= 2002 Atlantic hurricane season =

The 2002 Atlantic hurricane season was a slightly below average Atlantic hurricane season , officially starting on June 1 , 2002 and ending on November 30 , dates which conventionally limit the period of each year when most tropical cyclones develop in the Atlantic Ocean . The season produced 14 tropical cyclones , of which 12 developed into named storms ; four became hurricanes , and two attained major hurricane status . The season officially began on June 1 , although the season 's first cyclone did not develop until July 14 . Despite the late start , the 2002 season tied with 2004 , 2007 , and 2010 in which a record number of tropical storms , eight , developed in the month of September . It ended early however , with no tropical storms forming after October 6 ? a rare occurrence caused partly by El Niño conditions . The most intense hurricane of the season was Hurricane Isidore with a minimum central pressure of 934 mbar , although Hurricane Lili attained higher winds and peaked at Category 4 . The season 's low activity is reflected in the low cumulative accumulated cyclone energy (ACE) rating of 67 . ACE is , broadly speaking , a measure of the power of the hurricane multiplied by the length of time it existed , so low number reflects the small number of strong storms and preponderance of tropical storms .

The season was less destructive than average , causing an estimated $ 2 @.@ 6 billion (2002 USD) in property damage and 23 fatalities . Most destruction was due to Isidore , which caused about $ 970 million (2002 USD , $ 1 @.@ 28 billion 2016 USD) in damage and killed seven people in the Yucatán Peninsula and later the United States , and Hurricane Lili , which caused $ 860 million (2002 USD) in damage and 15 deaths when it made landfall in Louisiana .

= = Seasonal forecasts = =

Noted hurricane expert William M. Gray and his associates at Colorado State University issue forecasts of hurricane activity each year , separately from the National Oceanic and Atmospheric Administration (NOAA) . Gray 's team determined the average number of storms per season between 1950 and 2000 to be 9 @.@ 6 tropical storms , 5 @.@ 9 hurricanes , and 2 @.@ 3 major hurricanes (storms exceeding Category 3) . A normal season , as defined by NOAA , has 9 to 12 named storms , of which 5 to 7 reach hurricane strength and 1 to 3 become major hurricanes .

= = = Pre @-@ season forecasts = = =

On December 7 , 2001 , Gray 's team issued its first extended @-@ range forecast for the 2002 season , predicting above @-@ average activity (13 named storms , 8 hurricanes , and about 2 of Category 3 or higher) . It listed an 86 percent chance of at least one major hurricane striking the U.S. mainland . This included a 58 percent chance of at least one major hurricane strike on the East Coast , including the Florida peninsula , and a 43 percent chance of at least one such strike on the Gulf Coast from the Florida Panhandle westward . The potential for major hurricane activity in the Caribbean was forecast to be above average .

On April 5 a new forecast was issued , calling for 12 named storms , 7 hurricanes and 3 intense hurricanes . The decrease in the forecast was attributed to the further intensification of El Niño conditions . The estimated potential for at least one major hurricane to affect the U.S. was decreased to 75 percent ; the East Coast potential decreased slightly to 57 percent , and from the Florida Panhandle westward to Brownsville , Texas , the probability remained the same .

= = = Mid @-@ season forecasts = = =

On August 7 , 2002 , Gray 's team lowered its season estimate to 9 named storms , with 4 becoming hurricanes and 1 becoming a major hurricane , noting that conditions had become less favorable for storms than they had been earlier in the year . The sea @-@ level pressure and trade wind strength in the tropical Atlantic were reported to be above normal , while sea surface temperature anomalies were on a decreasing trend .

On August 8 , 2002 , NOAA revised its season estimate to 7 ? 10 named storms , with 4 ? 6 becoming hurricanes and 1 ? 3 becoming major hurricanes . The reduction was attributed to less favorable environmental conditions and building El Niño conditions .

= = Storms = =

= = = Tropical Storm Arthur = = =

Arthur formed out of a tropical depression off the coast of North Carolina on July 14 from a decaying frontal zone . It then moved out to sea , strengthening slightly into a tropical storm on July 15 . Arthur gradually strengthened and peaked as a 60 mph (97 km / h) tropical storm on the following day . However , cooler waters and upper level shear caused it to weaken . By July 17 , Arthur had become extratropical , and moved north over Newfoundland . It proceeded to weaken below gale strength . The precursor system produced up to 4 @.@ 49 in (114 mm) of rainfall in Weston , Florida . Later , one person drowned in the Conne River in Newfoundland due to Arthur .

= = = Tropical Storm Bertha = = =

A surface trough of low pressure that would later spawn Tropical Storm Cristobal developed a tropical depression in the northern Gulf of Mexico on August 4 . It quickly strengthened into a minimal tropical storm early on August 5 , and made landfall near Boothville , Louisiana just two hours later . Bertha weakened to a tropical depression , but retained its circulation over Louisiana . A high pressure system built southward , unexpectedly forcing the depression to the southwest . It emerged back over the Gulf of Mexico on August 7 , where proximity to land and dry air prevented further strengthening . Bertha moved westward , and made a second landfall near Kingsville , Texas on August 9 , having made no significant gain in strength .

Across the Gulf Coast of the United States , Bertha dropped light to moderate rainfall ; most areas received less than 3 inches (76 mm) . Precipitation from the storm peaked at 10 @.@ 25 inches (260 mm) in Norwood , Louisiana . Minor flooding was reported , which caused light damage to a few businesses , 15 to 25 houses , and some roadways . Overall , damage was very minor , totaling to $ 200 @,@ 000 (2002 USD , $ 263 thousand 2016 USD) in damage . In addition , one death was reported due to Bertha , a drowning due to heavy surf in Florida .

= = = Tropical Storm Cristobal = = =

On August 5 , Tropical Depression Three formed off the coast of South Carolina from a surface trough of low pressure ? the same trough that spawned Tropical Storm Bertha in the Gulf of Mexico . Under a southerly flow , the depression drifted southward , where dry air and wind shear inhibited significant development . On August 7 , it became Tropical Storm Cristobal , and reached a peak of 50 mph (80 km / h) on August 8 . The storm meandered eastward and was absorbed by a front on August 9 .

The interaction between the extratropical remnant and a high pressure system produced strong rip currents along the coastline of Long Island . The storm also caused waves of three to four ft (1 @.@ 2 m) in height . Three people drowned from the rip currents and waves in New York .

= = = Tropical Storm Dolly = = =

A tropical wave exited the African coast on August 27 , and with low favorable conditions the system organized into Tropical Depression Four on August 29 about 630 mi (1 @,@ 020 km) southwest of Cape Verde . Six hours later , the depression was upgraded to Tropical Storm Dolly after developing sufficient outflow and curved banding features . The storm continued to intensify as more convection developed , and Dolly reached peaked winds of 60 mph (95 km / h) on August 30

. After peaking in intensity , the storm suddenly lost organization , and the winds decreased to minimal tropical storm force . After a brief re @-@ intensification trend , Dolly again weakened due to wind shear . On September 4 Dolly weakened to a tropical depression , and later that day was absorbed by the trough ; it never affected land .

= = = Tropical Storm Edouard = = =

Edouard formed out of an area of disturbed weather north of the Bahamas on September 2 . It drifted northward , then executed a clockwise loop off the coast of Florida . Despite dry air and moderate upper level shear , Edouard strengthened to a peak of 65 mph (105 km / h) winds , but the unfavorable conditions caught up with it . The storm weakened as it turned west @-@ southwestward , and made landfall near Ormond Beach , Florida on September 5 as a minimal tropical storm . Edouard crossed Florida , and emerged over the Gulf of Mexico as a minimal depression . Outflow from the stronger Tropical Storm Fay caused Tropical Depression Edouard to weaken further , and Edouard was eventually absorbed by Fay .

Tropical Storm Edouard dropped moderate rainfall across Florida , peaking at 7 @.@ 64 inches (194 mm) in DeSoto County . Though it was a tropical storm at landfall , winds were light across the path of the storm over land . Several roads were flooded from moderate precipitation . No casualties were reported , and damage was minimal .

= = = Tropical Storm Fay = = =

In early September , a low pressure center developed along a trough of low pressure , and on September 5 , the system had gained sufficient organization to be a tropical depression , to the southeast of Galveston . The depression drifted south @-@ southwest while strengthening into Tropical Storm Fay , reaching its peak strength of 60 mph (95 km / h) on the morning of September 6 . The system then abruptly turned to the west @-@ northwest , and remained steady in strength and course until landfall the next day , near Matagorda . It quickly degenerated into a remnant low , which itself moved slowly southwestward over Texas . The low eventually dissipated on September 11 over northeastern Mexico .

The storm brought heavy rainfall in Mexico and Texas . The storm also caused six tornadoes , up to 20 in (510 mm) of rain , and extended periods of tropical storm force winds . The storm caused moderate flooding in some areas due to high rainfall amounts , which left about 400 homes with some form of damage . In total , 400 houses sustained damage from flooding . 1 @,@ 575 houses were damaged from the flooding or tornadic damage , 23 severely , amounting to $ 4 @.@ 5 million (2002 USD , $ 5 @.@ 92 million 2016 USD) in damage . No deaths are attributed to Fay .

= = = Tropical Depression Seven = = =

A tropical wave exited Africa on September 1 , and after initial development became disorganized . It moved west @-@ northwestward for a week , reorganizing enough by September 7 to be declared Tropical Depression Seven about 1155 mi (1855 km) east @-@ southeast of Bermuda . At the time , the depression had persistent convection around a small circulation , and it moved steadily westward due to a ridge to its north . Shortly after forming , strong wind shear diminished the convection and left the center partially exposed . By September 8 , there was no remaining thunderstorm activity , and the depression degenerated into a remnant low @-@ pressure area . The storm dissipated shortly after as strong wind shear continued to cause the storm to deteriorate while located 980 mi (1580 mi) southeast of Bermuda . The depression never affected land .

= = = Hurricane Gustav = = =

An area of unsettled weather developed between the Bahamas and Bermuda on September 6 , and over the next few days convection increased in intensity and coverage . On September 8 , the

system gained sufficient organization to be declared a subtropical depression off the Southeast United States coast ; later that day , the system was named Subtropical Storm Gustav . After attaining tropical characteristics on September 10 , Gustav passed slightly to the east of the Outer Banks of North Carolina as a tropical storm before moving northeastward and making two landfalls in Atlantic Canada as a Category 1 hurricane on September 12 .

The storm was responsible for one death and $ 100 @,@ 000 (2002 USD) in damage , mostly in North Carolina . The interaction between Gustav and a non @-@ tropical system produced strong winds that caused an additional $ 240 @,@ 000 (2002 USD) in damage in New England , but this damage was not directly attributed to the hurricane . In Atlantic Canada , the hurricane and its remnants brought heavy rain , tropical storm and hurricane @-@ force winds , as well as storm surges for several days . Localized flooding was reported in areas of Prince Edward Island , and 4 @,@ 000 people in Halifax , Nova Scotia and Charlottetown , Prince Edward Island were left without power .

= = = Tropical Storm Hanna = = =

In early September , a tropical wave merged with a trough of low pressure in the Gulf of Mexico and spawned a low pressure system . Convection steadily deepened on September 11 east of the upper level low and the surface low ; it was classified as Tropical Depression Nine the next day . The disorganized storm moved westward , then northward , where it strengthened into Tropical Storm Hanna later that day . After reaching a peak with winds of 55 mph (90 km / h) , it made two landfalls on the Gulf Coast , eventually dissipating on September 15 over Georgia .

Because most of the associated convective activity was east of the center of circulation , minimal damage was reported in Louisiana and Mississippi . To the east 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 . Throughout the state , 20 @,@ 000 homes lost electricity . The heavy rainfall progressed into Georgia , where significant flooding occurred . Crop damage was extensive , and over 300 structures were damaged by the flooding . The storm caused a total of about $ 20 million (2002 USD) in damage and three fatalities .

= = = Hurricane Isidore = = =

On September 9 , a tropical wave moved off the coast of Africa , and by September 14 it was classified as a tropical depression . The next day the storm was located just south of Jamaica , and it developed into Tropical Storm Isidore . On September 19 , it intensified into a hurricane , and Isidore made landfall in western Cuba as a Category 1 storm . Just before landfall near Puerto Telchac on September 22 , Isidore reached its peak intensity , with wind speeds of 125 miles per hour (201 km / h) , making it a strong Category 3 storm . After returning to the Gulf of Mexico as a tropical storm , Isidore 's final landfall was near Grand Isle , Louisiana on September 26 , where the storm weakened to a depression .

Isidore made landfall on the Yucatán Peninsula of southern Mexico as a Category 3 hurricane , leaving $ 640 million (2002 USD , $ 842 million 2016 USD) in damage in the country . Despite dropping over 30 inches (760 mm) of rainfall among other effects , only two indirect deaths were reported there . As a tropical storm , Isidore produced a maximum of 15 @.@ 97 inches (406 mm) of rainfall in the United States at Metairie , Louisiana . The rainfall was responsible for flooding that caused moderate crop damage , with a total of $ 330 million in damage (2002 USD , $ 434 million 2016 USD) .

= = = Tropical Storm Josephine = = =

A non @-@ tropical low developed along a dissipating stationary front on September 16 in the central Atlantic and drifted north @-@ northeastward . The National Hurricane Center classified it as

Tropical Depression Eleven on September 17 about 710 mi (1 @,@ 150 km) east of Bermuda , and initially the depression did not have significant deep convection . A wind report early on September 18 indicated the depression intensified into Tropical Storm Josephine . The storm continued generally northeastward , steered between a subtropical high to the northeast and a frontal system approaching from the west . Josephine maintained a well @-@ defined circulation , but its deep convection remained intermittent . Early on September 19 the storm began being absorbed by the cold front , and as a tropical cyclone its winds never surpassed 40 mph (75 km / h) . Later that day Josephine transitioned into an extratropical cyclone and suddenly intensified to winds of 60 mph (95 km / h) . The extratropical low was quickly absorbed by another larger extratropical system on the afternoon of September 19 .

= = = Hurricane Kyle = = =

A non @-@ tropical low formed into Subtropical Depression Twelve , well east @-@ southeast of Bermuda on September 20 . It became Subtropical Storm Kyle the next day , and Tropical Storm Kyle on September 22 . Kyle drifted slowly westward , slowly strengthening , and reached hurricane strength on September 25 ; it weakened back into a tropical storm on September 28 . The cyclone 's strength continued to fluctuate between tropical depression and tropical storm several times . Its movement was also extremely irregular , as it shifted sharply north and south along its generally westward path . On October 11 , Kyle reached land and made its first landfall near McClellanville , South Carolina . While skirting the coastline of the Carolinas , it moved back over water , and made a second landfall near Long Beach , North Carolina later the same day . Kyle continued out to sea where it merged with a cold front on October 12 , becoming the fourth longest @-@ lived Atlantic hurricane .

Kyle brought light precipitation to Bermuda , but no significant damage was reported there . Moderate rainfall accompanied its two landfalls in the United States , causing localized flash flooding and road closures . Floodwaters forced the evacuation of a nursing home and several mobile homes in South Carolina . Kyle spawned at least four tornadoes , the costliest of which struck Georgetown , South Carolina ; it damaged 106 buildings and destroyed seven others , causing eight injuries . Overall damage totaled about $ 5 million (2002 USD , $ 6 @.@ 58 million 2016 USD) , and no direct deaths were reported . However , the remnants of Kyle contributed to one indirect death in the British Isles .

= = = Hurricane Lili = = =

On September 16 , a tropical wave moved off the coast of Africa and across the Atlantic . It developed a low level cloud circulation midway between Africa and the Lesser Antilles on September 20 . The next day , the system had become sufficiently organized to classify the system as a tropical depression about 900 nautical miles (1 @,@ 700 km) east of the Windward Islands . On September 30 Lili became a hurricane while passing over the Cayman Islands . The storm attained Category 4 status in the Gulf of Mexico before making landfall on the Louisiana coast on October 2 . The next day , it was absorbed by an extratropical low near the Tennessee ? Arkansas border .

In Louisiana , wind gusts reaching 120 mph (190 km / h) , coupled with over 6 inches (150 mm) of rainfall and a storm surge of 12 feet (3 @.@ 7 m) , caused over $ 860 million (2002 USD , $ 1 @.@ 13 billion 2016 USD) in damage . A total of 237 @,@ 000 people lost power , and oil rigs offshore were shut down for up to a week .

= = = Tropical Depression Fourteen = = =

A weak tropical wave moved through the Lesser Antilles on October 9 . As the system reached the southwestern Caribbean Sea on October 12 , convection increased , and a broad low pressure area formed later that day . Over the next two days , the low significantly organized , and became

Tropical Depression Fourteen at 1200 UTC on October 14 . The depression initially tracked west @-@ northwestward , but then curved to the north @-@ northeast . Due to vertical wind shear , the depression was unable to intensify , and remained below tropical storm status during its duration . By 1600 UTC on October 16 , the depression made landfall near Cienfuegos , Cuba with winds of 30 mph (45 km / h) . While crossing the island , the depression was absorbed by a cold front early on October 17 . Minimal impact was reported , which was limited to locally heavy rains over portions of Jamaica , Cuba , and the Cayman Islands .

= = Storm names = =

The following names were used on named storms that formed in the North Atlantic during the 2002 season . Names that were not used are marked in gray . The 2002 list was taken from the 1996 season with the substitution of Cesar , Fran , and Hortense for Cristobal , Fay , and Hanna respectively . The three new names were used for Atlantic storms for the first time . The list was used again in the 2008 Atlantic hurricane season with the exception of Isidore and Lili , which were retired in the spring of 2003 by the World Meteorological Organization ; they were replaced with Ike and Laura , respectively .

= = Season effects = =

The following table lists all of the storms that formed in the 2002 Atlantic hurricane season . It includes their duration , names , landfall (s) ? denoted by bold location names ? damages , and death totals . Deaths in parentheses are additional and indirect (an example of an indirect death would be a traffic accident) , but were still related to that storm . Damage and deaths include totals while the storm was extratropical , a wave , or a low , and all of the damage figures are in 2002 USD .