

= 1993 Atlantic hurricane season =

The 1993 Atlantic hurricane season was a below average Atlantic hurricane season that produced ten tropical cyclones and tropical storms , four hurricanes , and one major hurricane . It officially started on June 1 and ended on November 30 , dates which conventionally delimit the period during which most tropical cyclones form in the Atlantic Ocean . The first tropical cyclone , Tropical Depression One , developed on May 31 , while the final storm , Tropical Depression Ten , dissipated on September 30 , well before the average dissipation date of a season 's last tropical cyclone ; this represented the earliest end to the hurricane season in ten years . The most intense hurricane , Emily , was a Category 3 on the Saffir ? Simpson Hurricane Scale that paralleled close to the North Carolina coastline causing minor damage and a few deaths before moving out to sea .

The most significant named storm of the season was Hurricane Gert , a tropical cyclone that devastated several countries in Central America and Mexico . Throughout the impact areas , damage totaled to \$ 170 million (1993 USD) and 102 fatalities were reported . The remnants of Gert reached the Pacific Ocean and was classified as Tropical Depression Fourteen @-@ E. Another significant system was Tropical Storm Bret , which resulted in 184 deaths and \$ 25 million in losses as it tracked generally westward across Trinidad , Venezuela , Colombia , and Nicaragua . In the Pacific Ocean , the remnants of Bret were attributed to the development of Hurricane Greg . Three other tropical cyclones brought minor to moderate effects on land ; they were Tropical Depression One and Tropical Storms Arlene and Cindy . The storms of the 1993 Atlantic hurricane season collectively caused 339 fatalities and \$ 319 million in losses .

= = Season summary = =

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

Forecasts of hurricane activity are issued before each hurricane season by Dr. William M. Gray and his associates at Colorado State University (CSU) and the Weather Research Center (WRC) . A normal season as defined by the National Oceanic and Atmospheric Administration (NOAA) has 12 @.@ 1 named storms , of which 6 @.@ 4 reach hurricane strength , and 2 @.@ 7 become major hurricanes . In December 1992 , Gray anticipated a near average season with 11 named storms , 6 hurricanes , and 3 major hurricanes . Another predication on April 16 , 1993 was unchanged from the previous forecast . In June , Gray revised the number of hurricanes to seven , though the forecast of named storms and major hurricanes remained the same . By August , the number hurricanes predicted was lowered back to six , matching the December 1992 and April forecasts . The sole prediction made by the WRC called for seven named storms and five hurricanes , though no forecast was made on the numbers of major hurricanes .

= = = Season activity = = =

The Atlantic hurricane season officially began on June 1 , those activity began a day early with the development of Tropical Depression One on May 31 . It was a below average season in which 10 tropical depressions formed . Eight of the depressions attained tropical storm status , and four of these attained hurricane status . In addition , one tropical cyclone eventually attained major hurricane status , which is below the 1981 ? 2010 average of 2 @.@ 7 per season . The low amount of activity is attributed to abnormally strong wind shear across the Atlantic basin . Only one hurricanes and three tropical storm made landfall during the season ; Tropical Depression One and Hurricane Emily also caused land impacts . However , the storm collectively caused 339 deaths and \$ 302 @.@ 7 million in damage . The last storm of the season , Tropical Depression Ten , became extratropical on September 30 , two months before the official end of the season on November 30 .

Tropical cyclogenesis in the 1993 Atlantic hurricane season began with the development of Tropical Depression One on May 31 . However , in the following two months , minimal activity occurred , with

only one named storm , Arlene , in June . August was the most active month , with four tropical cyclones developing , including Tropical Storms Bret , Cindy , and Dennis , as well as Hurricane Emily . Although September is the climatological peak of hurricane season , only two system formed that month , which were Hurricane Floyd and Gert . Thereafter , activity briefly halted until Hurricane Harvey developed in October . The final tropical cyclone , Tropical Depression Ten , became extratropical on September 30 , two months before the official end of the season on November 30 .

Overall , the season 's activity was reflected with an accumulated cyclone energy (ACE) rating of 39 . ACE is , broadly speaking , a measure of the power of the hurricane multiplied by the length of time it existed , so storms that last a long time , as well as particularly strong hurricanes , have high ACEs . ACE is only calculated for full advisories on tropical systems at or exceeding 34 knots (39 mph , 63 km / h) or tropical storm strength . Subtropical cyclones are excluded from the total .

== Storms ==

== Tropical Depression One ==

A westward @-@ moving tropical wave developed into Tropical Depression One near the Isle of Youth on May 31 . Due to strong wind shear and its proximity to land , the depression was unable to strengthen and struck western Cuba later that day . It emerged into the Straits of Florida early on June 1 and began to organize and intensify slightly further , but nonetheless remained below tropical storm intensity . Around that time , an approaching shortwave trough accelerated the depression northeastward across the western Bahamas . Thereafter , the wind field of the depression began expanding and lost all tropical characteristics while located northeast of The Bahamas on June 2 .

Heavy rainfall in Cuba caused flooding in the central and eastern portions of the country , forcing the evacuation of 40 @, @ 000 people , destroying 1 @, @ 860 homes and damaging an additional 16 @, @ 500 . Additionally , crops suffered severe impact from the flooding , just two months after significant agricultural damage in Cuba from the Storm of the Century in March . Overall , the depression left seven fatalities and another five people were listed as missing . In Haiti , flooding from the outerbands of the storm killed thousands of livestock and resulted in 13 deaths . Heavy precipitation in Florida peaked at nearly 10 in (250 mm) , though it caused little impact other than bringing drought relief . Impact , if any in The Bahamas , is unknown .

== Tropical Storm Arlene ==

A tropical wave was tracked in the Caribbean Sea beginning on June 9 and subsequently moved across Central America . Eventually , the system entered the Gulf of Mexico , though further development was interrupted by unfavorable wind shear . After conditions became somewhat more favorable , the wave developed into Tropical Depression Two on June 18 . The depression slowly strengthened as it tracked west @-@ northwestward and eventually north @-@ northwestward across the western Gulf of Mexico . By June 19 , the depression became Tropical Storm Arlene . At 09 : 00 UTC on the following day , Arlene made landfall on Padre Island , Texas with winds of 40 mph (65 km / h) . The storm quickly weakened inland and degenerated into a remnant low pressure area on June 21 .

In El Salvador , rainfall from the precursor tropical wave caused mudslides throughout the country , which in turn resulted in 20 fatalities . Immense amounts of precipitation in Mexico caused flooding in the states of Veracruz , Campeche , Yucatán , San Luis Potosí , Quintana Roo , Nuevo León , and Jalisco . Five deaths and \$ 33 million in damage was reported in Mexico . Arlene also dropped torrential rainfall in Texas , peaking at 15 @. @ 26 in (388 mm) Angleton , while precipitation amounts elsewhere was mainly between 9 and 11 in (230 and 280 mm) . Throughout the state , numerous roads were inundated and more than 650 houses , including 25 mobile homes , suffered water damage . Agriculture losses in eastern Texas include 20 % of cantaloupe , 10 % of watermelon , and 18 % of tomatoes . One fatality occurred and damage in Texas reached \$ 22

million . Overall , Tropical Storm Arlene caused 26 deaths and \$ 55 million in losses .

== Tropical Storm Bret ==

A westward @-@ moving tropical wave developed into Tropical Depression Three while located about 1 @, @ 150 miles (1 @, @ 850 km) west of Cape Verde on August 4 . The depression strengthened and was upgraded to Tropical Storm Bret on the following day . It strengthened slightly and reached winds of 60 mph (95 km / h) and maintained that intensity until crossing Trinidad on August 7 . Later that day , Bret made landfall near Macuro , Venezuela , before briefly re @-@ emerging into the Caribbean Sea . Bret made another landfall in Venezuela on August 8 and crossed northern Colombia . It weakened over the mountainous terrain and fell to tropical depression intensity over the southwestern Caribbean Sea . Bret re @-@ strengthened to a 45 mph (75 km / h) tropical storm before making landfall in southern Nicaragua on August 10 . It crossed into the Pacific Ocean and dissipated , although it later regenerated into Hurricane Greg .

In Trinidad , winds left 35 @, @ 000 people without electricity , while rainfall caused minor damage to crops and roads , with losses totaling to about \$ 909 @, @ 000 . Rainfall in Venezuela reached 13 @. @ 3 in (340 mm) in some areas . As a result , widespread mudslides were reported , which in turn destroyed 10 @, @ 000 houses and caused 173 deaths . One fatality was reported in neighboring Columbia . In Nicaragua , the storm destroyed 850 houses and damaged an additional 1 @, @ 500 . Overall , 35 @, @ 000 people were left homeless in that country . In addition , the destruction of 25 medical centers , 10 schools , and 10 churches occurred . Road infrastructure damage was also reported , with 12 bridges collapsing during the passage of Bret . There were 10 fatalities in Nicaragua , 9 of which were drowning victims after a Spanish vessel sank . Overall , Tropical Storm Bret caused 184 deaths and about \$ 25 million in damage .

== Tropical Storm Cindy ==

A tropical wave entered the Atlantic Ocean from northwest Africa on August 8 . It traversed the Atlantic and organized into Tropical Depression Four on August 14 , while located within 100 mi (160 km) to the north of Barbados . After six hours , the depression strengthened into Tropical Storm Cindy , while crossing the island of Martinique . Due to a poor upper @-@ level structure , Cindy barely intensified as it tracked west @-@ northwestward across the eastern Caribbean Sea . Nonetheless , the storm peaked with winds of 45 mph (75 km / h) on August 16 . However , interaction with the terrain of Hispaniola caused Cindy to weaken . Late on August 16 , the storm had been reduced to a tropical depression , around the time of landfall near Barahona , Dominican Republic . Cindy rapidly weakened inland and dissipated by early on August 17 .

The storm dropped torrential rainfall in Martinique , peaking at 15 @. @ 55 in (395 mm) in Saint @-@ Joseph , which fell in only two hours . Further , 2 @. @ 75 in (70 mm) fell in just six minutes . Several rivers overflowed as a result , which in turn caused widespread flooding and mudslides . Several roads were washed out , numerous cars were swept away , and at least 150 houses were destroyed , leaving about 3 @, @ 000 people homeless . Overall , the storm caused two fatalities , 11 injuries , and ? 107 million (US \$ 19 million) in damage . On other Lesser Antilles , the storm caused minimally impact , limited to mostly small amounts of precipitation , light winds , and minor beach erosion , especially on Puerto Rico . In Dominican Republic , street and minor river flooding was reported , which affected hundreds of residents . In addition , Cindy left two deaths in the Dominican Republic .

== Hurricane Emily ==

A tropical wave passed through Cape Verde on August 17 . The system moved northwestward and slowly acquired a low @-@ level center of circulation . At 18 : 00 UTC on August 22 , Tropical Depression Six developed while located several hundred miles east @-@ northeast of the Lesser Antilles on August 22 . Initially , it headed northwestward while minimal intensification , though by

August 25 , the depression was upgraded to Tropical Storm Emily . The storm then became nearly stationary while southeast of Bermuda and steadily strengthened during that time . Late on August 26 , Emily briefly became a hurricane , though it weakened back to a tropical storm early on the following day . However , by late on August 27 , Emily was a hurricane once again . The storm then moved northwestward and maintained Category 1 intensity until becoming a Category 2 hurricane on August 31 . By 18 : 00 UTC , Emily became a Category 3 hurricane while just offshore Cape Hatteras .

However , the storm veered out to sea later on August 29 and weakened , falling to tropical storm intensity while located northeast of Bermuda on September 3 . After curving southward and then back to the northeast , Emily weakened to a tropical depression on September 4 . The storm lost all tropical characteristics on September 6 , while located several hundred miles southeast of Newfoundland . The outerbands of Emily lashed the Outer Banks of North Carolina with heavy rainfall , high tides , and strong winds . The combination of those effects damaged 553 homes beyond repair . Sinkholes formed along North Carolina Highway 12 and strong winds uprooted trees , downed power lines , and tore off roofs . Further north , two fishermen near Nags Head drowned , while a 15 @-@ year @-@ old boy also drowned . Light rainfall was also reported in Maryland and Delaware . Losses reached \$ 45 million , with all damage in North Carolina .

= = = Tropical Storm Dennis = = =

A tropical wave and its associated low pressure area emerged into the Atlantic from the west coast of Africa on August 21 . By the following day , two METEOSAT satellites indicated that the system had a distinct cyclonic rotation and increasing deep convection . At 12 : 00 UTC on August 23 , Tropical Depression Five developed while located about 415 mi (670 km) west @-@ southwest of Brava , Cape Verde . Initially , a weak deep @-@ layer mean flow caused the depression to track west @-@ northwest . It is estimated that by 12 : 00 UTC on August 24 , the depression became Tropical Storm Dennis , based on satellite imagery .

Early on August 25 , Dennis attained its peak intensity with winds of 50 mph (85 km / h) and a minimum barometric pressure of 1 @,@ 000 mbar (30 inHg) . After peak intensity , a relatively strong mid- to upper @-@ level trough caused Dennis to turn north @-@ northwestward on August 26 . Thereafter , an increase in vertical wind shear and a decrease in sea surface temperatures caused the storm to begin weakening . Eventually , the low @-@ level circulation became nearly void of deep convection . On August 27 , Dennis was downgraded to a tropical depression . The storm later curved west @-@ southwestward , while located about midway between Bermuda and the southernmost islands of Cape Verde .

= = = Hurricane Floyd = = =

A tropical wave crossed the west coast of Africa on August 28 . Although had it a well @-@ defined low @-@ level circulation , the system was not classified as a tropical cyclone . While tracking west , deep convection diminished and was nearly non @-@ existent by August 31 , though the cloud pattern began re @-@ developing on September 3 . Eventually , the system curved northwestward and remained well away from the Lesser Antilles . Because a reconnaissance flight into the system indicated a low @-@ level circulation with persistent deep convection , it is estimated that the system became Tropical Depression Seven at 12 : 00 UTC on September 7 , while located about 440 mi (710 km) north @-@ northwest of San Juan , Puerto Rico . Only six hours after becoming a tropical cyclone , the depression strengthened into Tropical Storm Floyd . Initially , strong southwesterly wind shear prevented further significant intensification .

The storm accelerated north @-@ northwestward after becoming embedded within fast air currents , which was as Floyd moved between a strong trough and a subtropical high pressure area . Later on September 8 , the storm passed about 230 mi (370 km) west of Bermuda . By early on September 9 , convection developed along the once exposed low @-@ level circulation . After a buoy reported a two @-@ minute sustained wind speed of 69 mph (111 km / h) and an eye

appeared on satellite imagery , Floyd was upgraded to a hurricane at 18 : 00 UTC on September 9 . While accelerating at nearly 52 mph (84 km / h) , the storm began losing tropical characteristics as a result of colder sea surface temperatures and became extratropical at 18 : 00 UTC on September 10 . The remnants of Floyd continued rapidly eastward and struck Brittany , France , at an intensity equivalent to a Category 1 hurricane . While passing southeast of Newfoundland , the storm produced light rainfall , peaking at about 0 @. @ 86 in (22 mm) .

= = = Hurricane Gert = = =

A tropical wave emerged into the Atlantic Ocean from the west coast of Africa on September 5 . The system slowly organize while tracking across the Atlantic Ocean and much of the Caribbean Sea . It developed into a tropical depression while located north of Panama on September 14 . On the following day , the depression was upgraded to Tropical Storm Gert before moving ashore in Nicaragua . After weakening to a tropical depression , it proceeded into Honduras and reorganized into a tropical storm over the Gulf of Honduras on September 17 . Gert made landfall in Belize on the following day and again weakened to a depression while inland . After crossing the Yucatán Peninsula , Gert emerged over warm water in the Bay of Campeche , and strengthened into a Category 2 hurricane on September 20 . The hurricane then made landfall on the Gulf Coast of Mexico near Tuxpan , Veracruz , with winds of 100 mph (165 km / h) . Rugged terrain quickly disrupted its structure and Gert entered the Pacific Ocean as a tropical depression from Nayarit on September 21 . Five days later , the depression dissipated near Baja California .

Because Gert had a broad wind circulation , it produced widespread and heavy rainfall across Central America , which , combined with saturated soil from Tropical Storm Bret a month earlier , caused significant flooding of property and crops . Although hurricane @-@ force winds occurred upon landfall in Mexico , the worst effects in the country were due to flooding and mudslides induced by torrential rain . Following the overflow of several rivers , deep flood waters submerged extensive parts of Veracruz and Tamaulipas and forced hundreds of thousands to evacuate , including 200 @, @ 000 in the Tampico area alone . The heaviest rainfall occurred further inland over the mountainous region of San Luis Potosí , where as much as 31 @. @ 41 in (798 mm) of precipitation were measured . In the wake of the disaster , the road networks across the affected countries were severely disrupted and thousands of people became homeless . Extensive , but less severe flooding occurred in Costa Rica , El Salvador , Guatemala , Honduras , and Nicaragua . Throughout the effected areas , flooding damaged or destroyed more than 40 @, @ 000 buildings . The storm caused at least 102 fatalities and more than \$ 170 million in damage .

= = = Hurricane Harvey = = =

A tropical wave passed south of Cape Verde on September 12 . By the following day , satellite imagery indicated a cloud system center . The system tracked northwestward across the Atlantic Ocean with slow further development . Due to interaction with an upper @-@ level low on September 18 , the system began to significantly organize . After a ship known as ELFS reported winds of 43 mph (69 km / h) , it is estimated that Tropical Depression Nine developed at 18 : 00 UTC on September 18 , while located about 400 miles (640 km) south @-@ southeast of Bermuda . The depression initially moved north @-@ northwest , though an approaching short @-@ wave trough eventually caused it to northeastward .

Convection remained disorganized and the low @-@ level circulation was exposed on September 19 . However , by the following day , the depression strengthened into Tropical Storm Harvey . Thereafter , the storm began to rapidly intensify and developed an eye appeared on satellite imagery . While accelerating northeastward , Harvey was upgraded to a hurricane at 18 : 00 UTC on September 20 . However , decreasing sea surface temperatures caused Harvey to immediately weaken back to a tropical storm , while also losing tropical characteristics . At 18 : 00 UTC on September 20 , Harvey transitioned into an extratropical cyclone while located well east of Newfoundland . Six hours later , the extratropical remnants of Harvey were absorbed into a frontal

band .

== Tropical Depression Ten ==

Tropical Depression Ten developed about 185 mi (300 km) southeast of Bermuda at 18 : 00 UTC on September 29 . Initially , convection associated with the depression was confined to north and east of the center . The depression was difficult to track , though wind observations in Bermuda suggested that it passed just north of the island between 0300 and 07 : 00 UTC on September 30 . Although no intensification was predicted , the National Hurricane Center noted that interaction with the approaching cold front could result in baroclinic strengthening . The depression did not organize further and merged with the cold front at 00 : 00 UTC on October 1 .

== Storm names ==

Below is a list of names used for systems that reached at least tropical storm intensity in north Atlantic Ocean during the 1993 Atlantic hurricane season . This was the same list used for the 1987 season . Following the season , the World Meteorological Organization did not retire any names , resulting in the entire list being re @-@ used in the 1999 season . Names that were not assigned during the 1993 Atlantic hurricane season are marked in gray .

== Season effects ==

This is a table of the storms in the 1993 Atlantic hurricane season . It mentions all of the season 's storms and their names , landfall (s) , peak intensities , damages , and death totals . The damage and death totals in this list include impacts when the storm was a precursor wave or post @-@ tropical low , and all of the damage figures are in 1993 USD .