

= Hurricane Esther =

Hurricane Esther was the first large tropical cyclone to be discovered by satellite imagery . The fifth tropical cyclone , named storm , and hurricane of the 1961 Atlantic hurricane season , Esther developed from an area of disturbed weather hundreds of miles west @-@ southwest of the southernmost Cape Verde Islands on September 10 . Moving northwestward , the depression strengthened into Tropical Storm Esther on September 11 , before reaching hurricane intensity on the following day . Early on September 13 , Esther curved westward and deepened into a major hurricane . The storm remained a Category 3 hurricane for about four days and gradually moved in west @-@ northwestward direction . Late on September 17 , Esther strengthened into a Category 4 hurricane and peaked with sustained winds of 145 mph (233 km / h) on September 18 . The storm curved north @-@ northeastward on September 19 , while offshore North Carolina . Esther began to weaken while approaching New England and fell to Category 3 intensity on September 21 . The storm turned eastward early on the following day , and rapidly weakened to a tropical storm .

Esther then executed a large cyclonic loop , until curving northward on September 25 . Early on the following day , Esther struck Cape Cod , hours before emerging into the Gulf of Maine . Later on September 26 , the storm made landfall in southeastern Maine , before weakening to a tropical depression and becoming extratropical over southeastern Quebec . The remnants persisted for about 12 hours , before dissipating early on September 27 . Between North Carolina and New Jersey , effects were primarily limited to strong winds and minor beach erosion and coastal flooding due to storm surge . In New York , strong winds led to severe crop losses and over 300 @, @ 000 power outages . High tides caused coastal flooding and damage to a number of pleasure boats . Similar impact was reported in Massachusetts . Additionally , some areas observed more than 8 inches (203 mm) of rainfall , flooding basements , low @-@ lying roads , and underpasses . Overall , damage was minor , totaling about \$ 6 million (1961 USD) . There were also seven deaths reported when a United States Navy P5M aircraft crashed about 120 miles (190 km) north of Bermuda .

= = Meteorological history = =

On September 10 , the Television Infrared Observation Satellite observed an area of convection , or thunderstorms , to the southwest of the Cape Verde islands , suggesting the possibility of tropical cyclogenesis . At 18 : 00 UTC that day , a tropical depression formed and subsequently moved on a northwest trajectory . By the time the Hurricane Hunters reached the system on September 12 , winds of hurricane force were recorded , and as such , the San Juan , Puerto Rico Weather Bureau began issuing warnings on Hurricane Esther . It was later estimated that the system attained tropical storm status on September 11 , although the National Hurricane Center later noted that it could have attained hurricane status by this date , thus potentially being one of four simultaneous hurricanes , along with hurricanes Betsy , Carla , and Debbie . The only other such occasions were in 1893 and 1998 . This also made Esther the first hurricane to be discovered by satellite imagery , although not the first to be imaged by one .

After becoming a hurricane , Esther turned more to the west @-@ northwest , influenced by the strengthening Bermuda High that built behind Hurricane Debbie well to the north . By September 13 , the storm attained major hurricane status , which is a Category 3 on the current @-@ day Saffir @-@ Simpson scale with sustained winds of 115 mph (185 km / h) . By that time , the gale force winds extended about 230 mi (370 km) from the center , with hurricane @-@ force winds spreading 135 mi (217 km) to the north . After maintaining winds of 125 mph (201 km / h) for about two days , Esther weakened slightly on September 16 while passing well north of the Lesser Antilles . On the next day , the hurricane passed about 375 mi (604 km) north of Puerto Rico . Late on September 17 , the barometric pressure fell to 927 mbar (92 @. @ 7 kPa ; 27 @. @ 4 inHg) in the center of Esther , and operationally the Hurricane Hunters estimated winds of 150 mph (241 km / h) . This was later lowered slightly to 145 mph (233 km / h) , which would be its peak intensity attained on September 18 , making it a Category 4 hurricane .

Around the time of attaining peak winds , Esther began moving more to the northwest toward the east coast of the United States , influenced by a dissipating cold front that exited the coast on September 15 . On September 20 , the hurricane passed about 120 mi (193 km) east of Cape Hatteras while turning to the north @-@ northeast . It continued up the coastline , later passing about 150 mi (241 km) east of the Delmarva Peninsula . Another trough from the west steered Esther to the northeast and was expected to cause the storm to accelerate , potentially bringing it over Cape Cod . While turning , the hurricane passed about 110 mi (177 km) south of the eastern tip of Long Island , 35 mi (56 km) southeast of Block Island , and just 27 mi (43 km) south of Nantucket Island . After the trough bypassed the hurricane , Esther slowed and turned to the east away from land and over much cooler waters . It quickly weakened to tropical storm status on September 22 , and on that day the Weather Bureau discontinued advisories , remarking that Esther no longer had tropical characteristics .

As a weakened tropical storm , Esther turned to the southeast and gradually executed a large loop . On September 24 , it turned back to the west and subsequently turned back to the north , influenced by another approaching trough . Warmer waters allowed the storm to re @-@ intensify slightly . As a result , the Boston Weather Bureau reissued advisories on the storm on September 25 while Esther was 275 mi (443 km) south of Nantucket . The storm crossed over eastern Cape Cod while gradually weakening , making a final landfall near Rockland , Maine , on September 26 . After crossing into Canada , Esther became extratropical early on September 27 while continuing to the east @-@ northeast . It was last noted at 06 : 00 UTC that day while over eastern Quebec .

= = Preparations = =

While Esther was becoming a powerful hurricane over the open Atlantic , the San Juan Weather Bureau office issued a small craft advisory for the Leeward Islands , United States Virgin Islands , Puerto Rico , Hispaniola , the Bahamas , and Bermuda . Because of uncertainty about the storm 's future path , the Weather Bureau advised residents along the east coast of the United States to closely follow the storm . The agency later issued a hurricane watch from Myrtle Beach , South Carolina to Norfolk , Virginia on September 18 .

In Norfolk , Virginia , between 10 @,@ 000 and 15 @,@ 000 people were evacuated to emergency shelters on September 19 , but were able to return home the next day as Esther passed far to the east . Preparations for Esther were described by the National Weather Service 's Norfolk bureau as " the most thorough ever seen here " at the time . Naval ships and aircraft carriers based in the city headed for open waters to endure the storm , while over 200 military airplanes were flown inland away from the coast .

The National Weather Service , in anticipation of a possible landfall in the Carolinas , issued a gale warning and a hurricane watch from Myrtle Beach , South Carolina to Norfolk , Virginia on September 18 (tropical storm warnings were not issued at the time) . A hurricane warning was issued from Cherry Point , North Carolina to the Virginia capes on September 19 , but was discontinued early on September 20 as the hurricane passed to the east . A hurricane watch was also issued from Cape May , New Jersey to the Massachusetts coast on September 19 , and like the warning , was discontinued on September 20 .

As Esther began to parallel the coastline , a hurricane warning was issued for coastal areas from Long Island to Provincetown , Massachusetts on September 20 , and were extended to Eastport , Maine early on September 21 . All hurricane watches were discontinued on September 21 as Esther moved away from the New England coast , and all hurricane warnings were downgraded to gale warnings later that day as Esther passed near Nantucket and weakened to a tropical storm , and all warnings were discontinued on September 22 after the storm moved away from the coast . After Esther completed its anticyclonic loop over the northwestern Atlantic , a gale warning was again issued from Provincetown , Massachusetts to Eastport , Maine on September 25 , and was discontinued the next day after Esther made its second landfall in Maine . Personnel on two offshore surveillance stations called the Texas Towers were evacuated ; a third tower had collapsed during a storm in January 1961 , prompting higher safety standards .

= = Impact and aftermath = =

A powerful hurricane , Esther produced high waves and strong swells across much of the western Atlantic , including along the north coast of Puerto Rico , the Virgin Islands , and the Bahamas .

= = = North Carolina and Virginia = = =

In North Carolina , the outer edges of Esther brought sustained winds of 35 mph (56 km / h) with gusts up to 60 mph (97 km / h) . A storm surge of 6 ft (1 @. @ 8 m) was reported in Wilmington , North Carolina . The storm surge caused minor flooding and beach erosion in the Outer Banks , where road damage was extensive . Damage to property , however , was minimal , and the storm 's effects in the Wilmington area were compared to those of " a good nor 'easter " by the local weather bureau . Southeastern Virginia experienced tides 2 to 4 ft (0 @. @ 6 to 1 @. @ 2 m) above normal , which flooded some coastal highways in the Hampton Roads area . There was minor beach erosion in the Norfolk area due to turbulent seas .

= = = Mid @-@ Atlantic = = =

Esther mainly produced heavy rainfall and gale force wind gusts along the coasts of Maryland and Delaware . These areas also experienced storm surges of 6 ? 7 ft (1 @. @ 8 ? 2 @. @ 1 m) above normal . Wind gusts to 45 mph (72 km / h) were observed at Ocean City , Maryland , and storm surge flooding caused damage to the city 's sea wall and boardwalk . Minor to moderate damage was reported along the New Jersey coast . A wind gust of 69 mph (111 km / h) was observed in Atlantic City . Winds downed trees and power lines and damaged apple crops . Storm surge resulted in minor beach erosion and wrecked some boats . Damage totaled less than \$ 1 million .

In New York , sustained winds of 40 mph (64 km / h) and gusts up to 60 mph (97 km / h) in Putnam and Rockland counties downed numerous trees , caused power outages , and damaged crops . Farther south on Long Island , the hardest hit areas were Nassau and eastern Suffolk counties . Wind gusts up to 108 mph (174 km / h) felled trees and power lines , leaving over 300 @, @ 000 homes without electricity ; minor structure damage was also reported . Downed power lines and minor flooding due to rainfall amounts of up to 7 in (178 mm) also caused public transportation delays on Long Island . Tides as high as 35 ft (10 @. @ 7 m) damaged many pleasure boats . Minor flooding was reported in Queens and Brooklyn . Damage likely exceeded \$ 3 million , with nearly one @-@ third of that amount incurred to crops and property each .

= = = New England = = =

In Connecticut , sustained winds between 35 and 50 mph (56 and 80 km / h) and gusts between 45 and 65 mph (72 and 105 km / h) caused electrical and phone service outages , as well as generally minor property damage . There was also some loss to crops , especially apples and corn . Similar impact was reported farther east in Rhode Island , though winds were much stronger , with sustained winds of 74 mph (119 km / h) and a gust up to 83 mph (134 km / h) observed at Block Island . Tides ranging from 4 to 6 ft (1 @. @ 2 to 1 @. @ 8 m) above normal damaged small crafts and caused severe beach erosion , destroying a parking lot and washing out several roads . In south @-@ central and northeastern Maine , precipitation totals between 2 and 4 in (51 and 102 mm) flooded basements , underpasses , and low @-@ lying roads , resulting in traffic being delayed by detours .

Strong winds were also observed in eastern Massachusetts , with the strongest wind gust being 70 mph (110 km / h) in Chatham .

Despite gale and storm force wind gusts in eastern Massachusetts and southern New Hampshire , damage was minimal and consisted mainly of downed trees and isolated power outages . Rainfall totals ranged from 1 inch (25 mm) in southern Maine to around 6 inches (152 mm) in the Boston

area . The storm separated Smith 's Point from the rest of Nantucket Island , creating what came to be known as Esther 's Island (which has since re @-@ connected in 1988 , re @-@ separated , and re @-@ connected again in 2009) . In all , Esther caused an estimated \$ 6 million (1961 USD) in damage .

= = = Navy plane crash = = =

While over open waters , Esther caused seven indirect deaths when a United States Navy P5M aircraft crashed about 120 miles (193 km) north of Bermuda . A merchant ship , the African Pilot , was in the area where the plane crashed when the captain of the ship received a message from the Bermuda Coast Guard that " We have aircraft in trouble in that vicinity ... " The captain of the African Pilot diverted the ship in order to assist the Coast Guard 's search for the lost plane . The heavy seas brought by Esther made search @-@ and @-@ rescue efforts difficult . In the end , only three of the ten crewmen were rescued ; the other seven were declared lost at sea .

The survivors told Coast Guard officials that during the storm , one of the engines of the plane failed , along with most of the electrical power ; as a result , the crew was unable to drop the reserve tank or close the bomb bay doors automatically . Before the crew could close the bomb bay doors manually , the plane crashed in shark @-@ infested waters and broke apart ; three of the crewmen were able to get out of the downed plane , but the other seven were unable to escape . The three survivors were then attacked by sharks before being rescued .

= = Project Stormfury = =

Hurricane Esther was also one of the first targets of a Navy experiment in modifying or weakening hurricanes by seeding them . On September 16 , a Navy plane flew into the eye of Esther about 400 miles (644 km) northeast of Puerto Rico , and dropped canisters of silver iodide into the storm . The hurricane appeared to weaken slightly in response to the seeding , reportedly by ten percent . This weakening was temporary , however , as the hurricane resumed strengthening shortly after . The aircraft returned the next day to seed again , but the seeding canisters fell outside the eyewall with no effect on its structure , and the hurricane continued to strengthen . Despite this result , the experiment was deemed a success , and led to the establishment of Project Stormfury .