

2.4 WINTER STORM

Canadian and Arctic cold fronts that push cold temperatures, ice, and snow into the State generally cause winter storms, blizzards, and ice storms. Severe winter weather in Ohio consists of freezing temperatures and heavy precipitation, usually in the form of snow, freezing rain, or sleet. Severe winter weather affects all parts of the State.

Blizzard conditions occur when the following conditions last three hours or longer:

- 35 mph or greater wind speeds,
- Considerable snowfall and blowing snow bringing visibility below $\frac{1}{4}$ mile, and,
- Temperatures of 20° F or lower.

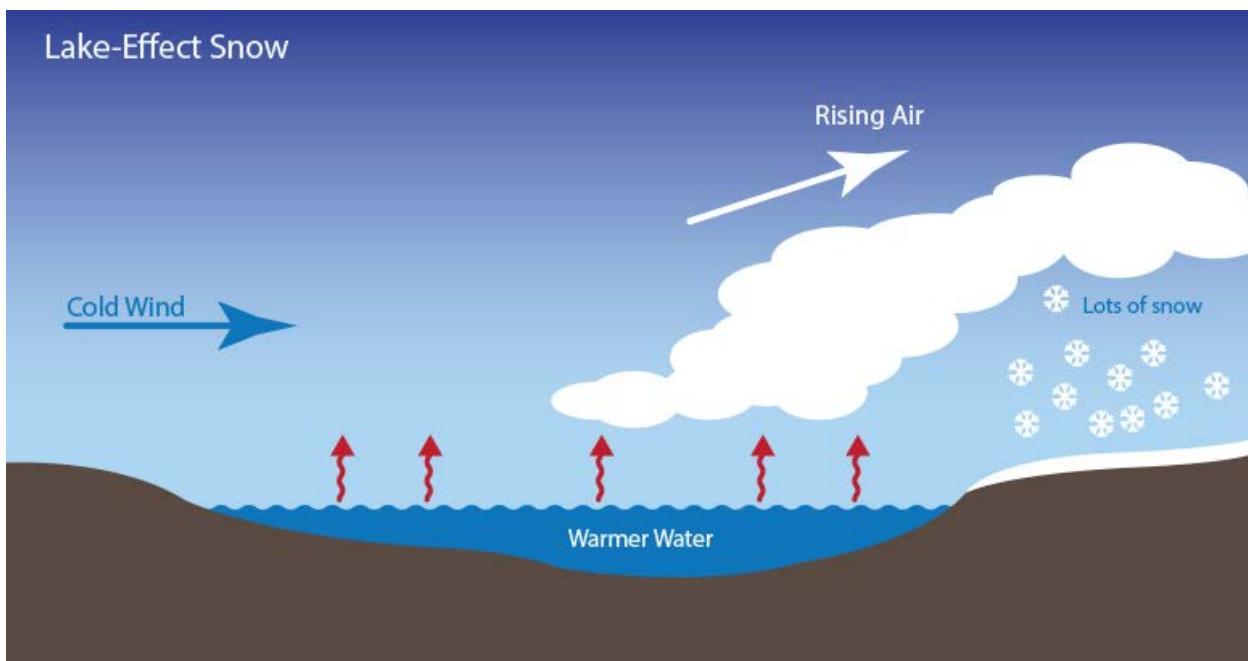
Severe blizzards have wind speeds exceeding 45 mph, visibility near zero, and temperatures of 10° F or lower.

While Ohio residents and governments are accustomed to handling winter storm events, occasional extreme events can make conditions dangerous and disruptive. Heavy snow volume makes snow removal difficult. Trees, cars, roads, and other surfaces develop a coating of ice, making even small accumulations of ice extremely hazardous to motorists and pedestrians. The most prevalent impacts of heavy accumulations of ice are slippery roads and walkways that lead to vehicle and pedestrian accidents; collapsed roofs from fallen trees and limbs from heavy ice and snow loads; and felled trees, telephone poles and lines, electrical wires, and communication towers. As a result of severe ice storms, telecommunications and power can be disrupted for days.

The northeastern portion of Ohio near the Great Lakes experiences what is known as “lake-effect snow” (see Figure 2.4.a). As cold air passes over the relatively warm waters of the large lakes, the weather system absorbs moisture and heat, and releases this in the form of snow. Lake effect snowfall intensity is affected by:

- The contrast between the lake and air temperatures,
- The distance air has traveled over water, known as the fetch, and
- The regional weather conditions-- a snow storm’s maximum penetration inland will generally be greatest during late autumn/early winter and shortest during the late winter.

Figure 2.4a
Generation of Lake Effect Snow



Source: <https://sciinks.gov/lake-snow/>

Lake-effect snowstorms have been known to cause continuous snowfall for as long as 48 hours over a sharply defined region. One single, intense local storm cell can yield as much as 48 inches of light-density snow in 24 hours or less. Consequently, snowfalls can vary greatly, with areas of deep snowfall adjacent to areas with relatively little snow.

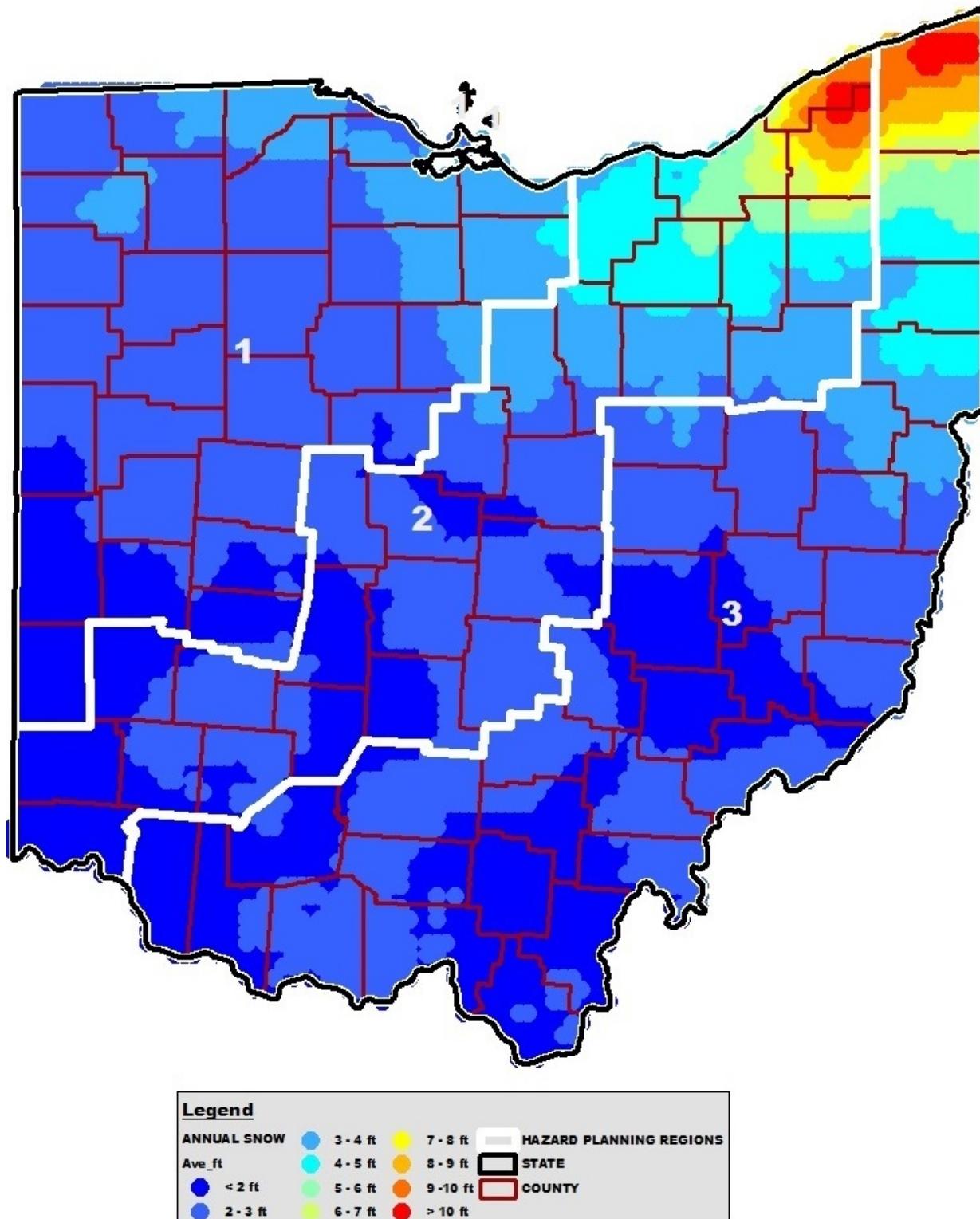
Snow and strong easterly wind conditions ahead of a warm front usually cause ice storms. The snow, however, changes temporarily to sleet and then to rain that freezes when it hits the ground, covering exposed surfaces with a layer of ice. Local accumulations of ice may be heavy if the storm halts over a region for extended periods of time. Ice storms lasting more than 12 hours usually produce ice accumulations several inches thick and affect an area that may range from a few square miles to areas covering several states. The typical ice storm swath is 30 miles wide and 300 miles long.

RISK ASSESSMENT

LOCATION

Winter storms are non-spatial hazards; therefore, it is difficult to determine the actual location of the damage that may result from a winter storm event. In an effort to address this limitation the mean annual snow depth from 2013 to 2017 was mapped (see Map 2.4.a).

State of Ohio
Map 2.4a: Annual Mean Snow Depth
2013-2017



Source: <https://www.nohrsc.noaa.gov/snowfall/>

In the last five years, the state of Ohio has experienced more snow in the northeastern part of the state. Counties that are closer to Lake Erie see greater levels of snowfall than the rest of the state. Lake, Geauga, and Ashtabula counties can see greater than ten feet of snowfall in a given year. This trend tapers off as the level of snowfall generally decreases as you move closer to the south and southwestern counties. Region 1 generally receives milder levels of snowfall compared to the other regions.

PAST OCCURANCES

Ohio experienced more than 280 severe winter storms between 1925 and 2014. Several storms were notable and since 1964, two involved federal declarations. In the 10-year window from the beginning of 2008 to the end of 2017, there were 69 days with winter storm events.

In January 1978, the Great Blizzard of 1978 closed homes and businesses for one week and caused the deaths of 51 people. Wind gusts reached 70 mph and caused blowing and drifting snow. The worst winter storm in Ohio history struck before dawn on Thursday, January 26th, 1978. The Blizzard of '78 continued through Thursday and into Friday. Transportation, business, industry, and schools were closed statewide for two days with the normal pace of society not returning to the state for five days. Atmospheric pressure fell to 28.28 inches at Cleveland, the lowest ever recorded in Ohio, as the center of the blizzard crossed Ohio. This rapidly intensifying storm pulled bitterly cold air across Ohio on winds of 50 to 70 mph. These conditions, combined with heavy snow and blowing of deep snow already on the ground, caused extreme blizzard conditions all across Ohio. Enormous snowdrifts covered cars and houses, blocked highways and railways, and closed all airports for two days. More than 5,000 members of the Ohio National Guard were called to duty and were pressed into long hours of work with heavy equipment clearing roads, assisting electric utility crews, rescuing stranded persons, and transporting doctors and nurses to hospitals. Forty-five National Guard helicopters flew 2,700 missions across Ohio rescuing thousands of stranded persons, many in dire medical emergencies. Thousands of volunteers with snowmobiles and four-wheel drive vehicles responded to pleas from police statewide to deliver medicine and transport doctors and nurses to hospitals. The death toll of 51 made this one of the deadliest winter storms in Ohio history. As a result of this event, Ohio counties received a total of \$3,546,669 in public assistance funds.

February 2003 (DR-1453): Prior to this event, a several series of low-pressure systems tracked through the Ohio River valley, producing up to four inches of snow across west central Ohio all through the month of January. The main event happened when a warm front ahead of low-pressure passing through the Tennessee Valley brought abundant moisture to the Ohio Valley on east-southeast winds. Cold air was already in place on the surface and conditions were right for snow accumulation of 6 to 8 inches to occur over much of the region north of the Ohio River. Counties closest to the Ohio River saw some ice accumulations to a quarter or a half inch, but the majority of the weather associated with this system was heavy snow along the I-70 corridor. Fayette, Franklin, Greene, Guernsey, Monroe, and Muskingum counties received record snowfall from this event. Adams, Gallia, Lawrence, Meigs, and Scioto Counties had severe ice accumulation in addition to snow that downed trees and power lines. Loss of power to water treatment and sewage systems resulted in the loss of water pressure to customers. For those who had some water, boil alerts were issued. In Gallia County, most of the water customers lost service and needed generators to restore service. Booster station in the affected areas did not have full power until a week after the storm hit the region. At one time more than an estimated 12,000 customers were without water. As a result of this event, thirty Ohio counties received a total of \$15,761,979.42 in public assistance funds.

December 2004 – January 2005 (DR-1580): A low-pressure system moved into the northeast across the Ohio Valley. Cold west to northwest winds behind the low caused lake effect snow showers to develop in Northeast Ohio. This activity began during the predawn hours of the 16th and continued through midday on the 17th. The heaviest fell during the late afternoon and evening hours of the 16th when visibilities at times were near zero. Accumulations ranged from 6 to 8 inches in Geauga, southern Ashtabula, and eastern Cuyahoga Counties. This storm system affected four additional counties to the previous storm and caused an approximate \$106,901,000 in property damage. As a result of this event, Ohio counties received a total of \$7,948,685.48 in public assistance funds.

January - February 2005 (EM-3198): An Alberta Clipper passed to the north of Lake Erie during the evening hours of November 23rd. An arctic cold front trailing this low swept east across Ohio by the early morning hours of the 24th. Cold northwest winds behind this front caused lake effect snow showers to develop just before daybreak on the 24th. These bands quickly intensified and by mid-morning, visibilities in some areas were less than one-quarter mile. Northwest winds gusting in excess of 30 mph accompanied the snow and caused considerable blowing and drifting. The snow showers tapered to flurries during the early evening hours. Snowfall totals of 6 to 9 inches were reported in both Geauga and inland Ashtabula Counties by sunset on the 24th. Then, after midnight on the 25th, an upper-level disturbance rotated through the region. This caused a new round of lake effect snow showers to develop. This activity diminished during the afternoon of the 25th after another 6 to 9 inches of snow had fallen. Two-day totals for this event exceed a foot of snow in many locations.

A peak of 15.6 inches was measured in Hambden Township (Geauga County) with 14 inches at Hartsgrave (Ashtabula County). This storm system affected four additional counties to the previous storm and caused an approximate \$5,475,000 in property damage. As a result of this event, Ohio counties received a total of \$1,447,217.85 in public assistance funds.

March 2008 (EM-3286): On the morning of March 7th, snow spread into the region during the morning and afternoon hours, then tapered off during the evening and overnight into the 8th. Snow intensified across the area as low-pressure moved north into the Carolinas by the morning of the 8th. Snow persisted across much of the area but did mix with sleet and freezing rain at times across far eastern Ohio. By the evening hours of the 8th, snow began tapering off from west to east. Any areas of mixed precipitation across far eastern Ohio changed back to snow before ending. The low-pressure continued intensifying as it moved into New England by the morning hours of the 9th. Some light snow and flurries persisted overnight, mainly from around Cleveland and points east, but by midday on the 9th the snow tapered off across the entire area. Throughout this event, locations across northwest Ohio picked up between 5 and 10 inches. Those locations experienced a rather steep gradient for snowfall totals. In eastern Ohio, snowfall amounts were slightly lower as sleet and freezing rain mixed in at times causing reduced snowfall amounts. Locations across northeast and north-central Ohio saw the greatest snowfall amounts with 21.5 inches in Broadview Heights in Cuyahoga County, and 21.0 inches in Galion located in Crawford County. As a result of this event, Ohio counties received a total of \$1,709,668.49 in public assistance funds.

PROBABILITY OF FUTURE EVENTS

Map 2.4.a depicts National Climatic Data Center figures of Ohio's annual mean snow depth for the years 2013 to 2017. South and Southwestern portions of Ohio have mean snow depths of one to two feet and central Ohio has between two and three feet. However, the northeastern corner of the state has mean snow depths of four feet or more. Lake, Geauga, and Ashtabula counties can see greater than ten feet of snowfall in a given year.

In the ten-year timeframe from January 1, 2008 to December 31, 2017, there were 69 days with winter storm events. In terms of probability, the state has a 100% chance of seeing snowfall in any given year, and 6.9 days with winter storm events per year. However, the level and severity of snowfall vary greatly by location. The vast majority of Ohio has the same chance of exceeding one to three feet of snow. The higher snowfall totals and probability for the northeastern portion of Ohio can be attributed to the lake effect snows caused by the area's proximity to the Great Lakes. Global climate change may have an impact on the probability of future events; however, it is unclear as to the extent of this impact.

LHMP DATA

Cuyahoga County: The Countywide All Natural Hazards Mitigation Plan of 2017 states that severe winter storm hazards can cause a range of damage to structures that will depend on the magnitude and duration of storm events. Losses may be as small as lost productivity and wages when workers are unable to travel or as large as sustained roof damage or building collapse. According to the National Climatic Data Center website, between January 1996 and February 2015, Cuyahoga County has been impacted by 69 severe winter weather events that have accounted for \$17,770,000 in damages.

Lake County: The Lake County Hazard Mitigation Plan of 2017 indicates there have been 99 severe winter storms from 1950 to 2016 causing \$27,787,000 in damages. These types of storms are known to cause utility, infrastructure, structural damages. They can also cause severe transportation problems and make travel extremely dangerous. After extensive examination and spreadsheet calculations, loss estimates show a total of \$1,808,927.63 in possible structure damaged.

Ashtabula County: The HIRA of the Ashtabula County Countywide All Natural Hazards Mitigation Plan of August 2012 examines subcategories of winter storms: blizzards, ice storms, lake effect snow on the southeastern Lake Erie Snow Belt, and extreme cold. From 1993 to 2011, there were 105 severe winter events causing a total of over \$200 million in property and crop damage. The frequency is the expectation of eight storms in any given year.

VULNERABILITY ANALYSIS & LOSS ESTIMATION

METHODOLOGY

A hybrid approach was taken using historical data and the taxable value of real property for each county within the state. First, a historical analysis was done first for each county. The total reported property damage of each event was adjusted to 2017 dollars and summed up to for each county. This was then divided by 10 for the number of years assessed. The result of this is the estimated annual damage for each county. This number was then divided by the total taxable value of real property within the county to determine the percentage of estimated damage for each of the 88 county in any given year. The problem with this approach was that in last ten years, only 34 of 88 counties reported damage and that the other 54 counties would then have an estimated annual damage of 0 dollars which is unrealistic whether the county has reported damage or not.

To offset the lack of data for these counties, the sum of the ten-year damages across the state (\$144,653,100) was divided by 10 to determine the annual loss. This figure as well as the state-wide real value of property was respectively divided by the 88 (counties in the state) to determine the average damage per county and the average taxable value per county in the state. The first was then divided by the latter resulting in the percentage of estimated damage the average county, 0.00608%, in Ohio in any

given year. This percentage was for the 54 counties determined to have a zero-percent of estimated damage and the eight with less than 0.00608%.

RESULTS

In Region 1, it is estimated that Lucas County will have the highest county-wide damage per year at \$418,249.94. However, the county with the highest per-capita cost is tied between Crawford County and Wyandot at \$6.67 dollars per person. At \$278,348.50, Crawford has almost double the estimated annual damage than Wyandot County, however also has double the number of people in the county.

Table 2.4.a

Estimate of Potential Losses to Winter Storms by Region						
Region 1						
County	Region	Population	County-wide Taxable Value of Real Property	Percentage Relative to County-wide Real Property	Countywide Annual Damage	Annual Damage per Capita
Allen	1	103198	\$ 1,826,294,900	0.00608%	\$ 110,962.01	\$ 1.08
Auglaize	1	45778	\$ 1,045,961,280	0.00608%	\$ 63,550.50	\$ 1.39
Champaign	1	38840	\$ 837,712,700	0.00608%	\$ 50,897.74	\$ 1.31
Clark	1	134557	\$ 2,238,882,200	0.00608%	\$ 136,029.98	\$ 1.01
Crawford	1	41746	\$ 682,344,300	0.04079%	\$ 278,348.50	\$ 6.67
Darke	1	51536	\$ 1,204,199,630	0.00608%	\$ 73,164.75	\$ 1.42
Defiance	1	38156	\$ 810,287,070	0.00608%	\$ 49,231.41	\$ 1.29
Erie	1	74817	\$ 1,948,076,220	0.01147%	\$ 223,352.50	\$ 2.99
Fulton	1	42289	\$ 962,533,270	0.00608%	\$ 58,481.59	\$ 1.38
Hancock	1	75754	\$ 1,795,323,240	0.01374%	\$ 246,661.00	\$ 3.26
Hardin	1	31364	\$ 498,135,770	0.00608%	\$ 30,265.73	\$ 0.96
Henry	1	27185	\$ 733,870,540	0.00608%	\$ 44,588.50	\$ 1.64
Huron	1	58494	\$ 1,082,908,850	0.02258%	\$ 244,572.00	\$ 4.18
Logan	1	45325	\$ 1,184,524,350	0.00608%	\$ 71,969.32	\$ 1.59
Lucas	1	430887	\$ 6,883,867,330	0.00608%	\$ 418,249.94	\$ 0.97
Marion	1	64967	\$ 1,082,107,640	0.02203%	\$ 238,396.00	\$ 3.67
Mercer	1	40873	\$ 1,085,979,200	0.00608%	\$ 65,981.91	\$ 1.61
Miami	1	105122	\$ 2,201,940,990	0.00608%	\$ 133,785.51	\$ 1.27
Ottawa	1	40657	\$ 1,704,672,130	0.01455%	\$ 248,061.50	\$ 6.10
Paulding	1	18845	\$ 448,002,890	0.00608%	\$ 27,219.75	\$ 1.44
Preble	1	41120	\$ 881,141,010	0.00608%	\$ 53,536.36	\$ 1.30
Putnam	1	33878	\$ 895,134,450	0.00608%	\$ 54,386.57	\$ 1.61
Sandusky	1	59195	\$ 1,190,519,630	0.02125%	\$ 252,981.50	\$ 4.27
Seneca	1	55243	\$ 1,096,270,950	0.01387%	\$ 152,083.00	\$ 2.75
Shelby	1	48759	\$ 1,126,081,630	0.00608%	\$ 68,418.46	\$ 1.40
Van Wert	1	28217	\$ 692,123,620	0.00608%	\$ 42,052.04	\$ 1.49
Williams	1	36784	\$ 753,802,910	0.00608%	\$ 45,799.55	\$ 1.25
Wood	1	130492	\$ 2,940,024,810	0.00942%	\$ 276,890.00	\$ 2.12
Wyandot	1	22029	\$ 528,510,740	0.02781%	\$ 146,976.00	\$ 6.67
Total					\$ 3,906,893.60	

In Region 2, it is estimated that Cuyahoga County will have the highest county-wide damage per year at \$1,612,463.18. Close behind are Lake and Franklin Counties at \$1,590,875.00 and \$1,585,949.85 respectively. The county with the highest per-capita cost is Geauga County at \$8.53 dollars per person.

Region 2						
County	Region	Population	County-wide Taxable Value of Real Property	Percentage Relative to County-wide Real Property	Countywide Annual Damage	Annual Damage per Capita
Ashland	2	53628	\$ 962,136,090.00	0.03724%	\$ 358,262.50	\$ 6.68
Butler	2	380604	\$ 7,053,834,350.00	0.00608%	\$ 428,576.79	\$ 1.13
Clinton	2	42009	\$ 903,332,250.00	0.00608%	\$ 54,884.65	\$ 1.31
Cuyahoga	2	1248514	\$ 26,539,113,700.00	0.00608%	\$ 1,612,463.18	\$ 1.29
Delaware	2	200464	\$ 6,748,868,310.00	0.00608%	\$ 410,047.67	\$ 2.05
Fairfield	2	154733	\$ 3,379,701,100.00	0.00608%	\$ 205,343.84	\$ 1.33
Fayette	2	28752	\$ 701,511,200.00	0.00608%	\$ 42,622.41	\$ 1.48
Franklin	2	1291981	\$ 26,102,737,640.00	0.00608%	\$ 1,585,949.85	\$ 1.23
Geauga	2	93918	\$ 2,986,153,270.00	0.02683%	\$ 801,325.00	\$ 8.53
Greene	2	166752	\$ 3,823,992,400.00	0.00608%	\$ 232,338.09	\$ 1.39
Hamilton	2	813822	\$ 17,484,107,920.00	0.00608%	\$ 1,062,299.24	\$ 1.31
Knox	2	61261	\$ 1,257,755,060.00	0.01421%	\$ 178,744.00	\$ 2.92
Lake	2	230117	\$ 5,479,741,000.00	0.02903%	\$ 1,590,875.00	\$ 6.91
Licking	2	173448	\$ 3,737,212,631.00	0.00608%	\$ 227,065.52	\$ 1.31
Lorain	2	307924	\$ 6,291,968,810.00	0.00937%	\$ 589,724.50	\$ 1.92
Madison	2	44036	\$ 1,072,677,480.00	0.00608%	\$ 65,173.73	\$ 1.48
Medina	2	178371	\$ 4,827,956,520.00	0.01211%	\$ 584,555.00	\$ 3.28
Montgomery	2	531542	\$ 8,701,115,370.00	0.00608%	\$ 528,662.27	\$ 0.99
Morrow	2	34994	\$ 758,945,430.00	0.02502%	\$ 189,913.50	\$ 5.43
Pickaway	2	57830	\$ 1,206,929,010.00	0.00608%	\$ 73,330.58	\$ 1.27
Portage	2	162277	\$ 3,284,252,070.00	0.01184%	\$ 388,943.00	\$ 2.40
Richland	2	120589	\$ 1,892,485,930.00	0.03524%	\$ 666,999.00	\$ 5.53
Stark	2	372542	\$ 6,849,294,110.00	0.00826%	\$ 565,755.00	\$ 1.52
Summit	2	541228	\$ 11,172,733,850.00	0.00922%	\$ 1,029,598.00	\$ 1.90
Union	2	56741	\$ 1,579,301,910.00	0.00608%	\$ 95,955.21	\$ 1.69
Warren	2	228882	\$ 6,011,510,440.00	0.00608%	\$ 365,247.29	\$ 1.60
Wayne	2	116038	\$ 2,282,848,540.00	0.01412%	\$ 322,296.00	\$ 2.78
Total					\$ 14,256,950.81	

In Region 3, it is estimated that Ashtabula County will have the highest county-wide damage per year by far at \$1,572,526.50. The second highest is Trumbull County at \$573,621.50. Ashtabula County also had the highest per-capita cost at \$16.08 dollars per person and Holmes County had the second highest at \$4.56 per person.

Region 3						
County	Region	Population	County-wide Taxable Value of Real Property	Percentage Relative to County-wide Real Property	Countywide Annual Damage	Annual Damage per Capita
Adams	3	27726	\$ 413,701,850.00	0.00608%	\$ 25,135.69	\$ 0.91
Ashtabula	3	97807	\$ 1,708,599,100.00	0.09204%	\$ 1,572,526.50	\$ 16.08
Athens	3	66597	\$ 913,312,640.00	0.00608%	\$ 55,491.04	\$ 0.83
Belmont	3	68029	\$ 1,375,513,000.00	0.00608%	\$ 83,573.40	\$ 1.23
Brown	3	43576	\$ 761,341,030.00	0.00608%	\$ 46,257.55	\$ 1.06
Carroll	3	27385	\$ 795,006,730.00	0.00608%	\$ 48,303.01	\$ 1.76
Clermont	3	204214	\$ 3,954,639,620.00	0.00608%	\$ 240,275.95	\$ 1.18
Columbiana	3	103077	\$ 1,637,054,170.00	0.00608%	\$ 99,464.12	\$ 0.96
Coshocton	3	36544	\$ 652,306,860.00	0.00608%	\$ 39,632.85	\$ 1.08
Gallia	3	29973	\$ 520,288,280.00	0.00608%	\$ 31,611.67	\$ 1.05
Guernsey	3	39093	\$ 770,693,150.00	0.00608%	\$ 46,825.77	\$ 1.20
Harrison	3	15216	\$ 498,135,770.00	0.00608%	\$ 30,265.73	\$ 1.99
Highland	3	42971	\$ 751,637,960.00	0.00608%	\$ 45,668.01	\$ 1.06
Hocking	3	28474	\$ 548,516,950.00	0.00608%	\$ 33,326.79	\$ 1.17
Holmes	3	43957	\$ 958,818,840.00	0.02088%	\$ 200,225.50	\$ 4.56
Jackson	3	32449	\$ 472,159,990.00	0.00608%	\$ 28,687.49	\$ 0.88
Jefferson	3	66359	\$ 964,893,330.00	0.00608%	\$ 58,624.98	\$ 0.88
Lawrence	3	60249	\$ 913,035,320.00	0.00608%	\$ 55,474.19	\$ 0.92
Mahoning	3	229796	\$ 3,849,081,530.00	0.01228%	\$ 472,554.50	\$ 2.06
Meigs	3	23080	\$ 315,965,200.00	0.00608%	\$ 19,197.41	\$ 0.83
Monroe	3	13946	\$ 396,545,480.00	0.00608%	\$ 24,093.31	\$ 1.73
Morgan	3	14709	\$ 250,036,190.00	0.00608%	\$ 15,191.70	\$ 1.03
Muskingum	3	86149	\$ 1,490,291,520.00	0.00608%	\$ 90,547.12	\$ 1.05
Noble	3	14406	\$ 339,100,440.00	0.00608%	\$ 20,603.06	\$ 1.43
Perry	3	36024	\$ 542,980,750.00	0.00608%	\$ 32,990.42	\$ 0.92
Pike	3	28270	\$ 357,023,590.00	0.00608%	\$ 21,692.04	\$ 0.77
Ross	3	77313	\$ 1,212,098,990.00	0.00608%	\$ 73,644.70	\$ 0.95
Scioto	3	75929	\$ 950,713,830.00	0.00608%	\$ 57,763.46	\$ 0.76
Trumbull	3	200380	\$ 3,076,110,470.00	0.01865%	\$ 573,621.50	\$ 2.86
Tuscarawas	3	92297	\$ 1,737,945,240.00	0.00608%	\$ 105,594.06	\$ 1.14
Vinton	3	13092	\$ 170,345,810.00	0.00608%	\$ 10,349.87	\$ 0.79
Washington	3	60418	\$ 1,165,122,780.00	0.00608%	\$ 70,790.52	\$ 1.17
Total					\$ 4,330,003.88	

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

METHODOLOGY

A similar method as Method B above was used to determine the estimated damage to state-owned and state-leased critical facilities in Ohio. The total value of all critical facilities in each county was multiplied by the percentage of estimated damage of their respective counties. Table 2.4.b depicts the estimated annual damage to State-owned and State-leased critical facilities by county.

RESULTS

Table 2.4b

Estimate of Potential Losses to Winter Storms by Region				
Region 1				
County	Percentage Relative to County-wide Real Property	Number of State-owned and State-leased Critical Facilities	Value of State-owned and State-leased Critical Facilities	Estimated Annual Damage to State-owned and State-leased Critical Facilities
Allen	0.00608%	120	\$ 90,950,176.00	\$ 5,525.95
Auglaize	0.00608%	21	\$ 11,545,804.00	\$ 701.50
Champaign	0.00608%	24	\$ 5,161,316.00	\$ 313.59
Clark	0.00608%	17	\$ 8,868,061.00	\$ 538.81
Crawford	0.04079%	13	\$ 10,357,812.00	\$ 4,225.26
Darke	0.00608%	27	\$ 8,619,026.00	\$ 523.67
Defiance	0.00608%	11	\$ 7,562,674.00	\$ 459.49
Erie	0.01147%	54	\$ 162,265,731.00	\$ 18,604.23
Fulton	0.00608%	16	\$ 4,397,188.00	\$ 267.16
Hancock	0.01374%	23	\$ 16,195,898.00	\$ 2,225.17
Hardin	0.00608%	12	\$ 4,141,282.00	\$ 251.62
Henry	0.00608%	14	\$ 3,113,844.00	\$ 189.19
Huron	0.02258%	22	\$ 10,543,997.00	\$ 2,381.33
Logan	0.00608%	1	\$ 735,568.00	\$ 44.69
Lucas	0.00608%	47	\$ 276,597,391.00	\$ 16,805.50
Marion	0.02203%	100	\$ 128,613,896.00	\$ 28,334.55
Mercer	0.00608%	26	\$ 7,655,738.00	\$ 465.15
Miami	0.00608%	23	\$ 10,005,576.00	\$ 607.92
Ottawa	0.01455%	75	\$ 65,291,745.00	\$ 9,501.16
Paulding	0.00608%	3	\$ 1,387,796.00	\$ 84.32
Preble	0.00608%	24	\$ 4,859,547.00	\$ 295.26
Putnam	0.00608%	18	\$ 5,590,738.00	\$ 339.68
Sandusky	0.02125%	15	\$ 5,519,069.00	\$ 1,172.78
Seneca	0.01387%	49	\$ 33,546,722.00	\$ 4,653.86
Shelby	0.00608%	35	\$ 26,824,309.00	\$ 1,629.79
Van Wert	0.00608%	13	\$ 7,459,562.00	\$ 453.23
Williams	0.00608%	13	\$ 5,459,757.00	\$ 331.72
Wood	0.00942%	36	\$ 67,981,624.00	\$ 6,402.47
Wyandot	0.02781%	19	\$ 10,280,904.00	\$ 2,859.06
TOTAL		871	\$ 1,001,532,751.00	\$ 110,188.13

In Region 1, Lucas County had the highest value of State-owned and State-leased critical facilities. However because they reported zero dollars in property damages due to winter storms from 2008 to Section 2.4: Winter Storm

2017, they only had \$16,805, the third highest estimated damage, to critical facilities in Region 1 based on the baseline average percentage of 0.00608%. Marion County had less than half the value of critical facilities compared to Lucas County, however had the highest estimated damage at \$28,334 dollars.

Region 2				
County	Percentage of Real Property	Number of State-owned and State-leased Critical Facilities	Value of State-owned and State-leased Critical Facilities	Estimated Annual Damage to State-owned and State-leased Critical Facilities
Ashland	0.03724%	143	\$ 64,539,880.00	\$ 24,032.17
Butler	0.00608%	21	\$ 17,563,033.00	\$ 1,067.09
Clinton	0.00608%	22	\$ 11,528,821.00	\$ 700.47
Cuyahoga	0.00608%	84	\$ 248,840,544.00	\$ 15,119.05
Delaware	0.00608%	37	\$ 46,217,477.00	\$ 2,808.08
Fairfield	0.00608%	78	\$ 86,519,830.00	\$ 5,256.77
Fayette	0.00608%	26	\$ 5,118,182.00	\$ 310.97
Franklin	0.00608%	249	\$ 2,147,726,878.00	\$ 130,491.57
Geauga	0.02683%	24	\$ 8,594,197.00	\$ 2,306.23
Greene	0.00608%	25	\$ 10,629,296.00	\$ 645.81
Hamilton	0.00608%	35	\$ 173,140,806.00	\$ 10,519.69
Knox	0.01421%	34	\$ 40,507,246.00	\$ 5,756.63
Lake	0.02903%	21	\$ 5,525,021.00	\$ 1,604.02
Licking	0.00608%	64	\$ 168,043,312.00	\$ 10,209.97
Lorain	0.00937%	90	\$ 110,138,241.00	\$ 10,322.88
Madison	0.00608%	109	\$ 321,691,881.00	\$ 19,545.35
Medina	0.01211%	22	\$ 18,601,644.00	\$ 2,252.23
Montgomery	0.00608%	71	\$ 77,351,496.00	\$ 4,699.72
Morrow	0.02502%	21	\$ 6,874,959.00	\$ 1,720.34
Pickaway	0.00608%	133	\$ 195,643,558.00	\$ 11,886.91
Portage	0.01184%	25	\$ 7,594,529.00	\$ 899.39
Richland	0.03524%	73	\$ 109,750,465.00	\$ 38,681.11
Stark	0.00826%	41	\$ 102,066,812.00	\$ 8,430.77
Summit	0.00922%	67	\$ 201,182,298.00	\$ 18,539.50
Union	0.00608%	53	\$ 88,869,557.00	\$ 5,399.54
Warren	0.00608%	109	\$ 150,201,626.00	\$ 9,125.95
Wayne	0.01412%	6	\$ 7,056,104.00	\$ 996.19
TOTAL		1,683	\$ 4,431,517,693.00	\$ 343,328.40

In Region 2, Franklin County had by far the highest estimated annual damage to State-owned and State-leased critical facilities at \$130,491. This is largely due to it having the highest value of the assessed critical facilities in the region at 249. Richland County had the second highest estimated damage at \$38,681 with 73 critical facilities and a higher percentage of damage relative to county-wide taxable real property.

Region 3				
County	Percentage of Real Property	Number of State-owned and State-leased Critical Facilities	Value of State-owned and State-leased Critical Facilities	Estimated Annual Damage to State-owned and State-leased Critical Facilities
Adams	0.00608%	24	\$ 6,622,981.00	\$ 402.40
Ashtabula	0.09204%	62	\$ 20,008,110.00	\$ 18,414.67
Athens	0.00608%	31	\$ 45,496,640.00	\$ 2,764.28
Belmont	0.00608%	62	\$ 54,856,808.00	\$ 3,332.99
Brown	0.00608%	18	\$ 36,403,605.00	\$ 2,211.81
Carroll	0.00608%	17	\$ 3,661,999.00	\$ 222.50
Clermont	0.00608%	38	\$ 17,885,810.00	\$ 1,086.71
Columbiana	0.00608%	38	\$ 13,835,662.00	\$ 840.63
Coshocton	0.00608%	19	\$ 12,943,450.00	\$ 786.42
Gallia	0.00608%	71	\$ 35,860,837.00	\$ 2,178.83
Guernsey	0.00608%	54	\$ 39,704,477.00	\$ 2,412.36
Harrison	0.00608%	30	\$ 9,054,441.00	\$ 550.13
Highland	0.00608%	8	\$ 9,690,902.00	\$ 588.80
Hocking	0.00608%	19	\$ 7,123,096.00	\$ 432.78
Holmes	0.02088%	25	\$ 10,336,112.00	\$ 2,158.44
Jackson	0.00608%	18	\$ 15,130,501.00	\$ 919.30
Jefferson	0.00608%	37	\$ 7,592,901.00	\$ 461.33
Lawrence	0.00608%	27	\$ 11,760,373.00	\$ 714.54
Mahoning	0.01228%	66	\$ 72,389,280.00	\$ 8,887.28
Meigs	0.00608%	18	\$ 8,512,106.00	\$ 517.18
Monroe	0.00608%	22	\$ 11,202,381.00	\$ 680.63
Morgan	0.00608%	10	\$ 3,700,608.00	\$ 224.84
Muskingum	0.00608%	25	\$ 10,647,135.00	\$ 646.90
Noble	0.00608%	31	\$ 50,299,353.00	\$ 3,056.09
Perry	0.00608%	16	\$ 3,884,728.00	\$ 236.03
Pike	0.00608%	10	\$ 3,878,547.00	\$ 235.65
Ross	0.00608%	142	\$ 265,584,512.00	\$ 16,136.38
Scioto	0.00608%	55	\$ 171,351,723.00	\$ 10,410.99
Trumbull	0.01865%	60	\$ 55,012,652.00	\$ 10,258.55
Tuscarawas	0.00608%	53	\$ 56,132,900.00	\$ 3,410.52
Vinton	0.00608%	20	\$ 5,854,782.00	\$ 355.72
Washington	0.00608%	55	\$ 29,149,164.00	\$ 1,771.04
TOTAL		1,181	\$ 1,105,568,576.00	\$ 97,306.73

Region 3 the lowest estimated annual damage compared to the other two regions. Ashtabula, the county with the highest estimated damage per capita due to winter storms in the state had the highest estimated annual damage to critical facilities in the region at \$18,414. Ross County had the second highest estimated damage at \$16,136.38