

= Tropical Storm Grace ( 2003 ) =

Tropical Storm Grace was a weak tropical storm that struck Texas in the 2003 Atlantic hurricane season . The eleventh tropical depression and the seventh tropical storm of the season , Grace was also the weakest storm of the season . On August 30 the storm developed from a long @-@ track tropical wave in the western Gulf of Mexico . Grace remained disorganized throughout its lifetime due to an upper level low to its west . The weak storm moved northwestward and made landfall on southeastern Texas . Grace quickly weakened over land , and dissipated on September 2 as it merged into a cold front .

In Texas , the storm dropped heavy rainfall , causing minor flash flooding damage . The cold front , combined with the remnants of the storm , dropped moderate to heavy rainfall from Texas through the Mid @-@ Atlantic . The worst of the flooding occurred in Indianapolis , where record rainfall affected over 700 homes . Despite the rainfall , damage was minimal along its path .

= = Meteorological history = =

A strong tropical wave accompanied with a low pressure system moved off the coast of Africa on August 19 . It moved quickly westward and organized , developing banding features and cirrus outflow near the blossoming convection . The wave nearly developed into a tropical cyclone on August 21 , though its fast forward motion dislocated the low level circulation from the deep convection . The wave entered an area of dry air in the central Atlantic Ocean , and by late on August 22 most of the convection dissipated from the system . On August 24 , convection increased as the wave passed through the Lesser Antilles , though strong southwesterly upper level wind shear prevented further development . The tropical wave moved through the Caribbean Sea , and developed deep convection due to more favorable conditions over the Gulf of Honduras on August 28 . The wave crossed the Yucatán Peninsula , and developed a surface low pressure area on the 29th in the Gulf of Mexico . Convection continued to organize , and the tropical wave developed into Tropical Depression Eleven on August 30 while located 335 miles ( 540 km ) east @-@ southeast of Corpus Christi , Texas .

The depression moved to the northwest , and intensified into Tropical Storm Grace six hours after forming . Despite the increase in winds the center of circulation remained very broad , with Reconnaissance Aircraft having difficulty pinpointing the center . In addition , an upper level low located over Brownsville , Texas produced shear over the western portion of the system , which limited outflow to the east side . Forecasters predicted the upper level low to weaken , allowing for the possibility of Grace to intensify to a 65 mph ( 100 km / h ) tropical storm over warm waters . However , the upper level low remained in place and continued to produce shear across the system . A new center of circulation reformed 115 miles ( 185 km ) north of the original center , and made landfall near San Luis Pass on the southwestern portion of Galveston Island on August 31 as a minimal tropical storm . Grace quickly weakened to a tropical depression over land , and after turning northeastward into Oklahoma the depression was absorbed by a cold front .

= = Preparations = =

Three hours after forming , officials issued Tropical Storm Warnings from High Island to Corpus Christi , Texas . Local National Weather Service offices requested a voluntary evacuation for western Galveston Island including Jamaica Beach , the Bolivar Peninsula , and coastal areas of Brazoria and Matagorda counties , though few residents heeded the warnings . Local emergency management officials predicted tides of up to 5 feet ( 1 @.@ 5 m ) above normal with coastal flooding .

= = Impact = =

Grace produced moderate amounts of rainfall along its path , peaking in southern Texas . The

storm later merged with a cold front , which later dropped heavy rainfall in the Mid @-@ West United States . In addition to its impact on the United States , the outer rainbands of Grace caused light rainfall in Yucatán and northern Tamaulipas .

= = = South @-@ Central United States = = =

Upon making landfall , Tropical Storm Grace produced a light storm surge of 3 @.@ 5 feet ( 1 m ) in Matagorda and North Jetty , Texas . Wind gusts peaked at 53 mph ( 85 km / h ) with sustained winds of 40 mph ( 64 km / h ) at Sea Rim State Park . Locations closer to where the storm made landfall reported below tropical storm force winds , with the exception of Galveston which recorded a 40 mph ( 64 km / h ) wind gust . Rainfall was moderate to heavy across eastern Texas , peaking at 10 @.@ 36 inches ( 263 mm ) in Spindletop Bayou . The outer bands of Grace spawned a waterspout just south of the western tip of Galveston Island , prompting the issuance of a tornado warning . The waterspout dissipated before moving onshore . The storm also caused light beach erosion , though little occurred beyond the erosion caused by Hurricane Claudette one month prior . Near the coast , high tides from the storm flooded piers , bulkheads , and low @-@ lying areas . Further inland , heavy rainfall lead to flash flooding , covering roads and entering a few houses . Overall , damage was minor , and totaled to \$ 113 @,@ 000 ( 2003 USD , \$ 132 @,@ 400 2008 USD ) .

In Oklahoma , moisture from the storm , combined with a slow @-@ moving cold front , produced heavy rainfall across the state , peaking at 8 @.@ 98 inches ( 228 mm ) in Courtney . Due to below normal precipitation by as much as 5 to 10 inches ( 127 to 255 mm ) , flooding was localized and overall minimal . Near Medford , the rainfall lead to 2 feet ( 0 @.@ 6 m ) deep flooding on U.S. Highway 81 , forcing its closure . The rainfall was welcome in the state , and lessened the rainfall deficit .

Tropical Storm Grace , combined with the slow @-@ moving cold front , produced light to moderate rainfall totals across the southern United States , including isolated locations in Louisiana and Mississippi reporting over 3 inches ( 76 mm ) and over 5 inches ( 127 mm ) in northeastern Arkansas .

= = = Ohio Valley and Eastern United States = = =

In Missouri , the cold front combined with moisture from the remnants of Grace brought temporary relief to a severe drought by producing light to moderate rainfall of up to 5 inches ( 127 mm ) in the southeastern portion of the state . In Poplar Bluff , the rainfall caused severe flooding , resulting in rescues for people in trapped vehicles . The moisture produced over 5 inches ( 127 mm ) in northern Kentucky , as well .

Moisture from the remnants of Grace dropped heavy rainfall across central Indiana , including a record one @-@ day total of 7 inches ( 178 mm ) in Indianapolis , while other locations received over 9 inches ( 228 mm ) . Residents prepared sand bags to prevent overflowing rivers and creeks , though rising waters entered streets and over 700 homes . The rapid rainfall in Indianapolis backed up the sewage system , sending hundreds of millions of gallons of sewage into the streets . Following the deluge in the state , the governor declared a state of emergency for the state . Eight local American Red Cross chapters arrived to provide meals and aid to the affected people .

The remnants of Grace dropped moderate to heavy rainfall eastward through the Mid @-@ Atlantic States and New England . Locations in extreme western Maryland and southeastern Virginia received over 5 inches ( 127 mm ) of rain . In Maryland , Hagerstown recorded 3 @.@ 94 inches ( 100 mm ) , resulting in flash flooding . In Washington County , the system produced 1 @.@ 09 inches ( 27 @.@ 8 mm ) of rain , a new daily record . Damage in Maryland , if any , was unknown .