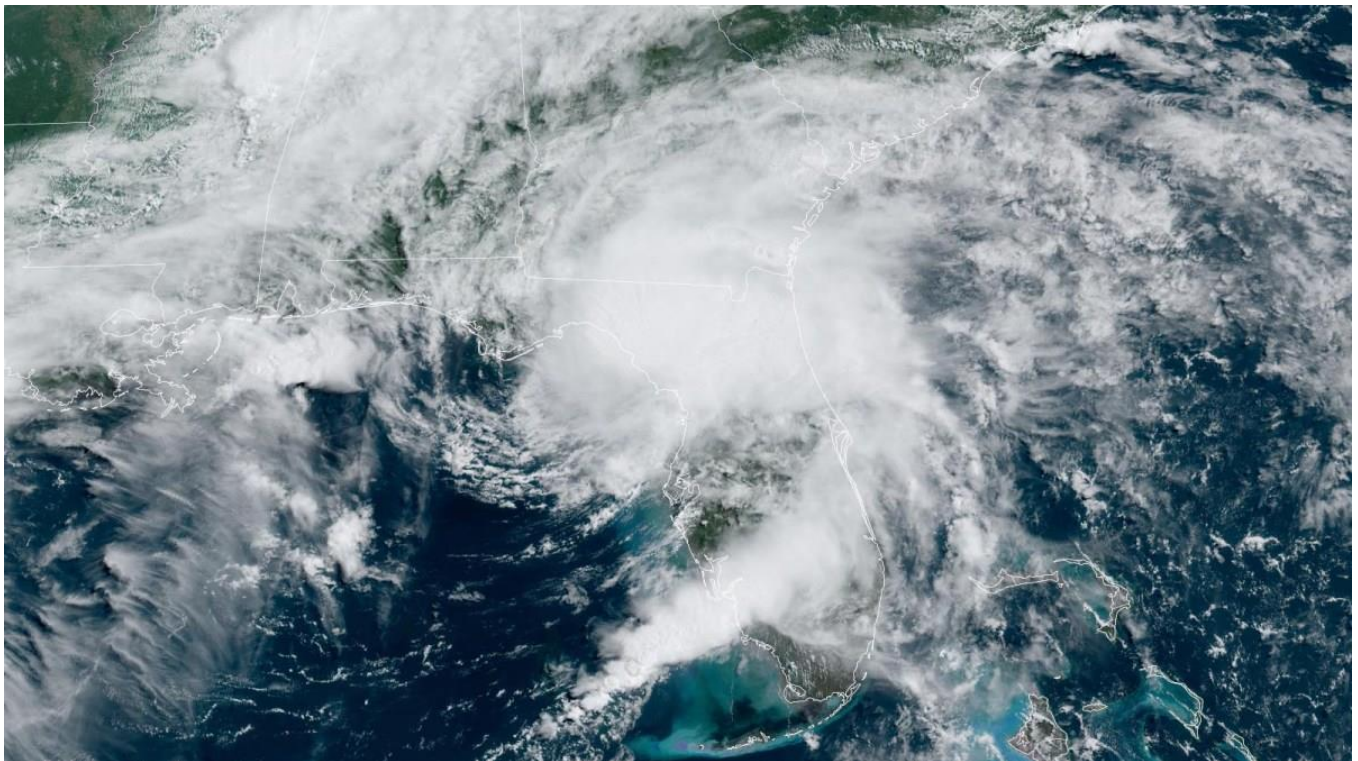




2021 FLORIDA WEATHER AND CLIMATE SUMMARY

A Year-End Review

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Florida Climate Center
January 21, 2022*



Tropical Storm Elsa, July 7, 2021



Temperatures

The National Centers for Environmental Information (NCEI) reports that 2021 was the fourth-warmest year on record for the contiguous U.S. based on records dating back to 1895. The average contiguous U.S. temperature was 54.5 °F, which was 2.5 °F above the 20th century average. The contiguous U.S. saw above-average temperatures in 2021, especially across the West and North (Figure 1). Annual average temperatures for most states, except for much of the Southeast, had their top 10 warmest years on record dating back to 1895.

In Florida, average temperatures across the state were above the historical average. The statewide annual average temperature was 72.3 °F in 2021, which was 0.9 °F above normal (1991-2020) and 2.2 °F above the 20th century average of 70.1 °F (Figure 2).

2021 tied with 2018 as the **8th-warmest year on record** in Florida since 1895. A few months of the year were relatively cool or near normal, which kept 2021 from ranking higher. However, Florida continues to see above-average warmth. 2021 was the 11th year in a row with above-average temperatures, and 21 out of the past 22 years have been warmer than the historical average in Florida. 2015 remains our warmest year on record, which had an annual average temperature of 73.4 °F.

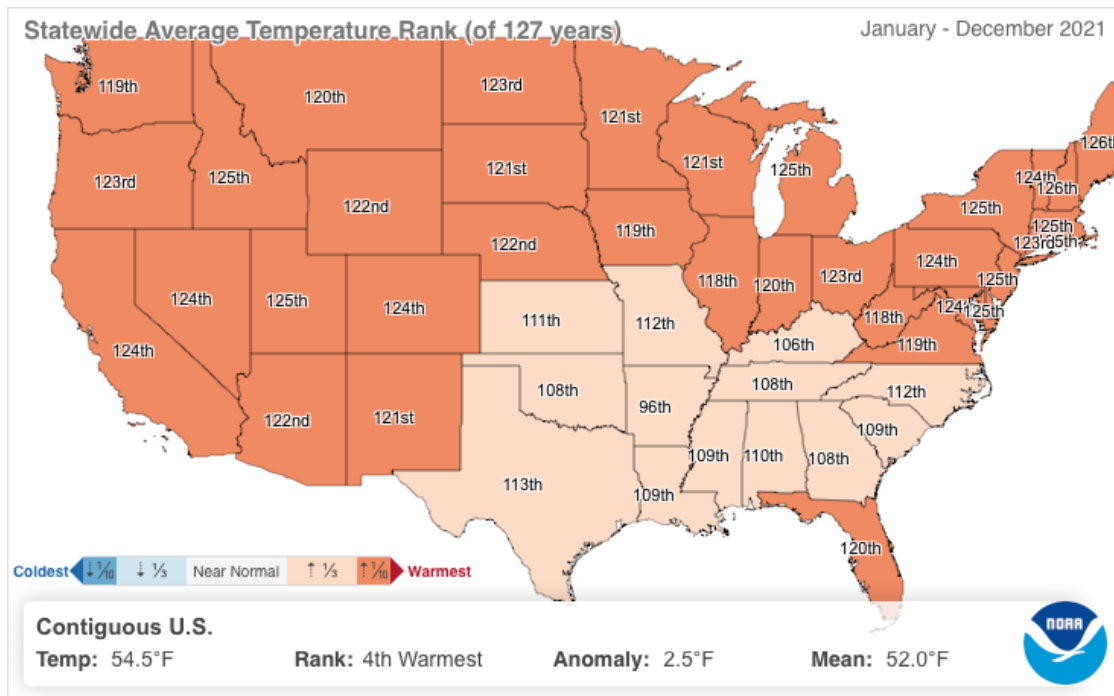
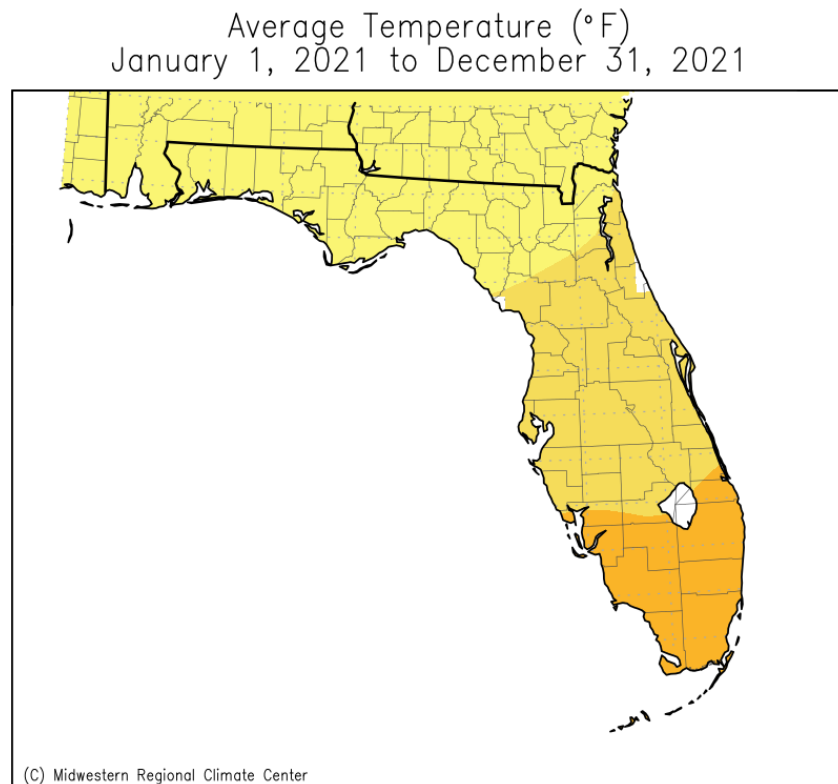


Figure 1. Map displaying the ranking of each state's annual average (mean) temperature in 2021, based on the historical instrumental record 1895-2021.

Based on a review of stations in the NWS COOP and ASOS networks, as well as stations from the Florida Automated Weather Network (FAWN), the highest temperature recorded in Florida in 2021 was 108 °F, which occurred at the Jacksonville Whitehouse Naval Outlying Field on October 7. The Naval Live Oaks station in Santa Rosa County recorded a temperature of 104 °F on August 22. The lowest temperature recorded in 2021 was 18 °F at Okeechobee on February 4, followed by 20 °F recorded near Venus (at the Archbold Bio Station), occurring on the same day.

As in recent years, annual overnight temperatures were above average across the state, with departures from normal ranging from +1 °F to +2 °F in most places. Daytime temperatures were near normal in north Florida and above normal in southern Florida.

Locally, several observing sites had one of their top five warmest years on record based on annual average temperatures, including in Jacksonville, Orlando, Tampa, Perrine, Ft. Myers, Miami, West Palm Beach, and Vero Beach. The average temperature county rankings are shown in Figure 3, along with select counties that recorded one of their top 10 warmest years on record since 1895.



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Figure 2. Annual average temperatures in Florida for 2021.

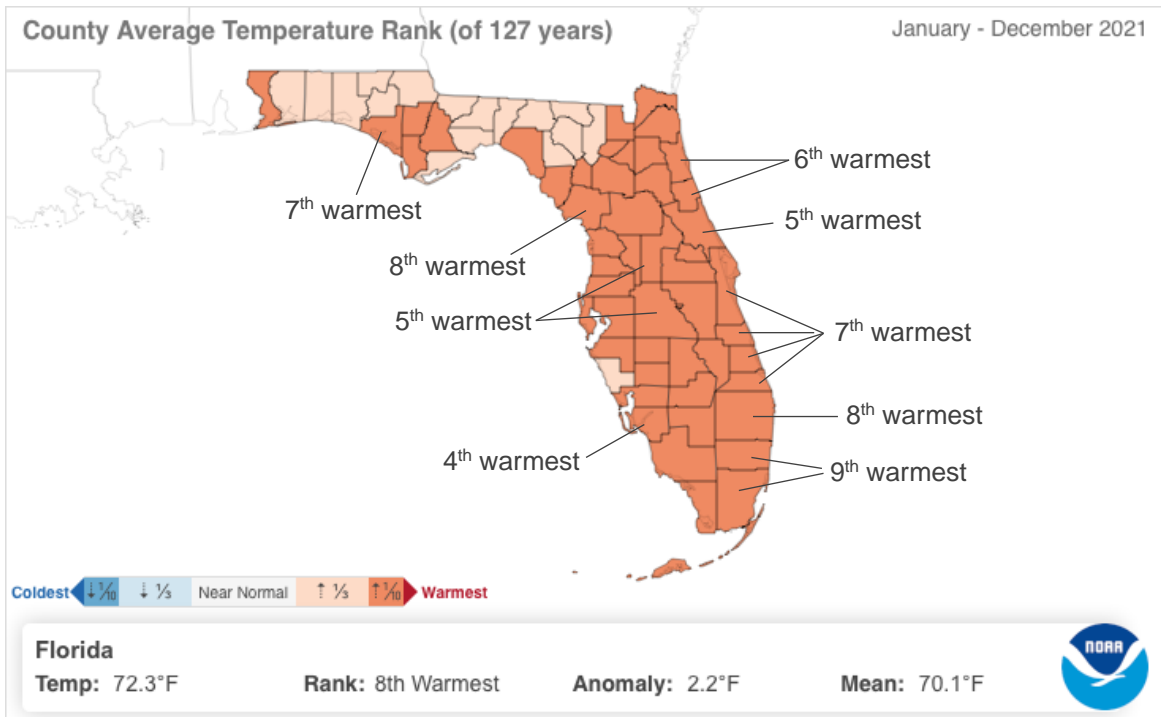


Figure 3. Map displaying the ranking of each county's annual average (mean) temperature in 2021, based on the historical instrumental record 1895-2021.

Florida is divided into 7 climate divisions representing regions of generally homogenous climate. These 7 divisions span from the Panhandle to the Keys, as follows: Panhandle (1), North (2), North Central (3), South Central (4), Everglades and Southwest Coast (5), Lower East Coast (6), and Keys (7) (Figure 3). The 2021 annual average temperatures by climate division and their rankings are shown in Table 1. All climate divisions, except the North (1), ranked within the top 10 warmest years on record since 1895. The seasonal average temperatures and their rankings (in parentheses) compared to the long-term average (1895-2021) by climate division are provided in Table 2. The southern part of the state was especially warm in spring, while central Florida was warmest during summer.

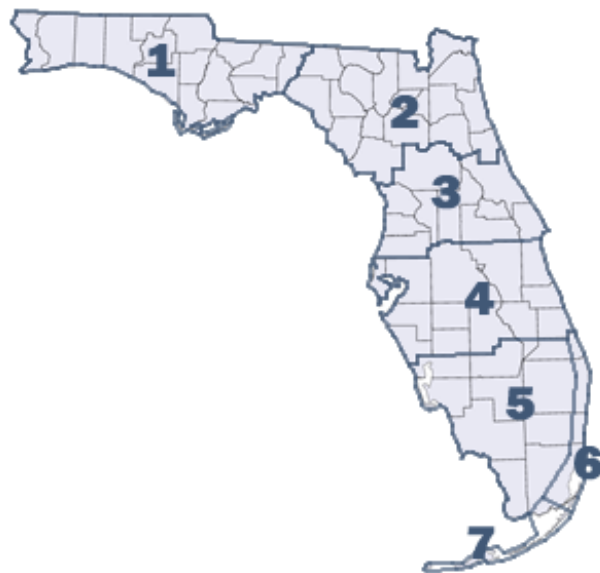


Figure 4. Map of Florida's seven climate divisions.

Table 1. Annual mean temperatures (°F) by climate division and rankings compared to historical values, based on data from the NOAA National Centers for Environmental Information.

DIVISION NO.	ANNUAL MEAN TEMPERATURE (F)	RANKING (since 1895)
1	68.4	16 th warmest
2	69.9	10 th warmest
3	73.1	5 th warmest
4	74.2	6 th warmest
5	75.9	9 th warmest
6	76.5	8 th warmest
7	78.1	9 th warmest

Table 2. Statewide and divisional seasonal mean temperatures (°F) and their rankings compared to the 1895-2021 instrumental record, in parentheses. Winter includes December 2020, consistent with the definition of that season.

DIVISION NO.	WINTER (DJF)	SPRING (MAM)	SUMMER (JJA)	FALL (SON)
Statewide	60.0 (40 th warmest)	71.3 (17 th warmest)	81.9 (12 th warmest)	72.9 (35 th warmest)
1	52.9 (60 th warmest)	67.5 (42 nd warmest)	81.0 (35 th warmest)	68.7 (49 th warmest)
2	56.2 (42 nd warmest)	68.8 (33 rd warmest)	81.3 (14 th warmest)	70.0 (53 rd warmest)
3	60.6 (39 th warmest)	72.1 (16 th warmest)	82.5 (6 th warmest)	73.8 (24 th warmest)
4	63.2 (43 rd warmest)	73.4 (16 th warmest)	82.4 (9 th warmest)	75.1 (30 th warmest)
5	67.1 (28 th warmest)	74.9 (16 th warmest)	82.4 (18 th warmest)	77.0 (32 nd warmest)
6	68.4 (28 th warmest)	75.9 (9 th warmest)	82.4 (15 th warmest)	77.5 (30 th warmest)
7	70.5 (30 th warmest)	77.2 (12 th warmest)	83.3 (23 rd warmest)	79.2 (24 th warmest)

Precipitation

Per the NCEI, nationwide precipitation in 2021 was above average across much of the Gulf Coast up to the Great Lakes and into the Northeast, but was below average across much of the West, northern Rockies, and mid-Atlantic regions. Elsewhere, annual precipitation was near normal for the year (Figure 5). The annual average precipitation for the contiguous U.S. was 30.48 inches, which was +0.54 inches above the historical average (1901-2000) of 29.94 inches. As such, 2021 was the 56th-wettest year on record for the U.S.

Precipitation in Florida was near the historical average in 2021, when considering the annual total averaged over the land area of the state. The 2021 statewide average precipitation was 56.14 inches (exclusively rainfall), which was +2.49 inches above the historical average of 53.65 inches (1901-2000). This total ranked **48th-wettest** in the instrumental record dating back to 1895. 12 of the last 22 years have been wetter than the historical average, and 10 of the last 22 years have been drier than average, per the NCEI.

Total annual precipitation values ranged from over 80 inches in parts of the Panhandle to nearly half that total in the central Peninsula (Figure 6). The **Pensacola** area closed out the year at 88.43

inches, which was 20 inches above normal (6th all time wettest on record); the **Gainesville** area recorded a total of 65.23 inches of rainfall in 2021, which was 17 inches above normal for the year (5th all time wettest on record). Rains from Tropical Cyclones Claudette (June) and Ida (August) contributed to the excessive annual rainfall across the western Panhandle region.

Other areas of the state were much drier with below normal annual rainfall totals, including the southern half of the Peninsula and small sections of northern Florida. **Stuart** was 16.3 inches below normal (at 46.43 inches total for the year), while the **Vero Beach** area was 12.7 inches below normal (at 40.53 inches total). **Tallahassee's** annual rainfall total was 48.63 inches, which was 10.2 inches below normal, and the total annual rainfall at **Key West** was 30.43 inches, which was also 10 inches below normal.

The greatest total annual rainfall observed during the year was 98.86 inches, recorded at a CoCoRaHS station near Vernon (Vernon 0.5 NW) in the Panhandle north of Panama City in Washington County. The greatest total annual rainfall observed among FAWN stations was 72.29 inches, recorded at the Wellington station in Palm Beach County. The lowest annual precipitation total was 35.36 inches at the Alachua FAWN station in Alachua County. The greatest daily rainfall total within the NWS COOP and ASOS networks was 9.19 inches at the Fort Green 12 WSW station (FL3153) in Hardee County on July 10.

Statewide seasonal precipitation departures from the 20th century average are provided in Figure 7. Total winter precipitation in 2021 was near normal, but slightly below the long-term average at -0.49 inches. As in the past two years, spring continued to be dry at -2.81 inches below average. The summer rainy season was wetter than average at +4.86 inches, and fall was also above average though closer to normal at +1.45 inches. Moderate drought conditions (D1) impacted parts of the southern Peninsula in spring through early summer but dissipated by mid to late June with the onset of the rainy season.

Total annual precipitation values by climate division and their rankings (in parentheses) are provided in Table 3. The Panhandle and northern Florida (climate divisions 1 and 2) were much wetter than average, while the southern half of the state was much drier in 2021. Seasonal precipitation totals and rankings for each climate division are provided in Table 4. South Florida was especially dry in spring, with several climate divisions seeing only ~3-5 inches of rainfall total over a 3-month period. As such, climate divisions 5 and 7 had their 8th-driest spring on record and climate division 6 had its 5th-driest spring on record. Summer was particularly wet across the Panhandle and North Florida (climate divisions 1 and 2), with summer precipitation totals ranking 10th and 2nd wettest on record, respectively.

2021 average precipitation rankings by county are shown in Figure 8. Most northern counties had above-average precipitation during the year. Many counties recorded one of their top 10 wettest years on record (dating back to 1895), including many in North-Central Florida (e.g., Bradford, Union, Clay, Alachua, Gilchrist, Citrus, and Dixie Counties), as well as counties in the western Panhandle (Escambia and Santa Rosa Counties). The southern Peninsula was drier than average, but no counties' precipitation totals ranked within the top 10 driest on record.

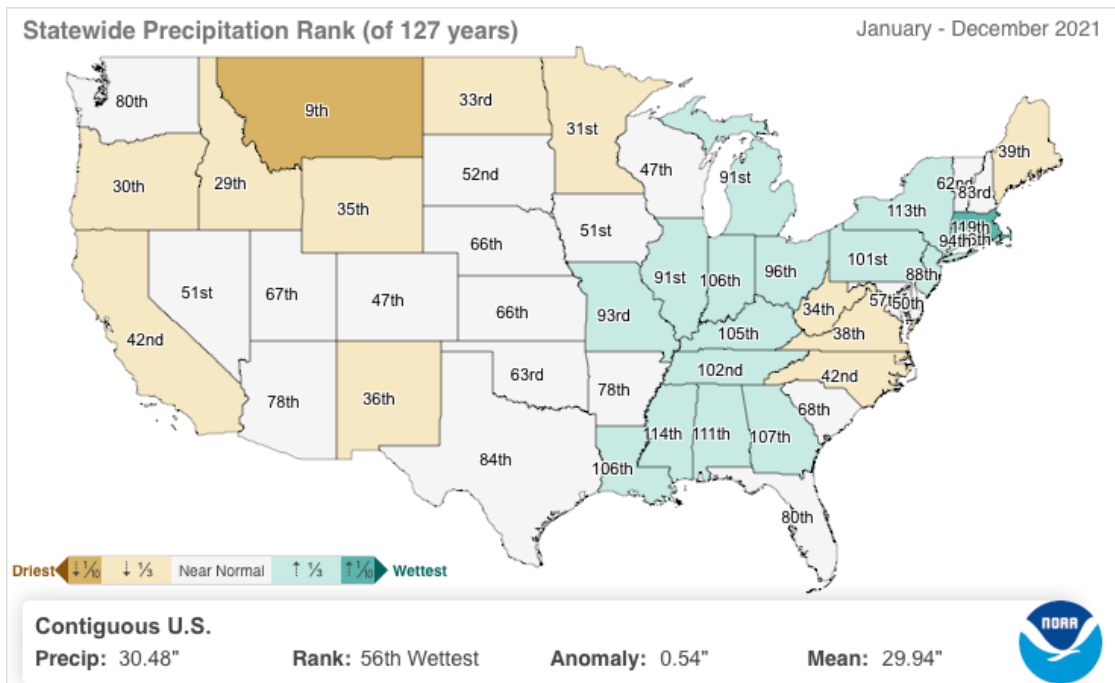


Figure 5. Map displaying the ranking of each state's annual average (mean) precipitation in 2021, based on the historical instrumental record 1895-2021.

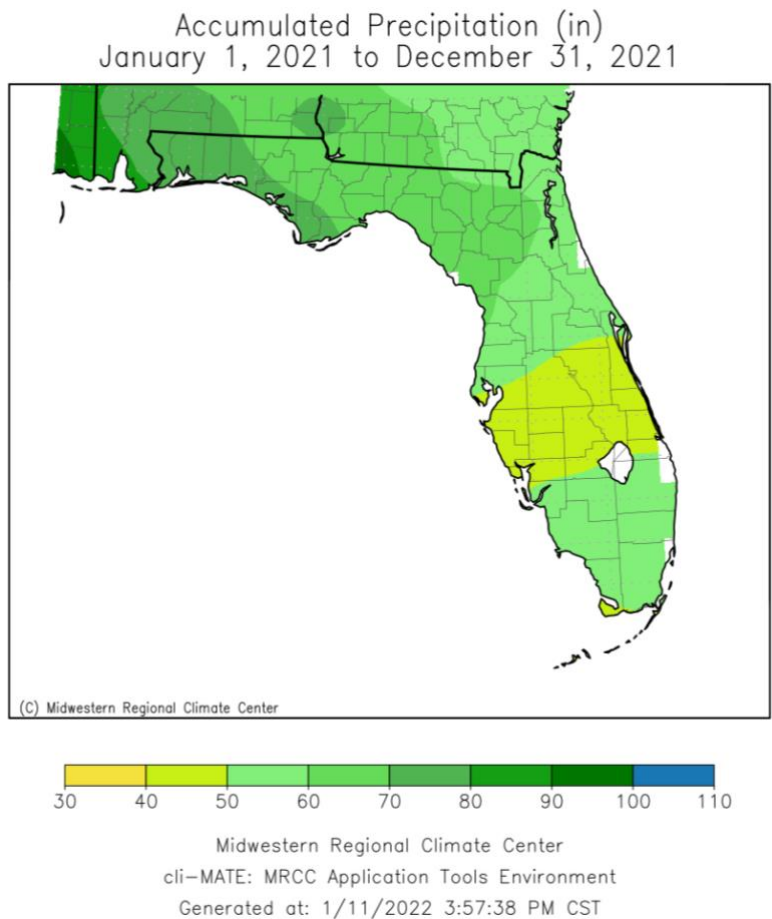


Figure 6. Map displaying statewide accumulated precipitation (in inches) for 2021.

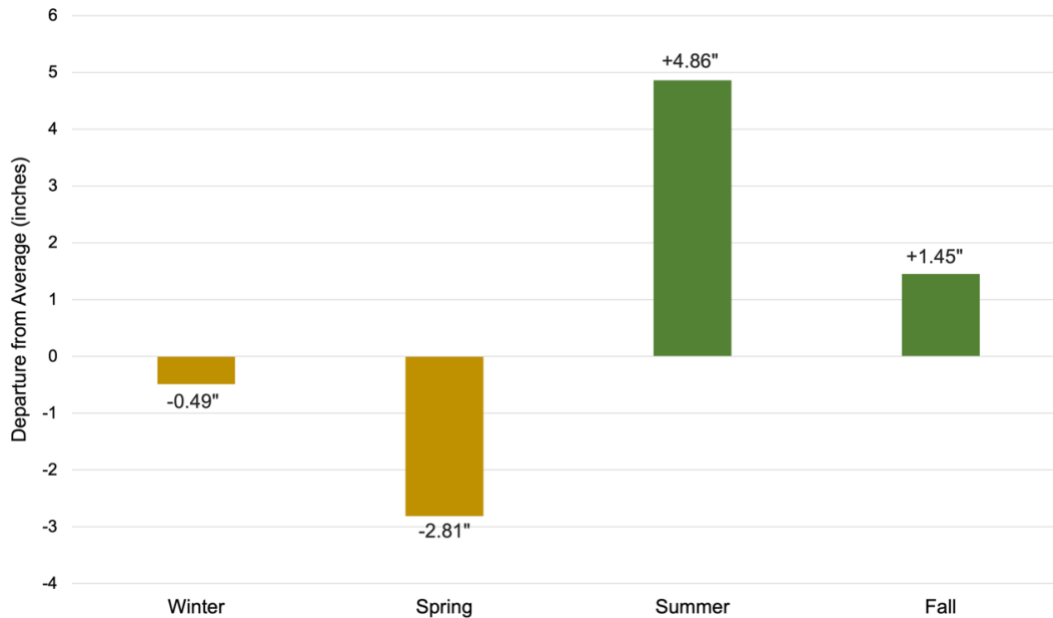


Figure 7. Statewide seasonal precipitation departures from average (1901-2000) for 2021.

Table 3. Annual total precipitation (inches) by climate division and rankings compared to historical values, based on data from the National Centers for Environmental Information.

DIVISION NO.	ANNUAL TOTAL RAINFALL (inches)	RANKING (since 1895)
1	68.32	17 th wettest
2	62.03	12 th wettest
3	54.79	41 st wettest
4	45.83	26 th driest
5	48.44	34 th driest
6	50.73	30 th driest
7	40.54	20 th driest

Table 4. Statewide and divisional seasonal total precipitation (in inches) and their ranking compared to the 1895-2021 instrumental record, in parentheses. Winter includes December 2020, consistent with the definition of that season.

DIVISION NO.	WINTER (DJF)	SPRING (MAM)	SUMMER (JJA)	FALL (SON)
Statewide	8.35 (55 th driest)	7.88 (31 st driest)	26.31 (14 th wettest)	14.15 (38 th wettest)
1	14.12 (57 th wettest)	13.90 (49 th wettest)	26.45 (10 th wettest)	14.83 (36 th wettest)
2	11.00 (47 th wettest)	8.07 (43 rd driest)	31.12 (2 nd wettest)	12.14 (48 th wettest)
3	5.56 (37 th driest)	7.00 (34 th driest)	27.17 (21 st wettest)	14.40 (29 th wettest)
4	5.47 (48 th driest)	5.47 (19 th driest)	22.91 (57 th wettest)	12.81 (63 rd wettest)
5	4.50 (53 rd driest)	4.70 (8 th driest)	23.98 (53 rd wettest)	16.36 (37 th wettest)
6	5.37 (48 th driest)	5.21 (5 th driest)	22.40 (48 th wettest)	18.15 (62 nd wettest)
7	4.01 (44 th driest)	3.55 (8 th driest)	17.08 (58 th wettest)	16.71 (46 th wettest)

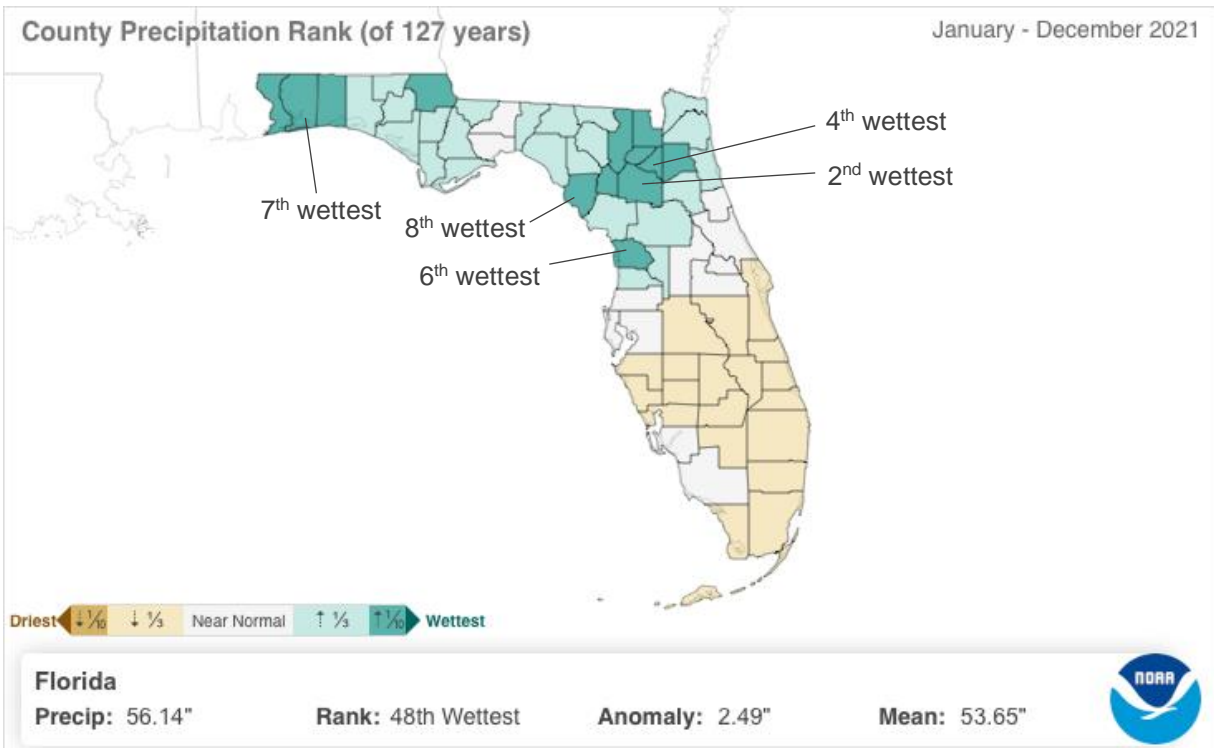


Figure 8. Map displaying the ranking of each county’s annual average (mean) precipitation in 2021, based on the historical instrumental record 1895-2021.

Severe Weather

According to NOAA, the U.S. had 20 billion-dollar weather and climate disasters in 2021, just 2 events shy of the record 22 events set in 2020. Among the more notable events that occurred in 2021 included a deep freeze in the Southern Plains (Feb. 10-19), western wildfires, a heat wave in the Pacific Northwest (July 27-30), Hurricane Ida (August 29-September 1), and two December tornado outbreaks in the Southeast (Dec. 10) and Central (Dec. 15) U.S.

Despite an active year nationwide, Florida largely missed the worst of these disasters. According to the NCEI Storm Events Database, there were 30 tornados reported in 2021 in Florida, which impacted 20 counties across the state. This number of tornado reports was below recent historical averages and, fortunately, there were no fatalities and only one injury was reported. The strongest tornado reported was an EF2 in Bay County on April 10.

No severe freezing or cold weather occurred in 2021, though widespread frost was reported as far south as parts of inland Collier County on the morning of February 4, as a strong cold front pushed through the region followed by high pressure, clear nighttime skies and calm winds to create the ideal conditions for frost. Only minor damage to bean crops was reported.

The 2021 Atlantic Hurricane Season was the third most active on record, with 21 tropical storms, 7 hurricanes, and 4 major hurricanes. While Florida did not experience any major damages, several tropical cyclones impacted the state, including Hurricanes Elsa and Ida and Tropical Storms Claudette, Fred, and Mindy.

Tropical Storm Claudette developed over the Gulf of Mexico in June and became a tropical storm as it moved ashore over southeastern Louisiana on June 19. The storm produced gusty winds in parts of Mississippi, Alabama, Georgia and Florida, as well as several tornadoes, as it moved eastward. The most significant wind gusts developed well east of the storm’s center, with the highest wind gust of 81 mph observed at the Pensacola International Airport, per the NWS.

Elsa became a hurricane on July 2 and was the earliest fifth named storm on record in the Atlantic Basin. Elsa affected the Florida Keys with wind gusts, heavy rain and flooding. It then made landfall in the Florida Panhandle near Steinhatchee in Taylor County on July 7 as a tropical storm with maximum sustained winds of 65 mph, generating heavy rain upwards of 8-11 inches and wind gusts up to 71 mph (recorded at Horseshoe Beach). The storm also caused flooding and generated a storm surge of 2.7 feet near Cedar Key. Elsa then moved quickly up the East Coast and impacted the Northeast.

The approach of Elsa further prompted officials in South Florida to bring the rest of the recently collapsed Champlain Towers South condo down in a controlled demolition on July 5, fearing the approaching storm might bring the rest of the unsteady building down in an uncontrolled manner and cause more damage. The collapse of the South Tower occurred on June 24 in Surfside, resulting in 98 fatalities. While primary cause(s) are still being studied, the collapse was a reminder of the vulnerability of coastal infrastructure to the combined effects of sea level rise, land subsidence, and saltwater intrusion.

On August 16, Tropical Storm Fred made landfall near Panama City with winds of 65 mph and a minimum pressure of 994 mb. The storm produced storm surge levels ranging from 1 to 4 feet along the Florida Panhandle and Big Bend coastal areas, with a peak surge of 4.64 observed at Apalachicola according to SURGEDAT. The storm weakened quickly as it moved north-northeastwards up the Atlantic Coast.



Surge flooding from Fred at Indian Pass in the Big Bend of Florida, August 16, 2021 (NWS).

Hurricane Ida was the strongest landfalling hurricane of 2021, which made came ashore on August 29 as a powerful category 4 hurricane near Port Fourchon, Louisiana. The storm brought heavy rain as far east as the western Panhandle and generated a peak storm surge of 2.43 feet in Pensacola Bay, per the NWS.

Tropical Storm Mindy made landfall on September 9 at St. Vincent Island near Apalachicola, Florida, with maximum sustained winds of 45 mph. It produced heavy rainfall and localized flooding but quickly weakened before moving off the coast of Georgia.

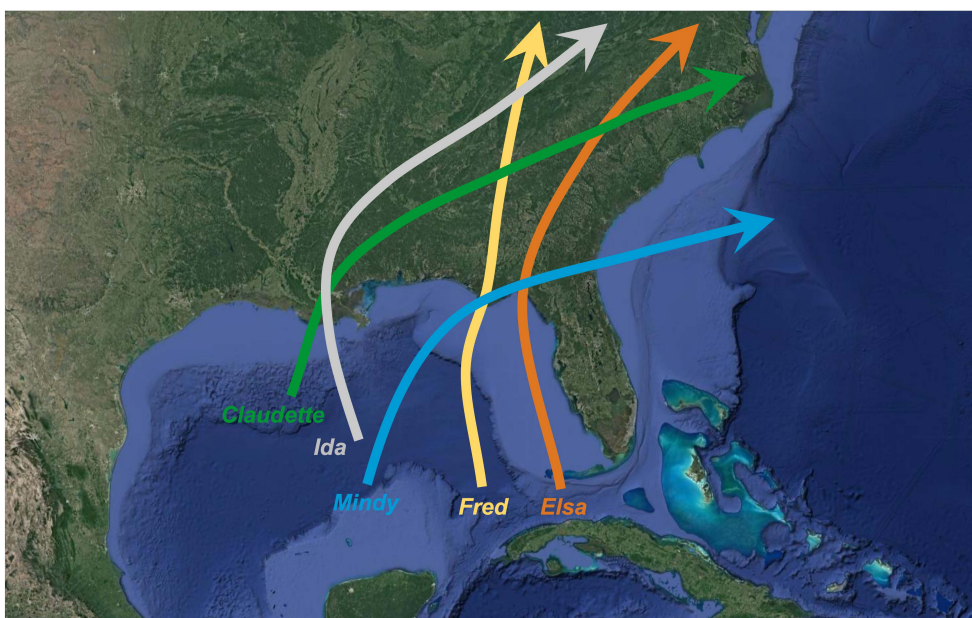


Figure 9. Tropical cyclones impacting Florida during the 2021 Atlantic Hurricane Season.