

Actuarial Weather Extremes: Rainfall Totals for Hurricane Elsa



Rainfall Totals for Hurricane Elsa

On June 29, a weather system formed in the central Atlantic Ocean, off the coast of the Cabo Verde Islands. The system intensified as it traveled in a westerly direction across the Atlantic, achieving sufficient strength to be classified as a tropical storm on July 1, whereupon it was given the name “Elsa”. On July 2, based on surface observations from Barbados, Elsa was reclassified as a Category 1 hurricane. The storm traversed Cuba on July 5 and arrived off the coast of western Florida on July 6, making landfall in Taylor County. After landfall, the storm turned northward and weakened, traveling across the Florida panhandle on July 7, through central South Carolina in the morning hours of July 8, and through North Carolina and southern Virginia in the afternoon and evening of July 8. On July 9, Elsa moved rapidly from Virginia to Massachusetts, hugging the shoreline. On July 10, still hugging the coast, the storm entered Canadian waters, affecting the provinces of Nova Scotia and New Brunswick. On July 11, the weakening storm, now moving away from land, drifted into the open seas of the North Atlantic.

Figure 1 shows rainfall totals for Elsa, computed with weather station data from the Global Historical Climatology Network¹ (GHCN). Each dot on the map represents an individual weather station. Only stations with more than two inches of rain are displayed. Table 1 shows the ten weather stations with the largest rainfall totals.

Figure 1
Total Rainfall Produced by Hurricane Elsa (source: GHCN data)



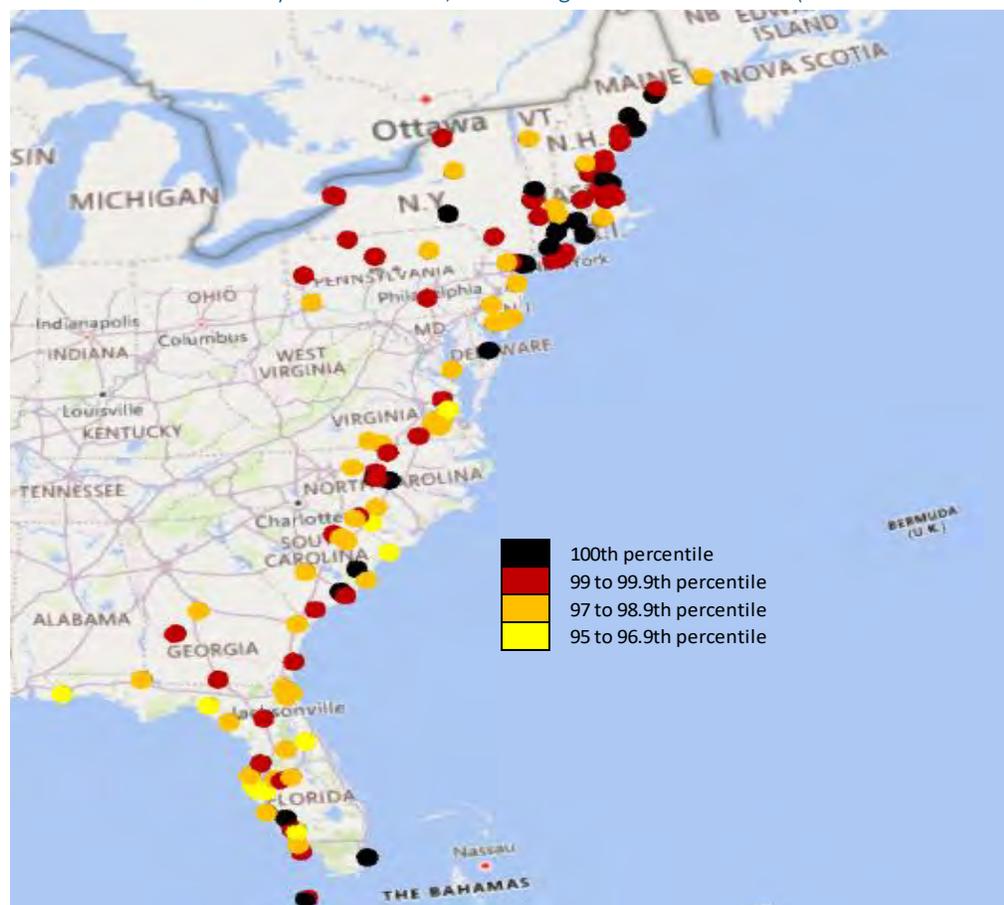
¹ <https://www.ncdc.noaa.gov/data-access/land-based-station-data/land-based-datasets/global-historical-climatology-network-ghcn>

Table 1
 Top Ten Rainfall Totals for Hurricane Elsa (source: GHCN data)

State	Name of Weather Station	Latitude (N)	Longitude (E)	Total Rainfall (Inches)
FL	NORTH PORT 4.7 NNE	27.1	277.8	10.10
FL	PORT CHARLOTTE 6.2 W	27.0	277.8	8.88
FL	GROVE CITY 2.8 NE	26.9	277.7	8.85
FL	NORTH PORT 5.4 SW	27.0	277.8	8.48
FL	GAINESVILLE 7.7 W	29.7	277.5	8.20
GA	SKIDAWAY ISLAND 0.8 NE	31.9	279.0	8.12
FL	BRONSON 3.0 SE	29.4	277.4	8.06
FL	NORTH PORT 2.6 E	27.1	277.9	7.92
FL	NORTH PORT 4.2 E	27.0	277.9	7.77
FL	CAPE CORAL 3.9 NNW	26.7	278.0	7.42

For most locations, Elsa produced rainfall across a period of one to two days. Therefore, to assess whether Elsa generated unusually heavy precipitation, the storm’s rainfall totals were compared to the historical distribution of two-consecutive-day rainfall totals (Figure 2). Only those stations with at least 2 inches of rainfall from Elsa, and with at least 20 years of data history, are shown in Figure 2.

Figure 2
 Total Rainfall Produced by Hurricane Elsa, Ranked Against Historical Data (source: GHCN data)



A ranking of 100% indicates a record-high level of precipitation relative to the historical period from 2000 through 2020, using data drawn from the latter half of June and the first half of July. A ranking of “N” percent indicates that the rainfall produced by Elsa exceeded N percent of historical two-day precipitation totals. The historical data includes both days with precipitation and days without precipitation.

Due to lack of sufficient historical data, it was not possible to rank all the stations shown in Figure 1 and Table 1. Among those stations with sufficient historical data, those shown in Table 2 recorded recording-setting rainfalls as measured against the historical period.

Table 2

List of Stations with Record-Setting Rainfall Totals (source: GHCN data)

State	Name of Weather Station	Latitude (N)	Longitude (E)	Total Rainfall (Inches)
FL	PUNTA GORDA CHARLOTTE CO AP	26.9	278.0	6.63
CT	BRIDGEPORT SIKORSKY MEM AP	41.2	286.9	5.22
FL	KEY WEST INTL AP	24.6	278.3	4.49
FL	CAPE FLORIDA	25.7	279.8	4.47
CT	HARTFORD BRAINARD FLD	41.7	287.4	4.44
NY	GREENE	42.3	284.2	4.42
NY	NEW YORK CNTRL PK TWR	40.8	286.0	4.33
DE	GEORGETOWN SUSSEX CO AP	38.7	284.6	4.32
CT	MERIDEN MARKHAM MUNI AP	41.5	287.2	4.31
SC	CHARLESTON INTL AP	32.9	280.0	4.12
NJ	TETERBORO AP	40.9	285.9	4.02
SC	ANDREWS	33.4	280.4	3.82
CT	WILLIMANTIC WINDHAM AP	41.7	287.8	3.80
ME	BANGOR INTL AP	44.8	291.2	3.48
ME	WISCASSET AP	44.0	290.3	3.42
NC	CLAYTON WTP	35.6	281.5	3.38
MA	NORTH ADAMS HARRIMAN AP	42.7	286.8	2.91
MA	BEVERLY MUNI AP	42.6	289.1	2.85
NY	NEW YORK LAGUARDIA AP	40.8	286.1	2.76
MA	LAWRENCE MUNI AP	42.7	288.9	2.75
NC	APEX	35.7	281.2	2.72
CT	GROTON NEW LONDON AP	41.3	288.0	2.46
ME	AUGUSTA STATE AP	44.3	290.2	2.44



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SOA Research Team for This Report

Patrick Wiese, ASA and Rob Montgomery, ASA, MAAA, FLMI

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Society of Actuaries
475 N. Martingale Road, Suite 600
Schaumburg, Illinois 60173
www.SOA.org