

Never in the observers experience were more timely or better warnings given the public, and great praise is freely tendered the Weather Bureau for its work. The benefits derived have to be roughly estimated, but the value of property saved by the warnings in the coast section between Titusville and Miami will reach \$30,000, or more, principally in boats of small size. Property that it was impracticable to protect to the value of about \$5,000 was destroyed in this section. No lives are known to have been lost.

Charleston, S. C., L. N. Jesunofsky, Observer, Weather Bureau:

Not a casualty occurred along the coast of South Carolina during the passage of the hurricane center at close range on the 15th and 16th, which may be attributed to the timely hoists of the hurricane signal, which caused vessels to seek safe harborage. Fortunately the storm tides along the coast reached only 2.8 feet above normal, and the rice and sea-island cotton crops escaped injury. Much rice would have been spoiled if timely warnings had not been given.

All available means were taken to disseminate the hurricane warnings, and it can be safely said that they were the most successful warnings of the year, in that the time which elapsed between the hoist and the beginning of the gale gave mariners and business interests along the south Atlantic coast more than ample time in which to prepare for the dreaded visitor.

Nine steamers, 3 barks, 4 brigs, 26 schooners, and many smaller craft were detained in port; the crews and passengers numbered 319, and the vessels and cargoes were valued at \$2,110,000.

Hatteras, N. C., S. L. Doshier, Observer, Weather Bureau:

The wind began blowing a gale from the east the morning of the 16th, varying in velocity from 36 to 50 miles an hour, and gradually shifting to northeast by 6 p. m., with nearly stationary pressure. During the early morning of the 17th the wind increased to a hurricane and at 4 a. m. was blowing at the rate of 70 miles an hour; 10 a. m. it had increased to 84 miles; and at 1 p. m. it was blowing 93 miles an hour, with occasional extreme velocity of 120 to 140 miles an hour. The record of wind after about 1 p. m. was lost, but it is estimated that it blew with even greater force from about 3 p. m. to 7 p. m., and it is believed that between these hours the wind reached a regular velocity of at least 100 miles an hour. The barometer began to fall rapidly about 8 a. m. of the 17th, and 8 p. m. of that date it had reached the unprecedentedly low reading of 28.620 inches, where it remained about an hour, when it began to rise rapidly, and by midnight it had risen nearly one-half inch. From 7:30 to 8 p. m. of the 17th there was a lull in the gale when it veered to southeast and begun to blow at an estimated velocity of 60 to 70 miles, which continued until well into the morning of the 18th.

This hurricane was the most severe in the history of Hatteras. The scene on the 17th was wild and terrific. By 8 a. m. the entire island was covered by water from the Sound, and by 11 a. m. all the land was covered to a depth of from 4 to 10 feet. This tide swept over the island at a fearful rate carrying everything movable before it. There were not more than four houses on the island in which the tide did not rise to a depth of 1 to 4 feet, at least half the people had to abandon their homes and seek safety with those who were fortunate enough to live on the higher grounds. The frightened people were crowded 40 or 50 in a house. All this day the gale, the tide, and the sea continued with unabated fury. During the lull in the evening the tide ran off with great swiftness, causing a fall in the water of several feet in less than half an hour. Domestic stock was drowned, and it is believed that the property loss to Hatteras alone will amount to \$15,000 or \$20,000. The fishing industry has, for a time, been swept out of existence, and of the 13 fish-packing houses, which were situated on the water front, 10 with all their equipments and contents were lost. A great proportion of the houses on the island were badly damaged and many families are without homes. All bridges are swept away and roadways are piled high with wreckage. All telegraph and telephone lines are down.

The following vessels are known to be lost between Hatteras and Big Kinnakeet:

A large steamship foundered about one mile off Hatteras beach the night of the 17th, and it is thought all on board were drowned. From the marks on some of the wreckage which drifted ashore it is supposed her name was the *Agnes* and that she was German or Norwegian. She was loaded with cotton and staves, a portion of which cargo drifted on the beach. The Diamond Shoals Light Ship which was stationed off Hatteras broke loose from her moorings the morning of the 17th and was carried southward by the gale; when the wind shifted to the southeast she was carried ashore near Creeds Hill Life-Saving Station, where she now lies high on the beach. The crew was saved by the Creeds Hill life-saving crew. The three-masted schooner *Florence Randall* went ashore 1 mile north of Big Kinnakeet Life-Saving Station the night of the 16th. The crew was saved by the Kinnakeet life-saving crew. The schooner will be a total loss. The damage to the instruments and property of the Weather Bureau office was considerable, the anemometer being carried away before the storm attained its maximum

strength, and the rain gage was swept away the early morning of the 17th.

The people of this locality had ample warning of this storm, yet such preparations as could be made were of little avail in a storm of this character. All of the stores, warehouses, and other buildings in which property is stored for safe keeping are situated along the water front, and in this case they were either flooded or swept away. No lives were lost at Hatteras, although there were many narrow escapes. At Ocracoke and Portsmouth, 16 and 20 miles south of this station, the storm was about as severe as at Hatteras; reliable details are, however, lacking.

The foregoing reports show that maritime and commercial interests have been lavish in commendatory utterances regarding the value of the Weather Bureau warnings and advices issued in connection with this hurricane. The Bureau of Navigation, United States Navy Department, has acknowledged the prompt and valuable telephone and telegraphic notices of the hurricane, whereby action calculated to provide against damage or disaster to vessels of the United States Navy could be taken, and the press of the United States and the West Indies has given full credit for the accurate and invaluable forecasts and reports that were furnished for the information and benefit of the public.

THE CARABELLE, FLA., STORM OF AUGUST 1-2, 1899.

The following is the substance of a report by Mr. A. J. Mitchell, Observer and Section Director, Weather Bureau, on a storm which visited a small part of western Florida on the 1st and 2d of August, 1899:

At Carabelle, Fla., over which the center of the storm doubtless passed, the wind was fresh to brisk from the northeast on July 31, and increased gradually until sunrise of August 1, when the gale was furious. About noon of the same day almost a calm prevailed. Within a short time the wind increased to a furious gale from the west, which continued until nearly sundown, the wind gradually diminishing with a west backing to south direction. At 3 a. m. of the 2d a severe thunderstorm with torrential rain, occurred.

The diameter of the storm was not more than 40 miles, and its force was spent before it progressed 50 miles inland.

Great damage befell the town of Carabelle, where not more than a score of unimportant houses withstood the storm. The result to shipping was disastrous. The following vessels, most of them loaded, were wrecked: 14 barks, 40 small boats under twenty tons, and 3 pilot boats. The value of the vessels and cargoes lost was \$375,000. Carabelle was damaged to the extent of \$100,000, other towns to the extent of \$50,000, and crops were destroyed to the value of \$50,000. The number of persons drowned and killed was 6.

This storm was purely local in character, and could not, therefore, be made the subject of a specific forecast. The weather conditions were somewhat threatening July 30 and 31, and on the 30th an advisory message, stating the likelihood of strong winds, was sent to all stations on the Florida Peninsula. The displayman at Cedar Keys, Fla., reports that "40 vessels, coasting schooners, and spongers were detained in port by the warning, and but for this information of the storm they would have sailed and some would have been lost."

RIVERS AND FLOODS.

River matters were entirely uneventful during the month of August, 1899. The period of the year at which the lowest stages of water are to be expected was rapidly approaching, and the rivers, as a rule, fell steadily throughout the month, the minimum stages being generally reached on the last day. The only exceptions occurred in the Atlantic States, where heavy local showers caused a temporary suspension of the fall during the last few days of the month.

The highest and lowest water, mean stage, and monthly range at 125 river stations are given in the accompanying table. Hydrographs for typical points on seven principal rivers are shown on the accompanying chart. The stations selected for charting are: Keokuk, St. Louis, Cairo, Memphis, Vicksburg, and New Orleans on the Mississippi; Cincinnati,

on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—H. C. Frank- enfield, Forecast Official.

Heights of rivers referred to zeros of gages, July, 1899.

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
<i>Mississippi River.</i>								
St. Paul, Minn.	1,957	14	8.8	26	3.5	6-9	5.2	5.3
Reads Landing, Minn.	1,887	12	4.4	31	1.2	18	2.2	3.2
La Crosse, Wis.	1,822	12	5.2	31	2.6	18, 19	3.4	2.6
North McGregor, Iowa.	1,762	18	3.8	4, 5	2.1	20	2.9	1.7
Dubuque, Iowa.	1,702	15	3.9	5	2.2	21, 22	3.0	1.7
Leclaire, Iowa.	1,612	10	2.3	6	1.2	23-26	1.7	1.1
Davenport, Iowa.	1,596	15	3.3	6	2.0	23-25	2.6	1.3
Muscataine, Iowa.	1,565	16	4.2	8, 10	2.6	24-26	3.4	1.6
Galland, Iowa.	1,475	8	1.8	1, 2, 9	0.9	28	1.4	0.9
Keokuk, Iowa.	1,466	14	3.1	1	1.2	26-29	2.1	1.9
Hannibal, Mo.	1,405	17	7.3	9	2.4	29-31	3.8	4.9
Grafton, Ill.	1,307	33	9.9	11	3.3	31	5.6	6.6
St. Louis, Mo.	1,264	30	16.2	11	7.3	31	12.0	8.9
Chester, Ill.	1,189	36	12.1	12	5.3	31	9.1	6.8
Memphis, Tenn.	843	33	11.6	1	5.7	31	9.6	5.9
Helena, Ark.	767	42	17.7	1	9.8	31	15.0	7.9
Arkansas City, Ark.	635	43	22.0	1	10.8	31	16.5	11.2
Greenville, Miss.	565	42	18.1	1	9.1	31	13.6	9.0
Vicksburg, Miss.	474	45	20.7	1	10.3	31	15.4	10.4
New Orleans, La.	108	16	5.9	1	4.1	20, 21	5.0	1.8
<i>Missouri River.</i>								
Bismarck, N. Dak.	1,201	14	6.6	1	3.8	31	5.3	2.8
Pierre, S. Dak.	1,006	14	7.1	1	4.4	30, 31	5.6	2.7
Sioux City, Iowa.	676	19	10.7	1	7.6	31	9.0	3.1
Omaha, Nebr.	561	18	11.0	1	8.5	31	9.5	2.5
St. Joseph, Mo.	373	10	7.2	6	4.6	31	6.2	2.6
Kansas City, Mo.	280	21	16.1	1	10.4	31	13.2	5.7
Boonville, Mo.	191	20	13.7	1	9.3	27, 28	11.6	4.4
Hermann, Mo.	95	24	12.9	1, 2	8.7	29, 30	11.1	4.2
<i>Des Moines River.</i>								
Des Moines, Iowa.	150	19	3.9	5-10	2.9	31	3.6	1.0
<i>Illinois River.</i>								
Peoria, Ill.	185	14	4.4	2	3.4	22-24, 27-29	3.8	1.0
<i>Youghiogheny River.</i>								
Confidence, Pa.	59	10	4.0	5	0.4	26	1.2	3.6
West Newton, Pa.	15	23	3.9	5	0.0	24-26	0.7	3.9
<i>Allegheny River.</i>								
Warren, Pa.	177	7	0.8	1	0.0	13-31	0.1	0.3
Oil City, Pa.	123	13	0.8	1	0.1	29-31	0.2	0.9
Parkers Landing, Pa.	73	20	1.4	13	0.2	21, 22	0.6	1.6
<i>Monongahela River.</i>								
Weston, W. Va.	161	18	0.0	12	-1.4	24-27	-0.8	1.4
Fairmont, W. Va.	119	25	2.2	7	0.2	19-27	0.7	2.0
Greensboro, Pa.	81	18	3.3	1	6.2	25-30	6.7	2.1
Look No. 4, Pa.	40	28	10.6	1	5.6	26	7.5	5.0
<i>Comaugh River.</i>								
Johnstown, Pa.	64	7	2.8	23	0.7	26	1.5	2.1
<i>Red Bank Creek.</i>								
Brookville, Pa.	35	8	0.6	4, 5	-0.2	30, 31	0.3	0.8
<i>Beaver River.</i>								
Ellwood Junction, Pa.	10	14	0.3	12, 13	-0.3	1-4	-0.1	0.6
<i>Great Kanawha River.</i>								
Charleston, W. Va.	61	30	7.0	6	6.3	8	6.7	0.7
<i>New River.</i>								
Hinton, W. Va.	95	14	1.8	2	1.0	25-29	1.4	0.8
<i>Cheat River.</i>								
Rowlesburg, W. Va.	36	14	2.8	1	-0.8	26	0.5	3.6
<i>Ohio River.</i>								
Pittsburg, Pa.	966	22	6.4	27	4.9	3	5.6	1.5
Davis Island Dam, Pa.	960	25	5.5	6	1.8	25, 26	3.1	3.7
Wheeling, W. Va.	875	36	6.2	7	1.3	27	3.2	4.9
Parkersburg, W. Va.	785	26	7.0	8, 9	1.9	29	4.5	5.1
Point Pleasant, W. Va.	708	39	7.8	3	1.7	29-31	3.8	6.1
Catlettsburg, Ky.	651	50	10.1	4	1.6	31	4.9	6.5
Portsmouth, Ohio.	612	50	10.3	5	2.4	31	6.0	7.9
Cincinnati, Ohio.	499	50	13.5	11	4.0	30, 31	8.0	9.5
Louisville, Ky.	367	28	7.0	12	2.8	31	4.8	4.2
Evansville, Ind.	184	35	10.9	15	3.8	31	6.8	7.1
Paducah, Ky.	47	40	7.6	17	2.3	31	5.3	5.8
Calro, Ill.	1,073	45	17.6	14, 15	8.0	31	14.2	9.6
<i>Muskingum River.</i>								
Zanesville, Ohio.	70	20	8.0	6	5.7	17, 24-27, 29-31	6.1	2.3
<i>Miami River.</i>								
Dayton, Ohio.	69	18	1.3	6	0.6	25, 26	0.9	0.7
<i>Wabash River.</i>								
Mount Carmel, Ill.	50	15	4.0	12-13	0.9	30, 31	2.2	3.4
<i>Licking River.</i>								
Falmouth, Ky.	30	25	4.3	12	0.4	31	1.2	3.6
<i>Clinch River.</i>								
Speers Ferry, Va.	156	20	1.2	1	-0.6	26, 27	0.1	1.8
Clinton, Tenn.	46	25	5.0	6	3.0	31	4.1	2.0
<i>Tennessee River.</i>								
Knoxville, Tenn.	614	28	0.4	1	-1.2	23, 29	-0.4	1.6
Kingston, Tenn.	534	25	1.3	1	0.3	21-23	0.5	1.0
Chattanooga, Tenn.	430	33	4.4	1	1.2	26-28	2.1	3.2
Bridgeport, Ala.	390	24	3.2	1	0.2	31	1.0	3.0

Heights of rivers referred to zeros of gages—Continued.

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
<i>Tennessee River—Con.</i>								
Florence, Ala.	220	16	2.6	3	0.1	31	0.9	2.5
Riverton, Ala.	190	25	2.7	3	-1.4	31	0.2	4.1
Johnsonville, Tenn.	94	21	3.7	5	0.7	31	2.0	3.0
<i>Cumberland River.</i>								
Burnside, Ky.	434	50	3.0	15	0.3	31	1.2	2.7
Carthage, Tenn.	237	30	3.0	1	0.6	30	1.6	2.4
Nashville, Tenn.	175	40	5.4	1	1.5	27, 30, 31	2.7	3.9
<i>Arkansas River.</i>								
Wichita, Kans.	720	10	4.9	12	1.6	31	2.8	3.3
Webbers Falls, Ind. T.	407	23	5.1	18	1.8	31	3.2	3.3
Fort Smith, Ark.	345	23	7.0	1	3.1	31	5.0	3.9
Dardanelle, Ark.	250	21	6.8	1	2.5	31	3.7	4.3
Little Rock, Ark.	170	23	8.9	1	3.9	31	5.4	5.0
<i>White River.</i>								
Newport, Ark.	150	26	4.5	1	1.5	26, 27	2.5	3.0
<i>Yazoo River.</i>								
Yazoo City, Miss.	80	25	7.0	3, 4	0.0	17, 18	3.7	7.0
<i>Red River.</i>								
Arthur City, Tex.	688	27	10.5	1	6.1	30, 31	7.4	4.4
Fulton, Ark.	595	23	15.7	1	3.9	31	6.4	11.8
Shreveport, La.	449	29	11.9	1	2.0	31	5.9	9.9
Alexandria, La.	139	33	9.5	1	0.9	31	4.9	8.6
<i>Ouachita River.</i>								
Camden, Ark.	340	39	4.0	1	2.7	29	3.2	1.3
Monroe, La.	100	40	3.0	1	0.6	30, 31	1.4	2.4
<i>Atchafalaya Bayou.</i>								
Melville, La.	100*	31	21.1	2	11.7	31	16.3	9.4
<i>Susquehanna River.</i>								
Wilkesbarre, Pa.	178	14	1.5	7	-1.8	21	-0.5	3.3
Harrisburg, Pa.	70	17	4.0	28	0.4	26	1.0	3.6
<i>W. Br. of Susquehanna.</i>								
Williamsport, Pa.	35	20	2.5	28	0.0	7, 8, 21	0.5	2.5
<i>Juniata River.</i>								
Huntingdon, Pa.	80	24	4.2	29	2.8	26, 27	3.0	1.4
<i>Polomac River.</i>								
Harpers Ferry, W. Va.	170	16	2.1	29	0.8	1-3	1.4	1.3
<i>James River.</i>								
Lynchburg, Va.	237	18	1.2	15	-0.1	24-26	0.3	1.3
Richmond, Va.	110	12	1.6	28	-2.6	3	-0.8	4.2
<i>Roanoke River.</i>								
Clarksville, Va.	155	12	4.6	29	0.8	26, 27	2.4	3.8
Weldon, N. C.	90	40	13.4	29	7.2	28	8.8	6.2
<i>Cape Fear River.</i>								
Fayetteville, N. C.	100	38	11.5	1	1.5	30	4.4	10.0
<i>Lumber River.</i>								
Fairbluff, N. C.	10	6	6.0	1	0.8	31	3.7	5.2
<i>Edisto River.</i>								
Edisto, S. C.	75	6	4.1	31	1.5	26	3.8	2.6
<i>Pedee River.</i>								
Cheraw, S. C.	145	27	5.3	2	0.8	29	1.9	4.5
<i>Black River.</i>								
Kingstree, S. C.	60	12	1.1	31	0.5	21-23	0.7	0.6
<i>Lynch Creek.</i>								
Effingham, S. C.	35	12	4.3	2	1.4	26	2.4	2.9
<i>Santee River.</i>								
St. Stephens, S. C.	50	12	5.9	1	-0.4	24, 25	1.7	6.3
<i>Congaree River.</i>								
Columbia, S. C.	37	15	2.3	29	-0.2	6	0.4	2.4
<i>Watauga River.</i>								
Camden, S. C.	45	24	7.1	31	2.9	22, 27	4.2	4.2
<i>Waccamaw River.</i>								
Conway, S. C.	40	7	6.9	15, 16	4.2	29	5.9	2.7
<i>Savannah River.</i>								
Calhoun Falls, S. C.			3.5	30	2.5	19, 20	2.8	1.0
Angusta, Ga.	130	32	13.2	28	4.7	22	6.6	8.5
<i>Broad River.</i>								
Carleton, Ga.			4.1	31	1.9	17-20, 22, 24	2.2	2.2
<i>Flint River.</i>								
Albany, Ga.	80	30	4.9	3, 4	0.2	30, 31	2.0	4.7
<i>Chattahoochee River.</i>								
Oakdale, Ga.			5.2	27	0.1	25, 26	1.9	5.1
West Point, Ga.	239	20	4.1	30	1.9	25	2.7	2.2
<i>Cosa River.</i>								
Rome, Ga.	225	30	2.5	27-29, 31	0.7	24-26	1.5	1.8
Gadsden, Ala.	144	18	3.4	1	-0.2	16, 17, 26	0.6	3.6
<i>Alabama River.</i>								
Montgomery, Ala.	265	35	9.4	1	1.3	16	2.9	8.1
Selma, Ala.	212	35	11.1	1	2.6	15-17	4.5	8.5
<i>Tombigbee River.</i>								
Columbus, Miss.	235	33	-0.4	1	-2.7	16, 25, 26	-2.0	2.3
Demopolis, Ala.	155	35	7.7	1	-0.9	16	0.8	8.6
<i>Black Warrior River.</i>								
Tuscaloosa, Ala.	90	38	6.5	1	0.3			