

3.3 TORNADO

3.3.1 HAZARD IDENTIFICATION

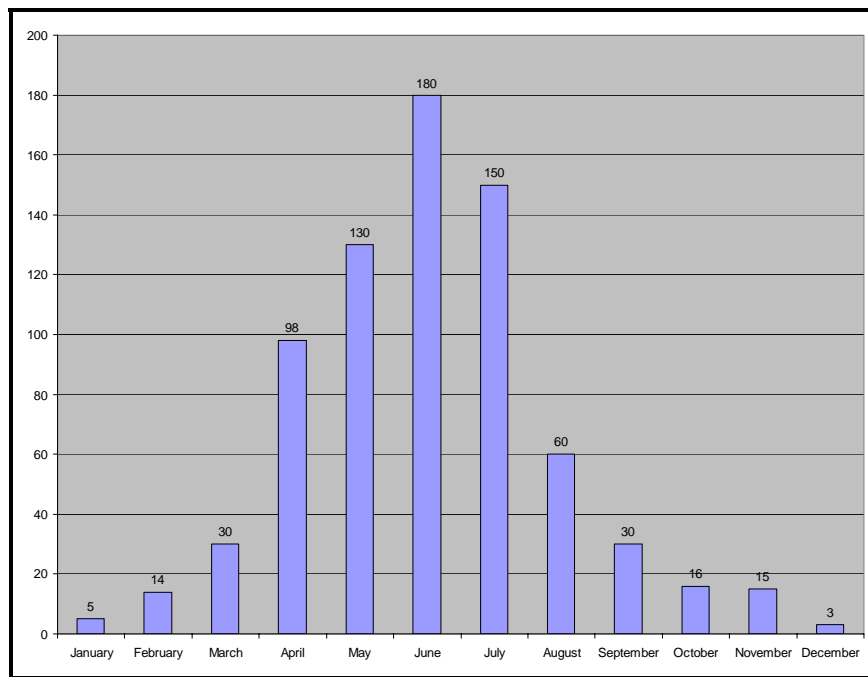
Tornadoes are not spatial hazards. As a result, it is often difficult to profile tornadoes and determine the exact vulnerability. However, estimations can be developed by analyzing historic occurrences and past declarations.

Tornadoes are rapidly rotating funnels of wind extending from storm clouds to the ground. They are created during severe thunderstorms when cold air overrides a layer of warm air, causing the warm air to rise rapidly. The midsection of the United States experiences a higher rate of tornadoes than other parts of the country because of the recurrent collision of moist, warm air moving north from the Gulf of Mexico with colder fronts moving east from the Rocky Mountains (FEMA, MHIRA 40).

Tornadoes are 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. In Ohio, tornadoes have higher frequency in the spring and summer months of April, May, June, and July (see Chart 3.3.1.a). While the majority of tornadoes cause little or no damage, some are capable of tremendous destruction, reaching wind speeds of 250 mph or more.

Chart 3.3.1.a

Frequency of Ohio Tornadoes by Month, 1950 to 2000



Source: SeverePlot Software, NOAA, <http://spc.noaa.gov/software/svrplot2/>

Table 3.3.1.a lists the top states in the nation for number of tornadoes; fatalities and injuries caused by tornado events, and accumulated dollar damages (adjusted for inflation by the consumer price index). While Ohio does not rank among the top states for the number of tornado events, it does rank within the top 20 states in the nation for fatalities, injuries, and dollar losses, indicating that it has a relatively high likelihood for damages resulting from tornado.

3.3.2 HAZARD PROFILE

3.3.2.1 Location

Ohio has a significant history of past tornado events. Map 3.3.2.1.a depicts the paths of 731 tornadoes that have struck the State of Ohio between 1950 and 2000. These storms caused over 200 deaths and over 4,000 injuries in the State. Between 1964 and 2004 10 tornadoes created damage that resulted in a federal disaster declaration (see Table 3.3.2.1.a). All regions in the state have had tornado declarations. However, Region 2 and Region 3 have the most counties that have received the most repetitive damage from historic occurrences and have had the largest estimate loss due to tornadoes.

3.3.2.2 Past Occurrences

One of the most significant storms is the April 1974 storm known as the Super-outbreak. One-hundred forty-eight tornadoes charged across Alabama, Georgia, Illinois, Indiana, Kentucky, Michigan, Mississippi, North Carolina, Ohio, South Carolina, Tennessee, Virginia, and West Virginia, killing 330 people and injuring 5,484 others. Within Ohio, the storm particularly affected Xenia, a municipality in Greene County within Region 1, where 37 tornadoes left 30 people dead, 1,100 injured, and more than 1,000 homes destroyed (NOAA, <http://www.publicaffairs.noaa.gov/storms/>). In September 2000, Xenia was again struck by an F4 tornado, damaging or destroying 300 homes and businesses, killing one person, and injuring 115 (Xenia 3-3).

Another notable storm occurred on April 1999, in Region 1 and Region 2 affecting 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 (OEMA 16).

In more recent years there have been two disaster declarations DR-1444, which was specifically for tornado, related damage and DR-1484, which covered tornado and flood, related damage. DR-1444 was in November 2002 and affected several counties in Region 1 and Region 2 and caused damage in Coshocton County, which is located in Region 3. The damage from this disaster was relative to a tornado that registers a F-4 on the Fujita Scale. Many of the residents of the impacted counties were left homeless, many were trapped in debris, damage to commercial structures created localized unemployment, hundreds of injuries were reported, and multiple lives were lost.

DR-1484 was in August 2003 and was the most recent declaration that included tornadic damage. The primary damage from this disaster was flood related and a

more thorough discussion of those issues can be found in the flood section of the Risk Assessment. However, Mahoning County in the eastern portion of Region 2 was left damaged by a tornado that spawned from the storm. The tornado 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 8 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.

3.3.2.3 Probability of Occurrence

Between 1950 and 2000, Ohio experienced 731 tornadoes, an average of 14.6 storms annually. Statewide, there is a statistical chance of 4% on any given day of having a tornado of any size (this represents a statistical probability calculated mathematically based on the occurrence of past tornado events: 14.6 tornadoes divided by 365 days = 0.04 occurrences per day. Of course the likelihood of a tornado is normally lower during the winter and higher during the summer). While tornado occurrences are generally considered to be unpredictable, past occurrences show that there is a 0.29% chance statewide of having a F3, F4, or F5 tornado with wind speeds of at least 158 mph. Based on historic occurrences the counties with the highest probability of occurrence include Huron, Medina, Richland (0.09%), Franklin (0.11%), and Lorain (0.12%). Portage, Greene, and Scioto have the highest chance, 0.01%, of having an F5 tornado.

The Fujita Tornado Scale measures tornado intensity. The Fujita Tornado Measurement Scale, shown in Table 3.3.2.3.a, determines likely wind speeds based on the severity of tornado damage and assigns a scale category, F0 through F5. The table below shows the tornado category, corresponding wind speed, types of damage possible, and the number of tornadoes per category that Ohio has experienced between 1950 and 2000. Tornado occurrence and intensities by county can be found in Appendix E, Additional Tornado Information.

Table 3.3.2.3.a shows that the majority of tornadoes in Ohio, about 70%, fall in the gale to moderate categories (F0 to F1), causing light to moderate damage, such as breaking tree limbs or overturning mobile homes. Fifteen or 2% of past tornadoes have been F4 or F5 with wind speeds similar to those that affected Xenia in the 1974 Superoutbreak.

Table 3.3.2.3.a

Fujita Tornado Measurement Scale and Frequencies in Ohio				
Category	Wind Speed	Examples of Possible Damage	Number in Ohio	% of OH Tornadoes
F0	Gale (40-72 mph)	Light damage. Some damage to chimneys; break branches off trees; push over shallow-rooted trees; damage to sign boards.	185	25.31%
F1	Moderate (73-112 mph)	Moderate damage. Surface peeled off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off roads.	330	45.14%
F2	Significant (113-157 mph)	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.	163	22.30%
F3	Severe (158-206 mph)	Severe damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; cars lifted off ground and thrown.	38	5.20%
F4	Devastating (207-260 mph)	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.	12	1.64%
F5	Incredible (261-318 mph)	Incredible damage. Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobile-sized missiles fly through the air in excess of 100-yards; trees debarked; incredible phenomena will occur.	3	0.41%
Total tornadoes in Ohio, 1950-2000			731	--

Source: SeverePlot Software, Storm Prediction Center, NOAA; FEMA Understanding Your Risks

For a more detailed understanding of the probability of future occurrence for the state Tables 3.3.2.3.b, 3.3.2.3.c, and 3.3.2.3.d determine the probability of future occurrence based on past occurrences by region for each county. In Region 1 Huron, Wood, and Seneca counties have the highest probability of future occurrence all having a probability of 28% or more. Most of the counties within this region have a probability of 8% to 15% probability.

In Region 2 Lorain, Franklin, Medina, and Richland have the highest probability of future occurrence all having a probability of more than 32%. The largest number of counties in this region has a probability of 20% or more.

Muskingum and Columbiana Counties have the highest probability of future occurrence in Region 3, both having 30% probabilities. Unlike other regions, Region 3 has two counties that have a 0% probability (Morgan and Vinton) as they have had no past occurrences. However, it does not mean tornadoes cannot occur in these areas, it simply means there is a less likely hood based on past occurrences.

3.3.3 VULNERABILITY AND ESTIMATE OF POTENTIAL LOSSES BY JURISDICTION

3.3.3.1 Methodology

The Tornado Relative Risk column indicates the relative likelihood of the occurrence of a strong tornado (F2 or above). These relative ratings were determined by review of actual tornado occurrences over a 50-year period. Based on the frequency of occurrence, each county has been assigned into a high, medium, or low *relative* risk categories.

There is a high probability that mobile homes and residential units built without wind-resistant construction standards would suffer catastrophic destruction as the result of a strike by an F2 or stronger tornado. On a statewide basis, Ohio does not have building codes that address wind resistance for most types of residential dwellings. However, since 1995 many local codes that address wind resistance have been adopted. Therefore, structures constructed prior to 1995 are potentially more susceptible to catastrophic destruction as the result of a tornado strike than those constructed after 1995.

By using U.S. Bureau of the Census housing data, the age of structures can be assessed on a countywide basis and the year 1995 was used as a benchmark to separate the most vulnerable pre-1995 housing stock from later construction. In addition, mobile homes are considered highly vulnerable to catastrophic damage from tornadoes and high wind regardless of construction date. Census housing data also include information on the number of mobile or manufactured homes for each county. The actual numbers of vulnerable residential housing units in each county was determined based on adding the resulting totals for residential structures built before 1995 and mobile homes. Vulnerable structures represent a percentage of the residential and total building units, indicating the relative exposure of the county to tornado damage.

The average residential home value of vulnerable structures has been estimated based upon Census and HAZUS-MH housing data. As the pre-1995 residential units and mobile homes are expected to suffer catastrophic damage as the result of Fujita class F2 or above tornado winds, the loss value has been estimated as the structure replacement value. Map 3.3.3.1.a shows the number of pre-1995 structures by county. Map 3.3.3.1.b shows replacement estimates based on Pre-1995 structures and historical tornadoes. The ratio of personal income to potential loss, expressed as a percentage, represents a relative measure of county economic vulnerability.

County commercial and governmental unit counts have been calculated from the number of structures per census block according to HAZUS-MH level one data. Average values for commercial and governmental units have been based on HAZUS-MH residential average value. Commercial unit average value equals three times HAZUS-MH residential census block average value. Governmental unit average value equals four times HAZUS-MH residential census block average value. Commercial and governmental Pre-95 structures have been based on HAZUS-MH census block residential year built ranges. Historical damages are 50-year tornado

damage totals for each county provided by NCDC / NOAA storm event database. At risk totals have been calculated by multiplying pre-95 structures by their respective average values.

3.3.3.2 Results

Tables 3.3.3.2.a, 3.3.3.2.d, and 3.3.3.2.g provide information on the number of residential structures and the estimate of potential residential loss based on the number of structures, date of construction and average value for each region by county.

Tables 3.3.3.2.b, 3.3.3.2.e, and 3.3.3.2.h provide information on the number of commercial structures and the estimate of potential commercial structure loss based on the number of structures, date of construction and average value for each region by county.

Tables 3.3.3.2.c, 3.3.3.2.f, and 3.3.3.2.i provide information on the number of local governmental structures and the estimate of potential local governmental structure loss based on the number of structures, date of construction and average value for each region by county.

Region 1 has the second highest number (751,118) total at risk residential structures with an estimate of potential loss of \$50,348,000. Within Region 1 Lucas County has the largest number of residential structures that are pre-1995. As a result, Lucas has the highest estimate of estimate of potential residential loss in the region (\$11,459,000). Wyandot County has the lowest number of pre-1995 residential structures within the region (4,831). In addition they have the lowest estimate of potential residential loss in the region (\$372,000).

Additionally, Region 1 has the second highest number (6,920) of commercial structures at risk to tornadoes with approximately 5,775 commercial units being constructed prior to 1995. The total at risk value of the pre-1995 at risk structures is \$1,635,328,689. Within Region 1 Lucas County has the largest number of commercial structures at risk with a total estimate potential loss of \$447,318,495. Paulding County has the least amount of commercial structures at risk with a total estimated potential loss of \$4,221,420.

Region 1 also has the second highest number of local governmental structures at risk to tornadoes (243) with a total estimated value of \$76,703,622. Again Lucas County has the highest vulnerability within the region with a total of 27 local governmental structures at risk. Of those structures 23 were constructed pre-1995 with a total estimated value of \$7,945,224.

Region 2 has the largest number of structures at risk to tornadoes and the greatest estimate of potential losses (2,346,074 with an estimate of potential residential loss of \$197,972,000). Within Region 2 Cuyahoga County has the largest number of pre-1995 residential structures with a total estimate of potential loss of \$33,343,000. Franklin County has the second largest with a total of 226,183 pre-1995 residential structures and an estimate of potential loss of \$25,802,000. Ashland County has the lowest number of pre-1995 structures (12,039) as well as the lowest estimate of potential residential loss in the region (\$1,090,000).

Region 2 greatly supersedes Region 1 and 3 in the number (33,060) of commercial structures at risk to tornadoes with approximately 79% (26,177) of those structures being constructed pre-1995. The total at risk value for the pre-1995 constructed structures is \$8,667,050,829. Within Region 2 Cuyahoga County has the largest number of commercial structures (7,165) at risk with a total estimated value of \$1,830,679,200. Pickaway County has the lowest number of at risk commercial structures (88) with the lowest estimated value of \$22,224,420.

As with residential and commercial vulnerability, Region 2 has the highest vulnerability to tornadoes for local governmental structures with a total of 1,518 structures at risk. Of those structures 1,193 were constructed prior to 1995 with a total at risk value of \$526,526,926. Franklin County has the highest number of local governmental structures at risk (562) with 443 of those structures being constructed prior to 1995. The total estimated value of the pre-1995 structures at risk is \$194,587,399.

Region 3 has the lowest number of total residential structures at risk (571,277) with an estimate of potential residential loss of \$30,369,000. Within the region Clermont County has the largest number of pre-1995 residential structures (51,686), which results in an estimate of potential loss of \$5,658,000. Noble County has the least number of pre-1995 residential structures (1,141), which results in the lowest estimate of potential residential loss in the region (\$185,000).

In addition to the lowest number of residential structures at risk to tornadoes, Region 3 also has the lowest number of commercial structures at risk to tornadoes. In all the region has 3,685 commercial structures at risk with approximately 83% constructed pre-1995. The total estimate risk for the pre-1995 commercial structures is \$768,551,679. Within the region Clermont County has the largest number (594) of commercial structures at risk with a total estimated risk of \$175,549,704.

Again Region 3 has the least vulnerability to tornadoes. The region as a whole has 168 local governmental structures at risk to tornadoes with 142 of those structures being constructed prior to 1995. The total at risk value of the pre-1995 structures is \$44,526,698. Within the region Clermont County has the highest vulnerability with 16 local governmental structures at risk. Of those structures 13 were constructed prior to 1995 with a total at risk value of \$6,300,291.

3.3.4 VULNERABILITY AND ESTIMATE OF POTENTIAL LOSSES OF STATE OWNED CRITICAL FACILITIES

3.3.4.1 Methodology

The methodology to determine the vulnerability of state owned structures and critical facilities to tornadoes were identified in section 3.1.4.1.

3.3.4.2 Results

Since tornadoes are non-spatial hazards and have the potential to affect all state owned structures and critical facilities in the state this section defaults to the overall

discussion of state owned structures and critical facilities identified in section 3.1.4.1, Table 3.1.4.2.a, and Appendix C.

Table 3.3.1.a

Top 20 States for Number of Tornadoes, Fatalities, Injuries, and Damages, 1950 to 1994											
Tornadoes			Fatalities			Injuries			CPI adjusted dollars		
Rank	State	Number	Rank	State	Number	Rank	State	Number	Rank	State	Number
1	Texas	5,490	1	Texas	475	1	Texas	7,452	1	Texas	\$1,955,927,552
2	Oklahoma	2,300	2	Mississippi	386	2	Mississippi	5,344	2	Indiana	\$1,648,654,336
3	Kansas	2,110	3	Arkansas	279	3	Alabama	4,483	3	Kansas	\$1,212,980,480
4	Florida	2,009	4	Alabama	275	4	Ohio	4,156	4	Georgia	\$1,117,426,176
5	Nebraska	1,673	5	Michigan	237	5	Arkansas	3,697	5	Oklahoma	\$1,065,659,392
6	Iowa	1,374	6	Indiana	218	6	Indiana	3,641	6	Minnesota	\$1,015,354,624
7	Missouri	1,166	7	Oklahoma	217	7	Illinois	3,599	7	Ohio	\$965,464,832
8	South Dakota	1,139	8	Kansas	199	8	Michigan	3,214	8	Illinois	\$823,819,264
9	Illinois	1,137	9	Illinois	182	9	Oklahoma	3,184	9	Missouri	\$739,382,784
10	Colorado	1,113	10	Tennessee	181	10	Georgia	2,662	10	Iowa	\$709,211,904
11	Louisiana	1,086	11	Ohio	173	11	Florida	2,594	11	Nebraska	\$632,463,872
12	Mississippi	1,039	12	Missouri	155	12	Tennessee	2,592	12	Massachusetts	\$617,793,280
13	Georgia	888	13	Louisiana	134	13	Kentucky	2,333	13	Pennsylvania	\$615,033,088
14	Alabama	886	14	Georgia	111	14	Kansas	2,267	14	Alabama	\$609,664,768
15	Indiana	886	15	Kentucky	105	15	Missouri	2,252	15	Louisiana	\$593,237,248
16	Arkansas	854	16	Massachusetts	99	16	Louisiana	2,169	16	Mississippi	\$541,601,536
17	Wisconsin	844	17	Wisconsin	94	17	North Carolina	1,778	17	Arkansas	\$516,939,264
18	Minnesota	832	18	Minnesota	87	18	Iowa	1,774	18	Florida	\$498,256,384
19	North Dakota	799	19	Florida	82	19	Minnesota	1,707	19	Wisconsin	\$410,756,864
20	Michigan	712	20	North Carolina	81	20	Wisconsin	1,442	20	Connecticut	\$385,388,800

Source: Storm Prediction Center, NOAA, www.spc.noaa.gov/archives/tornadoes/st-rank.html

Table 3.3.2.3.b

Number and Statistical Probability of Tornadoes for Region 1													
	F0		F1		F2		F3		F4		F5		
	#	F0	#	F1	#	F2	#	F3	#	F4	#	F5	Grand Total
Allen	4	8%	3	6%		0%	2	4%	1	2%		0%	20%
Auglaize	1	2%	4	8%		0%		0%		0%		0%	10%
Champaign		0%	2	4%	2	4%		0%		0%		0%	8%
Clark	3	6%	7	14%	1	2%		0%		0%		0%	22%
Clinton	4	8%	6	12%	2	4%		0%		0%		0%	24%
Crawford	1	2%	7	14%	1	2%		0%		0%		0%	18%
Darke	5	10%	2	4%	4	8%	1	2%		0%		0%	24%
Defiance	4	8%		0%	2	4%		0%		0%		0%	12%
Erie	5	10%	3	6%	2	4%		0%		0%		0%	20%
Fayette	1	2%	2	4%	2	4%	1	2%		0%		0%	12%
Fulton	4	8%	6	12%	1	2%		0%		0%		0%	22%
Hancock	1	2%	4	8%	3	6%		0%		0%		0%	16%
Hardin	1	2%	4	8%		0%		0%		0%		0%	10%
Henry	3	6%	2	4%	2	4%		0%		0%		0%	14%
Huron	4	8%	6	12%	6	12%		0%		0%		0%	32%
Logan	1	2%	2	4%	1	2%	1	2%		0%		0%	10%
Lucas	1	2%	1	2%	2	4%		0%	1	2%		0%	10%
Madison		0%	5	10%		0%		0%		0%		0%	10%
Marion	4	8%	5	10%	4	8%		0%		0%		0%	26%
Mercer	3	6%	7	14%	1	2%		0%		0%		0%	22%
Miami	2	4%	9	18%	2	4%		0%		0%		0%	26%
Morrow	3	6%	2	4%	5	10%	1	2%		0%		0%	22%
Ottawa	2	4%	2	4%	2	4%		0%		0%		0%	12%
Paulding		0%	5	10%	1	2%	1	2%		0%		0%	14%
Preble	1	2%	4	8%	2	4%	1	2%		0%		0%	16%
Putnam	4	8%	6	12%	1	2%	1	2%		0%		0%	24%
Sandusky		0%	3	6%		0%		0%		0%		0%	6%
Seneca	3	6%	6	12%	3	6%	2	4%		0%		0%	28%
Shelby	2	4%		0%	1	2%	1	2%	1	2%		0%	10%
Union	2	4%	3	6%	1	2%		0%		0%		0%	12%
Van Wert	1	2%	6	12%	1	2%	1	2%	1	2%		0%	20%
Williams	1	2%	2	4%	3	6%		0%		0%		0%	12%
Wood	8	16%	2	4%	4	8%	1	2%		0%		0%	30%
Wyandot	1	2%	4	8%	3	6%		0%		0%		0%	16%
Total	80		132		65		1		4		0		

Table 3.3.2.3.c

Number and Statistical Probability of Tornadoes for Region 2													
	F0		F1		F2		F3		F4		F5		
	#	F0	#	F1	#	F2	#	F3	#	F4	#	F5	Grand Total
Ashland	6	12%	3	6%	1	2%		0%		0%		0%	20%
Ashtabula	1	2%	4	8%	4	8%		0%	1	2%		0%	20%
Butler	2	4%	5	10%	4	8%	1	2%		0%		0%	24%
Cuyahoga	3	6%	3	6%	3	6%	2	4%		0%		0%	22%
Delaware	1	2%	1	2%	1	2%		0%		0%		0%	6%
Fairfield	2	4%	7	14%	1	2%	1	2%		0%		0%	22%
Franklin	8	16%	7	14%	5	10%	1	2%		0%		0%	42%
Geauga	2	4%	3	6%	3	6%		0%		0%		0%	16%
Greene	1	2%	4	8%	5	10%		0%	1	2%	1	2%	24%
Hamilton		0%	5	10%	2	4%	2	4%	2	4%		0%	22%
Knox	4	8%	1	2%	5	10%		0%		0%		0%	20%
Lake	1	2%		0%	1	2%		0%		0%		0%	4%
Licking	2	4%	8	16%	3	6%	1	2%		0%		0%	28%
Lorain	9	18%	8	16%	3	6%		0%	2	4%		0%	44%
Mahoning	5	10%	4	8%	4	8%	1	2%		0%		0%	28%
Medina	6	12%	9	18%	1	2%	1	2%		0%		0%	34%
Montgomery	1	2%	5	10%		0%	1	2%		0%		0%	14%
Pickaway	3	6%	5	10%	2	4%	2	4%		0%		0%	24%
Portage	1	2%	5	10%	1	2%		0%		0%	1	2%	16%
Richland	5	10%	7	14%	4	8%		0%		0%		0%	32%
Stark		0%	3	6%	2	4%		0%		0%		0%	10%
Summit	1	2%	5	10%	1	2%	2	4%		0%		0%	18%
Trumbull	5	10%	3	6%	1	2%	2	4%	1	2%		0%	24%
Warren	3	6%	3	6%	4	8%		0%		0%		0%	20%
Wayne	1	2%	9	18%	3	6%		0%		0%		0%	26%
Total	73		117		64		17		7		2		

Table 3.3.2.3.d

Number and Statistical Probability of Tornadoes for Region 3													
	F0		F1		F2		F3		F4		F5		
	#	F0	#	F1	#	F2	#	F3	#	F4	#	F5	Grand Total
Adams	1	2%	6	12%		0%	1	2%		0%		0%	16%
Athens		0%	1	2%		0%		0%		0%		0%	2%
Belmont	2	4%	1	2%		0%		0%		0%		0%	6%
Brown	3	6%	4	8%	1	2%		0%		0%		0%	16%
Carroll		0%	2	4%	1	2%		0%		0%		0%	6%
Clermont	4	8%	3	6%	1	2%	1	2%	1	2%		0%	20%
Columbiana	6	12%	5	10%	3	6%	1	2%		0%		0%	30%
Coshocton		0%	2	4%	1	2%		0%		0%		0%	6%
Gallia	1	2%	2	4%	1	2%		0%		0%		0%	8%
Guernsey	3	6%	2	4%	2	4%		0%		0%		0%	14%
Harrison		0%	1	2%	1	2%	1	2%		0%		0%	6%
Highland	1	2%	4	8%	3	6%	2	4%		0%		0%	20%
Hocking		0%	2	4%		0%		0%		0%		0%	4%
Holmes		0%	4	8%	2	4%		0%		0%		0%	12%
Jackson	3	6%	1	2%		0%		0%		0%		0%	8%
Jefferson	1	2%	1	2%	1	2%		0%		0%		0%	6%
Lawrence	1	2%	2	4%		0%		0%		0%		0%	6%
Meigs		0%	2	4%	1	2%		0%		0%		0%	6%
Monroe	1	2%	1	2%		0%		0%		0%		0%	4%
Morgan		0%		0%		0%		0%		0%		0%	0%
Muskingum		0%	9	18%	6	12%		0%		0%		0%	30%
Noble		0%	1	2%	1	2%		0%		0%		0%	4%
Perry		0%	4	8%	1	2%		0%		0%		0%	10%
Pike		0%	1	2%	2	4%		0%		0%		0%	6%
Ross		0%	6	12%	1	2%		0%		0%		0%	14%
Scioto	1	2%	8	16%	1	2%	1	2%		0%	1	2%	24%
Tuscarawas	2	4%	4	8%	2	4%		0%		0%		0%	16%
Vinton		0%		0%		0%		0%		0%		0%	0%
Washington	2	4%	2	4%	2	4%		0%		0%		0%	12%
Total	32		81		34		7		1		1		

Table 3.3.3.2.a

F-2 Vulnerability and Estimate of Potential Residential Losses for Region 1										
County	Tornado Relative Risk	Res. Units (Incl. Mobile Homes)	Avg. Res. Home Value	Non Mobile Home Res. Units Pre-1995	Mobile Homes	Pre-1995 Res. + Mobile Homes	% Res. Pre-1995 & MH (At Risk Pop.)	\$ Value of Historic Tornado Damages (50 yrs. NOAA)	At Risk Total Value (Pre-1995 Res. + All Mobile Homes) x1,000	Personal Income by Risk Value to (%)
Allen	MEDIUM	35,116	\$68,837	28,643	2,264	30,907	88%	\$5,879,000	\$2,128,000	89%
Auglaize	MEDIUM	15,483	\$92,359	9,557	856	10,413	67%	\$3,275,000	\$962,000	95%
Champaign	HIGH	14,029	\$87,183	7,477	1,401	8,878	63%	\$578,000	\$774,000	98%
Clark	HIGH	49,099	\$82,218	39,807	3,056	42,863	87%	\$3,118,000	\$3,524,000	80%
Clinton	HIGH	14,211	\$89,214	8,344	1,561	9,905	70%	\$8,120,000	\$ 884,000	85%
Crawford	MEDIUM	16,401	\$75,545	11,384	1,287	12,671	77%	\$1,780,000	\$957,000	86%
Darke	MEDIUM	17,992	\$87,458	10,674	910	11,584	64%	\$30,713,000	\$1,013,000	98%
Defiance	MEDIUM	14,471	\$79,561	9,253	1,415	10,668	74%	\$2,578,000	\$849,000	92%
Erie	LOW	28,326	\$103,990	22,023	1,606	23,629	83%	\$3,495,000	\$2,457,000	70%
Fayette	HIGH	9,633	\$82,187	6,633	673	7,306	76%	\$5,585,000	\$600,000	86%
Fulton	MEDIUM	14,738	\$99,753	8,001	1,517	9,518	65%	\$5,353,000	\$949,000	84%
Hancock	HIGH	24,756	\$98,415	16,115	2,084	18,199	74%	\$14,553,000	\$1,791,000	84%
Hardin	HIGH	11,048	\$67,522	6,062	1,236	7,298	66%	\$553,000	\$493,000	105%
Henry	HIGH	10,624	\$79,781	5,498	1,042	6,540	62%	\$2,578,000	\$522,000	104%
Huron	MEDIUM	19,854	\$89,372	11,682	1,881	13,563	68%	\$5,879,000	\$1,212,000	89%
Logan	HIGH	19,872	\$77,790	11,161	2,599	13,760	69%	\$60,808,000	\$1,070,000	82%
Lucas	HIGH	140,239	\$85,349	128,931	5,331	134,262	96%	\$578,000	\$11,459,000	81%
Madison	HIGH	12,605	\$102,672	8,184	1,255	9,439	75%	\$3,118,000	\$969,000	78%
Marion	MEDIUM	21,697	\$70,649	15,167	1,471	16,638	77%	\$8,120,000	\$1,175,000	103%
Mercer	MEDIUM	14,029	\$90,338	8,849	1,197	10,046	72%	\$1,780,000	\$908,000	84%
Miami	MEDIUM	32,203	\$110,134	23,185	782	23,967	74%	\$67,753,000	\$2,640,000	81%
Morrow	HIGH	12,198	\$83,621	5,695	1,972	7,667	63%	\$3,495,000	\$641,000	88%
Ottawa	MEDIUM	24,635	\$105,435	15,163	4,002	19,165	78%	\$6,718,000	\$2,021,000	45%
Paulding	MEDIUM	8,215	\$63,258	4,740	1,142	5,882	72%	\$5,353,000	\$372,000	99%
Preble	MEDIUM	14,663	\$91,528	8,904	807	9,711	66%	\$138,450,000	\$889,000	88%
Putnam	HIGH	11,430	\$86,129	6,447	982	7,429	65%	\$14,553,000	\$640,000	101%
Sandusky	MEDIUM	21,184	\$86,086	12,670	1,620	14,290	67%	\$2,578,000	\$1,230,000	97%
Seneca	MEDIUM	19,897	\$77,134	11,286	1,559	12,845	65%	\$28,000	\$991,000	101%
Shelby	HIGH	15,723	\$95,786	10,050	971	11,021	70%	\$3,103,000	\$1,056,000	92%
Union	LOW	13,271	\$112,133	6,806	1118	7,924	60%	\$275,000	\$889,000	95%
Van Wert	MEDIUM	10,949	\$68,697	5,886	937	6,823	62%	\$2,750,000	\$469,000	116%
Williams	LOW	14,386	\$79,873	8,156	1,473	9,629	67%	\$5,778,000	\$769,000	94%
Wood	HIGH	40,100	\$105,421	28,775	4,970	33,745	84%	\$5,195,000	\$3,557,000	72%
Wyandot	MEDIUM	8,041	\$76,954	4,100	731	4,831	60%	\$1,440,000	\$372,000	60%
REGIONAL TOTALS		751,118	\$2,952,382	525,308	57,708	583,016		\$425,910,000	\$50,348,000	

Source: NOAA and HAZUS-MH

Table 3.3.3.2.b

F-2 Vulnerability and Estimate of Potential Commercial Losses for Region 1							
County	Tornado Relative Risk	Commercial Units	Average Commercial Value (3x Res. Ave. Value)	Commercial Units Pre-1995	% Comm. Pre-1995	Dollar Value of Historic Tornado Damages (50 yrs. NOAA)	At Risk Total Value (Pre-1995 Commercial)
Allen	MEDIUM	466	\$216,735	386	83%	\$5,879,000	\$83,659,710
Auglaize	MEDIUM	112	\$297,135	97	87%	\$3,275,000	\$28,822,095
Champaign	HIGH	84	\$286,329	72	86%	\$578,000	\$20,615,688
Clark	HIGH	385	\$261,177	306	79%	\$3,118,000	\$79,920,162
Clinton	HIGH	108	\$293,388	89	82%	\$8,120,000	\$26,111,532
Crawford	MEDIUM	80	\$244,326	67	84%	\$1,780,000	\$16,369,842
Darke	MEDIUM	107	\$276,537	91	85%	\$30,713,000	\$25,164,867
Defiance	MEDIUM	108	\$259,167	90	83%	\$2,578,000	\$23,325,030
Erie	LOW	332	\$349,257	267	80%	\$3,495,000	\$93,251,619
Fayette	HIGH	71	\$257,247	60	85%	\$5,585,000	\$15,434,820
Fulton	MEDIUM	110	\$331,698	94	85%	\$5,353,000	\$31,179,612
Hancock	HIGH	279	\$317,820	226	81%	\$14,553,000	\$71,827,320
Hardin	HIGH	62	\$227,661	52	84%	\$553,000	\$11,838,372
Henry	HIGH	61	\$263,655	53	87%	\$2,578,000	\$13,973,715
Huron	MEDIUM	160	\$300,087	136	85%	\$5,879,000	\$40,811,832
Logan	HIGH	114	\$266,022	96	84%	\$60,808,000	\$25,538,112
Lucas	HIGH	2,027	\$262,665	1703	84%	\$578,000	\$447,318,495
Madison	HIGH	59	\$340,014	49	83%	\$3,118,000	\$16,660,686
Marion	MEDIUM	224	\$224,808	185	83%	\$8,120,000	\$41,589,480
Mercer	MEDIUM	86	\$289,254	72	84%	\$1,780,000	\$20,826,288
Miami	MEDIUM	305	\$336,726	247	81%	\$67,753,000	\$83,171,322
Morrow	HIGH	30	\$297,954	25	83%	\$3,495,000	\$7,448,850
Ottawa	MEDIUM	147	\$375,780	121	82%	\$6,718,000	\$45,469,380
Paulding	MEDIUM	24	\$222,180	19	79%	\$5,353,000	\$4,221,420
Preble	MEDIUM	72	\$292,035	62	86%	\$138,450,000	\$18,106,170
Putnam	HIGH	101	\$282,102	86	85%	\$14,553,000	\$24,260,772
Sandusky	MEDIUM	142	\$276,498	125	88%	\$2,578,000	\$34,562,250
Seneca	MEDIUM	147	\$250,818	129	88%	\$28,000	\$32,355,522
Shelby	HIGH	96	\$303,744	80	83%	\$3,103,000	\$24,299,520
Union	LOW	86	\$366,747	71	83%	\$275,000	\$26,039,037
Van Wert	MEDIUM	79	\$224,376	70	89%	\$2,750,000	\$15,706,320
Williams	LOW	93	\$266,754	78	84%	\$5,778,000	\$20,806,812
Wood	HIGH	501	\$361,752	416	83%	\$5,195,000	\$150,488,832
Wyandot	MEDIUM	62	\$257,331	55	89%	\$1,440,000	\$14,153,205
REGIONAL TOTALS		6,920	\$9,679,779	5,775		\$425,910,000	\$1,635,328,689

Source: NOAA and HAZUS-MH

Table 3.3.3.2.c

F-2 Vulnerability and Estimate of Potential Governmental Structure Losses for Region 1							
County	Tornado Relative Risk	Gov. Units	Average Governmental Value (4x Res. Ave. Value)	Governmental Units Pre-1995	% Gov. Pre-1995	Dollar Value of Historic Tornado Damages (50 yrs. NOAA)	At Risk Total Value (Pre-1995 Governmental)
Allen	MEDIUM	27	\$288,980	22	83%	\$5,879,000	\$6,459,804
Auglaize	MEDIUM	5	\$396,180	4	87%	\$3,275,000	\$1,719,344
Champaign	HIGH	4	\$381,772	3	86%	\$578,000	\$1,307,190
Clark	HIGH	6	\$348,236	5	79%	\$3,118,000	\$1,658,074
Clinton	HIGH	15	\$391,184	12	83%	\$8,120,000	\$4,861,529
Crawford	MEDIUM	6	\$325,768	5	84%	\$1,780,000	\$1,634,505
Darke	MEDIUM	4	\$368,716	3	85%	\$30,713,000	\$1,249,474
Defiance	MEDIUM	5	\$345,556	4	83%	\$2,578,000	\$1,439,529
Erie	LOW	16	\$465,676	13	80%	\$3,495,000	\$5,992,498
Fayette	HIGH	4	\$342,996	3	85%	\$5,585,000	\$1,161,886
Fulton	MEDIUM	6	\$442,264	5	86%	\$5,353,000	\$2,276,487
Hancock	HIGH	6	\$423,760	5	81%	\$14,553,000	\$2,058,992
Hardin	HIGH	3	\$303,548	3	84%	\$553,000	\$769,190
Henry	HIGH	4	\$351,540	3	86%	\$2,578,000	\$1,212,697
Huron	MEDIUM	8	\$400,116	7	85%	\$5,879,000	\$2,720,775
Logan	HIGH	3	\$354,696	3	84%	\$60,808,000	\$892,083
Lucas	HIGH	27	\$350,220	23	84%	\$578,000	\$7,945,224
Madison	HIGH	10	\$453,352	8	83%	\$3,118,000	\$3,759,820
Marion	MEDIUM	11	\$299,744	9	83%	\$8,120,000	\$2,730,318
Mercer	MEDIUM	3	\$385,672	3	84%	\$1,780,000	\$966,174
Miami	MEDIUM	10	\$448,968	8	81%	\$67,753,000	\$3,635,354
Morrow	HIGH	3	\$397,272	2	83%	\$3,495,000	\$989,162
Ottawa	MEDIUM	4	\$501,040	3	82%	\$6,718,000	\$1,652,072
Paulding	MEDIUM	3	\$296,240	2	78%	\$5,353,000	\$693,404
Preble	MEDIUM	9	\$389,380	8	86%	\$138,450,000	\$3,002,948
Putnam	HIGH	3	\$376,136	3	85%	\$14,553,000	\$963,412
Sandusky	MEDIUM	4	\$368,664	4	88%	\$2,578,000	\$1,295,569
Seneca	MEDIUM	5	\$334,424	4	88%	\$28,000	\$1,465,176
Shelby	HIGH	4	\$404,992	3	83%	\$3,103,000	\$1,343,172
Union	LOW	1	\$488,996	1	82%	\$275,000	\$403,079
Van Wert	MEDIUM	2	\$299,168	2	89%	\$2,750,000	\$529,976
Williams	LOW	3	\$355,672	3	84%	\$5,778,000	\$897,780
Wood	HIGH	13	\$482,336	11	83%	\$5,195,000	\$5,202,727
Wyandot	MEDIUM	6	\$343,108	5	88%	\$1,440,000	\$1,814,198
REGIONAL TOTALS		243	\$12,906,372	202		\$425,910,000	\$76,703,622

Source: NOAA and HAZUS-MH

Table 3.3.3.2.d

F-2 Vulnerability and Estimate of Potential Residential Losses for Region 2										
County	Tornado Relative Risk	Res. Units (Incl. Mobile Homes)	Avg. Res. Home Value	Non Mobile Home Res. Units Pre-1995	Mobile Homes	Pre-1995 Res. + Mobile Homes	% Res. Pre-1995 & MH (At Risk Pop.)	\$ Value of Historic Tornado Damages (50 yrs. NOAA)	At Risk Total Value (Pre-1995 Res. + All Mobile Homes) x1,000	Personal Income by Risk Value to (%)
Ashland	LOW	17,620	\$90,561	10,622	1,417	12,039	68%	\$7,203,000	\$1,090,000	83%
Ashtabula	HIGH	37,671	\$75,642	24,788	3,912	28,700	76%	\$6,353,000	\$2,171,000	80%
Butler	HIGH	102,651	\$107,639	85,029	4,956	89,985	88%	\$60,808,000	\$9,686,000	76%
Cuyahoga	HIGH	399,032	\$108,816	303,202	3,214	306,416	77%	\$67,753,000	\$33,343,000	93%
Delaware	MEDIUM	39,474	\$194,198	16,580	1,319	17,899	45%	\$3,800,000	\$3,476,000	100%
Fairfield	MEDIUM	40,497	\$120,319	25,943	1,549	27,492	68%	\$1,538,000	\$3,308,000	80%
Franklin	MEDIUM	302,592	\$111,630	226,183	4,953	231,136	76%	\$6,718,000	\$25,802,000	96%
Geauga	HIGH	31,135	\$165,026	21,468	1,368	22,836	73%	\$1,853,000	\$3,769,000	67%
Greene	HIGH	45,416	\$122,301	42,040	835	42,875	94%	\$268,860,000	\$5,244,000	65%
Hamilton	HIGH	234,751	\$114,903	147,443	3,302	150,745	64%	\$138,450,000	\$17,321,000	117%
Knox	MEDIUM	18,318	\$88,612	10,996	1,254	12,250	67%	\$250,000	\$1,085,000	89%
Lake	HIGH	73,399	\$136,994	70,356	2,329	72,685	99%	\$3,275,000	\$9,957,000	53%
Licking	HIGH	49,158	\$101,874	34,008	3,509	37,517	76%	\$10,078,000	\$3,822,000	78%
Lorain	LOW	89,269	\$110,349	76,386	3,470	79,856	89%	\$300,000	\$8,812,000	68%
Mahoning	MEDIUM	81,767	\$62,176	76,558	1,980	78,538	96%	\$5,660,000	\$4,883,000	99%
Medina	MEDIUM	46,980	\$148,399	34,362	703	35,065	75%	\$28,860,000	\$5,204,000	70%
Montgomery	MEDIUM	173,462	\$95,186	108,276	3,811	112,087	65%	\$2,578,000	\$10,669,000	114%
Pickaway	MEDIUM	17,324	\$92,297	10,453	2,291	12,744	74%	\$1,853,000	\$1,176,000	78%
Portage	HIGH	49,739	\$108,343	39,249	5,514	44,763	90%	\$3,353,000	\$4,850,000	64%
Richland	MEDIUM	41,696	\$77,608	34,861	2,523	37,384	90%	\$553,000	\$2,901,000	83%
Stark	HIGH	119,039	\$92,407	102,110	3,825	105,935	89%	\$10,208,000	\$9,789,000	79%
Summit	HIGH	171,766	\$107,341	151,050	2,525	153,575	89%	\$2,800,000	\$16,485,000	75%
Trumbull	HIGH	77,034	\$79,154	66,361	5,301	71,662	93%	\$285,000	\$5,672,000	76%
Warren	HIGH	49,723	\$138,478	33,288	1,012	34,300	69%	\$380,000	\$4,750,000	85%
Wayne	LOW	36,561	\$96,691	24,042	3,959	28,001	77%	\$30,175,000	\$2,707,000	76%
REGIONAL TOTALS		2,346,074	\$2,746,944	1,775,654	70,831	1,846,485		\$663,944,000	\$197,972,000	

Source: NOAA and HAZUS-MH

Table 3.3.3.2.e

F-2 Vulnerability and Estimate of Potential Commercial Losses for Region 2							
County	Tornado Relative Risk	Commercial Units	Average Commercial Value (3x Res. Ave. Value)	Commercial Units Pre-1995	% Comm. Pre-1995	Dollar Value of Historic Tornado Damages (50 yrs. NOAA)	At Risk Total Value (Pre-1995 Commercial)
Ashland	LOW	96	\$297,678	82	85%	\$7,203,000	\$24,409,596
Ashtabula	HIGH	224	\$250,800	193	86%	\$6,353,000	\$48,404,400
Butler	HIGH	1,304	\$334,416	1052	81%	\$60,808,000	\$351,805,632
Cuyahoga	HIGH	7,165	\$326,907	5600	78%	\$67,753,000	\$1,830,679,200
Delaware	MEDIUM	383	\$597,747	284	74%	\$3,800,000	\$169,760,148
Fairfield	MEDIUM	319	\$369,438	263	82%	\$1,538,000	\$97,162,194
Franklin	MEDIUM	5,004	\$337,038	3855	77%	\$6,718,000	\$1,299,281,490
Geauga	HIGH	299	\$512,148	240	80%	\$1,853,000	\$122,915,520
Greene	HIGH	431	\$372,669	326	76%	\$268,860,000	\$121,490,094
Hamilton	HIGH	4,606	\$346,338	3716	81%	\$138,450,000	\$1,286,992,008
Knox	MEDIUM	95	\$282,414	80	84%	\$250,000	\$22,593,120
Lake	HIGH	1,005	\$422,865	792	79%	\$3,275,000	\$334,909,080
Licking	HIGH	481	\$325,863	382	79%	\$10,078,000	\$124,479,666
Lorain	LOW	1,144	\$343,434	900	79%	\$300,000	\$309,090,600
Mahoning	MEDIUM	1,097	\$188,598	900	82%	\$5,660,000	\$169,738,200
Medina	MEDIUM	698	\$446,247	563	81%	\$28,860,000	\$251,237,061
Montgomery	MEDIUM	2,393	\$287,112	1857	78%	\$2,578,000	\$533,166,984
Pickaway	MEDIUM	88	\$313,020	71	81%	\$1,853,000	\$22,224,420
Portage	HIGH	432	\$362,688	334	77%	\$3,353,000	\$121,137,792
Richland	MEDIUM	443	\$246,243	358	81%	\$553,000	\$88,154,994
Stark	HIGH	1,453	\$282,630	1196	82%	\$10,208,000	\$338,025,480
Summit	HIGH	2,412	\$321,444	1946	81%	\$2,800,000	\$625,530,024
Trumbull	HIGH	759	\$252,069	618	81%	\$285,000	\$155,778,642
Warren	HIGH	457	\$423,396	345	75%	\$380,000	\$146,071,620
Wayne	LOW	272	\$321,486	224	82%	\$30,175,000	\$72,012,864
REGIONAL TOTALS		33,060	\$8,564,688	26,177		\$663,944,000	\$8,667,050,829

Source: NOAA and HAZUS-MH

Table 3.3.3.2.f

F-2 Vulnerability and Estimate of Potential Governmental Structure Losses for Region 2							
County	Tornado Relative Risk	Gov. Units	Average Governmental Value (4x Res. Ave. Value)	Governmental Units Pre-1995	% Gov. Pre-1995	Dollar Value of Historic Tornado Damages (50 yrs. NOAA)	At Risk Total Value (Pre-1995 Governmental)
Ashland	LOW	7	\$396,904	6	85%	\$7,203,000	\$2,365,521
Ashtabula	HIGH	18	\$334,400	16	86%	\$6,353,000	\$5,195,239
Butler	HIGH	45	\$445,888	36	81%	\$60,808,000	\$16,184,895
Cuyahoga	HIGH	267	\$435,876	209	78%	\$67,753,000	\$90,961,945
Delaware	MEDIUM	7	\$796,996	5	74%	\$3,800,000	\$4,141,998
Fairfield	MEDIUM	12	\$492,584	10	83%	\$1,538,000	\$4,879,133
Franklin	MEDIUM	562	\$449,384	433	77%	\$6,718,000	\$194,587,399
Geauga	HIGH	10	\$682,864	8	80%	\$1,853,000	\$5,477,821
Greene	HIGH	31	\$496,892	23	76%	\$268,860,000	\$11,633,883
Hamilton	HIGH	136	\$461,784	110	81%	\$138,450,000	\$50,663,053
Knox	MEDIUM	7	\$376,552	6	85%	\$250,000	\$2,230,822
Lake	HIGH	37	\$563,820	29	79%	\$3,275,000	\$16,445,815
Licking	HIGH	26	\$434,484	21	80%	\$10,078,000	\$8,981,185
Lorain	LOW	28	\$457,912	22	79%	\$300,000	\$10,092,371
Mahoning	MEDIUM	44	\$251,464	36	82%	\$5,660,000	\$9,075,821
Medina	MEDIUM	24	\$594,996	19	81%	\$28,860,000	\$11,527,300
Montgomery	MEDIUM	90	\$382,816	70	78%	\$2,578,000	\$26,729,689
Pickaway	MEDIUM	16	\$417,360	13	81%	\$1,853,000	\$5,417,978
Portage	HIGH	11	\$483,584	8	77%	\$3,353,000	\$4,109,131
Richland	MEDIUM	8	\$328,324	6	81%	\$553,000	\$2,122,293
Stark	HIGH	23	\$376,840	19	82%	\$10,208,000	\$7,133,031
Summit	HIGH	69	\$428,592	56	81%	\$2,800,000	\$23,853,417
Trumbull	HIGH	24	\$336,092	20	81%	\$285,000	\$6,564,124
Warren	HIGH	7	\$564,528	5	75%	\$380,000	\$2,982,186
Wayne	LOW	9	\$428,648	7	82%	\$30,175,000	\$3,170,876
REGIONAL TOTALS		1,518	\$11,419,584	1,193		\$663,944,000	\$526,526,926

Source: NOAA and HAZUS-MH

Table 3.3.3.2.g

F-2 Vulnerability and Estimate of Potential Residential Losses for Region 3										
County	Tornado Relative Risk	Res. Units (Incl. Mobile Homes)	Avg. Res. Home Value	Non Mobile Home Res. Units Pre-1995	Mobile Homes	Pre-1995 Res. + Mobile Homes	% Res. Pre-1995 & MH (At Risk Pop.)	\$ Value of Historic Tornado Damages (50 yrs. NOAA)	At Risk Total Value (Pre-1995 Res. + All Mobile Homes) x1,000	Personal Income by Risk Value to (%)
Adams	MEDIUM	12,853	\$49,195	6,636	3,162	9,798	76%	\$505,000	\$482,000	82%
Athens	LOW	22,548	\$68,278	13,430	4,709	18,139	80%	\$250,000	\$1,238,000	71%
Belmont	LOW	25,839	\$58,405	17,275	2,732	20,007	77%	\$50,000	\$1,169,000	97%
Brown	MEDIUM	18,186	\$69,872	9,044	3,820	12,864	71%	\$10,078,000	\$899,000	80%
Carroll	MEDIUM	13,079	\$74,100	7,032	2,250	9,282	71%	\$300,000	\$688,000	70%
Clermont	HIGH	59,058	\$109,471	45,576	6,110	51,686	88%	\$5,660,000	\$5,658,000	70%
Columbiana	MEDIUM	40,719	\$67,917	25,599	4,829	30,428	75%	\$28,860,000	\$2,067,000	90%
Coshocton	HIGH	15,607	\$68,418	8,731	2,625	11,356	73%	\$27,530,000	\$777,000	77%
Gallia	MEDIUM	14,508	\$58,048	8,111	3,489	11,600	80%	\$9,150,000	\$673,000	70%
Guernsey	MEDIUM	17,318	\$56,318	9,960	2,969	12,929	75%	\$3,353,000	\$728,000	87%
Harrison	LOW	7,433	\$48,630	3,823	1,289	5,112	69%	\$353,000	\$249,000	105%
Highland	HIGH	17,438	\$67,372	8,934	3,244	12,178	70%	\$1,100,000	\$820,000	82%
Hocking	LOW	12,097	\$68,437	6,602	2,136	8,738	72%	\$28,000	\$598,000	76%
Holmes	LOW	11,757	\$91,042	6,075	1,610	7,685	65%	\$505,000	\$700,000	79%
Jackson	MEDIUM	13,570	\$56,309	7,882	2,676	10,558	78%	\$7,203,000	\$595,000	81%
Jefferson	LOW	27,889	\$54,788	21,717	2,802	24,519	88%	\$6,353,000	\$1,343,000	91%
Lawrence	HIGH	25,923	\$54,973	17,960	4,576	22,536	87%	\$50,000	\$1,239,000	74%
Meigs	MEDIUM	11,733	\$45,300	5,785	2,862	8,647	74%	\$27,530,000	\$392,000	82%
Monroe	LOW	7,387	\$51,237	3,501	1,393	4,894	66%	\$30,713,000	\$251,000	91%
Morgan	LOW	8,124	\$51,759	4,113	1,853	5,966	73%	\$3,800,000	\$309,000	67%
Muskingum	HIGH	30,350	\$71,016	20,764	3,647	24,411	80%	\$1,538,000	\$1,734,000	86%
Noble	LOW	5,763	\$51,408	2,458	1,141	3,599	62%	\$5,585,000	\$185,000	107%
Perry	MEDIUM	13,659	\$62,872	6,507	2,433	8,940	65%	\$9,150,000	\$562,000	95%
Pike	HIGH	12,809	\$58,139	7,412	3,295	10,707	84%	\$268,860,000	\$622,000	72%
Ross	HIGH	28,884	\$72,480	16,684	5,284	21,968	76%	\$353,000	\$1,592,000	81%
Scioto	MEDIUM	30,362	\$52,115	20,984	4,640	25,624	84%	\$1,100,000	\$1,335,000	91%
Tuscarawas	MEDIUM	33,769	\$80,508	18,564	4,080	22,644	67%	\$1,250,000	\$1,823,000	86%
Vinton	LOW	6,643	\$45,723	3,160	1,901	5,061	76%	\$30,473,000	\$231,000	76%
Washington	LOW	25,972	\$67,097	16,894	4,117	21,011	81%	\$36,273,000	\$1,410,000	81%
REGIONAL TOTALS		571,277	\$1,831,227	351,213	91,674	442,887		\$517,953,000	\$30,369,000	

Source: NOAA and HAZUS-MH

Table 3.3.3.2.h

F-2 Vulnerability and Estimate of Potential Commercial Losses for Region 3							
County	Tornado Relative Risk	Commercial Units	Average Commercial Value (3x Res. Ave. Value)	Commercial Units Pre-1995	% Comm. Pre-1995	Dollar Value of Historic Tornado Damages (50 vs. NOAA)	At Risk Total Value (Pre-1995 Commercial)
Adams	MEDIUM	38	\$197,322	32	84%	\$505,000	\$6,314,304
Athens	LOW	159	\$239,247	130	82%	\$250,000	\$31,102,110
Belmont	LOW	236	\$195,318	207	88%	\$50,000	\$40,430,826
Brown	MEDIUM	56	\$263,715	46	82%	\$10,078,000	\$12,130,890
Carroll	MEDIUM	43	\$265,317	36	84%	\$300,000	\$9,551,412
Clermont	HIGH	594	\$362,706	484	81%	\$5,660,000	\$175,549,704
Columbiana	MEDIUM	257	\$225,315	220	86%	\$28,860,000	\$49,569,300
Coshocton	HIGH	87	\$245,946	73	84%	\$27,530,000	\$17,954,058
Gallia	MEDIUM	102	\$229,071	83	81%	\$9,150,000	\$19,012,893
Guernsey	MEDIUM	113	\$195,489	96	85%	\$3,353,000	\$18,766,944
Harrison	LOW	23	\$177,066	20	87%	\$353,000	\$3,541,320
Highland	HIGH	84	\$248,493	69	82%	\$1,100,000	\$17,146,017
Hocking	LOW	48	\$246,438	40	83%	\$28,000	\$9,857,520
Holmes	LOW	182	\$313,155	154	85%	\$505,000	\$48,225,870
Jackson	MEDIUM	61	\$211,704	51	84%	\$7,203,000	\$10,796,904
Jefferson	LOW	216	\$179,535	178	82%	\$6,353,000	\$31,957,230
Lawrence	HIGH	78	\$197,988	62	79%	\$50,000	\$12,275,256
Meigs	MEDIUM	38	\$182,805	32	84%	\$27,530,000	\$5,849,760
Monroe	LOW	38	\$185,421	33	87%	\$30,713,000	\$6,118,893
Morgan	LOW	30	\$202,092	25	83%	\$3,800,000	\$5,052,300
Muskingum	HIGH	286	\$235,728	238	83%	\$1,538,000	\$56,103,264
Noble	LOW	25	\$192,033	22	88%	\$5,585,000	\$4,224,726
Perry	MEDIUM	37	\$225,798	32	86%	\$9,150,000	\$7,225,536
Pike	HIGH	60	\$236,715	49	82%	\$268,860,000	\$11,599,035
Ross	HIGH	185	\$259,434	152	82%	\$353,000	\$39,433,968
Scioto	MEDIUM	188	\$180,240	158	84%	\$1,100,000	\$28,477,920
Tuscarawas	MEDIUM	223	\$269,772	192	86%	\$1,250,000	\$51,796,224
Vinton	LOW	15	\$193,548	13	87%	\$30,473,000	\$2,516,124
Washington	LOW	183	\$235,107	153	84%	\$36,273,000	\$35,971,371
REGIONAL TOTAL		3,685	\$6,592,518	3,080		\$517,953,000	\$768,551,679

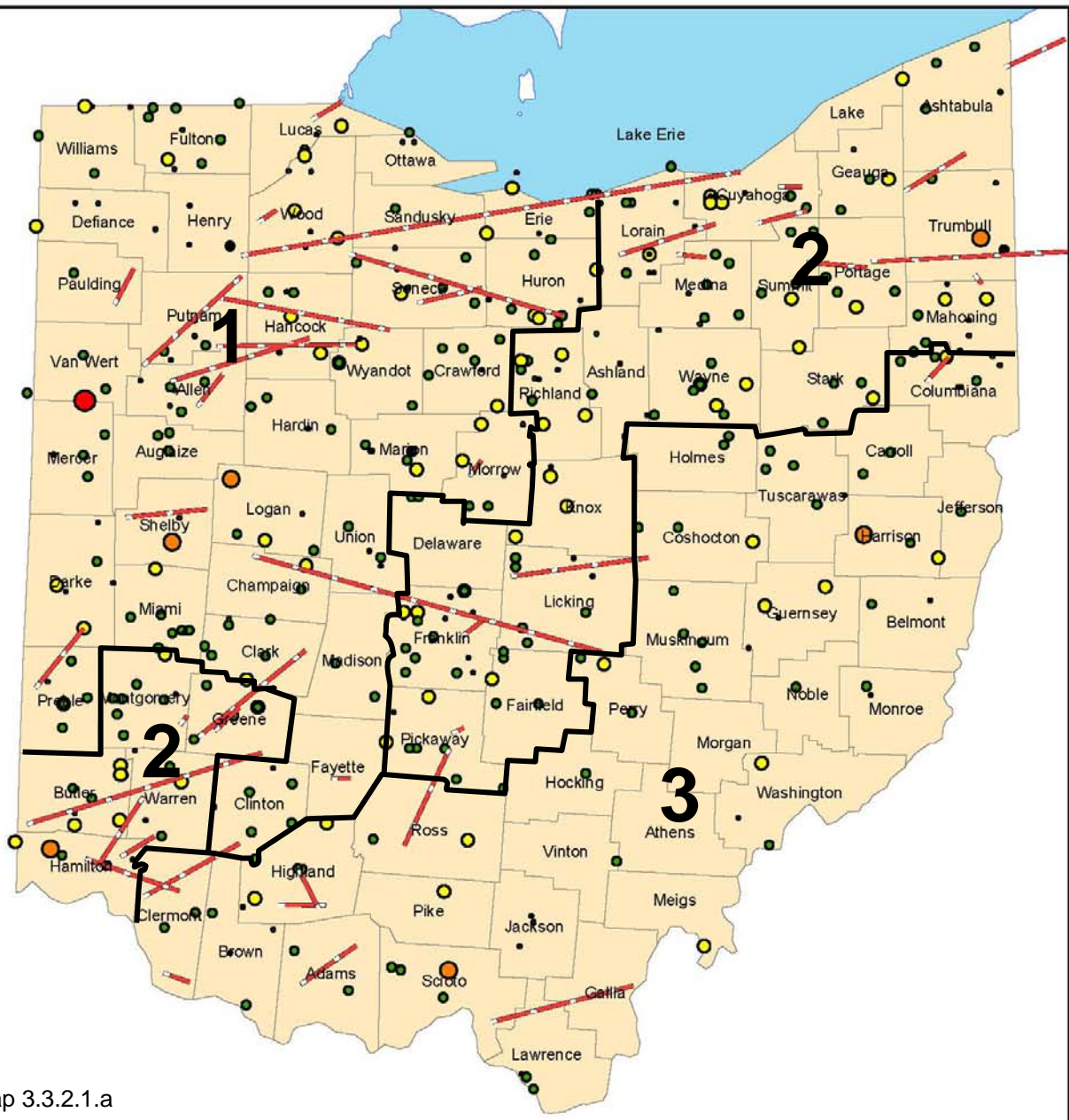
Source: NOAA and HAZUS-MH

Table 3.3.3.2.I

F-2 Vulnerability and Estimate of Potential Governmental Structure Losses for Region 3							
County	Tornado Relative Risk	Gov. Units	Average Governmental Value (4x Res. Ave. Value)	Governmental Units Pre-1995	% Gov. Pre-1995	Dollar Value of Historic Tornado Damages (50 yrs. NOAA)	At Risk Total Value (Pre-1995 Governmental)
Adams	MEDIUM	4	\$263,096	3	84%	\$505,000	\$884,558
Athens	LOW	12	\$318,996	10	82%	\$250,000	\$3,136,481
Belmont	LOW	13	\$260,424	11	88%	\$50,000	\$2,972,247
Brown	MEDIUM	3	\$351,620	2	83%	\$10,078,000	\$871,420
Carroll	MEDIUM	6	\$353,756	5	83%	\$300,000	\$1,761,556
Clermont	HIGH	16	\$483,608	13	81%	\$5,660,000	\$6,300,291
Columbiana	MEDIUM	9	\$300,420	8	85%	\$28,860,000	\$2,309,738
Coshocton	HIGH	3	\$327,928	3	84%	\$27,530,000	\$830,810
Gallia	MEDIUM	2	\$305,428	2	81%	\$9,150,000	\$496,603
Guernsey	MEDIUM	3	\$260,652	3	85%	\$3,353,000	\$662,344
Harrison	LOW	3	\$236,088	3	86%	\$353,000	\$612,292
Highland	HIGH	6	\$331,324	5	82%	\$1,100,000	\$1,637,010
Hocking	LOW	8	\$328,584	7	84%	\$28,000	\$2,196,339
Holmes	LOW	5	\$417,540	4	85%	\$505,000	\$1,766,825
Jackson	MEDIUM	5	\$282,272	4	84%	\$7,203,000	\$1,190,595
Jefferson	LOW	7	\$239,380	6	82%	\$6,353,000	\$1,381,258
Lawrence	HIGH	6	\$263,984	5	79%	\$50,000	\$1,251,722
Meigs	MEDIUM	2	\$243,740	2	86%	\$27,530,000	\$416,848
Monroe	LOW	4	\$247,228	3	86%	\$30,713,000	\$854,476
Morgan	LOW	2	\$269,456	2	85%	\$3,800,000	\$457,271
Muskingum	HIGH	10	\$314,304	8	83%	\$1,538,000	\$2,616,304
Noble	LOW	2	\$256,044	2	88%	\$5,585,000	\$448,537
Perry	MEDIUM	5	\$301,064	4	86%	\$9,150,000	\$1,296,251
Pike	HIGH	4	\$315,620	3	82%	\$268,860,000	\$1,033,061
Ross	HIGH	6	\$345,912	5	82%	\$353,000	\$1,707,555
Scioto	MEDIUM	8	\$240,320	7	84%	\$1,100,000	\$1,616,383
Tuscarawas	MEDIUM	6	\$359,696	5	86%	\$1,250,000	\$1,853,774
Vinton	LOW	3	\$258,064	3	84%	\$30,473,000	\$653,860
Washington	LOW	5	\$313,476	4	84%	\$36,273,000	\$1,310,289
REGIONAL TOTALS		168	\$8,790,024	142		\$517,953,000	\$44,526,698

Source: NOAA and HAZUS-MH

State of Ohio Past Tornado Occurrences 1950 - 2000



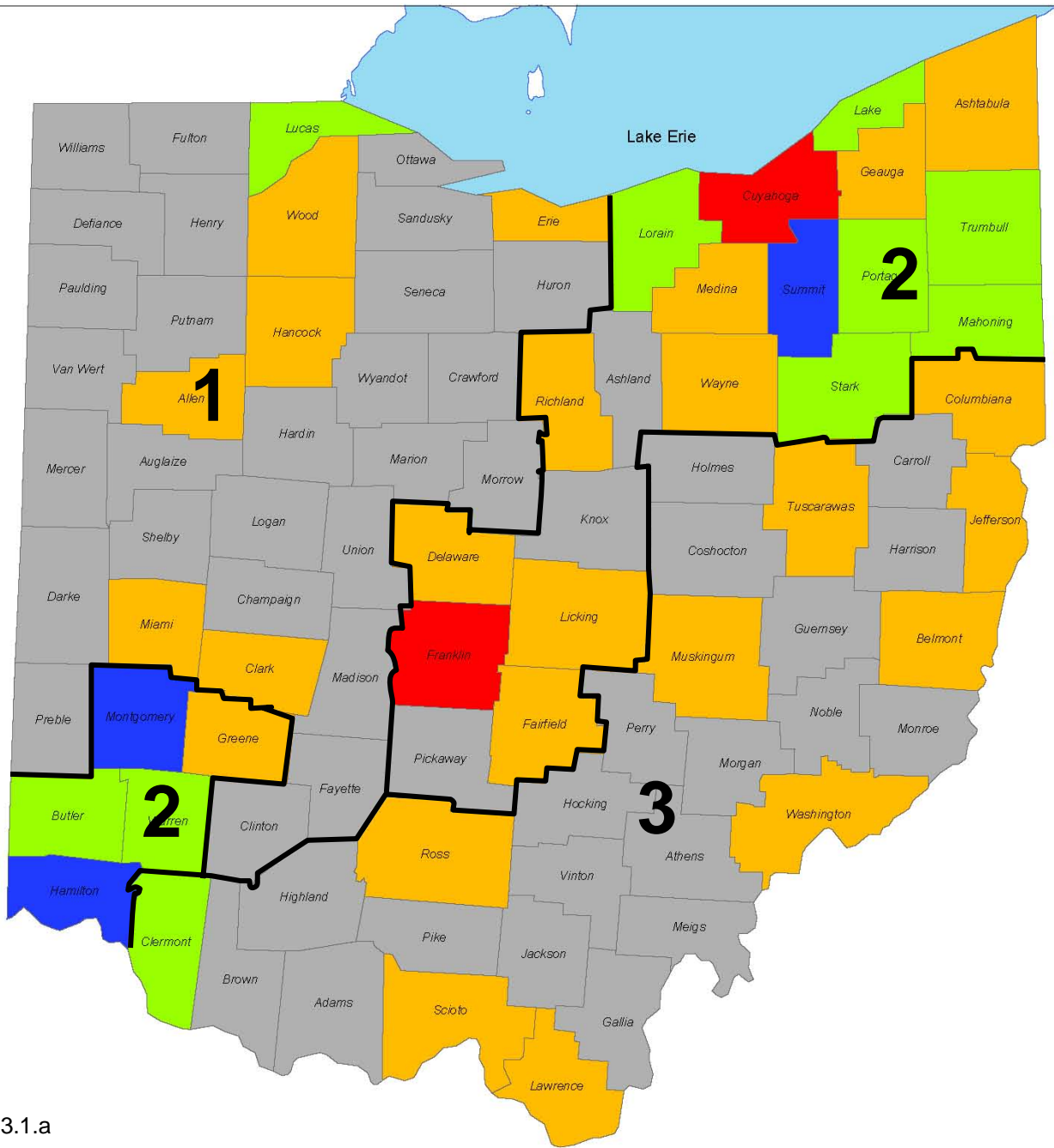
- Legend**
- Severe Tornado Tracks F3-F5
- Tornado Points**
- Magnitude**
- F0
 - F1
 - F2
 - F3
 - F4

731 tornadoes have struck the State of Ohio between 1950 and 2000. These storms caused over 200 deaths and over 4,000 injuries in the State.

Produced by URS and Ohio EMA
 Disclaimer: The information presented on this map has been compiled through various sources, the Ohio EMA does not guarantee its accuracy.
 Source: HAZUS-MH



Map 3.3.2.1.a



State of Ohio Number of Pre -1995 Structures by County

Legend

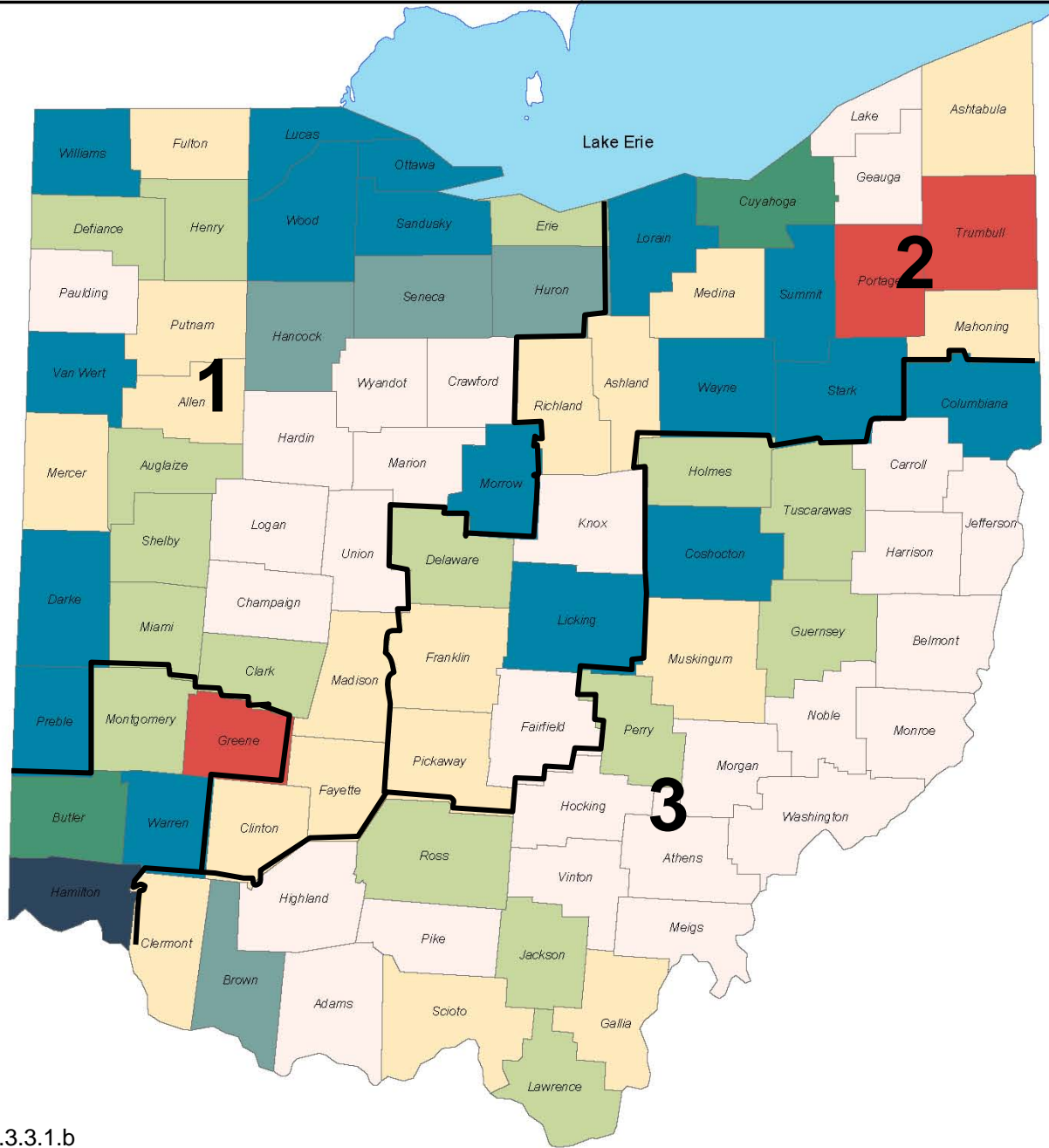
**Number of Structures
Pre - 1995**

- 5,770 - 25,000
- 25,001 - 50,000
- 50,001 - 150,000
- 150,001 - 250,000
- 250,001 - 450,000

Produced by URS and Ohio EMA
 Disclaimer: The information presented on this map has been compiled through various sources, the Ohio EMA does not guarantee its accuracy.
 Source: HAZUS-MH



Map 3.3.3.1.a



State of Ohio Replacement Estimates Based on Pre-1995 Structures and Historical Tornadoes

Legend

Total Value

- <\$ 2,000,000
- \$ 2,000,000 - \$ 4,000,000
- \$ 4,000,000 - \$ 10,000,000
- \$ 10,000,000 - \$ 20,000,000
- \$ 20,000,000 - \$ 50,000,000
- \$ 50,000,000 - \$ 100,000,000
- \$ 100,000,000 - \$ 200,000,000
- \$ 200,000,000 - \$ 510,000,000

The replacement value of vulnerable structures has been estimated based upon Census and HAZUS-MH housing data. As the pre-1995 residential units and mobile homes are expected to suffer catastrophic damage as the result of Fujita class F2 or above tornado winds, the loss value has been estimated as the structure replacement value.

Produced by URS and Ohio EMA
 Disclaimer: The information presented on this map has been compiled through various sources, the Ohio EMA does not guarantee its accuracy.
 Source: HAZUS-MH



Map 3.3.3.1.b