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 in Ohio. 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 ¼ mile,
- 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 or glaze 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 and 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 2.4.1.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 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.
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 considered to be non-spatial hazards. As a result, it is difficult to determine the actual location of the damage that may result from a winter storm event. In an effort to conquer this limitation the annual mean snow depth from 1961 to 2003 was mapped (see Map 2.4.2.1.a).
State of Ohio Hazard Mitigation Plan

Section 2: Hazard Identification & Risk Assessment

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 3.4.2.1.a

State of Ohio Annual Mean Snow Depth
1961-2003

Legend
Snow Depth
- 6.1 - 12.0 Inches
- 12.1 - 24.0 Inches
- 24.1 - 36.0 Inches
- 36.1 - 48.0 Inches
- 48.1 - 72.0 Inches
- > 72.0 Inches


Provisional Storm Data and Ohio EMA

The Ohio EMA acknowledges the following sources:

- Extreme Windstorms in Ohio during May 1995, from the Storm Data database published by the National Oceanic and Atmospheric Administration (NOAA).

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Provisional Storm Data and Ohio EMA

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- Extreme Windstorms in Ohio during May 1995, from the Storm Data database published by the National Oceanic and Atmospheric Administration (NOAA).
Most of the counties in Region 1 have experienced a mid level of snow in the time frame specified. However, Lucas, Van Wert, Auglaize, Logan, and Hardin counties have sparse areas where higher snow levels have been experienced.

Historically, Region 2 has experienced the highest annual mean snow depth. The Region contains all of the counties that have experienced the highest annual mean snow depth, with parts of Geauga and Ashtabula counties having the highest in the state, and Lake, Cuyahoga, Portage, and Trumbull having the second highest in the state.

The largest number of counties within the lower portion of Region 3 has had a moderate annual mean snow depth. The upper section of the region has, for the most part, a medium depth with parts of Columbiana, Carroll, and Tuscarawas having higher depths than other counties in the region. As a result, it appears that the lower portions of this region have the least chance of receiving a significant event than upper portions of the region.

**Past Occurrences**

Ohio experienced more than 270 severe winter storms between 1925 and 2003. Several being considered notable storms and, since 1964, two were declared federal declarations.

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 69 mph and caused blowing and drifting snow. The NWS classified the Great Blizzard of 1978 as a severe blizzard.

In February 1994, heavy freezing rain and sleet fell across southern and central Ohio counties. Ice accumulations averaged 0.75 to 2 inches, leading to downed trees and power lines. Supplies of salt, already low from previous storms, were not readily available in some areas, hindering ice removal. Very low temperatures, in the teens and single digits, also slowed ice removal. Travel on foot and by vehicle was treacherous, producing a record number of injuries, mostly due to falls. Six vehicular fatalities and one death due to exposure occurred.

In January 2002, low pressure passed to the northwest of Ohio. Freezing rain developed to the north of a warm front extending east from this low. Up to one-half inch of ice accumulation occurred in Lucas County with an excess of one-quarter inch of ice in Wood, Ottawa and Sandusky Counties. Scattered power outages resulted from downed power lines and trees. In Lucas County alone, over 400 trees and limbs were downed. This ice storm caused total damage of $3 million.

In February 2003, warm air currents in southeastern Ohio caused the precipitation to accumulate as heavy ice. This ice storm was known as the Ironton Ice Storm Incident. This ice adhered to the branches of trees and formed a thick layer, with some people reporting two to five inches of accumulation. As the ice accumulated, the branches began to snap. In some instances, the weight of the ice caused tree trunks to break completely, and in other cases trees became uprooted by the weight
of the ice in their crowns. Some trees broke off at the crown, while on others, the side branches snapped. Branches and trees fell across roadways and electrical lines throughout Gallia, Lawrence, and Scioto Counties. A large portion of Lawrence County went without electric or phone service for weeks. Large areas of the County remained inaccessible, until roads were cleared away. Damage to District facilities, roads, and trails appeared to be extensive. Early estimates indicated that 75 to 80 percent of the District’s 131 miles of trails were impacted. In March 2003 this event was federally declared as DR-1453 for 31 of the states 88 counties with the largest number of those counties residing in Region 3.

Probability of Future Events

Map 8 depicts National Climatic Data Center figures of Ohio’s annual mean snow depth for the years 1961 to 2003. Southern portions of Ohio have mean snow depths of 12 to 24 inches and central Ohio has between 24 and 36 inches. However, the northeastern corner of the state has mean snow depths of 48 to more than 72 inches. In terms of probability, the snow depth with a 5% chance of being exceeded in any given year is between 50 and 60 inches in parts of Ohio. However, the vast majority of Ohio has the same chance of exceeding only 10 to 30 inches. 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.

Environmental Impacts

Winter storms have an indirect impact on the environment due to industrialization and societal progress. Winter storms in the form of severe snow or blizzards have an impact on the environment through the clearing of roadways. The snow on the roads pick up not only contaminants of chemicals and oil products from traffic, but also the salt mixtures used to de-ice the roads. In 2002 the American Society of Engineers published an article regarding the accumulation of pollutants in snow exposed to urban traffic. This study, conducted in Cincinnati in 2001, collected approximately 6 kg of cyanide, used as an anti-caking agent, from de-icing salt used on a major north-south highway. With the melting of the snow and ice, the cyanide would then be carried into nearby waterways contaminating the aquatic life, absorbed into the groundwater, and enter the community’s water source.

Ice storms and heavy wet snowfalls, in addition to the indirect effects above, can have a direct effect the environment though damaging vegetation. The destruction of vegetation reduces available habitats, threatening endangered species, and reduces the amount of carbon dioxide removed from the atmosphere.
VULNERABILITY ANALYSIS & LOSS ESTIMATION

Methodology

The 10-year winter storm losses (1993-2003) for each county provided the basis for estimating potential vulnerability and losses. To yield the per capita 10-year damage total for each county, the total damage for the decade was divided by the 2001 population. That figure divided by ten, resulted in the annual per capita damage figure for severe winter storms in each county (in raw dollar unadjusted for inflation). This is the figure that appears in the column on the right.

Results

With an annual winter storm loss figure of $12.54 per capita, Ohio, with a 2001 population of 11,381,725, can expect an annual statewide winter storm loss of approximately $1,418,736,006 in the future, based on what occurred in the previous decade (see Table 2.4.a). The 10-Year loss includes all residential, commercial, governmental structures, as well as infrastructure and public facilities for each county. Map 2.4.3.2.a shows severe winter weather per capita loss.
### Table 2.4.a

#### Estimate of Potential Losses to Winter Storms by Region

<table>
<thead>
<tr>
<th>Region 1</th>
<th>County</th>
<th>2001 Pop.</th>
<th>10-Year Winter Storm Losses</th>
<th>Per-Capita Annual Winter Storm Losses</th>
<th>County</th>
<th>2001 Pop.</th>
<th>10-Year Winter Storm Losses</th>
<th>Per-Capita Annual Winter Storm Losses</th>
<th>County</th>
<th>2001 Pop.</th>
<th>10-Year Winter Storm Losses</th>
<th>Per-Capita Annual Winter Storm Losses</th>
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<tbody>
<tr>
<td>Allen</td>
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<td>Ashland</td>
<td>52,786</td>
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<td>Defiance</td>
<td>92,294</td>
<td>$47,743,000</td>
<td>$51.73</td>
<td>Coshocton</td>
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<td>$28.31</td>
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<td>TOTAL 1,458,464</td>
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<td>$470,780,000</td>
<td>$912</td>
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<td>TOTAL 2,159,323</td>
<td>$470,780,000</td>
<td>$912</td>
<td></td>
<td></td>
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</table>

TOTAL 2,159,323 | $470,780,000 | $912
The total 10-year winter storm loss for Region 1 is $470,780,000 which is the second highest in the state. Within the region, Darke County has historically had the highest 10-year loss at a total of $71,151,000 affecting approximately 53,178 people (see Table 2.4.3.2.a). Allen and Shelby counties have historically had the lowest 10-year loss at $1,375,000 in each county affecting 108,522 people in Allen County and 48,233 in Shelby County (see Table 2.4.3.2.a).

Region 2 has the highest 10-year winter storm loss in the state at a total of $608,003,000. Within the region, Summit County has historically had the highest 10-year loss at a total of $47,981,000 affecting approximately 542,899 people (see Table 2.4.3.2.a). The second highest is Geauga County with a total loss of $47,743,000 affecting approximately 92,294 people (see Table 2.4.3.2.a). Richland County has historically had the lowest 10-year loss at $13,726,000 affecting 128,549 people (see Table 2.4.3.2.a).

Region 3 has historically had the lowest 10-year winter storm loss. In total there has been a loss of $339,953,006, which has affected a population of approximately 1,458,464 persons. Brown County has had the highest 10-year loss at a total of $27,860,000 affecting approximately 42,425 persons (see Table 2.4.3.2.a). Jefferson County has had the least 10-year loss to winter storms at $335,000, which affected approximately 72,705 persons (see Table 2.4.3.2.a).

### 2.4.4 Vulnerability and Estimate of Potential Losses of State Owned Critical Facilities

#### 2.4.4.1 Methodology

The methodology to determine the vulnerability of state-owned structures and critical facilities to winter storms were identified in section 2.1.4.1.

#### 2.4.4.2 Results

Since winter storms 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 2.1.4.1, Table 2.1.4.2.a, and Appendix C.