FloridaClimateCenter
Office of the State Climatologist

Florida Annual Climate Summary for 2016

Prepared by Daniel J. Brouillette and David F. Zierden, Florida Climate Center

12 January 2017

Temperatures

Temperatures in Florida in 2016 were much above historical averages. The statewide annual average temperature registered 72.5°F, some 2.4°F above the 20th-century average value of 70.1°F (Figure 1). As such, 2016 was the second-warmest year in the instrumental record in Florida, ranked after 2015 (Figure 2). The instrumental record extends back to 1895. Florida was similar to the rest of the contiguous United States in registering a much warmer-than-average year. In the contiguous United States, the annual average temperature was 54.91°F, some 2.89°F above the 20th-century average value of 52.02°F, allowing 2016 to rank second warmest on record (since 1895) nationwide after 2012. Each of the 48 contiguous states, except Iowa and Nevada, registered a top-five-warmest year.

The highest temperature recorded in Florida in 2016 was 101°F at the Jacksonville-Craig Municipal Airport (Duval County) on 9 and 29 July, Jacksonville International Airport (Duval County) on 28 July, Jacksonville Naval Air Station (Duval County) on 8 and 10 July, and at the NWS COOP station 3 miles southeast of Inverness (Citrus County) on the afternoons of 9 and 27 July (recorded on 10 and 28 July).

The lowest temperature recorded in Florida in 2016 was 22°F at Crestview (Okaloosa County) on the morning of 24 January. Many locations on the panhandle and in the northern part of the peninsula registered their annual minimum temperatures that morning.

A continued trend this year has been the presence of greater positive anomalies in daily minimum (overnight) temperatures compared to anomalies in daily maximum (daytime) temperatures, especially during the warmer half-year. Contributing greatly to the recent large positive anomalies in and high rankings of mean temperature, this trend is likely related to higher humidity values, which may be related to consistently higher-than-average sea-surface temperatures in the western Atlantic Ocean, including the Gulf of Mexico.

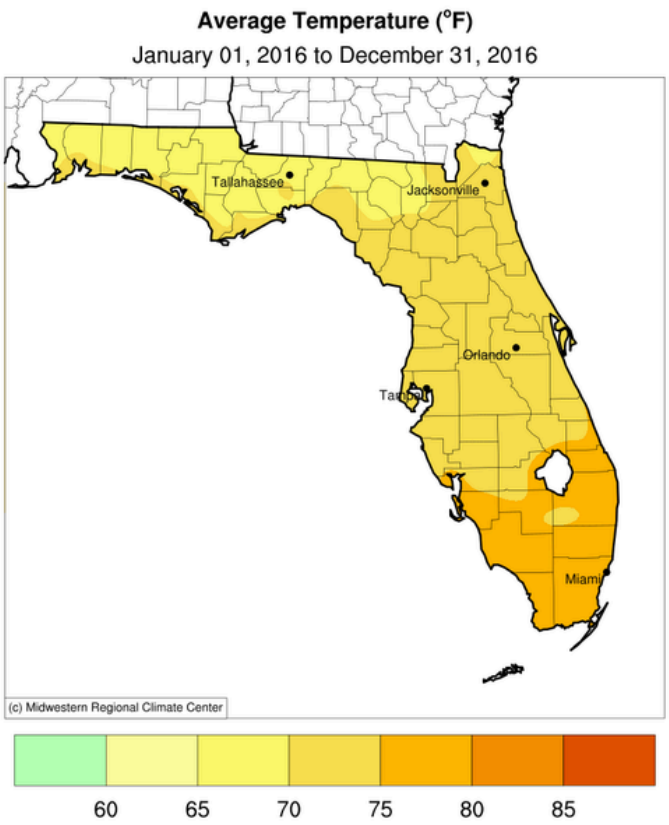

Figure 1: Map displaying annual average (mean) temperature in Florida in 2016.

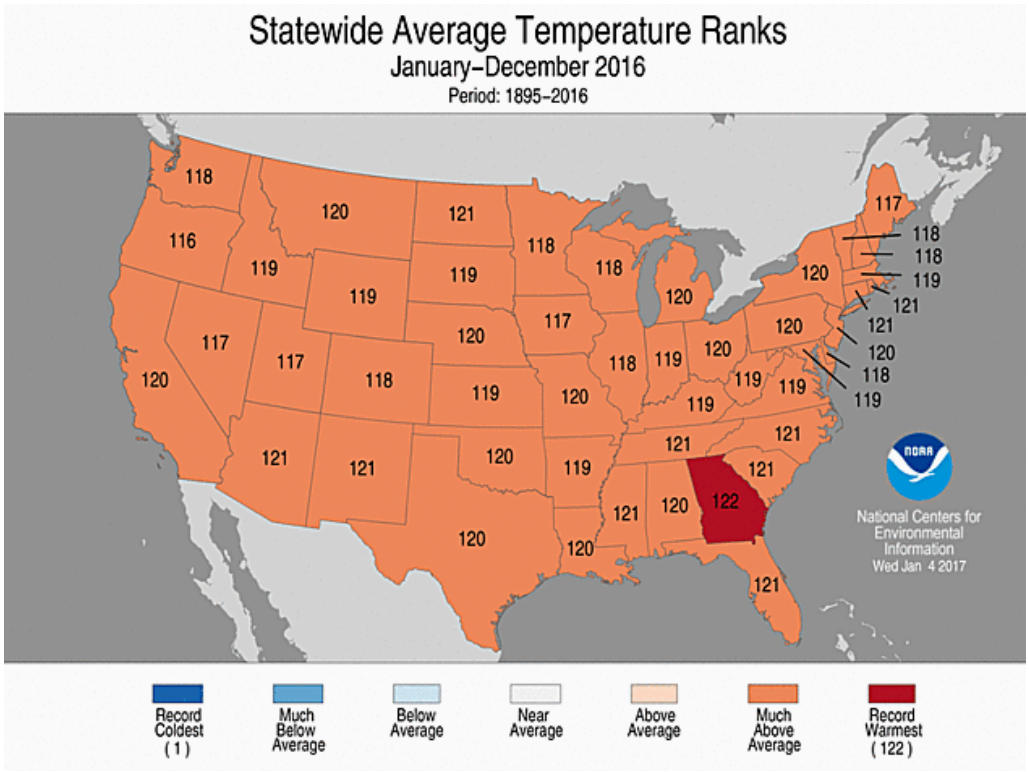

Figure 2: Map displaying the ranking of each state's annual average (mean) temperature in 2016.

Similar to the other states, Florida is broken into divisions of homogeneous climate. Seven such regions span from the Panhandle to the Keys: Panhandle (officially, Northwest; Division 1), North (2), North Central (3), South Central (4), Everglades and Southwest Coast (5), Lower East Coast (6), and Keys (7) (Figure 3).

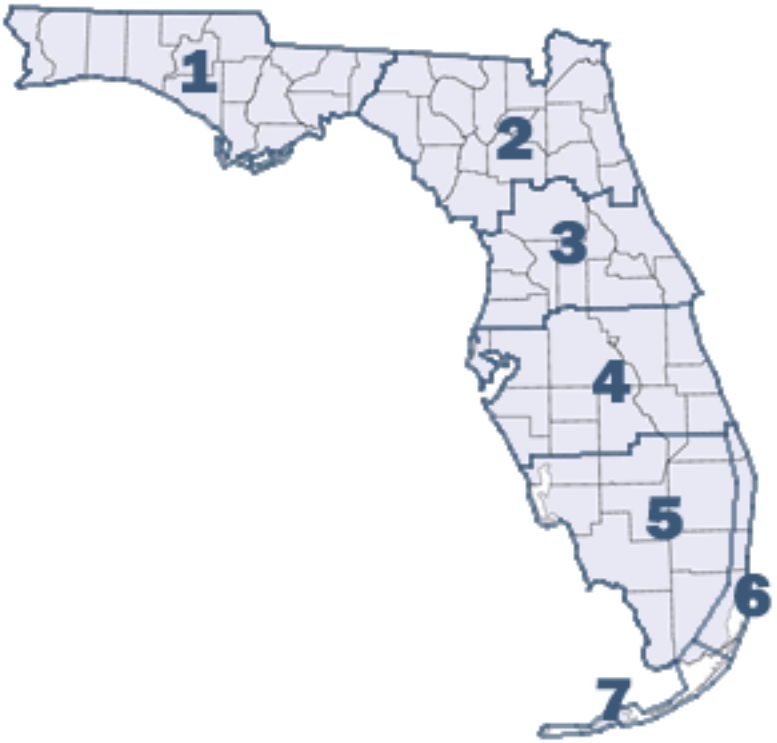

Figure 3: Map displaying Florida's seven climate divisions.

Annual mean-temperature values in all divisions ranked high in the 1895-present instrumental record although in no division was the highest-ranked value recorded. These values were, as usual, lowest in the panhandle and highest in the Keys (Table 1).

DIVISION NO.	ANNUAL MEAN TEMPERATURE (^{O}F)	RANKING (since 1895)
1	69.3	2nd warmest
2	70.4	3rd warmest
3	72.8	3rd warmest
4	74.1	3rd warmest
5	75.8	4th warmest
6	76.6	2nd warmest
7	78.7	2nd warmest

Table 1: Display of annual average temperature values (^{O}F) compared to historical values by climate division.

Statewide and divisional mean temperatures are also calculated for each season (Table 2). Each season is three months long: winter (December-January-February), spring (March-April-May), summer (June-July-August), and fall (September-October-November). The winter mean temperature values rank highly because of the record-warm December 2015; as discussed in a later section, January and February were much cooler in comparison to historical averages. Notably, for the second consecutive year, the summer seasonal-mean temperature ranked in the top five in all divisions. Values for three of the four seasons ranked in the top ten statewide.

DIVISION NO.	WINTER (DJF)	SPRING (MAM)	SUMMER (JJA)	FALL (SON)
Statewide	62.0 (11)	72.0 (9)	83.0 (3)	74.2 (6)
1	55.9 (17)	68.7 (15)	82.4 (5)	71.7 (3)
2	58.3 (15)	70.1 (9)	82.7 (3)	71.7 (11)
3	62.3 (15)	72.4 (9)	83.3 (2)	74.1 (13)
4	65.1 (12)	73.7 (7)	83.3 (3)	75.9 (8)
5	68.2 (12)	75.4 (5)	83.5 (3)	77.6 (11)
6	69.5 (10)	76.1 (5)	83.6 (3)	78.2 (10)
7	72.4 (7)	78.0 (4)	84.8 (2)	79.9 (8)

Table 2: Display of seasonal mean temperature values (^{o}F) and their ranking compared to the 1895-present instrumental record for the state and by division. Winter includes December 2015, consistent with the definition of that season. All rankings are higher than the median (e.g., 2nd warmest as opposed to 2nd coldest).

Statewide and divisional mean temperatures are also calculated for each month (Table 3). Statewide, monthly mean temperature values ranked in the top ten in six of the 12 months. July was especially anomalous for its warmth, with its monthly mean temperature value ranking highest on record and the second highest out all of the months in the instrumental record after the 84.2^{o}F recorded in June 1998. September and December were also notable for their anomalous warmth, especially in the southern half of the peninsula.

DIV. NO.	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
Fla.	56.9 (**56**)	59.5 (59)	68.7 (9)	71.2 (24)	76.2 (33)	82.0 (6)	84.0 (1)	83.1 (5)	81.2 (2)	74.7 (16)	66.7 (24)	66.1 (4)
1	50.2 (**51**)	54.5 (52)	64.1 (12)	67.8 (32)	74.1 (52)	81.2 (19)	83.4 (3)	82.7 (11)	80.4 (8)	71.9 (11)	62.7 (15)	59.2 (5)
2	52.4 (**47**)	56.1 (58)	66.0 (11)	69.3 (24)	75.0 (35)	81.7 (6)	83.9 (1)	82.6 (8)	79.7 (9)	72.3 (20)	63.2 (32)	62.0 (4)
3	57.1 (**53**)	59.5 (**58**)	69.3 (9)	71.7 (24)	76.5 (32)	82.2 (4)	84.5 (1)	83.1 (5)	81.0 (3)	74.5 (26)	66.7 (31)	66.9 (4)
4	60.3 (**58**)	61.8 (**55**)	71.1 (6)	72.7 (27)	77.0 (32)	82.0 (4)	84.2 (1)	83.4 (3)	82.1 (1)	76.4 (19)	68.9 (33)	69.6 (3)
5	64.2 (55)	65.2 (60)	73.2 (5)	74.4 (21)	78.0 (23)	82.4 (4)	84.0 (2)	83.6 (9)	82.7 (2)	78.1 (24)	71.5 (36)	72.8 (2)
6	65.6 (56)	66.2 (**56**)	74.6 (3)	75.1 (19)	78.4 (20)	82.7 (4)	84.4 (1)	83.6 (9)	82.6 (2)	78.9 (16)	73.0 (31)	74.3 (2)
7	68.9 (38)	69.2 (56)	76.4 (3)	76.9 (18)	80.5 (12)	84.1 (4)	85.4 (1)	84.9 (5)	84.3 (1)	81.0 (7)	75.2 (29)	77.4 (2)

Table 3: Display of monthly average temperature values (^{o}F) and their ranking compared to the 1895-present instrumental record for the state and by division. All rankings, except those that are in bold, are higher than the median (e.g., 2nd warmest as opposed to 2nd coldest).

Precipitation

Precipitation in Florida in 2016 was near the historical average when considered in the context of annual total averaged over the land area of the entire state. The statewide annual total precipitation (almost exclusively rain) was 53.83 inches, some 0.18 inches above the 20th-century average total of 53.65 inches (Figure 4). This total ranked 54th wettest, or near the median, in the instrumental record that stretches back to 1895 (Figure 5). In the contiguous United States, the annual total precipitation was 31.70 inches, some 1.76 inches above the 20th-century-average total of 29.94 inches and ranking 2016 as the 24th-wettest year on record (since 1895).

The greatest annual precipitation total in the state was 79.67 inches at a CoCoRaHS station located 1.2 miles ESE of Panama City Beach (station number FL-BY-11; Bay County). The highest total within only the NWS COOP and ASOS networks was 74.40 inches at Panama City (Bay County). The lowest annual precipitation total was 35.01 inches at Duck Key (Monroe County).

The greatest daily, 24-hour precipitation total in 2016 was 12.83 inches on 1 September at a CoCoRaHS station located 3.2 miles west-northwest of Seminole (station number FL-PN-64; Pinellas County). The greatest daily, 24-hour total within only the NWS COOP and ASOS networks was 9.60 inches at Chipley (Washington County) on 6 December. That total achieved an all-time record for that site, whose record extends back to 1939.

Snow flurries were seen in a few isolated locations in the far northern part of the state, as far south as Gainesville, on 22 and 23 January. However, no snow was recorded at any reliable station. Henceforth in this report, all precipitation will be assumed to be rain.

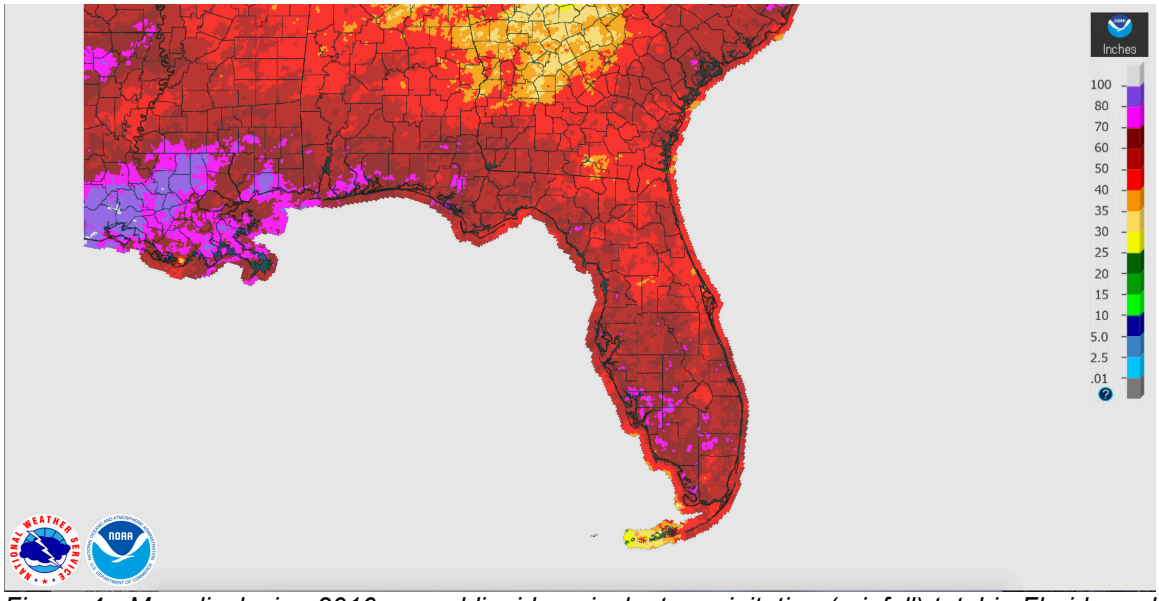

Figure 4: Map displaying 2016 annual liquid-equivalent precipitation (rainfall) total in Florida and the surrounding region.

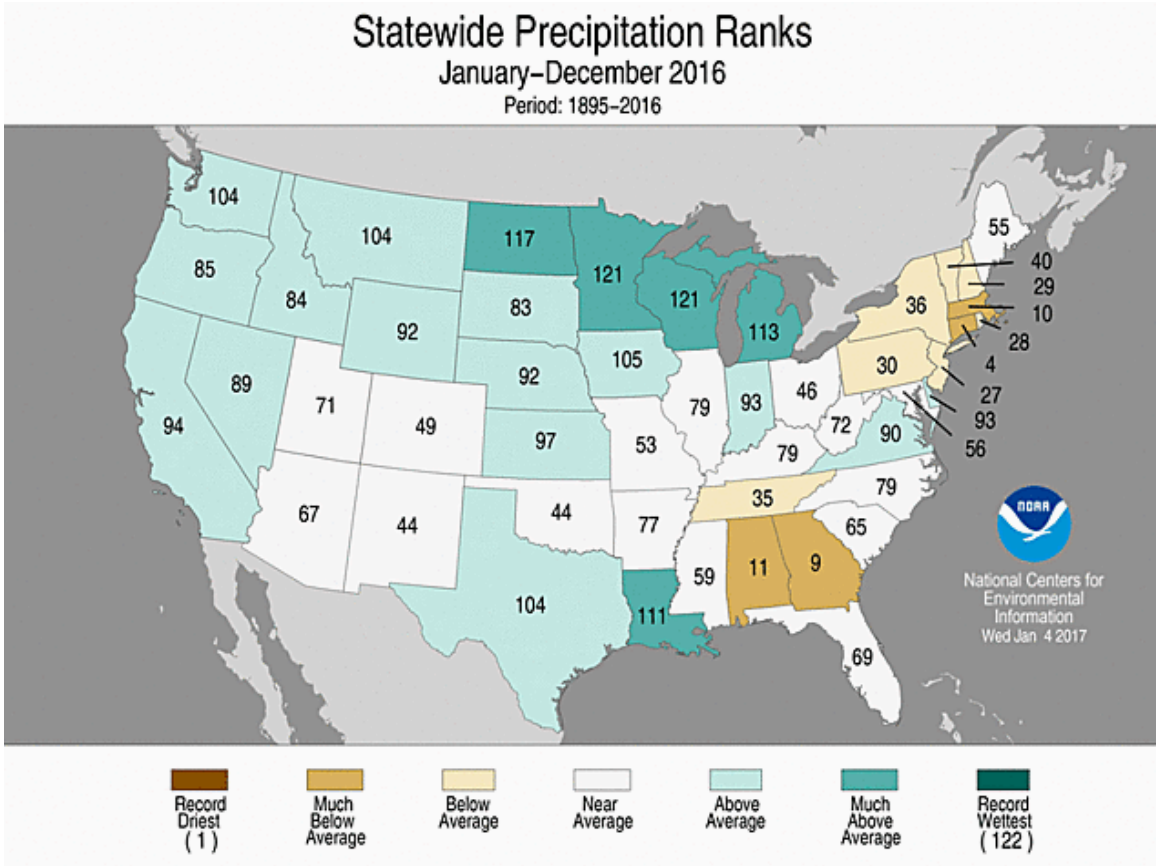

Figure 5: Map displaying the ranking of each state's 2016 annual liquid-equivalent precipitation total.

Divisional annual rainfall totals (Table 4) show that no part of the state was overwhelmingly drier or wetter compared to other parts within the historical record although the Keys and northern peninsula appear to have been driest compared to the historical record overall through the year.

DIVISION NO.	ANNUAL TOTAL RAINFALL (inches)	RANKING (since 1895)
1	59.02	58th wettest
2	48.42	38th driest
3	49.04	45th wettest
4	57.13	29th wettest
5	55.21	42nd wettest
6	53.86	45th driest
7	42.43	32nd driest

Table 4: Display of 2016 annual total rainfall values (inches) compared to historical values by climate division.

Statewide and divisional rainfall totals (Table 5) are also calculated for each season. These totals show that the 2015-2016 winter, partially bolstered by a wet December 2015, was particularly wet through much of the state, except in the northern half of the peninsula. Spring divisional totals and rankings show that near-median rainfall was observed in the most of the state, with pockets of relative wetness in the South Central division and to a slightly lesser extent in the Panhandle division. Notably lower-than-median summer rankings in the North, North Central, and Lower East Coast divisions are a reflection of less-than-normal diurnal-cycle thunderstorm activity along and near the Atlantic/eastern coast. Fall divisional rankings lean somewhat wetter in divisions that received substantial rainfall from either Hurricane Hermine or Hurricane Matthew.

DIVISION NO.	WINTER (DJF)	SPRING (MAM)	SUMMER (JJA)	FALL (SON)
Florida	12.85 (15th wettest)	11.05 (53rd wettest)	20.09 (39th driest)	10.32 (33rd driest)
1	16.30 (28th wettest)	15.99 (30th wettest)	18.88 (51st driest)	6.34 (12th driest)
2	9.32 (56th driest)	9.28 (55th driest)	18.23 (32nd driest)	10.52 (50th driest)
3	9.18 (41st wettest)	9.29 (59th driest)	17.87 (16th driest)	12.61 (50th wettest)
4	12.85 (9th wettest)	11.86 (24th wettest)	22.12 (57th driest)	11.63 (51st driest)
5	15.28” (1st wettest)	8.54 (52nd driest)	23.73 (52nd wettest)	10.97 (24th driest)
6	18.56” (1st wettest)	10.06 (51st driest)	18.15 (32nd driest)	12.00 (13th driest)

7	14.53" (2nd wettest)	6.39 (38th driest)	15.90 (50th driest)	10.43 (21st driest)

Table 5: Display of seasonal rainfall totals (inches) and their ranking compared to the 1895-present instrumental record for the state and by division. Winter includes December 2015, consistent with the definition of that season.

Statewide and divisional rainfall totals are also calculated for each month (Table 6). Highlights were a very wet January in the southern two-thirds of the peninsula, a rather dry July in most areas of the state outside the southwest and Keys, and a very dry November statewide that resulted in a record-low statewide total for that month (after 0.32 inches in 1931).

DIV. NO.	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
Fla.	6.07 (4)	3.29 (55)	3.46 (57)	2.94 (55)	4.65 (38)	7.09 (51)	4.87 (**4**)	8.13 (33)	7.43 (35)	2.68 (**38**)	0.21 (**1**)	3.01 (43)
1	4.88 (39)	4.69 (**61**)	6.79 (35)	6.83 (22)	2.37 (**31**)	5.72 (51)	5.18 (**17**)	7.98 (34)	5.85 (45)	0.17 (**4**)	0.32 (**2**)	8.24 (7)
2	3.84 (43)	3.78 (56)	2.99 (**51**)	3.33 (47)	2.96 (**61**)	6.11 (57)	4.03 (**2**)	8.09 (35)	7.64 (29)	2.78 (**55**)	0.10 (**1**)	2.77 (61)
3	5.87 (6)	2.53 (**57**)	3.01 (54)	1.72 (**38**)	4.56 (37)	6.55 (**49**)	4.26 (**4**)	7.06 (**57**)	8.92 (21)	3.59 (48)	0.10 (**1**)	0.87 (**21**)
4	7.93 (1)	2.65 (52)	2.72 (55)	1.50 (**36**)	7.64 (5)	8.34 (40)	5.05 (**9**)	8.73 (29)	8.05 (35)	3.41 (60)	0.17 (**2**)	0.94 (**29**)
5	8.04 (1)	2.48 (38)	1.72 (**52**)	1.01 (**20**)	5.81 (40)	9.08 (39)	6.14 (**29**)	8.51 (28)	7.38 (59)	3.32 (**41**)	0.27 (**2**)	1.45 (54)
6	7.95 (2)	2.97 (31)	2.26 (**58**)	0.82 (**12**)	6.98 (32)	6.39 (**44**)	3,29 (**7**)	8.47 (28)	5.71 (**20**)	5.55 (**53**)	0.74 (**8**)	2.73 (31)
7	5.28 (6)	2.70 (29)	1.21 (**44**)	1.26 (**35**)	3.92 (**60**)	4.77 (**44**)	3.83 (**33***)	7.30 (32)	6.19 (**53**)	3.86 (**39**)	0.38 (**8**)	1.73 (48)

Table 6: Display of monthly rainfall totals (inches) and their ranking compared to the 1895-present instrumental record for the state and by division. Bolded rankings fall below the median (e.g., third driest), and non-bolded rankings fall above (e.g., third wettest).

Severe Weather

A severe-weather event is defined as an instance of damaging straight-line winds of 58 miles per hour or greater, hail of 1.00 inch or greater, or any tornado. NOAA's Storm Prediction Center (SPC) logs reports of severe-weather events across the United States. The SPC indicates that a total of 496 severe-weather reports were made in Florida in 2016, including 48 tornadoes, 51 instances of large hail, and 391 instances of damaging winds (Figure 6). The numbers of tornado and damaging-wind reports were a little below recent historical averages. Because the threshold for large hail was increased from 0.75 to 1.00 inch in 2010, it is difficult to comment on how this year's number of instances compares to the historical-average number.

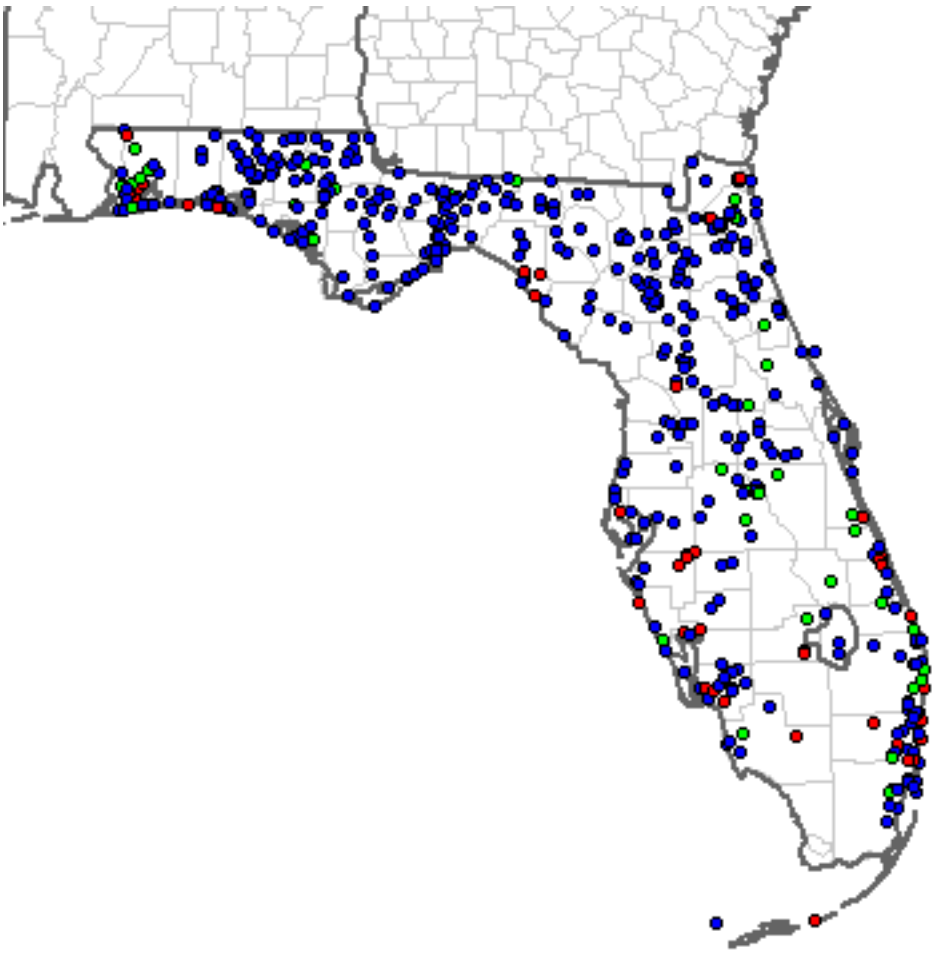

Figure 6: Map displaying the locations of severe-weather reports in Florida in 2016.

Major Climate and Weather Events

The following is a listing and summary of major climate and weather events that took place in Florida during 2016. This listing is not meant to be exhaustive.

Tropical Storm Colin

Tropical Storm Colin was the third named storm in 2016 in the Atlantic basin, coming together as a wave on 3 June in the western Caribbean Sea off the Yucatan Peninsula and achieving tropical-storm strength in the late afternoon of 5th. As such, it was the earliest-forming third named storm on record in the Atlantic basin, eclipsing 1887's Tropical Storm Three, which formed on 12 June. It rapidly moved northeast across the Gulf of Mexico after achieving tropical-storm strength, eventually making landfall on Taylor County in the late-evening hours of the 6th. Although it produced some mostly minor wind damage and two tornadoes (one near Jacksonville and one near Gainesville), Colin's main impacts were heavy rains and some flooding for portions of the Big Bend, the northern peninsula, and the Tampa Bay region. More information can be found in a report originally published by the NWS WFO at Tampa: http://www.webcitation.org/6iKGnJJjM. Information can also be found in a similar

report originally published by the NWS WFO at Jacksonville: http://www.webcitation.org/6iQM0Oo7M.

Hurricane Hermine

The second named tropical cyclone to affect Florida in 2016, Hurricane Hermine made landfall as a Category One storm early on 2 September near the boundary line between Jefferson and Wakulla Counties, making it the first hurricane to make landfall on Florida since 2005 and the first to make landfall on shoreline of the Apalachee Bay since 1966. It produced highly impactful wind damage in portions of the Big Bend, most notably Tallahassee, as well as a historically high storm surge along the Apalachee Bay. The Center previously published a detailed report about Hermine, which can be found on our Web site: http://climatecenter.fsu.edu/images/docs/Hurricane_Hermine_Fla_summary.pdf.

Tropical Storm Julia

Tropical Storm Julia was christened over land, without precedent in Florida's observational record, in the northeastern part of the state late on 13 September, making it the third named tropical cyclone to affect the state during the year. Aside from strong winds, its main impact was to bring beneficial rains to portions of the eastern coast. The Center previously published a detailed report about Julia, which can be found on our Web site: http://climatecenter.fsu.edu/images/docs/TS_Julia_Fla_summary.pdf.

Hurricane Matthew

Hurricane Matthew had a long, storied history as a major hurricane in the Lesser Antilles and Caribbean Sea before its center passed within less than 30 miles from the eastern coast from the Melbourne area northward on 7 October. Even though it never made landfall in Florida, it caused much damage and hardship along the central and north eastern coast. The Center previously published a detailed report about Matthew, which can be found on our Web site: http://climatecenter.fsu.edu/images/docs/Hurricane_Matthew_Florida_summary.pdf.

Late-Year Drought and Dry Streaks

Hurricane Hermine brought heavy rain at the very end of August and start of September to the western coast, the Big Bend, and the northern part of the peninsula and no rain to most of the panhandle. Indeed, Hermine bolstered the prevailing atmospheric conditions that were causing drought farther north in Alabama, Georgia, the western Carolinas, and middle and east Tennessee and introduced those atmospheric conditions to the panhandle. Early in October, Hurricane Matthew tracked farther east than Hermine had, bringing heavy rains to the eastern third of the northern half of the peninsula and little or no rain to the rest of the state, including the panhandle, which was already becoming dry. Similar to Hermine, Matthew reinforced atmospheric conditions that were contributing to a tendency toward drought conditions over time.

Indeed, some impressive streaks without measurable rainfall began to mount on the panhandle (Table 7), and drought conditions began to develop there (Figure 7). During December, a series of rainfalls began to ameliorate the drought in the far northern part of the state (and adjacent portions of the interior Southeast) although dry conditions continued to intensify across most of the peninsula at year's end.

LOCATION & PERIOD OF RECORD	NO. OF DAYS WITHOUT MEASURABLE RAINFALL & DATES	REMARKS
Chipley (1939-present)	62 (30 September to 30 November)	Record-long streak, beating 47 days from 22 September 1943 to 7 November 1943
Tallahassee (1892-present)	44 (16 October to 28 November)	Second-longest streak
Marianna (airport) (1950-present)	43 (17 October to 28 November)	Third-longest streak
Crestview (1948-present)	42 (27 September to 7 November)	Record-long streak, beating 38 days from 15 October 2001 to 21 November 2001
Pensacola (1879-present)	41 (28 September to 7 November)	Second-longest streak
Niceville (1927-present)	40 (30 September to 8 November)	Second-longest streak

Table 7: Display of data relating to long streaks of days without measurable rainfall at selected stations on the Florida panhandle.

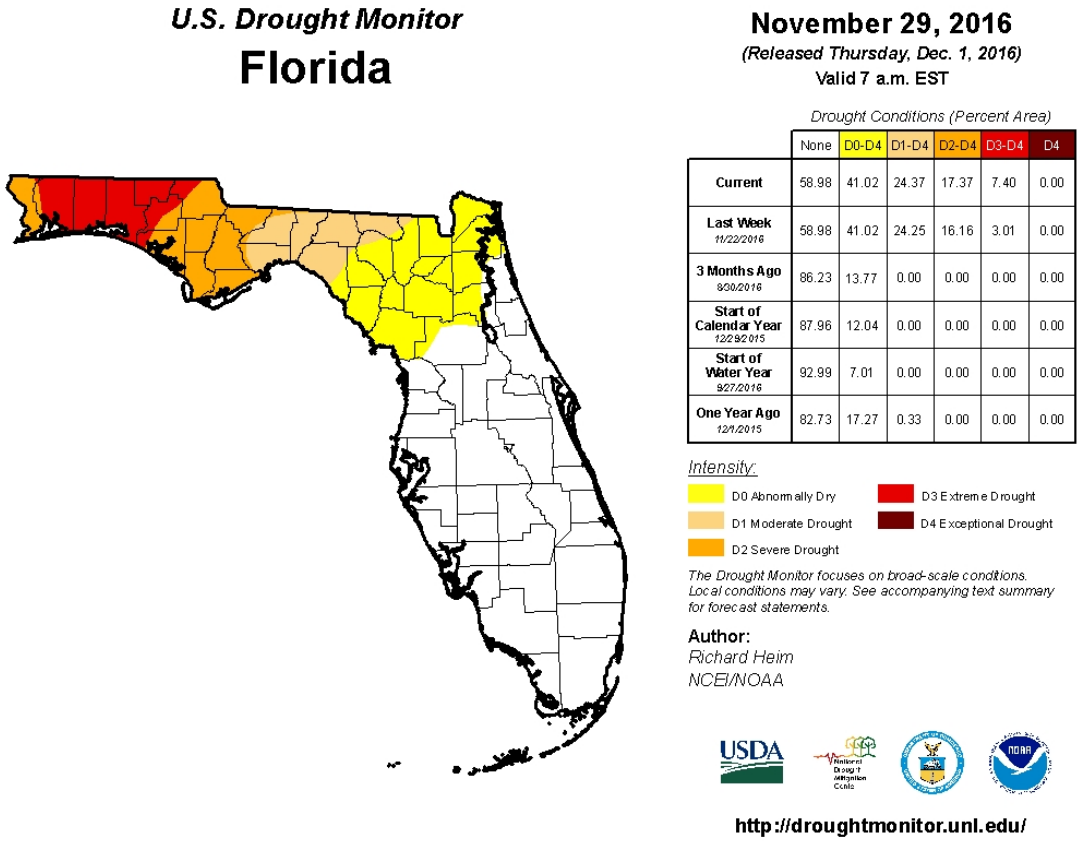

Figure 7: U.S. Drought Monitor map from issuance at which drought was at peak in the Florida panhandle. Drought amelioration began to occur in the panhandle following this issuance.