

Maryland Weather Extremes

Geography and Climate.

Maryland features a vast diversity of landscapes, each of which has a unique geography and climate. The state is separated into five main geographical areas including the Atlantic Coastal Plain, the Piedmont, the Blue Ridge Region, the Appalachian Ridge and Valley and the Appalachian Plateau. The Atlantic Coastal Plain is flat and is generally characterized by marshlands. The Piedmont region is marked by hills and valleys. The Blue Ridge Region features dense woodlands, and the Appalachian Ridge and Valley features farmland and mountainous terrain. The Appalachian Plateau is heavily forested and includes many rivers and mountains. The weather within a region can vary widely, especially where the hills and mountains become more prominent in north central and the western mountains of Maryland. The coldest temperatures generally are on clear nights with light winds. The coldest air can settle in the valleys, while the warm air rises to the hill tops. Central Maryland does have some river valleys with water that drains into the Chesapeake Bay. Baltimore City has the added influence of the Urban Heat Island Effect. This is the presence of asphalt, brick, steel, and concrete that make the city's infrastructure; these materials can hold heat at night, delaying the onset of colder or cooler weather. The Chesapeake Bay is the largest estuary in the world, and also provides a lot of jagged inlets and harbors. This gives Maryland the largest shoreline of all the states in our nation. Yes, more than California and Florida. Central Maryland Region (National Aquarium) Is the primarily the urban and suburban area between Baltimore, Annapolis, and Washington DC. It also includes the northern portion of the Eastern Shore counties of Kent and Cecil. It is around the I-95 corridor where there are some hills, but also the proximity of the Chesapeake Bay. It is the chameleon of the state. This region can get some of the cold air from the north or be influenced by the water and warmer regions to the south. Ty Christopher Taylor 4th Grade William Winchester Elementary Nor'easters & Snowstorms The Appalachian Mountains can affect the type of precipitation that falls in the region. If cold air gets trapped east of the mountains, this can lead to ice

storm conditions along and just east of the mountains. The damming effect can also contribute to new storm development off the mid-Atlantic shore. When coastal storms develop, the colder air remains over the region and significant snowfalls are more likely. Still, the location of the rain-snow line, or the position that decides the type and location of precipitation areas often lies across the larger Baltimore/Washington, D.C. metro area. Sometimes the northwest suburbs receive heavy snowfall while southeastern areas experience all rain or a snow-to-rain transition (I-95 corridor). If the coastal low pressure system is far to the southeast, the northwest suburbs might get no snow, while the southern suburbs are snowed in. This scenario, which often involves a shift in the snow band of 50-100 miles, makes a major difference in observed weather conditions anywhere in the region. Overall, snowfall amounts decrease from about 80 inches in the far western mountain areas to about a foot on Maryland's eastern shore and across Delaware. 14 The region's average annual snowfall (15-20 inches except for mountain locales) often accumulates in a few major storm events. One of the most memorable snowfalls in the region was part of the "Blizzard of '96." This massive storm system formed along the Gulf Coast and then moved northeastward, passing just southeast of Washington, D.C., during the January 6-7 weekend. While only reaching blizzard strength (winds of at least 35 mph and less than 1/4 mile visibility for at least 3 hours) at a few observing locations in this region, blizzard-like conditions occurred elsewhere along its path. Some two to three feet of snow fell across the region and caused the federal government, schools, and businesses to shut down for almost a week. While nor'easters might sometimes look like hurricanes on a satellite image, they are actually different in several ways. Nor'easters (which only occur in the cold season) feed off of cold and warm air interactions in middle latitudes, while hurricanes (occurring in the warm season) thrive on warm air and water in the tropics. Historically more devastating than hurricanes, stalled nor'easters can batter the coast for days, causing severe beach erosion and flooding from high storm surges.

One such storm, the **Ash Wednesday storm of 1962**, was said to be comparable in strength to some of the most intense hurricanes on record. It

was also the strongest nor'easter of the century, according to the U.S. Geological Survey. Waves reaching 25-40 feet in height slammed into the coastlines of Maryland and Delaware, destroying millions of dollars of beachfront property, claiming 40 lives, and causing significant beach erosion throughout its 5-day visit. Because they typically occur during the winter months, nor'easters can also become major snowproducers and have been the cause of some of the Northeast's most memorable snowstorms and blizzards.

***March 12-14, 1993: SUPERSTORM** 20 YEARS AGO THIS WEEK...some refer to this storm as "The storm of the Century". Produced wind gusts of 90 MPH at the beaches, Blizzard conditions in the I-95 Corridor with 10 to 20 inches of snow, and 30 to 35 inches in the Western Maryland Mountains! 270 U.S. deaths from this storm; 44 in Florida via tornados, 200 in NY Over 200 hikers were rescued from North Carolina and the Tennessee mountains. Curfews were enforced in many counties and cities as 'states of emergency were declared from Florida to Maine.

*January 7-13, 1996: **The Blizzard of '96** or the Great Furlough Storm began early on Sunday, January 7. Just two days earlier, a six week impasse between a republican congress and a democratic president over the 1996 Federal Budget had finally come to an end. Many federal employees had been on furlough with government offices shut down. Employees would finally return to work on Monday, January 8. Mother Nature had something else in mind. By Monday morning, Washington, DC was buried under 17 to 21 inches of snow. As much as 30 to 36 inches of snow fell over Frederick and Washington Counties. Baltimore recorded over 22 inches and even Ocean City received 10 inches of snow. A two-foot swath of heavy snow fell across Dorchester and Caroline Counties into southern Kent County, DE. The entire state was paralyzed and the Federal Government remained shut down. As road crews worked hard to clear the snow, an "Alberta Clipper" shot through on Tuesday, January 9 dumping an additional 3 to 5 inches from Washington northeast through Baltimore. Plows that would have been working on secondary roads and residential areas were sent back to the primary roads. The government remained shut for 4 days that week and many schools and businesses announced their

closure for the entire week. A third storm struck on Friday, January 12 dumping another 4 to 6 inches over the metro areas. A maximum of 6 to 12 inches of snow fell over Frederick and Carroll Counties. By the week's end, most of Maryland, west of Baltimore, had seen 3 to 4 feet of snow! Most areas to the east had received 1 to 2 feet! 15 Just one week later, a dramatic warming would occur melting the snow pack with an additional two to three inches of rain falling. No one expected that such a deep snow pack could disappear in just one night. A flood was the result. It had been 60 years since a flood of this type had hit Maryland. The Potomac and Susquehanna saw major flooding. Ice Jams on the lower Susquehanna River compounded the flood. An ice jam broke sending a surge of ice and water down to the Conowingo Dam. It was more than the dam could handle and operators had no choice but to open all of their gates to prevent the dam from being topped. Once water tops a dam, the entire dam can fail. With the gates open, the water surged to the Upper Chesapeake Bay causing a rapid and significant flood to hit the town of Port Deposit just a few miles below the dam. People were able to flee the cold waters, but there was no time to save any belongings. *February 2-3 and February 16, 1996, storms: The Delmarva area received 4 snowstorms in about 5 weeks from January 7 through February 16. The series of big snow storms went on to break an all time record at Baltimore with a season total of 62.5 inches. It broke the old record of 52 inches (set 1963-64 winter season) by almost a foot!

Snow records at Baltimore go back to 1883.

January 14-15, 1999: A low pressure system pushed northeast from the Tennessee Valley spreading rain across the Baltimore-Washington Region. The rain instantly froze to surfaces creating a glaze. After a half to three-quarter inch of ice accumulated on trees and wires, 40 mph winds was enough to bring many of them down. Trees fell on cars, houses, utility lines and roads. The Governor declared a state of Emergency in Harford, Baltimore, Carroll, Howard and Montgomery Counties. About a half a million customers were without power and 800 pedestrians were reported injured from falls on ice. Washington Hospital treated 250 patients for

storm-related injuries on the 15th. 30+ school buses slipped off the road in the region.

January 25, 2000: A storm that was expected to move away from the coast, instead rapidly intensified off Georgia and headed almost due north. The nor'easter spread heavy snow into Maryland by the early morning hours of the 25th. Storm warnings were posted by 10 pm on the 24th, but those who went to bed early without catching the news were startled to see the heavy white stuff falling in the morning. With just 2 to 4 inches of snow on the ground at daybreak, the storm began to pound the area through the morning hours with one and a half inch per hour snow fall and wind gusts of 25 to 45 mph. Blizzard conditions quickly brought the area to a stand-still. Airports and transit systems were shut down. Schools were closed. Federal and state government offices quickly closed once the full impact of the storm was realized. However, some people who begin their commutes well before 7 am were left battling the storm to attempt to return home. The Chesapeake Bay Counties and a band west into Frederick County were hardest hit with a foot to a foot and a half of snow. Drifts of four to five feet were common. Seven storm related fatalities were recorded and numerous injuries. One elderly man died from hypothermia and six more people died of heart attacks while shoveling the heavy snow.

***February 5-6, 9-10 2010:** The 'Snowmageddon' storm as referred to by President Obama was the **biggest snowstorm in 88 years** or since January 28, 1922 the Knickerbocker Snowstorm. The 'Snowmageddon' storm was the 2nd, 3rd, and even 4th significant winter storm for some parts of the Mid-Atlantic States during the 2010 winter season. Baltimore was hit with its 3rd heaviest snowfall with 24.8 inches. Washington D.C. was hit hard with its 4th heaviest snowfall with nearly 18 inches recorded at Reagan National Airport. At nearby Dulles International Airport, the record was shattered with 32 inches. 16 Parts of the Mid-Atlantic states were pounded by yet another major winter storm leaving many areas from Northern West Virginia eastward across Southern Pennsylvania, Northern Virginia, Maryland, Delaware, and Southern New Jersey buried under 1 to 3 feet of snow. 1st storm (Feb. 1st) developed over Baja California over warmer than normal Gulf Stream waters. Hurricanes & Tropical Storms Since 1985,

5 major hurricanes and more than a dozen tropical storms and depressions have made their way up the East Coast to inundate the Northeast and mid-Atlantic with heavy rainfall and strong, damaging winds. One of the most devastating, Hurricane Floyd, dropped more than a foot of rain in several areas along Maryland's Eastern Shore and Delaware. Property damage totaled \$14.75 million on the Eastern Shore and \$8.37 million in Delaware. Two children in Delaware drowned during this event.

***Hurricane Isabel September 18-19, 2003:** Heavy rain and storm surge due to Hurricane Isabel's high winds flooded coastal areas of Maryland and Delaware. The storm track (a southeast-to northwest trajectory west of the Chesapeake Bay) allowed for a storm surge to move up the Bay, inundating parts of downtown Baltimore, vast storm surge impact on the Inner Harbor, including the National Aquarium, which is usually removed from coastal storm surge areas. Not only did Isabel cause more than 1 million residents of Maryland and Washington, D.C., to lose power, but her damage totals crept close to \$1 billion.

August 27-28, 2011: Hurricane Irene caused localized flooding and widespread power outages on August 27-28. The Eastern Shore and Southern Maryland were particularly hard hit. From September 6-9, the remnants of Tropical Storm Lee combined with other weather elements to produce widespread flooding in central Maryland. Forecasters on the day believed that conditions were unfavorable for the development of dangerous thunderstorms and/or super cells. Skies cleared enough to heat the atmosphere, and the air became unexpectedly unstable coming from the west to the east, within Baltimore's Inner Harbor. Radar spotted a line of thunderstorms that suddenly formed moving northwest to southeast across the region towards Baltimore, 40 to 50 mph. High winds, high waves came in contact with a Harbor Water Taxi capsizing it with 25 passengers and 2 crew members on board, 5 guest died from drowning. Severe Weather, Derecho, Heat Waves March 6, 2004: Forecasters on the day believed that conditions were unfavorable for the development of dangerous thunderstorms and/or super cells. Skies cleared enough to heat the atmosphere, and the air became unexpectedly unstable coming from the west to the east, within Baltimore's Inner Harbor. Radar spotted a line

of thunderstorms that suddenly formed moving northwest to southeast across the region towards Baltimore, 40 to 50 mph. High winds, high waves came in contact with a Harbor Water Taxi capsizing it with 25 passengers and 2 crew members on board, 5 guest died from drowning. August 4, 2004: Derecho storm formed in Kentucky, moving northeastward spawning high wind reports in Ohio, West Virginia, Maryland and Pennsylvania. Power lines and trees were downed from Oakland in Western Maryland to Frederick and Taneytown and Central Maryland.

*** June 29-30, 2012: Derecho** Due to an extremely hot and highly unstable atmosphere, temperatures on the south side of a stationary front well in excess of 100°F prompting wide spread excessive heat warnings, the derecho strengthened and produced isolated instances of severe weather as it moved from the west to the east (Chicago through Washington D.C & Central Maryland) The derecho was 17 one of the most destructive and deadly fast-moving severe thunderstorm complexes in North American history. It resulted in 22 deaths, widespread damage and millions of power outages across the entire affected region, some residents without power for over 3 weeks! Heat Wave July 1995: Baltimore/Washington, D.C., is popularly known for being one of the hotter metro areas on the East Coast in summer, and the reputation is well deserved. The entire region can experience severe heat waves.

In July, 1995, temperatures peaked at 99°F, heat indices, which incorporate dew point effects, remained above 120°F. This contributed to two deaths from hyperthermia and eight others due to heat-related exposure. Later that month, oppressive heat was responsible for four more deaths. Heat wave conditions were likely intensified by the urban heat island effect. Farther toward the coast, however, a strong high pressure system during the Independence Day weekend of 1999 caused a heat wave responsible for the deaths of 4 people as well as thousands of chickens along the Delmarva Peninsula. High temperatures and humidity caused heat indices to exceed 110°F and led to record utility demands.

East Coast Extreme Hurricanes

History 1954 Hurricane Hazel on October 15. Hurricane-force gusts swept the eastern half of Maryland. Heavy rains pounded the west. Washington National Airport reported a record sustained wind of 78 mph; a gust of 98 mph. Gusts near 100 mph were common throughout the Chesapeake Bay region and on the Eastern Shore. Severe flooding occurred along the bay and its tidal tributaries. Flash flooding plagued western Maryland, where 3-6 inches of rain fell. Generally, less than 2 inches of rain fell in the eastern half of the state.

1955 Hurricanes Connie and Diane on August 12 and 18, respectively caused major flooding. Strong gales from Connie sunk the tour schooner Levin J. Marvel, about 20 miles south of its home port of Annapolis. Fourteen passengers drowned. Combined heavy rain from Connie and Diane caused major flooding in central Maryland, particularly along the Potomac River.

1972 Hurricane Agnes on June 21-23. Widespread and in some places record flooding made this one of the state's most destructive natural disasters. Many dams were menaced, Thousands of evacuations, primarily in central Maryland. The run-off from tributaries caused an ecological calamity in the Chesapeake Bay.

1975 The remnants of Hurricane Eloise combined with other weather systems to pelt the state from September 23-26. Widespread flooding plagued central Maryland.

1979 Hurricane David produced a tornado outbreak on September 5-6. Gusts of 45 to 60 mph, swept central Maryland. The Baltimore metropolitan area experienced disastrous flash flooding.

1985 Hurricane Gloria tracked about 50 miles offshore on September 27 and caused extensive damage to the Ocean City boardwalk. Several

inches of rain fell on the eastern half of Maryland. Gloria brought gusts of 80 to 90 mph to the coast. 18

1996 Hurricane Fran lashed the state with gales and heavy rain on September 5. A track west of the Chesapeake Bay and lengthy strong winds, gusting 40 to 60 mph, caused severe flooding along the bay and lower Potomac River. Also, flooding from torrential rain resulted in significant losses in western Maryland.

1999 Hurricane Floyd dumped more than 10 inches of rain on the Eastern Shore and along the Chesapeake Bay on September 16-17. Chestertown collected 14.00 inches. Annapolis had 11.60 inches. Floyd's eye passed over Ocean City, with a barometric pressure of 28.88 inches. Gusts in Ocean City peaked at about 60 mph.

2003 Tropical Storm Isabel tracked through the state on September 18, bringing widespread gales. More than nine hours of high winds created extreme flooding/storm surge along the Chesapeake Bay and its tidal tributaries. Isolated gusts near hurricane force blasted the Chesapeake region. Record power outages plagued the state.

2004 Hurricanes

Frances (Sept. 8)

Ivan (Sept 17)

Jeanne (Sept. 28)

These brought tornado outbreaks and flooding, particularly to central and western Maryland 2011 Hurricane Irene caused localized flooding and widespread power outages on August 27-28. The Eastern Shore and Southern Maryland were particularly hard hit.

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2012

Hurricane Sandy lashed Maryland on October 29-30 with isolated hurricane force gusts and widespread gales, heavy rain in the eastern two-thirds of

the state and significant snow wet snow, 30" in the western Maryland. The Ocean City fishing pier was partially destroyed and bay sections flooded.

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Graphs, and Photo Credits Ty Christopher Taylor 4th Grade William Winchester Elementary Maryland

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