more, in 24 hours.			Rainfall equaling or exceeding one inch per hour.			
	Amt.	Year.	Amt.	Day.	Year.	Amt.	Time.	Day.	Year.
<i>Tennessee—Continued.</i>	<i>Inches.</i>		<i>Inches.</i>			<i>Inches.</i>	<i>h. m.</i>		
Beech Grove			2.65	17	1886				
Caryville			3.12	7	1885				
Chattanooga			3.08	30	1880	1.80	1 38	8	1888
Do.			3.00	22	1883				
Do.			2.82	6-7	1885				
Do.			2.74	8	1888				
Covington			3.96	21	1886				
Farmingdale			3.17	7	1885				
Do.			3.37	17	1886				
Fostoria			2.70	21	1886				
Grief			3.28	7	1885				
Johnsonville			2.98	11	1886				
Knoxville			2.55	16-17	1873	1.05	0 55	30	1880
Do.			2.54	22-23	1874				
Do.			2.79	25-26	1878				
Do.			2.65	22-23	1883				
Do.			3.14	6-7	1885				
Manchester			3.60	17	1886				
Memphis	9.63	1875	2.54	3-4	1875	1.00	1 00	11	1886
Do.			3.24	21-22	1888				
Do.			2.64	6-7	1888				
Ridgely			2.87	17	1886				
Do.			2.65	22	1886				
Woodstock			3.15	21	1886				
<i>Texas.</i>			2.89	9-10	1866				
Austin			2.64	12-13	1870				
Do.			3.50	15-16	1874				
Do.			3.40	18-19	1874				
Do.			4.20	26	1875				
Belmont Farm	13.00	1873	2.70	1	1877				
Do.	12.00	1877	7.00	1	1877				
Do.			4.00	17	1877				
Bluff Settlement	10.00	1874	8.00	14-16	1874				
Brownsville			2.60	13	1882	1.98	1 23	18	1888
Clarksville	13.00	1873			1884				
Cleburne			2.75	22	1888				
Corpus Christi			4.59	7	1888	1.52	1 15	7	1888
Corsicana			3.62	23-24	1874	2.00	2 00	26	1887
Fort Brown			4.30	12-13	1874				
Galveston			2.67	12-13	1874	3.50	0 30	2	1873
Do.			5.63	6	1872	1.48	0 15	5	1877
Do.			4.06	2-3	1873				
Do.			2.53	19	1877				
Do.			2.51	22	1884				
Do.			3.58	7-8	1888				
Gilmer	10.67	1860			1877				
Indianola			2.95	5	1877				
Do.			3.16	17	1878				
Mason			3.26	9	1878				
New Ulm	14.92	1873	2.75	22	1884				

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	Amt.	Year.	Amt.	Day.	Year.	Amt.	Time.	Day.	Year.
<i>Texas—Continued.</i>	<i>Inches.</i>		<i>Inches.</i>			<i>Inches.</i>	<i>h. m.</i>		
Palestine			2.95	25-26	1882	2.18	0 50	10	1883
Do.			5.05	10	1883				
Do.			2.51	3-4	1885				
Rio Grande City						1.02	0 55	16	1878
San Antonio						1.30	1 00	27	1887
Do.						1.05	1 00	7	1888
Silver Falls						3.74	13-14		1888
<i>Utah.</i>									
Salt Lake City	5.81	1875							
<i>Vermont.</i>									
Newport	7.80	1886							
Post Mill Village			2.80	17	1886				
<i>Virginia.</i>									
Boonsborough			4.50	24	1877				
Cape Henry			2.81	23	1881				
Lynchburgh	9.65	1877	4.23	22	1877				
Mount Solon			4.65	24	1877				
Norfolk						1.14	(§)	10	1888
<i>Washington.</i>									
Cathlamet	13.20	1874							
Do.	13.00	1875							
Fort Canby	19.07	1866	2.70	19-20	1888				
Do.	13.72	1885							
Fort Cascades	12.95	1860							
Fort Vancouver	11.57	1853							
Neah Bay	27.60	1865							
Do.	17.86	1878							
Do.	19.60	1885							
Do.	11.80	1886							
Do.	11.20	1888							
Olympia	19.88	1877	3.24	15-16	1878				
Do.	11.09	1885							
Do.	10.18	1885							
Pyshyt	13.07	1885	2.63	13	1885				
Tatoosh Island	20.70	1869	3.58	28	1883				
Do.	15.83	1883	4.13	29	1883				
Do.	19.25	1885	2.97	27-28	1886				
Do.	10.44	1886							
Do.	10.15	1887							
Do.	10.76	1888							
<i>West Virginia.</i>									
Helvetia	7.98	1878							
<i>Wisconsin.</i>									
Bloomfield			2.50	10-11	1879				
Cadiz			3.60	1-2	1888				
Manitowoc	10.11	1882							
<i>Wyoming.</i>									
Fort Laramie	3.23	1886							

\* No date given. † Railroad records. ‡ Signal Service records. § Less than 1 hour.

WINDS.

The most frequent directions of the wind during November, 1888, are shown on chart ii, by arrows flying with the wind. On the Atlantic coast, south of the fortieth parallel, and along the Gulf coast northerly winds prevailed. In New England, the lake region, the Mississippi and Missouri valleys, the middle and southeastern Rocky Mountain slopes, and in the middle and southern plateau regions they were variable. In the northern plateau region southwest winds predominated, while on the immediate Pacific coast they were from northeast to north west over southern California, west at San Francisco, north at Eureka, Cal., and south to east in Washington Territory.

HIGH WINDS (in miles per hour).

Maximum velocities of fifty miles, or more, per hour, other than those given in the table of miscellaneous meteorological data, have been reported as follows: Eastport, Me., 53, ne., 25th; Hatteras, N. C., 58, n., 24th, 52, n., 26th; Block Island, R. I., 82, ne., 25th, 52, ne., 27th.

LOCAL STORMS.

1st. Iowa.—Iowa City: The most noticeable storm of the month occurred on this date. The temperature of the day was 22° above the normal, corresponding to the normal temperature of the first week of September. A light thunder-storm with little rain extended over Iowa in the morning, and was followed by a much more intense one in the evening. In the

valley of the Iowa and Cedar rivers this storm was most intense, and a straight blow traveled down this valley from 7 p. m. to 10 p. m., accompanied with heavy rain and lightning. The rain increased from about one-half inch in southern Mitchell county to nearly three inches at Iowa City. The wind was most severe between Waterloo and Vinton, destroying considerable town and farm property at La Porte City and Mount Auburn. It was not a tornado or cyclone but a straight blow. Hail and heavy rain fell only in connection with this storm just below the region of greatest intensity of the wind.—Report of Iowa Weather Service.

2d. Illinois.—Mattoon, Coles Co.: during a thunder-storm, hail of unusual size fell. Missouri.—Kansas City: a thunder-storm moving from southwest to northeast began 1.15 a. m. and ended 3.15 a. m. The thunder was very loud, and the lightning almost continuous. Maximum velocity of wind 30 miles per hour, from the southwest.

7th. Texas.—Abilene: a tornado was observed west of this station at 7.40 p. m., and disappeared 7.50 p. m. It was first observed twenty miles west of station. The track was through a sparsely settled section, and no serious damage was caused. In the afternoon a heavy thunder-storm, moving from west to east, occurred to the northwest of the station, continuing from 4.43 p. m. to 7.50 p. m. Light rain fell at this place from 7.15 p. m. to 7.48 p. m., during which time a very heavy rain was falling about two miles to the northwestward. An interesting

and detailed report of the tornado, with sketches and charts illustrating its prominent features, has been made by Sergeant J. M. Cline, Signal Corps, observer at Abilene, Tex.

**9th. Kansas.**—Wichita: high wind, accompanied by snow, prevailed; maximum velocity of wind, 30 miles per hour at 10 a. m., from the north, and at 2.35 p. m., from the northwest. Street cars were unable to run; business was generally interrupted; telegraph lines were reported down in all directions, and railroad trains were delayed. **Missouri.**—Kansas City: a snow storm caused much damage to telegraph and telephone wires. It is stated that this was the severest snow storm that

has occurred in this section so early in the season in many years.

**10-11th. Michigan.**—Detroit: a severe sleet and hail storm, moving from northwest to southeast, occurred during the night. The storm, which began and ended quite abruptly, seemed to pass in streaks, as in some parts of the city no hail or sleet fell.

**23d-24th. Arizona.**—Globe, Gila Co.: the storm which passed over this place is reported as the severest November storm in that section of which there is a record; 2.99 inches of rain fell in twenty-four hours.

INLAND NAVIGATION.

In the following table are shown the danger-points at the various stations; the highest and lowest depths for November, 1888, with the dates of occurrence and the monthly ranges:

Heights of rivers above low-water mark, November, 1888 (in feet and tenths).

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
<i>Red River:</i>						
Shreveport, La. ....	29.9	28-29	7.2	4, 5, 6	0.6	6.6
<i>Arkansas River:</i>						
Fort Smith, Ark. ...	22.0	21	5.9	6, 7	1.1	4.8
Little Rock, Ark. ...	23.0	22	8.6	2, 3	1.9	6.7
<i>Missouri River:</i>						
Leavenworth, Kans. ...	20.0	11	5.9	29	5.0	0.9
Kansas City, Mo. ...	21.0	10, 11, 12	6.5	28, 29, 30	5.8	0.7
<i>Mississippi River:</i>						
Saint Paul, Minn. ...	14.5	4, 5, 6, 7	3.7	18-19	2.4	1.3
La Crosse, Wis. ....	24.0	3, 4, 5, 6	3.9	27-30	2.9	1.0
Dubuque, Iowa. ....	16.0	5, 6, 10, 11	3.8	28-29	3.0	0.8
Davenport, Iowa. ...	15.0	11-12	2.7	28, 29-30	1.9	0.8
Keokuk, Iowa. ....	14.0	13	3.0	1	1.4	1.6
Saint Louis, Mo. ...	32.0	16	9.0	5	5.1	3.9
Cairo, Ill. ....	40.0	17	31.5	1	19.0	12.5
Memphis, Tenn. ...	34.0	19	25.1	1	13.0	12.1
Vicksburg, Miss. ...	41.0	24-25	28.9	1	8.0	20.9
New Orleans, La. ...	13.0	29-30	8.9	5, 6, 7	3.2	5.7
<i>Ohio River:</i>						
Pittsburgh, Pa. ....	22.0	16	12.3	30	4.1	8.2
Parkersburg, W. Va. ...	38.0	12	17.8	25	2.5	20.3
Cincinnati, Ohio. ...	50.0	10	34.0	30	17.6	16.4
Louisville, Ky. ....	25.0	10	14.9	30	8.4	6.5
<i>Cumberland River:</i>						
Nashville, Tenn. ...	40.0	13	26.5	7	6.4	20.1
<i>Tennessee River:</i>						
Chattanooga, Tenn. ...	33.0	12	21.0	8	5.4	15.6
<i>Monongahela River:</i>						
Pittsburgh, Pa. ....	29.0	16	12.3	30	4.1	8.2
<i>Savannah River:</i>						
Augusta, Ga. ....	32.0	11	24.5	3, 4-7	9.4	15.1
<i>Willamette River:</i>						
Portland, Oregon ...	15.0	6	4.6	30	0.5	4.1

Oswego, N. Y., 2d: ice formed on the canal, between this city and Syracuse, during the past twenty-four hours, detaining boats several hours.

Dubuque, Iowa, 6th: navigation on the Mississippi River closed on this date.

Cairo, Ill., 13th: heavy drift-wood passed down the Ohio River up to this date, causing considerable damage to the steel bridge, tearing away its false work, and causing a loss of about \$2,000.

Fort Totten, Dak.: thick ice formed along the shores of

Devil's Lake on the 15th, and the lake froze over on the 16th, closing navigation for the season.

Fort Sully, Dak., 16th: the Missouri River is rapidly icing over, and navigation may be considered closed for the winter.

Fort Buford, Dak.: the Missouri River was full of floating ice on the 17th and 18th, and on the 19th was frozen over; it remained partially open until the 30th, when it was entirely frozen over.

Bismarck, Dak., 20th: the Missouri River is at an extremely low stage, with considerable slush ice.

Port Huron, Mich., 26th: navigation on the Saint Clair River is practically closed for the season.

FLOODS.

Seymour, Jackson Co., Ind., 10th: it has been raining here steadily for forty-eight hours; the White and Mascaticuck rivers have overflowed their banks, and the low-lying lands are inundated. Much live stock has been drowned, and quantities of corn have been swept away.

HIGH TIDES.

Hatteras, N. O., 24th; Key West, Fla., Norfolk, Va., 26th; Wood's Holl, Mass., 25th to 27th. Atlantic City, N. J.: the high wind of the 25th and 26th caused the tide to rise to an unusual height, doing much damage to property. Kitty Hawk, N. C., 24th: a severe storm has continued since 7 a. m. of the 20th; the wind blowing from the northeast until 3 p. m. of the 24th, when it backed to north and continued steady at about sixty miles per hour. The tide in Currituck Sound was lower than ever before known. At Kitty Hawk wharf, where there is usually enough water for small steamers and sailing vessels, the water receded about seventy-five feet from the wharf. Between Nag's Head and New Inlet, a distance of about twenty-one miles, the entire "banks" were flooded by the tide, and all cattle on this low beach perished.

New London, Conn., 26th: the tide in the afternoon was about four feet above the usual high water mark. In consequence, several of the wharves were partially submerged. No serious damage followed. The Signal Service observer reports that this was the highest tide observed in twenty-five years.

LOW TIDE.

Kitty Hawk, N. C., 24th; Cedar Keys, Fla., 10th to 12th.

ATMOSPHERIC ELECTRICITY.

AUORAS.

Faint auroral displays were observed as far south as Lake Forest, Ill. They were most frequently noted at Saint Vincent, Minn., and were reported on from two to three dates in New England, south-central New York, the upper lake region, and the upper Mississippi and Missouri valleys.

At Fort Buford, Dak., an aurora was observed at 9.48 p. m. of the 5th, consisting of a diffused white light which rose to an altitude of 10° and covered 75° of the horizon; the aurora attained its maximum intensity at 10.30 p. m., when streamers

rose to an altitude of 60°, above which a faint arch was visible. The display gradually faded away, and had entirely disappeared at 3.55 a. m. of the 6th.

Auroras were observed during the month, as follows: 1st, Pontiac, Mich.; 4th, Cornish, Me.; 5th, Fort Buford, Fort Sully, and Webster, Dak.; Hanover, N. H.; 6th, Fort Buford, Dak.; Escanaba and Traverse City, Mich.; 7th, Saint Vincent, Minn.; 10th, Lake Forest, Ill.; 12th, Nashua, N. H.; 13th, Wedgewood, N. Y.; 16th, Saint Vincent, Minn.; 17th, Madison, Wis.; 25th, Davenport and Webster, Dak.; Saint