

= Tropical Storm Hanna (2002) =

Tropical Storm Hanna was a moderately strong tropical storm that affected the Gulf Coast and Southeastern regions of the United States . The tenth tropical cyclone and ninth named storm of the 2002 Atlantic hurricane season , Hanna formed through the complex interaction of a surface trough , a tropical wave , and an upper @-@ level low pressure system , a disturbance in the upper atmosphere . Designated a tropical depression at 0000 UTC on September 12 , the storm remained disorganized throughout its duration , though it attained tropical storm status and a peak intensity of 1 @, @ 001 mbar (29 @. @ 6 inHg) , with winds of 60 miles per hour (100 km / h) . Hanna crossed extreme southeastern Louisiana , and made a second landfall along the Alabama ? Mississippi border .

Because most of the associated convective activity was east of the center of circulation , Louisiana and Mississippi received minimal damage . However , on Dauphin Island , Alabama , the storm caused coastal flooding which closed roads and forced the evacuation of residents . Florida received high wind gusts , heavy rainfall , and strong surf that resulted in the deaths of three swimmers . 20 @, @ 000 homes in the state lost electricity . The heavy rainfall progressed into Georgia , where significant flooding occurred . Crop damage was extensive , and about 335 structures were damaged by the flooding . The storm caused a total of about \$ 20 million (2002 USD ; \$ 23 @. @ 96 million 2008 USD) in damage .

= = Meteorological history = =

A broad surface trough extended from the western Atlantic Ocean into the Gulf of Mexico in early September 2002 . At the same time , a westward @-@ moving tropical wave entered the gulf on September 10 and spawned a weak low along the trough , with little associated thunderstorm activity . On September 11 , an upper @-@ level low over the United States moved into the Gulf and became cut off from the flow , allowing atmospheric convection to develop to the east of the tropical wave . The surface low organized , and convection formed closer to the center of the low . At 0000 UTC on September 12 , a Hurricane Hunters aircraft was able to find a well @-@ defined center of circulation ; the National Hurricane Center (NHC) thus designated it a tropical depression while it was about 280 miles (450 km) south of Pensacola , Florida .

After being designated , the cyclone became disorganized , and contained little deep and persistent convection ; with dry air infringing on the western edge of the storm , substantial intensification was deemed unlikely . Despite being sheared , the cyclone neared tropical storm status later that day , though it remained a depression due to a partially non @-@ tropical appearance . Initially , the depression meandered towards the northeast due to weak steering currents , and it intensified into a tropical storm at 0600 UTC . As such , it was named Hanna by the National Hurricane Center . Over the next 24 hours , the low @-@ level center rotated around the mid- and upper @-@ level centers , and the entire tropical storm turned southwestward by late September 12 . After a jog to the northwest , the low @-@ level center became separated from the convection . Meandering , the storm started to turn northward under the steering currents of a southwesterly flow associated with an approaching mid @-@ level trough . Hanna then strengthened sharply to reach to its peak intensity of 60 miles per hour (100 km / h) at 0000 UTC on September 14 .

Convection shifted towards the eastern semicircle of the circulation , while the still @-@ exposed center became malformed and elongated . On September 14 , the poorly organized cyclone crossed southeastern Louisiana , turned towards the north @-@ northeast and made a second landfall close to the Alabama ? Mississippi border at 1500 UTC that day , still at its peak strength . The storm dissipated rapidly as it proceeded inland , and the remnant low pressure area moved into Georgia and South Carolina .

= = Preparations = =

Shortly after the formation of the storm , the National Hurricane Center issued a tropical storm

watch for the coastal area between Pascagoula , Mississippi and the Suwanee River in Florida . A tropical storm warning for the region between Grand Isle , Louisiana and Apalachicola , Florida replaced the watch , though it was discontinued east of Apalachicola . All tropical cyclone warnings and watches were discontinued by 1800 UTC on September 14 , as there was no longer a need for the advisories . After the landfall , officials issued flood watches for inland parts of Mississippi and Alabama as well as for western portions of Georgia and the Carolinas . On Dauphin Island in Alabama , some residents boarded up windows and filled sandbags provided by local fire departments to prepare for Hanna . The Red Cross opened 10 shelters throughout the Gulf Coast region .

= = Impact = =

The total damage caused by Tropical Storm Hanna amounted to about \$ 20 million ? equivalent to \$ 23 million in 2008 USD .

= = = U.S. Gulf Coast = = =

In Louisiana , damage was light , as the majority of Hanna 's convective activity was to the east . Rainfall was mostly less than 1 inches (25 mm) , and little rise in tide was reported . Little or no damage occurred in neighboring Mississippi , where similar effects were reported .

Damage was greater in Alabama , where rain reached 7 @. @ 55 inches (192 mm) at Coden and 5 @. @ 75 inches (146 mm) at Belle Fontaine . Sustained winds of 40 miles per hour (64 km / h) were reported at Dauphin Island , with gusts up to 51 mph (82 km / h) . The lowest barometric pressure was also at Dauphin Island ; it reportedly fell to 1005 mb . Storm tides of 3 @. @ 7 feet (1 @. @ 1 m) caused minor coastal flooding and beach erosion in some areas , including along the causeway that crosses the Mobile Bay . One tornado , an F0 on the Fujita Scale , touched down in south Mobile County , knocking down trees . Some residents were left without electric power , and there was flooding on both ends of Dauphin Island , leading to road closures . The storm forced the evacuation of some residents on the western end of the island . In addition to the heavy rains , trees were downed in parts of Baldwin County .

In Florida , peak gusts were recorded at 68 miles per hour (109 km / h) near Pensacola Beach . The winds , combined with associated thunderstorms , caused minor damage , and brought down small trees and power lines . Throughout Walton County , Hanna left approximately 15 @, @ 000 customers without power , forming a statewide total of 20 @, @ 000 power outages . Due to high winds , bridges to offshore islands were closed . Minor beach erosion was reported along the coast of Walton , Bay and Gulf counties . Three people drowned in high surf ; one near Pensacola Beach , one at Seagrove Beach and another at Panama City Beach . The fatalities prompted a local Police Major to comment , " People are getting into the water and not paying attention to the warning flags . " Heavy rain fell throughout the central and western Panhandle ; the highest reported total was 9 @. @ 68 inches (246 mm) , at Chipley . As a result , rivers topped their banks , while county roads and homes in Perry , as well as streets in the Tallahassee region , were flooded . The total damage in Florida is estimated at \$ 400 @, @ 000 (2002 USD) .

= = = Eastern United States = = =

Hanna dropped heavy rainfall across much of Georgia , peaking at 15 @. @ 56 inches (395 mm) at Donalsonville , 12 @. @ 47 inches (317 mm) at Carrollton , and 11 @. @ 23 in (285 mm) at Embry . Although the heaviest rainfall was mostly confined to southwestern parts of the state , precipitation was widespread within a northwest ? northeast feeder band over central and northern Georgia . Associated with the band was up to 2 inches (51 mm) of rainfall in a matter of hours , as well as gusty thunderstorms . The highest rainfall totals from this individual band were limited to an area north of a line from Atlanta to Athens . The heavy rainfall helped to relieve a persistent drought , bringing vegetation back to life . However , climatologists determined that the rainfall did not fully

alleviate the dry conditions . The band of thunderstorms produced gusts of 40 to 50 mph (64 to 80 km / h) , downing trees and power lines . In the Atlanta metropolitan area , 48 @, @ 000 customers received power outages . The winds tore a roof off a house and damaged a number of mobile homes . The heavy rainfall caused severe flooding ; in Donalsonville , 250 houses and 50 businesses suffered water damage , while another 35 were damaged in nearby Miller County . Roads were flooded , including parts of U.S. Route 27 . Crop damage was significant in the state . According to the Georgia Farm Services Agency , \$ 19 million (2002 USD ; \$ 22 million 2008 USD) in damage to cotton and peanut crops were reported . Due to the flooding and damage , Governor Roy Barnes declared Seminole , Miller and Decatur counties federal disaster areas .

Moderate to heavy rain extended as far north as the Carolinas , and light showers reached the Delmarva Peninsula . Locations in western South Carolina picked up around 3 inches (75 mm) of rainfall , causing flooding on some roads and highways . Various streams and ponds topped their banks , and flood waters on some roads reached an estimated 4 to 6 inches (100 to 150 mm) deep . On South Carolina Highway 20 , a motorist became stranded in high waters , and nearby houses were damaged . The rainfall delayed a football game at Williams @-@ Brice Stadium for about 50 minutes . Farther northward , the remnants of Tropical Storm Hanna contributed to around 1 inch (25 mm) of rainfall in New England , particularly in Vermont .