

= Hurricane Kathleen (1976) =

Hurricane Kathleen was a tropical cyclone that caused destructive impacts in California . On September 7 , 1976 , a tropical depression formed ; two days later it accelerated north towards the Baja California Peninsula . Kathleen brushed the Pacific coast of the peninsula as a hurricane on September 9 and made landfall as a fast @-@ moving tropical storm the next day . With its circulation intact and still a tropical storm , Kathleen headed north into the United States and affected California and Arizona . Kathleen finally dissipated late on September 11 .

Damage in the United States was considerable . California received record rainfall , with over a foot of rain falling in some areas . Flooding caused catastrophic destruction to Ocotillo , and six people drowned . Flooding extended west ; railway tracks were destroyed in Palm Desert and high winds and severe flooding were recorded in Arizona . Overall , the damage total was \$ 160 million (1976 USD) and 12 deaths were attributed to the storm .

= = Background = =

Tropical cyclones do not typically bring high winds to the southwestern United States . Most Pacific hurricanes are embedded in easterly winds south of the subtropical ridge , and thus move westward ? away from large land masses ? until they dissipate over cold waters . However , during early autumn , tropical cyclones generally form closer to the Mexican shoreline than average , making them more likely to recurve , or to curve again , northwards under the influence of an approaching trough . These troughs tend to extend farther to the south during the latter part of the Pacific hurricane season , in the period between late August and early October . They also produce a synoptic @-@ scale flow that is conducive to steering hurricanes towards the southwestern United States . However , many hurricanes that approach the southwestern United States tend to be undergoing extratropical transition as they encounter increased wind shear and markedly cooler sea surface temperatures , and as they interact with the deep troughs that caused them to recurve . Kathleen is one of only six recorded tropical cyclones in the eastern Pacific Ocean known to have brought gale @-@ force or hurricane @-@ force winds to the Continental United States .

= = Meteorological history = =

A large area of thunderstorms , with a diameter of about 500 mi (800 km) , formed 270 mi (430 km) southwest of Acapulco . Moving rapidly west @-@ northwest , a tropical depression formed on September 7 . While briefly moving towards the east , the depression intensified into Tropical Storm Kathleen . Moving above 83 ° F (28 ° C) sea surface temperatures , Kathleen quickly strengthened . Before passing 40 mi (64 km) east of Socorro Island , Kathleen reached its secondary peak with winds of 65 mph (115 km / h) . Kathleen then weakened considerably , and by 0600 UTC September 9 , Tropical Storm Kathleen was barely a tropical storm . At this time , the system was located at 55 mi (89 km) north of the island . Shortly thereafter , Kathleen turned north @-@ northeast into warmer waters .

Subsequently , the tropical storm began to re @-@ strengthen . Despite moving rapidly north , the cyclone strengthened into Hurricane Kathleen . The hurricane passed near several ships , and was intercepted by a Hurricane Hunter aircraft early on September 10 . It is estimated that the storm peaked in intensity around that time , with winds of 80 mph (130 km / h) and a barometric pressure of 986 mb (986 hPa) . However , Kathleen never developed an eye . About an hour after the first flight reached Kathleen , a second flight suggested that Kathleen had weakened back into a tropical storm . With precipitation falling in the United States , some 700 mi (1 @, @ 100 km) north of the cyclone 's atmospheric circulation , Kathleen 's motion accelerated to speeds of 35 mph (56 km / h) -38 mph (61 km / h) .

After crossing the Point Eugenia peninsula (the cyclones first landfall) later on the morning of September 10 , Kathleen made its second landfall 120 mi (190 km) north of Ensenada at 1130 UTC the same day . Unlike most tropical cyclones , Kathleen weakened slowly over California .

Tropical Storm Kathleen weakened further into a depression over southern California and shortly thereafter , moved across Death Valley . On September 11 , Kathleen entered western Nevada . Finally , the center became difficult to locate , and the depression dissipated later on September 11 . After undergoing a Fujiwhara @-@ like interaction , where two circulations interact with each other , with a low @-@ pressure area stalled off the Pacific coast , moisture later spread into the northwestern part of the United States . After the stalled low was pulled inland , Kathleen combined with the low to produce additional rainfall over parts of California .

= = Impact = =

= = = Mexico = = =

The bulk of the rainfall from the tropical cyclone fell over Baja California Norte and Baja California Sur , to the east of its track . The highest amount reported was 6 @.@ 52 in (166 mm) in San Antonio .

= = = Arizona = = =

On September 10 ? 11 , gale @-@ force winds caused considerable damage to the city of Yuma . For a time , the sustained winds exceeded 50 mph (80 km / h) , with gusts up to 76 mph (122 km / h) . The National Weather Service 's forecast office in Tucson estimates that tropical storm @-@ force winds extended as far east as Pima County , and as far north as Lake Havasu . Rains caused severe flash @-@ flooding in Mohave County . One man was killed when the wind blew a palm tree onto his mobile home and 13 people across the state were hurt . The Tucson metropolitan area was particularly hard hit with flash flooding , with golf @-@ ball size hail . On Mount Lemmon , the hail reached a depth of 5 in (13 cm) . While most of the rainfall from Tropical Storm Kathleen fell in California , 2 @.@ 87 inches (7 @.@ 3 cm) fell at the Davis Dam on the Colorado River .

= = = California = = =

The state received record rainfall , with 14 @.@ 76 in (37 @.@ 5 cm) falling on the southern slopes of Mount San Geronio , and 10 @.@ 13 in (25 @.@ 7 cm) accumulated on Mount Laguna . Because the village is situated atop an alluvial fan , a 40 ft (12 m) wall of water exited a mountain canyon . Ocotillo was flooded with 4 feet (1 @.@ 2 m) -6 ft (1 @.@ 8 m) of water ; subsequently , half the town was destroyed . Six people drowned in the mud and waters in the town and two people were initially reported missing , though they were later found by officials . Overall , Ocotillo was 70 % ? 80 % destroyed . Officials evacuated 175 people from the flooded area of Ocotillo and the nearby communities that surround the Salton Sea ; the sea rose 6 in (150 mm) -8 in (200 mm) . A quarter mile of interstate and a 60 @-@ foot bridge were destroyed by the flood , which also washed away mobile homes , trucks , and cars .

In Los Angeles , two people died of injuries suffered from slippery roads . One man drowned in El Centro. and two people drowned when their cars tumbled into the water near the city . Record flood stage was attained at numerous streams near the Coachella Valley . Widespread property damage was recorded on the eastern slopes of the Sierra Nevada as well as the nearby desert . Across the San Joaquin Valley , 2 / 3 of the \$ 150 million raisin crop was threatened . Crops including cotton , lettuce , and hay were damaged .

Homeowners in Palm Desert suffered \$ 4 million in damage from the storm ; the town received more than a year 's worth of rainfall in a matter of days . No serious injuries were reported throughout the desert city , though two agricultural dikes broke .

Several miles of railway track , including three trestles that belonged to the San Diego and Arizona Eastern Railway , were destroyed and five others were damaged . At more than 50 other locations , tracks were buried by mudslides or had the ground under them washed away . After assessing the

damage from Kathleen , the Southern Pacific Transportation Company decided in 1977 to abandon most of the railroad . A 700 ft (210 m) section of Interstate 8 from Yuma to San Diego was destroyed .

Overall , hundreds of homes were damaged or destroyed ; Tropical Storm Kathleen was described as a one @-@ in- 160 @-@ year event . Total damage was \$ 160 million , making Kathleen one of the costliest tropical storms in state history . Parts of California were declared a disaster area , and flash flood watches were issued throughout Southern California , including the desert and mountains . Flash flood warnings were also issued for parts of California , as well as nearby states Nevada and Arizona , but were dropped as the rain tapered off on September 11 .

= = = Rest of the United States = = =

In Wyoming , the cyclone is credited for the first known sighting of a white ibis in the state 's history . In Montana , Kathleen dropped locally heavy rainfall approaching 2 inches (51 mm) in localized spots , enough to become the wettest known tropical cyclone in state history . The remnants of the storm also affected Oregon and Idaho .