

# Description of Hazard Events

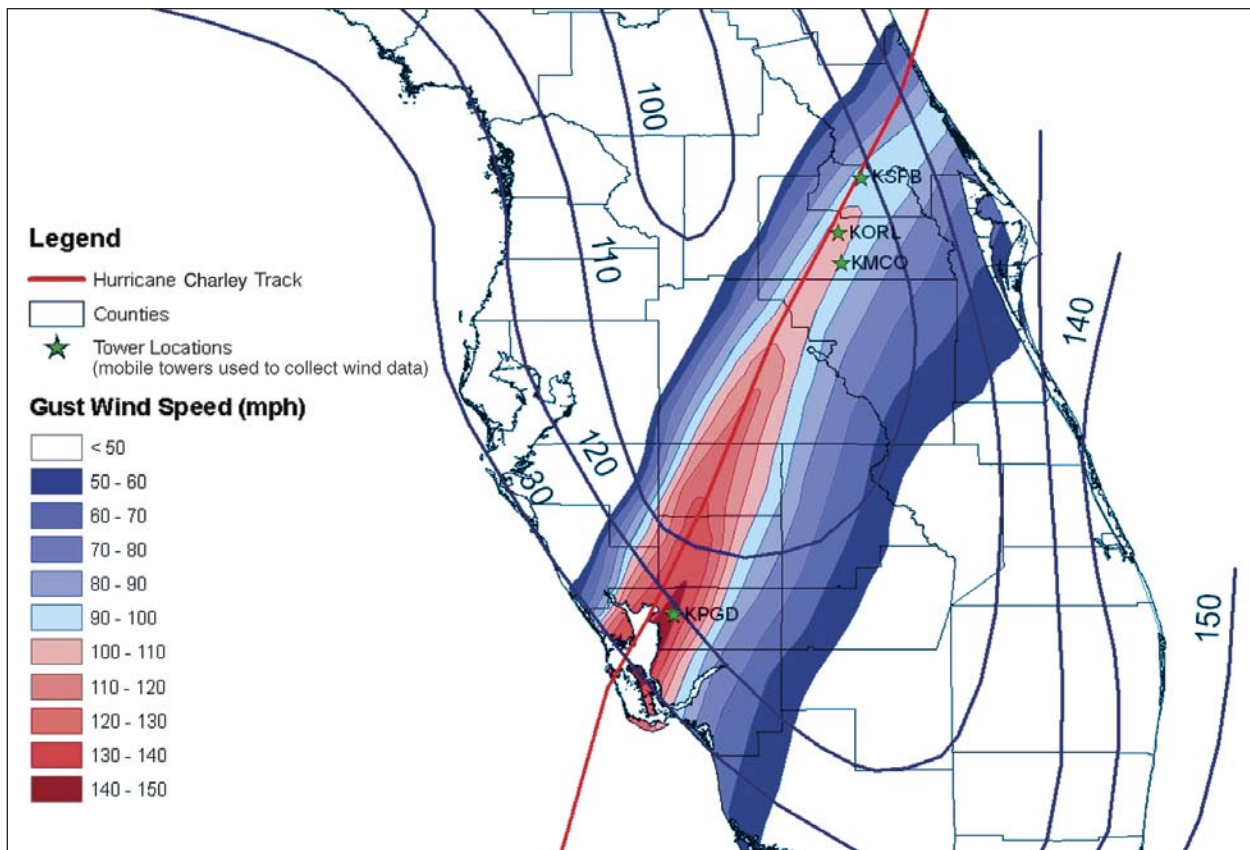


*To determine how well buildings performed, it is first important to understand the characteristics of the hurricanes, specifically their wind and water components at landfall.*

## 2.1 Charley

Hurricane Charley made landfall on the Gulf Coast of Florida on August 13 as a very compact storm (refer to Figure 1, Storm Track Map). The hurricane eye had an estimated radius of maximum winds of 6 miles with hurricane force winds extending outward up to 25 miles from the center, and tropical storm force winds extended outward up to 85 miles (Figure 2, Hurricane Charley Wind Swath Map). The maximum recorded wind speed obtained for the storm at landfall from National Weather Service (NWS) weather station (Station PGD) before it failed was 112 miles per hour (mph), 3-second gust wind speed.

According to reports from the NWS, the center of Charley crossed the barrier islands of Cayo Costa and Gasparilla as a Category 4 hurricane on the Saffir-Simpson scale with maximum sustained winds of 149 mph. After crossing the Florida barrier islands, Charley moved up Charlotte Harbor before making landfall at Mangrove Point, just southwest of Punta Gorda, Florida. Communities around Charlotte Harbor including Punta Gorda and Port Charlotte were impacted with sustained winds estimated at 125–130 mph (1-minute) and gust winds upward of 155 mph (3-second) in built-up areas. Hurricane force winds (with 3-second gust winds as high as 105 mph) in built-up areas of Orlando continued to cause damage across the peninsula of Florida until Hurricane Charley exited into the Atlantic Ocean near Daytona Beach, still categorized as a hurricane.

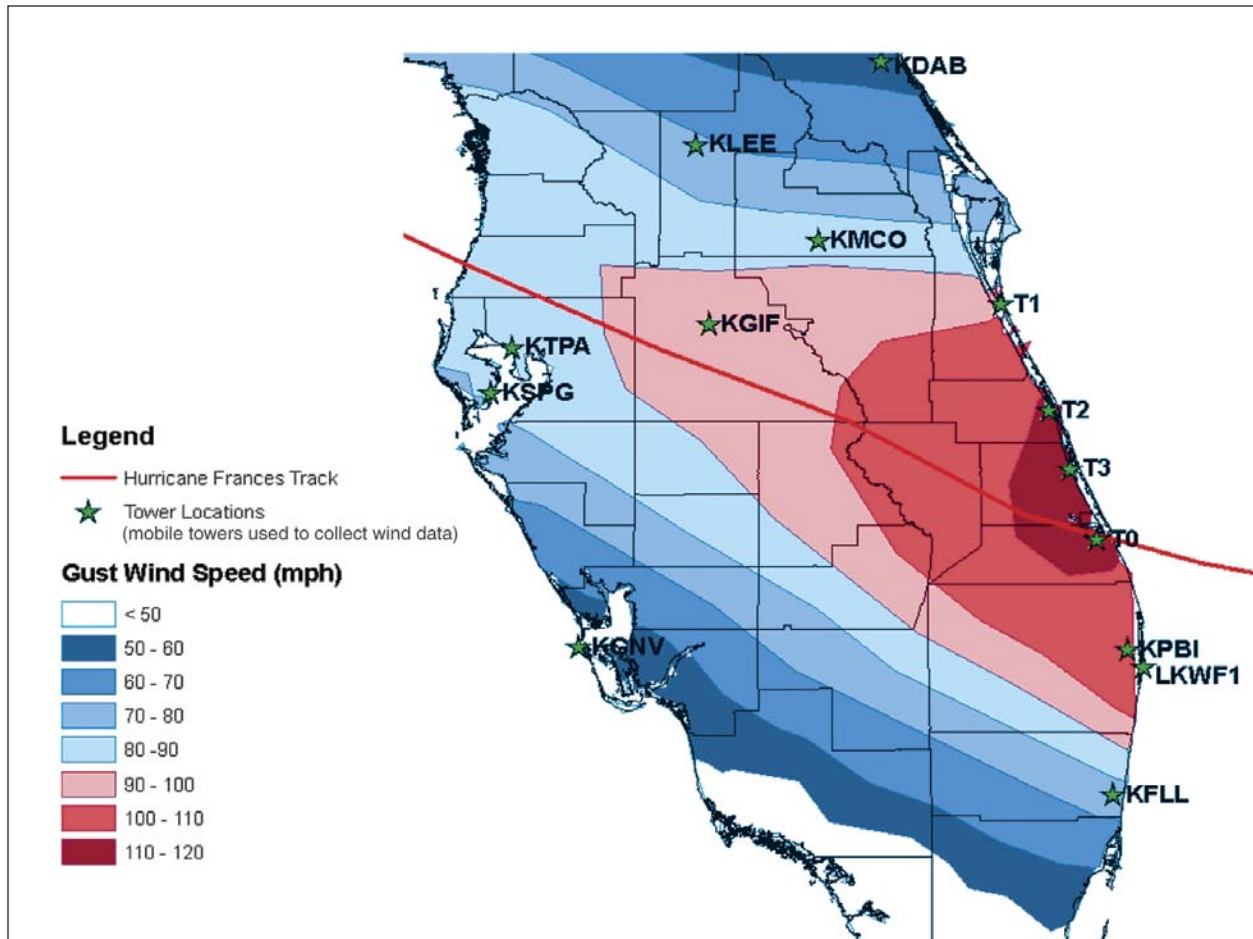


**Figure 2. Hurricane Charley Wind Swath Map**

The storm surge from the hurricane was significantly smaller than originally predicted due to the storm's compact size and the north-eastward turn it made just prior to landfall. Although the storm was reported to have some Category 4 winds, the hurricane did not generate water levels typical of a Category 4 hurricane, which are often in the range of 10 to 14 feet. Instead, high water elevations along the open coast from Naples north to Ft. Myers Beach and Sanibel Island were 5 to 8 feet. Inland bays, including areas near Port Charlotte and Punta Gorda, measured up to 1.5 feet.

## 2.2 Frances

Hurricane Frances was the second of four deadly hurricanes that swept through the State of Florida during the 2004 season, just weeks after Hurricane Charley left its catastrophic mark. Frances struck a wide stretch of Florida's east coast early September 5 as a Category 2 hurricane on the Saffir-Simpson scale according to the National Hurricane Center (NHC) (refer to Figure 1, Storm Track Map).



**Figure 3. Hurricane Frances Wind Swath Map**

Hurricane Frances hit Florida with reported maximum sustained winds of over 105 mph and storm surges over 5 feet. The highest 3-second gust winds measured by the Florida Coastal Monitoring Program during Hurricane Frances were 112 mph at an open-exposure site south of Fort Pierce. Hurricane-force winds extended outward up to 75 miles from the center, and tropical storm-force winds extended outward up to 205 miles (Figure 3, Hurricane Frances Wind Swath Map). Frances made landfall near Sewall’s Point, Florida, on September 5 as a Category 2 storm, and moved west across the central Florida peninsula while weakening to a tropical storm. Hurricane Frances’ unusually long duration, a result of its slow forward speed, significantly impacted the functions of critical facilities because of building “fatigue”.

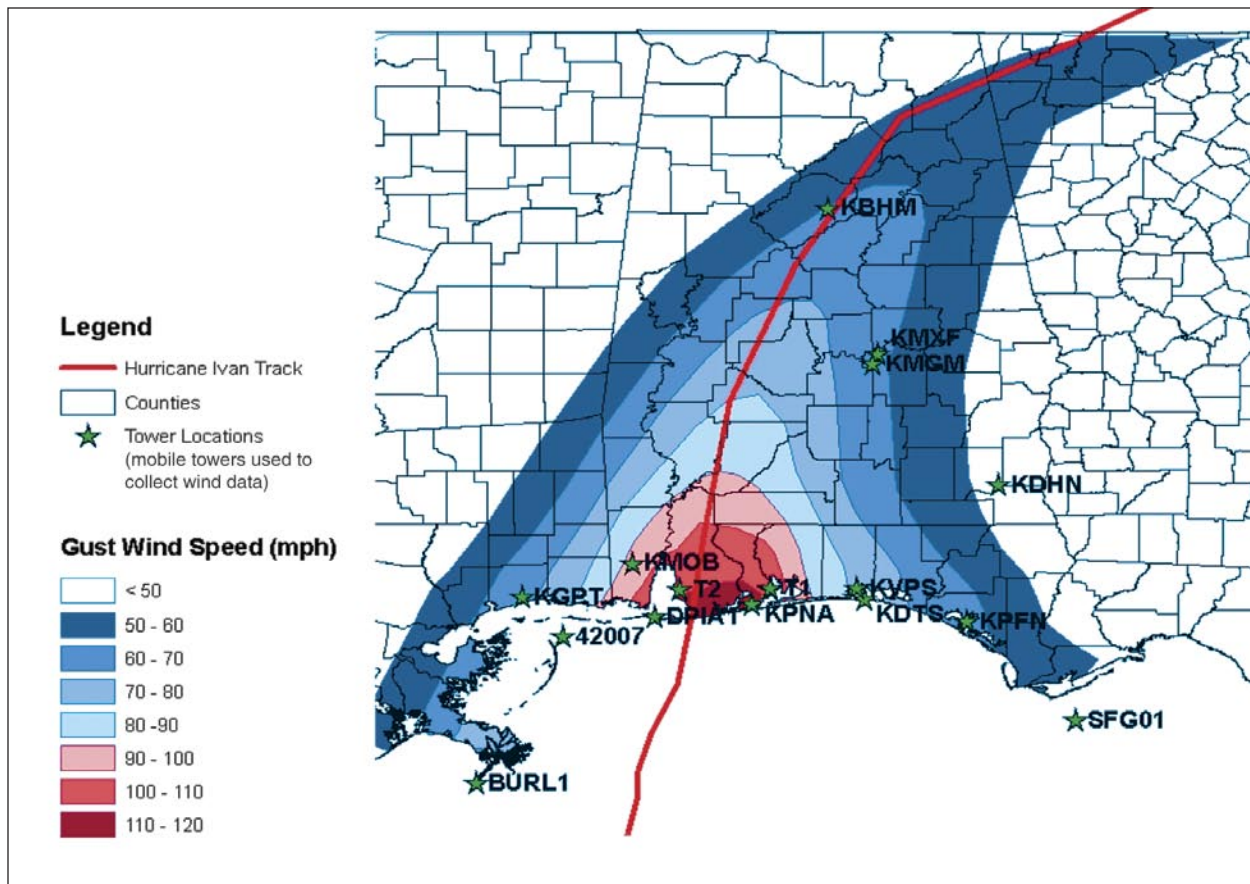


Figure 4. Hurricane Ivan Wind Swath Map

## 2.3 Ivan

Hurricane Ivan made landfall on September 16 as a Category 3 hurricane, according to the NHC, with estimated maximum sustained winds of over 100 mph and with wind gusts of up to 120 mph, torrential rains and coastal storm surge, and large battering waves of up to 16 feet in inland bays, and up to 19 feet along the open coast and inland bays (Figure 4, Hurricane Ivan Wind Swath Map). The hurricane's strongest winds were located east-northeast of the storm center. This aspect, coupled with the higher, on-shore directed winds, associated storm surge and accompanying breaking waves, resulted in much of Ivan's destructive impact on the Florida Panhandle coast and Gulf Shores, Alabama.

Many of the barrier islands exposed to Hurricane Ivan's strongest winds and storm surge are low lying and were washed over by storm surge. Coastal storm surge flooding crossed the barrier islands, undermined buildings and roads, and opened new island breaches. In

addition to the storm surge, breaking waves eroded dunes and battered structures. The storm's arrival was concurrent with high tide, which exacerbated storm surge flooding.

## 2.4 Jeanne

Hurricane Jeanne made landfall as a Category 3 hurricane on September 25 at Hutchinson Island, just east of Stuart, Florida. The storm's landfall location was only about 2 miles north (3 km) from Sewall's Point, where Hurricane Frances struck Florida just 3 weeks earlier. According to the NHC, Jeanne's eye diameter at the time of landfall was approximately 60 miles, its maximum winds were 120 mph over a very small area north of the center of circulation, and movement was west-northwest at approximately 9 mph (Figure 5, Hurricane Jeanne Wind Swath Map). Storm surge of 3.8 feet above normal tide levels was measured near Port Canaveral, Florida, about an hour after Jeanne made

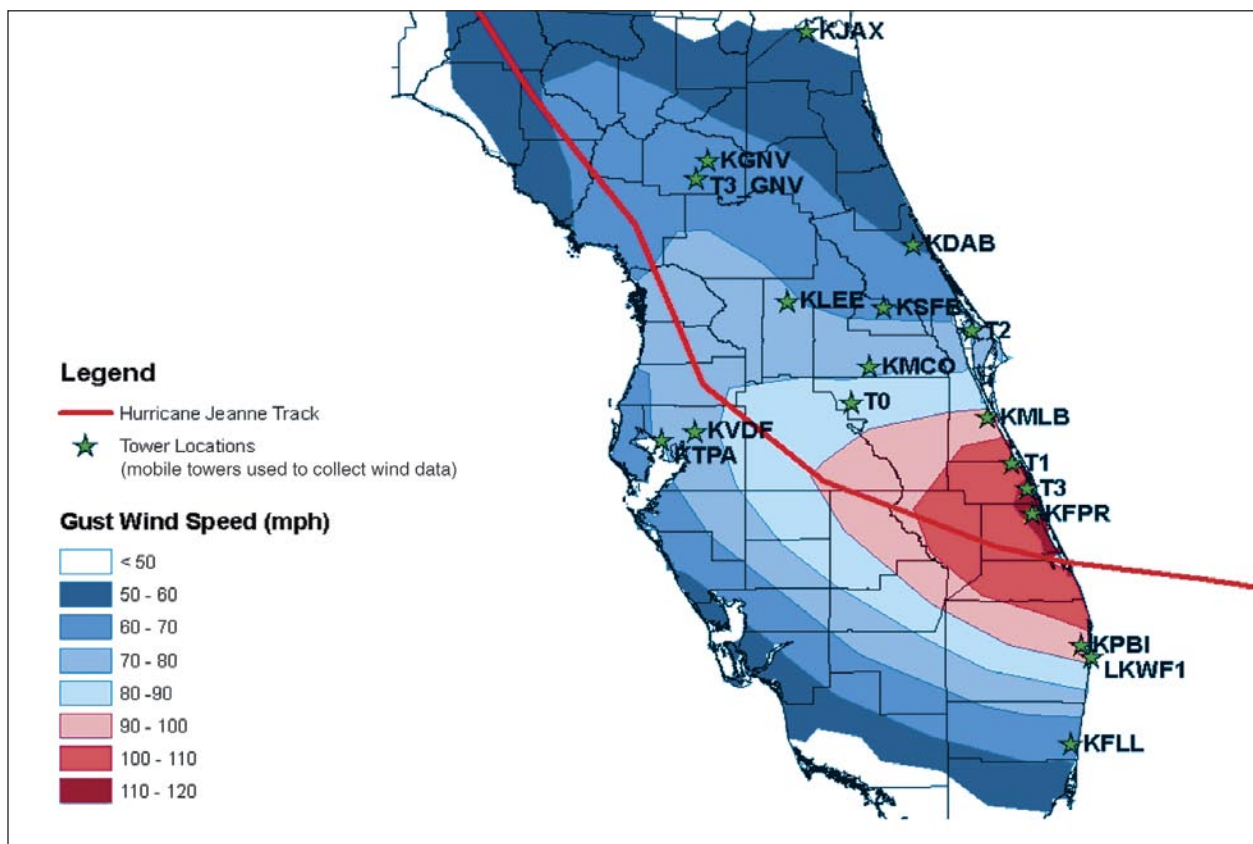


Figure 5. Hurricane Jeanne Wind Swath Map

landfall. The maximum storm surge was estimated to be 6 feet above normal tide levels.

## 2.5 Cumulative Hurricane Damages

Alabama and Florida residents braced for impact and endured the aftermath of four hurricanes in August and September 2004, large events separated by a brief pause of just days. Intensifying the rapid-fire hurricane strikes was the track similarity shared by Frances and Jeanne, and the overlapping zone of effects among Frances, Jeanne, and Charley. Though Hurricane Ivan tracked through the Gulf of Mexico and hit Alabama, the storm brought severe wind and water effects to Florida as well as Alabama. Though varied in degree, the hurricanes each resulted in wind and water damage to commercial, residential, and public facilities, as well as vegetation, agricultural crops, and infrastructure such as utilities and roadways. Though the wind swaths, flood levels, and tracks of the hurricanes are easily mapped, the boundary of damages associated with each event is not so easily drawn. Field observations were difficult to perform before the next hurricane struck. As such, the overlapping hurricane events and track similarities led to a succession of damages that is almost easier to consider cumulatively than separately.

The outlay of resources to disaster communities can put into perspective the degree of sustained damages (FEMA, 2005b):

- More than 548,000 citizens were assisted in FEMA Disaster Recovery Centers throughout Florida.
- Approved aid for Public Assistance (public facilities) disaster damages surpassed \$604 million (FEMA, 2005c).
- Approved aid for Individual Assistance disaster damages surpassed \$1.16 million (FEMA, 2005b).
  - ▶ Nearly 1.24 million victims applied for federal and state assistance.
  - ▶ Almost 877,000 housing inspections were completed.
  - ▶ FEMA provided more than 15,600 temporary housing units to hurricane victims.
- An estimated 53 million cubic yards of debris was cleared.
- More than 33,000 NFIP claims were received.