

### 2.3 TORNADO

National Oceanic Atmospheric Association (NOAA) defines a tornado as a narrow, violently rotating column of air that extends from the base of a thunderstorm to the ground. Because wind is invisible, it is hard to see a tornado unless it forms a condensation funnel made up of water droplets, dust and debris. Tornadoes are the most violent of all atmospheric storms and the most hazardous when they occur in populated areas. Tornadoes can topple mobile homes, lift cars, snap trees, and turn objects into destructive missiles. Among the most unpredictable of weather phenomena, tornadoes can occur at any time of day, in any state in the union, and in any season. While the majority of tornadoes cause little or no damage, some are capable of tremendous destruction, reaching wind speeds of 200 mph or more.

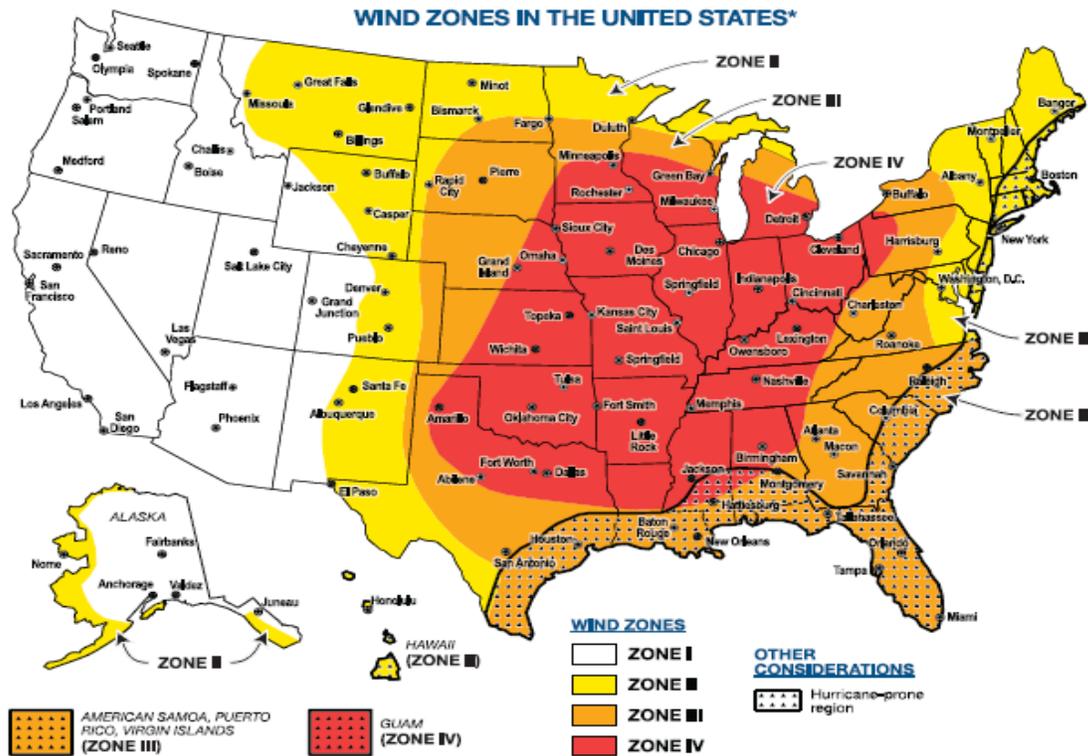


Figure 2-7: Wind Zones in the United States\*

\* If you are uncertain of your location because of the level of detail and size of the map, or if you live on or very near one of the delineation lines, use the highest adjacent wind zone.

#### Map 2.3.a

Tornadoes are non-spatial hazards; therefore, it is often difficult to profile tornadoes and determine the exact risk. However, estimations can be developed by analyzing historic occurrences and past declarations. While Ohio does not rank among the top states for the number of tornado events, it does rank within the top 20 states for fatalities, injuries, and dollar losses, indicating that it has a relatively high likelihood for damages resulting from tornadoes. Tornadoes are measured by damage scale based on their winds, with greater damage equating to greater wind speed. The original Fujita-scale (F-scale) was developed without considering a structure’s integrity or condition as it relates to the wind speed necessary to damage it. The process of rating the damage was subjective with the original F-scale and

arbitrary judgments were the norm. In order to reduce this subjectivity, the Enhanced F-scale (EF- scale) took effect February 1, 2007.

The Enhanced F-scale uses the original F-scale (i.e., F0-F5) and classifies tornado damage across 28 different types of damage indicators, which mostly involve building/structure type, and these are assessed at eight damage levels (1-8). Therefore, construction types and their strengths and weaknesses are incorporated into the EF classification given to a particular tornado. The most intense damage within the tornado path will generally determine the EF-scale given the tornado. Table 2.3.a. lists the classifications under the EF- and F-scale. It should be noted the wind speeds listed are estimates based on damage rather than measurements. Also, there are no plans by National Oceanic Atmospheric Administration or the National Weather Service to re- evaluate the historical tornado data using the Enhanced scale.

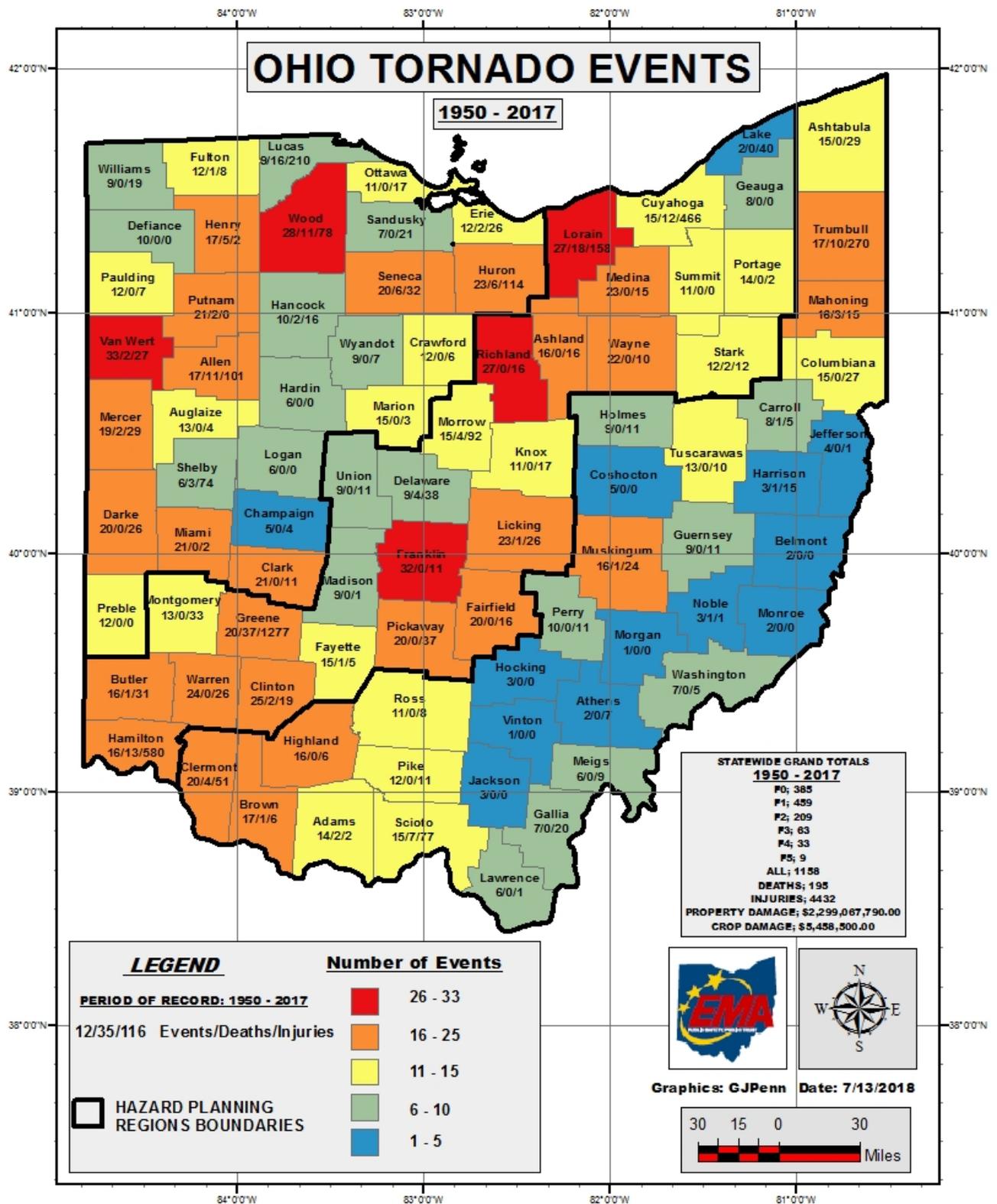
Fujita Scale 3-Second Gust (mph)		Damage Levels	Enhanced Fujita Scale 3-Second Gust (mph)	
<b>F-0</b>	<b>45-78</b>	Light - tree branches down	<b>EF-0</b>	<b>65-85</b>
<b>F-1</b>	<b>79-117</b>	Moderate - roof damage	<b>EF-1</b>	<b>86-110</b>
<b>F-2</b>	<b>118-161</b>	Considerable - houses damaged	<b>EF-2</b>	<b>111-135</b>
<b>F-3</b>	<b>162-209</b>	Severe - buildings damaged	<b>EF-3</b>	<b>136-165</b>
<b>F-4</b>	<b>210-261</b>	Devastating - structures leveled	<b>EF-4</b>	<b>166-200</b>
<b>F-5</b>	<b>262-317</b>	Incredible - whole towns destroyed	<b>EF-5</b>	<b>Over 200</b>

Table 2.3.a - Source: <http://www.spc.noaa.gov/faq/tornado/ef-scale.html>

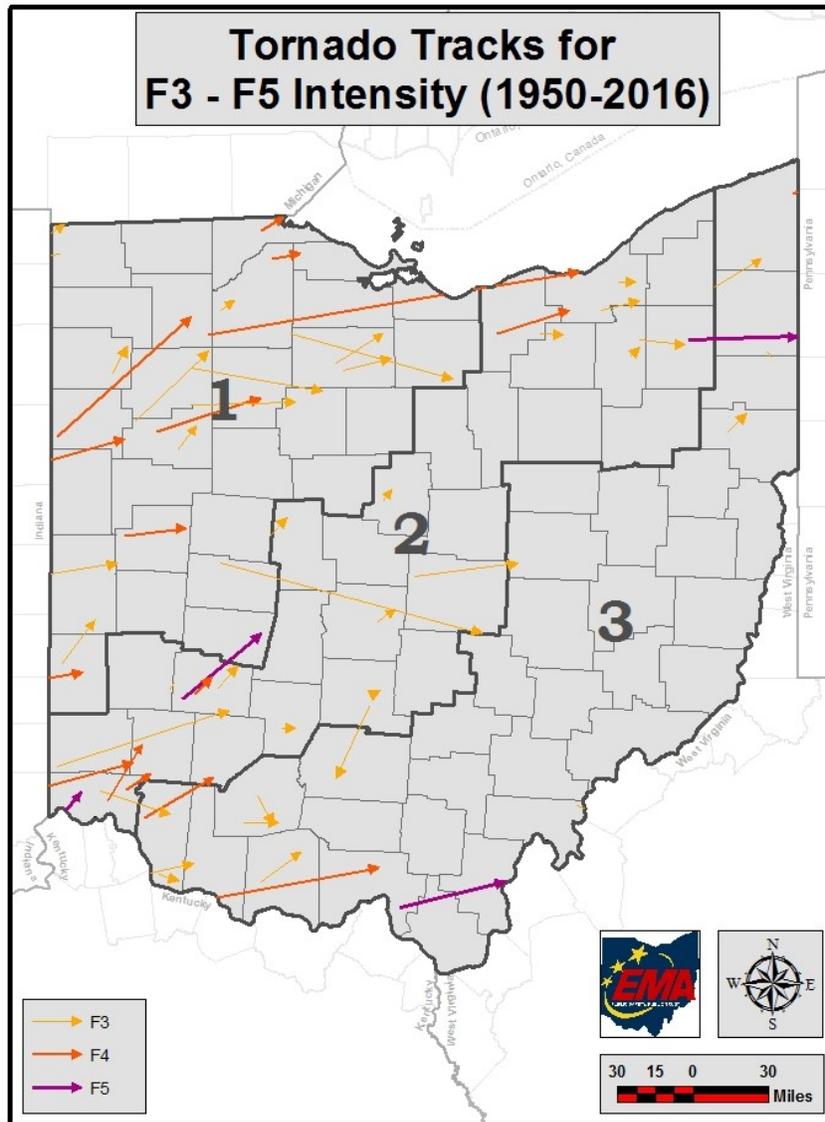
## RISK ASSESSMENT

### LOCATION

The wind zones in the United States map (Map 2.3.a) indicate that the entire state falls within the 250 mile per hour zone, but the frequency in which tornados occurs varies greatly depending on which county you are located. Ohio has a significant history of past tornado events. Map 2.3.b depicts the touchdowns of 1158 tornadoes that struck the State between 1950 and 2017. The counties in red have the greatest number of tornadoes touchdowns in that time period. In order, those counties are: Van Wert (33), Franklin (32), Wood (28), Lorain (27) and Richland (27). When looking at a regional perspective Region 1 (416) and Region 2 (454) have had significantly more tornados than Region 3 (288). Much of the variance in the number of tornados between Region 1 and 2, and Region 3 is due to the topography of Region 3.



Map 2.3.b – Source - NOAA Storm Database



Map 2.3.c indicates the tracks of the F3 or greater tornadoes that have occurred in the state from 1950-2016. The tracks of these high intensity tornadoes are generally spread throughout the state with the exception of the southern and eastern portions of Region 3. The highest intensity, or F5 tornadoes tracks, are indicated in purple and have occurred in all of the regions in the state. Only one F5 tornado has occurred in Region 1, even though a large number of F3 and F4 tornadoes occurred within that Region.

Map 2.3.c – Source - NOAA Storm Database

**LHMP DATA  
CLERMONT COUNTY**

There were two events in 2012 that caused significant damages. The first was on March 2, 2012, and this tornado was categorized as an EF3. The Village of Moscow, parts of Franklin, Washington, & Tate Townships were all in the direct path, resulting in 353 structures damaged and 18 residential structures destroyed causing roughly \$3,700,000 in damages with three lives lost and 13 injured. The second tornado event occurred on September 8, 2012. The Village of Moscow was hit the hardest with two homes destroyed. The location, frequency and impacts of tornadoes cannot be accurately predicted. However, an analysis of historic events can provide a reasonable understanding of expected future risks. Clermont County has had 18 tornadoes in 16 unique years since 1953, and they have sustained total losses of approximately \$11.5 million. The annual chance of occurrence for a tornado is 23%. The annualized risk is approximately \$190,883 with one injury and 3% chance of life loss.

**GREENE COUNTY**

Although tornadoes can occur throughout the state, the City of Xenia appears to be especially tornado-prone. According to the Greene County LHMP, “Nineteen tornadoes were reported in Greene County, Ohio since 1884. These tornadoes caused 43 deaths, 1,377 injuries and over \$1 billion dollars of damage. Xenia was the location of seven tornadoes, responsible for the majority of the fatalities and caused the highest amount of damage.” Greene County considers tornadoes major hazards with the potential of high damage, personal injury, and loss of life. They have conducted a number of studies involving tornadoes and have incorporated those studies into their LHMP.

**CUYAHOGA COUNTY**

The Cuyahoga County All-Hazards Mitigation Plan provides a comprehensive history of the tornado events that have occurred within Cuyahoga County from 1951-2015 including a tornado track map. According to the Cuyahoga County LHMP, fifteen tornadoes were reported in between 1951 and 2015. These tornadoes caused 12 deaths, 466 injuries and over 68 million dollars of damage. The Cuyahoga County LHMP states, while all County assets are considered at risk from this hazard, a particular tornado would only cause damages along its specific track. A high-magnitude tornado sweeping through densely populated portions of the County would have extensive injuries, deaths, and economic losses. There is no way to be sure how many people would be injured or killed due to the difference that time of day and year can make, but property values can provide an estimate of economic losses.

**VAN WERT COUNTY**

Per the 2014 Van Wert County LHMP, Van Wert County has the highest occurrences of tornados in the state. The most devastating event in recent history occurred on November 10, 2002, when a F4 tornado struck the City of Van Wert, killing 2 people and causing over \$50 million dollars in damages and other economic losses. This event is ranked among the top 10 tornados to ever hit the northeastern United States. The Vulnerability Assessment in the Van Wert County LHMP provides the following estimates developed based on an EF 5 Tornado striking the heart Van Wert County, with a path 1-mile wide and 20-miles long. Using those assumptions, Van Wert County has a total exposure of 5,690 structures valued at \$231,092,000.

**PAST OCCURRENCES****XENIA – 1974**

According to a Dayton Daily News article (April 2011), on April 3, 1974, an F-5 tornado tore through the heart of Xenia, killing 33 people and injuring more than 1,300 others. It bulldozed a path more than a half-mile wide, destroying or damaging more than 1,400 buildings, including 1,200 homes, dozens of businesses, 10 churches, and several schools. By the time it lifted into the sky near Cedarville, it left behind more than \$100 million of damage in Greene County. The Xenia tornado was part of a super outbreak, when 148 twisters swept across several states, killing 335 people in a 16-hour period on April 3-4, 1974. It still ranks as one of the largest natural disasters in American history, with Xenia the hardest hit community.



The Xenia subdivision of “Arrowhead” was especially hard-hit, the tornado leaving it in ruins. The 4-year-old subdivision on the city’s southwest side lost more than 300 homes, many on concrete slabs with no basements. Greene Memorial Hospital in northeast Xenia narrowly escaped the tornado’s wrath, but lost its power and telephone service and its water quality was suspect. About 500 people were treated there in the first 24 hours, 34 of them being admitted with a number transferred to hospitals in nearby Dayton for treatment.

**Photograph 2.3.a** – Source - NWS

### **XENIA - 2000**

Twenty-six years later another tornado (an F-4) struck at an unusual time – early autumn and after dark – on September 20, 2000. The tornado would follow an eerily familiar path of destruction through Xenia, killing one man and destroying or damaging more than 300 homes and 30 businesses.



**Photograph 2.3.b** – Source - Dayton Daily News

### MAY TORNADO OUTBREAK - 1985

Per the NWS, on May 31, 1985, twenty-one tornadoes tracked across Northeast Ohio and Northwest Pennsylvania during that evening. Of these 21, one was rated an F5, and six were rated F4's. Tragically, these tornadoes killed 76 people in Ohio and Pennsylvania. In Ohio, this was the worst event since the April 3-4th, 1974 outbreak that killed 37 in Xenia.

The strongest of the tornadoes touched down at the Ravenna Arsenal in eastern Portage County around 6:35 p.m. The tornado intensified to an F5 as it tracked east across southern Trumbull County, devastating the communities of Newton Falls and Niles. Nine people were killed in the business district of Niles.



Photograph 2.3.c – Source - NWS



Photograph 2.3.d – Source - NWS

The residents of Ohio will long remember May 31, 1985. Rarely has such an outbreak of tornadoes been seen in this county and never before in this area. This day serves as a reminder that devastating tornadoes can occur in any month of the year at any time of the day and at any location in the country.

### BLUE ASH TORNADO - 1999

Another notable tornado occurred in April 1999 in the counties of Clinton, Hamilton, and Warren. The tornadoes killed four people, injured 42, and damaged or destroyed 400 structures, causing about \$82 million in losses (Ohio EMA 16). A lone supercell thunderstorm produced this F4 tornado, with winds between 207 and 260 mph.



Photograph 2.3.e – Source - Cincinnati Enquirer

**DR-1444 - 2002 & DR-1484 - 2003**

In more recent years, there have been two disaster declarations: DR-1444, which was for tornado-related damage, and DR-1484, which covered tornado and flood related damage. DR-1444 was in November 2002 and affected several counties throughout the state. Many of the residents of the impacted counties were left homeless or were trapped in debris, damage to commercial structures created localized unemployment, hundreds of injuries were reported, and multiple lives were lost.



**Photograph 2.3.F** – Source - OSHP

DR-1484 occurred in August 2003 and was the most recent declaration that included tornadic damage. The tornado was confirmed as an F-1 and affected part of the City of Youngstown and parts of the unincorporated areas of the County. The tornado was 50-100 yards wide and eight miles long. Sixty homes received major damage and 20 received minor damage. The estimated loss from this tornado was \$900,000 and approximately 33% of the structures were insured.

**2010 TORNADOS**

The first event occurred in June 5 - 6, when a major tornado outbreak affected the Midwestern United States and Great Lakes Region. At least 46 tornadoes were confirmed from Iowa to southern Ontario and Ohio as well as northern New England. Tornadoes moved through northern Ohio affecting Fulton, Lucas, Wood, Ottawa, Richland, Holmes and Tuscarawas Counties. While all counties sustained heavy structural damage, the event resulted in seven people dead in Wood County. The Governor of Ohio issued an Emergency Proclamation for the event and requested a Presidential Declaration for the area, however, none was granted. Regardless, tornadoes ranged from EF-0 northeast of Lucas, Ohio in Richland County, to an EF-4 tornado that resulted in 78 homes with major damage and 97 with minor damage. The total residential loss was approximately \$7,545,300. Thirty-two businesses had major damage and three had minor damage resulting in \$4,661,000 in losses. The Counties experienced a total of \$1,263,858 in infrastructure damage.

The second event occurred when severe weather and tornadoes swept across the state in the afternoon of September 16th. The National Weather Service confirmed 11 tornadoes in Wayne, Holmes, Fairfield, Athens, Perry, Meigs, Delaware and Tuscarawas Counties. The tornadoes ranged from EF-0 to EF-3, and Athens, Meigs, Pickaway, Perry and Wayne Counties declared a local state of emergency. Thirteen people were injured in Athens County, while six were injured in Meigs County. State and county teams assessed the damaged structures to be 62 destroyed, 77 with major damage, 113 with minor damage and 373 structures as affected. Residential loss equated to 2,227 claims amounting in \$11,400,000, while business losses included 287 claims amounting in \$4,700,000.

**MOSCOW TORNADO - 2012**

In March 2012, Brown and Clermont Counties experienced a devastating EF-3 tornado that came up from Kentucky and into Ohio. Thunderstorms developed during the afternoon in a high wind shear environment ahead of a strengthening low-pressure system. Many of these storms became severe, with large hail, damaging thunderstorm winds, and tornadoes all being the main threats. The tornado traveled seven miles in the Kentucky counties of Campbell and Pendleton. The tornado then moved into Clermont County, Ohio at 4:46 pm, where it hit the town of Moscow. It continued on the ground across Clermont County, crossing into Brown County around 4:58 pm. It then lifted south of Hamersville in western Brown County. This tornado caused extensive damage to structures and trees along its entire path on both sides of the Ohio River. Numerous homes were very heavily damaged or destroyed. Many homes lost their roofs, having complete exterior wall failure. Some modular homes were completely removed from their foundations, lifted, and thrown in excess of 100 yards where they were destroyed. The damage in Ohio from this tornado was consistent with maximum winds estimated at 160 miles per hour in Clermont County, and 100 miles per hour in Brown County. Clermont County experienced three deaths from the tornado. One fatality occurred in Moscow in Clermont County, while two others occurred in Bethel. Thirteen injuries were reported resulting from this storm. Property damage was estimated at \$5,660,000.



**Photograph 2.3.g** – Source - OEMA

As this same system moved into Adams County, it caused an additional fatality. A tornado touched down just east of Highway 41, about 2 miles northeast of West Union. The tornado then traveled northeast for just over 11 miles, destroying at least 5 mobile homes and damaging two other houses. One of these homes was built of brick. A 99-year-old woman was in her mobile home in Tiffin Township when the tornado struck. She was injured from this tornado and passed away several days later. Two other people were also injured from this tornado. A dozen cattle were killed and major power transmission poles were knocked over. Numerous trees were snapped or uprooted. Based on the damage surveyed, the maximum

estimated wind speed of this tornado was 125 miles per hour and caused an estimated \$2 million in damage. The path of the tornado continued east into Pike and Scioto Counties causing an additional estimated \$230,000 in damage, but no other fatalities or injuries were reported.

#### **CEDARVILLE TORNADO - 2014**

A narrow but intense tornado ripped through Greene County on May 14, 2014, while sparing the nearby town of Cedarville. The NWS in Wilmington confirmed an EF3 tornado hit the area, packing winds as high as 145 mph. Cedarville is nine miles northeast of Xenia, the site of a massive F5 tornado that killed dozens during the Super outbreak of April 4, 1974. The NWS says two people were injured and several homes were hit by the tornado. This includes completely destroying two homes and causing over \$500,000 in damage.



Photograph 2.3.h - Source - NWS

#### **PROBABILITY OF FUTURE EVENTS**

Between 1950- 2017, Ohio has experienced 1,158 tornadoes, an average of 17.28 tornadoes annually. The majority of tornadoes that have occurred in the state have been between an EF-0 and EF-2 (90.1%). Table 2.3.b give a breakdown of the various EF tornado events that have occurred in the state from 1950-2017.

Probability of Future Tornado Events							
Year	F0	F1	F2	F3	F4	F5	Total
1951	0	1	2	0	0	0	3
1952	0	2	0	0	0	0	2
1953	0	1	1	0	6	0	8
1954	5	5	2	0	0	0	12
1955	0	2	2	2	0	0	6
1956	1	2	5	2	0	0	10
1957	0	1	3	0	0	0	4
1958	0	5	6	0	0	0	11
1959	5	2	2	1	0	0	10
1960	1	4	2	0	0	0	7
1961	4	6	4	3	1	0	18
1962	0	1	2	0	0	0	3
1963	2	8	6	0	0	0	16
1964	0	2	4	0	0	0	6
1965	2	14	12	3	8	0	39
1966	0	1	1	1	0	0	3
1967	0	3	3	0	0	0	6
1968	1	7	4	0	5	3	20
1969	1	11	1	8	0	0	21

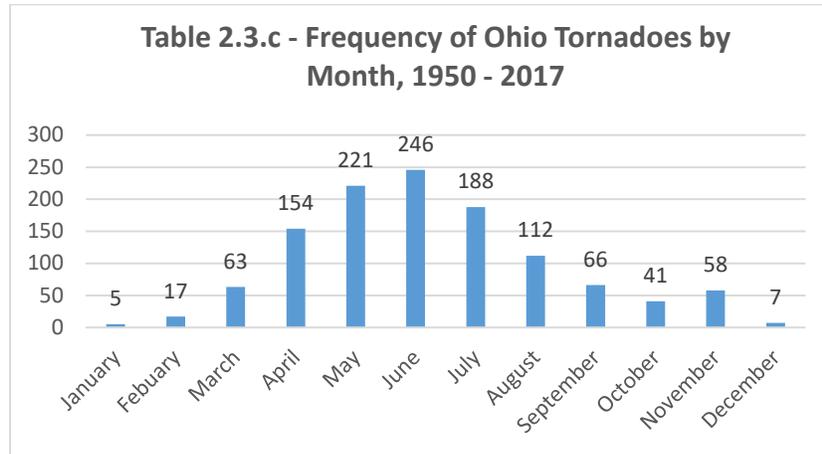
<b>1970</b>	3	7	9	1	0	0	<b>20</b>
<b>1971</b>	1	3	7	4	0	0	<b>15</b>
<b>1972</b>	1	7	2	0	0	0	<b>10</b>
<b>1973</b>	17	17	11	10	0	0	<b>55</b>
<b>1974</b>	3	11	4	2	2	3	<b>25</b>
<b>1975</b>	2	6	4	0	0	0	<b>12</b>
<b>1976</b>	7	3	2	0	0	0	<b>12</b>
<b>1977</b>	5	15	3	1	0	0	<b>24</b>
<b>1978</b>	4	15	2	1	0	0	<b>22</b>
<b>1979</b>	1	2	1	0	0	0	<b>4</b>
<b>1980</b>	1	30	6	0	0	0	<b>37</b>
<b>1981</b>	6	14	6	1	0	0	<b>27</b>
<b>1982</b>	0	7	3	0	0	0	<b>10</b>
<b>1983</b>	0	6	2	2	0	0	<b>10</b>
<b>1984</b>	0	2	0	0	0	0	<b>2</b>
<b>1985</b>	2	11	5	4	2	3	<b>27</b>
<b>1986</b>	3	13	11	0	0	0	<b>27</b>
<b>1987</b>	2	3	1	0	0	0	<b>6</b>
<b>1988</b>	0	0	0	0	0	0	<b>0</b>
<b>1989</b>	4	11	4	0	0	0	<b>19</b>
<b>1990</b>	13	8	7	0	4	0	<b>32</b>
<b>1991</b>	6	2	0	1	0	0	<b>9</b>
<b>1992</b>	26	20	12	4	1	0	<b>63</b>
<b>1993</b>	2	3	0	0	0	0	<b>5</b>
<b>1994</b>	4	5	0	0	0	0	<b>9</b>
<b>1995</b>	1	2	0	0	0	0	<b>3</b>
<b>1996</b>	6	4	0	0	0	0	<b>10</b>
<b>1997</b>	7	6	1	1	0	0	<b>15</b>
<b>1998</b>	17	6	3	0	0	0	<b>26</b>
<b>1999</b>	10	9	1	1	1	0	<b>22</b>
<b>2000</b>	9	10	7	0	1	0	<b>27</b>
<b>2001</b>	4	2	2	1	0	0	<b>9</b>
<b>2002</b>	8	12	8	5	1	0	<b>34</b>
<b>2003</b>	7	4	2	0	0	0	<b>13</b>
<b>2004</b>	4	5	0	0	0	0	<b>9</b>
<b>2005</b>	2	2	0	0	0	0	<b>4</b>
<b>2006</b>	22	11	4	0	0	0	<b>37</b>
<b>2007</b>	8	5	0	0	0	0	<b>13</b>
<b>2008</b>	12	2	1	0	0	0	<b>15</b>
<b>2009</b>	10	3	0	0	0	0	<b>13</b>
<b>2010</b>	20	23	5	2	1	0	<b>51</b>
<b>2011</b>	24	14	2	0	0	0	<b>40</b>
<b>2012</b>	11	2	1	1	0	0	<b>15</b>

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<b>2013</b>	20	14	3	0	0	0	<b>37</b>
<b>2014</b>	16	4	0	1	0	0	<b>21</b>
<b>2015</b>	5	2	0	0	0	0	<b>7</b>
<b>2016</b>	14	7	3	0	0	0	<b>24</b>
<b>2017</b>	13	11	2	0	0	0	<b>26</b>
<b>Total</b>	<b>385</b>	<b>459</b>	<b>209</b>	<b>63</b>	<b>33</b>	<b>9</b>	<b>1158</b>

Table 2.3.b - Source - NOAA Storm Database

Considering more tornadoes have formed in June than any other month, there is approximately a 20.8 percent chance of a tornado on any day in June. The likelihood of a tornado is lower during the winter and higher during the summer, as indicated in Graph 2.3.a.



Graph 2.3.a – Source NOAA Storm Database

Every County in the state of Ohio has experienced at least one tornado from 1950-2017, and six counties have each recorded at least 25 tornadoes (see table 2.3.d). Van Wert and Franklin Counties have had the most tornados with 33 and 32 respectively. Note that prior to 1900 tornados were not documented and rarely reported.

## VULNERABILITY ANALYSIS & LOSS ESTIMATION

### METHODOLOGY

The tables shown in this section were compiled using historic data from the NWS, and NOAA’s National Centers for Environmental Information Storm Event Database. For each county in the State, information on tornadoes was entered in a spreadsheet using a time period of January 1, 1950, through December 31, 2017. Calculations were performed to obtain the following information: average damage amounts per tornado, annual probability, and estimated future annual losses.

The following are definitions of the terms used in the tables in this section:

- Total Damages = Cumulative sum of all reported damages associated with all tornadoes occurring in the 67 year period from January 1, 1950, to December 31, 2017 (reported damages obtained from the Storm Events Database)
- Average Damage per Tornado = Total damages divided by the number of tornadoes
- Estimated Annual Tornadoes = Number of tornadoes divided by the number of reporting years (67)
- Estimated Future Annual Losses = Average Damage per Tornado x Estimated Annual Tornadoes

Damage calculations include all reported property and crop damage as well as injuries and deaths sustained as a result of the tornadic event. Injury and death values were calculated as follows:

1. Injury was assigned a value based on the December 2011 FEMA Benefit-Cost Analysis Re-engineering (BCAR) Development of Standard Economic Values report, which incorporates research completed on behalf of the Department of Homeland Security in 2008. The values can be thought of as the “willingness-to-pay” (WTP) to avoid an injury.

The report recommends using 1997 values and adjusting for inflation using the US Bureau of Labor Statistics (BLS) Consumer Price Index (CPI) Inflation Calculator. These are the adjusted 2017 values:

- Minor - \$14,000**
- Moderate - \$109,000**
- Serious - \$406,000**
- Severe - \$1,325,000**
- Critical - \$5,391,000**

2. Since the NWS does not differentiate between injury categories in their data, a combined injury value was calculated. 3.6 percent of tornadoes in the state are EF-4 to EF-5 (violent). About 23.5 percent are EF-2 to EF-3 (strong), and 72.8 percent are EF-0 to EF-1 (weak). That means that the types of injuries suffered will overwhelmingly be those types most likely to occur in weak tornadoes.

According to FEMA’s BCAR Tornado Safe Room Methodology Report (2009), on average, 5% of those injured will be hospitalized (injury categories Serious through Critical) in an EF-1 tornado and 10% in an EF-2. Therefore, the Serious through Critical injury WTP values were averaged and weighted as 10% of the total. The Minor and Moderate injury (non-hospitalization categories) WTP values were averaged and weighted as 90% of the total. The total was then rounded to the nearest thousand.

$$\{[(\$14,000 + \$109,000)/2] \times .9\} + \{[(\$406,000 + \$1,325,000 + \$5,391,000)/3] \times .1\} = \$292,750$$

3. The CPI 2015 adjusted value of a statistical life is \$7.07 million.

These calculations were done for each county to arrive at the future annual probability of a tornado and estimated annual losses from tornado events. Table 2.3.d lists the counties in alphabetical order and highlights the top five counties in each category. The top county is in black, the next four in grey.

<b>County</b>	<b>Total # of Tornadoes</b>	<b>Total Damages</b>	<b>Avg. Damage per Event</b>	<b>Estimated Annual Tornadoes</b>	<b>Est. Future Annual Losses</b>	<b>Region</b>
<b>Adams</b>	14	\$4,327,105	\$309,079	0.21	\$64,584	3
<b>Allen</b>	17	\$24,334,255	\$1,431,427	0.25	\$363,198	1
<b>Ashland</b>	16	\$11,349,327	\$709,333	0.24	\$169,393	2
<b>Ashtabula</b>	15	\$20,952,867	\$1,396,858	0.22	\$312,729	3
<b>Athens</b>	2	\$1,683,093	\$841,546	0.03	\$25,121	3
<b>Auglaize</b>	13	\$7,172,782	\$551,752	0.19	\$107,056	1
<b>Belmont</b>	2	\$114,500	\$57,250	0.03	\$1,709	3
<b>Brown</b>	17	\$47,933,351	\$2,819,609	0.25	\$715,423	3
<b>Butler</b>	16	\$157,021,006	\$9,813,813	0.24	\$2,343,597	2

Carroll	8	\$1,491,625	\$186,453	0.12	\$22,263	3
Champaign	5	\$2,866,932	\$573,386	0.07	\$42,790	1
Clark	21	\$16,425,120	\$782,149	0.31	\$245,151	1
Clermont	20	\$33,461,205	\$1,673,060	0.30	\$499,421	3
Clinton	25	\$32,697,805	\$1,307,912	0.37	\$488,027	2
Columbiana	15	\$74,652,331	\$4,976,822	0.22	\$1,114,214	3
Coshocton	5	\$64,768,200	\$12,953,640	0.07	\$966,690	3
Crawford	12	\$7,173,778	\$597,815	0.18	\$107,071	1
Cuyahoga	15	<b>\$353,263,446</b>	\$23,550,896	0.22	<b>\$5,272,589</b>	2
Darke	20	\$79,928,571	\$3,996,429	0.30	\$1,192,964	1
Defiance	10	\$6,156,855	\$615,686	0.15	\$91,893	1
Delaware	9	\$23,330,489	\$2,592,277	0.13	\$348,216	2
Erie	12	\$6,776,978	\$564,748	0.18	\$101,149	1
Fairfield	20	\$6,588,032	\$329,402	0.30	\$98,329	2
Fayette	15	\$13,892,275	\$926,152	0.22	\$207,347	2
Franklin	<b>32</b>	\$101,400,430	\$3,168,763	<b>0.48</b>	\$1,513,439	2
Fulton	12	\$14,241,637	\$1,186,803	0.18	\$212,562	1
Gallia	7	\$20,530,908	\$2,932,987	0.10	\$306,431	3
Geauga	8	\$5,514,050	\$689,256	0.12	\$82,299	2
Greene	20	<b>\$1,376,241,590</b>	<b>\$68,812,079</b>	0.30	<b>\$20,540,919</b>	2
Guernsey	9	\$14,225,350	\$1,580,594	0.13	\$212,319	3
Hamilton	16	\$293,041,197	\$18,315,075	0.24	\$4,373,749	2
Hancock	10	\$46,967,448	\$4,696,745	0.15	\$701,007	1
Hardin	6	\$1,294,050	\$215,675	0.09	\$19,314	1
Harrison	3	\$2,077,930	\$692,643	0.04	\$31,014	3
Henry	17	\$7,232,458	\$425,439	0.25	\$107,947	1
Highland	16	\$8,020,573	\$501,286	0.24	\$119,710	3
Hocking	3	\$116,165	\$38,722	0.04	\$1,734	3
Holmes	9	\$12,127,975	\$1,347,553	0.13	\$181,015	3
Huron	23	\$33,799,378	\$1,469,538	0.34	\$504,468	1
Jackson	3	\$8,507,500	\$2,835,833	0.04	\$126,978	3
Jefferson	4	\$2,486,820	\$621,705	0.06	\$37,117	3
Knox	11	\$4,732,072	\$430,188	0.16	\$70,628	2
Lake	2	\$1,951,567	\$975,783	0.03	\$29,128	2
Lawrence	6	\$8,526,589	\$1,421,098	0.09	\$127,263	3
Licking	23	\$76,313,779	\$3,317,990	0.34	\$1,139,012	2
Logan	6	\$1,965,000	\$327,500	0.09	\$29,328	1
Lorain	<b>27</b>	\$225,473,132	\$8,350,857	<b>0.40</b>	\$3,365,271	2
Lucas	9	\$215,581,412	<b>\$23,953,490</b>	0.13	\$3,217,633	1
Madison	9	\$14,624,520	\$1,624,947	0.13	\$218,276	2
Mahoning	16	\$18,135,126	\$1,133,445	0.24	\$270,674	3
Marion	15	\$4,659,811	\$310,654	0.22	\$69,549	1
Medina	23	\$13,618,884	\$592,125	0.34	\$203,267	2

Meigs	6	\$3,472,484	\$578,747	0.09	\$51,828	3
Mercer	19	\$31,396,989	\$1,652,473	0.28	\$468,612	1
Miami	21	\$11,655,246	\$555,012	0.31	\$173,959	1
Monroe	2	\$1,788,750	\$894,375	0.03	\$26,698	3
Montgomery	13	\$20,618,124	\$1,586,010	0.19	\$307,733	2
Morgan	1	\$68,400	\$68,400	0.01	\$1,021	3
Morrow	15	\$104,942,762	\$6,996,184	0.22	\$1,566,310	2
Muskingum	16	\$21,649,573	\$1,353,098	0.24	\$323,128	3
Noble	3	\$729,544	\$243,181	0.04	\$10,889	3
Ottawa	11	\$63,939,460	\$5,812,678	0.16	\$954,320	1
Paulding	12	\$5,193,593	\$432,799	0.18	\$77,516	1
Perry	10	\$15,800,575	\$1,580,057	0.15	\$235,829	3
Pickaway	20	\$18,824,010	\$941,201	0.30	\$280,955	2
Pike	12	\$2,665,815	\$222,151	0.18	\$39,788	3
Portage	14	\$591,200,591	\$42,228,614	0.21	\$8,823,889	2
Preble	12	\$67,178,530	\$5,598,211	0.18	\$1,002,665	1
Putnam	21	\$31,619,797	\$1,505,705	0.31	\$471,937	1
Richland	27	\$23,032,052	\$853,039	0.40	\$343,762	2
Ross	11	\$11,596,973	\$1,054,270	0.16	\$173,089	3
Sandusky	7	\$108,672,854	\$15,524,693	0.10	\$1,621,983	1
Scioto	15	\$26,951,836	\$1,796,789	0.22	\$402,266	3
Seneca	20	\$44,069,859	\$2,203,493	0.30	\$657,759	1
Shelby	6	\$23,286,876	\$3,881,146	0.09	\$347,565	1
Stark	12	\$88,937,842	\$7,411,487	0.18	\$1,327,430	2
Summit	11	\$92,890,210	\$8,444,565	0.16	\$1,386,421	2
Trumbull	17	\$1,198,682,122	\$70,510,713	0.25	\$17,890,778	3
Tuscarawas	13	\$14,948,159	\$1,149,858	0.19	\$223,107	3
Union	9	\$2,235,309	\$248,368	0.13	\$33,363	2
Van Wert	33	\$51,911,893	\$1,573,088	0.49	\$774,804	1
Vinton	1	\$25,500	\$25,500	0.01	\$381	3
Warren	24	\$93,912,531	\$3,913,022	0.36	\$1,401,680	2
Washington	7	\$4,958,252	\$708,322	0.10	\$74,004	3
Wayne	22	\$75,075,209	\$3,412,510	0.33	\$1,120,526	2
Williams	9	\$68,787,593	\$7,643,066	0.13	\$1,026,680	1
Wood	28	\$192,134,845	\$6,861,959	0.42	\$2,867,684	1
Wyandot	9	\$872,714,153	\$96,968,239	0.13	\$13,025,584	1
State	1158	\$7,519,337,586	\$6,044,992	0.20	\$112,228,919	

Table 2.3.d –Source: NWS, NOAA and OEMA. All dollar amount have been adjusted to 2018 dollars

There are 14 counties in the Ohio (out of 88) which have experienced over \$100 million in tornado damages, as reported by the NWS. Table 2.3 lists those top 14 counties.

County	Total # of Tornadoes	Total Damages
Greene	20	\$1,366,757,514
Trumbull	17	\$1,196,447,155
Wyandot	9	\$872,683,567
Portage	14	\$591,191,852
Cuyahoga	15	\$349,961,028
Hamilton	16	\$289,135,143
Lorain	27	\$222,883,361
Lucas	9	\$212,975,476
Wood	28	\$190,633,284
Butler	16	\$156,780,032
Sandusky	7	\$108,581,096
Morrow	15	\$104,118,686
Franklin	32	\$101,352,366

**Table 2.3.e** – Source: NWS, NOAA and OEMA. All dollar amount have been adjusted to 2018 dollars

There is a large difference between the areas of the state that may experience the greatest number of tornadoes versus where the costliest tornadoes occur. Table 2.3.f lists the counties in Ohio which have on average experienced the costliest tornado events. Nine counties have experienced average reported damages that exceed 10 million dollars per event.

County	Total # of Tornadoes	Avg. Damage per Event
Wyandot	9	\$96,964,841
Trumbull	17	\$70,379,244
Greene	20	\$68,337,876
Portage	14	\$42,227,989
Lucas	9	\$23,663,942
Cuyahoga	15	\$23,330,735
Hamilton	16	\$18,070,946
Sandusky	7	\$15,511,585
Coshocton	5	\$12,953,640

**Table 2.3.f**—Source: NWS, NOAA and OEMA. All dollar amount have been adjusted to 2018 dollars

When we look at the regional perspective, Region 2 had sustained more losses, other than crop damage, than another other region. Region 2 also leads in every other category related damages and possible future losses. Region 3 has the least amount in every category including related damages and possible future losses per Table 2.3.g.

County	Property Damage	Crop Damage	Total Damages	Avg. Damage per Event	Estimated Annual Tornadoes	Est. Future Annual Losses
Region 1	\$2,038,000,183	\$168,220	\$2,049,138,150	\$6,617,648	0.214	\$1,416,851
Region 2	\$3,799,492,312	\$290,620	\$3,822,722,240	\$8,205,254	0.251	\$2,059,251
Region 3	\$1,641,377,786	\$61,710	\$1,647,477,196	\$3,703,301	0.132	\$487,223

Table 2.3.g –Source: NWS, NOAA and OEMA. All dollar amount have been adjusted to 2018 dollars

NWS data was used to project the annual probability of death and injury at the county level. Table 2.3.h lists the counties in alphabetical order for estimated future death and injury losses from tornado events with dollar amounts determined using the methodology explained earlier in this section.

County	Deaths	Estimated Annual Deaths	Estimated Annual Lost Due to Death	Injuries	Estimated Annual Injuries	Estimated Annual Lost Due to Injuries
Adams	2	0.030	\$211,045	2	0.030	\$8,739
Allen	11	0.164	\$1,160,746	101	1.507	\$441,310
Ashland	0	0.000	\$0	16	0.239	\$69,910
Ashtabula	0	0.000	\$0	29	0.433	\$126,713
Athens	0	0.000	\$0	7	0.104	\$30,586
Auglaize	0	0.000	\$0	4	0.060	\$17,478
Belmont	0	0.000	\$0	0	0.000	\$0
Brown	1	0.015	\$105,522	6	0.090	\$26,216
Butler	1	0.015	\$105,522	31	0.463	\$135,451
Carroll	1	0.015	\$105,522	5	0.075	\$21,847
Champaign	0	0.000	\$0	4	0.060	\$17,478
Clark	0	0.000	\$0	11	0.164	\$48,063
Clermont	4	0.060	\$422,090	51	0.761	\$222,840
Clinton	2	0.030	\$211,045	19	0.284	\$83,019
Columbiana	0	0.000	\$0	27	0.403	\$117,974
Coshocton	0	0.000	\$0	0	0.000	\$0
Crawford	0	0.000	\$0	6	0.090	\$26,216
Cuyahoga	12	0.179	\$1,266,269	466	6.955	\$2,036,142
Darke	0	0.000	\$0	26	0.388	\$113,604
Defiance	0	0.000	\$0	0	0.000	\$0
Delaware	4	0.060	\$422,090	38	0.567	\$166,037
Erie	2	0.030	\$211,045	26	0.388	\$113,604
Fairfield	0	0.000	\$0	16	0.239	\$69,910
Fayette	1	0.015	\$105,522	5	0.075	\$21,847
Franklin	0	0.000	\$0	11	0.164	\$48,063
Fulton	1	0.015	\$105,522	8	0.119	\$34,955
Gallia	0	0.000	\$0	20	0.299	\$87,388

Geauga	0	0.000	\$0	0	0.000	\$0
<b>Greene</b>	<b>37</b>	<b>0.552</b>	<b>\$3,904,328</b>	<b>1277</b>	<b>19.060</b>	<b>\$5,579,728</b>
Guernsey	0	0.000	\$0	11	0.164	\$48,063
<b>Hamilton</b>	<b>13</b>	<b>0.194</b>	<b>\$1,371,791</b>	<b>580</b>	<b>8.657</b>	<b>\$2,534,254</b>
Hancock	2	0.030	\$211,045	16	0.239	\$69,910
Hardin	0	0.000	\$0	0	0.000	\$0
Harrison	1	0.015	\$105,522	15	0.224	\$65,541
Henry	5	0.075	\$527,612	2	0.030	\$8,739
Highland	0	0.000	\$0	6	0.090	\$26,216
Hocking	0	0.000	\$0	0	0.000	\$0
Holmes	0	0.000	\$0	11	0.164	\$48,063
Huron	6	0.090	\$633,134	114	1.701	\$498,112
Jackson	0	0.000	\$0	0	0.000	\$0
Jefferson	0	0.000	\$0	1	0.015	\$4,369
Knox	0	0.000	\$0	17	0.254	\$74,280
Lake	0	0.000	\$0	40	0.597	\$174,776
Lawrence	0	0.000	\$0	1	0.015	\$4,369
Licking	1	0.015	\$105,522	26	0.388	\$113,604
Logan	0	0.000	\$0	0	0.000	\$0
<b>Lorain</b>	<b>18</b>	<b>0.269</b>	<b>\$1,899,403</b>	<b>158</b>	<b>2.358</b>	<b>\$690,366</b>
<b>Lucas</b>	<b>16</b>	<b>0.239</b>	<b>\$1,688,358</b>	<b>210</b>	<b>3.134</b>	<b>\$917,575</b>
Madison	0	0.000	\$0	1	0.015	\$4,369
Mahoning	3	0.045	\$316,567	15	0.224	\$65,541
Marion	0	0.000	\$0	3	0.045	\$13,108
Medina	0	0.000	\$0	15	0.224	\$65,541
Meigs	0	0.000	\$0	9	0.134	\$39,325
Mercer	2	0.030	\$211,045	29	0.433	\$126,713
Miami	0	0.000	\$0	2	0.030	\$8,739
Monroe	0	0.000	\$0	0	0.000	\$0
Montgomery	0	0.000	\$0	33	0.493	\$144,190
Morgan	0	0.000	\$0	0	0.000	\$0
Morrow	4	0.060	\$422,090	92	1.373	\$401,985
Muskingum	1	0.015	\$105,522	24	0.358	\$104,866
Noble	1	0.015	\$105,522	1	0.015	\$4,369
Ottawa	0	0.000	\$0	17	0.254	\$74,280
Paulding	0	0.000	\$0	7	0.104	\$30,586
Perry	0	0.000	\$0	11	0.164	\$48,063
Pickaway	0	0.000	\$0	37	0.552	\$161,668
Pike	0	0.000	\$0	11	0.164	\$48,063
Portage	0	0.000	\$0	2	0.030	\$8,739
Preble	0	0.000	\$0	0	0.000	\$0
Putnam	2	0.030	\$211,045	0	0.000	\$0
Richland	0	0.000	\$0	16	0.239	\$69,910

Ross	0	0.000	\$0	8	0.119	\$34,955
Sandusky	0	0.000	\$0	21	0.313	\$91,757
Scioto	7	0.104	\$738,657	77	1.149	\$336,444
Seneca	6	0.090	\$633,134	32	0.478	\$139,821
Shelby	3	0.045	\$316,567	74	1.104	\$323,336
Stark	2	0.030	\$211,045	12	0.179	\$52,433
Summit	0	0.000	\$0	0	0.000	\$0
Trumbull	10	0.149	\$1,055,224	<b>270</b>	<b>4.030</b>	<b>\$1,179,739</b>
Tuscarawas	0	0.000	\$0	10	0.149	\$43,694
Union	0	0.000	\$0	11	0.164	\$48,063
Van Wert	2	0.030	\$211,045	27	0.403	\$117,974
Vinton	0	0.000	\$0	0	0.000	\$0
Warren	0	0.000	\$0	26	0.388	\$113,604
Washington	0	0.000	\$0	5	0.075	\$21,847
Wayne	0	0.000	\$0	10	0.149	\$43,694
Williams	0	0.000	\$0	19	0.284	\$83,019
Wood	11	0.164	\$1,160,746	78	1.164	\$340,813
Wyandot	0	0.000	\$0	7	0.104	\$30,586
<b>State</b>	<b>195</b>	<b>0.033</b>	<b>\$233,828</b>	<b>4432</b>	<b>0.752</b>	<b>\$220,059</b>

Table 2.3.h— Source: NWS, NOAA and OEMA. All dollar amount have been adjusted to 2018 dollars

When we look at the regions, Region 1 has sustained more losses than another other region related to deaths and injuries. This is driven primarily by Greene, Lucas and Cuyahoga Counties.

County	Total # of Tornadoes	Deaths	Estimated Annual Deaths	Estimated Annual Lost Due to Death	Injuries	Estimated Annual Injuries	Estimated Annual Lost Due to Injuries
Region 1	416	69	0.036	\$251,071	844	0.434	\$127,165
Region 2	454	95	0.053	\$371,282	2955	1.633	\$478,207
Region 3	288	31	0.014	\$102,225	633	0.295	\$86,432

Table 2.3.i— Source: NWS, NOAA and OEMA. All dollar amount have been adjusted to 2018 dollars

**STATE-OWNED AND STATE-LEASED CRITICAL FACILITIES VULNERABILITY ANALYSIS & LOSS ESTIMATION**

Tornadoes, being non-spatial hazards, make it difficult to predict their impact on state owned and leased critical facilities. The entire state is within the 250 mph wind speed zone per map 2.a.; therefore, the potential for tornado to impact state-owned or leased structures exists. When comparing the Counties with the greatest value of state owned and leased critical facilities noted in Appendix C and the vulnerability analysis and loss estimation performed above using historical data, there is only one county (Cuyahoga) who is in the top ten for both value of critical facilities and estimate future losses to property and crops.

County	Critical Facility Value	Total # of Tornadoes	Total Damages	Avg. Damage per Event	Est. Future Annual Losses
Adams	\$ 6,635,481	14	\$4,327,105	\$309,079	\$64,584
Allen	\$ 90,950,176	17	\$24,334,255	\$1,431,427	\$363,198
Ashland	\$ 64,079,271	16	\$11,349,327	\$709,333	\$169,393
Ashtabula	\$ 18,832,622	15	\$20,952,867	\$1,396,858	\$312,729
Athens	\$ 33,380,530	2	\$1,683,093	\$841,546	\$25,121
Auglaize	\$ 11,545,804	13	\$7,172,782	\$551,752	\$107,056
Belmont	\$ 54,856,808	2	\$114,500	\$57,250	\$1,709
Brown	\$ 36,403,605	17	\$47,933,351	\$2,819,609	\$715,423
Butler	\$ 17,563,033	16	\$157,021,006	\$9,813,813	\$2,343,597
Carroll	\$ 3,661,999	8	\$1,491,625	\$186,453	\$22,263
Champaign	\$ 5,161,316	5	\$2,866,932	\$573,386	\$42,790
Clark	\$ 8,868,061	21	\$16,425,120	\$782,149	\$245,151
Clermont	\$ 17,885,810	20	\$33,461,205	\$1,673,060	\$499,421
Clinton	\$ 11,528,821	25	\$32,697,805	\$1,307,912	\$488,027
Columbiana	\$ 13,236,861	15	\$74,652,331	\$4,976,822	\$1,114,214
Coshocton	\$ 12,943,450	5	\$64,768,200	\$12,953,640	\$966,690
Crawford	\$ 10,357,812	12	\$7,173,778	\$597,815	\$107,071
Cuyahoga	<b>\$ 248,840,544</b>	15	<b>\$353,263,446</b>	\$23,550,896	<b>\$5,272,589</b>
Darke	\$ 8,619,026	20	\$79,928,571	\$3,996,429	\$1,192,964
Defiance	\$ 7,562,674	10	\$6,156,855	\$615,686	\$91,893
Delaware	\$ 46,217,477	9	\$23,330,489	\$2,592,277	\$348,216
Erie	\$ 162,265,731	12	\$6,776,978	\$564,748	\$101,149
Fairfield	\$ 86,519,830	20	\$6,588,032	\$329,402	\$98,329
Fayette	\$ 5,118,182	15	\$13,892,275	\$926,152	\$207,347
Franklin	<b>\$ 2,160,396,499</b>	<b>32</b>	\$101,400,430	\$3,168,763	\$1,513,439
Fulton	\$ 4,397,188	12	\$14,241,637	\$1,186,803	\$212,562
Gallia	\$ 35,860,837	7	\$20,530,908	\$2,932,987	\$306,431
Geauga	\$ 8,594,197	8	\$5,514,050	\$689,256	\$82,299
Greene	\$ 9,914,088	20	<b>\$1,376,241,590</b>	<b>\$68,812,079</b>	<b>\$20,540,919</b>
Guernsey	\$ 39,704,477	9	\$14,225,350	\$1,580,594	\$212,319
Hamilton	\$ 173,140,806	16	\$293,041,197	\$18,315,075	\$4,373,749
Hancock	\$ 16,195,898	10	\$46,967,448	\$4,696,745	\$701,007
Hardin	\$ 4,141,282	6	\$1,294,050	\$215,675	\$19,314
Harrison	\$ 9,054,441	3	\$2,077,930	\$692,643	\$31,014
Henry	\$ 3,113,844	17	\$7,232,458	\$425,439	\$107,947
Highland	\$ 9,678,402	16	\$8,020,573	\$501,286	\$119,710
Hocking	\$ 19,239,206	3	\$116,165	\$38,722	\$1,734
Holmes	\$ 10,336,112	9	\$12,127,975	\$1,347,553	\$181,015
Huron	\$ 10,543,997	23	\$33,799,378	\$1,469,538	\$504,468
Jackson	\$ 15,130,501	3	\$8,507,500	\$2,835,833	\$126,978

Jefferson	\$ 7,592,901	4	\$2,486,820	\$621,705	\$37,117
Knox	\$ 40,507,246	11	\$4,732,072	\$430,188	\$70,628
Lake	\$ 5,525,021	2	\$1,951,567	\$975,783	\$29,128
Lawrence	\$ 7,469,158	6	\$8,526,589	\$1,421,098	\$127,263
Licking	\$ 158,043,312	23	\$76,313,779	\$3,317,990	\$1,139,012
Logan	\$ 6,290,042	6	\$1,965,000	\$327,500	\$29,328
Lorain	\$ 110,598,850	27	\$225,473,132	\$8,350,857	\$3,365,271
Lucas	\$ 276,597,391	9	\$215,581,412	\$23,953,490	\$3,217,633
Madison	\$ 321,691,881	9	\$14,624,520	\$1,624,947	\$218,276
Mahoning	\$ 73,288,381	16	\$18,135,126	\$1,133,445	\$270,674
Marion	\$ 128,613,896	15	\$4,659,811	\$310,654	\$69,549
Medina	\$ 18,601,644	23	\$13,618,884	\$592,125	\$203,267
Meigs	\$ 8,547,106	6	\$3,472,484	\$578,747	\$51,828
Mercer	\$ 7,655,738	19	\$31,396,989	\$1,652,473	\$468,612
Miami	\$ 14,677,401	21	\$11,655,246	\$555,012	\$173,959
Monroe	\$ 6,530,556	2	\$1,788,750	\$894,375	\$26,698
Montgomery	\$ 78,066,704	13	\$20,618,124	\$1,586,010	\$307,733
Morgan	\$ 3,950,084	1	\$68,400	\$68,400	\$1,021
Morrow	\$ 6,874,959	15	\$104,942,762	\$6,996,184	\$1,566,310
Muskingum	\$ 10,647,135	16	\$21,649,573	\$1,353,098	\$323,128
Noble	\$ 50,867,811	3	\$729,544	\$243,181	\$10,889
Ottawa	\$ 65,293,745	11	\$63,939,460	\$5,812,678	\$954,320
Paulding	\$ 1,387,796	12	\$5,193,593	\$432,799	\$77,516
Perry	\$ 3,884,728	10	\$15,800,575	\$1,580,057	\$235,829
Pickaway	\$ 195,643,558	20	\$18,824,010	\$941,201	\$280,955
Pike	\$ 3,878,547	12	\$2,665,815	\$222,151	\$39,788
Portage	\$ 7,594,529	14	\$591,200,591	\$42,228,614	\$8,823,889
Preble	\$ 4,859,547	12	\$67,178,530	\$5,598,211	\$1,002,665
Putnam	\$ 5,590,738	21	\$31,619,797	\$1,505,705	\$471,937
Richland	\$ 109,750,465	27	\$23,032,052	\$853,039	\$343,762
Ross	\$ 265,584,512	11	\$11,596,973	\$1,054,270	\$173,089
Sandusky	\$ 5,519,069	7	\$108,672,854	\$15,524,693	\$1,621,983
Scioto	\$ 171,351,723	15	\$26,951,836	\$1,796,789	\$402,266
Seneca	\$ 33,546,722	20	\$44,069,859	\$2,203,493	\$657,759
Shelby	\$ 26,824,309	6	\$23,286,876	\$3,881,146	\$347,565
Stark	\$ 102,066,812	12	\$88,937,842	\$7,411,487	\$1,327,430
Summit	\$ 201,182,298	11	\$92,890,210	\$8,444,565	\$1,386,421
Trumbull	\$ 54,712,352	17	\$1,198,682,122	\$70,510,713	\$17,890,778
Tuscarawas	\$ 56,132,900	13	\$14,948,159	\$1,149,858	\$223,107
Union	\$ 88,869,557	9	\$2,235,309	\$248,368	\$33,363
Van Wert	\$ 7,459,562	33	\$51,911,893	\$1,573,088	\$774,804
Vinton	\$ 5,854,782	1	\$25,500	\$25,500	\$381
Warren	\$ 150,201,626	24	\$93,912,531	\$3,913,022	\$1,401,680

<b>Washington</b>	\$ 28,580,706	7	\$4,958,252	\$708,322	\$74,004
<b>Wayne</b>	\$ 7,056,104	22	\$75,075,209	\$3,412,510	\$1,120,526
<b>Williams</b>	\$ 5,459,757	9	\$68,787,593	\$7,643,066	\$1,026,680
<b>Wood</b>	\$ 67,981,624	<b>28</b>	\$192,134,845	\$6,861,959	\$2,867,684
<b>Wyandot</b>	\$ 10,280,904	9	<b>\$872,714,153</b>	<b>\$96,968,239</b>	<b>\$13,025,584</b>

**Table 2.3.j** – Source: NWS, NOAA and OEMA. All dollar amounts have been adjusted to 2018 dollars

From a regional perspective, the impacts to Region 2 are significantly greater for two very clear reasons; one the amount of exposed critical facilities is significantly greater in Region 2 compared to the other regions. Second, Region 2 is impacted at a greater rate across all of the tornado related categories when compared to the other regions.

<b>County</b>	<b>Critical Facility Value</b>	<b>Total # of Tornadoes</b>	<b>Total Damages</b>	<b>Avg. Damage per Event</b>	<b>Est. Future Annual Losses</b>
<b>Region 1</b>	\$ 1,011,761,050	416	\$2,049,138,150	\$6,617,648	\$1,416,851
<b>Region 2</b>	\$ 4,434,187,314	454	\$3,822,722,240	\$8,205,254	\$2,059,251
<b>Region 3</b>	\$ 1,095,714,524	288	\$1,647,477,196	\$3,703,301	\$487,223

**Table 2.3.k** – Source: NWS, NOAA and OEMA. All dollar amount have been adjusted to 2018 dollars