

TABLE 3.—Recorded occasions with winds attaining 50 miles per hour or over, at Pensacola, Fla., from Nov. 14, 1879, to July 20, 1916.

[Maximum velocities maintained for 5 minutes or more.]

Five-minute velocity.	Direction.	Date.	Five-minute velocity.	Direction.	Date.	Five-minute velocity.	Direction.	Date.
Mts./hr.			Mts./hr.			Mts./hr.		
50	n.	Sept. 9, 1882	54	so.	Feb. 21, 1910	76	se.	May 11, 1912
60	sw.	Aug. 20, 1888	54	e.	Feb. 26, 1910	79	se.	Sept. 13, 1912
50	sw.	Jan. 21, 1891	50	se.	Apr. 15, 1910	51	se.	Sept. 14, 1912
50	s.	Aug. 17, 1892	36	sw.	Apr. 24, 1910	50	s.	Oct. 18, 1912
52	sw.	Dec. 31, 1892	58	s.	Nov. 28, 1910	60	s.	Jan. 26, 1913
57	w.	Apr. 20, 1893	52	se.	Dec. 22, 1910	56	sw.	Feb. 27, 1913
66	sw.	Oct. 2, 1893	60	s.	Feb. 19, 1911	54	s.	Mar. 21, 1913
56	se.	Nov. 27, 1893	53	e.	Mar. 26, 1911	52	se.	Sept. 5, 1913
52	se.	Aug. 7, 1894	52	se.	Apr. 5, 1911	60	se.	Feb. 6, 1914
64	ne.	Oct. 8, 1894	52	nw.	Apr. 11, 1911	62	se.	Nov. 27, 1914
72	n.	July 7, 1896	68	e.	Apr. 26, 1911	60	se.	Nov. 28, 1914
51	se.	Mar. 23, 1901	66	e.	Apr. 27, 1911	52	s.	Feb. 5, 1915
70	sw.	Aug. 15, 1901	50	e.	June 3, 1911	54	nw.	June 25, 1915
60	sw.	Dec. 28, 1901	58	se.	Aug. 10, 1911	50	ne.	July 10, 1915
52	sw.	Feb. 27, 1902	80	so.	Aug. 11, 1911	60	se.	Sept. 29, 1915
50	sw.	Mar. 29, 1906	56	s.	Aug. 12, 1911	64	s.	Sept. 30, 1915
52	ne.	Sept. 26, 1906	56	nw.	Nov. 12, 1911	70	sw.	Dec. 28, 1915
83	e.	Sept. 27, 1906	60	e.	Dec. 19, 1911	51	s.	Mar. 25, 1916
50	s.	May 31, 1907	80	se.	Dec. 20, 1911	52	s.	Apr. 7, 1916
63	s.	Aug. 19, 1909	52	sw.	Jan. 8, 1912	66	s.	June 13, 1916
53	n.	Aug. 28, 1909	58	sw.	Feb. 21, 1912	104	se.	July 5, 1916
64	se.	Sept. 20, 1909	62	nw.	Mar. 11, 1912	67	s.	July 6, 1916
60	s.	Sept. 21, 1909	50	s.	Mar. 14, 1912	52	sw.	July 7, 1916
52	se.	Dec. 12, 1909	56	s.	Apr. 17, 1912	50	sw.	July 8, 1916
60	s.	Feb. 17, 1910						

HURRICANE OF JULY 5-6, 1916. AT MOBILE, ALA.

By ALBERT ASHENBERGER, Meteorologist.

[Dated: Weather Bureau Office, Mobile, Ala., July 28, 1916.]

The hurricane of July 5-6, 1916, was more destructive within the city limits of Mobile than any other storm in the recorded meteorological history of this section.

THE WARNINGS.

On Sunday July 2 a telegram was received from the Central Office as follows:

Tropical disturbance central short distance north of Swan Island, approximately latitude 17° north, longitude 84° west; apparently moving north or northwest.

The information was bulletined; and the warning was published in the Mobile Register on July 3. Subsequent warnings received were bulletined and given to the press; on July 4, the harbor master and the pilots' office were informed that no vessels should leave port, and the Mobile Item published two of the warnings. The storm warning received at 9:13 p. m. July 4 was bulletined, repeated to the substations on the Alabama coast (except Fort Morgan, the telegraph office to which was closed), and published in the morning Mobile Register of July 5. The hurricane warning received at 9:53 a. m. July 5 was given extraordinary dissemination; and in the work the office had the cooperation of the Mobile & Ohio Railroad, the Louisville & Nashville Railroad, the Home Telephone Co., and the Southern Bell Telephone & Telegraph Co. At about 11 a. m. the chief of police was requested to notify parties along the river front that high tides were expected. The telegraph line to Fort Morgan was down from July 4, and the telephonic communication to points in Baldwin County, Ala., was interrupted before the warning could be sent out.

METEOROLOGICAL CONDITIONS.

No unusual cloud formations or optical phenomena were observed on the day preceding the storm. A thunderstorm occurred on the afternoon of July 4; light

rain began between 4 and 5 a. m. of July 5 and the gusty character of the wind was noticeable at about 4:30 a. m. of the 5th.

On July 4 there was a slight decrease in barometric pressure, but there were only gentle winds excepting a squall with a maximum velocity of 33 miles, from the east, which occurred at about 3 p. m., during the thunderstorm. The barometric pressure decreased steadily on July 5, the fall becoming more rapid until about 3:06 p. m. at which time the rapid fall ceased and the wind reached its highest velocity, a maximum of 107 miles an hour from the east. (See fig. 2, p. 397.) The barometer registered a minimum of 28.92 inches at 3:45 p. m. July 5 and began to rise rapidly after 6 p. m. Prior to the squall on July 4 the wind was prevailing from the southeast; subsequently it varied from east to north till about 9 p. m., after which it came constantly from the northeast till noon of July 5. In the afternoon it gradually veered to east, changed to southeast between 4 and 5 p. m., and was generally south after 11 p. m. The wind reached a velocity of 26 miles an hour at 4:55 a. m. July 5; and a maximum of 44 miles at 10:07 a. m. was the highest in the forenoon. The wind increased rapidly after noon, reaching 60 miles an hour at 12:15 p. m., after which higher velocities were registered at intervals until the highest was reached at 3:06 p. m. The hourly wind movement from 3 to 4 p. m. was 99 miles; from 4 to 5 p. m., 81 miles; from 5 to 6 p. m., 88 miles; from 6 to 7 p. m., 91 miles; from 7 to 8 p. m., 84 miles; and then there was a decrease. The record was lost from 9:55 p. m., July 5, to 6:35 a. m., July 6, owing to a broken wire. A maximum of 40 miles an hour on July 6 last occurred, beginning at 9:04 a. m.

The rain which began on the morning of the 5th continued to 1:59 p. m. of the 6th, but was interrupted from 11:45 a. m. to 12:55 p. m. of the 6th. The total was 8.56 inches. Heavy rains on July 7, which amounted to 4.99 inches, caused considerable damage in unroofed houses, and the obstructions near the river caused the water to cover the lower floors in buildings on Water Street.

THE TIDES.

The tide in Mobile River was observed to be below normal at about 5:30 a. m. July 5. The water began to rise rapidly near midday, and Deputy Harbor master Farrell reported that at 4:45 p. m. it began to come over the wharf at the foot of St. Francis Street, although it had entered Water Street about a half hour earlier, probably through the sewers. The highest stage was reached at about 10:30 p. m. July 5, and there was no marked fall until about 2:30 a. m. July 6. The entire wholesale business district was inundated, and on St. Francis Street the water extended inland about four blocks. The water receded very slowly and only disappeared from the streets about 4 p. m. July 6. City Engineer Wright Smith contributes in Table 1 the measurements of the height of the tides which have occurred during the last six storms. He has not yet had time to check the last measurement.

TABLE 1.—Stages reached by tides accompanying recent storms at Mobile, Ala.

Year.	Above mean low tide.
1893.....	8.3
1901.....	8.23
1906.....	9.87
1909.....	8.7
1915.....	7.2
1916.....	11.6

THE DAMAGE AT MOBILE BY THE STORM.

The damage to buildings was probably more general than from any other storm, although only a few houses were demolished. Of the houses destroyed, the Lowenstein Building, valued at about \$30,000, was the greatest individual loss. Numerous tin roofs were rolled up and other roofs totally or partly torn off, so that few interiors of houses escaped damage by rain.

Nearly all merchants in the wholesale business district elevated their wares above the level of the highest tide, which occurred in 1906, but the unprecedented high water wet the lowermost goods, and the grain in sacks was damaged to the fourth layer of sacks above the one submerged. All electric services were totally crippled, the telegraph lines going down at about noon July 5. The Western Union Telegraph Co. reestablished communication over one wire at about 11 p. m. July 7. Railroad traffic was suspended, and the heavy rains on July 7 again deterred the movement of trains. The wharves suffered greater damage than from any other storm, and shipping suffered considerably, although not so much as in the storm of 1906. The official list of the American vessels wrecked, kept in the office of the collector of customs, will not be completed for a month, as, owing to the disturbed conditions, returns are not being made by vessel owners. Through observation and inquiry of boatmen information was obtained for the following list of marine disasters: Two bay steamships are probably complete losses, and four others are sunk or aground; four tugs are sunk or aground; one Russian ship, one Russian bark, and the four-masted schooner *Elizabeth Doyle* are aground; 12 barges, mostly laden with coal, are sunk or aground; two river steamers are on top of the wharf; four large yachts and numerous small craft are sunk or aground.

The day preceding the storm being a holiday some of the tugs were without steam, and the prevalent opinion that a severe storm could not occur so early in the year resulted in many vessel masters not taking sufficient precautions.

The estimated damage to buildings, street paving, and electric services by wind and tide is \$1,300,000; the damage to merchandise by tide is \$500,000 and by rain \$200,000; the damage to docks and railroads entering Mobile, \$200,000; damage to vessels, \$150,000; the loss of timber floated away, \$75,000. Generally the parties that lost are not disposed to make known the extent of their losses, and more difficulty was experienced in securing information than following any storm since that of 1906. The estimates of the damage made by different parties differ by as much as \$2,000,000 or \$3,000,000.

At Mobile one death by drowning occurred, that of a colored woman blown from a house boat. Three other bodies of drowned persons were found near Mobile, but these may have come from the lower bay, as parts of a barge that was near Fort Morgan were found at Mobile.

VALUE OF THE WARNINGS.

The warnings issued were instrumental in saving lives and probably preventing some marine disasters. The protection of goods from high tides at Mobile probably prevented a loss of \$100,000.

INFORMATION FROM STORM-WARNING SUBSTATIONS.

On the Mississippi coast the severity of the storm decreased rapidly west of Pascagoula. Based principally on reports from the storm-warning displaymen, the following is an account of the damage at the storm-warning substations:

Fort Morgan.—The storm was severe from early in the morning. Considerable damage was done to property. In lower Mobile Bay, near Fort Morgan, the barge *Harry Morse* and the schooner *Emma Lord* were sunk and the number of lives lost is probably 11. The barometer was 29.50 inches at midnight, July 4, and 28.38 at 4 p. m. July 5. (The instrument will be compared with the standard.)

Pascagoula.—Half of the buildings in the town were damaged. The monetary loss is estimated at \$40,000, and an equal loss in the near-by town of Moss Point. The wind veered from northeast to southwest and there was a lull for about 20 minutes between 4 and 5 p. m.

Biloxi.—The property loss within the city limits by wind and water is estimated at \$10,000. One person was killed. The wind backed from northeast to southwest. The tide was about 3 feet lower than during the storm of September, 1915.

Gulfport.—The estimated damage to property is \$40,000.

Pass Christian.—The estimated damage to property is about \$10,000; the tides were not high.

Bay St. Louis.—The damage by storm was slight, probably amounting to \$200.

THE TROPICAL HURRICANE OF JULY 5, 1916, IN LOUISIANA.

By ISAAC M. CLINE, District Forecaster.

[Dated: Weather Bureau Office, New Orleans, La., Aug. 3, 1916.]

The western segment of an unusually severe tropical storm passed over southeastern Louisiana July 5, 1916. Advisory warnings giving the location and probable movement of the storm were received from the Central Office, July 2, 3, and 4, telegraphed to all coast stations, radiographed to ships at sea, telephoned to shipowners and agents, and published in the daily papers.

The following specific warnings were distributed to the public:

July 4. Hoist northeast storm warnings Louisiana coast, 8:15 p. m. Disturbance probably centered near middle Gulf, moving northwest. Caution is advised.

July 5. Advisory Louisiana and Texas coast stations, 9 a. m. Tropical storm nearing middle Gulf coast, moving northwest. Strong northerly winds and moderate gales on the Louisiana coast, with rising tide to-day and to-night. Moderate to fresh northerly winds on the Texas coast.

July 5. Change to hurricane warning, 11 a. m., Louisiana coast. Notify people in exposed localities. High tides and hurricane winds indicated this afternoon and to-night. Shipping should remain in port.

This warning was given an extraordinary distribution. It was telephoned to Fishers' Landing and Harvey's Canal, with instructions to send to Grand Isle by motor boat. Another motor boat was started out from Myrtle Grove with instructions to distribute warnings throughout the Barataria section and reach Grand Isle if possible. This boat carried the warning 18 miles, distributing it to fishing camps, and returned, covering a distance of 36 miles. It was sent to all telephone exchanges in south Louisiana at Government expense, and Superintendent Baird instructed all managers of telephone exchanges to which the warnings had been sent to give the warnings the widest possible distribution. Mr. W. A. Porteous, manager of the Western Union Telegraph Co., Mr. N. E. Church, manager of the Postal Telegraph Co., and Mr. Charles Marshall of the Louisville & Nashville Railroad, sent the warning to all managers and station agents without expense to the United States, with instructions to advise their patrons.

The warnings were heeded generally. Small craft put into safer harbors, large vessels stopped in the Mississippi at Pilottown or remained at New Orleans until advised