

VULNERABILITY ASSESSMENT

5 VULNERABILITY ASSESSMENT

Adams County is susceptible to many different kinds of natural hazards as reviewed in the previous section of this plan. If a hazard event struck vacant land, there would not be much cause for concern. Because Adams County has close to 27,330 residents and thousands of homes, businesses and critical facilities, the potential for damage and injury could be high, especially in higher populous areas such as West Union, Manchester, Peebles and Seaman.

This chapter reviews how vulnerable Adams County is to property damage and threats to public health and safety. This chapter also reviews how hazards may have an adverse impact on the economy. The potential for property damage is measured in dollars based on historical events of the past and damage incurred from those events.

A four-step process was followed to estimate the cost to Adams County of the hazards reviewed in the Hazard Profile section (Section 4.0) of this report. This process was documented on a per hazard basis. The steps that were used are as follows:

- Step 1: Inventory critical facilities and structures susceptible to property damage.
- Step 2: Determine potential dollars lost based on various levels of damage on different categories of structures.
- Step 3: Evaluate the impact on infrastructure and general population.
- Step 4: Evaluate property damage, loss of life and economic losses.

5.1 Critical Facilities

Members of the Core Group from each of the communities were asked to compile a list of critical facilities pertaining to their community. All the critical facilities within Adams County (schools, hospitals, water treatment plants, airports, police and fire stations, nursing homes, entertainment facilities, and any other facility deemed a critical facility for their county) are charted on the map entitled 'Adams County Multi-Hazard Map' in Appendix F. See Table 5-1 for a summary of critical facilities by facility type. Please refer to Appendix H for a complete list of these critical facilities.

Table 5-1

Critical Facilities in Planning Area

Property	Count
Water/Wastewater Plants	14
Medical Facilities	16
Police/EMS/Fire	25
Schools/Churches/Libraries	74
Air Fields	5
Government Facilities	7
Energy	4
Commercial Assets	2
Other	1
Total Critical Facilities	148

5.2 Potential Dollars Lost

The second step of the vulnerability assessment was to calculate the impact of the given hazards in terms of property damage and loss of their use. Averages and typical situations were used. This approach does not predict which facilities will be hit by which hazard, but it does provide a general estimate of the level of damage that would be expected based upon available data.

First, the value of the property being damaged was determined based on the average value of a facility within that category. Typical values of the structures were determined using data received from the County's Auditor's Office.

Contents value was calculated as a percentage of the structure's value. Table 5-2 shows the relative value of the typical contents to the typical structure type. These ratios were taken from FEMA guidance.

Table 5-2

Contents Value as a Percentage of Structure Value

Occupancy Class	Value (%)
Residential	50%
Commercial	100%
Industrial	150%
Medical Facilities	150%
Emergency Services	150%
General Government	100%
Schools/Libraries	100%
Colleges/Universities	150%
Religion/Non-profit	100%
Shelters	100%

Second, three levels of physical damage were evaluated for each category of structure. These levels have a percentage of damage associated with each. The dollars lost for each level, however, may be underestimated since there may be some downtime associated with closing a business for an extended period of time.

- **Minor damage:** Many structures exposed to a storm or other hazard will suffer only moderate damage. For examples, a hurricane may just damage the roof and windows of some structures. For this calculation, 5% of the structure's value was used. Because the structure stays substantially intact, no contents losses were considered.
- **Moderate damage:** This category represents more serious damage, such as a collapsed wall or floodwater over the first floor of a building. Moderate damage is calculated as 40% of the structure's value plus 40% of the content's value.

- **Major damage:** This category is used when a building is demolished or heavily damaged. An example of the former is a house leveled by a tornado. An example of the latter is floodwater more than 1.5 feet over the lowest floor (i.e., over the electrical outlets). The average dollar figure for this category is 75% of the structure's value and 75% of the contents' value.

Table 5-3 shows the calculated dollar losses for each level of damage per facility type. The type of facility as listed was limited to that information available from the County Auditor's Office.

Table 5-3

Physical Potential Dollar Losses

Property	Average Value	Minor Damage	Moderate Damage	Major Damage
Residential	\$31,915	\$1,596	\$12,766	\$23,936
Commercial	\$70,207	\$9,499	\$151,976	\$284,955
Industrial	\$3,134,833	\$156,741	\$1,410,674	\$2,351,124
Farmland	\$25,662	\$1,283	\$11,547	\$19,246

5.3 Vulnerability Data Collection

Prior to beginning an assessment of a community's vulnerability to hazards, local sources of information were researched including comprehensive plans, land use plans, land development regulations and flood regulations, to determine if the county previously addressed its vulnerability to any particular hazard. In most cases, local plans and regulations did not yet exist or were very minimal in addressing natural hazard situations and building parameters.

Therefore, other state and national sources were researched for detailed information. One of these resources was the NCDC. The NCDC is the world's largest active archive of weather data. The NCDC produces numerous climate publications and responds to data requests from all over the world. The NCDC supports a three-tier national climate services support program that includes partners such as the NCDC, Regional Climate Centers, and State Climatologists. The NCDC has long served as a national resource for climate information. The NCDC's data is used to address issues that span the breadth of this nation's interests. As climate knows no boundaries, the NCDC works closely with scientists and researchers world-wide to develop both national and global data sets that have been used by both government and the private sector to maximize the resources provided by our climate and minimize the risks of climate variability and weather extremes. The NCDC has a statutory mission to describe the climate of the United States and acts as the nation's scorekeeper regarding the trends and anomalies of weather and climate. The NCDC's climate data have been used in a variety of applications including agriculture, air quality, construction, education, energy, engineering, forestry, health, insurance, landscape design, livestock management, manufacturing, recreation and tourism, retailing, transportation, and water resources management among other areas. The NCDC's data and products fulfill needs ranging from building codes to power plant and space shuttle design.

Another source of hazard information that was explored was the Ohio Seismic Network as described in previous sections of this report. The Division of Geological Survey of the ODNR coordinates a 23-station cooperative network of seismograph stations throughout the state in order to continuously record earthquake activity. OEMA's Ohio Earthquake Program Manager

was also contacted to discuss the risks associated with each county to determine if the type of geology lends itself to increased damage.

Because the state and national agencies are not always privy to the local knowledge, some information extracted from their libraries may not be comprehensive or complete. Therefore, the Core Group used their experience and knowledge with verification from the local EMA directors to prioritize the hazards determined to affect the county the most and assess them according to local concerns.

5.4 Vulnerability Assessment by Hazard

5.4.1 FLOODS

Flooding is a site specific hazard. Therefore, floodplains are an important planning consideration. A floodplain is any land area susceptible to inundation by floodwaters from any source. Floodplains are measured in terms of the amount of stormwater that it takes to cover a given area of land. These storm events are measured in frequency of occurrence, such as 5-year, 100-year and 500-year, with the standard measurement being the 100-year storm or floodplain. The 100-year floodplain is the land area having a 1 in 100 chance of flooding in any given year, but the statistics can be misleading. In reality, the 100-year storm or flood could occur two, three, or several years in a row (unlikely but possible), because the 100-year flood is a statistical probability and not a predictable recurrence. Statistically, the 100-year flood has a 25% chance of occurring during the typical 30-year lifespan of a home mortgage.

Any development within floodplains can impact the direction, flow and level of the watercourse during periods of high water or flooding. In other words, if fill material is placed or a house constructed in a floodplain, it will alter the boundaries of the floodplain downstream of that area. This alteration happens because structures or fill utilize valuable space that would otherwise act as a natural retaining area for floodwaters to spread and slow. Not only does development in the floodplain increase dangers downstream, developments within the floodplain are at higher risk of damage due to flooding. This damage includes fill material and debris from destroyed structures upstream colliding with structures in the floodplain downstream of an affected area. Many bridges are washed out in floods because river borne debris clog their free-flow area.

See Appendix I for tables extracted from the NCDC that show the number of reported events since 1950.

5.4.1.1 Infrastructure Impact

There are a total of 519 structures in Adams County considered to be at-risk. Of this total number, 64 of the structures are located in Greene Township out of which 39 are located within the municipality of Rome. 430 are located within Manchester Municipality and 4 are within Cherry Fork Municipality. (This information was collected from the ODNR, Division of Water Floodplain Geographical Information Management System (GIMS) Project.) All the at-risk structures are located on the map in Appendix F. These at-risk structures are located within the 100-year floodplain and are therefore susceptible to damage during a flood. With the number of at-risk structures being so high, the potential for negative impacts to infrastructure is high.

At-risk structures in areas of flash flooding, which are not within the 100 year floodplain, were not identified by the ODNR's GIMS project and consequently have not been mapped.

5.4.1.2 Population Impact

Based on the NCDC data published for the 1950 through May 2007 time period, Adams County's citizens have had to endure multiple flooding situations, including flash floods and river floods. Flash floods affect a specific area over a short period of time and a smaller population than river floods. On occasion, a life may be lost because of water rising very quickly in this short time. In Adams County's history from 1950, two deaths or injuries have been reported due to a flash flood event in 1997.

Unlike flash flooding, special zone flooding has a less likelihood of occurring but will impact a larger population. The streams and rivers within the floodplain will flood in special zone flood areas on average of once every 100 years. The populations occupying at-risk structures located in the floodplain shown on the Multi-hazard Map will be affected by this flood. See Appendix F for the Multi-hazard Map.

5.4.1.3 Property Damage

Based on information retrieved from the NCDC, river flooding in Adams County has accounted for \$31,950,001 in property damage and no crop damage from 1993 through May 2007. Flash flooding has accounted for \$8,202,000 in property damage. Other flooding conditions has accounted for \$ 23,600,000 in property damage. Hail has accounted for 17,001 in property damages and heavy snow has caused 131,000 in property damages.

The year 2004 has proved to be the most costly through the month of May with damages recorded equaling \$14 million. With the number of flooding events and at risk structures being large, the potential for property damage is high as the contents of these structures may be lost each time a flood occurs.

Approximately 3.3% of Adams County is in a 100-year floodplain as shown on the Multi-Hazard Map in Appendix F. There are an estimated 519 at-risk structures in the 100-year floodplain.

Table 5-4

STRUCTURE INVENTORY DATA							
County Name	Flood-prone Structures	Median Value of Occupied Housing Units	Total Estimated Value of Flood-prone Structures	Damage Estimate of Flood-prone Structures			
				5%	10%	25%	50%
ADAMS	519	\$67,400	\$34,980,600	\$1,749,030	\$3,498,060	\$8,745,150	\$17,490,300

Table 5-5

VULNERABILITY AND ESTIMATE OF POTENTIAL LOSS										
County	# Flood Prone Structures by Type			Total Residential Units (Including Mobile Homes)	% Residential Units Flood Prone	Total Number of Commercial Structures	% Commercial Structures Flood Prone	Total Number of Governmental Structures	% Governmental Structures Flood Prone	Total Estimated Loss (2' Flood Depth)
	Res.	Comm.	Gov.							
Adams	511	1	0	12,853	4%	38	3%	4	0%	\$5,000,000

5.4.1.4 Loss of Life

During flash floods water rises very quickly and may catch citizens by surprise. Homeowner's may not be prepared for the rising waters and the need to seek safety quickly. Motorists often think that they can drive through standing water and risk getting stuck in the flooded area. Due to the frequency of flash flooding in Adams County, the risk to human life is high but can be reduced by educating the County's residents. NCDC has recorded 2 deaths in the year 1997 due to flash floods.

5.4.1.5 Economic Losses

The economic losses a community suffers during a flood event can be high. Productivity decreases as residents miss work to tend to the damage incurred at their homes. Some inventory within a business itself may be lost if the owner was not prepared and the facility not flood proofed prior to a flood event. Small businesses may suffer so much damage that they are unable to reopen. Contractors and clean up companies may reap the benefits of the damage but not enough to offset the overall losses to the economy.

The County's infrastructure will also suffer damage to be repaired. Some roads and bridges may wash out. Roads may become blocked by debris such as tree limbs, which may strand some residents until the floodwaters recede.

Residents often cannot rely on federal assistance for the damages incurred. Since January 1, 1964, Adams County has been declared a federal disaster area on ten occasions due to damage suffered by severe storms and associated flooding. If a Presidential Disaster Declaration is granted to the County, federal money may not cover the entire amount of damage. Therefore, the County and local governments must find the additional money needed to complete the clean up process.

5.4.2 SEVERE STORMS

Adams County is highly susceptible to severe storms, which encompass thunderstorms, high winds, lightning, snow, ice and hail. These storms occur throughout the year and have historically had a significant impact on the community as a whole and for the individual municipalities. See Appendix H for tables extracted from the NCDC that show the number of reported events since 1950.

5.4.2.1 Infrastructure Impacts

Since severe storms are random in nature, the impact on the County's infrastructure is not limited to a certain area as with river flooding. Homes and businesses all throughout the County are susceptible to high winds, lightning and hail. Shingles are blown from rooftops and hail may dent siding or break windows. Lightning strikes may be more damaging to structures that are not grounded with lightning rods. Trees may become uprooted and limbs detached and blown into structures. Winds also cause severe damage to mobile home parks and campgrounds if units are not properly secured to permanent structures. Because the area receives a significant amount of snowfall, all of the structures erected in the County are susceptible to damage if not designed to the proper snow loading parameter.

Utilities and municipal plants may also be damaged during severe storms. Debris, such as tree limbs, blown into utility lines may cause downed power lines. Wastewater plants may also be adversely affected with blown limbs and debris clogging the tanks and filters.

5.4.2.2 Population Impacts

Because severe storms are random in nature, the entire County population is susceptible and should be prepared. The populations located in mobile home parks and campgrounds should take particular care to seek adequate shelter with approaching severe weather.

Since winter storms occur countywide, the entire County population should be aware of the dangers of snow and ice. Motorists should be aware of declared snow emergencies and seek safety before becoming stranded. The sensitive populations will be the most susceptible to the deep snows and should prepare for such events prior to the winter months.

5.4.2.3 Property Damage

According to the NCDC, there have been 158 severe storm events, including thunderstorms, high winds, lightning, hail, ice storms, winter storms and heavy snow in Adams County reported since 1950. Property damage has been reported at about \$30 million between 1966 and 2007. The significant ones among these were the two ice storms in the year 1994 that caused property damages worth 5 million each. The blizzard of 1996 caused damages worth 14.3 million to Adams County. In the year 1997, estimated rainfall of 6 to 12 inches across the county in less than 36 hours caused area creeks and streams to rise out of their banks. Numerous roads were closed due to high water. Several rescue operations occurred. Five hundred homes were damaged beyond repair with 700 more having reparable damage causing property damages worth 8 million.

With no damage being recorded prior to 1994, the total crop damage since 1994 was \$1 million – with damages worth \$500,000 each in the year 1994 – one for an ice storm in the early part of the year and a lightning strike in the middle of the year.

5.4.2.4 Loss of Life

There have been a total of 12 deaths and 118 injuries reported due to high winds, excessive heat, winters storms, and thunderstorm winds. Out of these, ice storms have caused most of the injuries at 40. High winds of the magnitude of 73 knots in the year 2002 caused 1 death, 12 injuries and property damages worth \$1.5 Million. At one time, approximately 100,000 people were without power.

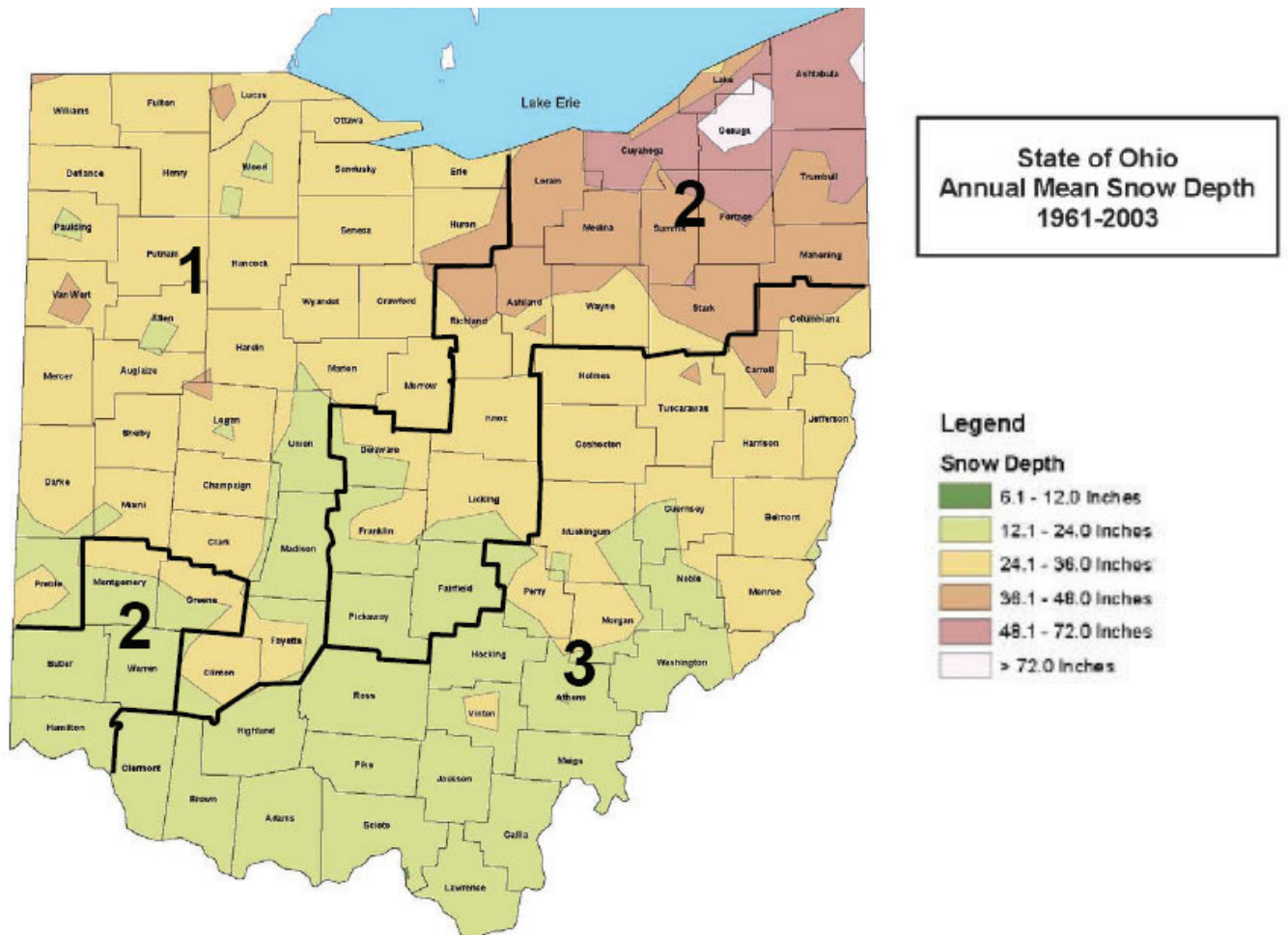
As the population of the County will grow slightly, as forecasted by the 2000 Census, there is more potential for injury and/or loss of life. One of the biggest problems associated with severe weather is the lack of public education and awareness. Citizens are not aware of the warnings and dangers associated with severe weather, such as driving on wet roads, ice and snow and medical conditions relative to frost bite and hypothermia.

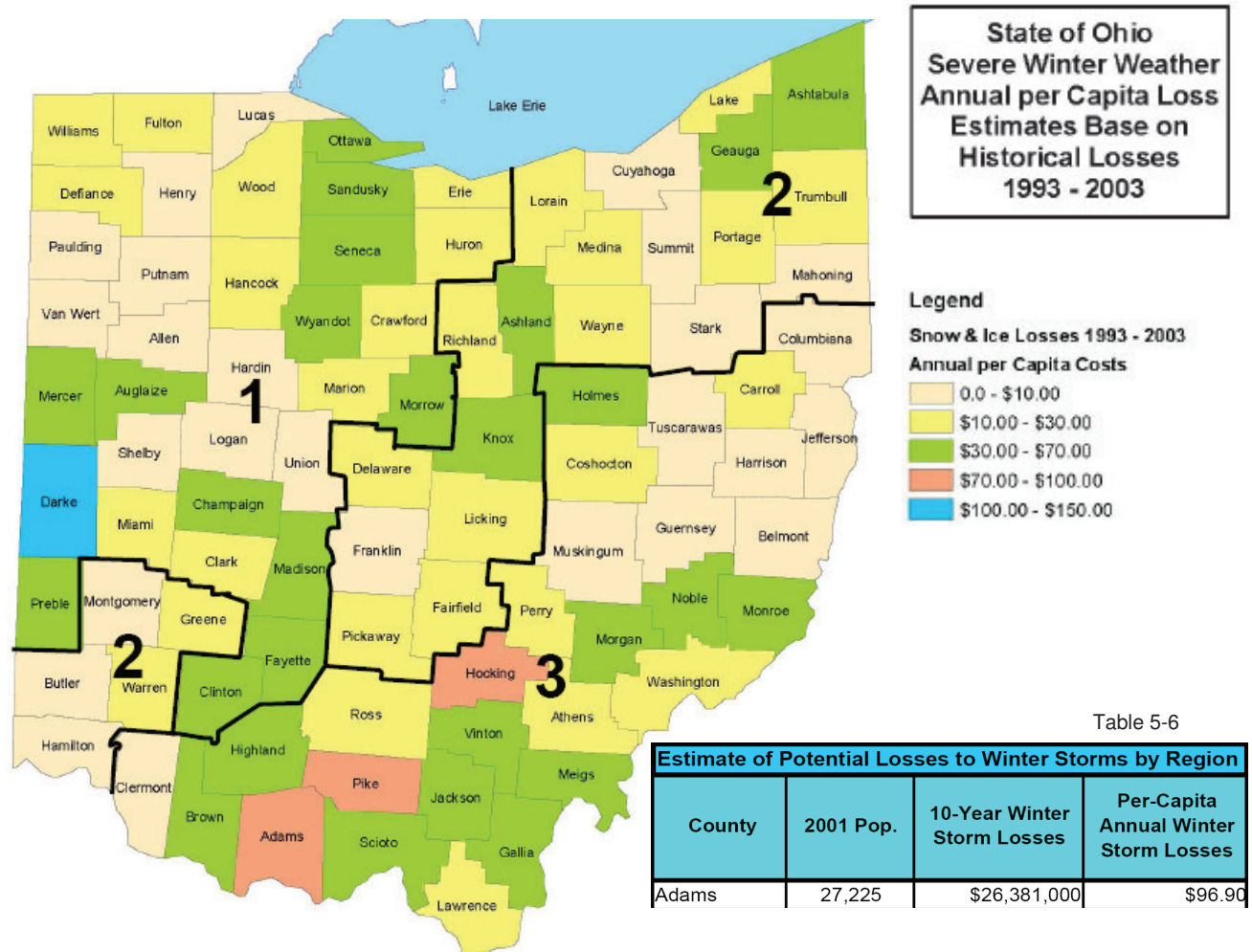
5.4.2.5 Economic Losses

The economic losses a community suffers during a severe storm event can be high, especially a winter storm which can leave behind three to five feet of snow. In communities with hazard trees, these trees have the potential to destroy homes and businesses if uprooted. Fallen branches may also cause severe damage. If power lines become burdened with snow and snap, prolonged power outages may cause some businesses to close for an extended period of time leading to loss of revenue. Residents and business owners then turn their efforts from work and running a business to clean up efforts and digging themselves out of the snow.

With the average house value at \$67,400 and the majority of the houses built prior to 1970, damage costs from severe storms would accumulate quickly due primarily to the age of the house and its susceptibility to damage. Residents often can not rely on federal assistance for the total damages incurred. Since January 1, 1964, the President of the United States has declared Adams County a disaster area on eleven occasions:

[http://ema.ohio.gov/Documents/OhioMitigationPlan/Appendix A State of Ohio Disaster History Chart.pdf](http://ema.ohio.gov/Documents/OhioMitigationPlan/Appendix%20A%20State%20of%20Ohio%20Disaster%20History%20Chart.pdf) (Appendix O) due to damage suffered by flooding, tornadoes and snow storms. If a Presidential Disaster Declaration is granted to the County, federal money may not cover the entire amount of damage. Therefore, the County and local governments must find the additional money needed to complete the clean up process.





5.4.3 DROUGHT, TEMPERATURE EXTREMES

As seen in the hazard profile and as determined by the Core Group, Adams County has a low to moderate risk of incurring damage from droughts, extreme temperatures and lightning strikes. Due to the non-site specific nature of this hazard, the best way to deal with preparing for future events is to consider historical occurrences. This information was obtained from the NCDC website, and is shown in Appendix F.

5.4.3.1 Infrastructure Impact

Because droughts are a non-site specific hazard, the effects of a drought should be evaluated countywide. By themselves droughts and temperature extremes do not damage developed property. However, over long periods of time, certain soils can expand and contract resulting in some structural damage to buildings. A small percentage of buildings in areas with such soils suffer minor damage during their “useful lives.” Therefore the overall impact on the County’s infrastructure will be very low. Lightning is an atmospheric discharge of electricity, which typically occurs during thunderstorms, and sometimes during volcanic eruptions or dust storms. In the atmospheric electrical discharge, a leader of a bolt of lightning can travel at speeds of 60,000 m/s, and can reach temperatures approaching 30,000 °C (54,000 °F). There are also quite infrequent in Adams County, with only 2 being recorded.

5.4.3.2 Population Impact

Since droughts and temperature extremes are non-site specific, the entire County population could be affected by the hot, dry and extremely cold conditions. The overall impact on the Adams County population is low since 2 drought and 5 extreme temperature events in only four separate years have been recorded by the NCDC since 1993. The County's residents, especially the sensitive populations, should be aware of the dangers of extreme heat and cold, such as heat exhaustion, heat stroke and hypothermia. Those populations that still rely on wells for water supply also need to have a contingency plan in case their wells run dry.

5.4.3.3 Property Damage

According to the NCDC, there have been 2 droughts and 3 cold spells and 2 excess heat occurrences in Adams County reported since 1993.

The drought of 1999 was the most significant event, lasting four months and causing \$200.0 million in crop damage.

The droughts recorded in 1995 and 1996 had no significant property or crop damage associated with them. There have been two summers in which the County suffered from extreme heat.

The summer of 1995 produced a heat wave that caused \$1.1 million in property damage. No damage was incurred by the extremely hot weather during the summer of 1999.

In addition, extremely cold temperatures occurring in five separate years caused a total of \$4.4 of property damage.

The extreme cold that hit the County in early 1996 caused \$3.4 million in damage. No damage has been recorded due to extreme cold since 1997.

With the exception of the heat wave and cold spell in 1995 and the 1999 drought, the County has not suffered significant property or crop damage due to extreme heat and drought conditions. Therefore, based on the number of occurrences, there is a low impact relative to property damage.

5.4.3.4 Loss of Life

Since 1993, there have been 31 recorded deaths and 76 recorded injuries due to extreme heat and cold. Twenty-five of the deaths and all of the injuries occurred in 1995. Because 1993, 1995, 1997 and 1999 were the only years with recorded deaths and injuries and the overall number of drought and extreme heat events that have affected Adams County is small, the potential for death and injury is low. As the population of the County continues to grow, as forecasted by the 2000 Census, there is more potential for injury and/or loss of life. Since drought and extremely cold conditions in the County are infrequent the potential for death or injury will still be relatively low, even with a growing population.

One of the biggest problems associated with extreme heat is the lack of public education and awareness. Citizens are not aware of the warnings and dangers associated with conditions like heat exhaustion, heat stroke and hypothermia and thus may not be prepared.

5.4.3.4 Economic Losses

Due to the infrequency of drought and extreme temperature events in Adams County, the overall impact on the economy is very low. However, if a drought does occur, the economic losses would be countywide hitting the farming community the hardest. It is very unlikely that a Presidential Disaster Declaration would occur, therefore the all mitigation costs would be funded locally.

5.4.4 TORNADOES

As seen in the hazard profile and as determined by the Core Group, Adams County has a moderate risk of incurring damage from tornadoes. See Appendix H for tables extracted from the NCDC that show the number of reported events since 1950.

5.4.4.1. Infrastructure Impact

Because tornadoes are random in nature, no one area of the County is more susceptible to infrastructure damage than another area. In Adams County, the occurrence of tornadoes is moderate with 10 occurring since 1968. Most of these tornadoes have been in the F0 and F1 range with an occasional F3 and F4 on the Fujita Scale. Therefore, Adams County is susceptible to moderate damage to infrastructure which may include damaged chimneys, signboards, windows and rooftops, mobile homes pushed off foundations or overturned and some demolished outbuildings. On occasion, a major structure may be destroyed completely but a high frequency of this extent of damage will not be expected.

Please see the Adams County Multi-Hazard Map in Appendix F for tornado paths recorded in the County.

5.4.4.2 Population Impact

Since tornadoes typically present localized hazards, the overall population impact within the County is relatively low based on area affected. However, based on the number of events that have occurred in the past, the risk may be considered moderate. Since the strength of the tornadoes in this area tends to be low, several homes may need repair, but typically homeowners will have insurance to cover these expenses and will not suffer any long term financial hardship. The populations located in mobile home parks and campgrounds should take particular care to seek adequate permanent shelter with approaching severe weather.

5.4.4.3 Property Damage

According to the NCDC, there have been 10 tornadoes in Adams County reported since 1953 with magnitudes ranging from F0 to F4. The majority of the tornadoes have been in the F0 to F1 range with only one being categorized as F4 tornadoes. These tornadoes caused total property losses of \$630,000. An F0 tornado in 1997 caused \$100,000 in damages. F1s in 1974, 1977, 1979, 1985, 2002, 2004 and 2007 caused \$505,000 in damages totally. An F3 in 1974 caused \$25,000 in damages and an F4 tornado in 1968 has no figures reported. Based on the frequency and low intensity of tornadoes in the County, there is a moderate impact relative to property damage.

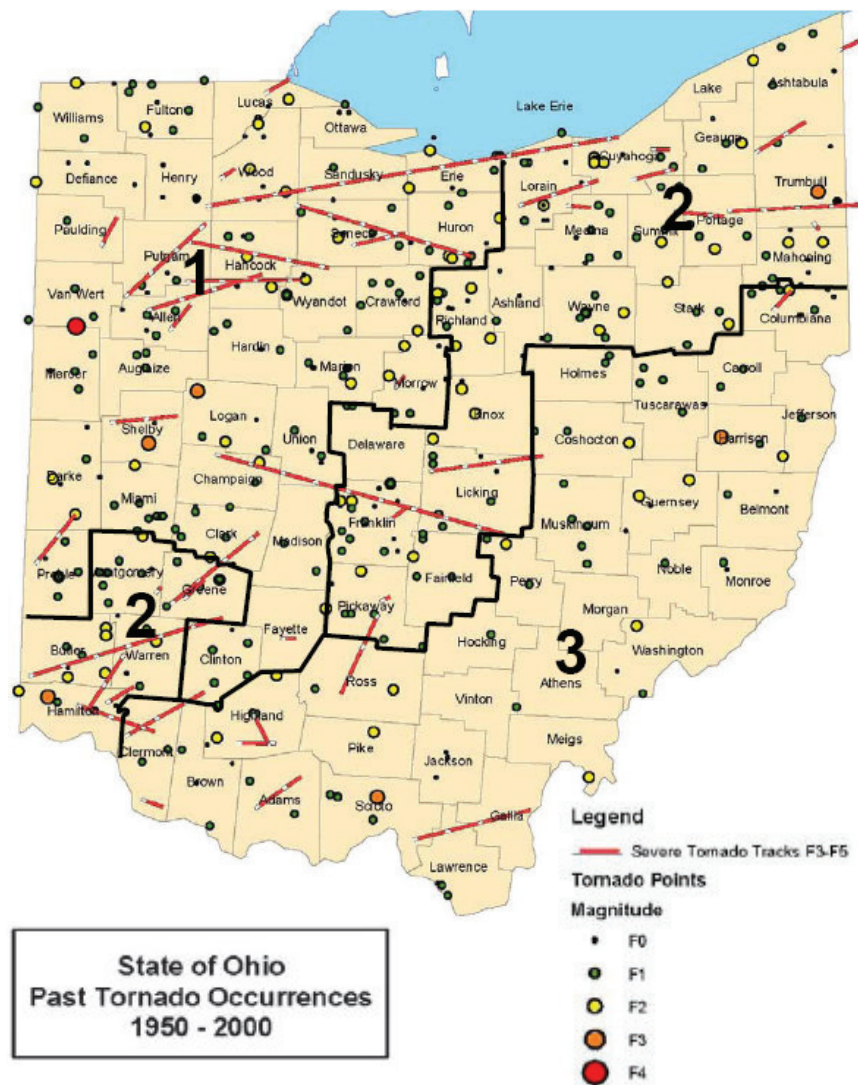
5.4.4.4 Loss of Life

Since 1953, there have been 18 recorded deaths and 160 recorded injuries due to tornadoes. One death and 47 injuries were the result of an F4 tornado hitting the County in 1953. Seventeen deaths and 100 injuries occurred as a result of an F4 tornado that struck the County in 1965. There have been no recorded deaths and 10 injuries since 1970, all between 1970 and 1992. Since 1970, the potential for death and injury in Adams County due to tornadoes has been low. Since the population of the County is forecasted by the 2000 Census to increase, the potential for injury and/or loss of life will also increase.

One of the biggest problems associated with tornadoes is the lack of public education and awareness, especially since tornadoes do not happen that frequently. Citizens are not aware of the warnings and dangers associated with severe weather and tornadoes and thus may not be prepared.

5.4.4.5 Economic Losses

Due to the frequency and intensity of some of the tornadoes that have occurred in Adams County, the overall impact on the economy can be considered low to moderate. If a tornado were to touch down, the majority of the economic losses would be local versus countywide. However, the economy in the local area may be changed dramatically based on the amount of damage that has been known to occur. Businesses may be completely destroyed and unable to reopen. It is unlikely that a Presidential Disaster Declaration would occur, therefore the all clean up costs would be funded locally. Adams County has been declared a federal disaster area on two occasions since 1964 due to tornado damage.



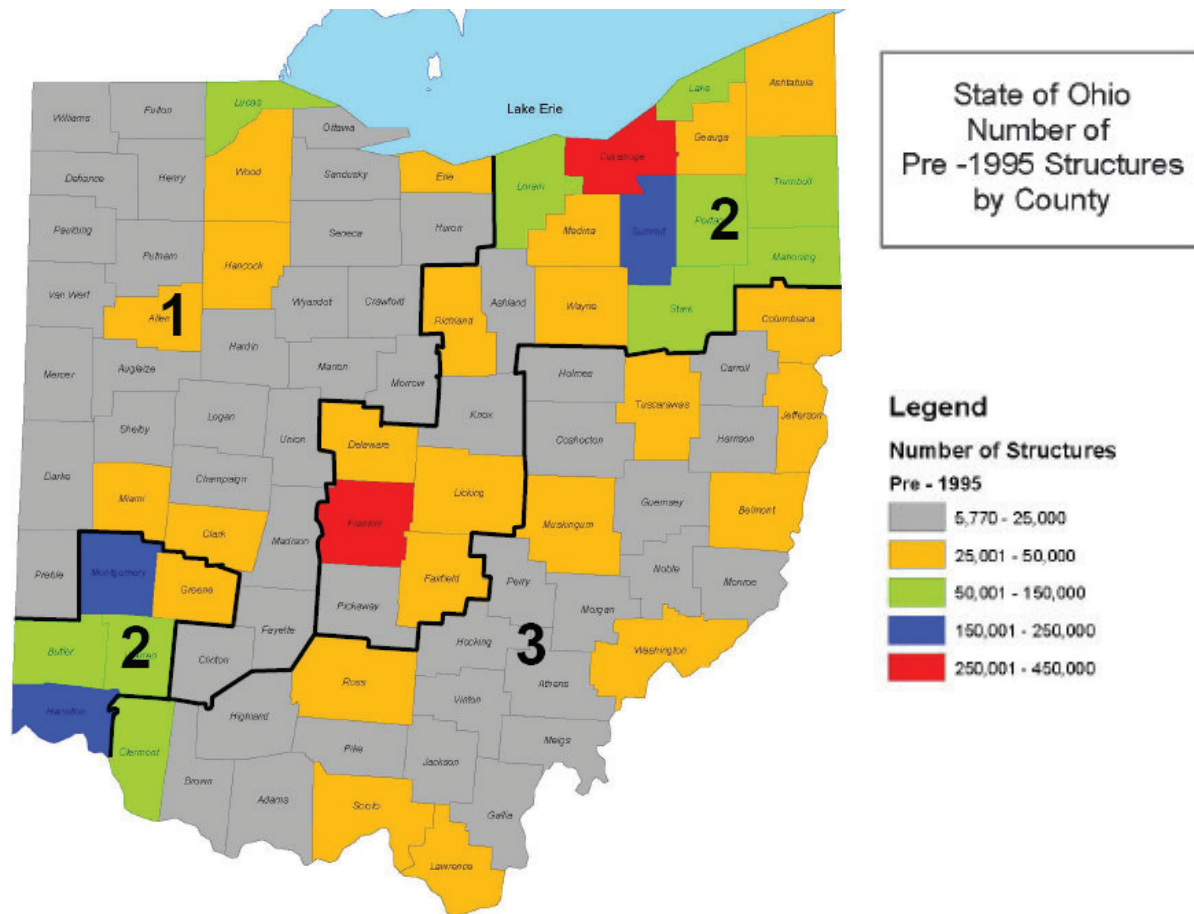


Table 5-7

Number and Statistical Probability of Tornadoes												
	F0		F1		F2		F3		F4		F5	
	#	F0	#	F1	#	F2	#	F3	#	F4	#	F5
Adams	1	2%	6	12%		0%	1	2%		0%		0%
												16%

Table 5-8

F-2 Vulnerability and Estimate of Potential Residential Losses										
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%

Table 5-9

F-2 Vulnerability and Estimate of Potential Governmental Structure Losses							
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

Table 5-10

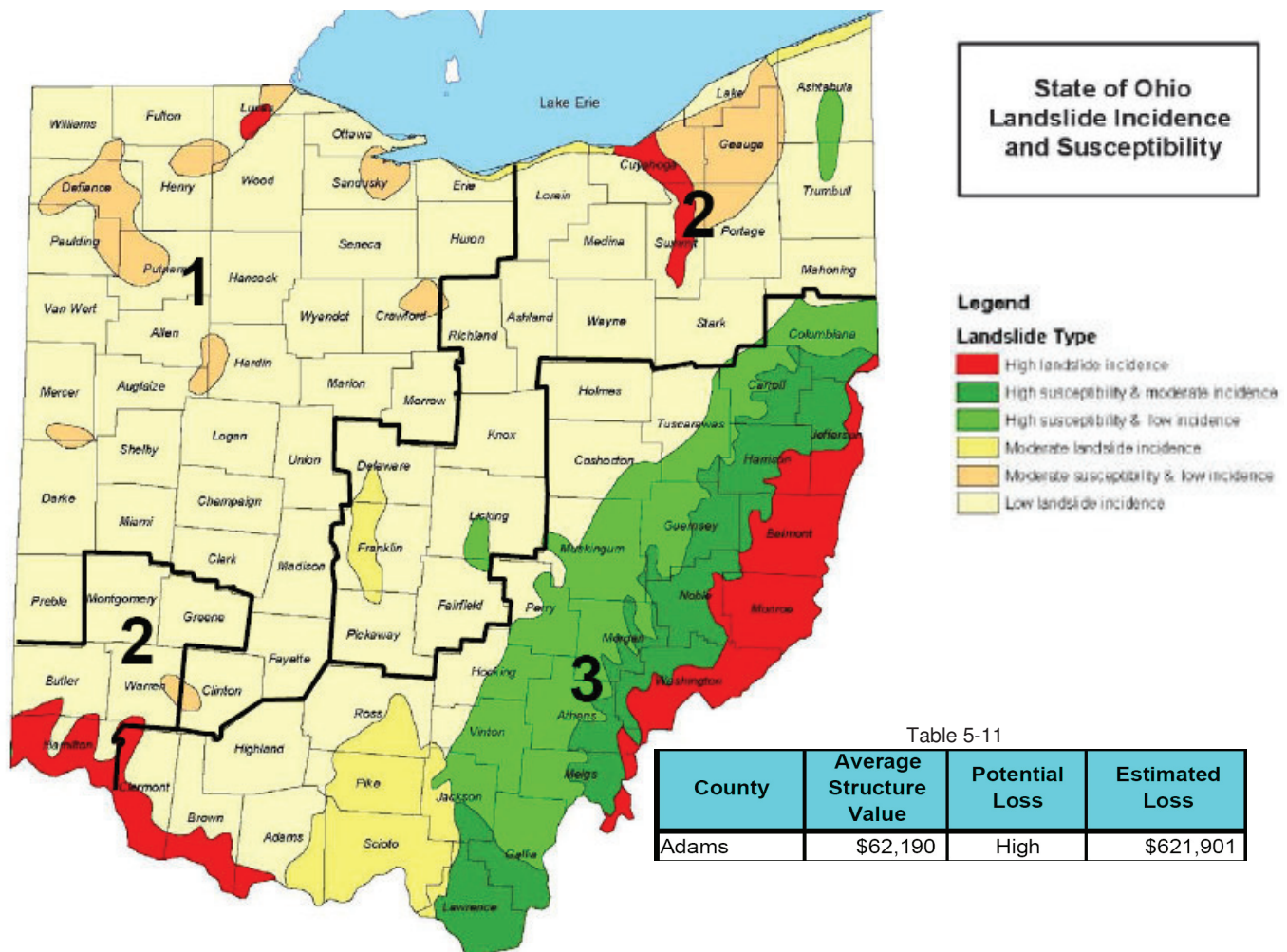
F-2 Vulnerability and Estimate of Potential Commercial Losses							
County	Tornado Relative Risk	Commercial Units	Average Commercial Value (3x Res. Ave. Value)	Commercial Units Pre-1995	% Comm. Pre-1995	Dollar Value of Historic Tornado Damages (50 yrs. NOAA)	At Risk Total Value (Pre-1995 Commercial)
Adams	MEDIUM	38	\$197,322	32	84%	\$505,000	\$6,314,304

5.4.5 LANDSLIDES

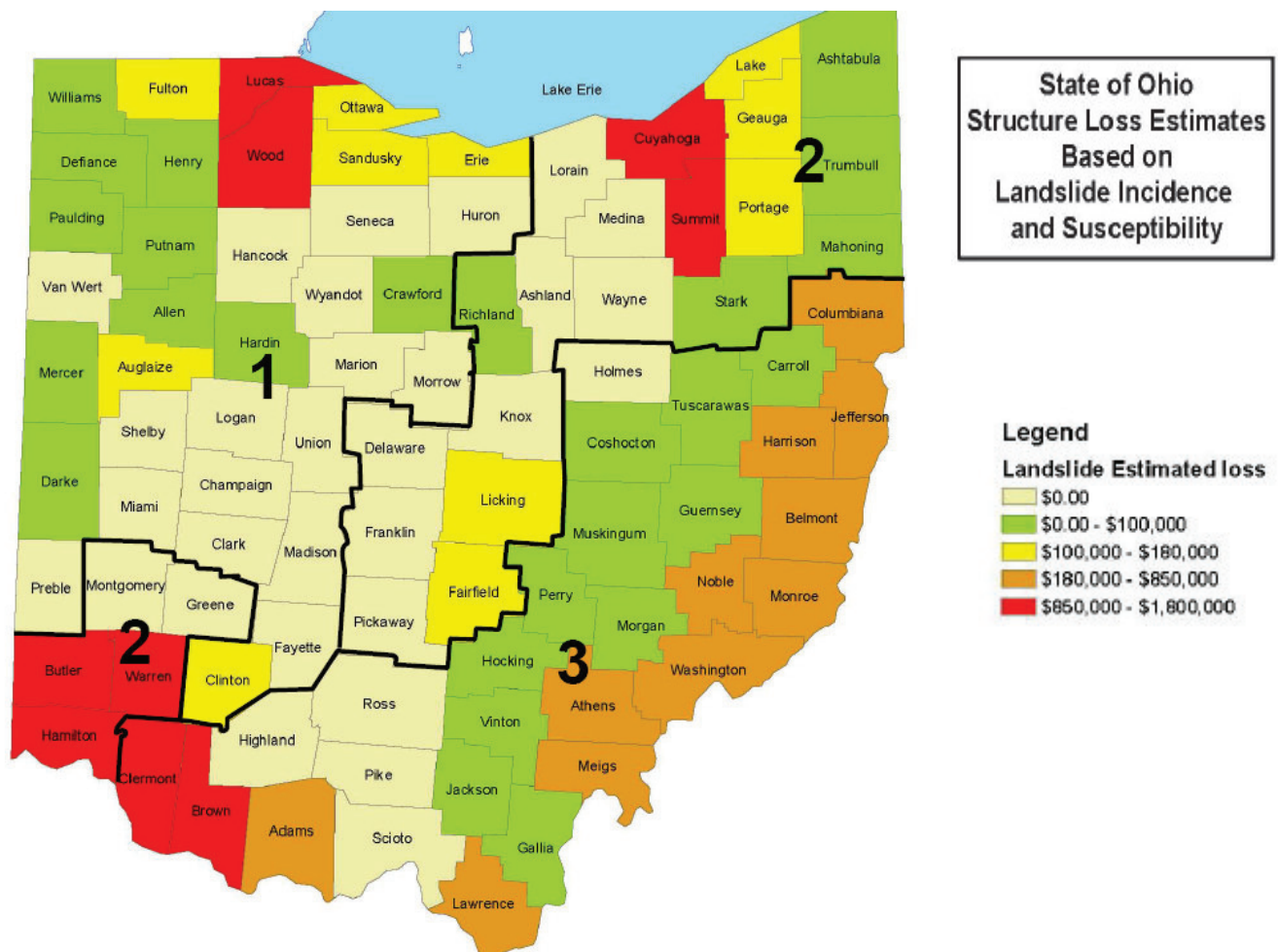
The area around Adams County is the most susceptible to landslides with a low or moderate incidence. The hilly and mountainous terrain of the southern and southeastern portions of Ohio makes this region more potential to landslides than the rest. The Ohio State Natural Hazards Mitigation Plan says that Adams County has about 12 average annual landslides.

Impact:

Due to the mountainous terrain areas of Adams County, the potential for landslides is high. But due to the low population, landslides in Adams County tend to go unnoticed unless it affects a roadway or an inhabited area.



An estimated potential losses to landslide was calculated for Adams County at \$621,901, according to the Ohio State Natural Hazard Mitigation Plan.



5.4.6 EARTHQUAKES

As seen in the hazard profile and as determined by the Core Group, Adams County has a very low risk of incurring damage from earthquakes. The County has had one epicenter within its boundaries in 1877.

5.4.6.1 Infrastructure Impact

Due to the infrequency of earthquakes occurring in Adams County, the impact on the County's infrastructure is low. The quake of 1877, epi-centered in Adams County had an intensity of 3.4 on the Richter scale. An earthquake of this magnitude is not expected to cause much damage to infrastructure. The other earthquakes in neighboring counties occurred in 1901, 1957, 1980, 1994 and 1995. The earthquake of 2008 centered in Mount Carmel in southern Illinois was felt in Adams County.

5.4.6.2 Population Impact

Since the threat of an earthquake is minimal, the overall impact on the County's population will be very low.

5.4.6.3 Property Damage

The level of damage expected from an earthquake in Adams County is very low. It would be expected to be on the order of a 3.0 to 3.9 magnitude quake as registered on the Richter scale. All the earthquakes in and around Adams County have been of the range 2.5 to 4.3, the average being around 3.3. A quake of this magnitude would be felt by most people and include some breakage of dishes, windows and plasters.

5.4.6.4 Loss of Life

The level of an expected earthquake is not considered to be life threatening. Some minor injuries may result from falling objects. Because the likelihood of an earthquake occurring is very low, the potential for death or injury is minimal.

5.4.6.5 Economic Losses

Based on the very limited property damage expected from a 3.0 to 3.9 magnitude earthquake, the impact on the local economy and local government expenditures is considered to be minimal.

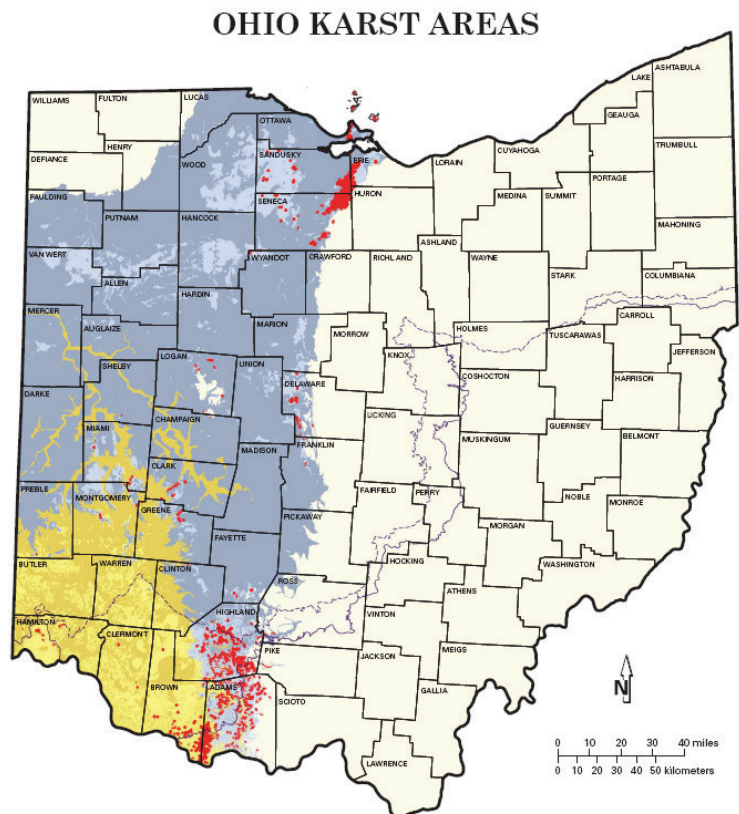
5.4.7 OTHER HAZARDS

5.4.7.1 KARST

Adams County contains the largest and most dense area of karst topography in the state. Nearly the entire County except for its eastern edge contains karst topography.

Impact:

Karst topography poses difficulties for human inhabitants. Sinkholes can develop gradually as surface openings enlarge, but quite often progressive erosion is unseen and the roof of an underground cavern suddenly collapses. Farming in karst areas must take into account the lack of surface water. The soils may be fertile enough, rainfall may be adequate, but rainwater quickly moves through the crevices into the ground, sometimes leaving the surface soil parched between rains.



5.4.7.2 DAM SAFETY

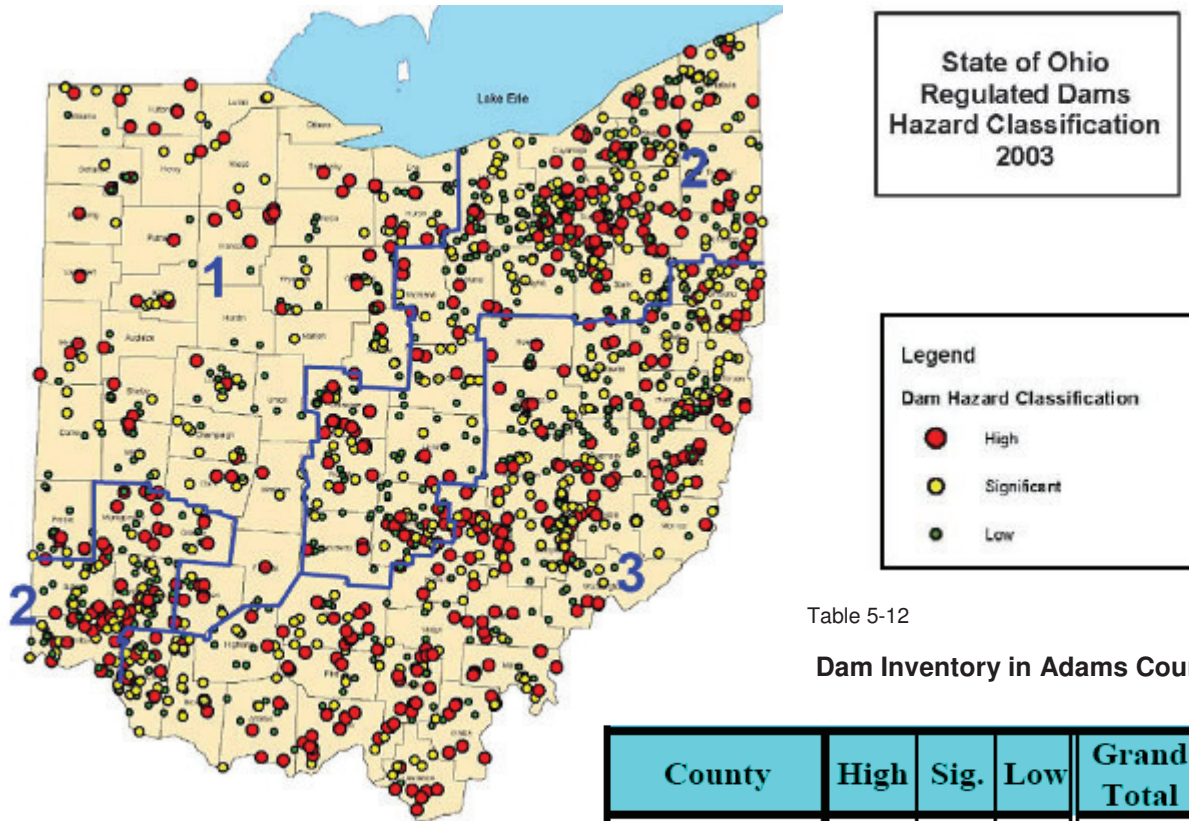


Table 5-12

Dam Inventory in Adams County

County	High	Sig.	Low	Grand Total
Adams	4	4	7	15

Table 5-13

Dam Failures/Near Failures From 1950 to 2003				
Dam Name	County	State	Incident Date	Incident Description
Thomas Pond Dam	Adams	OH	1997	Heavy rain led to dam overtopping and breach; spillway clogged with debris; foundation poorly constructed; downstream damage included road underground power lines being destroyed and three homes receiving flood damage.

Environmental Impact:

Dam failures can have a greater environmental impact than that associated with a flood event. Large amounts of sediment from erosion would alter the landscape changing the ecosystem. Hazardous materials are carried away from flooded out properties and distributed throughout the floodplain. Industrial and agricultural chemicals and wastes, solid wastes, raw sewage, and common household chemicals comprise the majority of hazardous materials spread by flood waters along the flood zone, polluting the environment and contaminating everything they come in contact with, including the community's water supply. The soil loss from erosion and scouring

would be significantly greater because of a large amount of fast moving water affecting a small localized area, which would likely change the ecosystem.

5.4.7.3 WELL FIELD DEPENDENCY

Impact:

Since Adams County's sole source of water is from wells, exhaustion of well fields has the potential to cause serious problems for its citizens and various industries. (If a well field is drawn upon faster than water can be cyclically replaced, the well field may become exhausted and dry up.)

Karst has the potential to contaminate the aquifer. Water supplies from wells in karst topography may be unsafe, as the water may have run unimpeded from a sinkhole in a cattle pasture, through a cave and to the well, bypassing the normal filtering that occurs in a porous aquifer. Karst formations are cavernous and therefore have high rates of permeability, resulting in reduced opportunity for contaminants to be filtered out. Groundwater in karst areas is just as easily polluted as surface streams. Sinkholes have often been used as farmstead or community trash dumps. Overloaded or malfunctioning septic tanks in karst landscapes may dump raw sewage directly into underground channels.

