

= Hurricane Joan ? Miriam =

Hurricane Joan was a powerful hurricane that caused death and destruction in over a dozen countries in the Caribbean and Central America . Moving on a due west course for nearly two weeks in October 1988 , Hurricane Joan caused widespread flooding and over 200 deaths after moving into Central America . Widespread suffering and economic crises were exacerbated by Joan , primarily across Nicaragua , as heavy rains and high winds impacted those near the hurricane 's path .

After crossing Central America into the Pacific , the cyclone was renamed Tropical Storm Miriam , with the system 's dissipation occurring southwest of Mexico . Joan @-@ Miriam was the final hurricane of the 1988 Atlantic hurricane season and the final named storm of the Pacific hurricane season .

= = Meteorological history = =

One of the latest Cape Verde @-@ type hurricanes to form in any season , Joan formed from an area of convection in the intertropical convergence zone that moved off the coast of Africa early in October . It developed banding and was upgraded to Tropical Depression Seventeen on October 10 and later designated as Tropical Storm Joan while located at low latitude in the central Atlantic Ocean .

Joan gradually strengthened as it passed over the southern Windward Islands on October 15 . It continued heading west in response to a strong Ridge , and passed over the Guajira Peninsula on October 17 . After entering the extreme southwestern Caribbean Sea , Joan strengthened into a hurricane . It then slowly executed a small counterclockwise loop , possibly in response to the nearby Tropical Depression Eighteen . Upwelling caused by the quasi @-@ stationary hurricane weakened the system . As the nearby depression dissipated , Joan resumed its westward track . A strong anticyclone over the southwestern Caribbean Sea created an extremely favorable environment , and Joan underwent rapid deepening at a rate of 38 millibars in the space of a day . With a minimum pressure of 932 millibars , Joan was one of the strongest October hurricanes since 1961 . At the time , it was located at 12 ° N , the southernmost Category 4 hurricane ever recorded at the time . That record has since been broken by Hurricane Ivan .

Joan made landfall just south of Bluefields on October 22 . It passed over the northern portion of Lake Nicaragua , passed over Managua , and entered the Pacific Ocean near Leon on October 23 . Joan remained a hurricane or tropical storm during its entire passage over Central America , and was a minimal tropical storm when it reached the Pacific . As per the policy at the time , Joan was renamed Miriam .

Tropical Storm Miriam hugged the coast of Central America and reached its peak of 986 millibars on October 24 . Ordinarily , a pressure this low would indicate a Category 1 hurricane , but due to its disorganized convection , Miriam was not upgraded to a hurricane . Land interaction and wind shear weakened Miriam to a tropical depression on October 26 . Low @-@ level winds carried the system out to sea , and its convection dissipated on October 28 .

Miriam 's remnants continued out to sea , and they regenerated on October 30 . The tropical depression hung on for the next few days , until its second , and final , dissipation on November 2 .

= = = Unusual path = = =

Hurricane Joan 's path through the southern Caribbean in late October was highly unusual . Most October storms in the Atlantic gravitate towards the northern portion of the Caribbean , and often recurve quickly . Joan took the southernmost path of a tropical cyclone since a June system in 1933 , although Hurricane Irene in 1971 took a path that was just north of Joan 's . Joan @-@ Miriam was also unusual in that it survived passage from the Atlantic to Pacific Ocean . Only seven other storms have been known to survive the passage between the Atlantic and Pacific Oceans .

## == Preparations ==

Tropical Storm watches and later warnings were issued for the Windward Islands as far north as Martinique on October 13 . They were dropped over the subsequent two days as Joan passed through . Along the coast of South America , additional warnings were raised and later dropped as Joan paralleled the coast .

The first hurricane watches were issued for parts of Panama , and Providencia starting on October 18 . The watch area was expanded to include Costa Rica and Nicaragua on October 19 as the watches were upgraded to warnings . These warnings provided several hours ' worth of lead time , allowing evacuations and preparations to be made . In addition , flash flood and mudslide warnings were issued for western Panama , Costa Rica , Honduras , and Nicaragua starting on October 21 .

In response to Miriam , the flood and mudslide warnings issued because of Joan were not lifted until October 23 and 25 . Tropical Storm warnings were issued for the Pacific coast of Nicaragua , El Salvador , and the Gulf of Fonseca on October 24 . They were dropped the next day . Guatemala was placed under a warning on October 24 . In addition , new flash flood and mudslide warnings were raised for Guatemala and the Mexican state of Chiapas on October 24 and 25 , respectively . All warnings and watches were discontinued later on October 25 as Miriam turned away from the coast .

Despite the dangers from the intense hurricane , evacuations in Bluefields were met with resistance and disbelief from residents . In Managua , 70 @, @ 000 people were evacuated to safe areas . In the remaining areas of Nicaragua , 300 @, @ 000 people were evacuated . In Costa Rica , a total of 55 @, @ 000 people were evacuated .

## == Impact ==

Hurricane Joan killed at least 216 people , with 118 unaccounted for . The total cost of damage was around \$ 2 billion ( 1988 USD ) . All of the deaths and most of the damage were due to the Joan portion of Hurricane Joan ? Miriam .

## == Lesser Antilles ==

No casualties were reported in the Windward Islands , including Grenada , where , on October 15 , Joan made landfall . Passing just south , Joan brought rough seas and winds of 40 mph ( 65 km / h ) with gusts to 55 mph ( 90 km / h ) to the islands of Aruba , Bonaire , and Curaçao on October 16 , damaging coastal facilities and roofs . Structural damage from the storm was estimated at \$ 1 @. @ 5 million ( 1988 USD ) . Increased moisture in Joan 's wake caused persistent rainfall on the islands for several days , leading to widespread flooding . In Trinidad and Tobago , Joan was described as a " minor inconvenience " . Sustained winds up to 51 mph ( 82 km / h ) with gusts up to 64 mph ( 103 km / h ) were recorded on Grenada . Heavy rains amounted to 6 in ( 152 @. @ 4 mm ) in St. George 's . Significant flooding was reported throughout the island , resulting in hundreds of thousands of dollars in damage . A rare invasion of African desert locusts in the Windward Islands were blamed on the storm .

## == South America ==

In Venezuela , 11 people were killed due to flash @-@ flooding caused by heavy rains . Landslides and flooding killed 25 people in Colombia . The rains and flooding left 27 @, @ 000 people homeless . Throughout Colombia , damages amounted to \$ 1 billion .

## == Nicaragua ==

Most of the destruction was in Nicaragua . Throughout the country , 148 people perished , 184 were badly hurt , and 100 were unaccounted for . Roughly 23 @, @ 300 homes were destroyed , with 6

@, @ 000 being damaged . Many settlements on the Atlantic coast of the country were completely destroyed . The national electric company had 620 miles ( 1 @, @ 000 km ) of downed power lines , at the cost of 2 @. @ 5 million USD ( 1988 dollars ) . A port being constructed with Bulgarian help at El Bluff was severely damaged . On a brighter note , public health measures managed to keep the death toll lower than it could have been .

Bluefields was hit with extreme impact . Almost all of the 7 @, @ 500 structures in the city were demolished or had their roofs blown off . The majority of the main buildings in the city were destroyed . The hurricane also wreaked havoc on agriculture in the country . Around 15 @, @ 700 head of cattle , 20 @, @ 000 pigs , and 456 @, @ 000 chickens were killed . The hurricane caused severe disruption in most of Nicaragua 's remaining rain forests in the areas it hit , and also stripped trees of leaves . In the southeast rain forests , Joan toppled or snapped 80 percent of the trees and completely destroyed 500 @, @ 000 hectares ( 1 @, @ 200 @, @ 000 acres ) of canopy . Hurricane Joan caused transportation difficulties in the country . Floodwaters destroyed 30 bridges and seriously damaged 36 others . Roads totaling 404 miles ( 650 km ) in length were washed away .

In an unfortunate coincidence , Hurricane Joan hit shortly after an armed conflict in the region had started to cool off . The hurricane destroyed much of the infrastructure in Nicaragua , contributing to a recession that was already underway . The losses to cash crops severely reduced exports to under 200 million dollars ( 1988 USD ) . These factors combined to aggravate a recession and deepen the economic crisis . Government spending to rebuild infrastructure negated recently introduced anti @-@ inflation measures . Hurricane Joan was a partial cause of Nicaraguans being , on average , worse @-@ off than they were in the 1970s . In all , the storm left at least 250 @, @ 000 people homeless . Total damages in the country amounted to \$ 751 @. @ 1 million . Joan was the first major hurricane to strike Nicaragua since Edith in 1971 .

= = = Rest of Central America = = =

In Costa Rica , 28 people were killed , 75 were injured , and 18 were missing . Rainfall caused 20 rivers to burst their banks , flooding 75 settlements , including the city of Quepos , Costa Rica on the Pacific coast . At Ciudad Neily , Costa Rica , the Rio Corredores broke through a dike . In total , 7 @, @ 500 Costa Ricans were rendered homeless . Damages in Costa Rica amounted to \$ 65 million .

In the remaining portions of Central America , heavy rainfall , locally exceeding 300 millimetres ( 12 in ) , was reported . These rains caused flooding and landslides , especially in mountainous regions . Those heavy rains caused seven deaths in Panama and left \$ 60 million in damages .

= = = Mexico = = =

In Mexico , heavy rainfall associated with Tropical Storm Miriam caused the cancellation of flights from the airport at Tuxtla Gutiérrez . The highest rainfall reported recorded was 10 @. @ 37 inches ( 263 mm ) at Lazaro Cardenas . In small settlements , rivers were flooded and mudslides were reported . Casualties from the flooding are not known .

= = Aftermath = =

The response to requests for international aid was moderate . American church groups , Cuba , and Mexico collectively contributed around 2 @, @ 500 tons of food and medicine . The Canadian , Swedish , West German , Spanish , and Dutch Governments contributed aid amounting to 2 million dollars ( 1988 ) each . No aid was sent by the United States government . The Soviet Union contributed an unknown sum . The slow response to requests for aid was contributed to by the Sandinista Government 's actions , which was viewed by a few anonymous diplomats from other countries who commented to the press , as undermining the peace process championed by Óscar Arias . Those actions were the July 10 arrests of opposition activists and the closing down of independent radio stations . In addition , the government also barred foreign humanitarian groups

from receiving American aid , as well as turning back a relief shipment days before the storm .

On October 28 , 1988 , the United Nations General Assembly passed without a vote Resolution 17 of its 43rd session in response to the disaster . The resolution called on countries to contribute to the relief effort .

= = = Retirement = = =

The name Joan was retired in 1989 and replaced by Joyce on the list for the 1994 season . The name will never again be used for a North Atlantic hurricane . Because the impact of the Miriam portion of the tropical cyclone was minimal , the name Miriam was not retired in the Pacific and is still on the list of names for that basin , and was most recently used in the 2012 season .