12. SEVERE WINTER WEATHER

12.1 HAZARD PROFILE

12.1.1 Hazard Description

A winter storm is a weather event in which the main types of precipitation are snow, sleet, or freezing rain. They can be a combination of heavy snow, blowing snow, and dangerous wind chills and are typically accompanied by low temperatures. According to the National Severe Storms Laboratory (NSSL), the following three basic components are needed to make a winter storm (NOAA 2021):

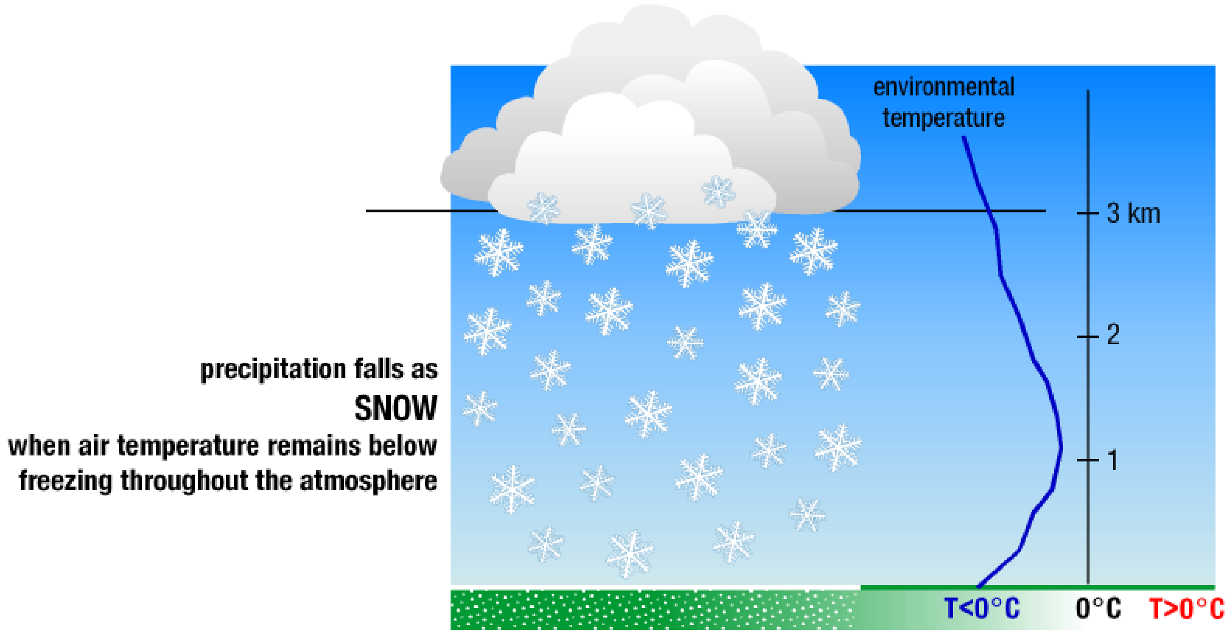
- Below freezing temperatures (i.e., cold air) in the clouds and near the ground to make snow and ice.
- Lift, something to raise the moist air to form clouds and cause precipitation, such as warm air colliding with cold air and being forced to rise over the cold dome or air flowing up a mountainside (oliographic lifting).
- Moisture to form clouds and precipitation, such as air blowing across a large lake or the ocean.

Some winter storms can immobilize an entire region, while others might only affect a single community. The aftermath of a winter storm can impact a community or region for days, weeks, or even months, potentially causing cold temperatures, flooding, storm surge, closed or blocked roadways, downed utility lines, and power outages. Cape May County County's winter storms include, but are not limited to heavy snow, blizzards, sleet, ice storms, and nor'easters.

Heavy Snow

According to the National Snow and Ice Data Center (NSIDC), snow is precipitation in the form of ice crystals (NSIDC 2024). It originates in clouds when temperatures are below the freezing point (32 °F) and water vapor in the atmosphere condenses directly into ice without going through the liquid stage. Once an ice crystal has formed, it absorbs and freezes additional water vapor from the surrounding air, growing into snow crystals or a snow pellet, which then falls to the earth. Snow falls in different forms: snowflakes, snow pellets, or sleet. Snowflakes are clusters of ice crystals that form from a cloud. Figure 12-1 depicts snow creation.

Figure 12-1. Snow Creation



Source: NOAA 2023

Blizzards

A blizzard is a winter snowstorm with sustained or frequent wind gusts of 35 miles per hour (mph) or more, accompanied by falling or blowing snow reducing visibility to or below 0.25 mile, as the predominant conditions over a three-hour period (NOAA NWS n.d.). Extremely cold temperatures often are associated with blizzard conditions but are not a formal part of the definition. The hazard, created by the combination of snow, wind, and low visibility, significantly increases when temperatures are below 20°F. A severe blizzard is categorized as having temperatures near or below 10°F, winds exceeding 45 mph, and visibility reduced by snow to near zero (NOAA NWS n.d.). For more information on the extreme temperature hazard, refer to Chapter 9 (Extreme Temperatures).

Storm systems powerful enough to cause blizzards usually form when the jet stream dips far to the south, allowing cold air from the north to clash with warm, moister air from the south. Blizzard conditions often develop on the northwest side of an intense storm system. The difference between the lower pressure in the storm and the higher pressure to the west creates a tight pressure gradient, resulting in strong winds and extreme conditions caused by the blowing snow (Lam 2019).

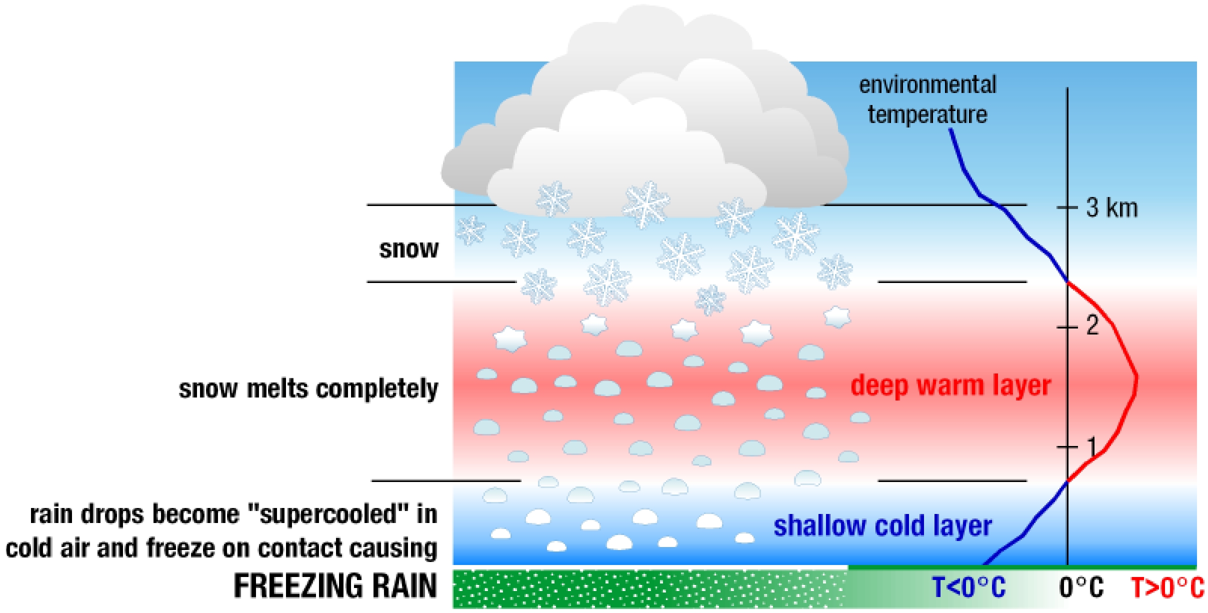
Ice Storms

An ice storm describes those events when damaging accumulations of ice are expected during freezing rain situations. Significant ice accumulations typically are accumulations of 0.25-inches or greater (NOAA n.d.). Heavy accumulations of ice can bring down trees, power lines, utility poles, and communication towers. Ice can disrupt communications and power for days. Even small accumulations of ice can be extremely dangerous to motorists and pedestrians (NWS 2019). Figure 12-2 depicts freezing rain creation.

- **Sleet** is made up of drops of rain that freeze into ice as they fall. They are usually smaller than 0.30 inch in diameter (NSIDC 2013). A sleet storm involves significant accumulations of solid pellets, which form from the freezing of raindrops or partially melted snowflakes, causing slippery surfaces that pose a hazard to pedestrians and motorists (NWS 2009).

- **Freezing Rain** occurs when rain falls into areas that are below freezing and turns to ice on the ground and other surfaces. For this to occur, ground-level temperatures must be colder than temperatures aloft. Freezing rain can also occur when the air temperature is slightly above freezing but the surface that the rain lands upon is still below freezing from prior cold air temperatures (NWS 2009).

Figure 12-2. Freezing Rain Creation



Source: NOAA 2023

Nor'easter

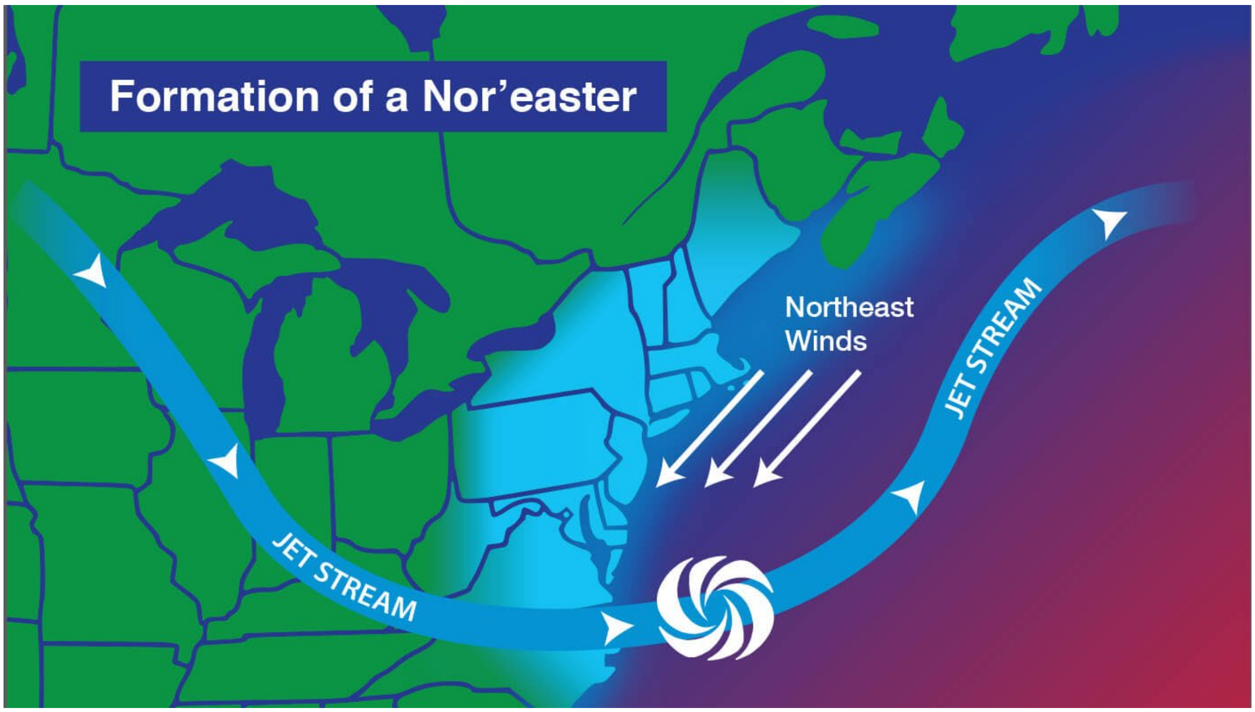
A nor'easter is a cyclonic storm that moves along the East Coast of North America. It is called a nor'easter because the damaging winds over coastal areas blow from a northeasterly direction. Nor'easters can occur any time of the year but are most frequent and strongest between September and April. These storms usually develop between the States of Georgia and New Jersey within 100 miles of the coastline and typically move from southwest to northeast along the Atlantic Coast of the United States (NWS n.d.).

To be called a nor'easter, a storm must have the following conditions, as per the Northeast Regional Climate Center (NRCC) (Hirsch 2000):

- Must persist for at least a 12-hour period.
- Have a closed circulation.
- Be located within the quadrilateral bounded at 45°N by 65° and 70°W, and at 30°N by 85°W and 75°W.
- Show general movement from the south-southwest to the north-northeast.
- Contain wind speeds greater than 23 mph.

A nor'easter event can cause storm surges, waves, heavy rain, heavy snow, wind, and coastal flooding. Nor'easters have diameters that can span 1,200 miles, impacting large areas of coastline. The forward speed of a nor'easter is usually much slower than a hurricane, so with the slower speed, a nor'easter can linger for days and cause tremendous damage to those areas impacted. Each year, the northeastern United States experiences approximately 20 to 40 nor'easters, with at least two classified as severe. In the State of New Jersey, 10 to 20 nor'easters can occur annually, with about five to 10 of these having a significant impact on the State (Storm Solutions 2014). The intensity of a nor'easter can rival that of a tropical cyclone in that, on occasion, it may flow or stall off the mid-Atlantic coast resulting in prolonged episodes of precipitation, coastal flooding, and high winds. Figure 12-3 displays the formation of a Nor'easter.

Figure 12-***3***. Formation of a Nor'easter



Source: NOAA 2023

12.1.2 Location

Heavy Snow

Winter storms tend to have the heaviest snowfall within a 150-mile-wide swath to the northwest of what are generally southwest to northeast moving storms. Depending on whether all or a portion of New Jersey falls within this swath, the trajectory determines which portion of the State (or all of the State) receives the heaviest amount of snow. Between 1945 and 2006 (the most recently available record), Cape May County received 14 inches of snow on average every year, based on totals measured by the U.S. Climate Data (U.S. Climate Data 2025)

Blizzards

A blizzard's trajectory—whether it passes close to the New Jersey coast or at a distance—largely determines which portion of the County receives the heaviest amount of snow. Severe winter weather events tend to have the heaviest snowfall within a 150-mile-wide swath to the northwest of what are generally southwest to northeast moving storms.

Ice Storms

All regions of the State are subject to ice storms. The distribution of ice storms often coincides with general distribution of snow within several zones in the State (NJOEM 2024). A cold rain may be falling over the southern portion of the State, freezing rain over the central region, and snow over the northern counties as a coastal storm moves northeastward offshore. A locality's distance to the passing storm center is often the crucial factor in determining the temperature and type of precipitation during a winter storm.

Nor'easter

Historical data shows that several nor'easters have impacted New Jersey. Nor'easters can occur any time of the year but are most frequent and strongest between September and April (NWS n.d.). The entire State of New Jersey is susceptible to the effects of these storms, depending on the storm's track. However, coastal communities and other low-lying areas of the State are particularly vulnerable. As development and re-development increase, even less-intense storms may lead to costly storm damage. Most of the damage following these storms often results from residual wind damage, as was demonstrated during recent storms.

12.1.3 Extent

Heavy Snow, Blizzards, and Ice Storms

The magnitude or severity of a severe winter weather depends on several factors, including snowfall rates, regional climatological susceptibility to snowstorms, snowfall amounts, wind speeds, temperatures, visibility, storm duration, topography, time of occurrence during the day and week (e.g., weekday versus weekend), and time of season.

The extent of severe winter weather can be classified both by meteorological measurements and by evaluating societal impacts. The National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC) is currently producing the Regional Snowfall Index (RSI) for significant snowstorms that impact the eastern two-thirds of the United States. The RSI ranks snowstorm impacts on a scale from 1 to 5 and is based on the spatial extent of the storm, the amount of snowfall, and the interaction of the extent and snowfall totals with population. The NCDC has analyzed and assigned RSI values to over 500 storms since 1900 (NOAA n.d.). Table 12-1 presents the five RSI ranking categories.

Table 12-1. RSI Ranking Categories

Category	Description	RSI Value
1	Notable	1–3
2	Significant	3–6
3	Major	6–10
4	Crippling	10–18
5	Extreme	18.0+

Source: NOAA n.d.

Sleet accumulation is measured and tracked in a method similar to snow. Ice accumulation is determined by taking the average from the thickest and thinnest portions of ice on a sample used for measurement. Ice does not coat the surface of objects evenly, as gravity typically forces rainwater to the underside of an object before it freezes. Wind can also force rainwater downward prior to freezing, resulting in a thicker coating of ice on one side of the object than the other side (NWS n.d.).

The NWS operates a widespread network of observing systems, such as geostationary satellites, Doppler radars, and automated surface observing systems that feed into the current state-of-the-art numerical computer models to provide a look into what will happen next, ranging from hours to days. The models are then analyzed by NWS meteorologists who then write and disseminate forecasts (NOAA 2017).

The NWS operates a widespread network of observing systems that feed into computer models to forecast weather for the upcoming hours and days. NWS meteorologists analyze the model output and disseminate forecasts (NWS n.d.). The NWS issues alerts to help people anticipate approaching storms (NWS n.d., NWS 2009):

- A ***winter storm watch*** is issued when severe winter conditions (heavy snow, ice, etc.) may affect a certain area, but its occurrence, location, and timing are uncertain. A watch is issued to provide 24 to 72 hours of notice of the possibility of severe winter weather.
- A ***winter storm warning*** is issued when hazardous winter weather, in the form of heavy snow, heavy freezing rain, or heavy sleet, is imminent or occurring. A warning is usually issued 12 to 24 hours before the event is expected to begin.
- A ***winter weather advisory*** is issued when a hazardous winter weather event is occurring, is imminent, or has a greater than 80 percent chance of occurrence. Advisories are used to inform people that winter weather conditions are expected to cause significant inconveniences and that conditions may be hazardous. These conditions may refer to sleet, freezing rain, or ice storms, in addition to snow events.
- NWS may issue a ***blizzard warning*** when snow and strong winds combine to produce the potential for blinding snow, deep drifts, and wind chill.

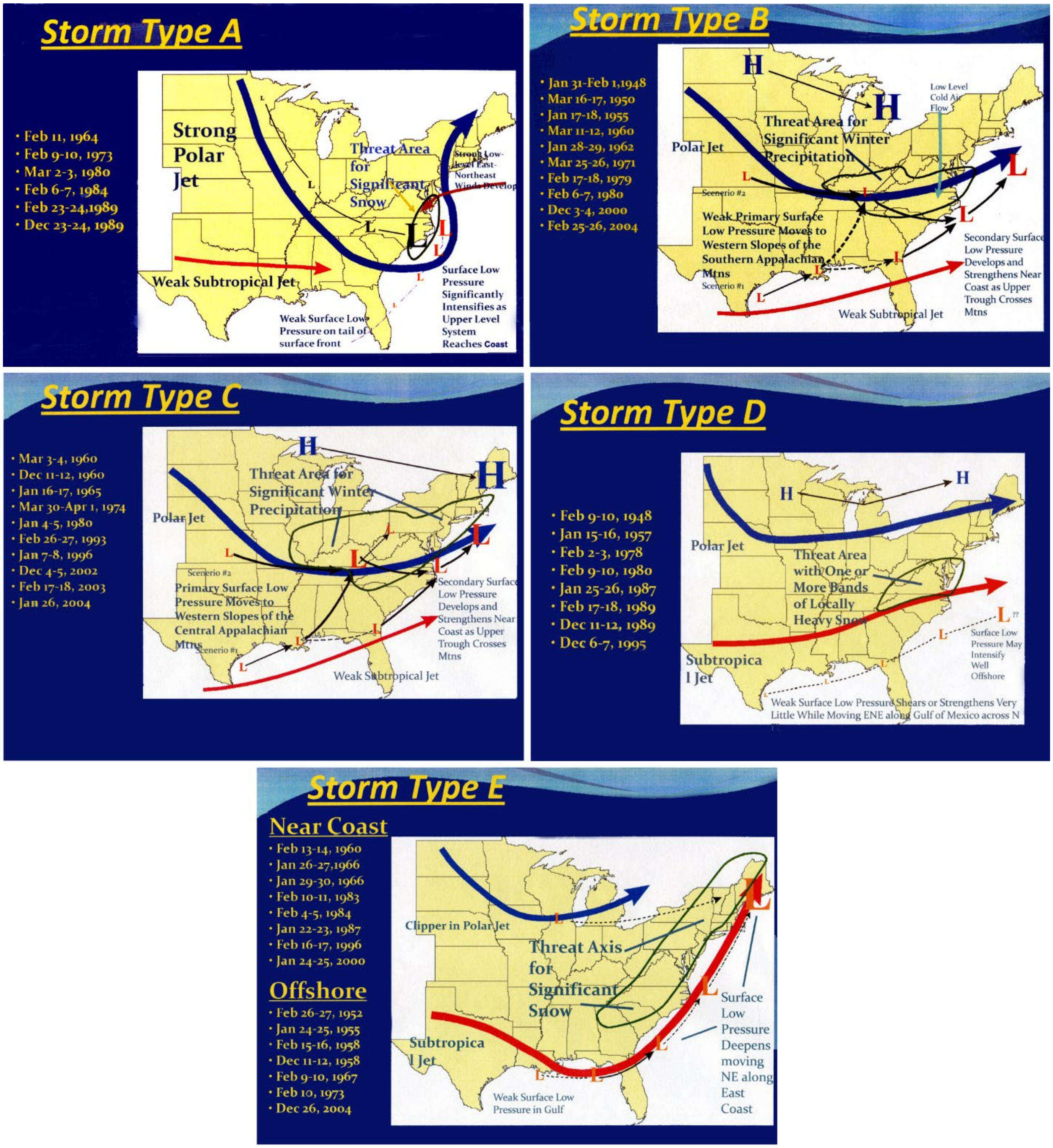
Nor’easter

The extent of a nor’easter can be classified by meteorological measurements and by evaluating its societal impacts. Nor’easters have the potential to impact society to a greater extent than hurricanes and tornadoes. These storms often have a diameter three to four times larger than a hurricane and therefore impact much larger areas. More homes and properties become susceptible to damage as the size and strength of a nor’easter intensifies (NWS n.d.). The severity of a nor’easter depends on several factors including a region’s climatological susceptibility to snowstorms, snowfall amounts, snowfall rates, wind speeds, temperatures, visibility, storm duration, topography, time of occurrence during the day (e.g., weekday versus weekend), and season.

Nor’easters are classified into two major categories, which were developed by researcher J. E. Miller in 1946. The first type of nor’easter, and the most common, is the Miller Type A nor’easter. These classic nor’easters form in the Gulf of Mexico and develop into full-fledged storms that moves along the East Coast. Miller Type B nor’easters originate as low-pressure systems in the United States' Midwest. These less-common systems diminish after crossing the Appalachian Mountains and reform into nor’easters on the East Coast (National Geographic 2022).

A study written by Albright and Cobb (2004) showed that there are five predominant patterns that produce four inches or more of snowfall across the Mid-Atlantic. They added classification types C through E, adding onto the Miller Classification (Siebers n.d.). View Figure 12-5 for visuals on the formation of each Miller Category.

Figure 12-4. Nor'easter Miller Classifications



Source: Siebers n.d.

12.1.4 Previous Occurrences

FEMA Major Disaster and Emergency Declarations

Between 1954 and 2025, Cape May County was included in seven major disaster (DR) or emergency (EM) declarations for severe winter weather-related events (FEMA 2025). Table 12-2 lists these declarations.

Table 12-2. FEMA Declarations for Severe Winter Weather Events in Cape May County (1954 to 2025)

FEMA Declaration Number	Date(s) of Event	Date of Declaration	Event Type
DR-528-NJ	February 8, 1977	February 8, 1977	Severe Ice Storm
DR-973-NJ	December 10-17, 1992	December 18, 1992	Coastal Storm, High Tides, Heavy Rain, Flooding
EM-3106-NJ	March 13-17, 1993	March 17, 1993	Snowstorm
DR-1088-NJ	January 7-12, 1996	January 13, 1996	Snowstorm
DR-1206-NJ	February 4-8, 1998	March 3, 1998	Severe Winter Coastal Storm, High Winds, Flooding
EM-3181-NJ	February 16,-17, 2003	March 20, 2003	Snowstorm
DR-1867-NJ	November 11-15, 2009	December 22, 2009	Severe Storms and Flooding Associated with Tropical Depression Ida and a Nor'easter
DR-1889-NJ	February 5,-6, 2010	March 23, 2010	Snowstorm
DR-1954-NJ	December 26-27, 2010	February 4, 2011	Snowstorm
DR-4264-NJ	January 22-24, 2016	March 14, 2016	Severe Winter Storm and Snowstorm
DR-4597-NJ	January 31 – February 2, 2021	April 28, 2021	Snowstorm

Sources: FEMA 2025

USDA Declarations

The Secretary of Agriculture from the U.S. Department of Agriculture (USDA) is authorized to designate counties as disaster areas to make emergency loans to producers suffering losses in those counties and in contiguous counties. Between August 2019 and March 2025, Cape May County was not included in any USDA severe winter weather-related agricultural disaster declarations (USDA 2025).

Previous Events

Known hazard events that impacted Cape May County between August 2019 and March 2025 are discussed in Table 12-3. For events prior to 2019, refer to the 2019 Cape May County HMP.

Table 12-3. Severe Winter Weather Events in Cape May County (2019 to 2025)

Event Date	FEMA Declaration or State Proclamation Number	Cape May County included in declaration?	Location Impacted	Description
January 12, 2019	N/A	N/A	Local	Local winter weather resulted in up to 4 inches of snowfall in North Cape May and 3 inches in Cape May Harbor.
February 1, 2019	N/A	N/A	Local	Winter weather caused 3 inches of snowfall in Wildwood Crest and Green Creek.
February 10- 20, 2019	N/A	N/A	Countywide	Winter weather caused 2 inches of snow fall across the norther half of the County. Up to 2.3 inches were recorded in Eldora. No severe damage was recorded.
March 1, 2019	N/A	N/A	Local	Local winter weather caused up to 2.8 inches of snow fall in Seaville.
October 9-12, 2019	N/A	N/A	Countywide	A distant but stalled coastal storm generates a week of strong north/northeast winds but no rain. High tides flood streets over the course of four days, reaching the moderate threshold on two days.
April 21, 2020	N/A	N/A	Countywide	A strong cold front caused hail to occur throughout the County. No severe damage was recorded.
September 1, 2020	N/A	N/A	Countywide	There were reports of quarter size hail (approximately one inch in diameter) in Ocean City and Petersburg.
January 31 – February 2, 2021	DR-4597-NJ	Yes	Regional	Snowstorm
February 11, 2021	N/A	N/A	Countywide	Winter weather resulted in light snow fall across the County. Up to 4 inches of snow was recorded in Dennisville and 3.8 inches in Ocean City.
January 3-7, 2022	N/A	N/A	Regional	A snowstorm resulted in up to 12 inches of snowfall. A report of 11.3 inches of snow was seen in Ocean View.
January 29, 2022	N/A	N/A	Regional	A blizzard was recorded across the region resulting in 15 inches of snow fall widespread across the County. No severe damage was recorded.
December 23, 2022	N/A	N/A	Regional	Light precipitation during a strong Arctic cold front resulted regional winter weather. Flash freezes were recorded in the County on untreated surfaces and icy roadways as temperatures dropped below freezing.
January 15-19, 2024	N/A	N/A	Regional	Winter weather was seen throughout the region causing snowfall and ice accumulation. Dennisville received up to 4.9 inches of snowfall, the most in the County.

Event Date	FEMA Declaration or State Proclamation Number	Cape May County included in declaration?	Location Impacted	Description
February 17, 2024	N/A	N/A	Countywide	Winter weather caused snowfall throughout the County. The most snowfall was recorded in Woodbine with 3 inches of snow.
January 6-7, 2025	N/A	N/A	Countywide	A winter storm brought heavy banded snow. Moderate to heavy snowfall with totals ranging from 5-9 across Cape May County occurred, with the highest report of 9.7 inches.
January 11, 2025	N/A	N/A	Countywide	A winter system brought widespread light snowfall to Cape May County. Light snowfall with totals ranging from 1-2 occurred across Cape May County. The highest report was 2.2 from Rio Grande.
February 6, 2025	N/A	N/A	Countywide	A winter system brought a wintry mix of sleet, freezing rain, and snow across the County. Wintry mix changed to rain across much of the area before ending by the afternoon.
February 8, 2025	N/A	N/A	Countywide	A wintry mix of freezing rain and some sleet occurred. Trace amounts of sleet were reported in several locations, including Woodbine and Ocean City. No freezing rain measurements were received, however surrounding reports indicate less than 0.1 occurred.
February 11-12, 2025	N/A	N/A	Countywide	A winter storm brought light to moderate snowfall to the County. Totals reached around 6-8 inches. The highest reported total was 8.8 inches.

Sources: FEMA 2025; NOAA NCEI 2025

12.1.5 Probability of Future Occurrences

Information on previous severe winter weather occurrences in the County was used to calculate the probability of future occurrence of such events, as summarized in Table 12-5. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. In Chapter 14, the identified hazards of concern for Cape May County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Steering Committee, the probability of occurrence for severe winter weather in the County is considered “*frequent*”.

Table 12-4. Probability of Future Severe Winter Weather Events in Cape May County

Hazard Type	Number of Occurrences Between 1950 and 2025	Percent Chance of Occurring in Any Given Year
Blizzard	4	5.33%

Hazard Type	Number of Occurrences Between 1950 and 2025	Percent Chance of Occurring in Any Given Year
Frost/Freeze	3	4.00%
Heavy Snow	24	32.00%
Ice Storm	1	1.33%
Sleet	2	2.66%
Winter Storm	23	30.66%
Winter Weather	93	100%
Snowstorm	6	8.00%
Total	**156**	**100.00%**

Sources: NOAA NCEI 2025; FEMA 2025

Notes: Due to limitations in data, not all severe winter weather events occurring between 1950 and 1996 are accounted for in the tally of occurrences. As a result, the number of hazard occurrences is calculated using the number of occurrences between 1950 and 2025. Nor'easter events are not tracked in the NCEI database but are often recorded as winter storms.

100% probability indicates that it is statistically likely for an event to occur every year. It does not indicate that the occurrence of an event is a certainty in any given year.

Table 12-4 does not include the annual probability of nor'easters or freezing rain because these events are not discretely recorded in the National Centers for Environmental Information (NCEI) database. Because of limitations in classifying and tracking of nor'easter events, it is nearly impossible to assign probabilities to nor'easters, except over the long-term. High activity seasons are when storm activity exceeds the historical 75th percentile. This means that seasons with this number of storms are expected to occur during one out of four years. Lower activity seasons are defined as when storm activity falls below the historical 75th percentile; meaning this number of storms are expected to occur during three out of four years (NWS n.d.).

Climate Change Projections

Projections of climate change for New Jersey predict higher temperatures, more intense rainfall events, and increases in total annual precipitation (NJDEP 2020). There is a lack of quantitative data to predict how future climate change will affect snowfall and ice storms in New Jersey. It is likely that the number of winter weather events will decrease, and the winter weather season will shorten. However, it is also possible that the intensity of winter weather events may increase. The exact effect on winter weather is still highly uncertain (Sustainable Jersey Climate Change Adaptation Task Force 2011). Future enhancements in climate modeling will provide an improved understanding of how the climate will change and impact Cape May County.

12.1.6 Cascading Impacts on Other Hazards

Severe winter weather may exacerbate flooding. As discussed, the heavy precipitation and freezing and thawing of snow and ice can create major flooding issues in the County. Nor'easter events can also create coastal flooding which can impact the southeastern portion of the County. Refer to Chapter 10 (Flood) for more information about the flood hazard of concern.

Severe winter weather events, especially nor'easters, often coincide with or are followed by extreme cold events and generate strong winds that create very low wind chills. For more information on the extreme cold hazard, refer to Chapter 8 (Extreme Temperature).

High winds and ice and snow accumulation can be destructive to the functionality of utilities by breaching power lines and disconnecting the utility systems. Severe winter weather could also result in trees and branches falling due to ice, snow, and strong winds. Fallen trees and branches increase available fuel for wildfires. For more information on the wildfire hazard, refer to Chapter 13 (Wildfire).

12.2 VULNERABILITY AND IMPACT ASSESSMENT

All of Cape May County is exposed and vulnerable to the winter storm hazard. In general, structural impacts include damage to roofs and building frames, rather than building content. Current modeling tools are not available to estimate specific losses for this hazard. A qualitative analysis was conducted to assess the county’s vulnerability to this hazard of concern.

12.2.1 Life, Health, and Safety

Overall Population

The entire population of Cape May County (95,263) is exposed to severe winter weather events (US Census Bureau 2020). According to the NOAA, winter weather indirectly and deceptively kills hundreds of people in the U.S. each year, primarily due to automobile accidents, overexertion, and exposure. These events are often accompanied by strong winds, creating blizzard conditions with blinding wind-driven snow, drifting snow, extreme cold temperatures, and dangerous wind chills (NOAA n.d.). People can die in traffic accidents on icy roads, suffer heart attacks while shoveling snow, or succumb to hypothermia from prolonged exposure to cold. Heavy accumulations of ice can bring down trees and power lines, disabling electric power and communications for days or weeks. Heavy snow can immobilize a region and paralyze a city, shutting down all air and rail transportation and disrupting medical and emergency services (NOAA 2023).

Socially Vulnerable Population

The homeless, elderly, children, and low-income individuals are particularly vulnerable to severe winter weather hazards. The elderly are at an increased risk of injuries and fatalities due to falls, overexertion, and hypothermia, often resulting from efforts to clear snow and ice. This vulnerability is exacerbated by factors such as reduced mobility, chronic health conditions, and a diminished ability to regulate body temperature. Children are also at heightened risk due to their smaller body size, which makes them more susceptible to hypothermia, and their dependence on adults for appropriate winter clothing and shelter. Low-income individuals frequently lack access to adequate heating, proper winter attire, and safe housing, increasing their exposure to extreme cold. The homeless population faces significant risks due to prolonged exposure to the elements, limited access to warm shelters, and challenges in obtaining necessary resources to remain safe during harsh winter conditions (US Census 2022).

Without a quantitative assessment of potential impacts of severe winter weather on socially vulnerable populations, the Planning Partners can best assess mitigation options through an understanding of the general numbers and locations of such populations across Cape May County. Table 12-5 summarizes the highlights of this information. For planning purposes, it is reasonable to assume that the percentages and distribution of socially vulnerable populations affected by drought will be similar to the countywide numbers.

Table 12-5. Cape May County Socially Vulnerable Populations by Jurisdiction

Category	Cape May County Total		Municipality Highest in Category		Municipality Lowest in Category	
	Number	Percent	Number	Percent	Number	Percent
			Lower (T)	Avalon (B)	Cape May Point (B)	Wildwood (C)
Population Over 65	**26,529**	**27.8%**	**5,517**	**61.5%**	**118**	**15.5%**
			Lower (T)	Dennis (T)	Cape May Point (B), North Wildwood (C)	Cape May Point (B), North Wildwood (C)
Population Under 5	**4,117**	**4.3%**	**1,111**	**7.7%**	**0**	**0.0%**
			Middle (T)	Wildwood (C)	Avalon (B), Cape May Point (B), North Wildwood (C), Stone Harbor (B), West Wildwood (B), Wildwood Crest (B)	Avalon (B), Cape May Point (B), North Wildwood (C), Stone Harbor (B), West Wildwood (B), Wildwood Crest (B)
Non-English-Speaking Population	**1,408**	**1.5%**	**497**	**7.2%**	**0**	**0.0%**
			Lower (T)	Woodbine (B)	Cape May Point (B)	Cape May (C)
Population With Disability	**14,049**	**14.7%**	**3,632**	**35.8%**	**43**	**6.0%**
			Lower (T)	Woodbine (B)	West Wildwood (B)	Upper (T)
Population Below Poverty Level	**8,443**	**8.9%**	**2,369**	**30.4%**	**18**	**1.8%**

Source: U.S. Census Bureau 2022 ACS Vulnerable Population Totals

12.2.2 General Building Stock

The entire general building stock inventory is exposed and vulnerable to severe winter weather hazards, with aging infrastructure being particularly at risk. Older buildings may be more susceptible due to less stringent building codes and the use of less resilient materials. Extreme blizzards or snowstorms can carry and deposit significant amounts of snow, which can be heavy enough to damage roofs and aging buildings. High winds associated with these storms can also cause structural damage. Additionally, the freeze/thaw cycle can further weaken building materials, leading to cracks and other forms of deterioration. Some building materials, such as wood, are more vulnerable to these conditions. In general, the structural impacts of severe winter weather include partial damage to roofs and building frames, rather than the complete destruction of buildings. This vulnerability is not only due to the infrastructure itself but also to the environmental stresses imposed by severe winter weather.

Current modeling tools are not available to estimate specific losses for this hazard. As an alternate approach, this plan considers percentage damages that could result from severe winter storm conditions. Table 12-6 summarizes percent damages that could result from severe winter storm conditions for the Planning Area's total general building stock. Given professional knowledge and the currently available information, the potential loss for this hazard is considered to be overestimated because of varying factors (building structure type, age, load distribution, building codes in place, etc.). Therefore, the following information should be used as estimates only for planning purposes with the knowledge that the associated losses for severe winter weather events vary greatly.

Table 12-6. General Building Stock Exposure and Estimated Losses from Severe Winter Weather Events

Jurisdiction	Total Replacement Cost Value (RCV) *STRUCTURE ONLY*	1-Percent of Total Replacement Cost Value	5-Percent of Total Replacement Cost Value	10-Percent of Total Replacement Cost Value
Avalon (B)	$16,995,660,013	$169,956,600	$849,783,001	$1,699,566,001
Cape May (C)	$9,887,681,223	$98,876,812	$494,384,061	$988,768,122
Cape May Point (B)	$1,115,268,285	$11,152,683	$55,763,414	$111,526,829
Dennis (T)	$5,103,464,814	$51,034,648	$255,173,241	$510,346,481
Lower (T)	$14,395,215,040	$143,952,150	$719,760,752	$1,439,521,504
Middle (T)	$16,236,957,216	$162,369,572	$811,847,861	$1,623,695,722
North Wildwood (C)	$7,468,894,485	$74,688,945	$373,444,724	$746,889,449
Ocean (C)	$29,039,901,438	$290,399,014	$1,451,995,072	$2,903,990,144
Sea Isle (C)	$15,832,258,528	$158,322,585	$791,612,926	$1,583,225,853
Stone Harbor (B)	$5,400,079,902	$54,000,799	$270,003,995	$540,007,990
Upper (T)	$9,445,962,731	$94,459,627	$472,298,137	$944,596,273
West Cape May (B)	$1,836,355,315	$18,363,553	$91,817,766	$183,635,532
West Wildwood (B)	$704,337,461	$7,043,375	$35,216,873	$70,433,746
Wildwood (C)	$7,614,997,341	$76,149,973	$380,749,867	$761,499,734
Wildwood Crest (B)	$7,662,804,650	$76,628,047	$383,140,233	$766,280,465
Woodbine (B)	$1,816,078,321	$18,160,783	$90,803,916	$181,607,832
Cape May County	**$150,555,916,763**	**$1,505,559,168**	**$7,527,795,838**	**$15,055,591,676**

Source: Cape May County 2024; RS Means 2024

A specific area that is vulnerable to severe winter weather is the floodplain. Severe winter weather can cause flooding through blockage of streams or through snow melt. At-risk residential infrastructures are presented in the flood hazard profile (Chapter 10). Generally, losses resulting from flooding associated with severe winter storms should be less than that associated with a 100-year flood. Please refer to the Severe Weather (Chapter 11) profile for losses resulting from high winds which may also accompany severe winter weather.

12.2.3 Community Lifelines and Other Critical Facilities

Full functionality of critical facilities such as police, fire, and medical facilities is essential for response during and after severe winter weather events. These critical facility structures are largely constructed of concrete and masonry; therefore, they should only suffer minimal structural damage from severe winter weather events. Because power interruption can occur, backup power is recommended. Infrastructure at risk for this hazard includes roadways that could be damaged due to the application of salt and intermittent freezing and warming conditions that can damage roads over time. Severe snowfall requires clearing roadways and alerting citizens to dangerous conditions.

Following the winter season, resources for road maintenance and repair of winter weather related damages including cracks and potholes caused by freezing plowing are required (NWS 2019).

Heavy accumulations of snow and ice can bring down trees, electrical wires, telephone poles and lines, and communication towers. Communications and power can be disrupted for days while utility companies work to repair the extensive damage. Bridges and overpasses are particularly dangerous because they freeze before other surfaces (NWS 2019). Heavy snow can immobilize a region and paralyze a region, shutting down all air and rail transportation and disrupting medical and emergency services (NOAA 2023).

12.2.4 Economy

The severity and duration of severe winter weather events can cause significant damage to the general building stock, critical facilities, and community lifelines. This damage may include roof damage from heavy snow loads, structural damage from downed trees, and power outages. The financial burden of snow and ice removal, roadway treatments (such as salt and brine), and road repairs from the freeze/thaw process and plowing can strain local resources. Additionally, severe winter weather disrupts commuting for work or school, as power outages and road closures prevent travel within and outside the County, potentially leading to a loss in economic productivity. The economic impact of winter weather each year is substantial, with costs for snow removal, damage, and business losses reaching millions of dollar(NOAA 2023).

According to FEMA's National Risk Index, Cape May County's expected annual losses from severe winter weather events are as follows (FEMA 2024):

- Ice Storm: Over $97,000,000
- Winter Weather: Over $88,000,000

12.2.5 Natural, Historic and Cultural Resources

Natural

Excessive snowfall can significantly affect natural processes, such as the flow within water resources. Winter weather not only alters these natural processes but also has residual impacts on the environment due to the methods communities use to maintain their infrastructure during severe winter conditions (NSIDC n.d.).

Rain-on-snow events, which occur when rain falls onto an existing snowpack and freezes, forming an ice crust, can exacerbate runoff rates during warming winter weather. Consequentially, these flow rates and excess volumes of water can erode banks, tear apart habitat along the banks and coastline, and disrupt terrestrial plants and animals. Road-salt runoff can cause groundwater salinization, modify the soil structure, and result in loss or reduction in lake turnover. Additionally, road salt can cause changes in the composition of aquatic invertebrate assemblages and pose threats to birds, roadside vegetation, and mammals (Tiwari and Rachlin 2018).

Historic

Historic sites are at risk from the extreme cold or freeze hazard. Historic buildings may be susceptible to damage from severe winter weather conditions. Proper strategies help safeguard buildings and their contents. Sudden and dramatic fluctuations in heating or cooling should be minimized. Slower heating and cooling give building materials and stored contents time to acclimate to new temperatures in the building and corresponding new humidity levels (CCAHA 2019).

Cultural

Cultural resources, such as historic buildings, archaeological sites, and artifacts, are particularly vulnerable to severe winter weather due to several factors. Freeze-thaw cycles can cause significant damage as water seeps into cracks, freezes, expands, and then thaws, leading to the gradual breakdown of materials like stone, brick, and mortar. Snow and ice introduce moisture into structures and artifacts, which can freeze and cause expansion and cracking, while fluctuating humidity levels can deteriorate organic materials like wood and textiles. The weight of accumulated snow and ice can stress roofs and other structural elements, potentially leading to collapses. Extreme cold makes materials more brittle and susceptible to cracking, and sudden temperature changes can cause thermal shock, damaging delicate artifacts. Additionally, severe winter weather can hinder access and maintenance, making it challenging to perform necessary upkeep and repairs (NPS 2016).

12.3 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

12.3.1 Potential or Planned Development

As discussed in Chapter 3 (County Profile), areas targeted for future growth and development have been identified across the County. Potential or planned development can influence the risk and impact of severe winter weather in several ways. Urbanization often leads to the creation of urban heat islands, which are warmer than their rural surroundings due to human activities and infrastructure. While this might reduce the severity of winter weather in urban areas, it can also lead to more significant temperature contrasts and potentially more intense weather events. New developments might not always be designed with severe winter weather in mind, especially in regions that historically experience milder winters, increasing the vulnerability of buildings, roads, and utilities to damage from snow, ice, and freezing temperatures. As development expands into previously undeveloped areas, more people and properties become exposed to the risks of severe winter weather, leading to higher potential for economic losses and disruptions. Additionally, development can alter natural landscapes, affecting local weather patterns and potentially increasing the frequency or severity of winter weather events. For example, deforestation and changes in land cover can influence local climate conditions. Rapid development can also strain local resources and emergency services, making it more challenging to respond effectively to severe winter weather events.

12.3.2 Projected Changes in Population

Changes in the density of population can impact the number of persons exposed to the severe winter weather hazard. Persons that move into older buildings may increase their overall vulnerability. Those moving into newer construction may decrease their vulnerability. Refer to Chapter 3 (County Profile), which includes a more thorough discussion about population trends for the County.

12.3.3 Climate Change

Projecting future climate change for specific regions is challenging, especially for longer-term predictions, which are more subject to changing dynamics. Coastal areas are particularly sensitive to sea-level rise, storm frequency and intensity, increased precipitation, and warmer ocean temperatures. In the northeastern United States, temperatures have risen by 1.5°F since 1900, with most of this warming occurring since 1970. The State of New Jersey has seen a 1.2°F increase in average annual temperatures between 1971-2000 and 2001-2010, with projections indicating a further rise of 1.5°F to 3°F by the 2020s and 3°F to 5°F by 2050 (Sustainable Jersey Climate Change Adaptation Task Force 2011). Winter temperatures in the Northeast have increased by 4°F since 1970, leading to less intense cold waves, fewer sub-freezing days, and less snow accumulation. As temperatures rise, the atmosphere can hold more water vapor, increasing precipitation potential. The State's annual precipitation has slightly increased, with projections of a 4 percent to 11 percent rise by 2050. Heavy precipitation events are expected to become more frequent and intense. While quantitative data on future snowfall and ice storms in the State of New Jersey is lacking, it is likely that winter weather events may decrease in number but increase in intensity. Future climate modeling will enhance understanding of these changes.

12.3.4 Other Identified Conditions

The State of New Jersey is expected to see an increase in average annual temperatures and precipitation due to climate change. While winters may become milder with fewer cold days and less frequent snowfall, the winter storms that do occur are likely to be more intense. This is because a warmer atmosphere can hold more moisture, leading to heavier precipitation. Additionally, the increased temperature contrast between warmer air masses and cold Arctic air can intensify storm systems. As a result, winter weather events may become less frequent but more severe. The projected increase in annual precipitation, primarily in the form of heavy rainfalls, can freeze into heavy snowfall and icing. This could lead to higher risks to life and health, increased structural losses, more resources needed for response and recovery, and more business closures due to severe winter events. (The Climate Reality Project 2022).