FloridaClimateCenter
Office of the State Climatologist

HURRICANE HELENE
Post-Storm Summary Report

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October 7, 2024

Hurricane Helene caused catastrophic damage across the Southeast U.S. in parts of Florida, Georgia, North and South Carolina, and Tennessee. Helene was a major category 4 hurricane with peak winds of 140 mph as it made landfall just southwest of Perry, Florida in Taylor County on the night of September 26, 2024. The storm devastated Florida's Big Bend and Gulf coast communities. Helene's large size and expansive wind field led to tropical storm force winds, or even higher at times, as far as Florida's east coast, hundreds of miles away from the storm's center in the Gulf of Mexico. As the storm moved inland, it maintained hurricane-force wind speeds into Georgia where it caused major wind damage and eventually produced torrential rainfall and flooding in western North Carolina and eastern Tennessee, devastating towns throughout the region. Widespread power outages along Helene's track can be seen in the satellite image below from NOAA.

Satellite imagery from the Visible Infrared Imaging Radiometer Suite (VIIRS) Day-Night band showing the impact of Hurricane Helene after landfall, revealing power outages in northern Florida, southern Georgia, and South and North Carolina. Source: NOAA Joint Polar Satellite System (JPSS).

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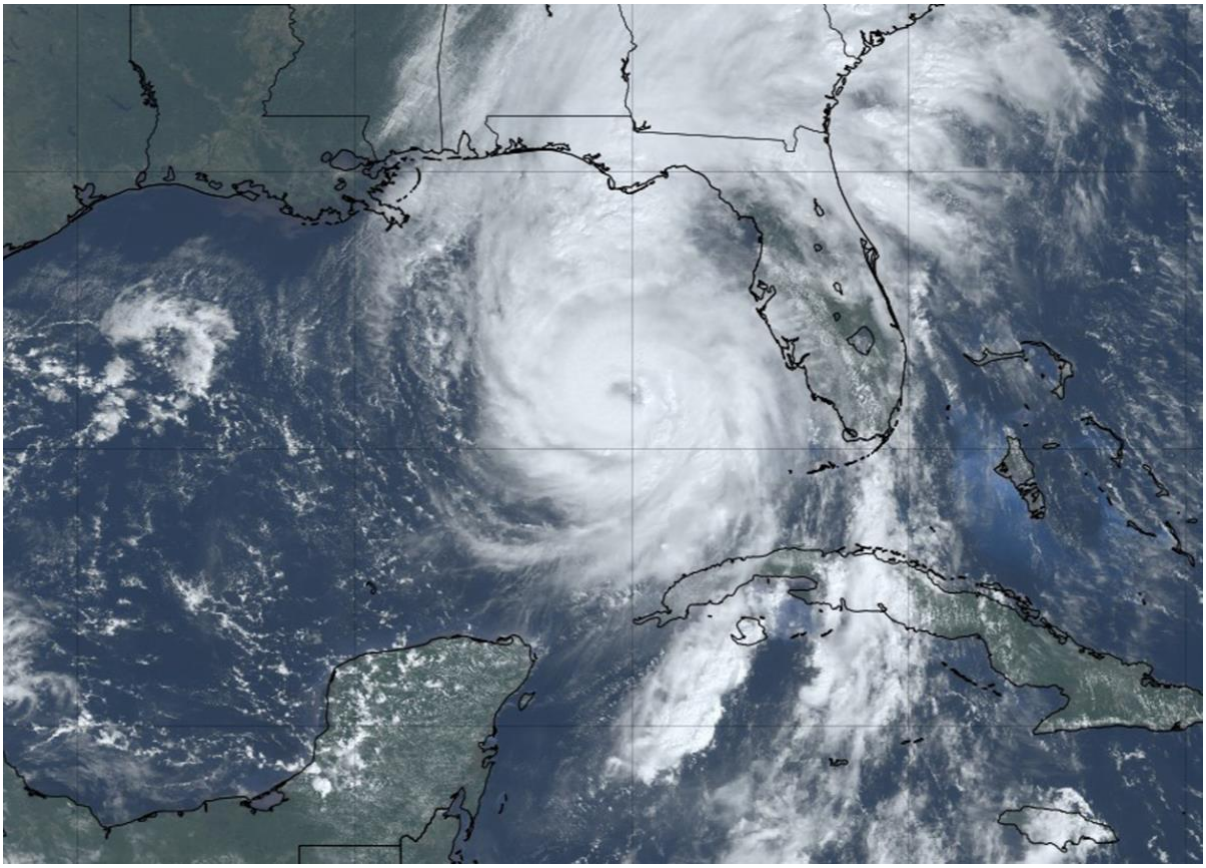
Due to the storm's fast forward motion (at 23 mph) and its distance from the coast, Helene did not produce significant heavy rainfall in central or south Florida. However, even as the storm's center was well offshore around 170 miles west-southwest of Tampa, the storm's forward momentum and outer bands produced strong onshore winds and pushed large amounts of water onshore, generating record high storm surge levels. Major coastal flooding occurred along Florida's west coast and roadways and homes were left covered in sand.

Hurricane Helene rapidly intensified as it moved north through the Gulf of Mexico. The storm intensified within a day from a category 1 to a category 4 hurricane on Thursday prior to making landfall that night. This was an increase in maximum sustained wind speeds of 55 mph in under 24 hours. Helene's development and intensification in the Gulf of Mexico was aided by above normal water temperatures in the Gulf of Mexico, low atmospheric wind shear, and its track over the Gulf loop current, an area of very warm waters. Helene joins the ranks of other storms in recent years to have achieved rapid intensification (>35 mph increase in wind speed in 24 hours), including Harvey (2017), Michael (2018), Laura (2020), Ida (2021), Ian (2022), and Idalia (2023).

Helene's track and intensity from the Caribbean Sea through the Carolinas and Tennessee. Credit: North Carolina State Climate Office.

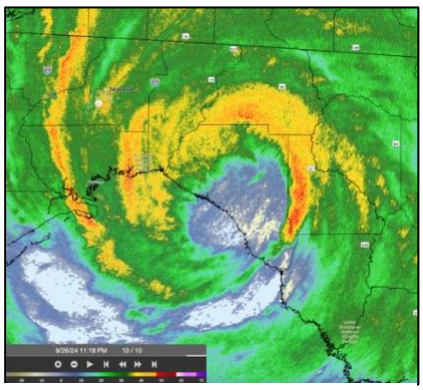
Helene became the 3rd hurricane in 13 months to make landfall in the Big Bend region of Florida, following Hurricanes Idalia in August 2023 (category 3) and Debby in August 2024 (category 1). It was the 7th hurricane to make landfall in the Florida Panhandle or Big Bend region in the past 9 years since 2016.

To date, Helene has led to more than 230 fatalities across six states, with at least 14 fatalities occurring in Florida.



Satellite image of Hurricane Helene in the Gulf of Mexico in the afternoon of Thursday, September 26 (Source: NOAA/AOML GOES-16).

Rainfall Totals



Radar image of Hurricane Helene at landfall on Sep. 26, 2024 around 11:00pm ET.

Coastal flooding was the major impact in Florida; however, any rain that Helene delivered was over a short timeframe, on the order of a few hours, as the storm moved through the region quickly. Rainfall totals were generally 6-12 inches in the Florida Panhandle, with higher amounts in isolated areas. The highest rainfall totals were found along the west side of the storm's center, or eyewall, in Liberty County just west of Tallahassee.

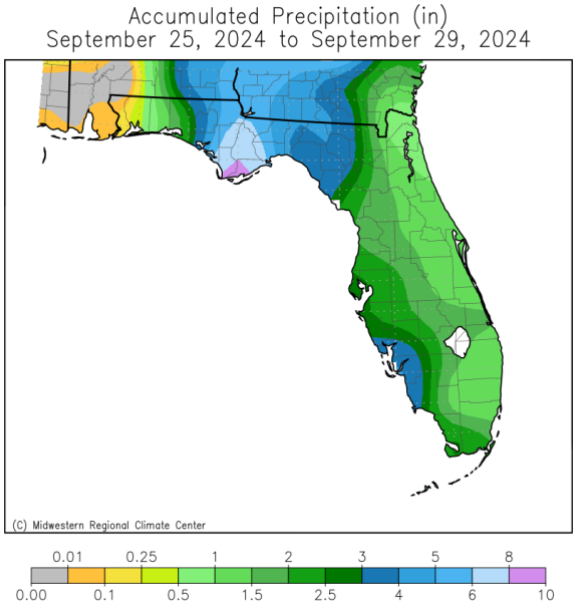
Flash and riverine flooding impacted other states as the storm moved inland. Extreme rainfall was observed as the system made its way inland into Georgia and the Appalachians, where moisture from the storm was amplified by uplift from the mountainous terrain and precursor rainfall from a stalled cold front. Western North Carolina recorded upwards of 30 inches over a 3-day period, causing devastating and long-lasting impacts to the region.

Extreme rainfall in the mountain regions of western North Carolina and eastern Tennessee led to major riverine flooding, severe erosion of highways and interstates, mudslides, downed trees, and

catastrophic damage to homes and businesses. Communities lost power, internet, and water and were only accessible by air following the storm. The nation's largest climate data center, the NOAA National Centers for Environmental Information, located in Asheville, NC shut down after the building lost internet and water.

Table 1. Hurricane Helene select storm total rainfall amounts, in inches, in Florida from September 25-28, 2024, compiled from various networks.

Station Name	County	Rainfall Total (in inches)	Station Network
Sumatra	Liberty	15.91	GHCN
Wilma	Liberty	11.94	GHCN
Alford 0.6 SSE	Jackson	11.72	CoCoRaHS
Gulf County Salinas Park	Gulf	10.75	WeatherSTEM
Midway 6.9 SW	Leon	10.30	CoCoRaHS
Apalachicola Airport	Franklin	9.54	COOP
Havana 5.1 SSW	Gadsden	9.54	CoCoRaHS
Marianna	Gadsden	9.43	FAWN
St. George Island Lighthouse	Franklin	9.32	WeatherSTEM
Quincy 7.5 SSW	Gadsden	8.79	CoCoRaHS
Marianna 0.8 NNE	Jackson	8.65	CoCoRaHS
Graceville 7 S	Jackson	8.55	CoCoRaHS
Quincy	Jackson	8.18	FAWN
Marianna Municipal AP	Jackson	7.73	COOP
Tallahassee Forestry Center	Leon	6.13	RAWS



Accumulated rainfall totals during Hurricane Helene in Florida, from September 25-29, 2024. Source: Midwestern Regional Climate Center.

Peak Winds and Water Levels

Tropical storm force winds were observed across a large area of Florida far from the storm's center, and peak wind gusts over 90 mph were observed in areas directly in the storm's path in Taylor, Jefferson, and Madison Counties. Table 2 provides select peak wind gusts observed during Helene, compiled from the Weather Prediction Center and National Weather Service offices serving Florida.

Table 2. Select peak wind gusts, in miles per hour (mph), in Florida from Hurricane Helene.

Station	Peak Wind Gust (mph)
Perry	99
Lowdes City Util.	96
Cedar Key	84
Albert Whitted Airport	82
Madison City EOC	80
Clearwater Beach	75
Sarasota/Bradenton	74
Jacksonville Intl. Airport	73
St. Petersburg/Clearwater AP	71
Venice	69
Dunedin Causeway	68
Tallahassee Intl. Airport	67
Punta Gorda	66
Crystal Beach	63
Fort Myers	62
Tarpon Pt.	62

The storm's onshore winds produced record storm surge levels and coastal flooding along the western Gulf Coast of Florida. Major flooding, debris, and damages to structures were observed from the Keys north to Florida's Big Bend region. Among the hardest hit areas were those in the direct path of the storm including Steinhatchee, Horseshoe Beach, and Cedar Key, where hundreds of homes, businesses, and other structures were destroyed or washed away.

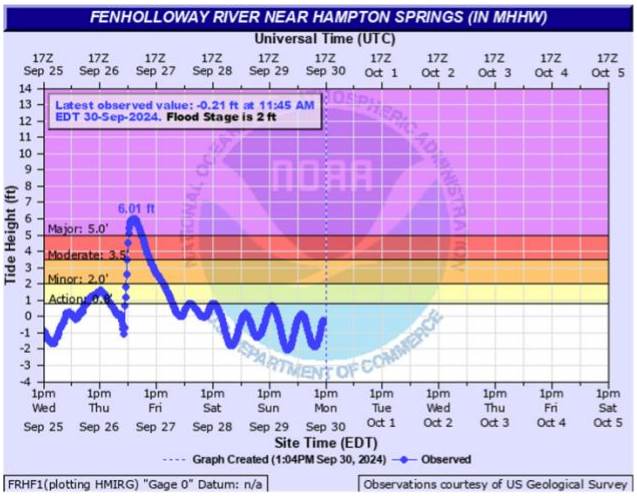
The peak surge level in Cedar Key (of 9.3 ft) surpassed the peak storm surge observed during Hurricane Idalia last year (6.89 ft) and became the highest storm surge seen there in a long time. Based on the historical record dating back to the late 19th century, a storm surge of 10 ft was observed at Cedar Key in 1896 during an unnamed tropical cyclone, according to a historical peak storm surge database called SURGEDAT. Preliminary storm surge data for Taylor and Dixie Counties estimate more than 15 feet of surge above ground level occurred during Helene. If confirmed, this would be a new record high storm surge level for this region.

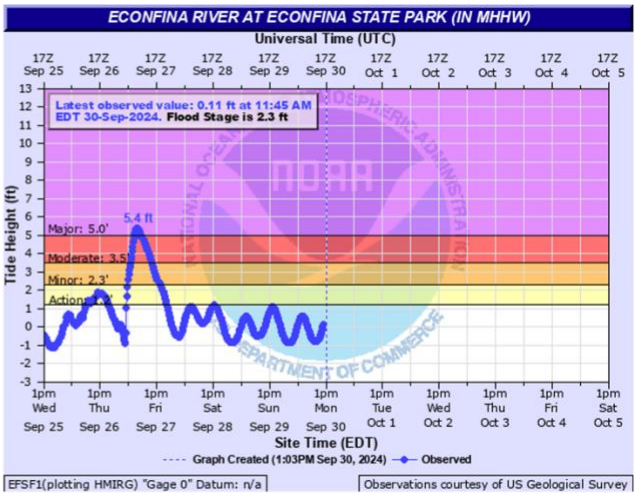
Storm debris and clean up in Steinhatchee on Friday, October 4, 2024, one week following Hurricane Helene.

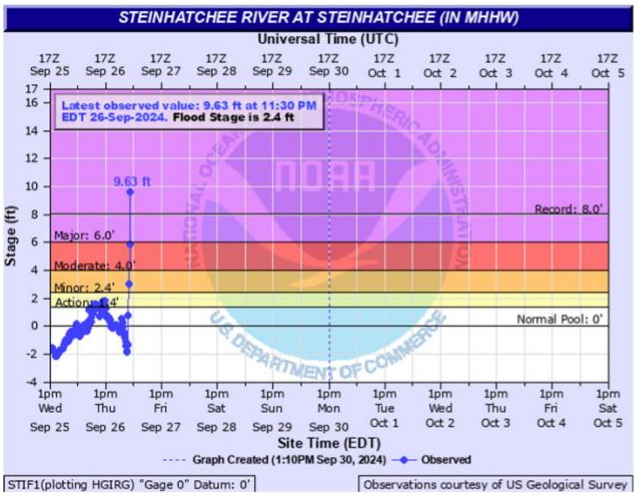
Areas further south saw major coastal flooding and damages as well, particularly across Pinellas, Hillsborough, and Manatee Counties. Tampa saw historic damage with peak storm surge levels over 6 feet, which had not been experienced there in over a century since 1921.

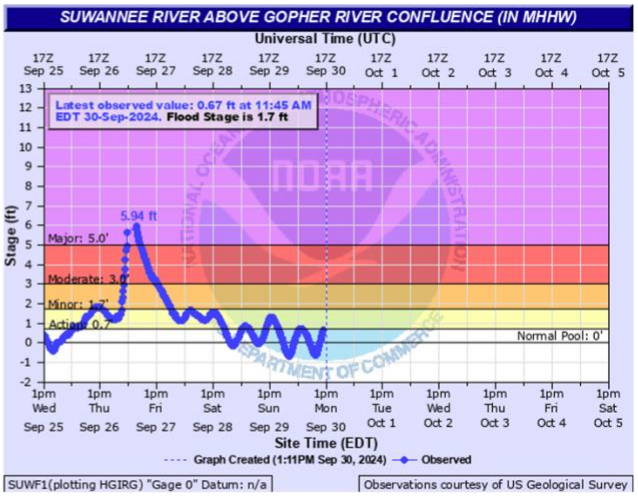
Record storm surge levels were recorded at the coastal tide gauge stations of Old Port Tampa (6.8 ft), East Bay (7.2 ft.), and Port Manatee (6 ft), surpassing the previous records set last year during Hurricane Idalia. Storm surge observed in Clearwater Beach (6.7 ft) and St. Petersburg (6.3 ft) were the highest experienced in a long time in those locations. However, Hurricane Easy in 1950 generated higher surge levels that reached 8 feet between Clearwater and Sarasota, per SURGEDAT.

Rivers and streams crested to major flood stage in several locations near and or south of the storm's center. The four graphs just below show peak water levels recorded at different river locations as the storm passed through the state on September 26. The Steinhatchee River reached a new record flood stage of 9.63 ft (above MHHW), surpassing the previous record of 8.0 ft (above MHHW) set just last year during Hurricane Idalia. The last set of graphs show coastal water levels during Helene from the NOAA tide gauge stations along the west coast of Florida.

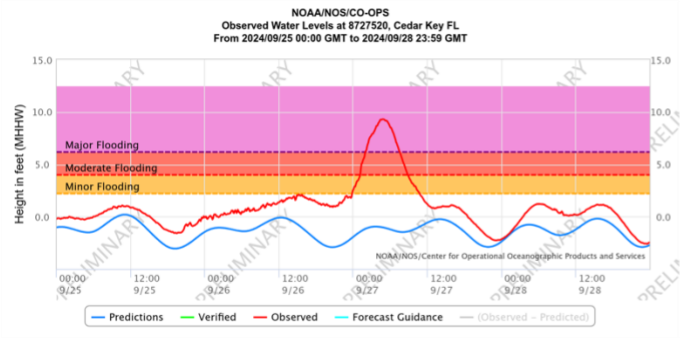


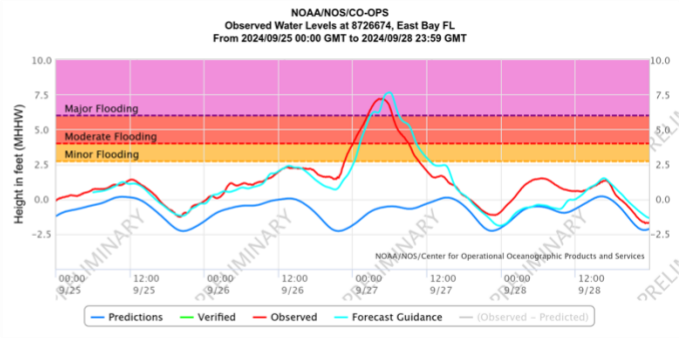


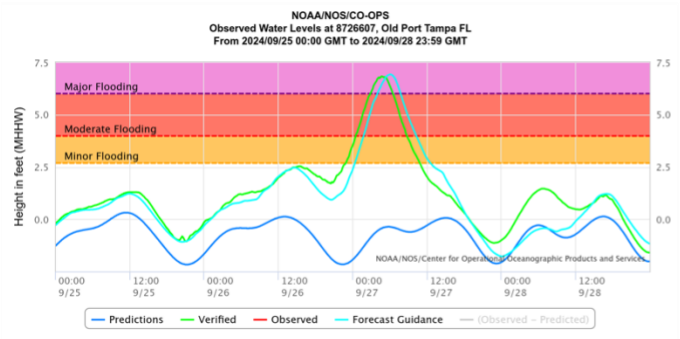


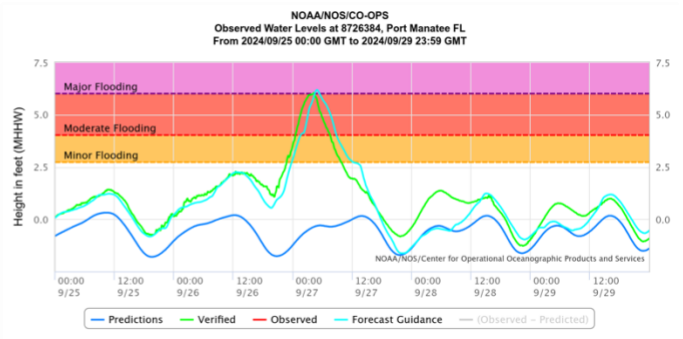


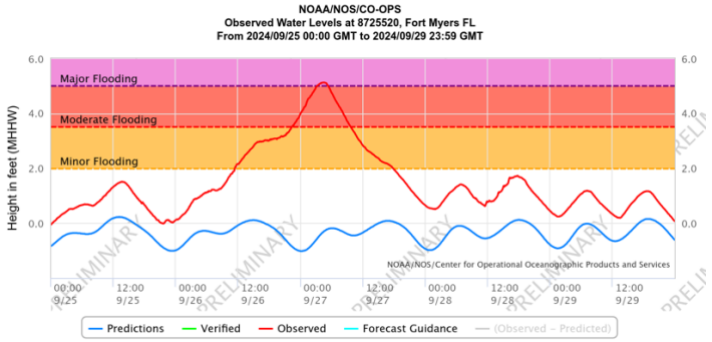
Observed river flood levels during Hurricane Helene. Water levels are referenced to the Mean Higher High Water (MHHW) datum (source: NOAA National Water Prediction Service).











Observed water levels from coastal tide gauges along west coast of Florida during Hurricane Helene. Source: NOAA Tides and Currents).