

= Effects of Hurricane Isabel in Maryland and Washington , D.C. =

The effects of Hurricane Isabel in Maryland and Washington , D.C. , were among the most damaging from a tropical cyclone in the Baltimore @-@ Washington Metropolitan Area , United States . Hurricane Isabel formed from a tropical wave on September 6 , 2003 , in the tropical Atlantic Ocean . It moved northwestward , and within an environment of light wind shear and warm waters , it steadily strengthened to reach peak winds of 165 mph (265 km / h) on September 11 . After fluctuating in intensity for four days , Isabel gradually weakened and made landfall on the Outer Banks of North Carolina with winds of 105 mph (165 km / h) on September 18 . It quickly weakened over land and became extratropical over western Pennsylvania the next day .

On September 19 , Tropical Storm Isabel passed through extreme western Maryland , though its large circulation produced tropical storm force winds throughout the state . About 1 @.@ 24 million people lost power throughout the state . The worst of its effects came from its storm surge , which inundated areas along the coast and resulted in severe beach erosion . On the Eastern Shore , hundreds of buildings were damaged or destroyed , primarily in Queen Anne 's County from tidal flooding . Thousands of houses were affected in Central Maryland , with severe storm surge flooding reported in Baltimore and Annapolis . Washington , D.C. , sustained moderate damage , primarily from the winds . Throughout Maryland and Washington , damage totaled about \$ 945 million (2003 USD , (\$ 1 @.@ 22 billion 2016 USD) , with only one fatality due to flooding .

= = Preparations = =

While Isabel was still over the western Atlantic Ocean as a Category 5 hurricane , forecasters predicted the storm would move northwestward and within five days be at a position 130 miles (210 km) east @-@ southeast of Ocean City , Maryland as a 115 mph (185 km / h) major hurricane . By four days before Isabel made landfall , most computer models predicted Isabel to make landfall between North Carolina and New Jersey . On September 16 , about two days before the hurricane struck land , the National Hurricane Center issued a hurricane watch for the southern region of the Maryland coastline on the Chesapeake Bay . Later that day , a tropical storm watch was issued for the eastern Maryland coastline , which was upgraded to a tropical storm warning by about 24 hours before landfall .

Officials recommended the citizens on Smith Island to evacuate on the day prior to the hurricane making landfall , the only evacuations for the Eastern shore of Maryland . Mandatory evacuations were ordered for low @-@ lying and other specific areas in Calvert , St. Mary 's , and Charles counties , and the residents in six homes were asked to leave in Howard County . Officials recommended residents in flood areas of Baltimore County to evacuate , and some in the city of Baltimore left spontaneously due to flooding . Evacuation rates were low throughout the Maryland coastline , with the highest rate being in the southernmost counties on the western shore . The primary reason for people staying was due to the track of the hurricane . Between 20 % and 33 % of those who participated in an evacuation survey said they had concerns about being caught on roadways while trying to evacuate as the storm arrived , with similar numbers expressing concern about being able to return to their homes if they evacuated . Of those who left , most went to the house of a friend or family member , with two @-@ thirds to three @-@ fourths going to destinations in their own neighborhood or county . Most did not evacuate until the day before or the day of landfall . In most areas , the public response to the evacuation orders was normal to fast , with traffic during the evacuation described as light to normal . The most significant problems experienced during the evacuation were downed trees , inadequate signage , flooded roads , or stalled cars . In all , 3 @,@ 080 people evacuated their homes in preparation for Hurricane Isabel . Boats , trucks , and school buses helped more than 1 @,@ 000 people evacuate the Inner Harbor of Baltimore , as well .

Washington , D.C. , mayor , Anthony Williams , declared a state of emergency for the district . In Washington , preparations began several days prior to the arrival of the hurricane , including placing sandbags in flood @-@ prone areas . Many people , including non @-@ emergency government

personnel , were told to stay home . Most people in the district took shelter by the time the hurricane passed through the area , and the streets across the city were largely empty . President George W. Bush along with Abdullah II of Jordan were evacuated from the city to the presidential retreat at Camp David . Most United States Congress representatives and members of the Department of Defense also left the city . Many buildings , including some federal , were shut down . All three airports in the Baltimore @-@ Washington Metropolitan Area were closed , with flights into the capital cancelled or diverted . Many train routes were canceled or delayed , and the Washington Metro and Metrobus systems were closed entirely . Workers at the National Zoo prepared by moving animals inside and lowering water levels .

= = Impact = =

= = = Eastern Shore = = =

On the Eastern Shore of Maryland , Hurricane Isabel produced a storm surge peaking at 8 feet (2 @.@ 4 m) on the Chesapeake Bay in Hoopers Island and 6 @.@ 5 feet (2 m) on the Atlantic coast in Ocean City . The track of the hurricane to the west funneled into the bay and was so strong it negated the normal tide cycle in the bay . Tolchester Beach recorded a record @-@ breaking high tide of 7 @.@ 91 feet (2 @.@ 4 m) above mean low water . Rainfall in the Maryland portion of the Delmarva Peninsula reached 3 @.@ 2 inches (81 mm) in Steeles Neck . The large circulation of the hurricane produced strong winds across the area , including maximum sustained winds of 52 mph (84 km / h) and a gust of 66 mph (106 km / h) in Cambridge .

Tidal flooding from the storm surge forced residents to evacuate near the bay . Tidal flooding was reported in and around Rock Hall , Chestertown , Skinners Neck , Piney Neck , and Cliffs City , and was carried along the Chester River slightly inland . The flooding destroyed or damaged over 100 homes , vehicles , and boats , and also destroyed the Romancoke pier , one of the pre @-@ Bay Bridge ferry landings which was still in use as a fishing pier at the time . The flooding also severely damaged eleven marinas , three restaurants , four hotels , one boat @-@ building business , and one marine railway . In Queen Anne 's County , the hurricane destroyed 37 homes , greatly damaged 151 , and moderately damaged 192 , with damage totaling \$ 37 million (2003 USD , (\$ 47 @.@ 6 million 2016 USD) . The damage was mainly due to the tidal flooding , though four homes were destroyed due to falling trees . Moderate wind gusts knocked down numerous trees , tree limbs , and power lines , leaving about 65 @,@ 750 homes and businesses without power , half of which occurred in Cecil County . The resulting power outage was described as one of the worst in the history of Conectiv Energy . Damage in the Eastern Shore of Maryland totaled about \$ 50 million (2003 USD , (\$ 64 @.@ 3 million 2016 USD) .

= = = Central Maryland = = =

Wind gusts in central Maryland peaked at 83 mph (134 km / h) in Silver Spring , with a location along the Patuxent River recording sustained winds of 55 mph (88 km / h) . Unofficially , rainfall reached 7 inches (178 mm) in portions of Maryland , though the highest precipitation amount totaled 3 @.@ 21 inches (82 mm) at the Baltimore @-@ Washington International Airport . Swells from the hurricane produced high storm surges along the Western Shore which peaked at 8 @.@ 2 feet (2 @.@ 5 m) in Baltimore . Annapolis also reported a surge of 7 @.@ 2 feet (2 @.@ 2 m) . In many locations , the storm surge was higher than the previous record set by the 1933 Chesapeake Potomac Hurricane . Throughout central Maryland , 472 buildings and homes were destroyed , with 3 @,@ 260 greatly damaged and another 3 @,@ 600 affected in general . Strong storm surge from the hurricane washed 43 @,@ 000 tons (39 @,@ 000 t) of salt , millions of pounds of nitrogen and phosphorus , and millions of gallons of raw sewage into the Chesapeake Bay . One person died as a result of a traffic death in the state . Property damage totaled \$ 530 @.@ 5 million (2003 USD , (\$ 682 million 2016 USD) , with an additional \$ 190 @,@ 000 (2003 USD , (\$ 244 thousand 2016

USD) in crop damage . The crop damage was primarily limited to minor damage to livestock buildings and sheds , though the winds destroyed a hay barn and a dairy barn at one farm in Frederick County . The United States Department of Agriculture estimated the winds of the hurricane destroyed 15 ? 30 % of the field corn and 10 ? 15 % of the soybean crop . Excess amounts of water led to the closure of many crab processing plants and crab house restaurants , and officials restricted harvest on shellfish for eleven days due to unsafe impurities in the water .

Most coastal areas under 10 feet (3 m) above sea level experienced severe wave damage . The Maryland Geological Survey estimates the waves removed 20 acres (8 @. @ 1 ha) of sand along the coastline , based on an estimate of losses in Baltimore County . The 20 acres (81 @. @ 000 m²) of lost in single day represent about 15 % of the total beach loss in an average year . The average location lost about 5 feet (1 @. @ 5 m) of beach , and throughout the Chesapeake Bay the erosion deposited about 81 @. @ 000 tons (73 @. @ 500 t) of sediment into the bay . The erosion was irregular , however ; some locations were unaffected , while others experienced greater losses , despite that the two locations were similar . The erosion and storm surge damaged many bulkheads , and after the storm surge retreated into the bay it washed away freestanding structures . The passage of Isabel resulted in an unusual increase in phytoplankton in the middle portion of the Chesapeake Bay , followed by an abrupt return to normal conditions by early October .

= = = Effects by county = = =

Six foot (2 m) waves along the coastline of Saint Mary 's County , with Point Lookout State Park suffering \$ 3 million in damages (2003 USD , (\$ 4 @. @ 24 million 2016 USD) . In the county , 2 @. @ 500 wharves and piers were destroyed , with another 1 @. @ 000 moderately damaged , resulting in \$ 10 @. @ 25 million in monetary damage (2003 USD , (\$ 13 @. @ 2 million 2016 USD) . The storm surge destroyed the bridge to Saint George Island by a few hours after the hurricane made landfall , and the flooding covered much of the island for a week . There , 20 homes were destroyed . Shore revetments experienced \$ 53 @. @ 4 million in damage (2003 USD , (\$ 80 @. @ 4 million 2016 USD) . Throughout Saint Mary 's County , residential damage amounted to about \$ 17 million (2003 USD , (\$ 239 million 2016 USD) with about \$ 1 @. @ 5 million to commercial buildings (2003 USD , (\$ 1 @. @ 93 million 2016 USD) . The damage was caused primarily by the storm surge , though the winds produced minor to moderate damage , the worst effects in the state from winds . In the county , the winds blew off the roof of a home and downed 70 trees , leaving 27 @. @ 092 without power .

In Charles County , the hurricane resulted in about \$ 2 million (2003 USD , (\$ 2 @. @ 57 million 2016 USD) in damage to roads . Two homes were destroyed with several others damaged on Cobb Island . Elsewhere in the county , Chigger City , Port Tobacco , Woodland Point , Swan Point , and Morgantown also reported damage from Hurricane Isabel , with 52 houses damaged and eight homes destroyed or severely damaged . Seven businesses were also destroyed or greatly damaged . Many piers along the shore were damaged or lost , and two private community wells were contaminated . The winds downed several trees and power lines , leaving about 32 @. @ 000 people without power . Residential damage totaled \$ 1 @. @ 1 million (2003 USD , \$ 1 @. @ 2 million 2006 USD) , with another \$ 600 @. @ 000 (2003 USD , (\$ 772 thousand 2016 USD) to commercial buildings .

Four to five foot (1 @. @ 2 to 1 @. @ 5 m) waves hit the eastern portion of Calvert County , causing a home to be knocked off its foundation in North Beach . The storm surge destroyed the pier and greatly damaged buildings along the shoreline at Solomons Island . Power was lost to 22 @. @ 400 residents as a result of the passage of the hurricane .

The storm surge produced higher than usual tides in along the Patuxent , Potomac , and Anacostia River coastlines . Much of the shoreline of Prince George 's County possessed adequate rise of terrain to prevent significant flooding , though the high waters closed three roads where the shoreline was not high enough . The passage of the hurricane created about 5 @. @ 000 tons (4 @. @ 500 t) of debris to be removed . Fifteen buildings sustained major damage , with another 53 buildings affected to some degree . Nearly 200 @. @ 000 residents in the county lost power . When

two of the largest sewage treatment plants in the state lost power , 96 million US gallons (360 @, @ 000 m³) of hazardous sewage overflowed to mix with storm water into two waterways in the county . The wastewater combined with rainwater , making it less threatening . No humans or animals were known to have become sick due to the overflows .

In Annapolis in Anne Arundel County , the storm surge surrounded many of the buildings at the United States Naval Academy , resulting in about \$ 116 million in damage (2003 USD , (\$ 149 million 2016 USD)) The Annapolis Maritime Museum suffered severe damage as well , though volunteers moved artifacts to a safer location . There , the storm surge flooded the building in 6 feet (1 @. @ 8 m) of water , causing great damage to the floor , drywall , and electricity . About 93 % of the 211 @, @ 000 power customers in the county were left without electricity after the storm . FEMA estimated a damage total of up to \$ 500 million (2003 USD , (\$ 643 million 2016 USD)) in the county .

Moderate wave action produced severe beach erosion along the shore of Baltimore County at a loss of \$ 3 million (2003 USD , (\$ 3 @. @ 86 million 2016 USD)) . Residential areas of Millers Island , Edgemere , North Point , Bowleys Quarters and Turners Station suffered severe damage from the hurricane , with over 400 people needing to be rescued . Over 300 buildings were destroyed . The storm surge flooding killed a man in Dundalk , and either destroyed or greatly damaged most marinas . Strong winds downed 118 trees on school grounds and hundreds of others elsewhere , some of which fell on power lines which resulted in leaving 220 @, @ 000 customers without power . The passage of Hurricane Isabel left 3 @, @ 189 tons (2 @, @ 893 t) of debris across the county .

The storm surge flooded Fells Point and the Inner Harbor of Baltimore , causing millions of dollars of damage to waterfront properties . As the Inner Harbor began to flood , boat owners helped evacuate 35 people in flooded homes . Winds from Isabel destroyed at least three buildings in the city . The Baltimore Museum of Industry alone suffered \$ 1 @. @ 5 million in damage (2003 USD , (\$ 1 @. @ 93 million 2016 USD)) . 70 @, @ 000 were left without power in the city .

In Harford County , high waves and the storm surge caused moderate flooding in areas , forcing 55 to evacuate along the Bush River and 12 to evacuate along the waterfront to Havre de Grace . The promenade boardwalk in Havre de Grace was destroyed . Moderate winds left 51 @, @ 600 residents in the county without power . Damage in the county totaled at least \$ 12 @. @ 5 million (2003 USD , (\$ 16 @. @ 1 million 2016 USD)) .

= = = Western Maryland = = =

The center of Tropical Storm Isabel passed over Garrett County on September 19 , with its unusually large and powerful wind field producing 50 to 60 mph (80 to 95 km / h) wind gusts across western Maryland . Some rainbands produced up to 70 mph (110 km / h) gusts (113 km / h) , and in some areas isolated streaks of damage were described as being caused by tornadoes . Rainfall varied between 2 and 4 inches (50 to 100 mm) across the area , resulting in the Potomac River overflowing its banks . At Point of Rocks , the river crested at 23 @. @ 12 feet (7 m) , 7 @. @ 12 feet (2 @. @ 2 m) above flood stage . Moderate flooding occurred there , and minor flooding occurred in Paw Paw , West Virginia where the river crested at 2 @. @ 91 feet (0 @. @ 9 m) . The flooding closed a portion of the Chesapeake and Ohio Canal .

The gusty winds from the passage of the hurricane resulted in widespread and extensive tree damage . Due to previous rainfall , moist grounds easily allowed for trees to be uprooted . Wind damage to structures was minor , however , with one house in Carroll County being damaged when a tree fell on it . Trees fell onto cars , roads , homes , and power lines , leaving 358 @, @ 000 without power after the storm . 600 traffic signals were without power in Montgomery County , and about 70 roads were closed due to fallen trees . Isabel destroyed 94 buildings and damaged 87 , including 33 homes , six of which were severely impacted with one losing a portion of its roof . Fallen trees injured two in Frederick County . In western Maryland , damage totaled \$ 2 @. @ 07 million (2003 USD , (\$ 2 @. @ 66 million 2016 USD)) .

= = = Washington , D.C. = = =

In Washington , D.C. , sustained winds remained below tropical storm force , though gusts reached 71 mph (114 km / h) as recorded by the National Academy of Science . Hurricane @-@ force winds existed several hundred feet in the air , with wind sensors on the top of tall buildings recording winds of 70 to 85 mph (115 to 135 km / h) . Rainfall was minimal , amounting to around two inches across the district . A gauge on Wisconsin Avenue recorded a storm surge of 11 @. @ 3 feet (3 @. @ 4 m) , and a gauge on a pier in the southwest portion of the district recorded a storm surge of 10 @. @ 25 feet (3 @. @ 1 m) . Both observations were records , surpassing the previous observation set by the 1933 Chesapeake Potomac Hurricane .

Moderate winds blew down about 1 @, @ 600 trees in the district , 23 of which fell onto houses . The United States National Arboretum lost many mature trees and azaleas on the bank of the Anacostia River . The winds also downed many power lines , leaving 129 @, @ 000 customers without power . Many streets were blocked by the fallen trees and power lines . At the White House , the winds downed one tree in the front garden , though there was no damage to the building itself . The storm surge resulted in flooding at the Washington Navy Yard . There , the marina was damaged , and some buildings and cars in low area garages were flooded . Five people were rescued from cars in flood waters during the storm , and several roads were closed due to the flooding . Throughout the district , the passage of Isabel created approximately 30 @, @ 000 pounds (13 @, @ 600 kg) of debris . Damage in Washington , D.C. , totaled \$ 125 million (2003 USD , (\$ 161 million 2016 USD) .

= = Aftermath = =

Power crews restored 75 % of the power outages in the Eastern Shore of Maryland by two days after the hurricane struck , and by one week after the hurricane the power was restored completely to the Eastern Shore . Buildings in Washington , D.C. , remained closed for two days after the hurricane . After the hurricane , several people in central and western Maryland were injured with three killed from carbon monoxide due to improperly running generators in their houses . Additionally , others were injured due to chain saws and cleaning up debris . In the days after the hurricane , the Calvert County Hospital reported an extra 130 patients per day .

The strong winds and storm surge of the hurricane dislodged and damaged a large number of home heating oil tanks , releasing thousands of gallons of oil onto yards and into the environment . The Maryland Department of the Environment and the United States Environmental Protection Agency worked together to recover more than 50 @, @ 000 US gallons (190 @, @ 000 L) of oil from the tanks . Five hundred properties were contaminated by the oil , causing the Federal Emergency Management Agency to provide 75 % of the funding for cleaning the properties , with the government of Maryland providing for the remainder of the cost .

On September 19 , 2003 , President George W. Bush declared the entire state of Maryland as a disaster area , which allowed residents affected by the hurricane to apply for federal aid . FEMA officials urged residents and business owners with significant damage to call as soon as possible , while those with minimal damage were asked to wait for a few days . All residents in the state who received damage from the storm had sixty days to apply for assistance . Federal and state officials opened disaster recovery centers in Annapolis , Baltimore , Essex , and Prince Frederick five days after the hurricane passed through the area , with the centers designed to provide more information to those who applied for federal assistance . About six days after Isabel made landfall , additional disaster recovery centers opened in Rock Hall in Kent County , California in Saint Mary 's County , Silver Spring in Montgomery County , Chester in Queen Anne 's County , Crisfield in Somerset County , Cambridge in Dorchester County , and Easton in Talbot County . Around a month after the hurricane , officials placed some residents unable to live in their damaged homes into travel trailers because they had no options for alternate housing , such as staying with a relative or friend .

On September 26 , the affected residents began receiving housing assistance grants , totaling \$ 4 @. @ 3 million in aid . By a month after the hurricane passed through the area , disaster aid

amounted to just over \$ 30 million (2003 USD , (\$ 38 @. @ 6 million 2016 USD) . Ultimately , aid in the state totalled just under \$ 100 million (\$ 129 million 2016 USD) . Business owners applied for 14 @, @ 595 loans and received \$ 53 @. @ 4 million (\$ 68 @. @ 7 million 2016 USD) in low interest loans from the Small Business Administration . The state also received more than \$ 16 @. @ 9 million in funds (2003 USD , (\$ 21 @. @ 7 million 2016 USD) to rebuild infrastructure damaged by Isabel . 17 @, @ 855 residents applied to receive more than \$ 20 @. @ 8 million (\$ 26 @. @ 8 million 2016 USD) in housing assistance , and \$ 8 million (2003 USD , (\$ 10 @. @ 3 million 2016 USD) in assistance for other needs such as personal property , transportation and medical expenses .

President Bush also declared Washington , D.C. , as a disaster area two days after Isabel passed through the area . The United States Department of Agriculture approved a request for an emergency food stamp program for two weeks for the city to ensure those who lost food as a result of the hurricane would not go hungry . By eight days after the hurricane , the Department of Employment Services created disaster unemployment benefits for those who lost their work as a direct result of Isabel . By 11 days after Isabel , the government approved \$ 5 @. @ 21 million in disaster assistance (2003 USD , \$ 6 @. @ 7 million 2016 USD) . The U.S. Army Corps of Engineers delivered nearly 800 @, @ 000 pounds (363 @, @ 000 kg) of dry ice to four distribution sites for use with cold food storage to areas in the District suffering from power outages . Various groups joined to provide more than 15 @, @ 000 meals for residents who lost stored food due to spoilage resulting from the power outages . Volunteers assisted in distributing 515 tons (467 t) of ice , along with 21 @, @ 000 sandbags throughout the district . Officials opened two disaster recovery centers which moved through the neighborhoods of the district . Ultimately , nearly 1 @, @ 500 residents in the district applied for federal assistance , with FEMA providing the residents more than \$ 600 @, @ 000 in aid (2003 USD , (\$ 772 thousand 2016 USD) .