



## Belmont County Hazard Mitigation Plan

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### APPENDIX 1

#### *Multi-Jurisdictional Hazard Risk Assessment*

Belmont County's Multi-Jurisdictional Hazard Risk Assessment, because of its size, is considered an appendix to the Hazard Mitigation Plan. The contents of the risk assessment can be found in Volumes 2 and 3 of the Hazard Mitigation Plan.

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*Including the Villages of Barnesville, Belmont, Bethesda, Bridgeport, Brookside, Flushing,  
Holloway, Morristown, Powhatan Point, Shadyside, and Yorkville and the Cities of Bellaire,  
Martins Ferry, and St. Clairsville*

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**ATTACHMENT 1 TO APPENDIX 1**

Historical Hazard Event Information

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## **DESCRIPTION OF THE PLANNING AREA – BELMONT COUNTY**

*Including the cities and villages of the county*

### **BELMONT COUNTY**

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Belmont County is located in the eastern portion of Ohio and is part of the state's Appalachian Region. Harrison and Jefferson Counties border Belmont County to the north; the Ohio River makes up the eastern border; Monroe County borders to the south; and Guernsey and Noble Counties comprise the western border. The county contains 14 municipalities, including the villages of Barnesville, Belmont, Bethesda, Bridgeport, Brookside, Flushing, Holloway, Morristown, Powhatan Point, Shadyside, and Yorkville, and the cities of Bellaire, Martins Ferry, and St. Clairsville. The county was established in September of 1801, and its name is French for "Beautiful Mountain". According to the 2000 Census, the highest concentration of residents live in the cities of Martins Ferry, St. Clairsville, and Bellaire.

Belmont County's transportation infrastructure is comprised of land, air, and water components. The county contains approximately 34 miles of interstate highway. Other components of Belmont County's transportation infrastructure include 32 miles of U.S. highway and 217 miles of state highway. Interstates 70 and 470 and US Routes 40 and 250, as well as State Routes 147, 148, and 331 cross the county east west. State Routes 7, 9, and 800 run north south. Three (3) small commercial airports, including Alderman, Bradfield, and Howell, one (1) commercial heliport, several miles of railroad, and the Ohio River are also vital to the county's transportation infrastructure. Belmont County encompasses approximately 537 square miles of land.

Though Belmont County contains several miles of highway, there are villages with limited access, such as Holloway. Limited access creates a problem if those areas are required to evacuate during an emergency.

The Ohio River makes up the entire eastern border of Belmont County, flowing past several villages and cities, including Powhatan Point, Shadyside, Bellaire, Bridgeport, Brookside, Martins Ferry, and Yorkville. There is a great deal of barge traffic on this portion of the Ohio River.

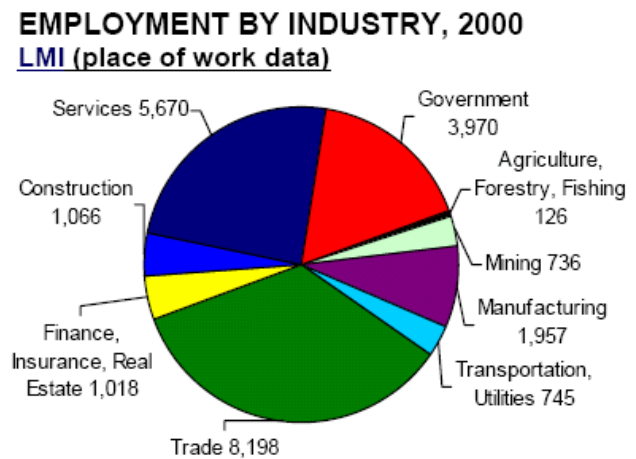
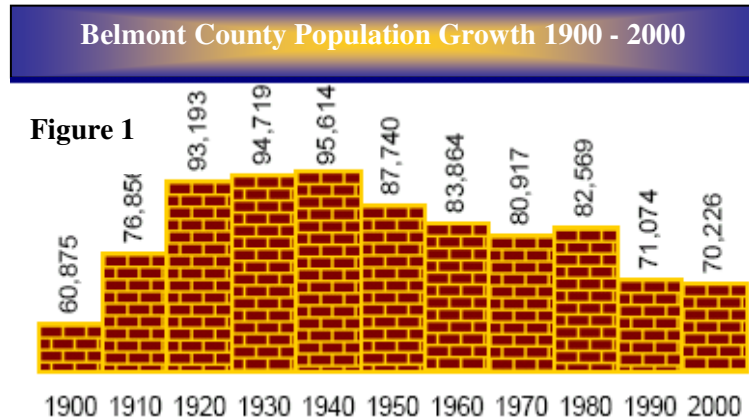
According to the 2000 Census, Belmont County has a population of 70,226 (see Figure 1), which is a slight decrease from 1990. Census figures also cite 31,236 housing units in the county, with an average of 2.25 persons per household. Further, the median household income is listed at \$29,714.

The majority of Belmont County's land cover is wooded or forested; nearly 60% or 208,064 acres, of the total land cover is forested. According to the Ohio Department of Development, 610 individual farms operate in Belmont County, with an average size of 239 acres per farm. 146,000 acres of land is devoted to farm land.

Belmont County has a diverse employment background. According to Census 2000 information, the largest areas of employment are trade, services, and government (as illustrated in Figure 2). Total employment is currently 30,600 persons. The unemployment rate stands at approximately 5.1 %, ranking 27<sup>th</sup> among Ohio's 88 counties. In 2002, a total of 117 new businesses opened while 78 closed, creating a net formation of 39 new businesses. This net brought the total number of active businesses to 1,386 in 2002.

Due to the county's location to the Ohio River, it was considered the gateway entrance for settlers moving west using "Zane's Trail." The Quakers were among the first to settle in the county, and today continue to run the Olney Friends School and hold meetings in the Stillwater Meeting House. Belmont County is the home of several tourist attractions, including the Barnesville Gay 90's Mansion and Museum, the Quaker Heritage Museum, Betty Zane Statue and Grave, the Benjamin Lundy House, the Barbara Barbe Doll Museum, Barkcamp State Park, Piedmont and Belmont Lakes, and the Ohio River.

The education system in Belmont County consists of 26 public schools at which 9,337 students attend and 658 teachers instruct, as well as 11 private schools at which another 1,447



**Figure 2**

students attend. There is currently one (1) two-year public college (Belmont Technical College), as well as a branch of Ohio University located near St. Clairsville. The graduation rate stands at 87.5 percent.

There are several health care facilities located in Belmont County. Currently, three (3) registered hospitals including, Barnesville Hospital, Belmont Community Hospital, and East Ohio Regional Hospital have a total of 442 available beds. There are three (3) licensed residential care facilities with 145 available beds and eight (8) licensed nursing homes with 650 available beds. The East Ohio Regional Hospital is among the largest employers in Belmont County.

The county's communications network consists of one (1) radio station and one (1) daily newspaper, which is distributed to 18,792 residents. According to the Belmont County Emergency Operations Plan (EOP), there are weather alert radios in place in various schools located throughout the county. EAS stations serving Belmont County include two (2) radio stations in Wheeling, West Virginia and one (1) in the City of Bellaire.

## **BELLAIRE CITY**

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The City of Bellaire is located in eastern Belmont County, along the Ohio River in Pultney Township. The major highways accessing the city include State Route 7 running north south along the Ohio River, as well as State Routes 147 and 149 running east west. The city can also be accessed by boat via the Ohio River. The Conrail railroad traverses the western portion of the city and runs parallel to State Route 7.

According to the Belmont County Emergency Operations Plan (EOP), Bellaire is situated in a known 100-year floodplain. According to the Ohio Department of Natural Resources, underground mines are located under the majority of the city, which could create subsidence problems. There is one (1) public school operating in the city; Bellaire High School. The city is also home to the Belmont Community Hospital.

As indicated by the 2000 Census, the City of Bellaire has a population of 4,892 and is the third most populated city in Belmont County. The city contains 2,507 housing units with an average of 1.95 persons per household. The median household income is listed at \$19,480.

## **MARTINS FERRY CITY**

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The City of Martins Ferry is positioned in northeastern Belmont County in Pease Township. The city can be accessed using State Route 7, which runs north south along the Ohio

River, and State Route 647 running east west through the central portion of the city. The Conrail Railroad passes north south through the city between State Route 7 and the Ohio River. According to an Abandoned Mine Locator Map prepared by the Ohio Department of Natural Resources, the majority of the city has been undermined. Martins Ferry is also located within a known 100-year floodplain and has been flooded in the past.

There are four (4) schools that operate in Martins Ferry, including Martins Ferry High School, South Elementary School, Elm Middle School, and North Elementary School. The city also contains a large portion of the county's commercial and industrial assets. Health care facilities in Martin's Ferry include the East Ohio Regional Hospital, which is the primary healthcare facility in Belmont County.

According to the 2000 Census, the City of Martins Ferry has a population of 7,226 and is the most populated municipality in Belmont County. Martins Ferry contains 3,680 housing units with an average of 1.96 persons per household. The current median household income is \$23,960.

## **ST. CLAIRSVILLE CITY**

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The City of St. Clairsville is located in north central Belmont County in Richland Township, approximately eight (8) miles west of the Ohio River. The transportation infrastructure into and out of the city includes Interstate 70 running east west through the southern portion of the city, US Route 40 also running east west through the center of the city, and State Route 9 running north south through the center of the city.

St. Clairsville has been named the county seat and contains a large portion of the county's commercial and industrial assets, including the Fox Commerce Industrial Park and the county fairgrounds. St. Clairsville is also home to a mall and other commercial development, primarily along I-70. There are four (4) schools located in St. Clairsville, including St. Clairsville Elementary, Middle, and High Schools, and the Belmont Career Center Vocational School.

The city has been flooded several times in the past as a result of Wheeling Creek, and McMahon Creek overflowing their banks. Additionally, a large portion of the city has been undermined.

According to the 2000 Census, the City of St. Clairsville has a population of 5,057 and is the second most populated municipality in Belmont County. The city contains 2,430 housing units with an average of 2.08 persons per household and currently boasts a median household income of \$36,630.

## **BARNESVILLE VILLAGE**

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The Village of Barnesville is located in the western Belmont County. The village is accessible using State Routes 147 running east west and 800 running north south. Barnesville contains one (1) of the county's three (3) registered hospitals. The Bradfield Airport is just north of the village's corporate limits. Leatherwood Creek flows through the western portion of the village and there are two (2) Class-I dams located to the south of the village, both of which are reservoirs. Barnesville also contains a water treatment facility. There are three (3) schools located in or near the Village of Barnesville, including, Barnesville Elementary, Middle, and High Schools.

According to the 2000 Census, the Village of Barnesville has a population of 4,225. The village contains 1,964 housing units with an average of 2.15 persons per household. The current median household income is reported at \$23,925.

## **BELMONT VILLAGE**

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The Village of Belmont is in central Belmont County in Goshen Township. Major roadways passing through the village include State Routes 147 running north south and 149 running east west. McMahon Creek flows through the eastern portion of the village. Barkcamp State Park, and the Belmont Lake Dam are positioned to the north and east of the Village.

There are three (3) schools that operate in the Belmont Village, including Union Local Elementary, Middle, and High Schools.

As indicated by the 2000 Census, the Village of Belmont has a population of 532 and contains 224 housing units with an average of 2.38 persons per household. The Village of Belmont currently reports a median household income of \$28,875.

## **BETHESDA VILLAGE**

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The Village of Bethesda is positioned in central Belmont County just south and east of Belmont Village in Goshen Township. Bethesda is accessible using State Route 147, which is the only major roadway through the village. This limited accessibility could be a concern if the village would need to be evacuated during an emergency. Bend Fork of Captina Creek flows into the village and has prompted flooding in the past.



The 2000 Census indicates that Bethesda has a population of 1,413. There are 679 housing units in the village with an average of 2.08 persons per household. The median household income is \$24,358.

## **BRIDGEPORT VILLAGE**

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Bridgeport Village is located in northeastern Belmont County in Pease Township. The Ohio River flows along the village's entire eastern border. There are three (3) major thoroughfares into and out of the village, including Interstate 70, which runs east west through the center of the village, and US Routes 40 and 250. State Route 7, the Conrail Railroad, and Baltimore & Ohio Railroad all traverse the corporate limits north south along the Ohio River. Wheeling Creek flows through the center of the village before dumping into the Ohio River. According to the Ohio Department of Natural Resources, there are several underground mines located beneath Bridgeport Village.

There are three (3) schools in the village: Bridgeport High School, Westbrooke Intermediate Elementary School, and Kirkwood School. According to the 2000 Census, the Village of Bridgeport has a population of 2,186. The village contains 1,090 housing units with an average of 2.00 persons per household. The 2000 Census also reports the median household income at \$25,685.

## **BROOKSIDE VILLAGE**

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The Village of Brookside is located in northeastern Belmont County, just west of Bridgeport Village. The transportation infrastructure into and out of the village includes, Interstate 70 and US Route 40, both of which run east west. Wheeling Creek flows through the southern portion of the village and has caused flooding in the past. Brookside, like many of the other villages and cities located along the Ohio River, has been under mined, which increases the areas vulnerability to subsidence.

As indicated by the 2000 Census, the Village of Brookside has a population of 644. There are 304 housing units in the village with an average of 2.12 persons per household. The reported median household income is \$34,297.

## **FLUSHING VILLAGE**

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The Village of Flushing is located in northern Belmont County, near the Belmont-Harrison County line. The only major highways that can be used to access the village include State Route 149 and 331. The Piedmont Reservoir Dam, which is a large Class I dam is located just to the west of Flushing Village.

According to the 2000 Census, Flushing has a population of 900. The village contains 434 housing units with an average of 2.07 persons per household, and currently boasts a median household income of \$26,875.

## **HOLLOWAY VILLAGE**

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The Village of Holloway is positioned in the northwestern-most portion of Belmont County, along the Belmont-Harrison County Line. The village is positioned just to the east of the Piedmont Reservoir. There is limited access into the village, as State Route 331 is the only major highway that can be used to access it. Wheeling Creek flows just to the south of the village and has caused flooding in the area in the past.

As indicated by the 2000 Census, the Village of Holloway has a population of 345, and is among the least populated municipalities in Belmont County. Holloway contains 151 housing units with an average of 2.28 persons per household. The village currently boasts a median household income of \$25,313.

## **MORRISTOWN VILLAGE**

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The Village of Morristown is located in north central Belmont County in Union Township. The major thoroughfares that can be used to access the village include US Route 40 running east west and State Route 149 running north south. McMahon Creek flows just to the south of the village and has caused flooding in the past. Barkcamp State Park and Belmont Lake are located near Morristown.

As indicated by the 2000 Census, the Village of Morristown has a population of 299, and is the least populated of Belmont County's 14 municipalities. Morristown contains 138 housing units with an average of 2.17 persons per household. The city currently boasts a median household income of \$34,375.

## **POWHATAN POINT VILLAGE**

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The Village of Powhatan Point is located in the southeastern-most corner of Belmont County in York Township along the Ohio River.

The village can be accessed using State Routes 7 and 148, as well as the Conrail Railroad, or by boat via the Ohio River. Captina Creek flows through the center of the village before dumping into the Ohio River, both of which have caused flooding in the past.

According to Census 2000 statistics, Powhatan Point Village has a population of 1,744. The village contains 830 housing units with an average of 2.10 persons per household. The current median household income is \$24,875.

## **SHADYSIDE VILLAGE**

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Shadyside Village is located in southeastern Belmont County, just south of Bellaire City. The village is positioned along the Ohio River. The only major roadway that can be used to access the village is State Route 7, which runs north south paralleling the Ohio River and the Conrail Railroad.

There are three (3) schools that operate in the Village of Shadyside, including Jefferson Avenue Elementary School, Shadyside High School, and Leona Avenue Middle School.

According to Census 2000 statistics, the Village of Shadyside has a population of 3,675 and contains 1,856 housing units, with an average of 1.98 persons per household. The current median household income for Shadyside is \$28,989.

## **YORKVILLE VILLAGE**

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The Village of Yorkville is located in the northeastern-most corner of Belmont County and extends into Jefferson County. The only major highway providing access to the village is State Route 7 running north south along the Ohio River. The Conrail Railroad traverses the village parallel to State Route 7.

According to Census 2000 statistics, the Village of Yorkville has a total population of 1,230, of which 538 is in Belmont County (the remainder is in Jefferson County). The village contains 600 total housing units, creating an average of 2.05 persons per household. The current median household income is \$29,583.

## HAZARD RISK ASSESSMENT – MULTI-JURISDICTIONAL PLAN REQUIREMENTS

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*According to 44 CFR Part 201.6(c)(2) (iii), the risk assessment section must assess each jurisdiction's risk where they vary from the risks facing the entire planning area.*

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For the purpose of this assessment, risks will be assessed separately for each jurisdiction involved where they differ significantly. If the risk affects one (1) jurisdiction and not another, or if the risk affects one (1) jurisdiction in a significantly different manner, it will be so noted in the hazard identification and hazard profile steps. If the risks are determined to impact each jurisdiction equally or in the same manner, it will be so noted. In such cases, please refer to the hazard profile contained in the larger jurisdiction's hazard profile (i.e. please refer to *Profiling Hazard Events – Belmont County* for risks affecting Belmont County and all of its municipalities in the same manner.)

## IDENTIFYING HAZARDS – BELMONT COUNTY

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*As per requirement 44 CFR Part 201.6(c)(2)(i): [The risk assessment shall include a] description of the type...of all natural hazards that can affect the jurisdiction.*

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Belmont County identified several hazards in its risk assessment that will be addressed in the county's Hazard Mitigation Plan. These hazards were delineated through an extensive research process that utilized input from the following sources:

- Reviews of newspapers ranging in date from 1970 to 2003.
- Interviews with local officials/experts:
  - Richard Quinlin, Belmont County EMA Director
  - Becky Horne, Belmont County EMA Deputy Director
  - Darlene Pempek, Belmont County Commission Clerk
  - Joni Palumba, Ohio EMA
  - Shannon Reelf, Ohio EMA
  - Chrissy Hotz, Ohio EMA
- Reviews of Flood Insurance Rate Map (FIRM) information for Belmont County and the Villages of Barnesville, Belmont, Bethesda, Bridgeport, Brookside, Flushing, Holloway, Morristown, Powhatan Point, Shadyside, Yorkville, and the Cities of Bellaire, Martins Ferry, and St. Clairsville.
- Review of the Belmont County Emergency Operations Plan and Hazardous Materials Emergency Response Plan.
- Public input.
- Searches of multiple Internet sites concerning hazard mitigation and planning (The following sites are general listings that were searched at the onset of the project. Sites that were searched regarding specific hazards are listed with those hazards below.):
  - American Red Cross – Local Chapters  
<http://www.redcross.org/where/where.html>
  - Disaster Center  
<http://www.disastercenter.com>
  - Digital Q3 Flood Data  
<http://msc.fema.gov/MS/statemap.htm>

- ESRI  
<http://www.esri.com/hazards>
- Federal Emergency Management Agency  
<http://www.fema.gov>
- HAZUS Instruction and Technical Information  
<http://www.fema.gov/hazus>
- Socio-Economic Data Resources  
[http://www.csc.noaa.gov/products/nchaz/htm/dinfo\\_4.htm](http://www.csc.noaa.gov/products/nchaz/htm/dinfo_4.htm)
- USDA Natural Resources Conservation Service  
<http://www.nhq.nrcs.usda.gov/RID/RID.html>
- National Oceanic Atmospheric Administration  
<http://www4.ncdc.noaa.gov/cgi-win>

The following hazards were identified for the Belmont County Hazard Risk Assessment.

<i><b>Hazard</b></i>	<i><b>How Identified</b></i>	<i><b>Why Identified</b></i>
<b>Dam Failure</b>	<ul style="list-style-type: none"> <li>• Ohio Department of Natural Resources, Division of Water</li> <li>• National Dam Inventory</li> <li>• Belmont County EOP</li> <li>• Internet research</li> </ul>	<ul style="list-style-type: none"> <li>• There are currently 14 dams in Belmont County, eleven (11) of which are Class I.</li> <li>• According to the Ohio Department of Natural Resources, Division of Water, damages resulting from the failure of a Class I dam could include loss of life, as well as considerable structural damage to homes, businesses, and major public utilities.</li> </ul>
<b>Drought</b>	<ul style="list-style-type: none"> <li>• Review of <i>Palmer Drought Index</i></li> <li>• NOAA (Event Records)</li> <li>• USGS web site</li> <li>• Ohio Department of Natural Resources, Division of Water</li> <li>• Belmont County EOP</li> <li>• Ohio Emergency Management Agency</li> <li>• Internet research</li> </ul>	<ul style="list-style-type: none"> <li>• The <i>Palmer Drought Severity Index</i> indicates that Ohio counties spend 0-5% of the summer and autumn months under drought conditions.</li> <li>• Belmont County contains approximately 239 individual farms; total agricultural cash receipts in 2002 were \$14.3 million.</li> </ul>

<b>Earthquake</b>	<ul style="list-style-type: none"> <li>• Review of US Geological Survey National Seismic Hazard Mapping Project</li> <li>• Review of ESRI GIS information on Ohio</li> <li>• Ohio Department of Natural Resources web site</li> <li>• Ohio Seismic Network</li> </ul>	<ul style="list-style-type: none"> <li>• The US Geological Survey lists Belmont County with a PGA 2.0 to 3.0 (MMI IV)</li> <li>• Earthquakes are capable of tremendous structural damage in a very short period of time.</li> </ul>
<b>Epidemic</b>	<ul style="list-style-type: none"> <li>• Internet research</li> <li>• Public input</li> <li>• Ohio Department of Natural Resources web site</li> <li>• Ohio Department of Health</li> </ul>	<ul style="list-style-type: none"> <li>• Epidemics can strike any area at any time.</li> <li>• Belmont County contains densely populated areas.</li> </ul>
<b>Flooding</b>	<ul style="list-style-type: none"> <li>• Review of FIRM information</li> <li>• Public input</li> <li>• Review of past newspaper coverage</li> <li>• NOAA (<i>Event Records</i>)</li> <li>• Belmont County EOP</li> <li>• Internet research</li> <li>• USGS Water Resources</li> </ul>	<ul style="list-style-type: none"> <li>• The Ohio River makes up Belmont County's entire eastern border.</li> <li>• At least 24 people died and the county sustained in excess of \$10 million in damage during the flood of June 14, 1990. Some sources list 26 fatalities.</li> <li>• As indicated in an article from <i>The Times Leader</i> dated January 21, 1996, many Belmont County residents spent the day moving their belongings to higher ground as they kept a close watch on rising water. The Ohio River was projected to crest at 47 feet.</li> </ul>
<b>Hailstorm</b>	<ul style="list-style-type: none"> <li>• Climatology reports</li> <li>• National Weather Service</li> <li>• NOAA (<i>Event Records</i>)</li> <li>• Reviews of past newspaper coverage</li> </ul>	<ul style="list-style-type: none"> <li>• Severe thunderstorms and windstorms are often accompanied by hail.</li> <li>• (NOAA) Event Records reported several hail incidents.</li> </ul>
<b>Landslide</b>	<ul style="list-style-type: none"> <li>• Reviews of the USGS Internet site</li> <li>• Reviews of the Belmont County Emergency Operations Plan (EOP)</li> <li>• Discussions with local officials.</li> </ul>	<ul style="list-style-type: none"> <li>• The majority of Belmont County is listed as having a high percentage of landslide incidences.</li> <li>• Belmont County has a high susceptibility/moderate incidence to landslides.</li> </ul>

<b>Hazmat Incident</b>	<ul style="list-style-type: none"> <li>• Review of past newspaper coverage</li> <li>• Environmental Protection Agency's National Priorities Listing</li> <li>• Belmont County EOP</li> <li>• Internet research</li> </ul>	<ul style="list-style-type: none"> <li>• There are currently 2,500 hazardous materials shipments per day on the highways that cross the state.</li> <li>• Almost half of all freight trains carry hazardous materials and there are railways that pass through eastern Belmont County.</li> <li>• According to the Belmont County Emergency Operations Plan (EOP), that are 32 Extremely Hazardous Facilities (EHFs) located throughout Belmont County.</li> </ul>
<b>Infestation</b>	<ul style="list-style-type: none"> <li>• Ohio Department of Health</li> <li>• Ohio Division of Forestry</li> <li>• Ohio Department of Natural Resources</li> </ul>	<ul style="list-style-type: none"> <li>• According to the Ohio Department of Natural Resource, Belmont County is among several Ohio counties to be placed under quarantine in an attempt to prevent the spread of gypsy moth caterpillars.</li> </ul>
<b>Mine Subsidence</b>	<ul style="list-style-type: none"> <li>• Ohio Department of Natural Resources, Division of Geological Survey</li> <li>• Internet research</li> <li>• Mine Safety and Health Administration</li> </ul>	<ul style="list-style-type: none"> <li>• There are several underground mine located beneath Belmont County. The majority of eastern Belmont County has been under mined.</li> </ul>
<b>Severe Thunderstorm</b>	<ul style="list-style-type: none"> <li>• Review of past newspaper coverage</li> <li>• NOAA (<i>Event Records</i>)</li> <li>• Belmont County EOP</li> <li>• National Weather Service</li> </ul>	<ul style="list-style-type: none"> <li>• There have been 105 occurrences of thunderstorms recorded in <i>NOAA Event Records</i>, between 1950 and 2003 most of which have resulted in property damage.</li> <li>• According to an article from <i>The Times Leader</i>, dated July 16, 1995, severe thunderstorms ripped through several riverfront communities in Belmont County, dumping up to five (5) inches of rain in one (1) hour in Martins Ferry and Colerain. Emergency Management Agency (EMA) Director Dick Quinlin assessed damages done by torrential rains, high winds, severe lightning, and hail.</li> </ul>



<b>Severe Wind and Tornado</b>	<ul style="list-style-type: none"> <li>• Review of past newspaper coverage</li> <li>• NOAA (<i>Event Records</i>)</li> <li>• Review of ESRI GIS information on Ohio</li> <li>• National Weather Service</li> <li>• <i>State and Local Mitigation Planning How-to Guide: Understanding Your Risks</i></li> </ul>	<ul style="list-style-type: none"> <li>• According to (NOAA) Event Records, there have been two (2) reported tornadoes in Belmont County between 1950 and 2003.</li> </ul>
<b>Severe Winter Storm and Sleet</b>	<ul style="list-style-type: none"> <li>• Review of past newspaper coverage</li> <li>• NOAA (<i>Event Records</i>)</li> <li>• Public input</li> <li>• Review of past disaster declarations</li> <li>• Belmont County EOP</li> </ul>	<ul style="list-style-type: none"> <li>• According to an article in <i>The Times Leader</i> dated January, 14, 1999, several roads in Belmont County were impassable following a significant ice storm. Approximately 190 American Electric Power customers were without power for several hours as the accumulation of ice caused a tree to fall, knocking down power lines. According to Belmont County EMA Director Richard Quinlin, there was a three (3) mile ice jam on Captina Creek.</li> <li>• (NOAA) Event Records list several severe winter storms events which indicate significant snowfall and property damage.</li> </ul>
<b>Temperature Extreme</b>	<ul style="list-style-type: none"> <li>• Review of past newspaper coverage</li> <li>• National Weather Service</li> <li>• NOAA (<i>Event Records</i>)</li> <li>• FEMA web site</li> </ul>	<ul style="list-style-type: none"> <li>• As indicated by an article from <i>The Times Leader</i> dated July 16, 1995, approximately 300 people were taken by emergency cart or stretcher to the medical tent to be treated at the Jamboree in the Hills concert for heat related illnesses. Temperatures reached over 100 degrees, and were 10 to 15 degrees hotter in front of the stage area.</li> </ul>
<b>Terrorism (Biological)</b>	<ul style="list-style-type: none"> <li>• Local officials requested terrorism be identified and evaluated</li> </ul>	<ul style="list-style-type: none"> <li>• Belmont County is not immune to a biological terrorist attack.</li> <li>• Belmont County contains several acres of crops and produce, which could be subject to agri-terrorism.</li> </ul>
<b>Terrorism (Chemical)</b>	<ul style="list-style-type: none"> <li>• Local officials requested man-made hazards be identified and evaluated</li> </ul>	<ul style="list-style-type: none"> <li>• Belmont County is not immune to a chemical terrorist attack.</li> <li>• Belmont County contains public water infrastructure.</li> </ul>

<b>Terrorism (WMD)</b>	<ul style="list-style-type: none"> <li>Local officials requested man-made hazards be identified and discussed</li> </ul>	<ul style="list-style-type: none"> <li>WMD events in neighboring or nearby counties could potentially affect Belmont County.</li> <li>Belmont County is located within the 50-mile ingestion zone of the Beaver Valley Nuclear Power Plant.</li> </ul>
<b>Wildfire</b>	<ul style="list-style-type: none"> <li>Review of past newspaper coverage</li> <li>Ohio Department of Natural Resources</li> <li>Ohio Division of Forestry</li> <li>Internet research</li> </ul>	<ul style="list-style-type: none"> <li>Belmont County contains several wooded areas including a Barkcamp State Park, and Dysart Woods.</li> </ul>

Following are hazards that were not discovered to be significant risks in Belmont County.

- Avalanche –The general elevation is not high enough and the climate not suitable for snow to cap mountains year-round. Therefore, avalanches are not a significant hazard. Sliding rock and/or earth is considered a landslide for the purpose of this report. (see also *Landslide and Erosion*)
- Coastal Erosion –Belmont County is a landlocked county and does not have any coastal boundaries.
- Coastal Storm – Belmont County is positioned inland from large bodies of water. (See also *Hurricane*)
- Hurricane – While Belmont County sometimes receives precipitation as hurricanes hit the southern coastal states, the county does not experience intense hurricane conditions. The precipitation that is received can be classified as a severe thunderstorm or winter storm. (see also *Severe Thunderstorm* and *Severe Winter Storm and Sleet*)
- Tsunami – Belmont County is located inland from large bodies of water.
- Volcano – Research shows no volcanic activity in Belmont County.

By virtue of their location in Belmont County, the municipalities in the county can be said to be susceptible to the hazards that are identified above. However, these municipalities may be more or less susceptible to the same hazard events as the rest of the county. The following table illustrates if the municipalities are likely to be affected by the hazard events more, less, or in the same manner as the rest of the county.

	Barnesville	Belmont	Bethesda	Bridgeport	Brookside	Flushing	Holloway	Morristown	Powhatan Point	Shadyside	Yorkville	Bellaire	Martins Ferry	St. Clairsville
<b>Dam Failure</b>	>	>	=	<	<	<	<	<	<	<	<	<	<	=
<b>Drought</b>	=	=	=	=	=	=	=	=	=	=	=	=	=	=
<b>Earthquake</b>	=	=	=	=	=	=	=	=	=	=	=	=	=	=
<b>Epidemic</b>	>	=	=	=	=	=	=	=	=	>	=	>	>	>
<b>Flooding</b>	=	=	=	>	>	=	=	=	>	>	>	>	>	>
<b>Hailstorm</b>	=	=	=	=	=	=	=	=	=	=	=	=	=	=
<b>HAZMAT</b>	=	=	=	>	>	=	=	>	=	=	=	>	>	>
<b>Infestation</b>	>	=	=	<	<	>	>	=	=	=	=	<	<	<
<b>Landslides</b>	=	=	=	=	=	=	=	=	=	=	=	=	=	=
<b>Mine Sub.</b>	<	=	<	>	>	>	<	<	>	>	>	>	>	>
<b>T. Storm</b>	=	=	=	=	=	=	=	=	=	=	=	=	=	=
<b>Tornado</b>	=	=	=	=	=	=	=	=	=	=	=	=	=	=
<b>Winter Storm</b>	=	=	=	=	=	=	=	=	=	=	=	=	=	=
<b>Heat Wave</b>	>	=	=	=	=	=	=	=	=	>	=	>	>	>
<b>Terrorism</b>	=	=	=	=	=	=	=	=	=	>	=	>	>	>
<b>Wildfire</b>	=	=	=	=	=	=	=	=	=	=	=	=	=	=

**Key**

- = : Municipality affected by hazard same as county
- > : Municipality affected by hazard more than county
- < : Municipality affected by hazard less than county

## **PROFILING HAZARD EVENTS – BELMONT COUNTY**

*Including the cities and villages of the county*

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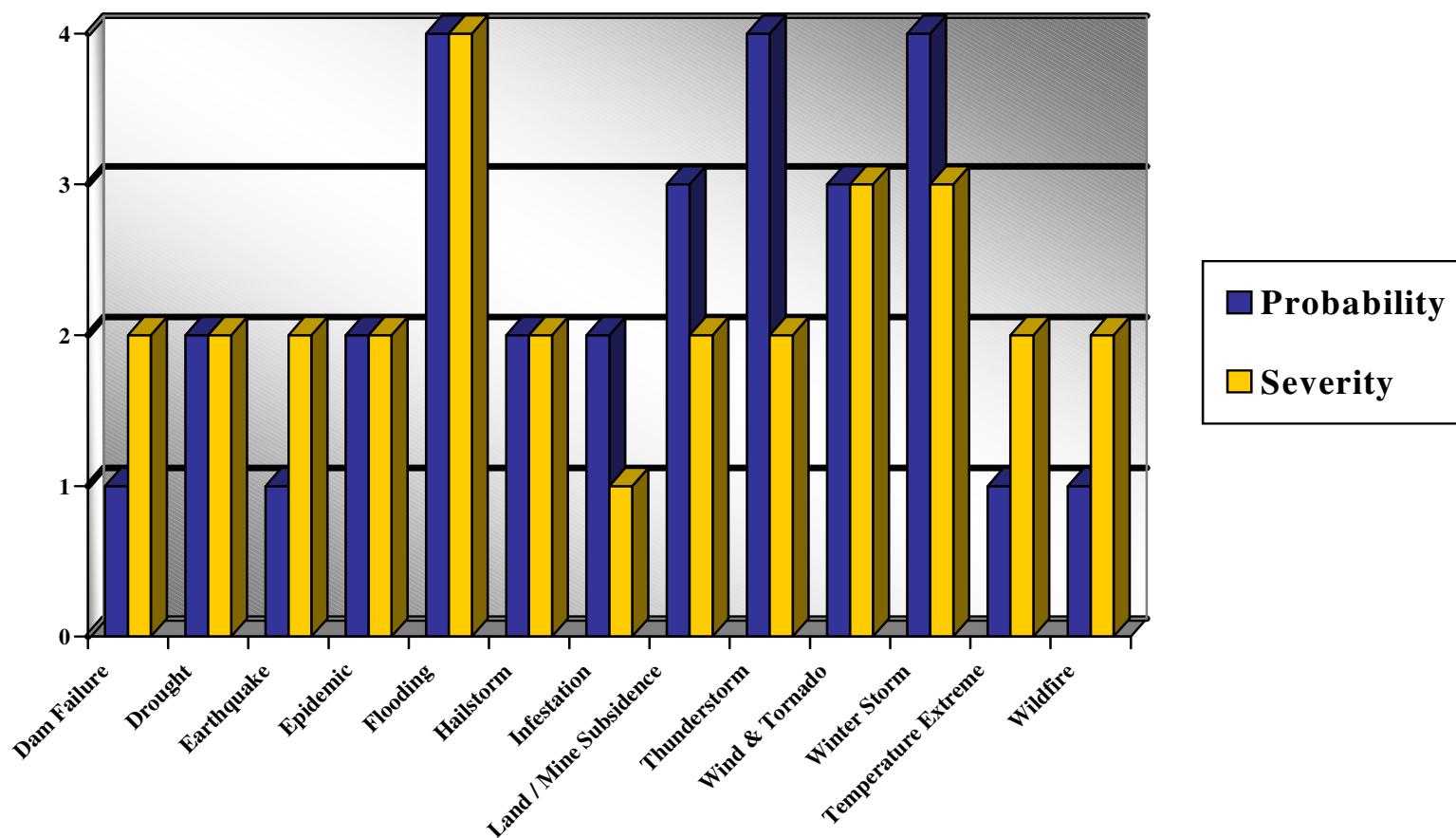
*As per requirement 44 CFR Part 201.6(c)(2)(i): [The risk assessment shall include a] description of the...location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future events.*

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Belmont County is subject to many hazard events. As discussed above, past newspaper research; reviews of existing plans that had previously been compiled, such as the Belmont County Emergency Operations Plan (EOP); searches of multiple Internet sites; reviews of current FIRM information; and discussions with local emergency management personnel assisted in the identification of these hazards. Each hazard is defined, discussed, and profiled below in detail. Also, a GIS-based map has been developed for each one of these hazards, which illustrates the areas that are most susceptible to them.

Hazard profiles are included in this report under a section labeled by the hazard, which includes Worksheet #3a, Worksheet #4, and the appropriate GIS-based mapping.

## Probability vs. Severity



0 = No Occurrence, 1 = Low, 2 = Moderate, 3 = High, 4 = Extreme High

## PROBABILITY VS. SEVERITY EXPLANATION

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In the case of many hazards, it is not possible to eliminate risks; they can only be reduced. When many risks exist at once, or when resources are limited, mitigation and preparedness require the setting of priorities. The classification of probability and severity for hazard risks in Belmont County is covered in the following Risk Assessment Decision Matrix.

The decision matrix was transposed into the Probability vs. Severity Chart for reader usability. A bar graph format is much easier to understand than the matrix below. For probability, frequent equals four (4), probable equals three (3), occasional equals two (2), remote equals one (1), and improbable equals zero (0). For severity, catastrophic equals four (4), critical equals three (3), marginal equals two (2), and negligible equals one (1).

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## METHODOLOGY

### Probability

The first task that was undertaken was to determine the frequency of hazard occurrences. For instance, how many floods occur in a year? How many winter storms has Belmont County experienced in the past ten (10) years? To answer these questions, NOAA (Event Records) were analyzed. NOAA keeps records of significant storm events back to 1950. The number of hazard events (i.e. floods, hailstorms, thunderstorms, tornadoes, winter storms, etc.) was counted. Based on records for Belmont County alone, probability was determined. From this analysis, it became evident that winter storms and flooding occur frequently.

If the information contained in NOAA's records was insufficient, other historical data such as media archives were examined. Again, if repeated coverage was given to a particular hazard event, that event was considered highly probable to occur. If neither source yielded sufficient data, information gathered from interviews with local representatives was used.

### Severity

The second and final task was to determine the severity of identified hazard events. Again, NOAA (Event Records) were used. Each of these documents records the atmospheric conditions of the event and other details such as wind speeds, the amount of loss incurred (in dollars), and the number of lives lost. If it appears that thunderstorms frequently occur but do not result in significant monetary losses or deaths, then thunderstorms were said to have a high probability and low severity. If winter storms, for example, appeared to occur frequently and also

cause significant damage or deaths, then winter storms were said to have a high probability and high severity.

Again, if NOAA Event Records were insufficient, local media archives were used as newspapers often report known damages and deaths following hazard events. If neither source yielded sufficient data, information was gathered from interviews with local representatives.

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### HAZARD PROBABILITY CLASSIFICATION

Description	Specific Hazard Event	Frequency
Frequent	Likely to occur frequently	Continuously experienced
Probable	Will occur several times in the life of an item	Experienced several times
Occasional	Likely to occur sometime in the life of an item	Experienced
Remote	Unlikely but possible to occur in the life of an item	Unlikely that it has been experienced
Improbable	So unlikely it can be assumed occurrence may not be experienced	Not experienced

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### HAZARD SEVERITY CLASSIFICATION

Description	Mishap Definition
Catastrophic	Death or major structural loss
Critical	Severe injury, severe illness, or marginal structural damage
Marginal	Minor injury, minor illness, or structural damage
Negligible	Less than minor injury, illness, or structural damage

### RISK ASSESSMENT MATRIX

HAZARD SEVERITY	PROBABILITY				
	Frequent	Probable	Occasional	Remote	Improbable
Catastrophic	5				
Critical	11	10			
Marginal	9	8	2, 4, 6	1, 3, 12, 13	
Negligible			7		

1 – Dam Failure	8 – Land / Mine Subsidence
2 – Drought	9 – Severe Thunderstorm
3 – Earthquake	10 – Severe Wind and Tornado
4 – Epidemic	11 – Severe Winter Storm
5 – Flooding	12 – Temperature Extremes
6 – Hailstorm	13 – Wildfires
7 – Infestation	



## ASSET INVENTORY – BELMONT COUNTY

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*As per requirement 44 CFR Part 201.6 (c)(2)(ii)(A): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of: the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.*

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### METHODOLOGY

Several resources were used to inventory the assets in Belmont County, both for the county as a whole and within designated hazard risk areas. For example, HAZUS U.S., and Census data were used in addition to extensive correspondence with local representatives.

The first task that was undertaken was to identify the number of residential, commercial, industrial, agricultural, religious/non-profit, government, education, and utility facilities throughout the county and municipalities. Each type of structure was further broken down into three (3) sub-categories: # in Community or State, # in Hazard Area, and % in Hazard Area. (The hazard area was identified in the mapping generated during the hazard-profiling step.) The number of structures, value of structures, and number of people for each type of structure was listed, along with the three (3) sub-categories mentioned above.

HAZUS, Census 2000 information, and the GIS-based mapping that was generated during the hazard-profiling step determined the number and value of structures. Finally, the number of people was determined by Census 2000 information. This was done by highlighting all of the affected census block groups in the previously identified hazard areas on the GIS-based maps. The census block group information had been loaded into an ArcView 3.2 base map at the start of this project. All of this information was marked on Worksheet #3a. from FEMA's *State and Local Mitigation Planning How-to Guide: Understanding Your Risks*. This information was listed and reanalyzed for each of the hazards that were profiled.

Next, a specific asset inventory was developed based on HAZUS, Census 2000 data, and information provided by local representatives in Belmont County. Each of these specific assets was classified in categories such as critical facility, vulnerable population, economic asset, special consideration, or historic/other consideration. The size of each of the structures, as well as the replacement value, contents value, function use or value, displacement cost (should the asset be non-operational for a day or longer), occupancy or capacity, and other hazard specific information was compiled.

Following are the methods used to determine the above-categories for each of the county's assets.

- Size of buildings = square footage (for assets such as railroads and highways, length was used): This was usually determined by calling an official representative of the asset (e.g. the company president, utility manager, etc.).
- Replacement value of the structure: This was usually determined by calling an official representative of the asset (e.g. the company president, utility manager, etc.).
- Contents value, if not obtained by calling an official representative of the asset, was determined by HAZUS, which gave a table breaking each type (i.e. commercial or residential) of facility into a percentage by which to multiply the replacement value. (e.g. Contents Value of Schools/Libraries = Replacement Value X 100%)
- Function use or value was determined by total annual operational budget.
- Displacement cost (\$ per day) was determined by the function use or value divided by 365.
- Occupancy was determined by calling an official representative of the asset. (e.g. Occupancy of Schools = Total Students + Paid Staff)

A composite list of all of the county's assets was compiled. The assets were also listed based on their location in regards to a hazard area. For example, if a government facility was located in an area listed as highly susceptible to flood hazards, then that facility was also listed as such on a list for assets in flood areas. Worksheet #3b. from the *State and Local Mitigation Planning How-to Guide: Understanding Your Risks* and other asset grids were used to show these calculations and lists.

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## ASSETS

Belmont County's Risk Assessment identifies specific assets located throughout the county and the hazards to which these facilities are susceptible. An asset is defined as a facility which is either in the public or private sector that provides essential products and services to the general public, is otherwise necessary to preserve the welfare and quality of life in Belmont County, or fulfills important public safety, emergency response, and/or disaster recovery functions. Assets can be a critical facility, vulnerable population, economic asset, special consideration, or historic/other consideration.

The assets identified in the county are emergency services facilities (i.e. fire departments, EMS stations, police stations, etc.), hospitals, utility systems (i.e. water, sewer, gas, and electric),

airports, government facilities, schools, historic sites, bridges and transportation systems, and large industrial or commercial facilities. (See “Belmont County Asset Inventory” map.)

In addition to critical facilities, an analysis of Census 2000 data indicates that the county contains at-risk populations that should be factored into this risk assessment. Belmont County and all of its municipalities contain elderly and youth populations with limited mobility in fact approximately 18% or 12,808 persons of the total population are between over the age of 65. Although several care facilities are located throughout the county, this population may be adversely affected during hazard events because of a lack of accessibility to emergency and other services. The county’s youth populations may also be affected. Hazards such as floods, winter storms, hail, etc. pose health and safety threats during hazard events.

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The following are major assets located in Belmont County. Please see the attached chart that lists the replacement value, contents value, function use or value, displacement cost, occupancy or capacity, and other hazard specific information for each of these assets.

• **EMERGENCY SERVICES FACILITIES**

- Barnesville Fire Department – Critical Facility (Emergency Services)
- Barnesville Village Police Department – Critical Facility (Emergency Services)
- Belmont County Sheriff – Critical Facility (Emergency Services)
- Belmont Fire Department – Critical Facility (Emergency Services)
- Bellaire Police Department – Critical Facility (Emergency Services)
- Bellaire Village Fire Department – Critical Facility (Emergency Services)
- Bethesda Police Department – Critical Facility (Emergency Services)
- Bethesda Volunteer Fire Department – Critical Facility (Emergency Services)
- Bridgeport Village Police Department – Critical Facility (Emergency Services)
- Brookside Village Fire Department – Critical Facility (Emergency Services)
- Colerain Volunteer Fire Department – Critical Facility (Emergency Services)
- Cumberland Trail Fire District – Critical Facility (Emergency Services)
- Flushing Fire Department – Critical Facility (Emergency Services)
- Flushing Police Department – Critical Facility (Emergency Services)
- Glencoe Volunteer Fire Department – Critical Facility (Emergency Services)
- Holloway Volunteer Fire Department – Critical Facility (Emergency Services)
- Martins Ferry Fire Department – Critical Facility (Emergency Services)

- Martins Ferry Police Department – Critical Facility (Emergency Services)
  - Maynard Fire Department – Critical Facility (Emergency Services)
  - Morristown Fire Department – Critical Facility (Emergency Services)
  - Morristown-Union Township Police Department – Critical Facility (Emergency Services)
  - Neffs Fire Department – Critical Facility (Emergency Services)
  - Powhatan Point Fire Department – Critical Facility (Emergency Services)
  - Powhatan Point Police Department – Critical Facility (Emergency Services)
  - Shadyside Police Department – Critical Facility (Emergency Services)
  - Shadyside Village Fire Department – Critical Facility (Emergency Services)
  - Smith Township Fire Department – Critical Facility (Emergency Services)
  - Spirit of 76 Volunteer Fire Department – Critical Facility (Emergency Services)
  - St. Clairsville Police Department – Critical Facility (Emergency Services)
  - St. Clairsville Fire Department – Critical Facility (Emergency Services)
  - State Highway Patrol – Critical Facility (Emergency Services)
  - Richland Township Police Department – Critical Facility (Emergency Services)
  - Rock Hill Volunteer Fire Department – Critical Facility (Emergency Services)
  - Wolfhurst Fire Department – Critical Facility (Emergency Services)
  - Yorkville Village Police Department – Critical Facility (Emergency Services)
- **HOSPITALS, NURSING HOMES, HEALTH CARE FACILITIES, AND AMBULANCE SERVICES**
    - Barnesville Health Care Center – Critical Facility (Health Care)
    - Barnesville Hospital – Critical Facility (Health Care)
    - Beacon House at Forest Hill – Vulnerable Populations (Elderly)
    - Belmont Community Hospital – Critical Facility (Health Care)
    - Belmont County Health Department – Critical Facility (Health Care)
    - Belmont County Park Health Care Center – Critical Facility (Health Care)
    - Belmont Manor at Villa Royale – Vulnerable Populations (Elderly)
    - Bell Nursing Home – Vulnerable Populations (Elderly)
    - Country Club Retirement Campus – Vulnerable Populations (Elderly)
    - Crestview Health Care Center – Vulnerable Populations (Elderly)
    - East Ohio Regional Hospital – Critical Facility (Health Care)
    - Forest Hill Retirement Community – Vulnerable Populations (Elderly)
    - Heartland-Lansing Nursing Center – Vulnerable Populations (Elderly)

- McGraw Nursing Home – Vulnerable Populations (Elderly)
- Shadyside Care Center – Vulnerable Populations (Elderly)

- **SCHOOLS AND EDUCATIONAL FACILITIES**

- Barnesville Elementary School – Critical Facility (Education)
- Barnesville Exempted Village School District – Critical Facility (Education)
- Barnesville High School – Critical Facility (Education)
- Barnesville Middle School – Critical Facility (Education)
- Bellaire Elementary School – Critical Facility (Education)
- Bellaire High School – Critical Facility (Education)
- Bellaire Local School District – Critical Facility (Education)
- Bellaire Middle School – Critical Facility (Education)
- Belmont Career Center – Critical Facility (Education)
- Bridgeport Exempted Village School District – Critical Facility (Education)
- Bridgeport High School – Critical Facility (Education)
- Elm Middle School – Critical Facility (Education)
- Hilltop Elementary School – Critical Facility (Education)
- Jefferson Avenue Elementary School – Critical Facility (Education)
- Kirkwood School – Critical Facility (Education)
- Lansing Primary Elementary School – Critical Facility (Education)
- Leona Avenue Middle School – Critical Facility (Education)
- Martins Ferry City School District – Critical Facility (Education)
- Martins Ferry High School – Critical Facility (Education)
- North Elementary School – Critical Facility (Education)
- Shadyside High School – Critical Facility (Education)
- South Elementary School – Critical Facility (Education)
- St. Clairsville Elementary School – Critical Facility (Education)
- St. Clairsville High School – Critical Facility (Education)
- St. Clairsville Middle School – Critical Facility (Education)
- St. Clairsville School District – Critical Facility (Education)
- Union Local School District – Critical Facility (Education)
- Union Local High School – Critical Facility (Education)
- Union Local Middle School – Critical Facility (Education)
- Westbrooke Intermediate Elementary School – Critical Facility (Education)

- **POST OFFICES**

- Barnesville Post Office – Special Consideration (Federal Facility)
- Barton Post Office – Special Consideration (Federal Facility)
- Bellaire Post Office – Special Consideration (Federal Facility)
- Belmont Post Office – Special Consideration (Federal Facility)
- Bethesda Post Office – Special Consideration (Federal Facility)
- Blaine Post Office – Special Consideration (Federal Facility)
- Bridgeport Post Office – Special Consideration (Federal Facility)
- Fairpoint Post Office – Special Consideration (Federal Facility)
- Flushing Post Office – Special Consideration (Federal Facility)
- Glencoe Post Office – Special Consideration (Federal Facility)
- Holloway Post Office – Special Consideration (Federal Facility)
- Jacobsburg Post Office – Special Consideration (Federal Facility)
- Lansing Post Office – Special Consideration (Federal Facility)
- Martins Ferry Post Office – Special Consideration (Federal Facility)
- Maynard Post Office – Special Consideration (Federal Facility)
- Neffs Post Office – Special Consideration (Federal Facility)
- Powhatan Point Post Office – Special Consideration (Federal Facility)
- St. Clairsville Post Office – Special Consideration (Federal Facility)
- Shadyside Post Office – Special Consideration (Federal Facility)
- Warnock Post Office – Special Consideration (Federal Facility)

- **TRANSPORTATION INFRASTRUCTURE**

- Alderman Runway – Critical Facility (Transportation Infrastructure)
- Barnesville-Bradfield Runway – Critical Facility (Transportation Infrastructure)
- Bridges – Critical Facility (Transportation Infrastructure)
- Howell Runway – Critical Facility (Transportation Infrastructure)
- Moundsville Runway – Critical Facility (Transportation Infrastructure)
- Railroads – Critical Facility (Transportation Infrastructure)
- Roads – Critical Facility (Transportation Infrastructure)
- Twin Ash Runway – Critical Facility (Transportation Infrastructure)

- **PUBLIC WORKS**

- Barnesville Village Water Department – Critical Facility (Utilities)

- Bellaire Water Department – Critical Facility (Utilities)
- Belmont Water Department – Critical Facility (Utilities)
- Bridgeport Water Department Office – Critical Facility (Utilities)
- Brookside Village Water Department – Critical Facility (Utilities)
- Flushing Water and Sewer Department – Critical Facility (Utilities)
- Martins Ferry Water Treatment Plant – Critical Facility (Utilities)
- Morristown Water Department – Critical Facility (Utilities)
- Powhatan Point Water Department – Critical Facility (Utilities)
- Shadyside Water Treatment Plant – Critical Facility (Utilities)
- St. Clairsville Water Treatment Plant – Critical Facility (Utilities)

• **OTHER CRITICAL FACILITIES**

- Barnesville Village – Special Consideration (Government Facility)
- Bellaire Village – Special Consideration (Government Facility)
- Belmont County Animal Shelter – Special Consideration (Community Service)
- Belmont County Court House – Special Consideration (Government Facility)
- Belmont Village – Special Consideration (Government Facility)
- Bethesda Village – Special Consideration (Government Facility)
- Bridgeport Village – Special Consideration (Government Facility)
- Brookside Village – Special Consideration (Government Facility)
- Flushing Village – Special Consideration (Government Facility)
- Holloway Village – Special Consideration (Government Facility)
- Martins Ferry City – Special Consideration (Government Facility)
- Morristown Village – Special Consideration (Government Facility)
- Powhatan Point Village – Special Consideration (Government Facility)
- Residential – Special Consideration (Residential Housing)
- St. Clairsville City – Special Consideration (Government Facility)
- Shadyside Village – Special Consideration (Government Facility)
- Yorkville Village – Special Consideration (Government Facility)

## ASSET INVENTORY – VILLAGE OF BARNESVILLE

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*As per requirement 44 CFR Part 201.6 (c)(2)(ii)(A): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of: the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.*

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## METHODOLOGY

The methodology for the asset inventory of the Village of Barnesville is exactly the same as for Belmont County. In fact, the assets that are located within the corporate limits are listed on the composite asset and hazard lists that encompass the county assets. For the purpose of clarity, the following assets are located within the corporate limits of the Village of Barnesville.

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## ASSETS

- Barnesville Elementary School – Critical Facility (Education)
- Barnesville Exempted Village School District – Critical Facility (Education)
- Barnesville Fire Department – Critical Facility (Emergency Services)
- Barnesville Health Care Center – Critical Facility (Health Care)
- Barnesville High School – Critical Facility (Education)
- Barnesville Hospital – Critical Facility (Health Care)
- Barnesville Middle School – Critical Facility (Education)
- Barnesville Post Office – Special Consideration (Federal Facility)
- Barnesville-Bradfield Runway – Critical Facility (Transportation Infrastructure)
- Barnesville Village – Special Consideration (Government Facility)
- Barnesville Village Police Department – Critical Facility (Emergency Services)
- Barnesville Village Water Department – Critical Facility (Utilities)
- Bridges – Critical Facility (Transportation Infrastructure)
- Roads – Critical Facility (Transportation Infrastructure)



## ASSET INVENTORY – VILLAGE OF BELMONT

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*As per requirement 44 CFR Part 201.6 (c)(2)(ii)(A): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of: the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.*

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## METHODOLOGY

The methodology for the asset inventory of the Village of Belmont is exactly the same as for Belmont County. In fact, the assets that are located within the corporate limits are listed on the composite asset and hazard lists that encompass the county assets. For the purpose of clarity, the following assets are located within the corporate limits of the Village of Belmont.

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## ASSETS

- Bell Nursing Home – Vulnerable Populations (Elderly)
- Belmont Fire Department – Critical Facility (Emergency Services)
- Belmont Post Office – Special Consideration (Federal Facility)
- Belmont Village – Special Consideration (Government Facility)
- Belmont Water Department – Critical Facility (Utilities)
- Bridges – Critical Facility (Transportation Infrastructure)
- Roads – Critical Facility (Transportation Infrastructure)
- Union Local High School – Critical Facility (Education)
- Union Local Middle School – Critical Facility (Education)
- Union Local School District – Critical Facility (Education)

## ASSET INVENTORY – VILLAGE OF BETHESDA

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*As per requirement 44 CFR Part 201.6 (c)(2)(ii)(A): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of: the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.*

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## METHODOLOGY

The methodology for the asset inventory of the Village of Bethesda is exactly the same as for Belmont County. In fact, the assets that are located within the corporate limits are listed on the composite asset and hazard lists that encompass the county assets. For the purpose of clarity, the following assets are located within the corporate limits of the Village of Bethesda.

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## ASSETS

- Bethesda Police Department – Critical Facility (Emergency Services)
- Bethesda Post Office – Special Consideration (Federal Facility)
- Bethesda Village – Special Consideration (Government Facility)
- Bethesda Volunteer Fire Department – Critical Facility (Emergency Services)
- Bridges – Critical Facility (Transportation Infrastructure)
- Roads – Critical Facility (Transportation Infrastructure)

## ASSET INVENTORY – VILLAGE OF BRIDGEPORT

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*As per requirement 44 CFR Part 201.6 (c)(2)(ii)(A): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of: the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.*

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## METHODOLOGY

The methodology for the asset inventory of the Village of Bridgeport is exactly the same as for Belmont County. In fact, the assets that are located within the corporate limits are listed on the composite asset and hazard lists that encompass the county assets. For the purpose of clarity, the following assets are located within the corporate limits of the Village of Bridgeport.

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## ASSETS

- Bridges – Critical Facility (Transportation Infrastructure)
- Bridgeport Exempted Village School District – Critical Facility (Education)
- Bridgeport High School – Critical Facility (Education)
- Bridgeport Post Office – Special Consideration (Federal Facility)
- Bridgeport Village – Special Consideration (Government Facility)
- Bridgeport Village Police Department – Critical Facility (Emergency Services)
- Bridgeport Water Department Office – Critical Facility (Utilities)
- Roads – Critical Facility (Transportation Infrastructure)
- Kirkwood School – Critical Facility (Education)
- Westbrooke Intermediate Elementary School – Critical Facility (Education)

## ASSET INVENTORY – VILLAGE OF BROOKSIDE

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*As per requirement 44 CFR Part 201.6 (c)(2)(ii)(A): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of: the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.*

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## METHODOLOGY

The methodology for the asset inventory of the Village of Brookside is exactly the same as for Belmont County. In fact, the assets that are located within the corporate limits are listed on the composite asset and hazard lists that encompass the county assets. For the purpose of clarity, the following assets are located within the corporate limits of the Village of Brookside.

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## ASSETS

- Bridges – Critical Facility (Transportation Infrastructure)
- Brookside Village – Special Consideration (Government Facility)
- Brookside Village Fire Department – Critical Facility (Emergency Services)
- Brookside Village Water Department – Critical Facility (Utilities)
- Roads – Critical Facility (Transportation Infrastructure)

## ASSET INVENTORY – VILLAGE OF FLUSHING

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*As per requirement 44 CFR Part 201.6 (c)(2)(ii)(A): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of: the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.*

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## METHODOLOGY

The methodology for the asset inventory of the Village of Flushing is exactly the same as for Belmont County. In fact, the assets that are located within the corporate limits are listed on the composite asset and hazard lists that encompass the county assets. For the purpose of clarity, the following assets are located within the corporate limits of the Village of Flushing.

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## ASSETS

- Bridges – Critical Facility (Transportation Infrastructure)
- Flushing Fire Department – Critical Facility (Emergency Services)
- Flushing Police Department – Critical Facility (Emergency Services)
- Flushing Post Office – Special Consideration (Federal Facility)
- Flushing Village – Special Consideration (Government Facility)
- Flushing Water and Sewer Department – Critical Facility (Utilities)
- Roads – Critical Facility (Transportation Infrastructure)

## ASSET INVENTORY – VILLAGE OF HOLLOWAY

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*As per requirement 44 CFR Part 201.6 (c)(2)(ii)(A): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of: the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.*

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## METHODOLOGY

The methodology for the asset inventory of the Village of Holloway is exactly the same as for Belmont County. In fact, the assets that are located within the corporate limits are listed on the composite asset and hazard lists that encompass the county assets. For the purpose of clarity, the following assets are located within the corporate limits of the Village of Holloway.

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## ASSETS

- Bridges – Critical Facility (Transportation Infrastructure)
- Holloway Post Office – Special Consideration (Federal Facility)
- Holloway Village – Special Consideration (Government Facility)
- Holloway Volunteer Fire Department – Critical Facility (emergency Services)
- Roads – Critical Facility (Transportation Infrastructure)

## ASSET INVENTORY – VILLAGE OF MORRISTOWN

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*As per requirement 44 CFR Part 201.6 (c)(2)(ii)(A): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of: the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.*

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## METHODOLOGY

The methodology for the asset inventory of the Village of Morristown is exactly the same as for Belmont County. In fact, the assets that are located within the corporate limits are listed on the composite asset and hazard lists that encompass the county assets. For the purpose of clarity, the following assets are located within the corporate limits of the Village of Morristown.

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## ASSETS

- Bridges – Critical Facility (Transportation Infrastructure)
- Morristown Water Department – Critical Facility (Utilities)
- Morristown Village – Special Consideration (Government Facility)
- Roads – Critical Facility (Transportation Infrastructure)

## ASSET INVENTORY – VILLAGE OF POWHATAN POINT

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*As per requirement 44 CFR Part 201.6 (c)(2)(ii)(A): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of: the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.*

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## METHODOLOGY

The methodology for the asset inventory of the Village of Powhatan Point is exactly the same as for Belmont County. In fact, the assets that are located within the corporate limits are listed on the composite asset and hazard lists that encompass the county assets. For the purpose of clarity, the following assets are located within the corporate limits of the Village of Powhatan Point.

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## ASSETS

- Bridges – Critical Facility (Transportation Infrastructure)
- Powhatan Point Fire Department – Critical Facility (Emergency Services)
- Powhatan Point Police Department – Critical Facility (Emergency Services)
- Powhatan Point Post Office – Special Consideration (Federal Facility)
- Powhatan Point Village – Special Consideration (Government Facility)
- Powhatan Point Water Department – Critical Facility (Utilities)
- Roads – Critical Facility (Transportation Infrastructure)



## ASSET INVENTORY – VILLAGE OF SHADYSIDE

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*As per requirement 44 CFR Part 201.6 (c)(2)(ii)(A): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of: the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.*

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## METHODOLOGY

The methodology for the asset inventory of the Village of Shadyside is exactly the same as for Belmont County. In fact, the assets that are located within the corporate limits are listed on the composite asset and hazard lists that encompass the county assets. For the purpose of clarity, the following assets are located within the corporate limits of the Village of Shadyside.

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## ASSETS

- Bridges – Critical Facility (Transportation Infrastructure)
- Jefferson Avenue Elementary School – Critical Facility (Education)
- Leona Avenue Middle School – Critical Facility (Education)
- Neffs Fire Department – Critical Facility (Emergency Services)
- Roads – Critical Facility (Transportation Infrastructure)
- Rock Hill Volunteer Fire Department – Critical Facility (Emergency Services)
- Shadyside Care Center – Vulnerable Populations (Elderly)
- Shadyside High School – Critical Facility (Education)
- Shadyside Police Department – Critical Facility (Emergency Services)
- Shadyside Post Office – Special Consideration (Federal Facility)
- Shadyside Village – Special Consideration (Government Facility)
- Shadyside Village Fire Department – Critical Facility (Emergency Services)
- Shadyside Water Treatment Plant – Critical Facility (Utilities)
- Spirit of 76 Volunteer Fire Department – Critical Facility (Emergency Services)

## ASSET INVENTORY – VILLAGE OF YORKVILLE

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*As per requirement 44 CFR Part 201.6 (c)(2)(ii)(A): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of: the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.*

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## METHODOLOGY

The methodology for the asset inventory of the Village of Yorkville is exactly the same as for Belmont County. In fact, the assets that are located within the corporate limits are listed on the composite asset and hazard lists that encompass the county assets. For the purpose of clarity, the following assets are located within the corporate limits of the Village of Yorkville.

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## ASSETS

- Bridges – Critical Facility (Transportation Infrastructure)
- Roads – Critical Facility (Transportation Infrastructure)
- Yorkville Village – Special Consideration (Government Facility)
- Yorkville Village Police Department – Critical Facility (Emergency Services)

## ASSET INVENTORY – CITY OF BELLAIRE

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*As per requirement 44 CFR Part 201.6 (c)(2)(ii)(A): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of: the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.*

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## METHODOLOGY

The methodology for the asset inventory of the City of Bellaire is exactly the same as for Belmont County. In fact, the assets that are located within the corporate limits are listed on the composite asset and hazard lists that encompass the county assets. For the purpose of clarity, the following assets are located within the corporate limits of the City of Bellaire.

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## ASSETS

- Bellaire Elementary School – Critical Facility (Education)
- Bellaire High School – Critical Facility (Education)
- Bellaire Local School District – Critical Facility (Education)
- Bellaire Middle School – Critical Facility (Education)
- Bellaire Police Department – Critical Facility (Emergency Services)
- Bellaire Post Office – Special Consideration (Federal Facility)
- Bellaire Village – Special Consideration (Federal Facility)
- Bellaire Village Fire Department – Critical Facility (Emergency Services)
- Bellaire Water Department – Critical Facility (Utilities)
- Bridges – Critical Facility (Transportation Infrastructure)
- Roads – Critical Facility (Transportation Infrastructure)
- Smith Township Fire Department – Critical Facility (Emergency Services)

## ASSET INVENTORY – CITY OF MARTINS FERRY

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*As per requirement 44 CFR Part 201.6 (c)(2)(ii)(A): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of: the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.*

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## METHODOLOGY

The methodology for the asset inventory of the City of Martins Ferry is exactly the same as for Belmont County. In fact, the assets that are located within the corporate limits are listed on the composite asset and hazard lists that encompass the county assets. For the purpose of clarity, the following assets are located within the corporate limits of the City of Martins Ferry.

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## ASSETS

- Bridges – Critical Facility (Transportation Infrastructure)
- East Ohio Regional Hospital – Critical Facility (Health Care)
- Elm Middle School – Critical Facility (Education)
- Martins Ferry City – Special Consideration (Government Facility)
- Martins Ferry City School District – Critical Facility (Education)
- Martins Ferry Fire Department – Critical Facility (Emergency Services)
- Martins Ferry High School – Critical Facility (Education)
- Martins Ferry Police Department – Critical Facility (Emergency Services)
- Martins Ferry Post Office – Special Consideration (Federal Facility)
- Martins Ferry Water Treatment Plant – Critical Facility (Utilities)
- North Elementary School – Critical Facility (Education)
- Roads – Critical Facility (transportation Infrastructure)
- South Elementary School – Critical Facility (Education)

## ASSET INVENTORY – CITY OF ST. CLAIRSVILLE

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*As per requirement 44 CFR Part 201.6 (c)(2)(ii)(A): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of: the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.*

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## METHODOLOGY

The methodology for the asset inventory of the City of St. Clairsville is exactly the same as for Belmont County. In fact, the assets that are located within the corporate limits are listed on the composite asset and hazard lists that encompass the county assets. For the purpose of clarity, the following assets are located within the corporate limits of the City of St. Clairsville.

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## ASSETS

- Barton Post Office – Special Consideration (Federal Facility)
- Beacon House at Forest Hill – Vulnerable Populations (Elderly)
- Belmont Career Center – Critical Facility (Education)
- Belmont Community Hospital – Critical Facility (Health Care)
- Belmont County Animal Shelter – Special Consideration (Community Service)
- Belmont County Court House – Special Consideration (Government Facility)
- Belmont County Health Department – Critical Facility (Health Care)
- Belmont County Sheriff – Critical Facility (Emergency Services)
- Belmont County Park Health Care Center – Critical Facility (Health Care)
- Blaine Post Office – Special Consideration (Federal Facility)
- Bridges – Critical Facility (Transportation Infrastructure)
- Crestview Health Care Center – Vulnerable Populations (Elderly)
- Cumberland Trail Fire District – Critical Facility (Emergency Services)
- Fairport Post Office – Special Consideration (Federal Facility)
- Forest Hill Retirement Community – Vulnerable Populations (Elderly)
- Maynard Fire Department – Critical Facility (Emergency Services)
- Maynard Post Office – Special Consideration (Federal Facility)
- Richland Township Police Department – Critical Facility (Emergency Services)
- Roads – Critical Facility (Transportation Infrastructure)

- St. Clairsville City – Special Consideration (Government Facility)
- St. Clairsville Elementary School – Critical Facility (Education)
- St. Clairsville Fire Department – Critical Facility (Emergency Services)
- St. Clairsville High School – Critical Facility (Education)
- St. Clairsville Middle School – Critical Facility (Education)
- St. Clairsville Police Department – Critical Facility (Emergency Services)
- St. Clairsville Post Office – Special Consideration (Federal Facility)
- St. Clairsville School District – Critical Facility (Education)
- St. Clairsville Water Treatment Plant – Critical Facility (Utilities)
- State Highway Patrol – Critical Facility (Emergency Services)
- Warnock Post Office – Special Consideration (Federal Facility)
- Wolfhurst Fire Department – Critical Facility (Emergency Services)

## ESTIMATE LOSSES – BELMONT COUNTY

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*As per 44 CFR Part 201.6(c)(2)(ii)(B): [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate.*

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Belmont County used GIS-based mapping, HAZUS, and interviews with local representatives, as well as Worksheet #4 from the Federal Emergency Management Agency's (FEMA) *State and Local Mitigation Planning How-to Guide: Understanding Your Risks* to estimate the potential dollar losses if the county was to experience the hazard events that are profiled above.

The information that was gathered in the asset inventory stage of the risk assessment was used to determine the estimated losses. For example, Worksheet #4 makes use of the replacement value, contents value, function use or value, displacement cost, and occupancy or capacity information from Worksheet #3b. Displacement time was estimated based on historical data of past hazard events. For example, historical data was reviewed to determine how long the average flooding event closes county schools.

Federal requirements guiding the development of hazard mitigation plans recommend local communities assess the vulnerability of future buildings, infrastructure and critical facilities. Please see the "Analyzing Development Trends" section for a discussion of infrastructure losses. Overall, new construction of critical facilities is unforeseen at this time. If governmental facilities, schools, or other critical facilities begin to consider relocation, vulnerability will be assessed at that time. Flooding is one of the most damaging hazards in Belmont County. However, many communities participate in the NFIP program, which requires these communities to enforce floodplain development regulations on new construction. Consequently, flooding losses in these communities are anticipated to be low. Land subsidence is another damaging natural hazard. Due to the unpredictability of the hazard, losses on future residential and commercial structures can be expected to be similar to losses to existing facilities, which is up to 1% of the facility's value. (See Worksheet #4 in the Land Subsidence section.)

Many natural hazards face Belmont County. Losses should be considered in the same way for future facilities as for current facilities, as a function of the total value of the facility. However, because the future value of those facilities is unknown at this time it is difficult to develop an accurate numerical vulnerability.

Following are the estimated losses to each asset if the denoted hazard event were to occur. Please note that these are *estimates* for *potential* hazard events. The percentage of

damage was determined on a “per hazard” basis depending also on the physical location of the asset. For example, assets in high hazard areas for winter storms received a higher damage percentage than assets in low hazard areas. The justification for such a determination is because winter storms are predicted to not only strike high hazard areas more frequently, but also be more severe (based on historical data). These dollar values do not represent actual losses from past hazard events.

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### Dam Failure

There are 14 dams in Belmont County, eleven (11) of which are Class I. According to the Ohio Department of Natural Resources, the failure of a Class I dam could potentially result in loss of life and structural damage to high valued properties such as homes, industries, and major public utilities.

Total loss to structures as a result of a dam failure is estimated to be \$1,833,300; total contents loss is estimated at \$148,900; total loss to structure use and function is anticipated to be \$315,280. The total estimated loss as a result of a dam failure is \$2,297,480.

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### Drought

It is very unlikely that drought would cause any damage to the county’s structural assets. Drought would, however, have a direct impact on the agricultural assets and the local water supply. Effects on the water supply can potentially disrupt service, especially in many residential areas that rely on private wells.

Total loss to structures as a result of a drought is estimated to be \$0.00; total contents loss is estimated at \$0.00; total loss to structure use and function is anticipated to be \$0.00. The total estimated loss as a result of a drought is \$0.00.

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### Earthquake

Belmont County is listed as an MMI IV area with a Peak Ground Acceleration (PGA) of 2.0 to 3.0 with respect to earthquakes. According to FEMA’s *State and Local Mitigation Planning How-to Guide: Understanding Your Risks*, MMI IV areas will experience little to no damage as a result of earthquakes. However, while individual facilities may experience little damage, the total loss figure for all assets in the county is relatively high.

Total loss to structures as a result of an earthquake is estimated to be \$13,309,500; total contents loss is estimated at \$120,700; total loss to structure use and function is anticipated to be as much as \$509,380. The total estimated loss as a result of an earthquake is \$13,939,580.



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### Epidemic

Losses to structural assets are relatively low when considering epidemic. This hazard primarily affects the human population. However, a large-scale epidemic could affect enough of the population to close an asset.

Total loss to structures as a result of an epidemic is estimated to be \$0.00; total contents loss is estimated at \$0.00; total loss to structure use and function is anticipated to be as much as \$156,340. The total estimated loss as a result of an epidemic is \$156,340.

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### Flooding

Flood damage is reported often throughout Belmont County, as a result of both flash flooding and riverine flooding along the Ohio River and its tributaries. Further, floods affect both structures and the contents in those structures as water often enters them. Consequently, loss estimates for flooding events are high.

Potential structural losses due to flooding are estimated to be \$33,070,900; potential contents losses total \$398,100; and structure use and function loss estimates total \$370,860. The total potential loss due to a flooding event in Belmont County is \$33,839,860.

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### Hailstorm

Hailstorms are a significant hazard throughout all of Belmont County. However, these events cause little to no structural damage to the county's assets, except for a possible broken window or damaged heating/cooling equipment. As such, the potential losses per structure are anticipated to be low.

Total, countywide structural losses are estimated to be \$1,210,100. This damage would be broken windows, damaged HVAC equipment, etc. Contents losses due to hail would also be relatively low. Potential contents losses total \$96,900. Potential losses in the structure use and function category are estimated at \$254,690. Total potential losses due to a hailstorm are \$1,561,690.

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### Infestation

This hazard primarily affects agricultural assets. Therefore, anticipated potential losses to structural assets due to an infestation are low.

Total, countywide structural losses are estimated to be \$0.00. Potential contents losses total \$0.00. Potential losses in the structure use and function category are estimated at \$0.00. Total potential losses due to infestation are \$0.00.

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### Land and Mine Subsidence

Landslides and mudslides are a significant problem throughout all of Belmont County. These slides are very damaging and difficult to stop, which results in relatively high estimated losses. Additionally, there are several abandoned mines in Belmont County most of which are located beneath heavily populated municipalities. Sinkholes are common occurrences around abandoned mines and can result in significant property damage to a large area over a short period of time, and places a large portion of the county's population at risk.

Potential structural losses in Belmont County total \$8,273,200; content losses total \$479,600; and structure use and function loss estimates total \$763,870. The total potential loss in Belmont County due to land and mine subsidence is anticipated to be \$9,516,670.

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### Severe Thunderstorm

Many of the structural damages associated with severe thunderstorms include downed power lines, fallen trees and other debris that causes structural damage, etc. Further, damage to contents is also potentially high, as in power surges due to lightning, etc.

Potential structural losses in Belmont County total \$4,240,300; content losses total \$482,400; and structure use and function loss estimates total \$254,690. The total potential loss in Belmont County due to a severe thunderstorm is \$4,977,390.

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### Severe Wind and Tornado

Strong windstorms, especially tornadoes, can cause significant damage to structural assets. Belmont County's topography is that of flat and open to gently sloping, which offers no natural barriers to break up severe wind or tornados that form. The following estimates were developed based on historic hazard events as well as statewide wind zone designations. Again, these figures are representative of the potential losses of a hazard event if it were to occur.

Potential structural losses total \$4,415,700; potential contents losses total \$515,700; and structure use or function loss totals \$519,570. Total potential losses in Belmont County due to severe wind and a possible tornado total \$5,450,970.

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#### Severe Winter Storm and Sleet

Damage as a result of winter storms often is associated with snow weight, hazardous driving conditions, etc. Loss estimates from winter storms were calculated both by the probability and severity of a potential hazard event.

Potential structural losses due to winter storms are estimated to be \$35,352,400; potential contents losses total \$644,600; and structure use and function loss estimates total \$676,110. The total potential loss due to a winter storm event in Belmont County is \$36,673,110.

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#### Temperature Extreme – Heat Wave

It is anticipated that extreme heat will not cause any damage to structural assets in Belmont County. A heat wave can affect employees at the county's assets. However, the probability of enough people getting sick as a result of heat wave to close the asset is relatively low.

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#### Wildfire

A large portion of Belmont County is covered with vast wooded areas. Many of the structural assets in the county are within close proximity of those wooded areas. If a wildfire were to occur, a large portion of structural assets could be damaged or completely destroyed.

Potential structural losses due to wildfires total \$2,146,900. Potential contents losses total \$243,800. Potential structure use and function loss estimates total \$0.00. The total potential losses for Belmont County due to wildfires are estimated at \$2,390,700.

## ANALYZING DEVELOPMENT TRENDS – BELMONT COUNTY

*Including the Villages of Barnesville, Belmont, Bethesda, Bridgeport, Brookside, Flushing, Holloway, Morristown, Powhatan Point, Shadyside, Yorkville, and the Cities of Bellaire, Martins Ferry, and St. Clairsville*

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*As per 44 CFR Part 201.6(c)(2)(ii)(C): [The plan should describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.*

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Belmont County is located in southeastern Ohio, and is bordered by Harrison and Jefferson Counties to the north, the Ohio River to the east, Monroe County to the south, and Guernsey and Noble Counties to the west. St. Clairsville, the county seat, is currently the second most populated of the municipalities in Belmont County, following Martins Ferry.

In the past, Belmont County has been the home of several small businesses. During the recent history of the county, these businesses have changed. For example, companies are bought and sold; old companies close, leaving empty facilities behind that are filled by new companies, etc. For instance, in 2002, there were 117 new businesses opened while 78 businesses closed, creating a net formation of a 39 new businesses within the county.

Other land uses in the county consist of the following:

- ***Industrial and commercial areas*** – The majority of the commercial areas can be found in and near the incorporated areas of the county, primarily in the larger cities of Bellaire, Martins Ferry, and St. Clairsville, as well as along Interstates 70 and 470, and along the Ohio River.
- ***Residential areas*** – Located primarily in the eastern portion of the county and elsewhere along the major roadways. The Village of Barnesville is the “residential anchor” of western Belmont County.
- ***Farmland*** – Agricultural land covers 146,000 acres of the county with a total of 610 individual farms. These agricultural areas are spread throughout the county; however, the majority are located in the eastern portion.
- ***Specialized land use designations*** – Gay 90’s Mansion and Museum, Quaker Heritage Museum, Betty Zane Statue and Grave, Benjamin Lundy House, Barbara Barbe Doll Museum, Barkcamp State Park, Piedmont and Belmont Lakes, and the Ohio River.

The residential areas in the county have experienced a slight population decrease. As indicated by Census data, the total population in 1990 was 71,074, which decreased to 70,226 in 2000, an average decrease of 85

people per year over the 10-year period. According to the Ohio Department of Development this is a trend that is expected to continue, as can be seen in the figure to the right the projected population for the year 2010 is 68,030. The majority of the employment sector in 2000 was

comprised of trade, service, and government. Organizations such as the Belmont County Department of Development are working to attract business to and retain business in Belmont County.

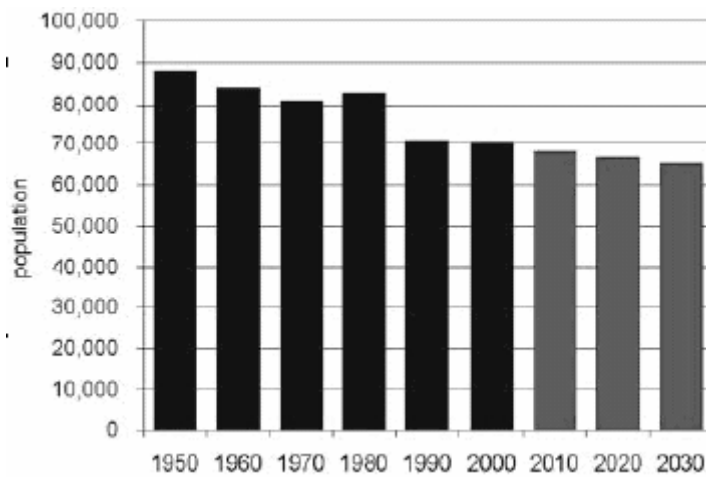
The Ohio River flows along the eastern border of Belmont County providing shipping and recreational opportunities. The major employers in the county include

Barnesville Hospital, Belmont County Government, Belmont Technical College, East Ohio Regional Hospital, Health Plan of the Upper Ohio Valley, Mayflower Vehicle Systems, Ohio Valley Coal Company, Times Leader, Wal-Mart Stores Inc., and Wheeling-Pittsburgh Steel Corporation. There is also an industrial park in Belmont County, the Fox Commerce Industrial Park, which is a 125-acre site.

The major industrial and manufacturing services of Belmont County include, publishing, printing, paving, stone and gravel production, limestone quarrying, metal stamping, tin plating, iron casting, stone cutting, strip and deep mining.

Due to the location of the county to the Ohio River, the county is vulnerable to riverine flooding. As development continues, especially residential development, local policymakers will want to take steps to reduce losses in newly developed areas. Many communities already participate in the National Flood Insurance Program, which requires them to have floodplain development regulations. As such, future losses in these communities are predicted to be low.

Also due to the potential for terrorism, both foreign and domestic security is a concern for large facilities, like the Beaver Valley Nuclear Power Plant located in nearby Shippingsport, Pennsylvania, as well as all water and wastewater systems within the county. A chemical or



**Projected**

2010	68,030
2020	66,813
2030	65,336

biological agent could be introduced into the system for destructive purposes. Domestic terrorism is the primary threat at these facilities. Disgruntled employees may spark a terrorist incident causing the need for additional locks, guards, etc. Large facilities also should consider strengthening security at sites where hazardous materials are stored. All of the aforementioned hazards should be considered and analyzed as the county continues to grow and develop.

In recent years, water availability and quality have come important public concerns in Belmont County. The county's population of 70,226 (2000 Census data) is predominantly rural and approximately 75% of the households rely on groundwater for their water supply. Future infrastructure may be damaged by hazard events, particularly land subsidence. However, the county does not have a detailed vulnerability assessment encompassing the infrastructure systems in the county. Current and future loss estimates for infrastructure would be contained in such an assessment.

## **Dam Failure**



A dam is a barrier built across a waterway to control the flow or raise the level of water. A dam failure occurs when the barrier constructed across the waterway fails or otherwise does not obstruct or restrain the flow of water, which can rapidly result in a large area of completely inundated land.

There are about 80,000 dams in the United States, the majority of which are privately owned. State and local authorities, public utilities, and federal agencies own others. The benefits of dams are numerous: they provide water for drinking, electrical power, navigation, and agricultural irrigation, and save lives by preventing or reducing floods. Several methods of research identified dam failure as a hazard in Belmont County. General information on dam failures was obtained from the following sources.

- Ohio Department of Natural Resources, Division of Water
- HAZUS Instruction and Technical Information

<http://www.fema.gov/hazus/>

Dams are man-made structures designed to obstruct or retain waters that may cause flooding downstream. These structures are generally constructed with concrete or earthen materials. The failure of these dams, although man-made structures, could often result in the natural event of flooding. There are 14 dams in Belmont County. Of those, 11 are Class I and three (3) are Class II. There is no record of any Class III or IV dams in Belmont County. Dams are classified by two (2) conditions, height and storage, as illustrated in the chart at right. The height

Height of Dam	
Class I	Greater than 60 feet
Class II	Greater than 40 feet
Class III	Greater than 25 feet
Class IV	Less than or equal to 25 feet
Storage Volume	
Class I	Greater than 5000 acre-feet
Class II	Greater than 500 acre-feet
Class III	Greater than 50 acre-feet
Class IV	Less than/equal to 50 acre-feet

of a dam is defined as the vertical dimension as measured from the natural streambed at the downstream toe to the low point along the top of the dam. The storage volume is defined as the total volume impounded when the pool level is at the top of the dam immediately before overtopping. According to the Ohio Department of Natural Resources, the damage predicted by a dam failure coincides with the class of the dam and are broken into four (4) categories. The potential downstream hazards are defined, as the resultant downstream damage should the dam fail, including probable future development.

<b>POTENTIAL DOWNSTREAM HAZARDS</b>	
<b>Class I</b>	<b>Probable loss of life and structural damage to high value property (i.e. homes, industries, major public utilities).</b>
<b>Class II</b>	<b>Flood water damage to structures (no loss of life envisioned) and damage to state and interstate highways, railroads and only access to residential areas.</b>
<b>Class III</b>	<b>Damage to low value non-residential structures, blocked roads and crops damaged and livestock.</b>
<b>Class IV</b>	<b>Losses restricted mainly to the dam.</b>

The potential for damage due to dam failure is increasing as residential and commercial development downstream of dams continues. In many cases, existing dams will need to be modified as they age to keep downstream areas safe from catastrophic flooding.

Belmont County contains several large dams which could present the possibility of significant flood damage if breached. In many cases, the dams are less than five (5) miles away from the nearest community. For instance, the community of Alledonia, located near Barnesville Village, is positioned near four (4) Class I dams and one (1) Class II dam. The four (4) class I Dams include the Meigs-Philips Dam, Barnesville Reservoirs No. 1 and 2, and the Ohio Valley Coal Slurry Disposal Dam. A failure of any one of these dams could place approximately 4,000 people and 2,000 housing units in jeopardy. There is also two (2) class I Dams located near St. Clairsville, which has a population of 5,057.

The majority of the dams in Belmont County are of earthen fill construction. There are three (3) types of failures of earthen dams: overtopping, seepage, and structural failure. Overtopping failures result from the erosive action of water on the embankment. Erosion is due to uncontrolled flow of water over, around, and adjacent to the dam. Earthen embankments are not designed to be overtopped and are particularly susceptible to erosion if overtopping occurs. Once erosion has begun during overtopping, it is almost impossible to stop.

All earthen dams have seepage resulting from water percolating slowly through the dam and its foundation. Seepage must, however, be controlled in both velocity and quantity. If uncontrolled, it can progressively erode soil from the embankment or the dam's foundation,



resulting in rapid failure. Erosion of the soil begins at the downstream side of the embankment, either in the dam proper or the foundation, progressively works toward the reservoir, and eventually develops a “pipe” or direct conduit to the reservoir. Seepage can cause slope failure by creating both high pressures in the soil pores or by saturating the slope.

Structural failures can occur in the embankment or the appurtenances. Structural failure of a spillway, lake drain, or other appurtenance may lead to a failure of the embankment. Cracks, settlement, and slides are the most common signs of structural failure of embankments. Large cracks either in an appurtenance or the embankment, major settlement, and major slides will require emergency measures to ensure safety, especially if they occur suddenly.

The three (3) types of failures previously described are often interrelated in a complex manner. For example, uncontrolled seepage may weaken the soil and lead to a structural failure. A structural failure may shorten the seepage path and lead to a piping failure. Surface erosion may result in structural failure, and so on. Minor defects such as cracks in the embankment may be the first visual sign of a major problem. Someone experienced in dam design and construction should evaluate the seriousness of all deficiencies as soon as is practical.

The following table lists the dams in Belmont County along with their, classification, owner, and nearest community.

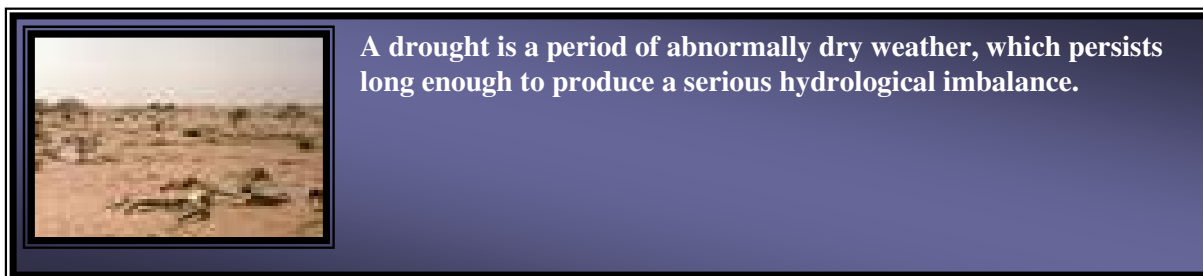
Name	Class	Owner	Nearest Community
Barnesville Lake Dam	I	Village of Barnesville	Hendrysburg
Barnesville Reservoir No. 1 Dam	I	Village of Barnesville	Alledonia
Barnesville Reservoir No. 2 Dam	I	Village of Barnesville	Alledonia
Barnesville Reservoir No. 3 Dam	I	Village of Barnesville	Malaga
Belmont Hills Country Club Lake Dam	I	Belmont Hills County Club	Warnock
Belmont Lake Dam	I	ODNR, Division of Parks	Loomis
Bethesda Reservoir Dam	I	Village of Bethesda	Armstrong Mills
Meigs-Philips No. 1 Dam	I	Capstone Mining Company	Alledonia
Ohio Valley Coal Slurry Disposal Dam	I	Ohio Valley Coal Company	Alledonia
St. Clairsville Reservoir No. 1 Dam	I	City of St. Clairsville	Echo
St. Clairsville Reservoir No. 2 Dam	I	City of St. Clairsville	Provident

R&F Lamira Freshwater Dam	II	Capstone Mining Company	Warnock
Shadyside WWTP Levee	II	Village of Shadyside	Shadyside
Switzerland Lake Dam	II	Switzerland of Ohio Country Club	Alledonia

## MAPPING

See the Belmont County Dam Failure Map for a graphical representation of the hazard areas with regard to dam failure. The green areas represent “low hazard areas,” the yellow areas represent “moderate hazard areas,” the orange areas represent “high hazard areas,” and the red areas represent “extreme high hazard areas.”

## **Drought**



Several methods of research identified drought as a hazard in Belmont County, including discussions with local representatives and a review of the Belmont County Emergency Operations Plan (EOP). Drought information was obtained from the following Internet sites.

- United States Department of Agriculture  
<http://enso.unl.edu/monitor/monitor.html>
- United States Geological Survey  
<http://www.usgs.gov>
- National Oceanic Atmospheric Administration (NOAA)  
<http://www.ncdc.noaa.gov>

Drought is a relative term and is used in relation to who or what is being affected by the lack of moisture. Droughts can be categorized into three (3) types – each one affecting the other.

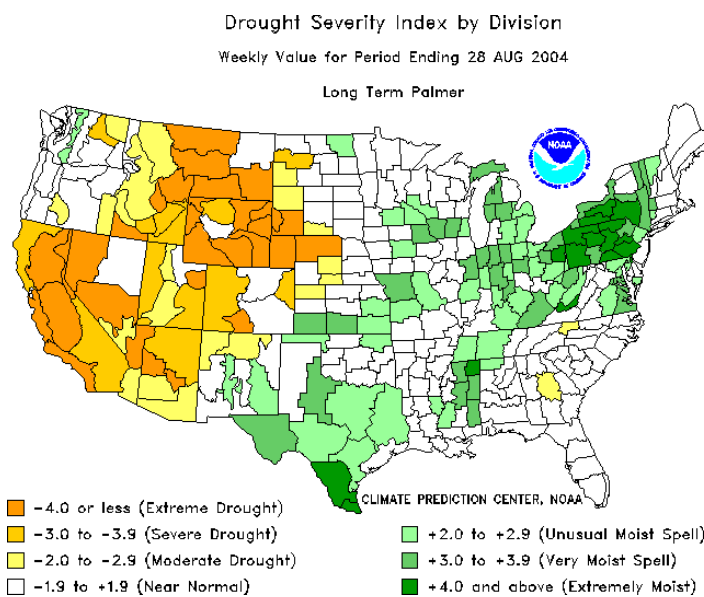
***Agricultural Drought*** – Moisture deficiency seriously injurious to crops, livestock, or other agricultural commodities. Parched crops may wither and die. Pastures may become insufficient to support livestock. Effects of agricultural droughts are difficult to measure because there are many other variables that may impact production during the same growing season.

***Hydrological Drought*** – Reduction in stream flow, lake and reservoir levels, depletion of soil moisture, and a lowering of the ground water table. Consequently, there is a decrease in groundwater discharge to streams and lakes. A prolonged hydrological drought will affect the water supply.

***Mathematical Drought*** – Computation in which rainfall deficiencies are expressed.

Extended, widespread droughts are fairly infrequent; however, brief local droughts are common and can be severe. Belmont County is susceptible to drought conditions during the summer and autumn months due to significant lack of rainfall and/or other precipitation. These drought conditions often affect farmers (both commercial farmers and personal farmers) and the local water supply (wells often run dry, rivers run low forcing public water supplies to decrease).

Belmont County's large agricultural sector, which makes up approximately 43% of the total land cover, is extremely



susceptible to drought and could suffer significant economic losses. Agriculture has long been an important component of the Belmont County economy, as agriculture generated \$14.3 million in total cash receipts in 2002. Drought conditions increase the county's susceptibility to wildfires which would also have a negative impact on the county's economy by diminishing the timbering industry. According to the *Palmer Drought Severity Index* for a period between 1985 and 1995, Ohio counties spend 0-5% of the summer and autumn months under drought conditions. As of August 28, 2004, Belmont County's precipitation levels were near normal, with "unusual moist spells" as shown in the figure above.

According to the National Oceanic and Atmospheric Administration's (NOAA) Event Record database, there have been two (2) droughts in Belmont County between 1950 and 2003. An August 1, 1999 *Event Record* indicated that dry conditions that actually began in July of 1998 continued through the month of August. On August 10, the U.S. Department of Agriculture declared all of Eastern Ohio an agricultural disaster area. Precipitation deficits for the period of May through August showed the area to be anywhere between two (2) and eight (8) inches below normal. Preliminary estimates predicted a \$600 million agricultural loss statewide as a result of the drought. Precipitation levels in Belmont County is 3.6 inches per months with January (2.5 inches) typically being the driest month, and July (4.8 inches) the wettest. There can be extreme variations in certain months within a year.

As indicated in the Belmont County EOP, the drought of 1988 was of such a duration that it resulted in the declaration of a State of Emergency in Morristown and Flushing.

### **MAPPING**

See the Belmont County Drought Map for a graphical representation of the hazard areas with regard to drought conditions. The green areas represent “low hazard areas,” the yellow areas represent “moderate hazard areas,” the orange areas represent “high hazard areas,” and the red areas represent “extreme high hazard areas.”

## **Earthquake**



An earthquake is a sudden motion or trembling that is caused by a release of strain accumulated within or along the edge of the Earth's tectonic plates. The severity of these effects is dependent on the amount of energy released from the fault or epicenter. The effects of an earthquake can be felt far beyond the site of its occurrence. They usually occur without warning and after just a few seconds can cause massive damage and extensive casualties. Common effects of earthquakes are ground motion and shaking, surface ruptures, and ground failure.

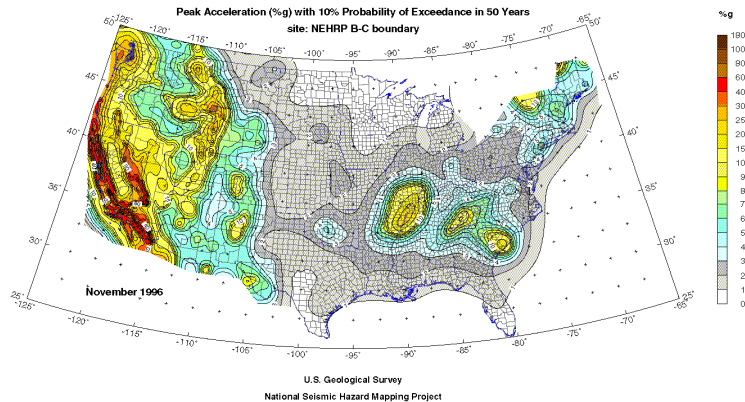
Earthquakes are one of nature's most damaging hazards and are more widespread than is often realized. The area of greatest seismic activity in the United States is along the Pacific Coast in the states of California and Alaska; however, as many as 40 states can be characterized as having moderate earthquake risk.

At least 170 earthquakes with epicenters in Ohio have been felt since 1776. Several methods of research identified earthquakes as a hazard in Belmont County, including a review of the FEMA-issued *State and Local Mitigation Planning How-To Guide: Understanding Your Risks* and reviews of several Internet sites, which are listed below.

- Building Seismic Safety Council  
<http://www.bssconline.org>
- Earthquake Hazard History by State  
<http://www.neic.cr.usgs.gov/neis/states.states.html>
- Earthquake Map and Information  
<http://www.abag.ca.gov/bayarea/eqmaps/eqmaps.html>
- FEMA HAZUS Homepage  
<http://www.fema.gov/hazus/>
- GIS Data Available on Earthquakes  
<http://geohazards.cr.usgs.gov/eq/html/genmap.html>
- USGS Earthquake Homepage  
<http://quake.wr.usgs.gov/>
- USGS National and Regional Custom Earthquake Risk Maps  
<http://eqint.cr.usgs.gov/eq/html/custom.shtml>

- Ohio Department of Natural Resources, Division of Geological Survey  
<http://www.ohiodnr.com/OhioSeis/>

According to the USGS, Belmont County is listed as an MMI IV with regard to earthquakes. Belmont County's Peak Ground Acceleration (PGA) is 2.0-3.0 according to the USGS National Seismic Hazard Mapping Project. The map was dated November 1996 and is illustrated in the figure at right. Because of the area's ranking as an MMI IV, earthquake hazards must be taken into consideration.



According to the FEMA *State and Local Mitigation Planning How-To Guide: Understanding Your Risks*, areas rated as an MMI IV (a PGA of 2.0-3.0 classifies an area as MMI IV) are not likely to experience damage as a result of earthquakes. In these areas, perceived shaking is also light.

Earthquake activity in Belmont County would probably stem from an event in the Buring Springs fault system. Ohio is on the periphery of the New Madrid Seismic Zone, an area in Missouri and adjacent states that was the site of the largest earthquake sequence to occur in historical times in the continental United States. According to an *Earthquake Epicenters In Ohio Map* prepared by the Ohio Department of Natural Resources, there have been no recorded earthquakes in Belmont County.

The table at right is the Modified Mercalli Scale, which is the general relationship between epicentral Modified Mercalli intensities and magnitude. Intensities can be highly variable depending on local geologic conditions. The Mercalli Scale is a semi-quantitative linear scale, whereas the Richter Scale (shown in the table

Modified Mercalli Scale		Magnitude Scale
I	Detected only by sensitive instruments	1.5
II	Felt by few persons at rest, especially on upper floors; delicately suspended objects may swing	2
III	Felt noticeably indoors, but not always recognized as earthquake; standing autos rock slightly, vibrations like passing truck	2.5
IV	Felt indoors by many, outdoors by few, at night some awaken; dishes, windows, doors disturbed; standing autos rock noticeably	3
V	Felt by most people; some breakage of dishes, windows, and plaster; disturbance of tall objects	3.5
VI	Felt by all, many frightened and run outdoors; falling plaster and chimneys, damage small	4
VII	Everybody runs outdoors; damage to buildings varies depending on quality of construction; noticed by drivers of autos	4.5
VIII	Panel walls thrown out of frames; walls, monuments, chimneys fall; sand and mud ejected; drivers of autos disturbed	5
IX	Buildings shifted off foundations, cracked, thrown out of plumb; ground cracked; underground pipes broken	5.5
X	Most masonry and frame structures destroyed; ground cracked, rails bent, landslides	6
XI	Few structures remain standing; bridges destroyed, fissures in ground, pipes broken, landslides, rails bent	6.5
XII	Damage total; waves seen on ground surface, lines of sight and level distorted, objects thrown up into air	7
		7.5
		8

below) is a quantitative logarithmic scale. The Richter Magnitude Scale was developed in 1935 by Charles F. Richter of the California Institute of Technology as a mathematical device to compare the size of earthquakes. The magnitude of an earthquake is determined from the logarithm of the amplitude of waves recorded between the various seismographs. Adjustments are located for the variation in the distance between the various seismographs and the epicenter of the earthquake. On the Richter scale, magnitude is expressed in whole numbers and decimal fractions. For example, a magnitude 5.3 might be computed for a moderate earthquake, and a strong earthquake might be rated as a magnitude 6.3. Because of the logarithmic basis of the scale, each whole number increase in magnitude represents a tenfold increase in measured amplitude.

<b>Severity</b>	<b>Richter Scale</b>	
	<b>Magnitude</b>	<b>Mercalli</b>
<b>Mild</b>	<b>0-2.9</b>	<b>I-III</b>
<b>Moderate</b>	<b>2.9-4.1</b>	<b>IV-V</b>
<b>Intermediate</b>	<b>4.1-5.4</b>	<b>VI-VII</b>
<b>Severe</b>	<b>5.4-7.3</b>	<b>VIII-X</b>
<b>Catastrophic</b>	<b>7.3 +</b>	<b>XI-XIII</b>

## MAPPING

See the Belmont County Earthquake Map for a graphical representation of the hazard areas with regard to earthquakes. The green areas represent “low hazard areas,” yellow represents “moderate hazard areas,” orange represents “high hazard areas,” and red represents “extreme high hazard areas.”



## **Epidemic**



An epidemic is a disease, usually contagious, that recurs in a community and attacks a large number of people at the same time. The potential impacts of an epidemic are illness or fatalities, disruption or closing of schools, or the forced closure of businesses and industrial operations.

Epidemic is a natural hazard risk in Belmont County. The probability of an epidemic striking Belmont County is relatively low. However, the risk associated with this hazard is very high.

An epidemic has the potential to affect the entire county, but is more probable to occur in densely populated areas, such as the cities of Martins Ferry, St. Clairsville, Bellaire, as well as the Village of Barnesville and especially at facilities containing large numbers of occupants. Many commercial and industrial sites throughout the county contain facilities at which a large workforce is employed. A potential epidemic is of particular concern at these facilities.

Epidemics can develop with little or no warning and quickly erode the capacity of local medical care providers. A fast-developing epidemic can last several days and extend into several weeks. In some extreme cases, they can last for several months.

An epidemic can occur at any time of the year, but the warm summer months, when bacteria and microorganism growth are at their highest, present the greatest risk. The West Nile Virus has created growing concern in Ohio and the northeast where widespread spraying to kill mosquitoes has not slowed the spread of the virus.

### **MAPPING**

See the Belmont County Epidemic Map for a graphical representation of high-risk areas with regard to epidemic. The green areas represent “low hazard areas,” the yellow areas represent “moderate hazard areas,” the orange areas represent “high hazard areas,” and the red areas represent “extreme high hazard areas.”

## **Flooding**



A flood is a general and temporary condition of partial or complete inundation of normally dry land areas from (1) the overflow of inland or tidal waters, (2) the unusual and rapid accumulation of runoff or surface waters from any source, or (3) mudflows or the sudden collapse of shoreline land.

Floods are the most widespread hazard in the United States. Each year, floods cause more property damage than any other type of natural disaster, killing an average of 150 people a year. The history of flooding within Belmont County indicates that flooding can occur at any time of the year.

However, nearly all major floods are produced by winter and spring rains falling on already-saturated, snow covered, or frozen soil. Winter and spring rains, although of lesser intensity than summer and fall rains, are usually of longer duration and result in greater peak flows in streams. According to records from the (National Oceanic and Atmospheric Administration's (NOAA) Event Record) database, the months when the most flooding occurs are June, with 19 reported floods from 1950 through 2003, and January with 13 reported floods.

Several methods of research identified flooding as a hazard in Belmont County, including reviews of FIRM maps, reviews of newspaper coverage, reviews of past disaster declarations, reviews of the Belmont County Emergency Operations Plan (EOP), discussions with local officials, and public input. The following Internet sites were also used to gain information on flooding.

- Association of Dam Safety Officials  
<http://crunch.tec.army.mil/nid/webpages/nid.cfm>
- Federal Emergency Management Agency  
<http://www.fema.gov/maps/>
- Flash-Flood Safety Rules  
<http://www.nws.noaa.gov/om/nh-flfd.htm>
- Flood Risk and Map Information  
<http://www.fema.gov/nfip/fmapinfo.htm>
- Flood Safety Rules  
<http://www.new.noaa.gov/om/nh-flood.html>
- Floodplain Management Association

<http://www.floodplain.org>

- General Flood Information  
[http://www.nfpa.org/Education/Consumers\\_and\\_Families/Fire\\_Safety\\_Information/Talking\\_About\\_Disaster/Flood\\_and\\_Flash\\_Flood/flood\\_and\\_flash\\_flood.html](http://www.nfpa.org/Education/Consumers_and_Families/Fire_Safety_Information/Talking_About_Disaster/Flood_and_Flash_Flood/flood_and_flash_flood.html)
- Guide to Flood Maps on the Web  
<http://www.fema.gov/nfip/readmap>
- Latest Hydrological Information (Flooding, Droughts, Snow Conditions, and Water Supply)  
<http://www.nws.noaa.gov/oh/hic/current/>
- Real-Time Hydrologic Data Page  
<http://water.usgs.gov/realtime.html>
- Regional River Forecast Centers  
[http://www.srh.noaa.gov/abrfc.rfc\\_wfo.html](http://www.srh.noaa.gov/abrfc.rfc_wfo.html)
- State Floodplain Managers  
<http://www.floods.org/stcoor.htm>
- United States Army Corps of Engineers (USACOE)  
<http://www.usace.army.mil/inet/functions/cw>
- USGS Streamflow Data  
<http://water.usgs.gov/usa/nwis/sw>

## **RIVERINE FLOODING**

There have been 29 flood events recorded in Belmont County between 1950-2003. Flooding continues to be a frequent and damaging natural disaster in Belmont County as a result of the Ohio River and several stream and creeks, including Captina Creek, Bend Fork of Captina Creek, Leatherwood Creek, McMahon Creek, and Wheeling Creek. There have been seven (7) presidential disaster declarations made in Belmont County due to flooding since 1980, three (3) of which occurred in June.

Riverine flooding, which is usually caused by a significant amount of rainfall over a period of days, is very likely to continue striking these same areas. Communities located along the banks of the Ohio River are in particularly low-lying areas. Powhatan Point is an example of such an area. According to the Belmont County EOP, the 100-year floodplain extends into portions of Bellaire, Bethesda, Bridgeport, Brookside, Holloway, Martins Ferry, Powhatan Point, Shadyside, and Yorkville. All of these areas are heavily populated.

As indicated by an article taken from *The Times Leader* dated June 29, 1998, an estimated eight (8) people perished as a result of a weekend storm that dumped more than 18 inches of rain over southeastern Ohio, prompting significant flooding in Belmont County. According to a *NOAA Event Record* dated January 19, 1996, floodwaters from the Allegheny and the Monongahela Rivers crested in phase at “the Point” in Pittsburgh. Water from these two (2) mainstem rivers flowed into the Ohio River causing major flooding to communities along the Ohio River occurred in Columbiana, Jefferson, Belmont and Monroe Counties. The crest at Hannibal, Ohio (just south of Belmont County) was 39.4 feet (4.4 feet above flood stage). In Belmont County, 318 residences were effected: 14-minimally, 107-minor damage, 136-major damage, and 61-destroyed.

There are 14 listed “repetitive loss” properties in Belmont County. The following table indicates the type of structures, the number of losses suffered, and the approximate location of the property. This information is legally privileged and confidential. Its use is protected under the privacy act of 1974, 5 U.S.C. Section 552(a). Use of this information should be restricted to applicable routine use.

<b>BELMONT COUNTY REPETITIVE LOSS DETAILS</b>		
<b>TYPE OF STRUCTURE</b>	<b>NUMBER OF LOSSES</b>	<b>LOCATION</b>
Single Family	2	Neffs City
Single Family	3	St. Clairsville City
Non Residential	1	Martins Ferry City
Non Residential	4	Martins Ferry City
Single Family	2	Bridgeport City
Single Family	5	Powhatan Point City
Single Family	2	Bridgeport City
Single Family	2	Glencoe City
Single Family	3	St. Clairsville City
Single Family	3	Bridgeport City
Single Family	2	Powhatan Point City
Non Residential	2	Bridgeport City
Non Residential	2	Martins Ferry City
Single Family	1	Neffs City

## **FLASH FLOODING**

Because the majority of Belmont County is of relatively steep or gently rolling topography, flash flooding occurs more often than riverine flooding. Flash flooding that occurs in or near the urban areas is often attributed to failing storm sewers and poor drainage systems. There have been 37 flash floods reported in Belmont County between 1950 and 2003.

Belmont County has four (4) major drainage basins: Captina Creek, McMahon Creek, Stillwater Creek, and Wheeling Creek, all of which are tributaries to the Ohio River.

According to the Belmont County EOP, flash flooding has affected or destroyed approximately 350 homes along Wheeling Creek, primarily in Colerain and Pease Townships, and approximately 90 homes along McMahon Creek mainly in Pultrey Township.

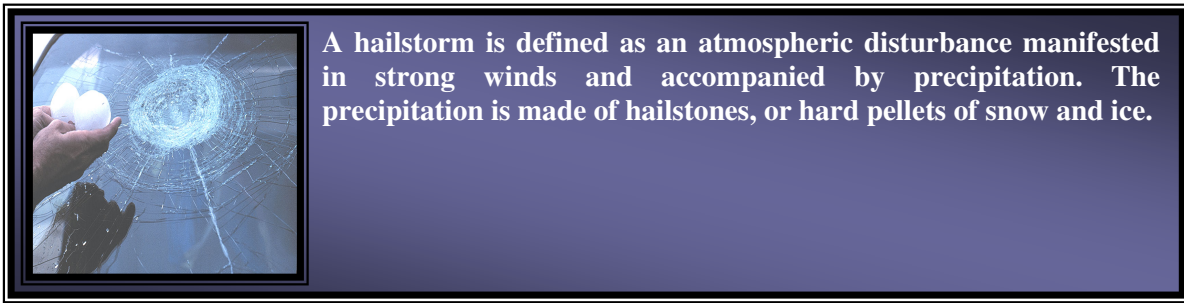
As indicated in the Belmont County EOP, significant flash flooding occurred in 1990 on Wegee Creek, Pipe Creek, McMahon Creek, Cumberland Creek, Tar Run, and Short Creek. This was the most devastating flash flood to strike Ohio in recent years. Several homes and businesses were completely destroyed and 26 fatalities were reported.

According to a *NOAA Event Record* dated July 15, 1995, several streets were flooded in St. Clairsville and Martins Ferry, as Doppler radar estimated approximately five (5) inches of rain fell in a two (2) hour period.

## **MAPPING**

See the Belmont County Flood Map for a graphical representation of the high-risk areas with regard to flooding in the county. The green areas represent “low hazard areas,” the yellow areas represent “moderate hazard areas,” the orange areas represent “high hazard areas,” and the red areas represent “extreme high hazard areas.”

## **Hailstorm**



Numerous methods of research identified hailstorms as a natural hazard in Belmont County, including discussions with local representatives and Internet searches at ESRI, National Weather Service, and National Oceanic Atmospheric Administration (NOAA) sites.

A hot summer afternoon thunderstorm is capable of transforming the landscape from verdant green to icy white with the onset of a hailstorm. The first sign that hail may be arriving is a growing whitening among shafts of rain. Soon a rattling sound is heard, as hailstones strike roofs and pavements, and the ground whitens, becoming slippery as hailstones cover grass and roadways. A hailstorm can be the most damaging part of a thunderstorm, inflicting injury to both man and beast and destroying crops, gardens, and property like a giant pummeling machine.

Hailstone damage is often confined to automobiles and crops; however, structural damage is a possibility in the form of broken windows and damaged gutters or HVAC systems (depending on the size of the structure). Historical records indicate that hailstorms are a countywide hazard, and can occur at any time and location. Hail is often associated with severe thunderstorms and/or severe winter storms, both of which have been identified as naturally occurring hazards in Belmont County.

As indicated in a *NOAA Event Record* dated April 9, 2001, a strong cold front passed through Belmont County producing the first severe weather outbreak of the spring season. Numerous hail reports were received from across east central Ohio, with the hailstones ranging in diameter from dime-sized to as large as golfballs. *NOAA Event Records* indicate that there have been eight (8) significant hailstorms in Belmont County between 1950 and 2003.

### **MAPPING**

See the Belmont County Hailstorm Map for a graphical representation of hazard areas with regard to hailstorms. The areas in green represent “low hazard areas,” the yellow areas represent “moderate hazard areas,” the areas in orange represent “high hazard areas,” and the red areas represent “extreme high hazard areas.”

## ***Landslide and Erosion***



Landslides are described as the downward movement of a slope and materials under the force of gravity. The term includes a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. Landslides are influenced by human activity (mining and construction of buildings, railroads, and highways) and natural factors (geology, precipitation, and topography).

Several research methods identified landslides and erosion as minor hazards in Belmont County, including reviews of the USGS Internet site, reviews of the Belmont County Emergency Operations Plan (EOP), and discussions with local officials. Further, the following Internet sites were also searched with regard to landslides (in addition to the USGS site).

- American Planning Association – Landslide Hazards and Planning  
<http://www.planning.org/landslides>
- General Landslide Information  
[http://www.nfpa.org/Education/Consumers\\_and\\_Families/Fire\\_Safety\\_Information/Talking\\_About\\_Disaster/Landslides\\_and\\_Debris\\_Flow\\_Mud/Landslide\\_and\\_debris\\_flow\\_mud.html](http://www.nfpa.org/Education/Consumers_and_Families/Fire_Safety_Information/Talking_About_Disaster/Landslides_and_Debris_Flow_Mud/Landslide_and_debris_flow_mud.html)
- How to Do Landslide Hazard Analysis  
<http://www.itc.nl/ilwi/s>
- Landslide and Mudflow Fact Sheet  
<http://www.fema.gov/library/landslid.htm>
- Landslide Overview Map of the US  
[http://landslide.usgs.gov/html\\_files/landslides/nationalmap/national.html](http://landslide.usgs.gov/html_files/landslides/nationalmap/national.html)

Landslides have been known to occur in Ohio and adjoining states since 1850, but the damage caused by landslides has become increasingly expensive as development encroaches more and more on the area's hillsides. A large portion of Belmont County's topography is that of steep to gently sloping. The topography, along with a large number of underground mines increases the county's vulnerability to landslides. Although land subsidence is a site-specific hazard, local officials feel proactive measures should be taken to mitigate subsidence across the county especially near areas targeted for development. According to the Belmont County EOP,

the entire county is prone to landslide activity; however, areas along the Ohio River are particularly vulnerable.

“Landslide” is a general term used for a wide variety of down-slope movements of earthen materials resulting in the perceptible downward and outward movement of soil, rock, and vegetation under the influence of gravity. The materials may move by falling, toppling, sliding, spreading, or flowing. Some landslides are rapid, occurring in seconds, whereas others may take hours, weeks, or even longer to develop. Although landslides usually occur on steep slopes, they also can occur in areas of low relief. The two (2) major types of landslides are rotational and translational. Rotational landslides occur when the surface of rupture is curved concavely upward and the slide movement is more or less rotational. A “slump” is an example of a small rotational landslide. Translational landslides occur when a mass of soil and rock moves out or down with little rotational movement or backward tilting. Translational landslide material may range from loose, unconsolidated soils to extensive slabs of rock and may progress over great distances.

The different sub-types of landslides include falls, which is the abrupt movement of material that becomes detached from steep slopes or cliffs, and move by free-fall, bouncing, and rolling.

Lateral spreads often occur on very gentle slopes and result in nearly horizontal movement of earthen materials. Lateral spreads are usually caused by liquefaction, where saturated sediments (usually sands and silts) are transformed from a solid into a liquefied state, usually triggered by earthquakes.

Many types of mass movements are included in the general term “flow”, including: creep, or the slow, steady down-slope movement of soil or rock (often indicated by curved tree trunks, bent fences or retaining walls, and tilted poles); debris flow, which is a rapid mass movement in which loose soils, rocks, and organic matter combine with entrained air and water to form a slurry that flows down-slope, usually associated with steep gullies; and mudflows, or the rapid flow in mass of wet material that contains at least 50 percent sand, silt, and clay-sized particles.




Subsidence is another major form of ground failure. Land subsidence affects more than 17,000 square miles in 45 states. Land subsidence is a gradual settling of the earth’s surface and is often an overlooked environmental consequence of land and water use practices. More than 80% of the identified subsidence in the nation is a consequence of ground water withdrawal. The increasing development of land and water resources threatens to exacerbate existing land subsidence problems and initiate new ones.






According to the United States Geological Survey (USGS), Ohio is listed as having low, moderate, and high percentages of landslide incidences. Specifically, the majority of Belmont County is listed as having a high percentage of landslide incidences, as illustrated in the figure below (the western-most portion of the county is in a moderate area). This ranking means that Belmont County has a high susceptibility/moderate incidence to landslides. Susceptibility to landslides is defined as the probable degree of response of the areal rocks and soils to natural or artificial cutting or loading of slopes, or to anomalously high precipitation. This information is taken from the *Landslide Overview Map of the Conterminous United States*.

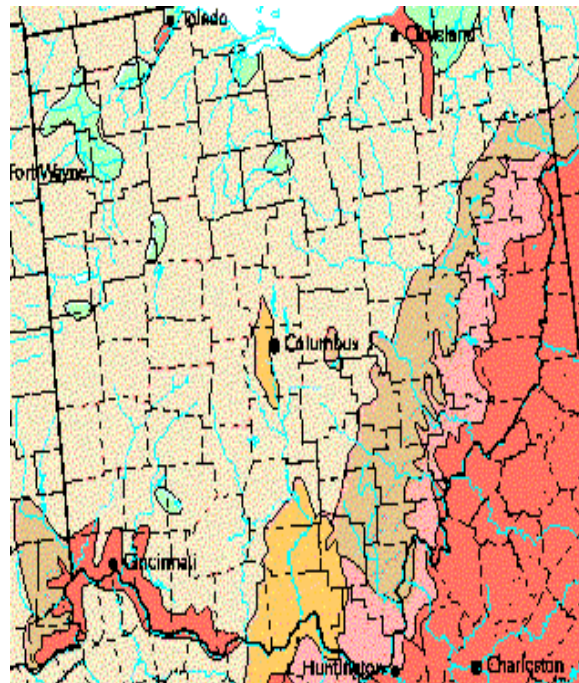
## EXPLANATION OF GRAPHIC

### LANDSLIDE INCIDENCE

-  Low (less than 1.5% of area involved)
-  Moderate (1.5%-15% of area involved)
-  High (greater than 15% of area involved)

### LANDSLIDE SUSCEPTIBILITY/INCIDENCE

-  Moderate susceptibility/low incidence
-  High susceptibility/low incidence
-  High susceptibility/moderate incidence



## MAPPING

See the Belmont County Landslide Map for a graphical representation of hazard areas with regard to landslides. The areas shaded in green represent “low hazard areas,” the yellow areas represent “moderate hazard areas,” the areas shaded in orange represent “high hazard areas,” and the red areas represent “extreme high hazard areas.”

## **Mine Subsidence**



Subsidence, in the context of underground mining, is the lowering of the Earth's surface due to the collapse of bedrock and unconsolidated materials (sand, gravel, silt, and clay) into areas mined underground.

Several methods of research identified mine subsidence as a hazard in Belmont County. Mine subsidence information was obtained from the following Internet sites.

- Ohio Department of Natural Resources, Division of Geological Survey  
[http://www.dnr.state.oh.us/geosurvey/geo\\_fact/geo\\_f12.htm](http://www.dnr.state.oh.us/geosurvey/geo_fact/geo_f12.htm)

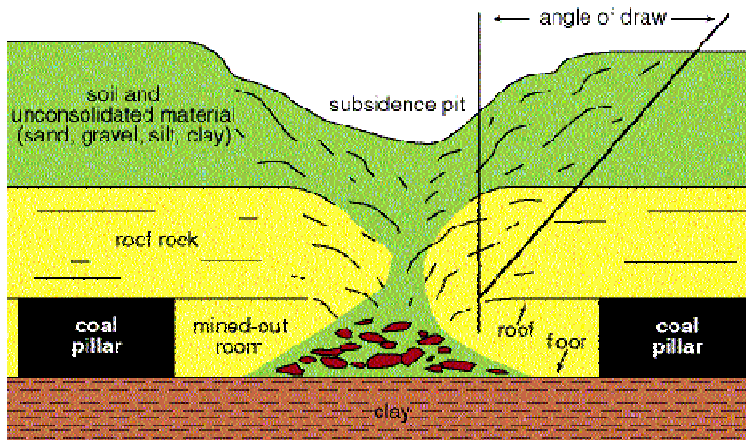
Belmont County has developed a prolonged dependence on coal mining, which remains an important albeit diminished component of the county's economy. There are several underground mines located in Belmont County, as the entire eastern and central portions of the county have underground mines located beneath them. The majority of these mines have been abandoned. Safety problems for travelers caused by sinkholes (illustrated in the figure below) and slides initiated by abandoned underground mines are a growing concern. The Ohio Department of Transportation (ODOT) developed an Abandoned Underground Mine Inventory and Risk Assessment process as a proactive method of locating and assessing the safety of mine sites underlying highways throughout Ohio.

Mine subsidence, like an earthquake, is a geologic hazard that can strike with little or no warning and can result in catastrophic and costly damages. Unlike an earthquake, mine subsidence normally only affects few people. However, if a mine collapses under an interstate highway, several lives and industries are subjected to potential damage and economic losses.



Mine subsidence can also cause foundation damage to buildings, disrupt underground utilities, and be a potential risk to human life. The majority of underground mines in Ohio are coal mines; as a result, Ohio has had a history of coal mine subsidence problems dating back to at least 1923. There are two (2) types of

subsidence: (1) pit, also called sinkhole or pothole, and (2) sag or through. (The term “sinkhole” more properly refers to solution collapse features in limestone). Pit subsidence is characterized by an abrupt sinking of the surface, resulting in a circular, steep-sided, craterlike feature



that has an inward drainage pattern, which is illustrated in the figure above. It is often associated with the roof collapse of mines that have total overburden (overlying unconsolidated material and rock) of less than 165 feet, weak roof rock of shale or mudstone, and a ratio of unconsolidated-material thickness to rock thickness of less than 1.2 feet. Sag subsidence is a gentle, gradual settling of the surface. It is associated with pillar crushing or pillar punching in deeper mines (overburden of more than 75 feet). Sag subsidence features may fill with water if the surface of the subsidence intersects the water table.

Mine subsidence can be controlled by several factors, including the height of mined-out areas, the width of unsupported mine roofs, the thickness of overburden, competency (strength) of bedrock, pillar dimensions, hydrology, fractures/joints, and time.

## MAPPING

See the Belmont County Mine Subsidence Map for a graphical representation of high-risk areas with regard to mine subsidence. The areas shaded in green represent “low hazard areas,” the yellow areas represent “moderate hazard areas,” the areas shaded in orange represent “high hazard areas,” and the red areas represent “extreme high hazard areas.”

## **Severe Thunderstorm and Lightning**

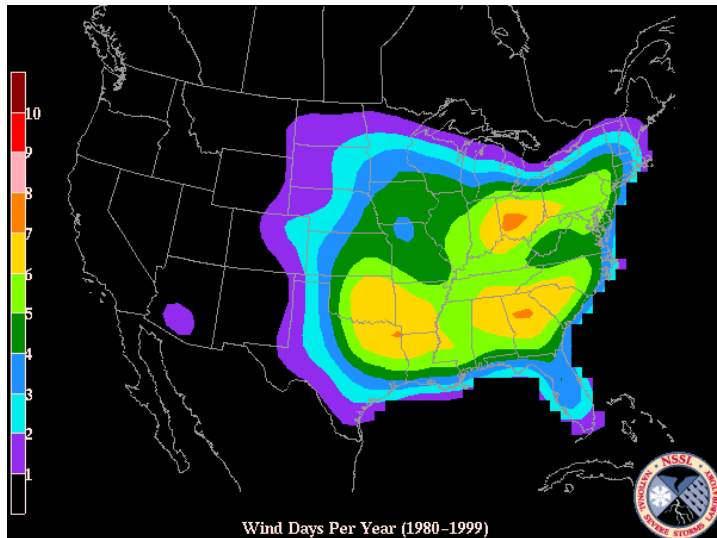


A severe thunderstorm is the result of a violent form of convection wherein cold, upper air falls and warm, moist air rises. As the warm air rises, cumulonimbus clouds can develop and turn into severe thunderstorms with strong winds, lightning, heavy rain, and hail.

Lightning is an electrical discharge that results from the buildup of positive and negative charges within a thunderstorm. When the buildup becomes strong enough, lightning appears as a bolt. This flash of light usually occurs within the clouds or between the clouds and the ground.

Several methods of research identified severe thunderstorms and lightning as natural hazards in Belmont County, including discussions with local representatives. General severe thunderstorm information was gathered at [http://www.nfpa.org/Education/Consumers\\_and\\_Families/Fire\\_Safety\\_Information/Talking\\_About\\_Disaster/Severe\\_Thunderstorm/severe\\_thunderstorm.html](http://www.nfpa.org/Education/Consumers_and_Families/Fire_Safety_Information/Talking_About_Disaster/Severe_Thunderstorm/severe_thunderstorm.html).

The National Weather Service (NWS) defines a thunderstorm as “severe” when wind speeds reach 58 mph or stronger, and/or hail is produced that is ¾ inch in diameter or larger, and/or a tornado is produced. The figure at right shows the number of high wind days that occur per year. To be classified as a “high wind event,” winds must be in excess of 52 mph. As can be seen, Ohio is one of the most prominent areas for high wind events. High wind events are also one of the most common types of hazards in Belmont County. Winds at the speeds represented on this graphic are capable of doing great damage.



Thunderstorms are a seasonal hazard and can be expected to occur every year. According to the NWS, the most active thunderstorm season in Ohio is late spring and early summer. The

key ingredient that defines a thunderstorm is lightning. Because lightning creates thunder, a storm with lightning is termed a thunderstorm. A bolt of lightning reaches a temperature approaching 50,000 degrees Fahrenheit in a split second. The rapid heating and cooling of air near the lightning causes thunder. Ohio averages four (4) deaths and 15 injuries per year as a result of lightning.

According to the *NOAA Event Record* database, there have been 105 severe thunderstorm events and three (3) reported incidents involving lightning in Belmont County between 1950 and 2003. A *NOAA Event Record* dated July 15, 1995 indicated that lightning struck the county's Emergency Operations Center (EOC) near St. Clairsville, damaging radio equipment, an antenna, and phone lines.

*NOAA Event Records* indicate on several occasions that severe thunderstorms with strong, straight-line winds downed trees and power lines, resulting in widespread power outages and property damage throughout Belmont County.

## **MAPPING**

See the Belmont County Severe Thunderstorm Map for a graphical representation of hazard areas with regard to severe thunderstorms and lightning. The areas shaded in green represent "low hazard areas," the yellow areas represent "moderate hazard areas," the areas shaded in orange represent "high hazard areas," and the red areas represent "extreme high hazard areas."



## **Severe Wind and Tornado**



A windstorm is a storm with high winds or violent gusts, sometimes called wind shears or microbursts, but with little or no rain.

A tornado is a violently rotating column of air extending from a thunderstorm to the ground. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. Damage paths can be in excess of one (1) mile wide and 50 miles long.

Several methods of research identified severe wind and tornadoes as natural hazards in Belmont County. General severe wind and tornado information was obtained from the following sources:

- FEMA *State and Local Mitigation Planning How-to-Guide: Understanding Your Risks*
- National Oceanic & Atmospheric Administration (NOAA) web site  
<http://www4.ncdc.noaa.gov/cgi-win/wwcgi.d11?wwdevent~ShowEvent>

Most sources have only been recording tornado activity since 1950. Ohio falls into the “high” category for tornado risk and the highest category for wind zones in the United States, which is illustrated in the figure at right. Belmont County actually falls within the lowest wind zone in Ohio. The entire county is in a Zone III wind zone, according to the *Design Wind Speed for Community Shelters Map*. This wind zone places the county in a category that could experience

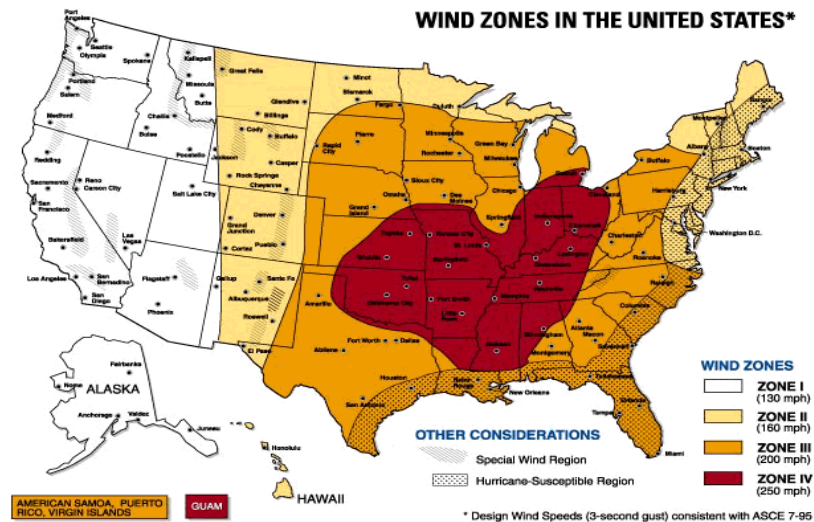


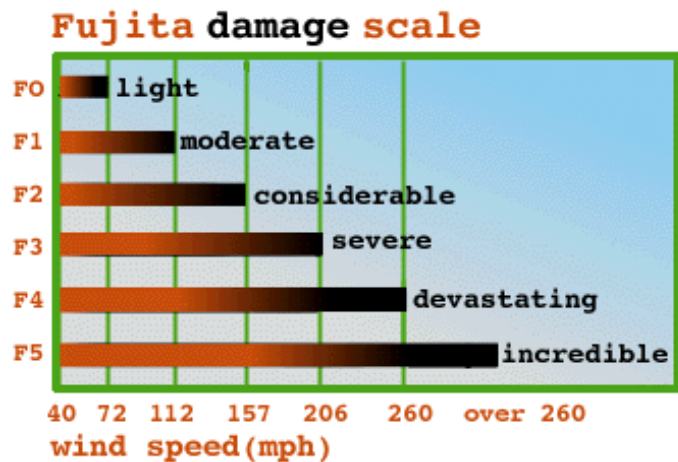
Figure 1.2 Wind zones in the United States

severe damage; for example, roofs and some exterior walls could be torn off well-constructed houses, trains could be overturned, most trees in forests are likely to be uprooted, and cars can be lifted off the ground and thrown. However, the county does have natural barriers to break up strong straight-line winds and tornadoes that form and touch down, as the majority of the county is comprised of steep to gently sloping topography. Belmont County has reported one (1) tornadoes between 1950-2003.

While tornadoes are relatively short lived in duration, they are intensely focused, making them one of the most destructive natural hazards. Ohio is positioned geographically on the eastern-most edge of what has come to be known as “tornado alley” and is no stranger to tornado sightings.

Although a touch down may not be recorded, a high wind event can be just as damaging. There have been six (6) such events with winds reaching upwards to 50 knots recorded between 1950 and 2003. According to *NOAA Event Records* dated December 12, 2000, a strengthening area of low pressure and associated cold front swept across the area during the overnight hours, bringing high winds to portions of east central Ohio. In general, damage was confined to downed trees and power lines, but several incidents of property damage were also reported. Several traffic accidents resulted from motorists driving into downed trees in Belmont County. An unoccupied camper was also blown from the top of a hill on Belmont Township Route 72, near Hunter.

The Fujita Damage scale is illustrated in the figure at right. The



The Fujita scale is a scale or measure developed by Theodore Fujita of the University of Chicago to relate the speed of winds associated with tornadoes to the damage they cause. *NOAA Event Records* indicate a tornado touched down in Belmont County on June 22, 1885. The tornado was recorded as an F1, meaning that wind speeds reached between 72 and 112 mph and moderate damage was experienced. The tornado measured 50 yards and left a damage path two (2) miles in length. Property damage totaled \$25,000.

## **MAPPING**

See the Belmont County Severe Wind/Tornado Map for a graphical representation of hazard risk areas with regard to tornadoes and windstorms. The areas shaded in green represent “low hazard areas,” the yellow areas represent “moderate hazard areas,” the areas shaded in orange represent “high hazard areas,” and the red areas represent “extreme high hazard areas.”



## **Severe Winter Storm and Sleet**



One or more of the following characterizes a winter storm: heavy snow, ice storms, strong winds, extreme cold, and, in certain areas, coastal flooding and beach erosion.

Several methods of research identified winter storms as a hazard in Belmont County, including reviews of newspaper coverage, reviews of past disaster declarations, reviews of the Belmont County Emergency Operations Plant (EOP), and interviews with local officials. General winter storm information was also gathered at [http://www.nfpa.org/Education/Consumers\\_and\\_Families/Fire\\_Safety\\_Information/Talking/About\\_Disaster/Winter\\_Storm/winter\\_storm.html](http://www.nfpa.org/Education/Consumers_and_Families/Fire_Safety_Information/Talking/About_Disaster/Winter_Storm/winter_storm.html), as well as the NOAA web site, <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.d11?wwevent~storms>.

Belmont County is highly vulnerable to the wide-ranging effects of snowstorms, blizzards, ice storms, and severe cold snaps. A severe winter storm could affect the entire county at the same time, virtually bringing all county operations to a standstill. This type of hazard creates a difficult emergency response effort due to adverse road conditions, which impede or prohibit vehicle movement. According to 2000 Census statistics, 34% of the structures in Belmont County were constructed in 1939 or earlier. These older buildings are more vulnerable to damage such as roof collapse as a result of snow weight.

Research indicates that all of Belmont County is equally susceptible to winter storms. Driving is treacherous during winter storms as roadways freeze and become covered with snow and slush. These adverse driving conditions may lead to additional property damage. According to a *FEMA Winter Storm Fact Sheet*, the leading cause of death during winter storms is from automobile or other transportation accidents. During severe winter storms, heavy snow may cause property damage and power outages. Roads are sometimes blocked, stranding rural residents from the incorporated areas where medical and other emergency services are located. Heavy snowfall and blizzards can trap motorists in their cars. Attempting to walk for help in a blizzard can be a deadly decision. Disorientation and confusion come quickly in blowing snow.

Health hazards stemming from severe winter storms include frostbite and hypothermia. Frostbite is a severe reaction to cold exposure that can permanently damage its victims. A loss of

feeling and a white or pale appearance in fingers, toes, nose, and/or ear lobes are symptoms of frostbite.

Hypothermia is a condition brought on when the body temperature drops to less than 55 degrees Fahrenheit. Symptoms of hypothermia include uncontrollable shivering, slow speech, memory lapses, frequent stumbling, drowsiness, and exhaustion. According to the Ohio Department of Development, approximately 20% or 6,000 residents use electricity to heat their homes. Thus, a loss of electrical power would leave this population without a heat source, and the chances for frostbite and hypothermia would dramatically increase.

Research indicates that winter storms are the third leading weather threat in Ohio. The storms of 1950 and 1978 were of a duration that required extensive mass sheltering or statewide response and recovery efforts. A total of 269 winter storms from 1923 to 1994 have been classified as severe. According to the *NOAA Event Record* database, there have been 14 severe winter storms reported in Belmont County between 1950 and 2003.

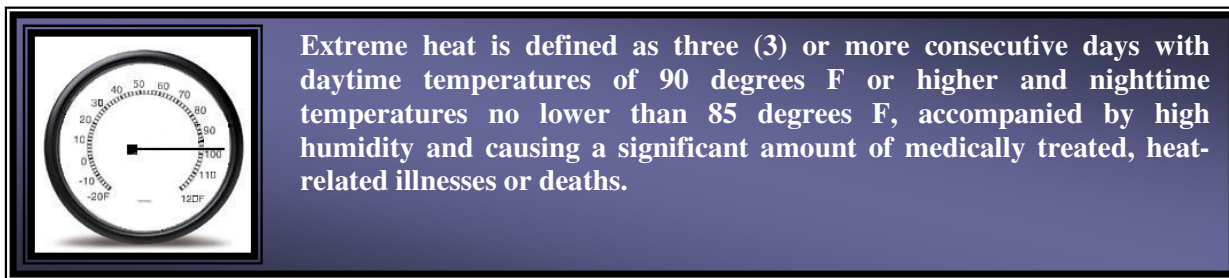
As indicated by a *NOAA Event Record* dated February 16, 2003, a massive, slow-moving snow storm dumped 12 inches of snow in 21 hours. Belmont County received a two (2)-day total of 22 inches. The roof of a business collapsed from the weight of the snow in Bellaire City, resulting in \$200,000 in damage to the building and 11 vehicles.

According to the Belmont County EOP, the majority of the county receives 20 to 30 inches of mean snowfall per winter season. The upper northern edge of the county could receive 30 to 40 inches of mean snowfall.

## **MAPPING**

See the Belmont County Severe Winter Storm Map for a graphical representation of the hazard risk areas associated with winter storms. The areas shaded in green represent “low hazard areas,” the yellow areas represent “moderate hazard areas,” the areas shaded in orange represent “high hazard areas,” and the areas in red represent “extreme high hazard areas.”

## **Temperature Extreme and Heat Wave**



Several methods of research identified extreme heat as a minor hazard in Belmont County, including searches of Internet sites such as:

- Extreme Heat Fact Sheet  
<http://www.fema.gov/library/heat.html>
- General Heat Wave Information  
[http://www.nfpa.org/Education/Consumers\\_and\\_Families/Fire\\_Safety\\_Information/Talking\\_About\\_Disaster/Heat\\_Heat\\_Wave/heat\\_heat\\_wave.html](http://www.nfpa.org/Education/Consumers_and_Families/Fire_Safety_Information/Talking_About_Disaster/Heat_Heat_Wave/heat_heat_wave.html)
- National Oceanic & Atmospheric Administration NOAA web site  
<http://www4.ncdc.noaa.gov/cgi-win/wwcgi.d11?wwevent~storms>

Extreme heat is a hazard usually found in more desert regions than Belmont County, Ohio. However, extreme heat can and has been a hazard in Ohio, causing heat stroke to occur to residents and proving detrimental to crops. The highest reported temperature in Ohio through the year 2000 was 113 degrees Fahrenheit, and was reported in the eastern portion of the state, near Belmont County.

Health hazards related to extreme heat include sunburns, heat cramps, heat exhaustion, and heat stroke. In a normal year, approximately 175 Americans die from extreme heat. Young children, the elderly, and those who are sick or overweight are more likely to become victims. According to the 2000 Census, approximately 18% (12,808 people) of the total population in Belmont County are over the age of 65. Because men sweat more than women, men are more susceptible to heat related illnesses as they become more quickly dehydrated.

According to a *NOAA Event Record* dated July 15, 1995, approximately 300 people fell ill during a music festival just west of St. Clairsville. Temperatures were in the upper 90s;

however, it was estimated that temperatures were 10 to 15 degrees hotter in the lower part of the arena's bowl in front of the stage.

## **MAPPING**

See the Belmont County Heat Wave Map for a graphical representation of hazard areas with regard to extreme heat. The areas shaded in green represent "low hazard areas," the yellow areas represent "moderate hazard areas," the areas shaded in orange represent "high hazard areas," and the red areas represent "extreme high hazard areas."

## **Wildfire**



A wildfire is an uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures. They often begin unnoticed, spread quickly, and are usually signaled by dense smoke that fills the area for miles around. Naturally occurring and non-native species of grasses, brush, and trees fuel wildfires.

Several methods of research identified wildfires (on a very small scale) as a hazard in Belmont County, including reviews of the Belmont County Emergency Operations Plant (EOP) and discussions with local representatives. The following Internet sites were searched with regard to wildfires.

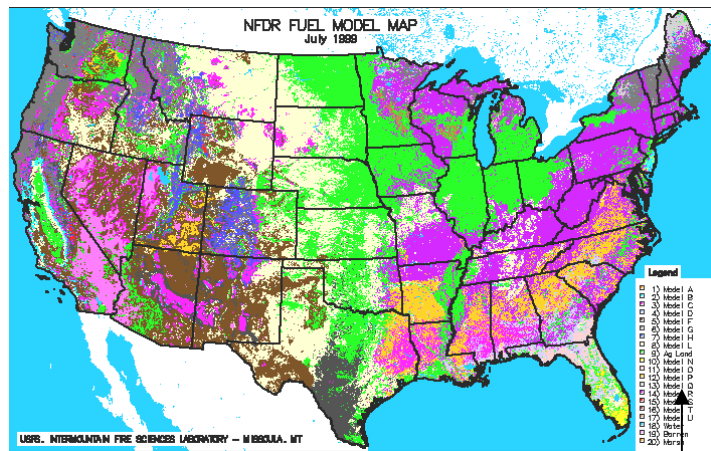
- Firewise  
<http://www.firewise.org>
- General Wildfire Information  
[http://www.nfpa.org/Education/Consumers\\_and\\_Families/Fire\\_Safety\\_Information/Talking\\_About\\_Disaster/Wildfire/wildfire.html](http://www.nfpa.org/Education/Consumers_and_Families/Fire_Safety_Information/Talking_About_Disaster/Wildfire/wildfire.html)
- Local Wildfire Observations and Trend Forecasts for Fire Weather Forecast Zones  
[http://www.fs.fed.us/land/wfas/fd\\_class.gif](http://www.fs.fed.us/land/wfas/fd_class.gif)
- NOAA Fire Event Satellite Photos  
<http://www.osci.noaa.gov/Events/Fires/>
- Resolution Fire Danger Rating Fuel Model Map  
[http://www.fs.fed.us/land/wfas/nfer\\_map.htm](http://www.fs.fed.us/land/wfas/nfer_map.htm)
- US Forest Service (USDA)  
<http://www.fs.fed.us/land/wfas/welcome.html>
- USGS Topographic Maps  
<http://mcmcweb.cr.usgs.gov/topomaps/>
- Wildland Fire Assessment System  
<http://www.fs.fed.us/land/wfas/>
- Wildland Fire Updates  
<http://www.nifc.gov/fireinfo/nfn.html>

According to the Ohio Division of Forestry, there are several factors that can contribute to the starting of wildfires in Belmont County, including arson, equipment fires, campfires, and lightning. According to the Belmont County EOP, 99 percent of wildfires in Ohio are caused by human factors; the leading causes being carelessness and arson. Additionally, approximately 10,000 forest fires are started nationally each year by lightning. Belmont County contains a great deal of forested land, with recreational campsites and other attractions in designated areas such as Barkcamp State Park, Piedmont and Belmont Lake campgrounds, and Dysart Woods Park. Campfires, coupled with large numbers of visitors and a large proportion of trees, make wildfires a potential hazard for Belmont County. A wildfire would be catastrophic to the local economy, as agriculture, tourism, recreation, and the timber industry are playing an increasingly important role.

Members of local volunteer fire departments confirm that small brush fires are a common occurrence during the dry summer months, in what is typically known as the “burning season.” These small brush fires are usually handled by local fire departments and often do not cause damage to structures. However, the threat is present that these brush fires could burn out of control and consume many structures, as well as a portion of the county’s 208,000 acres of forest.

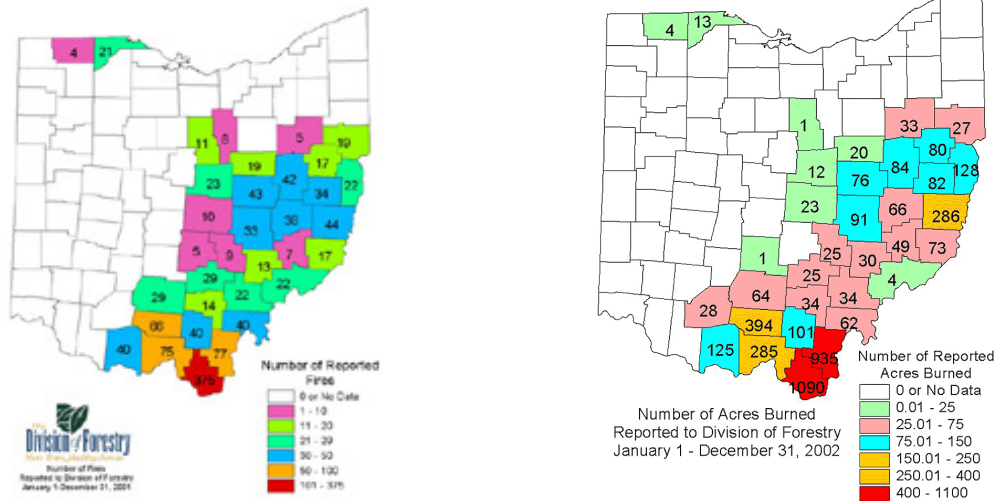
As shown at right, Ohio is currently marked as having a “low” fire class rating. However, this can change with climatic conditions. A large period of drought and high heat may dry up many areas and add to the amount of fuel for a potentially destructive wildfire.

Belmont County, as mentioned above, falls into the class of (R) Land and Hardwood with regard to fuel types. These classes are considered to be low hazards in terms of wildfires. With climatic changes over prolonged periods, the fuel that is not normally considered to be dangerous could become dry and



Fuel Model Map Key		
Heavy Fuel	G	Ag
	Vegetation consisting of round wood 3 to 8 inches in diameter	
Medium Fuel	B D F H O Q T	
	Vegetation consisting of round wood 1/3 to 3 inches in diameter.	
Light Fuel	A C L N P R S	
	Vegetation consisting of herbaceous plants and round wood less than 1/4 inch in diameter.	

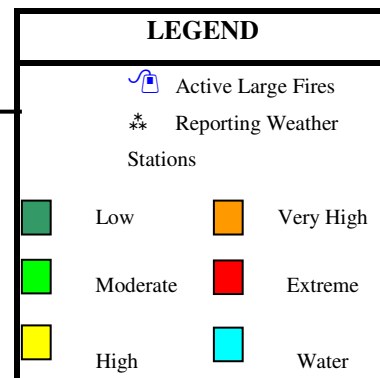
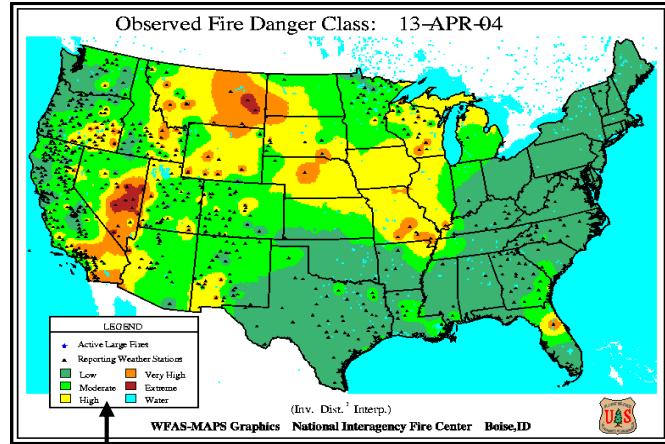
increase the potential for a large-scale wildfire. The monetary amount of damage will fluctuate according to where the fire occurs. If, for some reason, the area affected by a wildfire interfaced a municipality, the amount of damage could be greatly increased. However, most historical events have not consumed significant land or property.



According to the Ohio Department of Natural Resources, there were 44 reported fires in Belmont County from January 1 through December 31, 2002, consuming approximately 286 acres of forestland. This fact is illustrated in the figures above. Belmont County also reported 44 fires in 2001 destroying 149 acres, and previously in 1999 the county experienced only 27 fires with 186 acres burned. During this time span, the county was marked with a 61% increase in the number of wildfires fires and a 65% increase in the number of acres burned. With the ever-increasing popularity of campground attractions in Belmont County such as Bark Camp State Park, human factors contributing to the cause of wildfires also increase. Thus, the wildfire trends of the past several years are expected to continue in accordance with the influx of tourism and subsequently human factors contributing to wildfires.

Belmont County lies completely in the Forest Fire Protection District. The district encompasses the majority of Southeastern Ohio. The Ohio Department of Natural Resources (ODNR), Division of Forestry oversees the protection of this area in cooperation with local volunteer fire departments. The Division of Forestry offers training and grants for fire departments and government agencies located in the protection district. Training courses such as Intermediate Wildland Fire Behavior are available each year. Additionally, grants such as the Volunteer Fire Assistance Grant and the Wildland Fire Personal Protective Equipment Grant are also available to off set the costs of training and equipment. According to the ODNR, no fire departments or agencies in Belmont County received this funding in 2004.

The Observed Fire Danger Class Map developed by the US Forestry Service (at right) illustrates the fire danger conditions as of March 13, 2004 and is based on current and past weather, fuel types, and fuel moisture. As can be seen, the entire state of Ohio, with the exception of the northwestern most corner, is currently in a low fire danger class, including Belmont County.



## MAPPING

See the Belmont County Wildfire Map for a graphical representation of the hazard areas with respect to wildfires. The areas shaded in green represent “low hazard areas,” the yellow areas represent “moderate hazard areas,” the areas shaded in orange represent “high hazard areas,” and the red areas represent “extreme high hazard areas.”

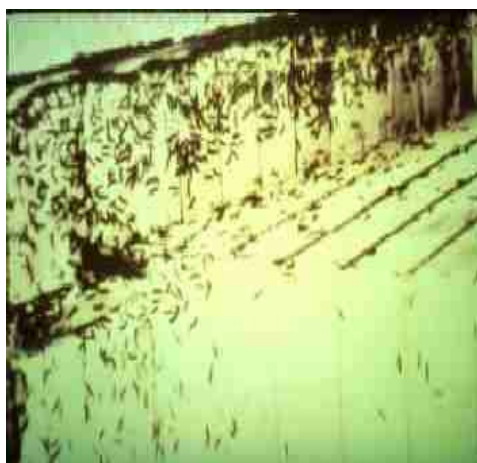


## **Infestation**



An infestation is to spread or swarm in or over in a troublesome manner; also, to live in or on as a parasite.

According to reviews of online information provided by the Ohio Division of Forestry, Belmont County is subject to an infestation primarily of a European strain of gypsy moth (pictured at right), which is one of the most destructive defoliating insect pests to attack the trees and forests of the northeastern United States. The impact of a gypsy moth infestation includes economic losses through timber mortality, loss of recreational opportunities in severely defoliated areas, and nuisances from gypsy moth caterpillars. With tourism, recreation, and the timber industry playing an increasingly important role in Belmont County's economy, an infestation of gypsy moths would have a significant impact. The picture at right illustrates the severity of the gypsy moth caterpillar infestation by showing the potential impacts to forested assets.



A state gypsy moth quarantine was established in 1987. The quarantine is an effort to minimize the movement of egg masses into non-infested areas of Ohio. Belmont County is among several counties in eastern Ohio that have been quarantined due to a gypsy moth infestation. Other infestations that could possibly occur in Belmont County include Asian long horned beetles, mosquitoes known to be infected with the West Nile Virus, and spider mites, as was the case in several areas of Ohio in 1999.

The probability of an infestation actually occurring in Belmont County is relatively low, with only moderate associated risk. Infestation is most likely to occur in the 208,064 acres of forest or the 146,000 acres of farmland in Belmont County, and will likely cause minimal damage to structural assets.

## **MAPPING**

See the Belmont County Infestation Map for a graphical representation of high-risk areas with regard to infestation. The areas shaded in green represent “low hazard areas,” the yellow areas represent “moderate hazard areas,” the areas shaded in orange represent “high hazard areas,” and the red areas represent “extreme high hazard areas.”