

= Hurricane Gert (1993) =

Hurricane Gert was a large tropical cyclone that caused extensive flood damage throughout Central America and Mexico in September 1993 . The seventh named storm and third hurricane of the annual hurricane season , Gert originated as a tropical depression from a tropical wave over the southwestern Caribbean Sea on September 14 . The following day , the cyclone briefly attained tropical storm strength before moving ashore in Nicaragua and proceeding through Honduras . It reorganized into a tropical storm over the Gulf of Honduras on September 17 , but weakened back to a depression upon crossing the Yucatán Peninsula . Once over the warm waters of the Bay of Campeche , Gert quickly strengthened into a Category 2 hurricane on September 20 . The hurricane made a final landfall on the Gulf Coast of Mexico near Tuxpan , Veracruz , with peak winds of 105 mph (165 km / h) . The rugged terrain quickly disrupted the cyclone 's structure , and Gert entered the Pacific Ocean as a depression near the state of Nayarit on September 21 . There , it briefly redeveloped a few strong thunderstorms before dissipating at sea five days later .

Gert 's broad wind circulation produced widespread heavy rainfall across Central America through September 15 ? 17 . Combined with saturated soil from Tropical Storm Bret 's passage a month earlier , the rain triggered flooding and mudslides in numerous communities . In Costa Rica , the storm destroyed a national park and had a significant impact on the agricultural and tourism sectors . Much of the Mosquito Coast of Nicaragua and Honduras was affected , and many cities , villages , and crops in those countries were under water . Although Gert 's highest winds occurred upon landfall in Mexico , the worst effects in the country were due to extreme rainfall across the Huasteca region , where as many as 31 @. @ 41 inches (798 mm) of rain were recorded . Following the overflow of several major rivers , catastrophic flooding submerged extensive areas surrounding the Pánuco basin . Tens of thousands were forced to evacuate , and scores of structures were demolished in what was described as the region 's worst disaster in 40 years .

In the wake of the hurricane , the road networks across the affected countries were severely disrupted , hampering relief efforts in many regions . Government and emergency officials opened shelters and distributed food for the thousands that had lost their homes or sources of income . Throughout Central America and Mexico , 116 people were killed and 16 were left missing , while private property , infrastructure , and farmland were left in ruins , leading to over \$ 170 million (1993 USD) in losses .

= = Meteorological history = =

A tropical wave ? an area of low pressure oriented north to south ? moved off the African coast well south of Dakar on September 5 , 1993 , and tracked rapidly westward across the tropical Atlantic . Positioned at a relatively low latitude , the wave interacted with the Intertropical Convergence Zone , allowing for the enhancement of convection in its vicinity . It developed a weak low @- @ pressure center at sea level , which passed directly over Trinidad on September 11 . The majority of the system subsequently moved inland along the northern coast of South America , although it maintained its identity and emerged over the southwestern Caribbean Sea on September 13 . Owing to favorable tropospheric conditions aloft , the system began showing signs of development as the deep convection organized into well @- @ defined curved rainbands . Based on the increase in organization and the presence of a surface circulation , the National Hurricane Center (NHC) classified it as a tropical depression at 1800 UTC on September 14 , about 105 miles (165 km) north of the northern coast of Panama .

The depression retained a large circulation during its formative stages , indicated by both satellite observations and data from rawinsondes in the region . Its cloud pattern continued to coalesce , and the NHC upgraded it to Tropical Storm Gert at 0900 UTC on September 15 . After tracking west @- @ northwestward , the center of the storm moved ashore near Bluefields , Nicaragua , around 1800 UTC that day , with winds of 40 mph (65 km / h) . An interaction with land impeded further development , and Gert weakened back to a tropical depression six hours later . Despite the center being inland for nearly two days , a large part of the circulation stayed over the adjacent Caribbean

and Pacific waters . This allowed Gert to remain a tropical cyclone while trekking northwestward through Nicaragua and Honduras , defying the NHC 's repeated forecasts of its dissipation over land .

The cyclone moved into the Gulf of Honduras on September 17 , restrengthening into a tropical storm soon thereafter . That same day , a mid- to upper @-@ level trough over the eastern Gulf of Mexico caused the storm to turn to the north @-@ northwest . Gert 's duration over water was short lived ; the storm moved back inland near Belize City the next day , granting it minimal opportunity for additional strengthening . Once inland , Gert began to feel the effects of a high @-@ pressure ridge to its northwest , causing the storm to again turn west @-@ northwest . After crossing the Yucatán Peninsula and decreasing in organization , it entered the Bay of Campeche offshore Champotón , Campeche , as a tropical depression late on September 18 . Gert restrengthened over open waters , as light wind shear allowed its deep convection to consolidate ; by 0600 UTC the next day , the cyclone once again became a tropical storm . On September 20 , data from a United States Air Force aircraft indicated that the storm had further strengthened into a hurricane with winds of 75 mph (120 km / h) . Gert veered toward the west and slowed slightly owing to a shortwave trough to its north , giving it more time to organize over water . The cyclone attained its peak intensity as a Category 2 hurricane on the Saffir ? Simpson scale , with winds of 100 mph (165 km / h) and a minimum pressure of 970 mbar (hPa ; 28 @. @ 64 inHg) .

Around 2100 UTC on September 20 , Gert made a final landfall at peak intensity on the coast of Mexico , just north of Tuxpan , Veracruz . Inland , the hurricane accelerated and weakened rapidly over the mountainous region of the Sierra Madre Oriental , diminishing to a tropical depression by September 21 . Despite the degeneration , the large circulation remained intact as it crossed the country . Gert exited the coast of Nayarit and entered the Pacific Ocean later that day , where the NHC reclassified it as Tropical Depression Fourteen @-@ E. The remaining deep convection waxed and waned in intensity ; satellite observations indicated the depression could have briefly been a tropical storm on September 22 . It continued a west to west @-@ northwestward motion for two days , though low @-@ level flow steered it toward the southwest after the convection diminished . There was no redevelopment due to cool sea temperatures , and the system dissipated at sea on September 26 .

= = Preparations = =

After confirming the development of a tropical depression , authorities in Costa Rica issued a green alert for coastal regions on September 14 . The following day , a tropical storm warning was issued for the Atlantic coast of the country . National television and radio stations broadcast warning messages to the public , and emergency crews were dispatched in case conditions were to warrant intervention . This helped with the effective and timely clearing of hospitals , as well as the evacuation of residents in high @-@ risk zones . A tropical storm warning was posted for the Atlantic coast of Nicaragua on September 15 , extending south from Puerto Cabezas to the adjacent islands . In Honduras , early storm warnings allowed several hundred residents to evacuate well ahead of Gert 's arrival . Once it became evident that the storm would strike the Yucatán Peninsula , coastal areas from Belize northward to Cozumel , Mexico were placed under a tropical storm warning on September 17 until Gert 's landfall the next day .

While Gert was still located over the peninsula , the government of Mexico issued a tropical storm watch for the Gulf Coast from the city of Veracruz northward to Soto la Marina , Tamaulipas . By September 18 , it had been upgraded to a tropical storm warning and extended southward to Minatitlán , although the initial watch area was placed under a hurricane watch after Gert showed signs of strengthening . The next day , the tropical storm watch from Soto La Marina to Nautla was upgraded to a hurricane warning as it became clearer where Gert would make landfall . Prior to impact , several ports along the Gulf Coast halted their operations , and people living in risk zones were evacuated . All warnings and watches were discontinued after the hurricane moved inland .

= = Impact = =

Gert was a large tropical cyclone for most of its lifespan ; it always remained close enough to the coast to restrengthen and redevelop strong thunderstorms . In consequence , the storm produced heavy rainfall over a large area , causing extensive flooding and mudslides from Central America to Mexico . The disaster resulted in at least 116 deaths and 16 missing persons ; damage to roads , property , crops and vegetation surmounted \$ 170 million .

= = = Costa Rica = = =

Although Gert 's center remained off the coast of Costa Rica , its large circulation produced brisk winds and heavy rainfall across the country . A local weather station recorded 13 @. @ 1 inches (332 mm) of rain during the storm . Geologically , the hardest @- @ hit regions consisted of sedimentary layers with poor hydraulic conductivity and were therefore prone to soil saturation . The initial rainfall rose the levels of many rivers , exacerbating the flood threat . The imminent overflow of the Tempisque River prompted wide @- @ scale evacuations , though the river crested gradually without major consequence . After hours of prolonged rainfall , many Pacific regions such as Quepos , Pérez Zeledón , and Osa experienced flooding and landslides , which inflicted moderate damage to roads and bridges .

The floods ruined about 500 acres (2 @. @ 0 km²) of banana crop and damaged oil palm plantations . Small @- @ scale farmers of reed , maize , beans , and rice were also affected . The storm disrupted local fishing and wrecked several small boats in Quepos . High winds brought great destruction to about 65 percent of the vegetation in the Manuel Antonio National Park , vastly impacting the tourism @- @ driven economy of Quepos . Gert left moderate property damage in its wake ; it destroyed 27 homes and otherwise damaged 659 , mostly because of flooding . Overall losses totaled \$ 3 @. @ 1 million , of which \$ 1 @. @ 7 million was due to the impaired infrastructure . Roughly 1 @, @ 000 people sought shelter during the storm . Owing to the timely preparations in the country , only one cardiac arrest fatality was attributable to Gert when a landslide buried a home .

= = = Nicaragua = = =

Moving ashore in Nicaragua a month after Tropical Storm Bret 's passage , Gert caused excessive rainfall over already saturated regions . Despite striking the Atlantic coast , the storm produced the largest amounts of precipitation over northern and Pacific coastal areas . A maximum of 17 @. @ 8 in (452 mm) fell at Corinto ; other significant totals include 17 @. @ 6 in (447 mm) at Chinandega and 17 @. @ 5 in (444 mm) at León . The capital of Managua recorded 9 @. @ 8 in (249 mm) of rain during the event . Sustained winds from the storm reached no more than 40 mph (65 km / h) upon landfall near Bluefields , though they downed trees and power lines and generated high waves of up to 12 feet (3 @. @ 7 m) offshore . After weakening to a depression inland , Gert continued to produce moderate gales along its path through the country .

Off the coast near Big Corn Island , rough surf and winds destroyed nine fishing boats . Two canoes with an unknown number of occupants disappeared at sea . Gert produced significant coastal flooding on moving ashore near Bluefields and Tasbapauni , prompting about 1 @, @ 000 residents and hundreds of indigenous Miskito villagers to evacuate . Farther inland , prolonged heavy rain caused numerous rivers to overflow , which in turn led to disastrous freshwater flooding . A river near Rama rose to 32 ft (10 m) above its normal stage , displacing 3 @, @ 900 people and leaving about 80 percent of the town submerged . Several communities in the Rivas Department were inundated by discharge from a river near the city of Rivas , while Cárdenas , a coastal community along the border with Costa Rica , endured several days of heavy rain . Throughout the Boaco Department , similar flooding killed five people and affected 6 @, @ 000 others . Landslides moved onto bridges and roads , disrupting local transportation . Gert destroyed at least 252 houses and damaged another 293 across 14 of the country 's departments . Moreover , the storm was responsible for considerable infrastructural damage and economic losses . As many as 123 @, @

000 people were affected throughout Nicaragua , and there were 37 confirmed fatalities . Since flooding from Tropical Storm Bret had occurred just one month earlier , an exclusive damage estimate for Gert is unavailable . The two storms inflicted a combined \$ 10 @. @ 7 million in losses , primarily to private property .

= = = Honduras = = =

Although it had weakened to a depression , Gert continued to drop significant rainfall while crossing Honduras . In Tegucigalpa , at least 6 @. @ 77 in (172 mm) of rain were recorded . Destructive floods swept through 13 of the country 's 18 departments , including much of northern Honduras and the Mosquitia Region , which had already suffered losses from Tropical Storm Bret in the previous month . The additional flooding from Gert affected 24 @, @ 000 people in the region and made communication with surrounding areas nearly impossible . Elsewhere , the rain filled several major rivers , including the Ulúa ; rivers across Sula Valley in particular had their banks destroyed , flooding much of San Pedro Sula ? the country 's second @- @ largest city ? and adjacent municipalities in the Cortés Department . The rising water prompted many residents to evacuate , and the Ramón Villeda Morales International Airport halted all of its operations .

The storm devastated Puerto Cortés , one of the most important port cities in Central America . Elsewhere in the Cortés Department , a river in Choloma overflowed and triggered widespread flooding ; landslides in that area claimed the lives of six people . The country 's agriculture was devastated , losing about 5 @, @ 700 acres (23 km²) of low @- @ lying farmland with banana , sugar , and citrus crops . In all , Gert wrought \$ 10 million worth of damage to roads , bridges , and property . The disaster affected 67 @, @ 447 people , of which roughly 60 percent had to evacuate their homes . In its final public statement , the government of Honduras confirmed 27 deaths , though 12 missing persons remain unaccounted for .

= = = Elsewhere in Central America = = =

While passing through Central America , Gert generated an increase in cloudiness and showers across El Salvador , with a maximum 15 @. @ 35 in (390 mm) of rain recorded . Strong winds uprooted trees or snapped their limbs , damaging power lines and knocking out power . In one community , mudslides destroyed a major highway . The Río Grande de San Miguel caused an excessive discharge of water just southwest of Usulután , washing out about 2 @, @ 500 acres (10 km²) of crops from adjacent plantations . Several other areas faced significant losses from the flooding , including San Marcos and San Vicente ; some property and road damage occurred in San Miguel . Although fishing operations were suspended at the height the storm , four Salvadorean fishermen disappeared at sea . Overall , Gert affected nearly 8 @, @ 000 residents and destroyed twelve homes in El Salvador ; officials there confirmed five drowning deaths related to the storm .

In Guatemala , torrential rains from Gert affected approximately 20 @, @ 000 people and killed one girl . The agricultural sector in the country suffered substantial losses from the flooding , though there were no specific reports of material damage . Gert moved ashore near Belize City as a minimal tropical storm , dropping rainfall in coastal areas . Just offshore , a weather station on Hunting Caye recorded 9 @. @ 5 in (241 mm) during the event . Despite the rain , only minor flooding occurred in Belize City .

= = = Mexico = = =

While crossing the Yucatán Peninsula , Gert dropped considerable rainfall in Quintana Roo ; a 24 @- @ hour accumulation of 7 @. @ 4 in (188 mm) was recorded at Chetumal , although higher localized totals of around 15 in (380 mm) fell elsewhere in the state . Gusty winds briefly buffeted the coast during the storm 's landfall , with a maximum wind speed of 44 mph (70 km / h) recorded in Chetumal . Its effects were limited to localized floods , however , which cut off one road to traffic and forced the inhabitants from low @- @ lying areas in Chetumal and Felipe Carrillo Puerto to

evacuate to higher ground . Scattered showers also caused light flooding in parts of the state of Campeche , including Ciudad del Carmen .

Upon Gert 's final landfall , high gales and waves battered wide stretches of coastline in the states of Tamaulipas and Veracruz , though hurricane @-@ force winds were largely confined to areas within the cyclone 's southern eyewall . Tuxpan , just south of where the eye moved ashore , recorded wind velocities of more than 100 mph (160 km / h) , while 80 mph (130 km / h) gusts occurred farther south in Poza Rica . To the north , winds reached 55 mph (90 km / h) in Tampico , Tamaulipas . Despite the severity of the winds , the worst of Gert was due to orographic lift when its broad circulation interacted with the eastern side of the Sierra Madre Oriental , generating extreme precipitation over much of the Huasteca region . As many as 31 @.@ 41 in (798 mm) of rain were recorded in Aquismón , San Luis Potosí , while Tempoal in Veracruz observed a 24 @-@ hour total of 13 @.@ 35 in (339 mm) from the storm .

The first signs of damage were from high winds on September 20 , which uprooted trees and tore off residential roofs in Tuxpan , Naranjos , Cerro Azul , and Poza Rica . Following Gert 's extreme rains , catastrophic flooding struck Mexico 's Huasteca region over a period of several days as many of its rivers rose to critical levels . Initially , in Veracruz , the imminent overflow of the Tempoal , Moctezuma , and Calabozo rivers forced thousands of residents from the municipalities of Tempoal , El Higo , and Platón Sánchez to leave their homes . The Calabozo River eventually topped its banks , cutting the village of Platón Sánchez off from the outside world . By far the most devastating , however , was the overflow of the Pánuco River on September 24 , which runs from the Valley of Mexico through the municipality of Pánuco and empties in the gulf . Rushing water swept through 30 of Veracruz 's 212 municipalities , completely submerging more than 5 @,@ 000 homes . El Higo bore the brunt of the flooding , with 90 percent of its residential area under water .

After days of continued downpours in Gert 's wake , the Pánuco River rose to 27 @.@ 60 ft (8 @.@ 72 m) above normal by September 27 ? its highest level in 40 years . Once again exceeding its banks , the river destroyed a major levee in city of Pánuco and forced 8 @,@ 000 residents to evacuate . Disastrous flooding reached as far north as southern Tamaulipas , where 5 @,@ 000 people had to seek refuge . Half of Tampico was coated in deep layers of mud , with scores of structures demolished . The urban areas of Madero and Altamira were also hard hit by the deluge . Roughly 2 @,@ 000 @,@ 000 acres (8 @,@ 100 km²) of land around the Pánuco basin and Tampico were under water , including vast amounts of citrus , coffee , corn , maiz , bean , grain , and soy crops . Telephone , water , and electricity services throughout the region were severely disrupted , and numerous communities were isolated due to broken bridges and roads .

In San Luis Potosí , water damage to schools , bridges , and roads was particularly widespread . The agricultural sector suffered heavy losses when the flooding washed away large amounts of livestock and roughly 80 percent of its crops . Throughout the state , 55 @,@ 000 residents were affected by the storm , and 25 people lost their lives . Gert 's trail of destruction extended as far inland as Hidalgo , where 35 rivers overtopped their banks . Floods and mudslides destroyed 38 bridges and 86 roads , as well cutting off power , telephone , and water services , disrupting communication in 361 localities . Property damage in Hidalgo was significant ; 4 @,@ 425 homes , 121 schools , and 49 public buildings were compromised across 35 municipalities . About 167 @,@ 000 acres (680 km²) of farmland were destroyed in the storm . Fifteen deaths occurred in the state , and eight people sustained injuries .

Overall , Gert became the worst natural disaster to strike the region in 40 years ; it displaced 203 @,@ 500 people ? many in need of shelter ? and left 29 @,@ 075 houses damaged or destroyed across Mexico . More than 667 @,@ 000 acres (2 @,@ 700 km²) of crops were in ruins . The associated losses totaled \$ 156 million , and the death toll stood at 45 .

= = Aftermath = =

= = = Central America = = =

Because of the storm 's impact on the country , the government of Costa Rica declared a national emergency on September 16 , 1993 . Emergency crews were dispatched to assess the damage and distribute life supplies to the affected population , including 90 @,@ 940 lbs (41 @,@ 250 kg) of food , 1 @,@ 422 mattresses , and 1 @,@ 350 blankets . With much of the road network left disrupted across the affected regions , the country 's agriculture , tourism , and commerce suffered considerable losses . In particular , the obstruction of the major Pan @-@ American Highway , which connects the central region to the south of the country , had a discernible impact on the local economy . Following the expansive flooding of farmland , many independent crop producers were unable to partake in subsequent sowings .

Prior to Gert , a state of emergency was in effect for Nicaragua as a result of Tropical Storm Bret . National and regional aid agencies , including the Red Cross , accordingly extended their relief efforts with the passage of Gert . Although the government did not reappeal for international assistance , several monetary contributions were made by overseas organizations ; a transfer channel for cash donations was opened at the Swiss Bank Corporation . The United Nations Development Programme provided \$ 50 @,@ 000 for the purchase of fuel , and UNICEF distributed \$ 25 @,@ 000 worth of household supplies and medicine . The World Food Programme donated approximately 160 @,@ 000 lbs (72 tonnes) of food supply and offered expert services in response to the disaster . The federal governments of Japan , Canada , Switzerland , Norway , Germany , and Spain donated a combined \$ 300 @,@ 000 in aid .

On September 18 , the President of Honduras declared a state of emergency for several municipalities after surveying the affected regions by helicopter . The governments of Japan , Canada , Germany , and the United Kingdom provided a combined \$ 310 @,@ 300 for the purchase of relief items . Although most storm victims received aid within a few days , the deteriorated road network caused a large delay in relief efforts to the hard @-@ hit Mosquitia region . Sewage systems and waterworks countrywide were in serious need of restoration . With the destruction of its sole water reservoir , much of Puerto Cortés endured potable water shortages for months in Gert 's wake . Public health concerns rose in the wake of Gert , with the cost of required medicines pinned at \$ 208 @,@ 000 . A contamination of the water supplies in rural areas exacerbated a cholera outbreak . By September 28 , about 27 @,@ 000 residents unable to reenter their flooded homes remained in government shelters . Seven weeks later , a temporary housing project was implemented for the 120 families most in need . Approximately 5 @,@ 900 families across Honduras lost their source of income due to the storm .

= = = Mexico = = =

In response to the flood disaster , the Red Cross immediately began distributing aid to victims across the Huasteca region . After assessing the situation by helicopter , the President of Mexico declared the Pánuco river basin an emergency zone and ordered search and rescue missions . Many homes sustained irreparable damage to their roofs , leaving tens of thousands homeless . The government appealed for international aid , seeking clothes , food , and medical supplies . Five storage centers in Hidalgo provided more than 93 million lbs (42 @,@ 000 tonnes) of food supplies . Throughout San Luis Potosí , 142 @,@ 000 lbs (64 tonnes) of chicken , 45 @,@ 000 pantries , and 76 @,@ 000 disposable plates were distributed , as well as 50 @,@ 440 blankets and 6 @,@ 081 airbeds . Several schools served as shelters for the homeless ; the sheltered elderly , children , and pregnant or nursing women received \$ 27 @,@ 000 worth of milk powder donations .

In the wake of Gert , the amount of respiratory disease and skin infection cases rose slightly , although the overall health situation for the country remained well under control . By two weeks after the hurricane , over 65 @,@ 000 people across the region had been accommodated in the shelters ; most of them remained there until the flood waters receded . A grant of \$ 22 @,@ 000 was made available for the purchase of roofing sheets for those in urgent need of home repair . The president approved \$ 37 @.@ 4 million for the reconstruction of roads and housing and the assistance of affected farmers .