

4.11 Severe Summer Weather

4.11.1 Description

Severe summer weather events may include severe thunderstorms and thunderstorm winds, hail, and lightning. High winds, tornadoes, and flooding may also be related to severe summer storms and, due to the potential threat of these events, they are each discussed in separate risk assessments. While tropical storms and hurricanes are also forms of severe storms, Clinton County does not have any record of such events affecting the County; therefore, the County has not deemed tropical storms and hurricanes to be a threat and these specific types of weather will not be addressed further.

According to the National Weather Service (NWS), a severe thunderstorm is a thunderstorm that produces a tornado, winds of at least 58 MPH, and/or hail at least one inch in diameter. A Severe Thunderstorm Watch is issued by the NWS if conditions are favorable for the development of severe thunderstorms. A watch is usually in place for four to eight hours, during which time people should be prepared to move to a safe place if threatening weather approaches.

A Severe Thunderstorm Warning is issued if either the WSR-88D radar indicates a severe thunderstorm or if a spotter reports a storm producing hail or winds meeting the criteria outlined in the description above. The WSR-88D radar is an advanced Weather Surveillance Doppler Radar utilized by the NWS to generate a radar image. The NWS recommends that people in the affected area seek safe shelter immediately, as severe thunderstorms have the potential to produce tornadoes with little-to-no advance warning. Lightning frequency is not a criterion for issuing a severe thunderstorm warning. The warnings are usually issued for one hour and can be issued without a Severe Thunderstorm Watch already in effect. The National Weather Service Forecast Office in Wilmington is responsible for issuing Severe Thunderstorm Watches and Warnings for Clinton County.

Lightning is caused by a rapid discharge of electrical energy that has built up in the atmosphere between clouds, the air, or the ground. Lightning strikes can be either direct or indirect. A direct strike is when lightning strikes a building or a specific zone, which can result in fusion points melting holes of varying sizes at the point of impact of materials with high resistivity. An indirect lightning strike is when lightning causes power surges that disrupt electrical equipment.

Severe summer storms can also create strong winds – often called “straight-line” winds – to differentiate thunderstorm winds from tornadic winds. These winds, which have the potential to cause damage, are caused by an outflow generated by a thunderstorm downdraft. Severe wind events are discussed in more detail in **Section 4.12**.

Hail is a type of frozen precipitation that occurs when thunderstorm updrafts carry raindrops upward into extremely cold atmospheric zones where they freeze before falling to the ground. The resulting hailstones can fall at speeds greater than 100 MPH and range in size from smaller than 0.50 inches (the size of a pea) to 4.5 inches (the size of a softball) (Source: National Weather Service).

4.11.2 Location

Severe summer storms are a countywide hazard and all of Clinton County is susceptible to severe weather.

4.11.3 Extent

Severe summer storm events have the potential to create large-scale damage in Clinton County. Specifically, lightning is responsible for approximately 50 deaths annually across the United States, as well as hundreds of injuries (Source: NOAA). Winds associated with severe summer storms have the potential to cause damage by bringing down tree limbs and generating widespread power outages. Additionally, hail can result in property damage.

Severe summer storms can lead to flooding, downed trees and power lines, and other dangerous conditions.

4.11.4 History

According to the National Centers for Environmental Information (NCEI), there have been 152 thunderstorm wind events, 16 heavy rain events, 61 hail events, and two lightning events recorded in Clinton County from February 1956 to June 2020. These events resulted in \$3.545 million in property damage and \$0 in crop damage. These events were not responsible for any deaths or injuries. These events are summarized in **Table 4.11.1**, below:

Table 4.11.1: Thunderstorm-Related Events in Clinton County since 1956

Severe Storm Event Type	Number of Events	Injuries	Deaths	Property Damages	Crop Damages
Thunderstorm Wind	152	1	0	\$3,114,000	\$0
Heavy Rain	16	0	0	\$0	\$0
Hail	61	0	0	\$281,000	\$0
Lightning	2	0	0	\$150,000	\$0
Total	231	1	0	\$3,545,000	\$0

Clinton County has not been associated with any thunderstorm-related disaster declarations since the previous hazard mitigation plan. The events that resulted in the largest amounts of property damage, as well as the sole injury due to summer storms in the County’s history, are described below.

March 14, 2019

Thunderstorms developed through the afternoon hours ahead of an approaching cold front. Some of the storms produced damaging winds and large hail. According to the Clinton County EMA, 92 poles were knocked down as a result. 35 of these poles were power transmission poles resulting in an eight-hour countywide power outage on March 16, 2020. All parts of the County were impacted except for Blanchester. This set of storms was responsible for \$165,000 in property damage, no crop damage, and no injuries or deaths.

April 9, 1999

This line of storms was also responsible for tornadoes in other parts of the County. Three homes and a business were destroyed by the storm and 20 other properties were damaged. This storm was responsible for \$1.0 million in property damages and no crop damage, injuries, or deaths.

June 19, 1994

This line of severe storms was responsible for the one injury reported due to this hazard type. A local resident was injured in a traffic accident during the storm from falling debris striking the car.

Numerous trees were downed, including some on homes and vehicles. A metal storage shed was blown from its foundation and found suspended in a tree. This storm was responsible for \$50,000 in property damage and no crop damage.

April 14, 1994

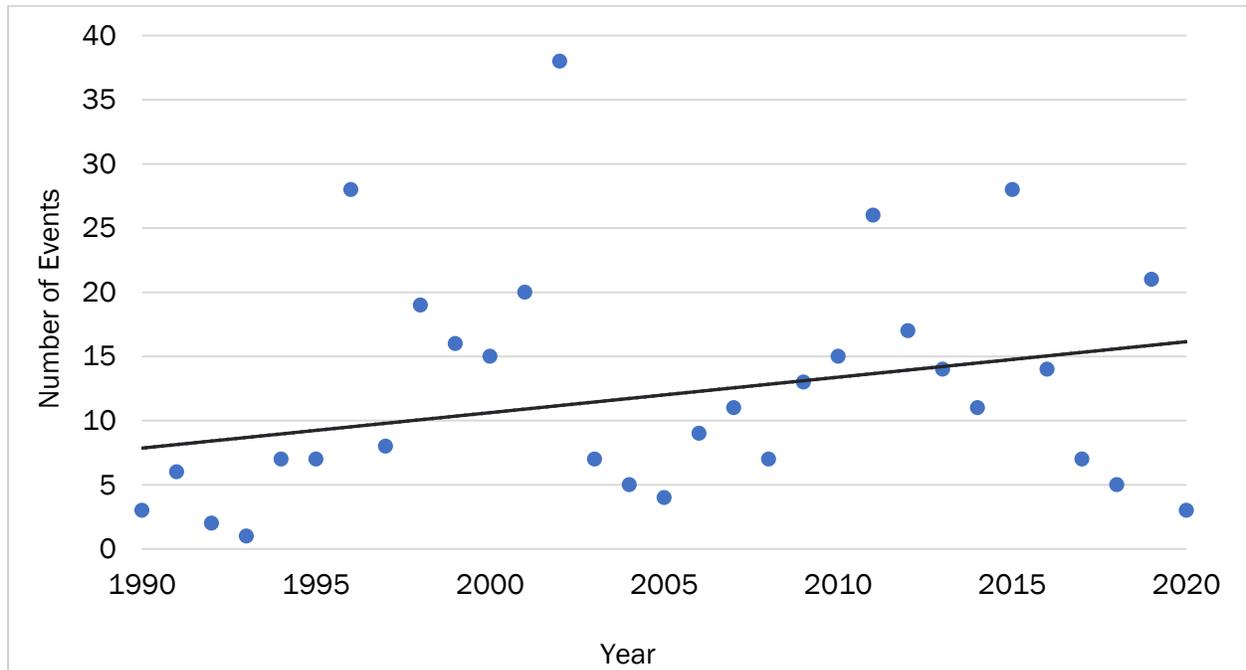
This severe storm event was responsible for \$500,000 in property damage, but no crop damage, injuries, or deaths. Reports indicate that trees were downed and there was minor roof and porch damage in several locations including the Village of Clarksville and City of Wilmington. A vacant mobile home was blown over in Vernon Township. A tractor-semitrailer was blown off US-68 just south of I-71 near the City of Wilmington.

4.11.5 Probability

According to the NCEI, there have been 231 severe summer storm events reported in Clinton County from February 1956 to June 2020 with total losses reaching more than \$3.545 million in property damage and \$0 in crop damage. This amounts to between three and four severe storm events annually with average annual damages of \$55,390.

Furthermore, **Figure 4.11.2** below shows the trend in number of thunderstorm events per year since 1990. The trend line has a slightly positive slope, which indicates that the number of severe summer storms has increased over the last 30 years. Years prior to 1990 are excluded from the probability calculation due to missing and/or unreliable data reporting.

Figure 4.11.2: Severe Summer Storm Probability



4.11.6 Vulnerability Assessment

Infrastructure Impact

Above-ground infrastructure is at risk for storm damage by wind and falling debris. For infrastructure, high winds and hail are the most damaging part of a severe storm. Thunderstorm winds can strip

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bark from trees and detach limbs. If large branches fall, they can damage buildings and supporting above-ground infrastructure. In the most severe storms with high winds, large trees can be uprooted and have the potential to fall on buildings including houses, which can cause harm or death.

Utilities are at risk for damage by severe summer storms as well. Electrical lines are spread throughout the County connecting homes, businesses, and other facilities. Severe storms are likely to down tree limbs and generate other debris that can affect above-ground electrical lines causing power outages. Downed power lines that are still live are extremely hazardous and can cause death by electrocution.

Population Impact

According to the American Community Survey’s 2018 population estimates, the population of Clinton County is approximately 41,896. Summer storms are random in nature and affect the entire area of the County. Everyone within the County should be prepared during a storm event. Populations residing in mobile home parks are particularly vulnerable and should seek out shelters.

Property Damage

As described above, these events have caused an average of \$55,390 in property damages annually. Due to the non-site-specific nature of this hazard, **Table 4.11.2** lists all structures within Clinton County as having potential impacts from severe storms.

Loss of Life

Although no loss of life was reported due to the 231 severe summer storm events on record with the NCEI, there is always potential for injuries and fatalities during severe weather.

Economic Losses

Severe storms usually cause minor damage to structures, such as blowing shingles off roofs and downed branches breaking windows or falling onto buildings and above-ground infrastructure. More severe damage may also result. Of the 231 severe summer storm events since 1956, 43 events resulted in property damage of \$10,000 or more. The costliest storm in the County’s history was a thunderstorm wind event on April 9, 1999 which caused \$1.0 million in property damage.

Table 4.11.2: Structure Vulnerability from Severe Storms

Structure Type	Number of Properties Exposed	Value of Vulnerable Structures		
		Land	Building	Total
Residential	17,871	\$110,107,680	\$406,567,870	\$516,675,550
Non-Residential	8,935	\$561,925,770	\$325,785,670	\$887,711,440
Critical Facilities	102	\$7,359,920	\$56,094,270	\$63,454,190
Total	26,806	\$672,033,450	\$732,353,540	\$1,404,386,990

**Note: Critical Facilities are non-residential structures and their value is incorporated into the non-residential totals as well. Calculated totals are determined by summing the residential and non-residential values.*

4.11.7 Land Use and Development Trends

Severe storms can occur anywhere. Any development that has occurred since the previous plan and any future development has the potential to be impacted by severe storms.