MIAMI COUNTY
HAZARD MITIGATION PLAN
Draft | October 2022

PREPARED FOR:
Miami County EMA
510 W. Water St.
Troy, Ohio
45373

PREPARED BY:
Burton Planning Services
252 Electric Avenue
Westerville, Ohio
43081

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INTRODUCTION

1.1 Overview

With the 2018 Miami County Hazard Mitigation Plan set to expire in May of 2023, Miami County and its constituents are aiming to adopt a new, updated hazard mitigation plan. As outlined in the Disaster Mitigation Act of 2000 (DMA2K), any local jurisdiction seeking funding from the Federal Emergency Management Agency (FEMA) must maintain an up-to-date disaster mitigation plan. This Plan meets the criteria as set forth by FEMA in the DMA2K and provides the Region and its participating jurisdictions with a comprehensive guide for future mitigation efforts to combat the hazards that affect their communities.

Natural, geological, and human-caused hazards pose a variety of risks to the lives, businesses, and properties within Miami County. As such, a Core Planning Committee within Miami County has been established with the goal of developing and implementing the 2023 Miami County Hazard Mitigation Plan. Through cooperative efforts between local, Region, state, and federal government agencies, this Plan is designed to minimize the adverse effects of hazardous events on the lives and properties of residents of the Region.

The 2023 Miami County Hazard Mitigation Plan is a multi-jurisdictional plan which considers the impacts of hazards on incorporated areas (villages and cities), counties, and unincorporated areas (townships). Miami County's incorporated areas and townships are listed below in **Table 1.1 and Table 1.2.** These jurisdictions are also displayed in **Figure 1.1** on the following page. The Plan is designed for a five-year implementation period and describes the methods and procedures utilized in its development, provides the results of community involvement activities such as survey collection, identifies the mitigation activities determined to the be most important to the County, and establishes a timeline for the implementation of the actions.

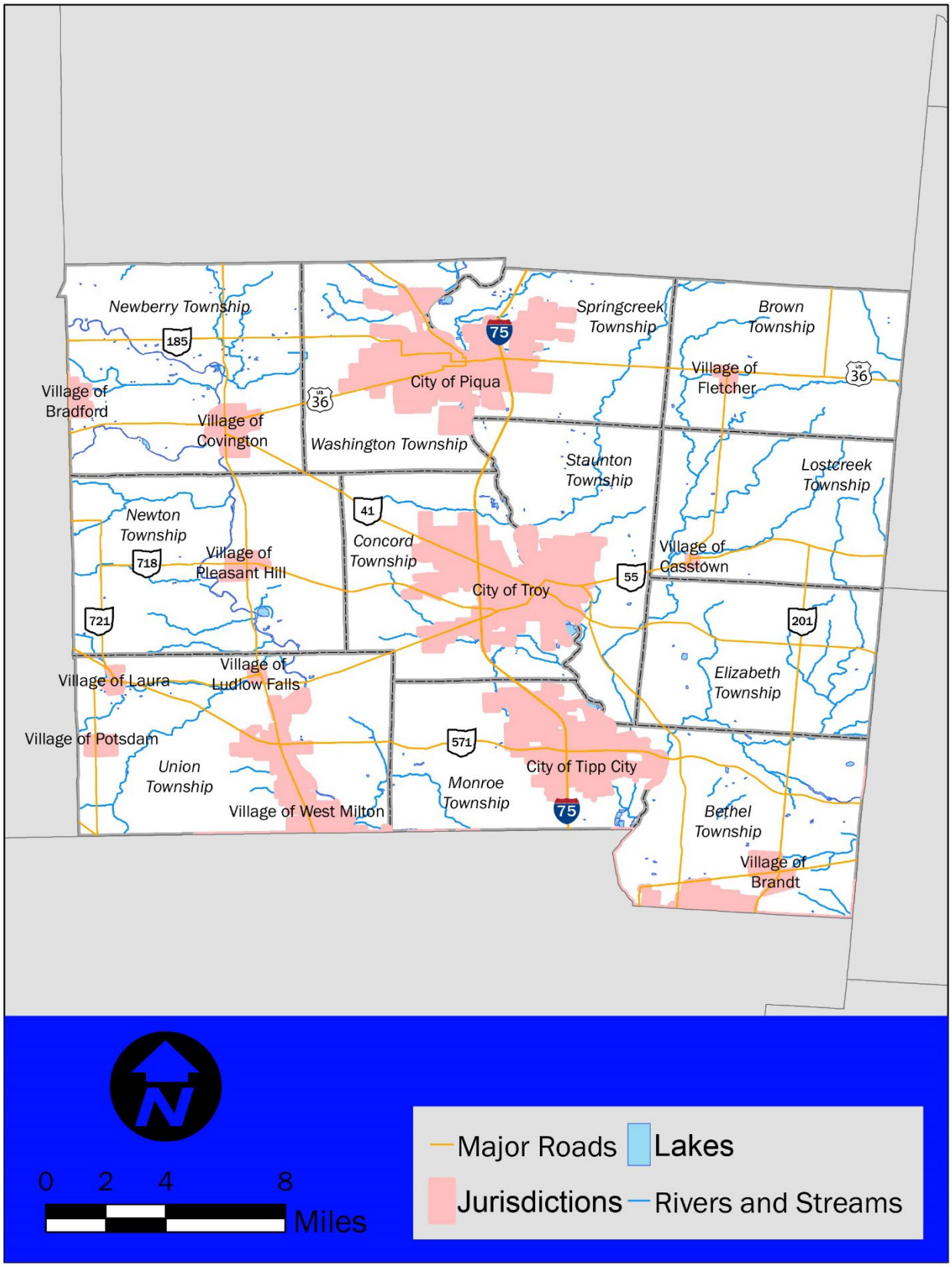
Table 1.1: Miami County Jurisdictions

Jurisdictions
City of Piqua
City of Tipp City
City of Troy
Village of Bradford
Village of Casstown
Village of Covington
Village of Fletcher
Village of Laura
Village of Ludlow Falls
Village of Pleasant Hill
Village of Potsdam
Village of West Milton
City of Huber Heights (partial)
Village of Union City (partial)

Table 1.2: Miami County Townships

Townships
Bethel Township
Brown Township
Concord Township
Elizabeth Township
Lost Creek Township
Monroe Township
Newberry Township
Newton Township
Spring Creek Township
Staunton Township
Union Township
Washington Township

Figure 1.1: Miami County Jurisdictions Map



This Plan is comprised of six sections, which detail the methods, analysis, and discussion surrounding the various hazards that threaten Miami County and its jurisdictions. These sections are as follows:

1. **Introduction** (Section 1) provides a discussion about the general purpose and goals that Miami County wishes to achieve throughout the development and implementation of this Plan. This section also includes a summary of the Plan's contents.
2. Section 2, **History and Demographics**, includes a description of Miami County and each participating jurisdiction, including their history, population, and other general information.
3. The process for the development of this Plan is detailed in Section 3, **Planning Process**. This section includes details about the process used to develop this Plan, including a description of who participated, how the community was involved, which hazards were included in the Plan and why, as well as how the Plan was developed through public meetings, reviews, and evaluations. This section also details the review and incorporation of existing plans, studies, reports, and technical information.
4. Section 4 contains the **Hazard Identification and Risk Assessment (HIRA)**. This section provides detailed descriptions and a corresponding analysis for each hazard that could potentially affect Miami County. The nature, location, extent, historical impact, vulnerability, and likelihood of occurrence for each hazard are provided for each hazard. These analyses include the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas; an estimate of the potential dollar losses to vulnerable structures; and a general description of land uses and development trends within the community.
5. The goals, strategies, and actions for the County are then outlined in Section 5, **Hazard Mitigation**. The proposed actions are presented in tables, categorized by the associated hazard and community, and then ranked from highest to lowest priority based on feedback received from County officials and participating jurisdictions and stakeholders. Excluded hazards are also documented in this section, along with the rationale for exclusion from the Plan.
6. The final section of this Plan, **Schedule and Maintenance**, provides a summary of the proposed Plan adoption, integration, and maintenance schedule. This section describes how the Region will review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within five years in order to continue to be eligible for mitigation project grant funding.

The resulting Miami County Hazard Mitigation Plan will be submitted to the Ohio Emergency Management Agency (OEMA) and subsequently FEMA for their review. Following the agency review, the jurisdictions will then review the Plan for adoption. This hazard mitigation plan serves as a helpful tool for citizens, policymakers, local businesses, and other local stakeholders who all share a public interest in keeping Miami County as safe and resilient as possible. As such, this Plan aims to:

- Minimize property damage, economic loss, injury, and loss of human life – to achieve the Plan's main goal of reducing the impact of natural and manmade hazards on the County's economy and the well-being of its citizens.
- Enhance public awareness and education – to widen the public's understanding of natural and manmade hazards and how they might affect public health and safety, the environment, the local economy, and basic day-to-day operations.
- Coordinate inter-jurisdictional preparedness measures – to encourage and ensure multi-jurisdictional cooperation in County-wide mitigation actions and programs so that they may be implemented efficiently and effectively.
- Provide decision-making tools for interested stakeholders – to formulate a comprehensive, updated analysis of Miami County's vulnerability to hazards so that decision-makers can better prepare for natural and manmade disasters.

- Achieve regulatory compliance – to ensure that the County and its political subdivisions meet state and federal mitigation planning requirements so that they may be eligible to participate in and receive funding from grant programs, policies, and regulations.

1.2 Setting

Miami County is in the western region of Ohio and has a total area of approximately 410 square miles. The County contains 10 villages, two cities, two partial cities, and 12 townships (**Table 1.2**). The City of Troy serves as the County seat. Miami County is bounded by five counties: Shelby County to the north, Champaign County to the northeast, Clark County to the southeast, Montgomery County to the south, and Darke County to the west.

Land use patterns in Miami County are currently being determined. Land cover in Miami County is shown in **Figure 1.3**. Land cover types include wetlands, unclassified, shrub/scrub, open water, herbaceous, crops and pasture, developed, forest, and barren land

1.3 Region Features

1.3.1 Transportation

Miami County contains several major roadways, including Interstates (I), US Routes (US) and State Routes (SR). Major roadways in Miami County include: SR-41, SR-48, SR-49, SR-55, SR-66, SR-185, SR-201, SR-202, SR-571, SR-589, SR-718, SR-721, US-36, US-40, I-75. Miami County contains 40.0 miles of interstates, 31.4 miles of US routes and 209.5 miles of state routes.

The Ohio Department of Transportation (ODOT) has record of two airports in Miami County, as well as two nearby airports in Montgomery County which are listed in **Table 1.3** below. There are four helipads in Miami County – one in the City of Piqua, one in the City of Tipp City, and two in the City of Troy.

Table 1.3: Aviation Facilities in Miami County, Ohio

Facility Name	Location	Facility Type	Ownership/Use Type
Hartzell Field	City of Piqua	Airport	Public
Troy Skypark	City of Troy	Airport	Private
Phillipsburg	Village of Phillipsburg (Montgomery)	Airport	Private
Dayton International	City of Dayton (Montgomery)	Airport	Public
Miami Valley Hospital	City of Troy	Heliport	Private (Healthcare)
Kettering Health Network	City of Troy	Heliport	Private (Healthcare)
Kettering Health Network	City of Piqua	Heliport	Private (Healthcare)
Private Helipad	City of Tipp City	Heliport	Private

The Ohio Department of Transportation (ODOT) has record of one active rail line in Miami County, which is operated by CSX Transportation. This is a freight line that runs primarily north-south through the cities of Troy, Piqua, and Tipp City. The line closely follows I-75 in Miami County.

1.3.2 Natural Features

Table 1.4, below, principal streams and water bodies in the Region. (Source: ODNR)

Table 1.4: Miami County Streams and Water Bodies

Water Body	
Great Miami River	Stillwater River
Ludlow Creek	Brush Creek
Canyon Run	Lost Creek
Spring Creek	Dry Creek
Indian Creek	Honey Creek
Pleasant Run	Painter Creek

Miami County also has several parks and nature areas which are listed in **Table 1.5** below.

Table 1.5: Parks & Nature Areas in Miami County, Ohio

Name	
Greenville Falls Scenic River Area	Stillwater Scenic River
Thomas B. Kyle Memorial Park	Great Miami River
Stillwater Prairie Reserve	Honey Creek Preserve
Paul G. Duke Park	Archer Park
Miami County Fairgrounds	Hobart Urban Nature Preserve

Figure 1.2: Miami County Land Use Map

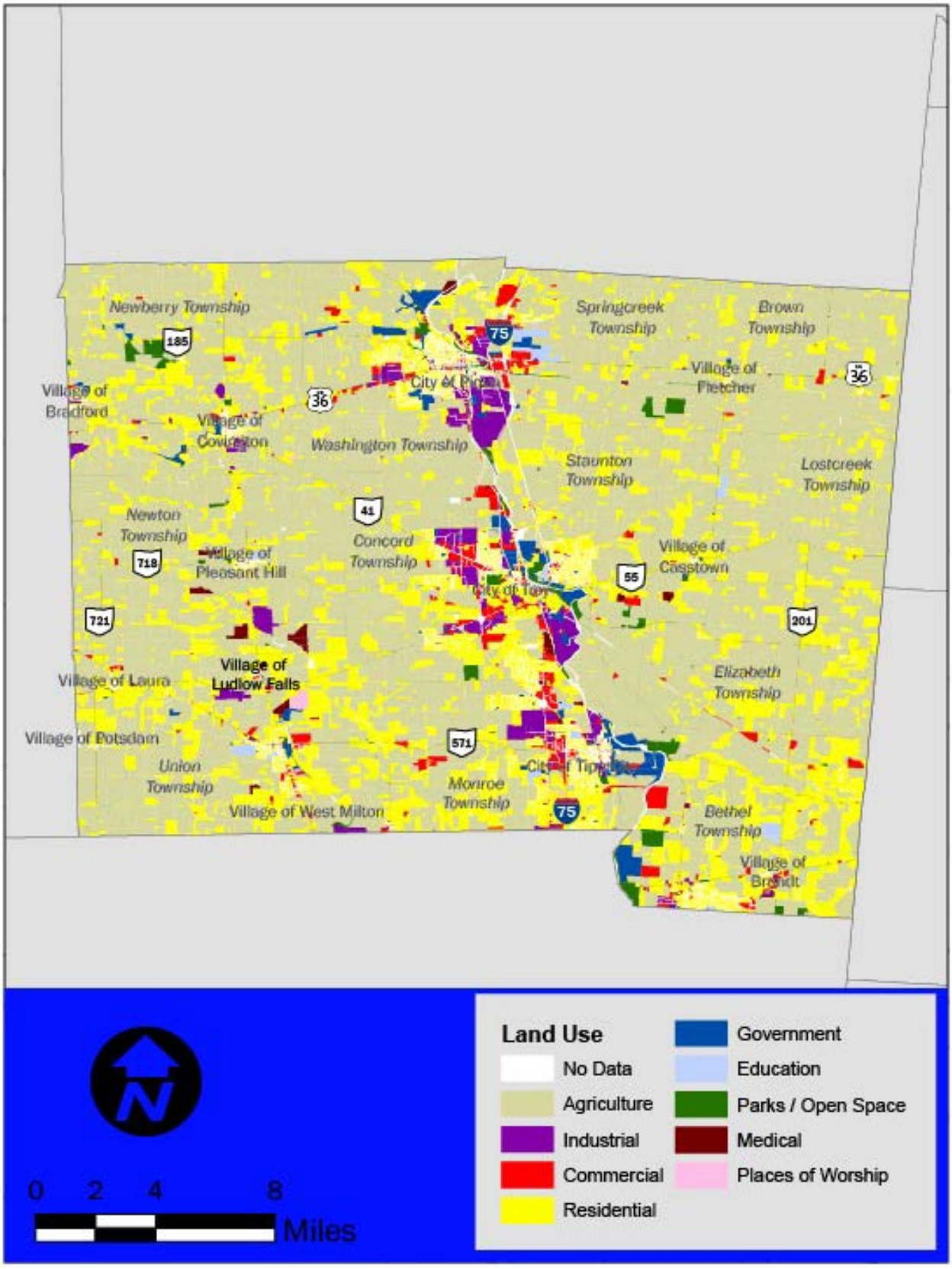
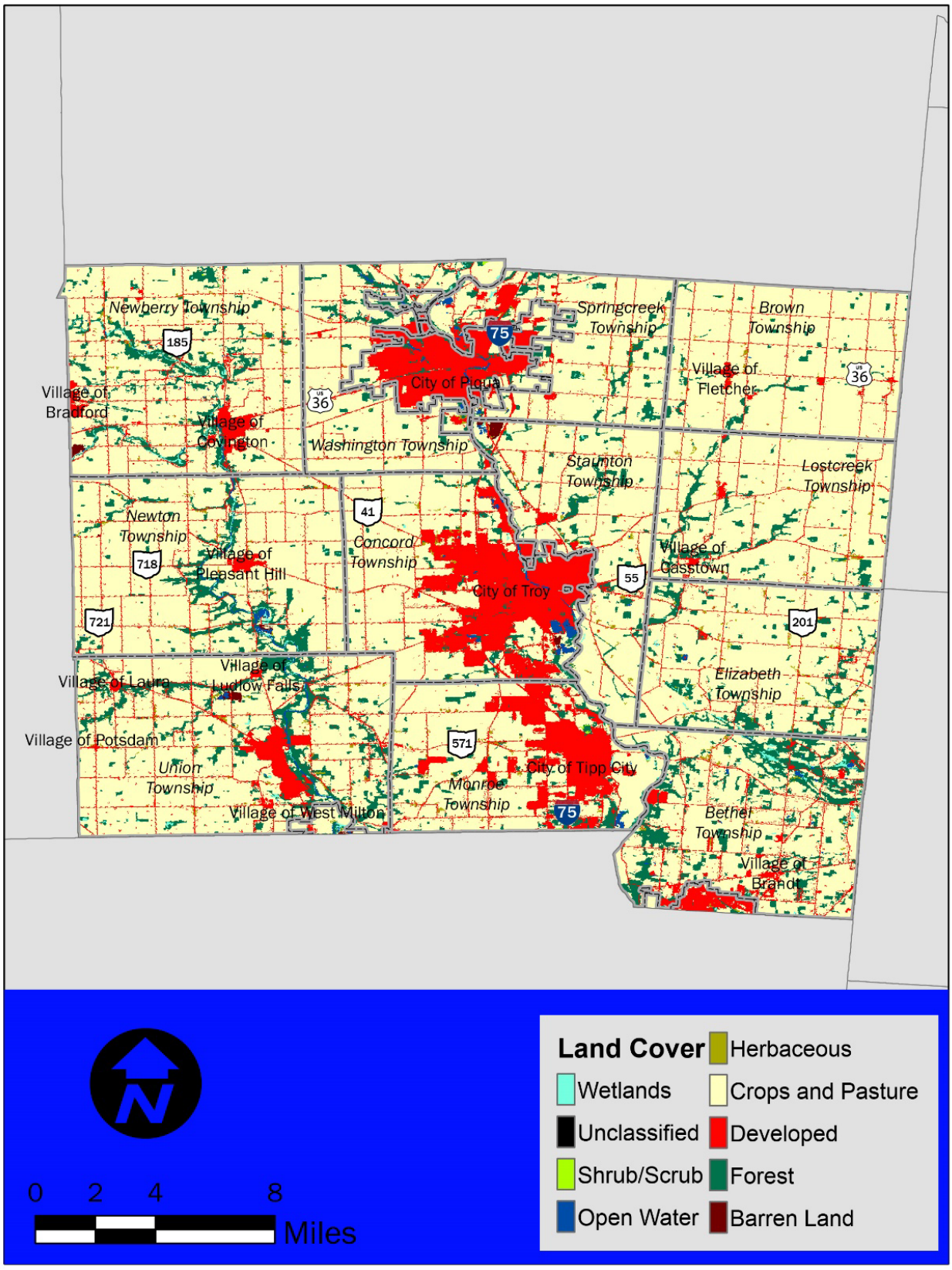


Figure 1.3: Miami County Land Cover Map



02 | History and Demographics

HISTORY AND DEMOGRAPHICS

2.1 History

Miami County was created in 1807. The name "Miami" comes from the Miami Tribe of Native Americans. The word "Miami" in an indigenous language means "Mother". Many of the early settlers of Troy, the county seat, were from Virginia and Kentucky. During the Civil War the City of Troy was a station for the Underground Railroad. Troy was once known for its wagon and buggy shops.

The City of Piqua was named by the clan of the Shawnee in their Creighton Myth meaning "man who arose from the ashes". Tipp City was originally named Tippecanoe in honor of William Henry Harrison whose campaign slogan was "Tippecanoe and Tyler Too". John Clark developed Tippecanoe in 1840 and purposely situated the town to take advantage of the traffic on the Miami and Erie Canal. The Tipp Roller Mill is situated at Lock #15 on the canal.

Figure 2.1: Eldean Covered Bridge

The Eldean Covered Bridge (Figure 2.1) is one of only two "long truss" covered bridges remaining in the County. It was built in 1860 and spans the Great Miami River at 224 feet in length. The bridge was placed on the Register of Historic Places in 1975. The 1869 home of former slave York Ryal still stands as a monument to freedom as it tells the history of the 383 slaves freed by John Randolph of The Roanoke Plantation in Virginia; their journey north; and the injustices they endured.

The Quakers also played a large role in Miami County history from their religious freedom to being a part of the Underground Railroad.

2.2 Communication Outlets

Miami County's primary communication outlets including websites, television, and social media are listed in **Table 2.1**, below:

Table 2.1: Communication outlets and social media

Communication Type	Source
Website	Miami County: https://www.co.miami.oh.us/ Miami County EMA: https://co.miami.oh.us/753/EMA Miami County Public Health: https://www.miamicountyhealth.net/ Miami Valley Chapter of the American Red Cross: https://www.redcross.org/local/ohio/central-and-southern-ohio/about-us/locations/miami-valley-chapter.html Miami Valley Fire/EMS Alliance: https://mvfea.com/
Twitter	Miami County: https://twitter.com/visitmiamico Miami County EMA: https://twitter.com/miamicountyema Miami County Public Health: https://twitter.com/miamicountyph

Communication Type	Source
Facebook	Miami County EMA: https://www.facebook.com/Miami-County-OH-Emergency-Management-Agency-1404960299787419/ Miami County Public Health: https://www.facebook.com/MiamiCountyPublicHealth/ Miami County Sherriff's Office: https://www.facebook.com/miamicountysherifftroy/
News/Newspaper	Dayton Daily News: https://www.daytondailynews.com/community/miami-county/ Miami Valley Today: https://www.miamivalleytoday.com/

2.3 Demographics Overview

Table 2.2, below, provides a summary of the total population changes that have occurred in Miami County between the 2010 U.S. Census and the 2020 U.S. Census. According to the U.S. Census, Miami County's population increased by 6,268 people (6.1% percent) between 2010 and 2019. All but five townships experienced population decline. The five townships with population growth include Concord, Newton, Spring Creek, Staunton, and Union Townships. Of the townships experiencing population decline, Washington Township experienced the greatest population decline, with a decrease of 73 people (4.6 percent).

A more detailed description of population, housing, and income demographics for Miami County and each jurisdiction is discussed on the following pages. Due to the COVID-19 pandemic on data collection, 2020 ACS housing and income estimates were unavailable.

Table 2.2: County/Incorporated Places population growth estimates between 2010 and 2020

County/Township	Total Population 2010 Census	Total Population 2020 Census	2010-2020	
			Population Change	Percent Change
Miami County	**102,506**	**108,774**	**6,268**	**6.1**
Bethel Township	4,843	4,758	-85	-1.7
Brown Township	1,595	1,585	-10	-0.6
Concord Township	30,353	37,417	7,064	23.3
Elizabeth Township	1,648	1,686	-38	-2.3
Lost Creek Township	1,676	1,606	-70	-4.2
Monroe Township	15,553	16,114	-561	-3.6
Newberry Township	6,449	6,395	-54	-0.8
Newton Township	3,399	3,516	117	3.4
Spring Creek Township	1,948	2,144	196	10.1
Staunton Township	2,090	2,439	349	16.7
Union Township	9,871	9,569	302	3.1
Washington Township	1,576	1,503	-73	-4.6

2.4 Community Profiles

2.4.1 Miami County

Tables 2.3 to 2.5 summarize Miami County's population, housing statistics, and income statistics. The tables show that the County's population increased by 6,268 people (6.11 percent) from 2011 to 2019. For housing units, the County had a combined owned and rental housing vacancy rate of 5.7 percent. Related to income, the largest percentage of households (18.7 percent) had an income between $50,000 and $74,999; approximately 27.6 percent of households had an annual income of greater than $100,000.

Table 2.3: Miami County Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	102,734
2012 ACS Estimate	102,934
2013 ACS Estimate	103,213
2014 ACS Estimate	103,856
2015 ACS Estimate	104,075
2016 ACS Estimate	104,553
2017 ACS Estimate	105,200
2018 ACS Estimate	106,042
2019 ACS Estimate	106,987

Table 2.4: Miami County Housing Statistics 2020

Housing Statistics	Number
Total Housing Units	46,766
Occupied Housing Units (Owned & Rented)	94.3%
Vacant Housing Units (Owned & Rented)	5.7%

Table 2.5: Miami County Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	4.0%
$10,000 to $14,999	3.7%
$15,000 to $24,999	10.5%
$25,000 to $34,999	8.7%
$35,000 to $49,999	12.8%
$50,000 to $74,999	18.7%
$75,000 to $99,999	13.9%
$100,000 to $149,999	18.4%
$150,000 to $199,999	5.0%
$200,000 or more	4.2%
Median Household Income	$61,041
Mean Household Income	$77,607

2.4.2 City of Huber Heights (partial)

Tables 2.6 to 2.8 summarize the City of Huber Height's population, housing statistics, and income statistics. The tables show that the City's population increased by 89 people (0.2 percent) from 2011 to 2019. For housing units, the City had a combined owned and rental housing vacancy rate of 4.3 percent. Related to income, the largest percentage of households (20.6 percent) had an income between $50,000 and $74,999; approximately 7.0 percent of households had an annual income of less than $15,000.

Table 2.6: City of Huber Heights Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	38,065
2012 ACS Estimate	38,055
2013 ACS Estimate	38,057
2014 ACS Estimate	37,998
2015 ACS Estimate	37,979
2016 ACS Estimate	38,013
2017 ACS Estimate	38,074
2018 ACS Estimate	38,127
2019 ACS Estimate	38,154

Table 2.7: City of Huber Heights Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	17,816
Occupied Housing Units (Owned & Rented)	95.6%
Vacant Housing Units (Owned & Rented)	4.3%

Table 2.8: City of Huber Heights Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	4.8%
$10,000 to $14,999	2.2%
$15,000 to $24,999	8.0%
$25,000 to $34,999	9.7%
$35,000 to $49,999	14.7%
$50,000 to $74,999	20.6%
$75,000 to $99,999	17.8%
$100,000 to $149,999	15.8%
$150,000 to $199,999	4.0%
$200,000 or more	2.3%
Median Household Income	$62,461
Mean Household Income	$72,831

2.4.3 City of Piqua

Tables 2.9 to 2.11 summarize the City of Piqua's population, housing statistics, and income statistics. The tables show that the City's population increased by 791 people (3.9 percent) from 2011 to 2019. For housing units, the City had a combined owned and rental housing vacancy rate of 7.7 percent. Related to income, the largest percentage of households (17.7 percent) had an income between $50,000 and $74,999; approximately 12.1 percent of households had an annual income of less than $15,000.

Table 2.9: City of Piqua Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	20,541
2012 ACS Estimate	20,576
2013 ACS Estimate	20,625
2014 ACS Estimate	20,745
2015 ACS Estimate	20,782
2016 ACS Estimate	20,870
2017 ACS Estimate	20,991
2018 ACS Estimate	21,150
2019 ACS Estimate	21,332

Table 2.10: City of Piqua Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	9,205
Occupied Housing Units (Owned & Rented)	92.2%
Vacant Housing Units (Owned & Rented)	7.7%

Table 2.11: City of Piqua Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	7.3%
$10,000 to $14,999	4.8%
$15,000 to $24,999	13.2%
$25,000 to $34,999	15.4%
$35,000 to $49,999	16.6%
$50,000 to $74,999	17.7%
$75,000 to $99,999	10.8%
$100,000 to $149,999	10.4%
$150,000 to $199,999	3.2%
$200,000 or more	0.6%
Median Household Income	$43,061
Mean Household Income	$55,865

2.4.4 City of Tipp City

Tables 2.12 to 2.14 summarize the City of Tipp City's population, housing statistics, and income statistics. The tables show that the City's population increased by 416 people (4.3 percent) from 2011 to 2019. For housing units, the City had a combined owned and rental housing vacancy rate of 4.1 percent. Related to income, the largest percentage of households (19.7 percent) had an income between $50,000 and $74,999; approximately 6.9 percent of households had an annual income of less than $15,000.

Table 2.12: City of Tipp City Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	9,699
2012 ACS Estimate	9,718
2013 ACS Estimate	9,748
2014 ACS Estimate	9,810
2015 ACS Estimate	9,834
2016 ACS Estimate	9,881
2017 ACS Estimate	9,944
2018 ACS Estimate	10,024
2019 ACS Estimate	10,115

Table 2.13: City of Tipp City Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	4,373
Occupied Housing Units (Owned & Rented)	95.9%
Vacant Housing Units (Owned & Rented)	4.1%

Table 2.14: City of Tipp City Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	4.5%
$10,000 to $14,999	2.4%
$15,000 to $24,999	5.9%
$25,000 to $34,999	8.7%
$35,000 to $49,999	11.9%
$50,000 to $74,999	19.7%
$75,000 to $99,999	15.1%
$100,000 to $149,999	15.7%
$150,000 to $199,999	7.9%
$200,000 or more	8.4%
Median Household Income	$69,881
Mean Household Income	$98,381

2.4.5 City of Troy

Tables 2.15 to 2.17 summarize the City of Troy's population, housing statistics, and income statistics. The tables show that the City's population increased by 1,041 people (4.1 percent) from 2011 to 2019. For housing units, the City had a combined owned and rental housing vacancy rate of 13.5 percent. Related to income, the largest percentage of households (19.5 percent) had an income between $50,000 and $74,999; approximately 10.6 percent of households had an annual income of less than $15,000.

Table 2.15: City of Troy Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	25,240
2012 ACS Estimate	25,290
2013 ACS Estimate	25,363
2014 ACS Estimate	25,519
2015 ACS Estimate	25,574
2016 ACS Estimate	25,692
2017 ACS Estimate	25,848
2018 ACS Estimate	26,052
2019 ACS Estimate	26,281

Table 2.16: City of Troy Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	11,859
Occupied Housing Units (Owned & Rented)	94.4%
Vacant Housing Units (Owned & Rented)	5.6%

Table 2.17: City of Troy Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	6.8%
$10,000 to $14,999	3.8%
$15,000 to $24,999	10.6%
$25,000 to $34,999	8.8%
$35,000 to $49,999	15.6.%
$50,000 to $74,999	19.5%
$75,000 to $99,999	12.7%
$100,000 to $149,999	14.7%
$150,000 to $199,999	4.2%
$200,000 or more	3.4%
Median Household Income	$54,161
Mean Household Income	$70,973

2.4.6 Village of Bradford

Tables 2.18 to 2.20 summarize the Village of Bradford's population, housing statistics, and income statistics. The tables show that the Village's population increased by 7 people (0.37 percent) from 2011 to 2019. For housing units, the Village had a combined owned and rental housing vacancy rate of 7.3 percent. Related to income, the largest percentage of households (22.6 percent) had an income between $50,000 and $74,999; approximately 10.1 percent of households had an annual income of less than $15,000.

Table 2.18: Village of Bradford Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	1,859
2012 ACS Estimate	1,857
2013 ACS Estimate	1,855
2014 ACS Estimate	1,859
2015 ACS Estimate	1,857
2016 ACS Estimate	1,855
2017 ACS Estimate	1,860
2018 ACS Estimate	1,862
2019 ACS Estimate	1,866

Table 2.19: Village of Bradford Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	743
Occupied Housing Units (Owned & Rented)	92.7%
Vacant Housing Units (Owned & Rented)	7.3%

Table 2.20: Village of Bradford Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	4.6%
$10,000 to $14,999	5.5%
$15,000 to $24,999	6.6%
$25,000 to $34,999	13.2%
$35,000 to $49,999	17.1%
$50,000 to $74,999	22.6%
$75,000 to $99,999	14.6%
$100,000 to $149,999	12.8%
$150,000 to $199,999	2.2%
$200,000 or more	0.9%
Median Household Income	$51,895
Mean Household Income	$60,825

2.4.7 Village of Casstown

Tables 2.21 to 2.23 summarize the Village of Casstown's population, housing statistics, and income statistics. The tables show that the Village's population increased by 11 people (4.1 percent) from 2011 to 2019. For housing units, the Village had a combined owned and rental housing vacancy rate of 12.8 percent. Related to income, the largest percentage of households (21.6 percent) had an income between $25,000 and $34,999; approximately 1.1 percent of households had an annual income of less than $15,000.

Table 2.21: Village of Casstown Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	267
2012 ACS Estimate	268
2013 ACS Estimate	269
2014 ACS Estimate	268
2015 ACS Estimate	269
2016 ACS Estimate	272
2017 ACS Estimate	274
2018 ACS Estimate	273
2019 ACS Estimate	278

Table 2.22: Village of Casstown Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	125
Occupied Housing Units (Owned & Rented)	87.2%
Vacant Housing Units (Owned & Rented)	12.8%

Table 2.23: Village of Casstown Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	0.0%
$10,000 to $14,999	1.1%
$15,000 to $24,999	20.5%
$25,000 to $34,999	21.6%
$35,000 to $49,999	12.5%
$50,000 to $74,999	20.5%
$75,000 to $99,999	19.3%
$100,000 to $149,999	4.5%
$150,000 to $199,999	0.0%
$200,000 or more	0.0%
Median Household Income	$45,833
Mean Household Income	$51,108

2.4.8 Village of Covington

Tables 2.24 to 2.26 summarize the Village of Covington's population, housing statistics, and income statistics. The tables show that the Village's population increased by 102 people (3.9 percent) from 2011 to 2019. For housing units, the Village had a combined owned and rental housing vacancy rate of 8.7 percent. Related to income, the largest percentage of households (22.2 percent) had an income between $50,000 and $74,999; approximately 9.9 percent of households had an annual income of less than $15,000.

Table 2.24: Village of Covington Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	2,606
2012 ACS Estimate	2,610
2013 ACS Estimate	2,616
2014 ACS Estimate	2,632
2015 ACS Estimate	2,637
2016 ACS Estimate	2,648
2017 ACS Estimate	2,663
2018 ACS Estimate	2,685
2019 ACS Estimate	2,708

Table 2.25: Village of Covington Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	1,135
Occupied Housing Units (Owned & Rented)	91.3%
Vacant Housing Units (Owned & Rented)	8.7%

Table 2.26: Village of Covington Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	4.1%
$10,000 to $14,999	5.8%
$15,000 to $24,999	16.3%
$25,000 to $34,999	8.3%
$35,000 to $49,999	13.0%
$50,000 to $74,999	22.2%
$75,000 to $99,999	14.0%
$100,000 to $149,999	12.0%
$150,000 to $199,999	2.0%
$200,000 or more	1.5%
Median Household Income	$50,842
Mean Household Income	$59,903

2.4.9 Village of Fletcher

Tables 2.27 to 2.29 summarize the Village of Fletcher's population, housing statistics, and income statistics. The tables show that the Village's population increased by 15 people (3.2 percent) from 2011 to 2019. For housing units, the Village had a combined owned and rental housing vacancy rate of 8.0 percent. Related to income, the largest percentage of households (23.6 percent) had an income between $75,000 and $94,999; approximately 5.5 percent of households had an annual income of less than $15,000.

Table 2.27: Village of Fletcher Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	468
2012 ACS Estimate	468
2013 ACS Estimate	467
2014 ACS Estimate	470
2015 ACS Estimate	471
2016 ACS Estimate	473
2017 ACS Estimate	476
2018 ACS Estimate	480
2019 ACS Estimate	483

Table 2.28: Village of Fletcher Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	187
Occupied Housing Units (Owned & Rented)	92.0%
Vacant Housing Units (Owned & Rented)	8.0%

Table 2.29: Village of Fletcher Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	3.9%
$10,000 to $14,999	1.6%
$15,000 to $24,999	16.5%
$25,000 to $34,999	2.4%
$35,000 to $49,999	15.0%
$50,000 to $74,999	17.3%
$75,000 to $99,999	23.6%
$100,000 to $149,999	13.4%
$150,000 to $199,999	4.7%
$200,000 or more	1.6%
Median Household Income	$63,438
Mean Household Income	$82,982

2.4.10 Village of Laura

Tables 2.30 to 2.32 summarize the Village of Laura's population, housing statistics, and income statistics. The tables show that the Village's population increased by 21 people (4.4 percent) from 2011 to 2019. For housing units, the Village had a combined owned and rental housing vacancy rate of 7.7 percent. Related to income, the largest percentage of households (26.8 percent) had an income between $50,000 and $74,999; approximately 3.2 percent of households had an annual income of less than $15,000.

Table 2.30: Village of Laura Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	473
2012 ACS Estimate	474
2013 ACS Estimate	475
2014 ACS Estimate	478
2015 ACS Estimate	479
2016 ACS Estimate	481
2017 ACS Estimate	484
2018 ACS Estimate	485
2019 ACS Estimate	494

Table 2.31: Village of Laura Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	182
Occupied Housing Units (Owned & Rented)	92.3%
Vacant Housing Units (Owned & Rented)	7.7%

Table 2.32: Village of Laura Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	1.6%
$10,000 to $14,999	1.6%
$15,000 to $24,999	8.2%
$25,000 to $34,999	9.3%
$35,000 to $49,999	14.2%
$50,000 to $74,999	26.8%
$75,000 to $99,999	17.5%
$100,000 to $149,999	14.8%
$150,000 to $199,999	3.8%
$200,000 or more	2.2%
Median Household Income	$56,875
Mean Household Income	$71,587

2.4.11 Village of Ludlow Falls

Tables 2.33 to 2.35 summarize the Village of Ludlow Falls' population, housing statistics, and income statistics. The tables show that the Village's population declined by 8 people (3.8 percent) from 2011 to 2019. For housing units, the Village had a combined owned and rental housing vacancy rate of 6.2 percent. Related to income, the largest percentage of households (36.0 percent) had an income between $50,000 and $74,999; approximately 5.6 percent of households had an annual income of less than $15,000.

Table 2.33: Village of Ludlow Falls Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	208
2012 ACS Estimate	209
2013 ACS Estimate	209
2014 ACS Estimate	210
2015 ACS Estimate	211
2016 ACS Estimate	212
2017 ACS Estimate	213
2018 ACS Estimate	215
2019 ACS Estimate	216

Table 2.34: Village of Ludlow Falls Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	81
Occupied Housing Units (Owned & Rented)	93.8%
Vacant Housing Units (Owned & Rented)	6.2%

Table 2.35: Village of Ludlow Falls Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	2.2%
$10,000 to $14,999	3.4%
$15,000 to $24,999	5.6%
$25,000 to $34,999	14.6%
$35,000 to $49,999	6.7%
$50,000 to $74,999	36.0%
$75,000 to $99,999	11.2%
$100,000 to $149,999	14.6%
$150,000 to $199,999	5.6%
$200,000 or more	0.0%
Median Household Income	$59,875
Mean Household Income	$64,538

2.4.12 Village of Pleasant Hill

Tables 2.36 to 2.38 summarize the Village of Pleasant Hill's population, housing statistics, and income statistics. The tables show that the Village's population increased by 50 people (4.2 percent) from 2011 to 2019. For housing units, the Village had a combined owned and rental housing vacancy rate of 6.7 percent. Related to income, the largest percentage of households (24.3 percent) had an income between $50,000 and $74,999; approximately 4.2 percent of households had an annual income of less than $15,000.

Table 2.36: Village of Pleasant Hill Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	1,204
2012 ACS Estimate	1,207
2013 ACS Estimate	1,210
2014 ACS Estimate	1,218
2015 ACS Estimate	1,220
2016 ACS Estimate	1,225
2017 ACS Estimate	1,233
2018 ACS Estimate	1,242
2019 ACS Estimate	1,254

Table 2.37: Village of Pleasant Hill Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	508
Occupied Housing Units (Owned & Rented)	93.3%
Vacant Housing Units (Owned & Rented)	6.7%

Table 2.38: Village of Pleasant Hill Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	2.9%
$10,000 to $14,999	1.3%
$15,000 to $24,999	8.6%
$25,000 to $34,999	9.0%
$35,000 to $49,999	19.1%
$50,000 to $74,999	24.3%
$75,000 to $99,999	17.3%
$100,000 to $149,999	14.9%
$150,000 to $199,999	1.3%
$200,000 or more	1.3%
Median Household Income	$57,794
Mean Household Income	$65,436

2.4.13 Village of Potsdam

Tables 2.39 to 2.41 summarize the Village of Potsdam's population, housing statistics, and income statistics. The tables show that the Village's population increased by 9 people (3.1 percent) from 2011 to 2019. For housing units, the Village had a combined owned and rental housing vacancy rate of 12.2 percent. Related to income, the largest percentage of households (31.5 percent) had an income between $50,000 and $74,999; approximately 5.4 percent of households had an annual income of less than $15,000.

Table 2.39: Village of Potsdam Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	288
2012 ACS Estimate	289
2013 ACS Estimate	290
2014 ACS Estimate	291
2015 ACS Estimate	289
2016 ACS Estimate	291
2017 ACS Estimate	292
2018 ACS Estimate	294
2019 ACS Estimate	297

Table 2.40: Village of Potsdam Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	98
Occupied Housing Units (Owned & Rented)	87.7%
Vacant Housing Units (Owned & Rented)	12.2%

Table 2.41: Village of Potsdam Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	1.8%
$10,000 to $14,999	3.6%
$15,000 to $24,999	8.1%
$25,000 to $34,999	13.5%
$35,000 to $49,999	23.4%
$50,000 to $74,999	31.5%
$75,000 to $99,999	15.3%
$100,000 to $149,999	1.8%
$150,000 to $199,999	0.9%
$200,000 or more	0.0%
Median Household Income	$49,844
Mean Household Income	$53,641

2.4.14 Village of Union City (partial)

Tables 2.42 to 2.44 summarize the Village of Union City's population, housing statistics, and income statistics. The tables show that the Village's population increased by 451 people (7.0 percent) from 2011 to 2019. For housing units, the Village had a combined owned and rental housing vacancy rate of 15.5 percent. Related to income, the largest percentage of households (24.7 percent) had an income between $50,000 and $74,999; approximately 4.9 percent of households had an annual income of less than $15,000.

Table 2.42: Village of Union City Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	6,440
2012 ACS Estimate	6,442
2013 ACS Estimate	6,444
2014 ACS Estimate	6,448
2015 ACS Estimate	6,532
2016 ACS Estimate	6,607
2017 ACS Estimate	6,642
2018 ACS Estimate	6,773
2019 ACS Estimate	6,891

Table 2.43: Village of Union City Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	743
Occupied Housing Units (Owned & Rented)	84.5%
Vacant Housing Units (Owned & Rented)	15.5%

Table 2.44: Village of Union City Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	0.0%
$10,000 to $14,999	4.9%
$15,000 to $24,999	4.9%
$25,000 to $34,999	10.1%
$35,000 to $49,999	10.8%
$50,000 to $74,999	24.7%
$75,000 to $99,999	18.9%
$100,000 to $149,999	15.3%
$150,000 to $199,999	5.8%
$200,000 or more	4.6%
Median Household Income	$70,360
Mean Household Income	$80,248

2.4.15 Village of West Milton

Tables 2.45 to 2.47 summarize the Village of West Milton's population, housing statistics, and income statistics. The tables show that the Village's population increased by 135 people (2.9 percent) from 2011 to 2019. For housing units, the Village had a combined owned and rental housing vacancy rate of 5.6 percent. Related to income, the largest percentage of households (22.2 percent) had an income between $25,000 and $34,999; approximately 7.3 percent of households had an annual income of less than $15,000.

Table 2.45: Village of West Milton Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	4,657
2012 ACS Estimate	4,655
2013 ACS Estimate	4,655
2014 ACS Estimate	4,659
2015 ACS Estimate	4,679
2016 ACS Estimate	4,690
2017 ACS Estimate	4,693
2018 ACS Estimate	4,729
2019 ACS Estimate	4,792

Table 2.46: Village of West Milton Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	2,147
Occupied Housing Units (Owned & Rented)	94.4%
Vacant Housing Units (Owned & Rented)	5.6%

Table 2.47: Village of West Milton Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	0.7%
$10,000 to $14,999	6.6%
$15,000 to $24,999	13.4%
$25,000 to $34,999	22.2%
$35,000 to $49,999	17.5%
$50,000 to $74,999	15.5%
$75,000 to $99,999	13.1%
$100,000 to $149,999	11.1%
$150,000 to $199,999	0.0%
$200,000 or more	0.0%
Median Household Income	$42,594
Mean Household Income	$51,642

03 | Planning Process

PLANNING PROCESS

3.1 Methodology

The Planning Process chapter describes the steps involved in the development of the 2022 Miami County Hazard Mitigation Plan, including details about who participated, how community involvement was organized and promoted throughout the community, what hazards were included in the Plan and why, as well as how stakeholder involvement played a critical role in the planning process. This chapter also explains how the Core Planning Committee was formed and how member feedback contributed to the updating of the County's Hazard Mitigation Plan.

3.2 Existing Plans and Regulations

Miami County and the State of Ohio maintain several plans and tools that were pertinent to reference in the development of the 2022 Hazard Mitigation Plan, including:

- 2017 Miami County Hazard Mitigation Plan
- Addendum to Miami County Hazard Mitigation Plan, Resolution No. 20-11-1439
- 2019 State of Ohio Hazard Mitigation Plan (SOHMP)
- 2019 Commodity Flow Study of Hazardous Materials, Miami County
- Miami County Comprehensive Plan 2006 Update
- Miami County Emergency Operations Plan, 2019
- Miami County Flood Damage Reduction Resolution
- Miami County Subdivision Regulations
- County-wide Zoning Resolutions

3.3 Miami County Authority to Adopt Plan

The Miami County Department of Development is composed of four sub-departments: building regulations, community development, economic development, and planning and zoning. The economic development department is responsible for demographics, site development, and workforce development. The community development department is responsible for Community Development Block Grant projects, Fair Housing compliance, and improving housing throughout the County. Building regulations include building permits, building code regulations, and residential permits. Planning and zoning include comprehensive planning, flood damage reduction resolutions, and County administered zoning.

County Commissioners are elected at large for four-year terms. Board responsibilities include financial management, management of county facilities, and personnel administration. The authority to adopt plans comes from statutory law and from Chapter 307 of the Ohio Revised Code.

Table 3.1 lists the existing authorities and regulations in place in Miami County and its municipalities.

Table 3.1: Existing Authorities and Regulations in Miami County's Municipalities

Community	Planning Commission	Comprehensive Plan	Floodplain Regulation	Building Codes*	Zoning Ordinances	Capital Budget	Public Works Budget
Miami County	Yes	Yes	Yes	Yes	Yes	Yes	Limited in-kind wages only
City of Huber Heights	Yes	Yes	Yes	Yes	Yes	(none)	Limited in-kind wages only
City of Piqua	Yes	Yes	Yes	Yes	Yes	(none)	Limited in-kind wages only
City of Tipp City	Yes	Yes	Yes	Yes	Yes	(none)	Limited in-kind wages only
City of Troy	Yes	Yes	Yes	Yes	Yes	(none)	Limited in-kind wages only
Village of Bradford	No	No	Yes	Yes	Yes	(none)	Limited in-kind wages only
Village of Casstown	No	No	Yes	Yes	Yes	(none)	Limited in-kind wages only
Village of Covington	Yes	No	Yes	Yes	Yes	(none)	Limited in-kind wages only
Village of Fletcher	No	No	Yes	Yes	No	(none)	Limited in-kind wages only
Village of Laura	No	No	Yes	Yes	Yes	(none)	Limited in-kind wages only
Village of Ludlow Falls	No	No	Yes	Yes	No	(none)	Limited in-kind wages only
Village of Pleasant Hill	Yes	No	Yes	Yes	Yes	(none)	Limited in-kind wages only
Village of Potsdam	No	No	Yes	Yes	No	(none)	Limited in-kind wages only
Village of Union City (partial)	No	No	Yes	Yes	Yes	(none)	Limited in-kind wages only
Village of West Milton	No	No	Yes	Yes	Yes	(none)	Limited in-kind wages only

* All jurisdictions within the state now follow the Ohio Building Code (Ohio Administrative Code 4101:1)

The Miami County Planning & Zoning Department administers county zoning for eight of the twelve townships in the county including: Concord, Monroe, Newberry, Newton, Springcreek, Staunton, Union and Washington Townships. The townships of Bethel, Brown, Elizabeth and Lostcreek administer their own zoning.

3.4 Notification Process

Core Planning Committee members were invited to participate at the beginning of the planning process through a Kickoff Meeting announcement. Prior to each additional meeting, members of the Core Planning Committee were invited to participate via an email notification sent by the Miami County EMA Director. Representatives included City/Village Mayors, City Managers, City Engineers, City/Village Administrators, Fire/EMS Chief, Public Safety Director, Project Managers, Management Analysts, Fiscal Officers, Utility Service Directors, Council Members, and Township Trustees. **Table 3.2** lists the participating jurisdictions and representatives and how they participated. Representatives from the following entities were invited to participate in the planning process:

Miami County

- Miami County Commissioners
- Miami County EMA
- Miami County Development Department
- Miami Conservancy District
- Miami County Park District
- Miami County Communications Center
- Miami County Auditor's Office
- Miami County Education Service Center
- Miami County Public Health
- Miami County Engineer's Office
- Miami Soil and Water Conservation District
- Miami County Sheriff's Office
- Miami County IT

City and Village Members

- City of Huber Heights
- City of Piqua
- City of Tipp City
- City of Troy
- Village of Union City
- Village of Bradford
- Village of Casstown
- Village of Covington
- Village of Fletcher
- Village of Laura
- Village of Ludlow Falls
- Village of Pleasant Hill
- Village of Potsdam
- Village of West Milton

Township Members

- Bethel Township
- Brown Township
- Concord Township
- Elizabeth Township
- Lost Creek Township
- Monroe Township
- Newberry Township
- Newton Township
- Spring Creek Township
- Stauton Township
- Union Township
- Washington Township

Other Organizations

- Ohio Emergency Management Agency
- Edison State Community College
- Miami County OSU Extension Office
- Tipp City Schools
- Troy City Schools
- Kettering Health
- Pioneer Electric
- United Way of Miami County
- Meijer Distribution
- AES Ohio

- Davita Kidney Care
- Spinnaker Coating
- New Path, Inc.
- Salvation Army
- Upper Valley Medical Center
- Hobart Brothers Company
- American Red Cross
- Independent News Media/Writer

Neighboring Counties

- Darke County
- Shelby County
- Champaign County
- Montgomery County
- Clark County

The public was invited to participate via public notices in the *Dayton Daily News, My Miami County Magazine,* as well as through social media posts on the Miami County EMA's Twitter and Facebook accounts, for both the November 2021 as well as the February 2022 meetings.

Table 3.2: Participating Jurisdictions

Community/ Organization	Region/ Group	Representative(s)	Surveys Completed			Meetings Attended		
			Goals & Hazard Priorities	Previous Mitigation Actions	New Mitigation Actions	1	2	Other
Miami County								
Miami County EMA	All	Joel Smith, Director	✓	✓	✓	✓	✓	
Miami County EMA	All	Mashell Stith, LEPC info coordinator	✓	NR		✓		
Miami County Administrator	North	Charlotte Colley, County Administrator	✓	NR		✓	✓	
Miami County Auditor's Office	Central	Amber Murray, real estate supervisor/ appraiser	✓	NR		✓	✓	
Miami County Commissioner	West	Greg Simmons, Miami County Commissioner		NR		✓		
Miami County Communications Center	Central	Jeffrey Busch, Director	✓	NR		✓		
Miami County Development Department	North	Dan Suerdieck, Planning & Zoning Manager	✓	✓		✓		
Miami County Education Service Center	Central			NR				
Miami County Engineer's Office	South	Paul P. Huelskamp, Miami County Engineer	✓	NR		✓		

Community/ Organization	Region/ Group	Representative(s)	Surveys Completed			Meetings Attended		
			Goals & Hazard Priorities	Previous Mitigation Actions	New Mitigation Actions	1	2	Other
Miami County Fire and EMS Chiefs' Association	-			NR				11/17/21
Miami County IT	West	Adam Emswiler	✓	NR		✓		
Miami County OSU Extension Office	South	Amanda Bennet, Extension Educator		NR		✓		
Miami County Park District	Central	J. Scott Myers, Executive Director	✓	NR				
Miami County Public Health	South	Nate Bednar, Director of Community Services	✓	NR				12/9/21
Miami County Sheriff's Office	West	Steve Lord, Chief Deputy	✓	✓		✓		
Cities and Villages								
City of Huber Heights	South			NR	✓			
City of Piqua	North	Amy Havenar, City Engineer	✓	NR	✓	✓		
City of Piqua	North	Chris Boeke. Health and Sanitation; Lee Adams		NR	✓	✓	✓	
City of Tipp City	South	Cameron Haller, Chief Emergency Services	✓	✓	✓	✓		
City of Troy	Central	Robin Oda, Mayor; Eric Krites, Asst Fire Chief; Stan Kegley, Project Manager; Nikki Reese, Community Development Manager	✓	NR	✓	✓	✓	
Village of Bradford	North	Ron Hoelscher	✓	NR	✓			
Village of Casstown	Central	Art Blackmore, Firefighter/former Chief	✓	NR	✓			
Village of Casstown	Central	Tim Schreadley	✓	NR	✓			
Village of Covington	North	Kyle Hinkelman, Village Administrator	✓	✓	✓	✓		
Village of Fletcher	North	Penny Reed, Mayor	✓	NR	✓	✓	✓	

Community/ Organization	Region/ Group	Representative(s)	Surveys Completed			Meetings Attended		
			Goals & Hazard Priorities	Previous Mitigation Actions	New Mitigation Actions	1	2	Other
Village of Laura	West	Kenneth James, Mayor	✓	✓	✓			
Village of Ludlow Falls	West	Chad Allen	✓	NR				
Village of Pleasant Hill	West			NR	✓		✓	
Village of Potsdam	West	Steve Post, Mayor	✓	NR	✓	✓		
Village of Union City	West			NR	✓			
Village of West Milton	West	Anthony Miller, Mayor; Jeff Sheridan, Village Manager	✓	NR	✓	✓	✓	
Townships								
Bethel Township	South	Andy Ehrhart, Fire Chief	✓	NR		✓		
Brown Township	North			NR				
Concord Township	Central	Neil Rhoades, Trustee; Don Pence, Trustee	✓	✓		✓	✓	
Elizabeth Township	Central	Randy Mott	✓	NR				
Lost Creek Township	Central	Samuel Buchman, Trustee; Walter Pemberton, Trustee	✓	NR		✓	✓	
Monroe Township	South	Philip Cox, Trustee	✓	NR		✓	✓	
Newberry Township	North	J. Jason Sargent, Chairman	✓	✓				
Newton Township	West			NR				
Spring Creek Township	North			NR				
Stauton Township	Central	Sarah Fine, Fiscal Officer	✓	NR		✓		
Stauton Township	Central	Michael Rindler, Trustee	✓	NR		✓		
Union Township	West	Dennis Albaugh, Phil Mote, Trustee Ty Dues, Supervisor	✓	NR		✓	✓	
Washington Township	North	Mikel R Brown	✓	NR				
Other								

Community/ Organization	Region/ Group	Representative(s)	Surveys Completed			Meetings Attended		
			Goals & Hazard Priorities	Previous Mitigation Actions	New Mitigation Actions	1	2	Other
Champaign County	Central	James Freeman, Director				✓		
Clark County	South	Ken Johnson, Deputy Director				✓		
Darke County	North							
Montgomery County	South							
Shelby County	North	Kristy Fryman, Director				✓		

NR = not required, as not all jurisdictions had a mitigation action defined in the previous plan.
*If representatives were unable to attend the in-person or digital Core Planning Committee meetings, they participated via "Other" formats, including online surveys, as documented in **Appendix G**.*

Core Planning Committee members were invited to participate at the beginning of the planning process through a Kickoff announcement which was sent out via email. Prior to each planning meeting, members of the Core Planning Committee were invited to participate in two formats - first via an email notification and calendar invite, and then via a packet that provided hard copies of the kickoff materials to jurisdictions that did not respond to the email invitation. Members of the public were encouraged to attend public meetings through press releases and social media announcements via Twitter and Facebook.

All kickoff materials and information regarding each individual planning meeting were made available on the project's website - www.burtonplanning.com/Miami-hmp. The website hosted informational handouts, meeting dates, WebEx connection links, agendas, presentations, surveys, meeting recordings, and contact information of consultant team members and the County EMA.

3.5 Meetings

The following section details the meetings that took place during the planning process. Documentation of each meeting, including newspaper postings, email announcements and attachments, meeting materials, and completed surveys, can be found in **Appendix G**.

3.5.1 Core Planning Committee Kick-off

A Kickoff Announcement was emailed to stakeholders on October 14, 2021 inviting them to participate in the 2022 Miami County Hazard Mitigation Plan update process as part of the Core Planning Committee. All kickoff materials were also made available on the project's website (www.burtonplanning.com/Miami-hmp).

The announcement outlined the following details regarding the planning process:

- Goals of the Hazard Mitigation Plan
- A summary of who is involved in the planning process

- Federal requirements of the hazard mitigation planning process
- An overview of the hazard mitigation planning process
- The proposed schedule for the Miami County Plan update
- The role of the Core Planning Committee in the update process
- Contact information for both Miami County EMA and Burton Planning Services (Consultant)
- Dates, times, and WebEx links of upcoming Core Planning and Public Meetings

For the Core Planning Committee Planning Meetings, the stakeholders were divided into four groups based on their geographical presence in the County. These groups were North, West, Central, and South groups. The list of jurisdictions and organizations in each group is provided in **Table 3.2**.

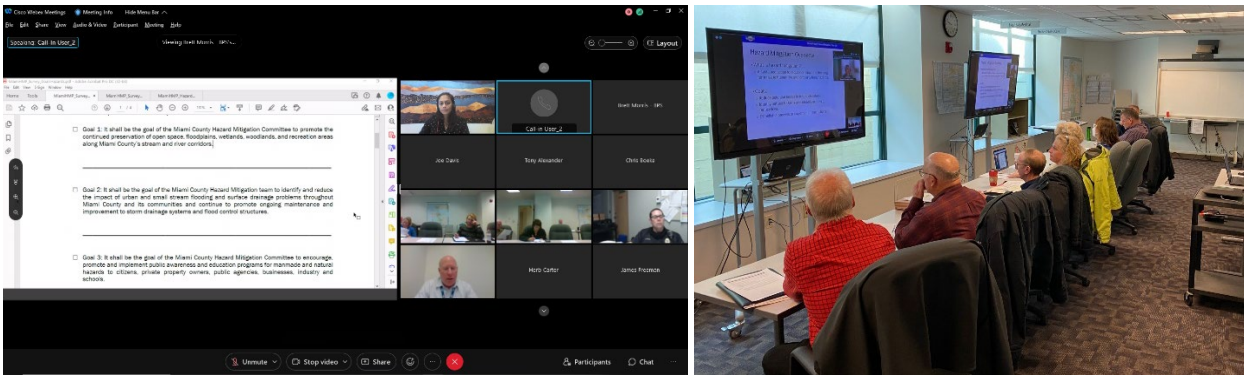
3.5.2 Core Planning Committee Meeting 1

The first Core Planning Committee meeting took place on Wednesday, November 17, 2021 and Thursday, November 18, 2021 at 9:30 AM and 1:00 PM on both days. Due to the ongoing pandemic, this meeting was held in a hybrid format, that is, participants could join the meetings by either attending in-person at the Hobart Government Building, 701 South Ridge Avenue, Troy, OH 45373, or by joining virtually using WebEx (**Figure 3.1**). Members of the Core Planning Committee that joined virtually were able to connect using the WebEx App on their phone or desktop or call into the meeting using a phone number. A total of 59 people attended the meeting, including three representatives from the Consultant team and the Director of the Miami County Emergency Management Agency.

The engagement process began by providing multiple options for participants to sign into the meetings. Physical sign-in sheets were available for those attending in-person. Participants attending virtually could sign in using the SurveyMonkey survey, via the chat function, or by sending an email or text to the County EMA. Participants were reminded multiple times throughout the course of the meeting to sign-in. The team also informed attendees that they could ask questions using the chat feature, or by unmuting themselves and asking their questions at any time throughout the meeting.

The meeting began with a presentation delivered by Ruchi Agarwal, Senior Planner at Burton Planning Services. Attendees were introduced to the fundamentals of the hazard mitigation planning process, including requirements of the plan update process, potential hazards that could be addressed, benefits of hazard mitigation planning, potential types of projects that could be federally funded as a result of the hazard mitigation plan, and the role that the Core Planning Committee would serve in the development of the 2022 Miami County Hazard Mitigation Plan.

Figure 3.1: Core Planning Meeting 1 held via WebEx and In-person



Following the completion of the presentation, Brett Morris, Resiliency Planner at Burton Planning Services, guided the attendees through two surveys, detailed below. Each participant was provided

multiple methods of completing the survey, including a physical hard copy of the survey (for in-person attendees), a fillable PDF that could be completed on their computer, or an online SurveyMonkey version. Links to survey locations were provided throughout the meeting. All meeting materials including links to the meeting recordings were made available on the project's website so attendees could compete surveys at their own pace.

1. Goals and Hazard Priority Survey:
Part 1 of this survey was to reflect on the goals included in the 2017 Hazard Mitigation Plan to determine if they were still relevant to the 2022 Plan. Each attendee reviewed the previous goals and determined if they were still applicable, provided comments or edits to the goals that needed changed, and suggested new goals to potentially be included in the Plan.

Discussion on the Goals Survey centered around the relevance of the previous goals. Attendees indicated a preference for adding goals related to hazardous materials incident response capability of the County, access to safe potable water, retrofitting critical facilities with disaster-resistant design practices and equipment, and making emergency shelters and facilities in the County ADA compliant.

Part 2 of this survey was to review all hazards that could be included in the 2022 Hazard Mitigation Plan and prioritize them. As such, attendees were asked to rate each hazard on a scale of zero to five, with five indicating that the hazard poses the greatest possible threat to the community and zero indicating that the hazard should not be included in the 2022 Plan. Attendees rated hazards that were included in the 2017 Hazard Mitigation Plan, as well as all potential hazards that could be included in the 2022 Plan.

Following the completion of this survey, a discussion continued on which hazards were deemed most important and which hazards attendees did not think needed to be included. Attendees emphasized on including 'non-hazardous mass transportation incidents' as a new hazard due to the County's proximity to Dayton International Airport and I-75. Attendees also recommended the addition of 'cyber threats and security issues' within the terrorism hazard.

2. Previous Mitigation Actions Status Survey
The purpose of the Previous Mitigation Actions Status Survey was to have attendees review the mitigation actions that were included in the 2017 Hazard Mitigation Plan, reflect on the status of each action, and determine if that action should be included in the 2022 Hazard Mitigation Plan.

3.5.3 Public Meeting 1

The first public meeting took place on Thursday, November 18, 2021 at 6:30 PM. Similar to the Core Planning Committee meetings, this meeting was held in a hybrid format with participants having the choice of attending in-person or virtually using WebEx. Stakeholders who were unable to attend the Core Planning Committee Meeting 1, were invited to attend the Public Meeting 1. A total of seven people attended the meeting, including two representatives from the Consultant team, as well as the Director and the LEPC Information Coordinator of the Miami County Emergency Management Agency.

The Public Meeting followed the same structure as the Core Planning Meeting 1 starting with sign-in forms, followed by introductions, delivery of the presentation, and finally completing the Goals and Hazard Priority Survey.

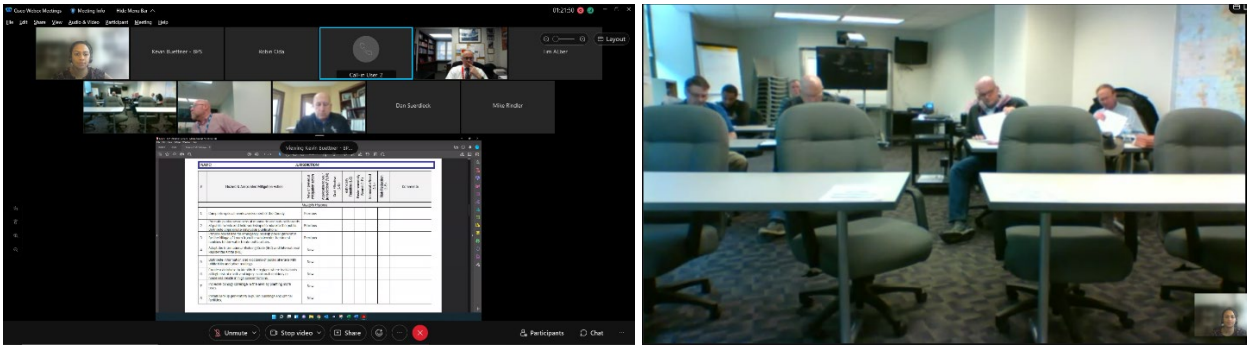
3.5.4 Core Planning Committee Meeting 2

The second Core Planning Committee meeting took place on Wednesday, February 16, 2022, and Thursday, February 17, 2022, at 9:30 AM and 1:00 PM on both days. Due to the ongoing pandemic,

this meeting was held in a hybrid format, that is, participants could join the meetings by either attending in-person at the Hobart Government Building, 701 South Ridge Avenue, Troy, OH 45373, or by joining virtually using WebEx (**Figure 3.2**). Members of the Core Planning Committee that joined virtually were able to connect using the WebEx App on their phone or desktop or call into the meeting using a phone number. A total of 43 people attended the meeting, including three representatives from the Consultant team and the Director of the Miami County Emergency Management Agency.

The meeting began with a brief introduction from Ruchi Agarwal, Senior Planner at Burton Planning Services. Ms. Agarwal then provided multiple options for participants to sign into the meetings, followed by a presentation which provided an update on the hazard mitigation planning process, including requirements of the planning process and results from the Goals and Hazard Priority Survey as well as the Previous Mitigation Actions Status Survey distributed at the previous meeting.

Figure 3.2: Core Planning Meeting 2 held via WebEx and In-person



Following the completion of the presentation, Brett Morris, Resiliency Planner at Burton Planning Services, guided the attendees through the Mitigation Actions Scoring Matrix, as described below. Each participant was provided multiple methods of completing the survey, including a physical hard copy of the survey (for in-person attendees), a fillable PDF that could be completed on their computer, or an online SurveyMonkey version. Links to survey locations were provided throughout the meeting. All meeting materials including links to the meeting recordings were made available on the project's website so attendees could compete surveys at their own pace.

3. Mitigation Actions Scoring Matrix:
This survey helps determine the mitigation actions attendees would like to see in their community to mitigate the impacts of hazards. Attendees were provided a list of previous and newly proposed mitigation actions and were asked if the action was relevant to their community. If attendees indicated that the mitigation action was relevant, they were asked to score the action in five categories: cost effective, technically feasible, environmentally sound, immediate need, and total risk reduction. These scores will help determine the priority of all mitigation actions included in the 2022 Hazard Mitigation Plan.

Discussion on the Mitigation Actions Scoring Matrix during the meetings centered around topics such as flood mitigation, urban and flash floods, high hazard dams, wetland improvements, site cleanup for potable water, and barriers faced by vulnerable populations.

3.5.5 Public Meeting 2

The second public meeting took place on Thursday, February 17, 2022, at 6:30 PM. Similar to the Core Planning Committee meetings, this meeting was held in a hybrid format with participants having the choice of attending in-person or virtually using WebEx. Stakeholders who were unable to attend

the Core Planning Committee Meeting 2, were invited to attend the Public Meeting 2. A total of four people attended the meeting, including one representative from the Consultant team, and the Director of the Miami County Emergency Management Agency.

The Public Meeting followed the same structure as the Core Planning Meeting 1 starting with sign-in forms, followed by introductions, delivery of the presentation, results from the surveys distributed at the previous meeting, and finally completing the Mitigation Actions Scoring Matrix.

3.6 Public Comment Period

The 2023 Miami County Hazard Mitigation Plan will be made available to the public and Core Planning Committee for review for a 15-day public comment period at a date to be determined. Hard copies of the Hazard Mitigation Plan were made available for review in-person at the Miami County EMA office, and a digital Draft Plan was made available online on the project's website. Both physical and digital surveys were provided to the public and the Core Planning Committee for their comments on the Plan.

3.7 Planning Process

Stakeholder and public input are essential for determining the hazard prioritization, as well as which hazards should be included or excluded from the Plan. Based on feedback from the Core Planning Committee, it was determined that landslides and wildfire are not hazards of concern to Miami County and its communities and have not been included in previous hazard mitigation plans, nor were they included in this Plan. However, as discussed above, 'non-hazardous mass transportation incidents' has been included as a new hazard due to the County's proximity to Dayton International Airport and I-75, and 'cyber threats and security issues' has been included with the terrorism hazard. More details about how survey feedback assisted in the determination of plan goals, which hazards to include and exclude, as well as the mitigation actions can be found in **Chapter 5, Hazard Mitigation.**

Chapter 4, Hazard Identification and Risk Assessment follows this chapter, and is organized alphabetically and not in order of risk. The ranking of hazard priorities can be found in **Chapter 5, Hazard Mitigation.**

04 | Hazard Risk Assessment

HAZARD RISK ASSESSMENT

4.1 Dam Failure

4.1.1 Description

FEMA describes the purpose of dams "is to retain or store water or other liquid-borne materials for any of several reasons, such as human water supply, irrigation, livestock water supply, energy generation, containment of mine tailings, recreation, and pollution or flood control." Types of dams include manmade dams, embankment dams, concrete dams, tailings dams, and ash impoundments. A majority of dams are privately owned but regulated by the State or Federal government. The National Flood Insurance Program defines a levee as a "man-made structure or earthen embankment… to contain, control, or divert the flow of water in order to reduce risk from temporary flooding". Levees can be standalone or a part of a levee system. A majority of levees are locally owned and maintained, while others are built and maintained by the United States Army Corps of Engineers (USACE).

Common dam- and levee-related terms include:

- **Spillway:** A structure that is part of a dam or found beside a dam which allows the controlled release of water from a reservoir.
- **Outlet works:** Used to regulate or release water flow from a dam. An outlet works is a device which consists of one or more pipes or tunnels which move water through the dam.
- **Auxiliary spillway**: Also known as an emergency spillway, the auxiliary spillway is a secondary spillway only designed to operate during periods of increased water inflow or high reservoir levels.
- **Structural failure:** Caused by foundation defects such as settlement and slope instability or earthquakes.
- **Mechanical failure:** Dam failure due to malfunctioning gates, conduits, or valves.
- **Hydraulic failure:** Occurs when water overtops the dam, usually causes by inadequate spillway design, blockages in spillways, or dam crest settlement.
- **Levee System**: A flood protection system which consists of a levee or other structures, such as closure or drainage devices.

Normally, water passes through a dam via the main spillway or outlet works. During periods of increased water inflow or high reservoir levels, water should pass through an auxiliary spillway. Dam failure or partial failures are typically caused by structural, mechanical, or hydraulic failures, rather than during extreme storm events.

According to Ohio Administrative Code Rule 1501:21-13-01 (2010), dams are classified as Class I-IV dams based on the following criteria:

- Class I: Dams having a total storage volume greater than 5,000 acre-feet or a height of greater than 60 feet.
- Class II: Dams having a total storage volume greater than 500 acre-feet or a height of greater than 40 feet.
- Class III: Dams having a total storage volume greater than 50 acre-feet or a height of greater than 25 feet.
- Class IV: Dams having a total storage volume of 50 acre-feet or less and a height of 25 feet or less.

Emergency action planning is an important component of dam safety. FEMA describes an Emergency Action Plan (EAP) as a document which identifies hazardous conditions at a dam and outlines the actions to be followed to minimize property damage and loss of life. In addition to procedures for issuing early warning messages, the EAP also includes inundation maps which outline critical areas for action in case of a dam failure. The EAP should be updated at least every 5 years.

4.1.2 Location

Dam and levee failure can occur throughout Miami County where dams or levees are located. Dam failure is more likely to occur if the dam is not maintained or operated correctly but can occur in other situations as well. Miami County has five Class 1 dams. **Table 4.1.1** lists all Class I dams within Miami County, organized alphabetically by hazard potential.

Table 4.1.1: Dams in Miami County, Ohio

Class	Name	Owner Type	Dam Type	NID Storage (Acre ft.)	Length (ft.)	Height (ft.)	EAP
I	Englewood Dam	Public, Local	Earth	413,000	4,716	120.5	Approved
I	Germantown Dam	Public, Local	Earth	142,000	1,210	107	Approved
I	Huffman Dam	Public, Local	Earth	297,000	3,340	73	Approved
I	Lockington Dam	Public, Local	Earth	165,000	6,400	78	Approved
I	Taylorsville Dam	Public, Local	Earth	386,000	2,980	78	Approved

4.1.3 Extent

Dams can fail in various ways. Two common causes of dam failures occur when water flows over the top of a dam (overtopping) and when water flows through the dam, causing erosion (seepage).

Overtopping occurs when a reservoir behind a dam, overflows. The overflow of water can cause erosion to the dam, its foundation, and the surrounding area. The spillway of a dam can also overflow, when can contribute to water back up. Erosion caused by overtopping can contribute to a dam breach. Overtopping is the most common cause of dam failure.

Seepage is when water flows through a dam, causing erosion. Erosion can occur over time, weakening the structural integrity of a dam and its systems. If the flow of water is not addressed, internal erosion can lead to a partial or complete dam collapse. Animal burrows, cracks in the structure of the dam, or roots from nearby plant life can lead to internal erosion.

As previously mentioned, Class I dams have a total storage volume greater than 5,000 acre-feet or a height of greater than 60 feet. Sudden failures of Class I dams would increase the probability that one of the following conditions would result in:

- Loss of human life;
- Structural collapse of at least one residence or one commercial or industrial business; and/or
- All items listed below for failure of Class II and III dams.

Sudden failures of Class II dams would result in at least one of the following conditions:

- Disruption of a public water supply or wastewater treatment facility, release of health hazardous industrial or commercial waste, or other health hazards;
- Flooding of residential, commercial, industrial, or publicly owned structures;
- Flooding of high-value property;
- Damage or disruption to major roads including, but not limited to, interstate and state highways and the only access to residential or other critical areas such as hospitals, nursing homes, or correction facilities as determined by the chief;
- Damage or disruption to railroads or public utilities; and/or
- Damage to downstream class I, II, or II dams or levees or other dams or levees of high value. Damage to dams or levees can include, but is not limited to, overtopping of the structure. At the request of the dam owner, the chief may exempt dams from the criterion of this paragraph if the dam owner owns the potential affected property

Sudden failures of Class III dams would result in at least one of the following conditions:

- Property losses including, but not limited to, rural buildings not otherwise described in the Ohio Administrative Code Rule 1501:21-12-01 (2010), and class IV dams and levees not otherwise listed as high-value properties in this rule; and/or
- Damage or disruption to local roads including, but not limited to, roads not otherwise listed as major roads

Sudden failures of Class IV dams would result in property losses restricted mainly to the dam and rural lands, and the loss of human life is not probable.

4.1.4 History

According to the National Performance of Dams Program (NPDP), hosted by Stanford University, dam failures have been reported in every state. Using historical records, the NPDP has cataloged dam failures from 1848 to 2017. During this time Ohio had 271 incidents and 18 dam failures, out of a total of 1,495 dams. There have been no recorded dam failures in Miami County.

4.1.5 Probability

The likelihood of dam failure will vary by the individual dam. Regular dam inspections are necessary to identify potential risks to the dam and to mitigate them.

4.1.6 Vulnerability Assessment

Individual dams will have different potential impacts. The discussions in the sections below are general, and assume the dam has a high hazard potential classification.

Infrastructure Impact

Dam failure can impact roadways, including interstates and state routes, by blocking them due to high water or by filling them with debris. Water, sediment, and refuse materials from a dam failure can permanently damage or destroy homes and businesses.

Population Impact
Dam failure has caused damage to homes in the past by rapidly washing away properties. After dam failure events, shelter may need to be provided to those impacted by the event. Deaths and injuries are also possible during dam failure events.

Property Damage
During a dam failure, large amounts of water, sediment, and refuse materials can inundate communities downstream and cause permanent destruction to homes and buildings in the floodplain.

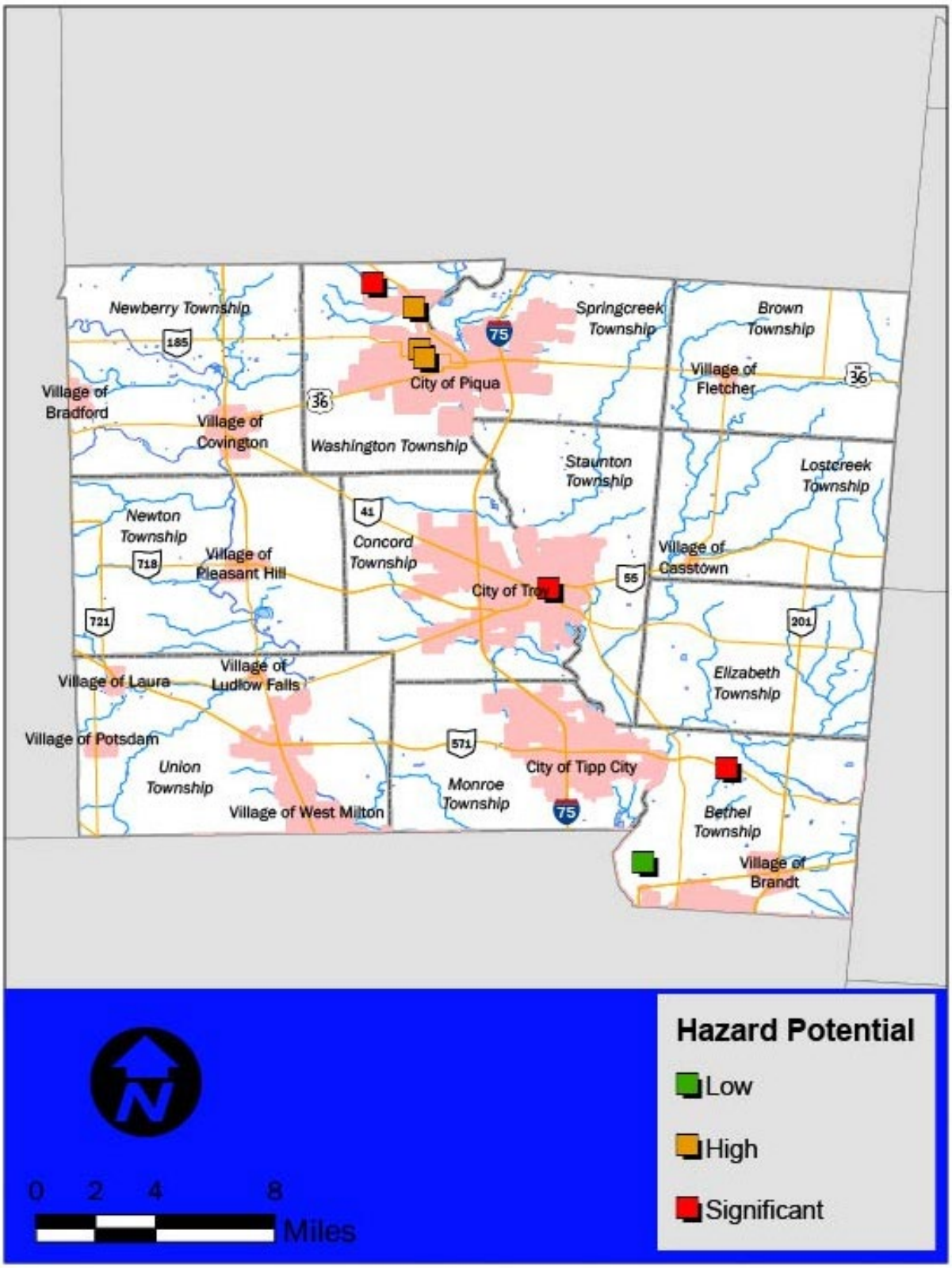
Loss of Life
Loss of life is possible during a Class I dam failure, especially when the failure occurs unexpectedly or without warning, or when there is no evacuation protocol in place. The potential for loss of life is heightened by Class I dams due to the volume of water impounded by the dam. The loss of life would likely be the result of drowning in the flood waters or being trapped in a structure that is damaged or collapsed due to the flooding.

Economic Losses
Dam failure floods can halt economic activity, block roadways, and destroy agricultural crops. Building contents are also likely to be lost during a failure event, especially for properties located downstream or within the floodplain.

4.1.7 Land Use and Development Trends

Any development near dams should occur in coordination with floodplain managers and private dam owners or managers. While development is unlikely to cause dam failure, nearby development will be at risk if a dam failure occurs.

Figure 4.1.1: Dam Locations in Miami County, Ohio

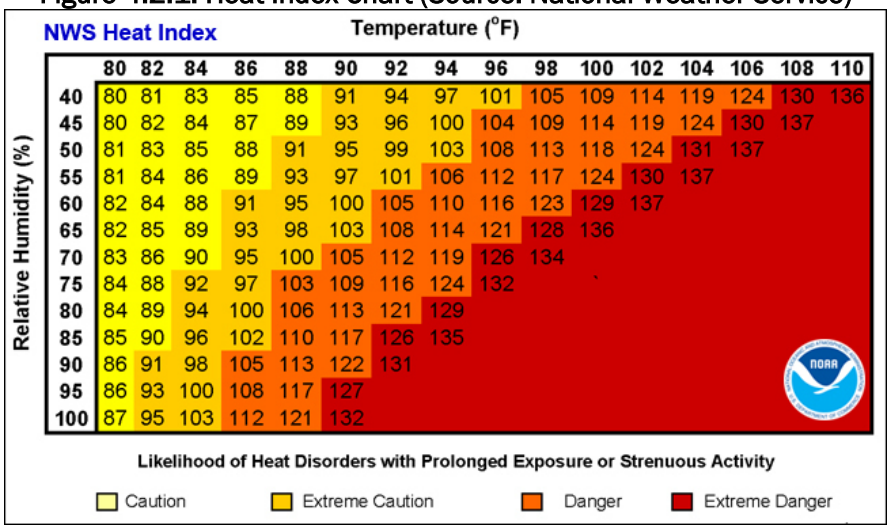


4.2 Drought & Extreme Heat

4.2.1 Description

According to the Federal Emergency Management Agency (FEMA), extreme heat is a period of high heat and humidity with temperatures above 90 degrees for at least two to three days. In extreme heat the human body works extra hard to maintain a normal temperature, which can lead to death. Extreme heat is responsible for the highest number of annual deaths among all weather-related hazards. Humid conditions, which add to the discomfort of high temperatures, occur when a high-pressure weather system traps hazy, moist air near the ground. Extreme heat may also contribute to the formation of a drought if moisture and precipitation are lacking. The National Weather Service's Heat Index Chart is provided in Figure 4.2.1.

Figure 4.2.1: Heat Index Chart (Source: National Weather Service)



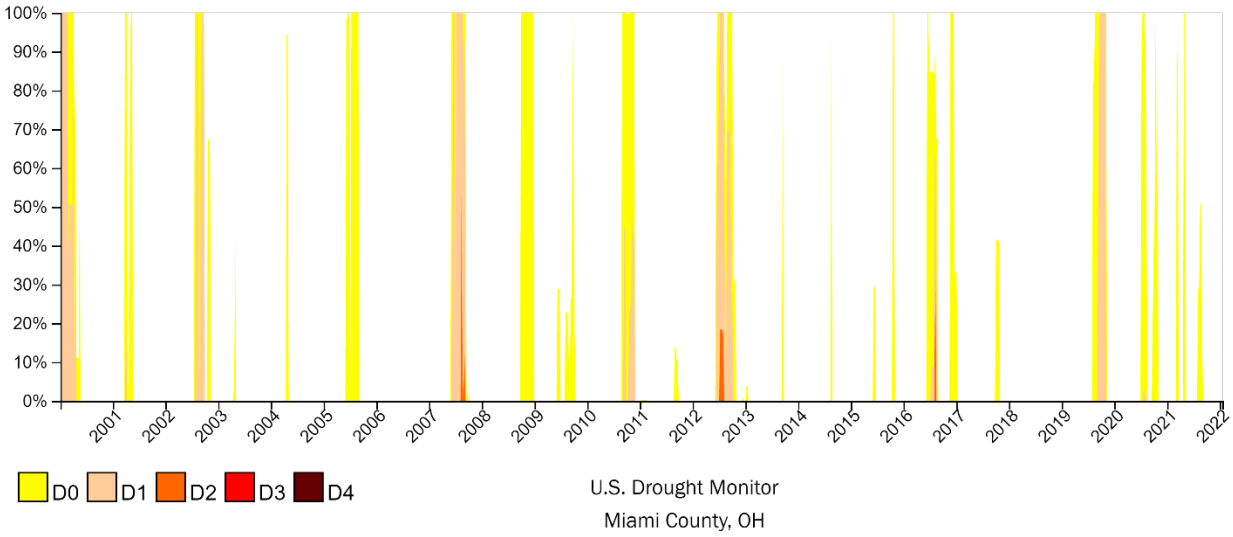
Extreme heat events are often accompanied by drought conditions when the events are prolonged. A drought is a shortage in atmospheric moisture or precipitation over an extended period. Droughts are common throughout all climatic zones and can range in length from a couple weeks to multiple years or decades in some areas. In 2012, Miami County experienced the most intensive drought conditions, with 100% of the County considered to be in at least a Moderate Drought (D1) and 20% of the County in a Severe Drought (D2).

According to the National Oceanic and Atmospheric Administration (NOAA), there are three common types of droughts: Meteorological, Agricultural, and Hydrological. Meteorological drought severity is calculated by the amount of the rainfall deficit (compared to annual averages) and the length of the dry period. Agricultural drought is based on the effects to agriculture by factors such as rainfall and soil water deficits or diminished groundwater/reservoir levels needed for irrigation. Hydrological drought is based on the effects of rainfall shortages on the water supply, such as stream flow, reservoir and lake levels, and groundwater table decline.

4.2.2 Location

Drought (and extreme heat) is a countywide hazard that can affect all locations and jurisdictions in Miami County. More specifically, this hazard typically occurs at a regional scale. Droughts most commonly occur in Ohio from spring through autumn; however, they may occur at any time throughout the year. Figure 4.2.2 depicts the drought monitor history for Miami County from 2000 through 2021. The drought in the summer and fall of 2012 was one of the worst on record for Miami County.

Figure 4.2.2: Drought in Miami County from 2000 to 2021



D0 = Abnormally Dry, D1 = Moderate Drought, D2 = Severe Drought, D3 = Extreme Drought, D4= Exceptional Drought

4.2.3 Extent

Due to the regional nature of droughts and extreme heat events, effects may be noticed throughout the County in both the urbanized and rural areas. All jurisdictions with the County may be affected in a single drought event. In Miami County, droughts are often linked to prolonged periods of above average temperatures and little to no precipitation.

Initial effects of drought can be noticed within a short period, as soils may dry out and plants may wither and die. When drought conditions persist over several weeks, months, or years, effects may be more pronounced with reductions in water levels of wells, lakes, reservoirs, streams, and rivers. Water supply issues for agriculture, commercial/industrial activities, and private consumption may arise if drought conditions persist over a long term.

The extent of the drought is determined by the Palmer Drought Severity Index (PDSI), shown below in **Table 4.2.1**. In this way, the Index can be utilized as a tool to help define disaster areas and indicate the availability of irrigation water supplies, reservoir levels, range conditions, amount of stock water, and potential for forest fires. The Palmer Drought Severity Index depicts prolonged (in months or years) abnormal dryness or wetness and is slow to respond, changing little from week to week. It also reflects long-term moisture runoff, recharge, and deep percolation, as well as evapotranspiration.

Table 4.2.1: Palmer Drought Severity Index Classifications and Federal Drought Categories

Palmer Drought Severity Index	Category	Description
-1.0 to -1.9	D0	Abnormally Dry
-2.0 to -2.9	D1	Moderate Drought
-3.0 to -3.9	D2	Severe Drought
-4.0 to -4.9	D3	Extreme Drought
-5.0 or less	D4	Exceptional Drought

The Palmer Drought Severity Index is a standardized index with values typically falling between -4.00 and +4.00, although extreme conditions can be greater in value (includes federal drought categories). Negative values indicate drought conditions while positive values represent wet conditions. Values around zero represent near normal conditions.

Abnormally dry (D0) and moderate drought (D1) conditions occur frequently and typically do not adversely affect agricultural activities unless conditions are sustained in nature. Severe and extreme drought (D2 & D3, respectively) conditions begin to impact agricultural crops, leading to potential economic losses. These more severe events also may impact drinking water resources, especially if the source is a lake or reservoir. Sustained severe droughts may alter the ability of the soil to absorb water, leading to potential flash flooding when rainfall resumes.

4.2.4 History

U.S. Drought Monitor (USDM) describes severe drought as a time when crops suffer, the numbers of wildfires are high and the soil is dry, cracked and pulling away from foundations. In an extreme drought, yields are minimal, livestock are stressed, and lawns go dormant. Data shows that Miami County has experienced severe drought four times since the year 2000. Periods of severe drought specific to Miami County are provided in Table 4.2.2 (Source: U.S. Drought Monitor).

Table 4.2.2: Periods of Drought in Miami County, Ohio, 2000-2021

Start Date	End Date	# Consecutive Weeks
8/14/2007	8/27/2007	2
9/4/2007	9/10/2007	1
7/10/2012	8/13/2012	5
8/9/2016	8/15/2016	1

Severe Drought (D2), July-August 2012

Dry conditions began in the spring and early summer continued into July 2012. Combined with extreme heat, substantial crop loss was experienced throughout the County and across much of the state. Rainfall was widely scattered and was not sufficient to break the drought until mid-August.

4.2.5 Probability

Miami County has experienced droughts in the past, and the potential exists for the County to experience droughts in the future. Seasons of drought and extreme heat have the potential to occur during any particular year, when necessary, conditions are met. More specifically, the County has record of four severe drought events from 2000 to 2021, which amounts to an approximate 20 percent chance of a drought occurring any given year. A more detailed commodity loss analysis is provided in the Vulnerability Assessment, below.

4.2.6 Vulnerability Assessment

- Drought projections suggest that some regions of the U.S. will become drier and that most will have more extreme variations in precipitation.
- Even if current drought patterns remained unchanged, warmer temperatures will amplify drought effects.
- Drought and warmer temperatures may increase risks of large-scale insect outbreaks and wildfires.
- Drought and warmer temperature may accelerate tree and shrub death, changing habitats and ecosystems in favor of drought-tolerant species.

- Forest and rangeland managers can mitigate some of these impacts and build resiliency in forests through appropriate management actions. Miami County is primarily agricultural outside of the urbanized/developed areas and does not have any recognized forests or rangelands.

Drought does not have a significant impact on infrastructure or structures. The greatest impacts of drought are on agricultural interests, as crops may fail, and livestock may not have sufficient water resources. Economic losses are the greatest threat from droughts to Miami County. According to the 2017 Census of Agriculture developed by the United States Department of Agriculture (USDA), top crop items based on acreage for Miami County include soybeans for beans, corn for grain, and wheat.

Based on data from the United States Department of Agriculture, Miami County's crop yields have not been permanently impacted from previous drought events. Crop yields have increased between the 2012 and 2017 Census of Agriculture, even though the amount of land used for agriculture has declined.

Table 4.2.3: Miami County Crop Yields 2012 - 2017

Commodity	Units	2012	2017
Soybeans	Acres	76,111	76,036
Hay	Acres	6,089	6,013
Corn	Acres	70,998	63,913
Wheat	Acres	4,949	4,228

4.2.7 Land Use and Development Trends

Drought is most likely to impact agriculture land uses and land uses that house or serve vulnerable populations, such as schools, daycares, hospitals, and nursing homes.

4.3 Earthquakes

4.3.1 Description

Earthquakes are sudden and rapid movements of the Earth's crust and are caused by the abrupt shifting of rocks deep underneath the earth's surface. These movements vary in length and may last from a few seconds to several minutes.

The seismicity, or seismic activity, of an area refers to the frequency, type, and size of earthquakes experienced over a period of time. Earthquakes are measured using observations from seismometers. The Moment Magnitude Scale (MMS), which was developed in the 1970s, is the most common scale on which earthquakes larger than approximately 5.0 in magnitude are reported for the entire world. Earthquakes smaller than magnitude 5.0, which are more numerous, are reported by national seismological observatories and measured most commonly on the local magnitude scale – also referred to as the Richter Scale. These two scales are numerically similar over their range of validity. Earthquakes of magnitude 3.0 or lower are often almost imperceptible or weak, while earthquakes of magnitude 7.0 or greater can potentially cause serious damage over larger areas.

Damage from an earthquake also depends on the earthquake's depth in the Earth's crust. The shallower an earthquake's epicenter, the more damage to structures it will cause. Alternatively, an earthquake can also be measured by its intensity. The Modified Mercalli Intensity Scale (MMI) ranges in value I to XII, in roman numerals (**Table 4.3.1**).

Earthquakes can happen anywhere without warning; they are low-probability, high-consequence events. Most major earthquakes in the U.S. have occurred in California as well as in Alaska, Hawaii, Oregon, Puerto Rico, Washington and the entire Mississippi River Valley. There have been recorded earthquakes throughout the U.S., and the Ohio River Valley has experienced earthquakes exceeding the 3.0 magnitude within the last 25 years.

4.3.2 Location

Earthquakes are countywide hazards and can affect all areas and jurisdictions within Miami County. According to the Ohio Department of Natural Resources, Ohio is located on the periphery of the New Madrid Seismic Zone, an area in and around Missouri that was the site of the largest earthquake sequence to occur in the country. Additionally, West Central Ohio is the area of Ohio with the highest risk for earthquakes in the State.

4.3.3 Extent

Earthquakes pose a risk to life and property depending on the severity. To monitor earthquakes, the State of Ohio and the Ohio Department of Natural Resources (ODNR) Division of Geological Survey coordinates a 21-station network (**Figure 4.3.1**) of seismograph stations throughout the state in order to continuously record earthquake activity. The Ohio Seismic Network (OhioSeis) stations are distributed across the state but are concentrated in the most seismically active areas or in areas that provide optimal conditions for detecting earthquakes. While the seismic network cannot predict earthquakes or provide an alert prior to an event, it can provide insight into earthquake risks in the state so that intelligent decisions about building and facility design and construction, insurance coverage, and other planning decisions can be made by individuals, business and industry, and governmental agencies.

The Vernon A Luthman WA (VLOH) seismometer situated in central Shelby County, the Sycamore State Park Station (SSPO) in Montgomery County, and the Kiser Lake State Park Station (KLOH) seismometer situated in western Champaign County are located in the closest proximity to Miami County. Seismic

station 049A of United States Geological Survey (USGS) US Array is located in Newberry Township in northwestern Miami County.

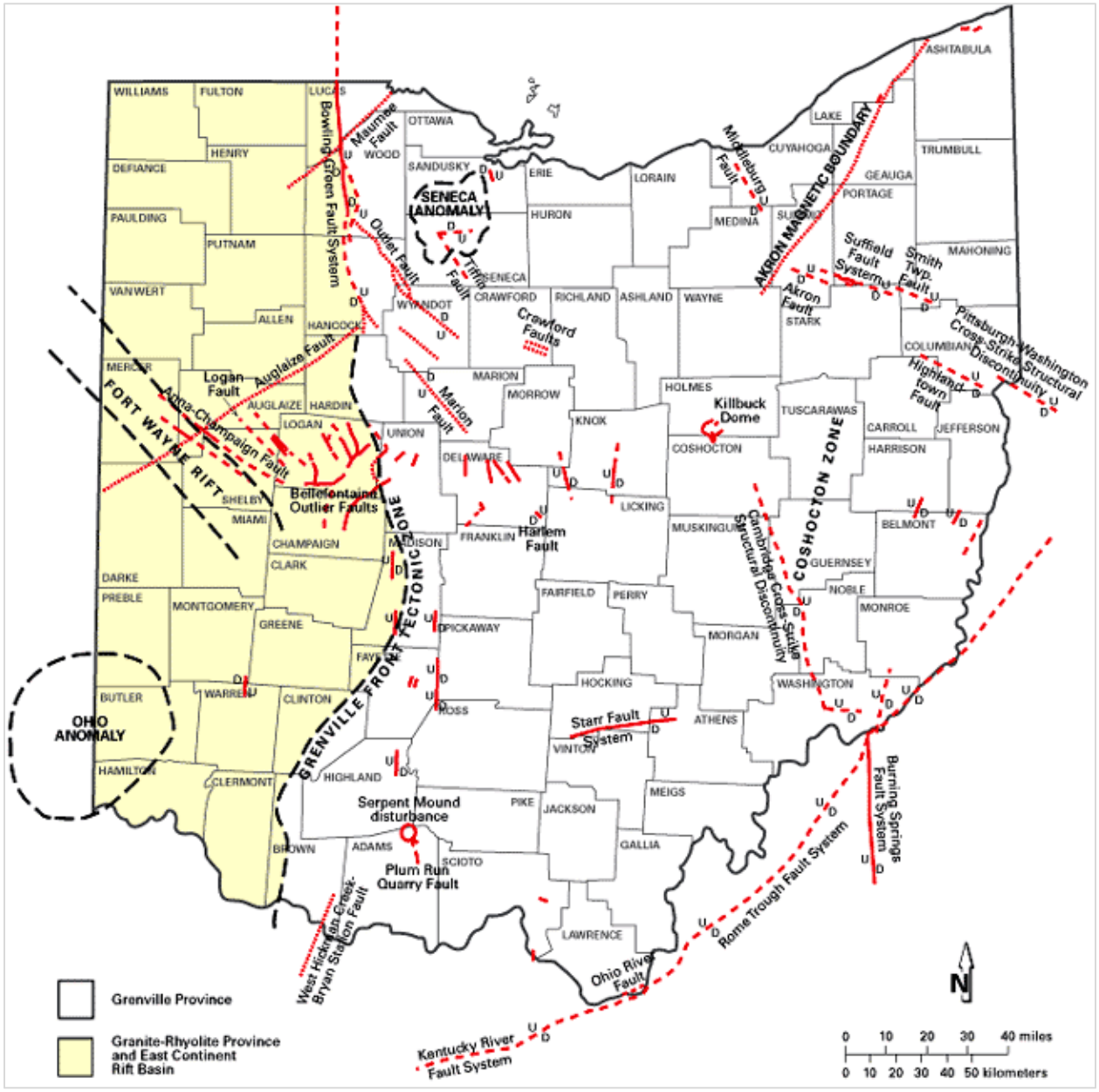
Earthquakes can yield a variety of different outcomes. With the ground shaking associated with earthquake events, buildings have a high potential to be impacted. If soil liquefaction, or the mixing of sand and soil with groundwater occurs, buildings can sink into the ground. Earthquakes also have the potential to rupture dams or levees along a river, resulting in flooding and even tsunamis (see Dam Failure section). Earthquakes can cause landslides or avalanches in high-risk areas and can cause mines to subside. Furthermore, earthquakes that break gas and power lines can result in fires.

Table 4.3.1: Modified Mercalli Intensity Scale

Modified Mercalli Intensity Scale		Magnitude
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

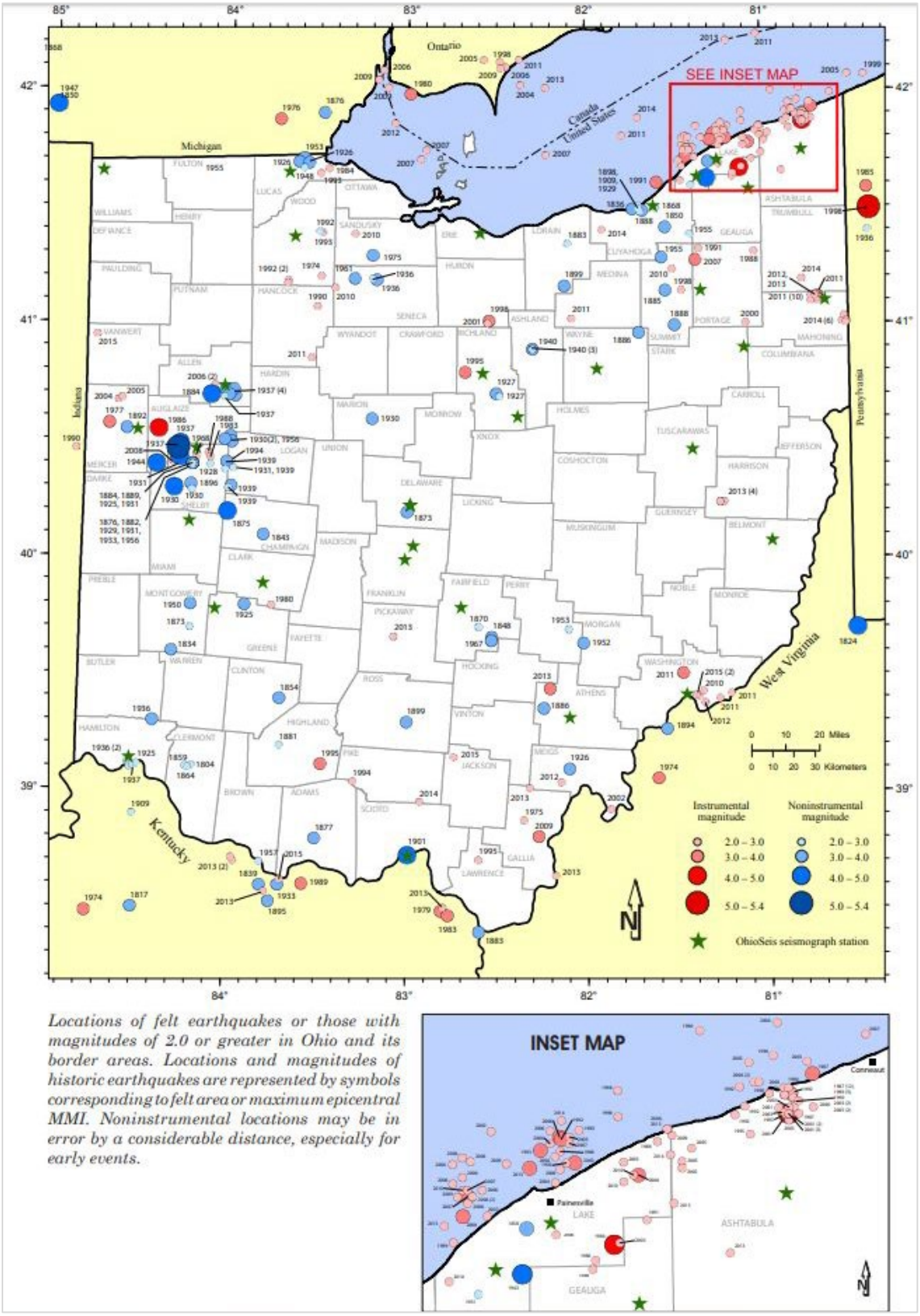
Source: ODNR

Figure 4.3.1 Map of Deep Structures in Ohio



Source: ODNR

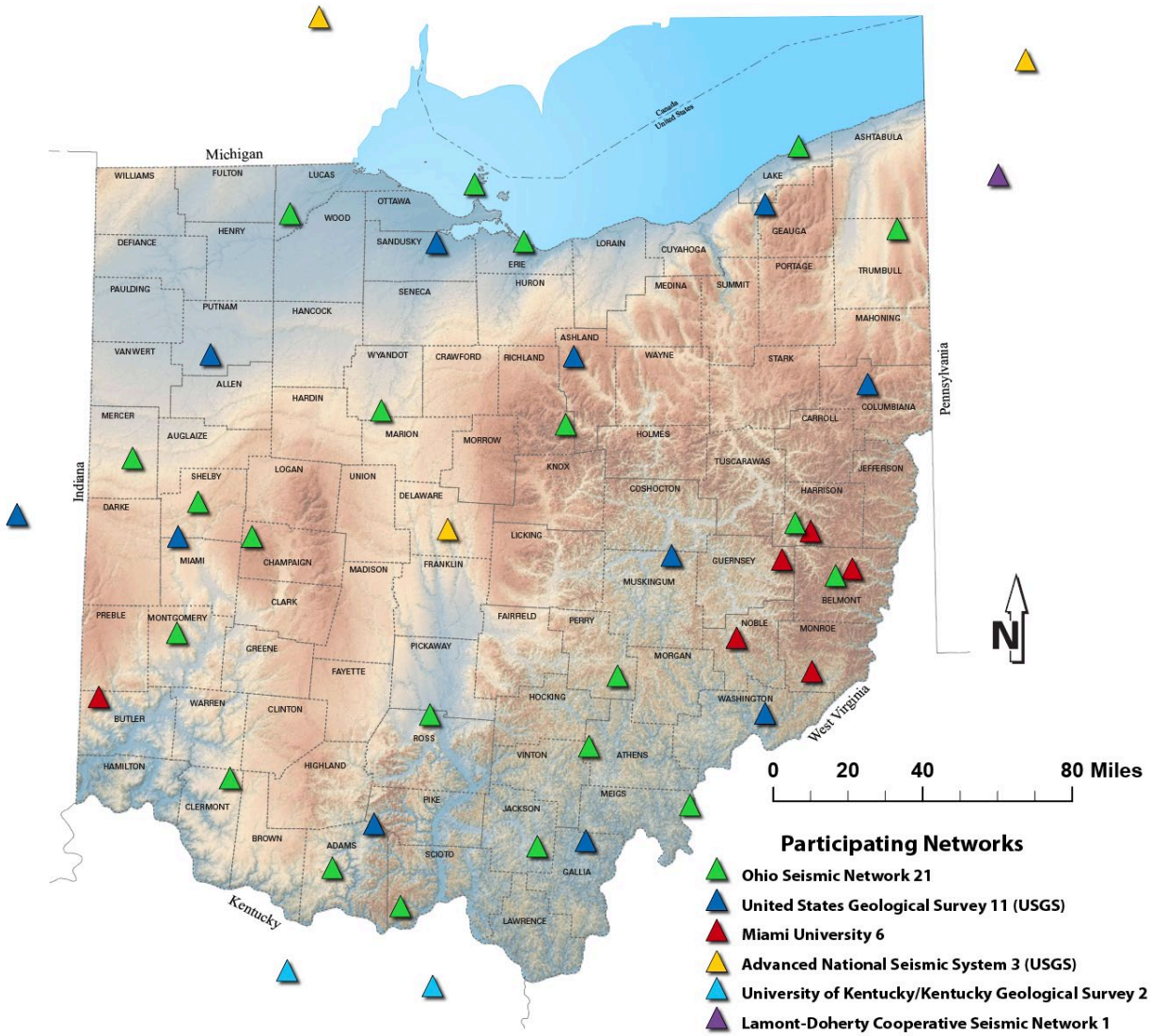
Figure 4.3.2: Earthquake Epicenters and Seismometers in Ohio



Locations of felt earthquakes or those with magnitudes of 2.0 or greater in Ohio and its border areas. Locations and magnitudes of historic earthquakes are represented by symbols corresponding to felt area or maximum epicentral MMI. Noninstrumental locations may be in error by a considerable distance, especially for early events.

Source: ODNR

Figure 4.3.3: Ohio and Cooperative Seismic Monitoring Network Stations



Source: ODNR

4.3.4 History

The State of Ohio has experienced more than 300 earthquakes since 1776. Most of these events have been small in 2 to 3 magnitude range, while fifteen (15) earthquakes have caused minor-to-moderate damage. The largest historic earthquake in western Ohio was centered in Shelby County in 1937. This event was estimated to have had a magnitude of 5.4 on the Richter scale. **Figures 4.3.2 and 4.3.3**, above, displays epicenters of all historical earthquakes with a magnitude greater than 2.0, as well as the location of seismometers in the State of Ohio.

The Ohio Department of Natural Resources (ODNR) and the United States Geological Survey (USGS) maintains a record of earthquake events. No known earthquakes are thought to have originated in Miami County, though earthquakes originating in neighboring counties may have been felt in Miami County in the last 10 years. Earthquakes registering at 2.0 or greater are supplied below.

Earthquake in Shelby County on January 15, 2021
A 2.1 magnitude earthquake with weak shaking was recorded in Shelby County on January 15, 2021 at 12:22 AM EST. The epicenter of this event was located in Dinsmore Township (40.434°N, 84.111°W). It had a depth of about 4.2 miles (6.7km). There are no reported damages or losses of life from this event.

Earthquake in Shelby County on July 14, 2020
A 2.5 magnitude earthquake with weak shaking was recorded in Shelby County on July 14, 2020 at 6:41 PM EST. The epicenter of this event was located in Dinsmore Township (40.421°N, 84.109°W. It had a depth of about 1.5 miles (2.37km). There are no reported damages or losses of life from this event.

4.3.5 Probability

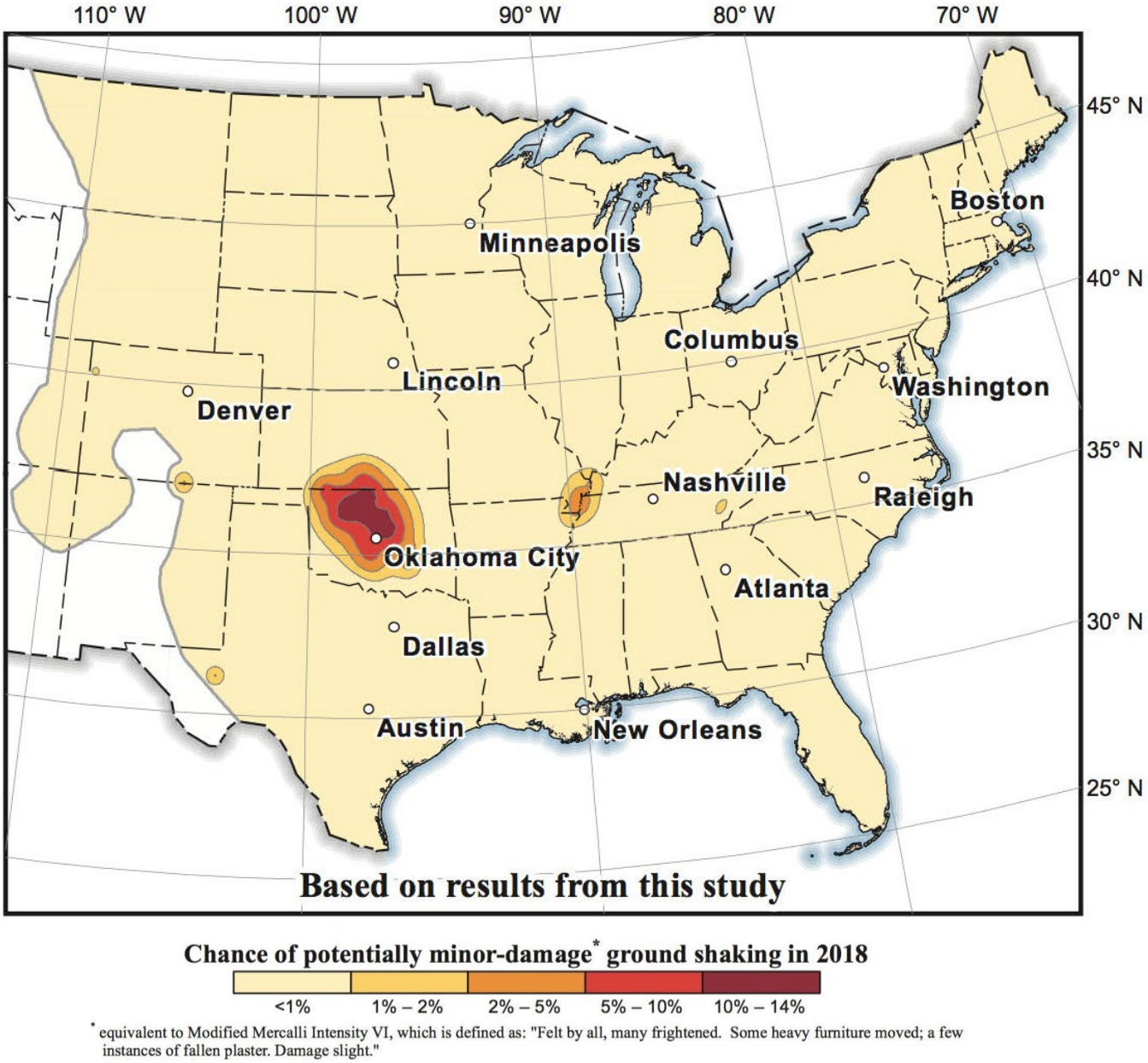
The USGS has both long-term and short-term probabilistic seismic hazard forecasts. In the 2018 one-year probabilistic seismic hazard forecast, the United States Geological Survey estimates that there is a less than one percent chance of potentially minor-damage ground shaking in 2018 for Miami County (**Figure 4.3.4**).

The USGS also determined the long-term hazard of earthquakes for the United States (**Figure 4.3.5**). The measurement used in this estimation is based on the chance of ground shaking – peak ground acceleration – as a percentage of the natural force of gravity over time. This map identifies that most of Miami County has the probability of experiencing an earthquake between 4 and 10 times in 10,000 years.

The USGS also prepared national seismic hazard maps (NSHMP) for the United States. These time-independent maps are shown for 2-percent and 10-percent probability of earthquake ground-shaking exceedance levels at specified probabilities over a 50-year time period at several hundred thousand sites across the United States. The map (**Figure 4.3.6)** identifies that Miami County has an 8- to 10-percent of peak ground acceleration for 2-percent probability of exceedance in 50 years in the southern third of the County and increasing to a 14- to 20-percent probability in the northern third of the County.

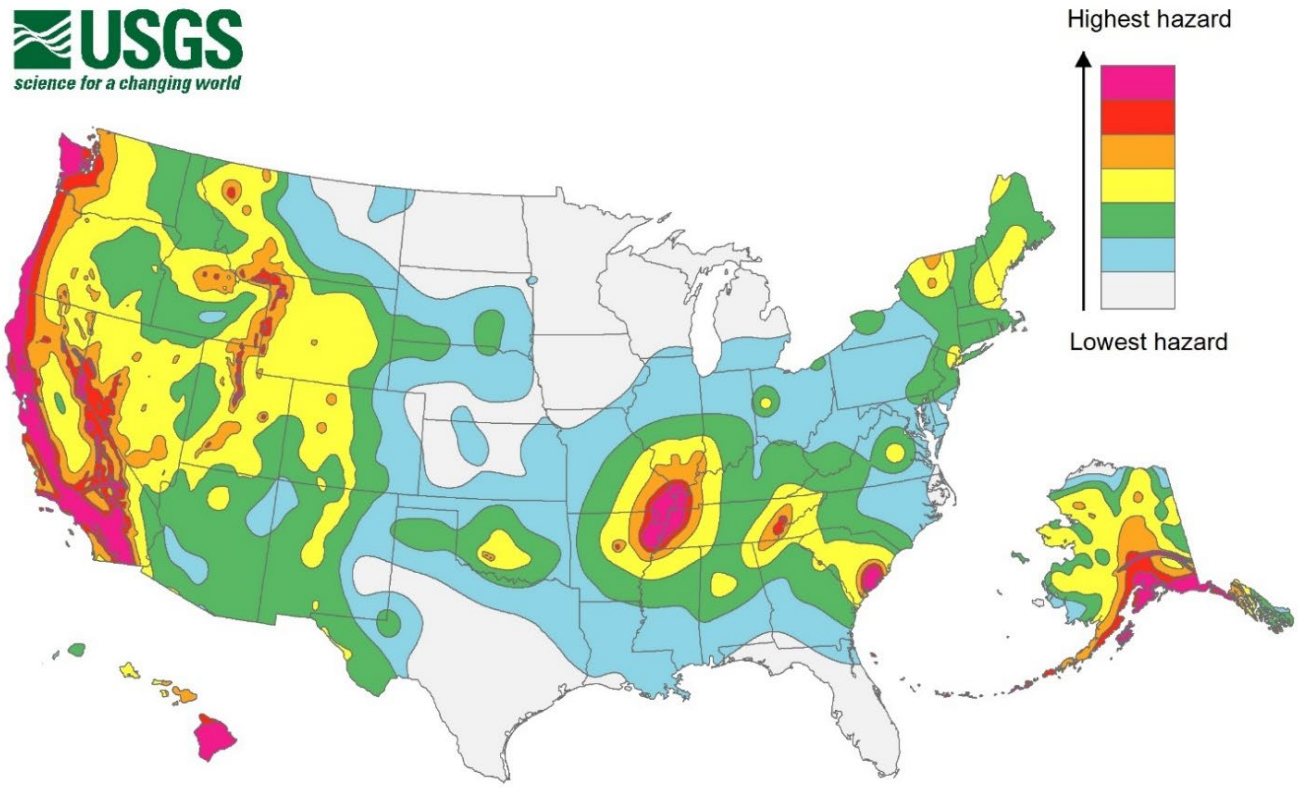
Furthermore, the ODNR indicates that the brief historic record of Ohio earthquakes suggests a risk of moderately damaging earthquakes in the western, northeastern, and southeastern parts of the State.

Figure 4.3.4: Chance of Potentially Minor-Damage Ground Shaking in 2018



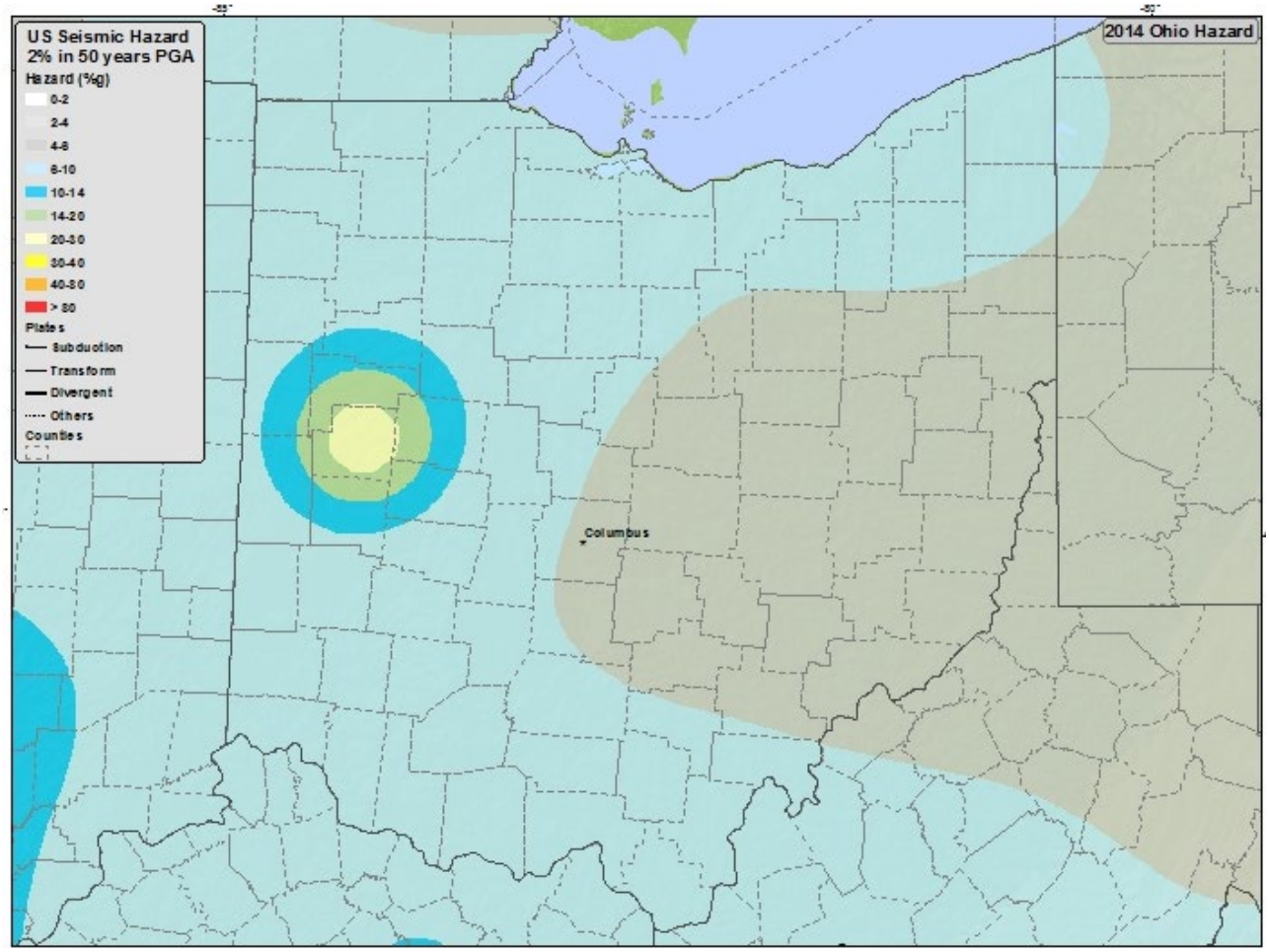
Source: USGS

Figure 4.3.5: Probability of Earthquakes in the United States



Source: USGS

Figure 4.3.6: 2014 Seismic Hazard Map of state of Ohio



4.3.6 Vulnerability Assessment

Infrastructure Impact

Since there are no recent earthquake events with recorded damages, exact damages to infrastructure are unknown. Buildings, roadways, and utilities, such as gas and power lines have the potential to be affected. Since the probability of an earthquake occurring in Miami County is less than one percent, there is a low risk of impact to infrastructure as a result.

Population Impact

There is a low risk of earthquakes occurring in Miami County. Accordingly, there is low risk of impact to the population. If an earthquake would occur within the County, the population could be impacted by loss of homes, loss of utilities, as well as potential reduction of air quality.

Property Damage

With any earthquake event, there is potential for property damage to occur, as ground shaking can lead to damaged buildings. Due to the non-site-specific nature of this hazard, **Table 4.3.2** lists all structures within Miami County as having potential impacts from earthquakes. It also provides values for two worst-case scenarios valued at one percent damage and five percent damage.

Loss of Life

Miami County has no recorded earthquake events that have resulted in loss of life; however, in the event that an earthquake occurs, there is potential for loss of life. If there are more people and structures in an earthquake prone location, there is likely to be more of an impact. Loss of life can be mitigated by educating the public on proper protection in the event of an earthquake. For example, the USGS resources on preparing for an Earthquake hazard (USGS Resources for Earthquake Preparedness) as well as the Ready Campaign (Ready.gov) is a national public service campaign designed to educate and empower the American people to prepare for, respond to, and mitigate disasters. These resources provide materials for how to educate the public on earthquake preparedness.

Economic Losses

Earthquakes have the potential to damage infrastructure, resulting in economic burden of clean up and repairs. Potential economic losses and damages associated with Miami County structures and potential worst-case scenarios are recorded in **Table 4.3.2**, below. Compared with other hazards, earthquakes are relatively unlikely to occur in Miami County, meaning there is low risk of economic loss as a result of an earthquake.

Table 4.3.2: Structure Vulnerability from Earthquakes

Structure Type	Number of Properties Exposed	Total Value of Structures	Damage for 1% Scenario	Damage for 5% Scenario
Residential	43,384	$5,240,732	$15,778,259	$21,018,991
Non-Residential	10,049	$5,840,723	$7,238,387	$13,079,110
Critical Facilities	35	$13,249	$217,699	$230,949
Total	53,433	$11,081,455	$23,016,645	$34,098,101

**Note: Critical Facilities are non-residential structures and their value is incorporated into the non-residential totals as well. Calculated totals are determined by summing the residential and non-residential values.*

4.3.7 Land Use and Development Trends

While incidence and likelihood of earthquakes is low in Miami County, all communities are at low risk. By planning for and managing land use to accomplish social, ecological, and economic sustainability, communities can reduce the negative impacts caused by earthquakes. This can be accomplished through comprehensive land-use plans and supportive federal and state policies. As such, enforcement of stricter building codes that ensure that all new developments are built up to code can reduce risk. Infrastructure (constructed facilities and lifelines) should be designed and constructed to resist earthquake shaking following the current state-of-the-art engineering and technology practices.

4.4 Epidemic/Pandemic

4.4.1 Description

The Centers for Disease Control and Prevention (CDC) defines an epidemic as "an increase, often sudden, in the number of cases of a disease above what is normally expected in that population in that area." Moreover, the World Health Organization (WHO) defines a pandemic as "an epidemic occurring worldwide, or over a very wide area, crossing international boundaries and usually affecting a large number of people."

Epidemics occur when an agent and susceptible hosts are present in adequate numbers, and the agent can be effectively conveyed from a source to the susceptible hosts. More specifically, an epidemic may result from any of the following:

- A recent increase in amount or virulence of the agent;
- The recent introduction of the agent into a setting where it has not been before;
- An enhanced mode of transmission so that more susceptible persons are exposed;
- A change in the susceptibility of the host response to the agent; and/or
- Factors that increase host exposure or involve introduction through new portals of entry.

While epidemics usually refer to infectious agents, CDC notes that non-infectious diseases such as diabetes and obesity exist in epidemic proportion in the United States. For the purposes of this report, only epidemics referring to infectious agents will be discussed. These types of infectious agents can include bacteria, viruses, fungi, and parasites.

Disease and epidemic can also impact animals that can then carry and spread harmful pathogens to people and cause illness. These are known as zoonotic diseases or zoonoses. In particular, Miami County is concerned with potential outbreaks of the COVID-19 virus, West Nile Virus, and H1N1 Influenza A virus, a virus that can impact swine and other livestock. The most common ways people can get infected with germs that can cause zoonotic diseases are:

- **Direct contact:** with the saliva, blood, urine, mucous, feces, or other body fluids of an infected animal;
- **Indirect contact:** with areas or surfaces where animals live and roam;
- **Vector-borne:** when bitten by a tick, or an insect like a mosquito or a flea;
- **Foodborne:** from eating contaminated food or drinking something unsafe, such as unpasteurized (raw) milk, undercooked meat or eggs, or fruits and vegetables that are contaminated with feces from an infected animal; and/or
- **Waterborne:** from drinking or coming in contact with water that has been contaminated with feces from an infected animal.

4.4.2 Location

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 weeks or even months in extreme cases. Epidemics can occur at any time of the year, but the warm summer months are favorable for bacteria and microorganism growth resulting in a higher risk for epidemics occurring due to these agents as seen in the case of Cholera. **Figure 4.4.1** indicates otherwise for COVID-19 showing that the winter months have been the deadliest. An epidemic has the potential to affect the entire County but is more likely to occur where living conditions are poor with lack of hygiene and in densely populated areas such as the Cities of Piqua, Tipp City, and Troy, where many people live or work in close proximity.

4.4.3 Extent

According to the WHO, 70 percent of emerging human pathogens come from animals. As such, some of the most likely epidemics that could locally affect Miami County include animal-sourced pathogens such as influenza A and West Nile Viruses. Furthermore, the ever-growing global interactions can also be a source of infection transfer across borders, especially when people are unaware of the germs they may be carrying.

Such events have the potential to cause serious injury or death to large numbers of people but would cause no damage to private property or structural damage to public facilities. Economic impacts at the individual level could be due to the inability of an infected person to go to work. At its worst, cascading effects could lead to civil unrest, food and fuel shortages, or utility failure due to inability for people to provide services.

Animal Disease and Epidemic

Animal agriculture is an important part of Ohio's economy and its rural areas. However, livestock can carry diseases that can make people sick. Animal-sourced pathogens can spread to humans when contaminated animal products are consumed or by direct contact with animals and their environment, such as influenza A viruses, that only spreads through direct contact with animals.

Ohio Department of Health (ODH), and Ohio Department of Natural Resources (ODNR) provides data on the various diseases that are of concern in Ohio, that are carried and transmitted by animals. Swine Flu - Influenza A virus and its variants, Salmonellosis bacteria, Toxoplasmosis protozoa, and the West Nile Virus have moderate level of risk in Ohio. Fifteen (15) other diseases listed have low levels of risk in Ohio. It is important for the County to monitor zoonotic diseases, because of the potential for animal-human interaction in the County and avoid potential impacts on agricultural workers and the industry at large.

4.4.4 History

Epidemics have impacted the United States including Ohio several times over the past several centuries. The history of epidemics and major disease outbreaks in Miami County is as follows:

- 1830's – Cholera outbreak.
- 1840 - 1979 – Poliomyelitis outbreak.
- 1914 – Quarantine imposed due to outbreak of Scarlet Fever.
- 1918 – The Spanish Influenza outbreak.
- 2003 – West Nile Virus outbreak.
- 2009 – H1N1 Influenza A Pandemic.
- 2012 – 2016 – Bed bug concerns in Ohio and United States.
- 2015 – 2016 – Zika Virus concerns in Ohio and United States.

A brief description of some of the major outbreaks and their impacts are summarized below:

The Coronavirus (COVID-19) pandemic, March 2020 - present

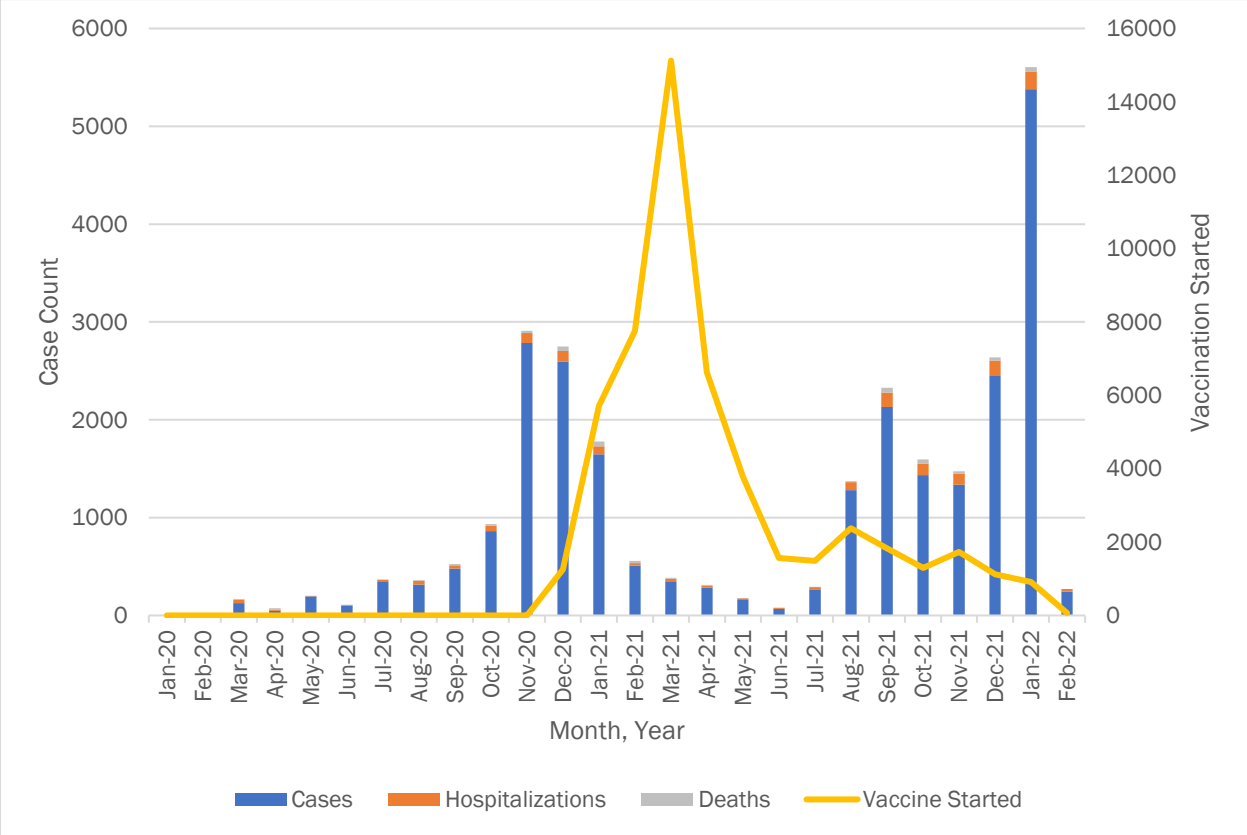
Most recently, the Coronavirus (COVID-19) pandemic has impacted the County, along with the rest of the world, beginning in March of 2020. The pandemic is an ongoing national emergency, and a National Emergency Declaration went into effect on March 13, 2020. Governor Mike DeWine and Ohio Department of Health Director, Dr. Amy Acton, issued a stay-at-home order on March 23, 2020. At that time, the stay-at-home order included, refraining from going outdoors to public places and gatherings, to follow social distancing guidelines (at least six feet apart) in public places and at events, regulating the number of people allowed to be in closed areas or establishments, and mandating 14-day

quarantine for travelers from out of state. Specific health orders and measures have changed since then.

In early May 2020, businesses and other organizations in Ohio started the process of reopening; however, by June hospitals begin to see an uptick in the number of COVID-19 hospitalizations. As the school year began, local schools utilized a combination of in-person and virtual education. **Figure 4.5.1** displays total COVID-19 case count, hospitalizations, and deaths, as well as the vaccination status in Miami County by month. Note that February 2022 data only includes February 1-10, 2022. As of February 10, 2022, Miami County has 25,401 total confirmed cases and 436 deaths attributed to COVID-19.

Food and Drug Administration (FDA) authorized Pfizer's COVID-19 vaccine for emergency use in December 2020. This vaccine, along with other authorized vaccines, was made available to the public shortly after. There was a decline in the number of cases and deaths since January 2021. However, in July 2021, the Delta variant of the COVID-19 virus was spreading fast in the United States, even in some vaccinated individuals. Miami County has about 52,623 persons who have received the first dose of vaccine.

Figure 4.4.1: Miami County COVID-19 Cases by Month



Source: Ohio Department of Health

It is important to note that the situation with COVID-19 is constantly changing. The exact long-term impacts from COVID-19 are unknown at this point. At the time this report was written, the State of Ohio was experiencing a fourth wave of the virus driven by the rise of new variants of the virus as well as COVID-19 fatigue.

The West Nile Virus, 2002 - present

West Nile virus (WNV) is the leading cause of mosquito-borne disease in the United States. It is most commonly spread to people by the bite of an infected mosquito. Cases of WNV occur during mosquito breeding season, which starts in the summer and continues through fall. Ohio's environment contributes to the breeding of mosquitoes with its hot weather, and areas that have stagnant water not being washed out during low rainfall months.

There are no vaccines or medications currently available to treat infected people. Most people infected with WNV do not feel sick. Only 1 in 5 people who are infected develop a fever and other symptoms. Very rarely the infections are serious and sometimes cause fatal illness.

WNV caused growing concern in Ohio in 2002 when 4,156 cases of the WNV were reported nationally resulting in 284 fatalities. That year, 441 cases were reported in Ohio. By 2003, the number dropped to 108 and has not reached triple digits since. Between 2002 and 2011, there were 64 reported human cases of WNV in Butler, Champaign, Clark, Greene, Miami, Montgomery and Warren counties. The number have gradually decreased with only two cases in 2011, one case each in Montgomery and Miami counties. However, the risk remains high. According to ODH, the number of mosquito samples testing positive for WNV in 2012 was 213 compared to 38 in 2011, the most since 2002. Some areas in Miami County where infected mosquitoes have been detected are – one on the south side of Troy in Kensington Park on Renwick Way in Troy and the other in Kyle Park on South First St. in Tipp City.

The best way to stay safe from West Nile virus is to avoid mosquitoes and mosquito bites. It is recommended that you:

- Use EPA registered repellants when you go outdoors
- Avoid outdoor activity during peak mosquito biting hours (dusk to dawn)
- Wear long sleeve shirts and long pants when you go outdoors
- Use screens on windows and doors. Repair holes in screens to keep mosquitoes outside
- Once a week, empty and scrub, turn over, cover, or throw out items that hold water,
- such as tires, buckets, planters, toys, pools, birdbaths, flowerpots, or trash containers.

The H1N1 Influenza A Pandemic ((H1N1)pdm09 virus), 2009 - present

The swine flu was identified in humans in California in April 2009. On June 11, 2009 the WHO declared it a pandemic. The new (H1N1)pdm09 virus spread between humans through infected droplets from a cough or sneeze. By June 19, 2009, all 50 states in the United States had reported cases of 2009 H1N1 infection.

As of June 24, 2009, there were 91 confirmed cases of swine flu in Ohio and 44 possible cases. By February 2010, the state had recorded 51 deaths. From April 12, 2009 to April 10, 2010, CDC estimated there were approximately 60.8 million cases, 274,304 hospitalizations, and 12,469 deaths in the United States due to the (H1N1)pdm09 virus. Between October 2009 and November 2009, the FDA announced its approval of five vaccines to protect against the virus. In October, five Miami County Medical Reserve Corps volunteers participated in a local H1N1 vaccination clinic. On August 10, 2010, WHO declared an end to the global 2009 H1N1 influenza pandemic. However, (H1N1)pdm09 virus continues to circulate as a seasonal flu virus, and cause illness, hospitalization, and deaths every year.

To monitor large-scale outbreaks of Influenza A Viruses among swine, pigs at Agricultural Fairs in Ohio are randomly checked each year by the Ohio State University's Department of Veterinary Preventive Medicine. They found that, on average, at least one animal at 25 percent of County fairs tests positive for swine flu.

4.4.5 Probability

Epidemics are rare, do not occur at regular intervals, and can begin without warning. Based on historical events, an epidemic has occurred once in about every 20-25 years.

However, various factors such as increasing urbanization, increased urban density, rapid globalization and mobility of people, demand for animal protein, climate change, habitat loss, and increased interactions at the human-animal interface increase the probability of a trigger event that may lead to the spread of a pathogen. If these trends continue, public health systems will have less time to detect and contain a pandemic before it spreads (Madhav N, Oppenheim B, Gallivan M, et al. 2017).

Furthermore, as global weather patterns shift and permafrost in areas of the world melts, there will be more opportunity for pathogens that have been frozen within layers of permafrost to be released, exposing humans to new diseases. As such, there will be more potential for epidemics to arise. In addition, the recent increase of disease emergence from animals associated with environmental change suggests a high probability of epidemics in the coming decades.

4.4.6 Vulnerability Assessment

Given the lack of data for historic epidemic events in the County, it is difficult to estimate potential damages. Additionally, the long-term impacts of a widespread virus like COVID-19 are still unknown. The following assessment was developed to provide a general vulnerability assessment for epidemics in Miami County.

Infrastructure Impact

There is likely to be little-to-no impact to infrastructure in the event of an epidemic. However, hospitals, in particular, will be challenged during an epidemic. Hospitals will need to double or even triple their supplies, facilities, and staff, while depending on other critical infrastructure outside of its own organization such as transportation. The failure of one such system can trigger a cascading effect of breakdowns in systems. This makes interconnected systems highly vulnerable to epidemics. The construction and infrastructure sectors relying on global supply chains and supply of labor from around the world, can also have damaging impacts.

Epidemics, such as the COVID-19 outbreak, caused offices to close down and downtown areas become empty. However, on the other hand, during COVID-19 Pandemic, cities around the world saw a rise in pedestrian only spaces, bicycle lanes, and outdoor dining spaces. While most of these measures are temporary till the pandemic lasts, some places have made it permanent.

Population Impact

The population of Miami County is likely to be significantly impacted should an epidemic occur. Day-to-day life can be significantly interrupted. People may be asked to quarantine, and schools and businesses may close causing unemployment and significant economic losses.

While diseases are especially fatal to older adults and those with a weakened immune system, population groups that are faced with long-standing systemic health and social inequities are at an increased risk of getting sick and dying during an epidemic. These groups include many racial and minority groups, people with disabilities, people in prison, and people living in dense areas without sufficient access to basic amenities (Source: CDC). In addition, those with mental health concerns are also vulnerable and can be worsened by isolation during an epidemic if not approached sensitively.

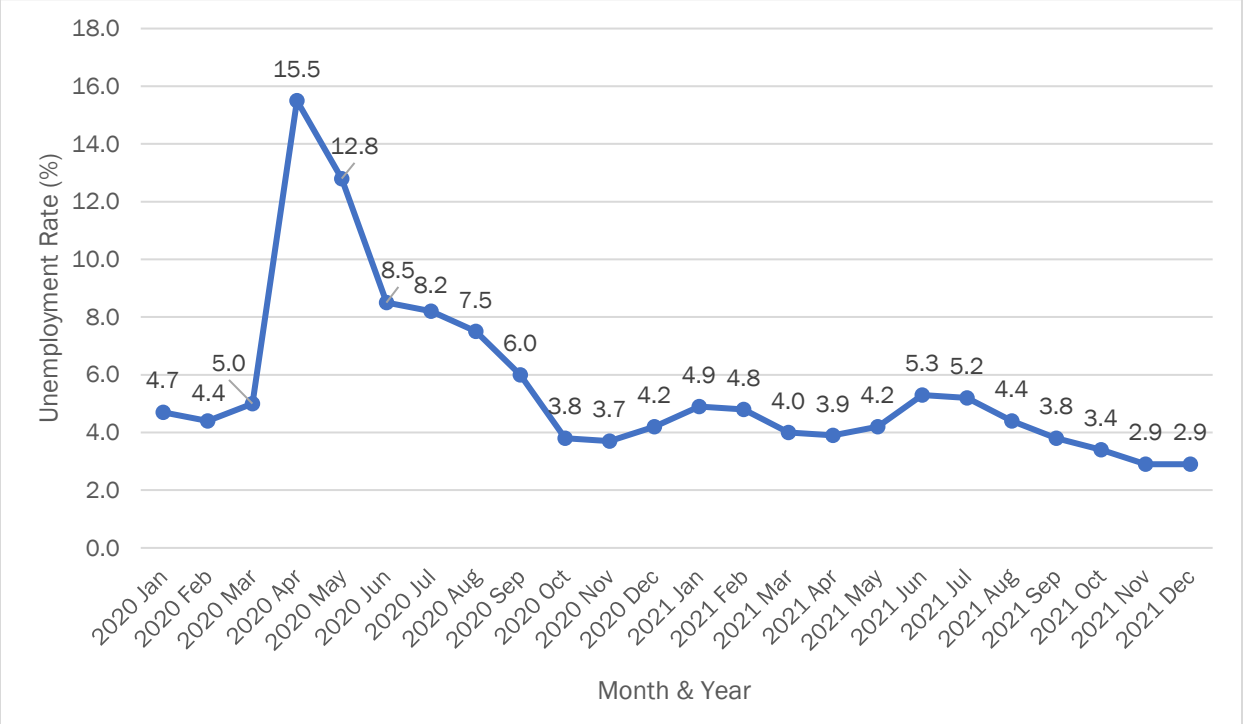
Property Damage
Property damage is not likely to occur as a direct result of an epidemic event. but most property insurances and policies do not cover losses resulting from a disease outbreak. This can cause detrimental damage to properties. Furthermore, there could be a loss of revenue from a closed facility or event.

Loss of Life
Loss of life is a potential outcome from any epidemic event. Epidemics are especially fatal to older adults and those with a pre-existing weak immune system. Adults of any age with medical conditions such as, but not limited to, cancer, diabetes, chronic lung and kidney diseases, heart conditions, liver disease, down syndrome, HIV infection, dementia or other neurological conditions, obesity, and pregnancy, are more likely to get severely sick or die from diseases and epidemics such as the Spanish Flu and COVID-19 (Source: CDC).

Economic Losses
While there is no widely accepted methodology for estimating the economic impacts of pandemics, losses would likely be observed through the inability for individuals to work. Large-scale epidemics then can have a significant impact on production and the supply chain. As such, these events can disrupt the flow of the economy. In the long run, the threat of epidemics is low, and there is little risk that economic losses will occur in the County due to an epidemic. With that being said, the COVID-19 pandemic has proven to be a multiple-month event resulting in ongoing losses. The full extent of this pandemic is still to be determined.

Figure 4.4.2 displays the unemployment rate for Miami County from January 2020 through December 2021. This shows the significant increase in unemployment associated with COVID-19 and accompanying business closures mandated by the State of Ohio during the most part of 2020.

Figure 4.4.2: Unemployment Rates in Miami County in 2020 and 2021 by Month



Source: Bureau of Labor Statistics

Other important economic impacts indicators may include a visible surge in the number of SNAP, TANF, Medicaid, and PRC applications as well as a rise in collections from Unemployment Claims for the payment of child support. These figures help capture snapshots suggesting some of the impacts of COVID-19. A detailed economic analysis of the impacts of COVID-19 can be completed once more data has been collected and made publicly available.

Economic impacts can also be observed should a swine influenza outbreak occur. Swine influenza costs pork produces approximately $3.23 - $10.31 per pig produced (national average).

4.4.7 Land Use and Development Trends

Land use and development are not likely to be impacted by epidemics. Adequate healthcare and emergency facilities as well as transportation systems and infrastructure should be maintained at close proximity to dense areas.

4.5 Flooding

4.5.1 Description

FEMA describes a flood as "a general and temporary condition of partial or complete inundation of normally dry land areas from the overflow of inland or tidal waters [and] the unusual and rapid accumulation or runoff of surface waters from any source." Floods are typically riverine, coastal, or shallow. Flash floods are floods that occur quickly, even occurring without visible signs of precipitation.

Urban flooding is a type of flood that can occur in areas of development that have a high level of impervious surfaces, such as concrete. The level of development and the level of stormwater management practices impact the severity of urban flooding.

Common flood-related terms include:

- **100-Year Flood:** A flood that has a one percent chance to occur each year. The 100-year floodplain can be seen in **Figure 4.5.1: Flood Hazard Map**. The elevation of the water from the 100-year flood is called the Base Flood. Mitigation strategies should be based on the base flood elevation.
- **Floodplain:** An area that has the potential to flood from any source.
- **Floodway:** Sometimes referred to as a regulatory floodway. FEMA defines a floodway as "the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the Base Flood without cumulatively increasing the water surface elevation more than a designated height."
- **Flash flood:** Flash floods are typically caused by heavy rainfall over a short period of time. These floods are particularly dangerous because they can occur in minutes and can sometimes occur even without rainfall, such as when an ice jam breaks or dissolves. Areas impacted by wildfires are particularly susceptible to flash floods.

4.5.2 Location

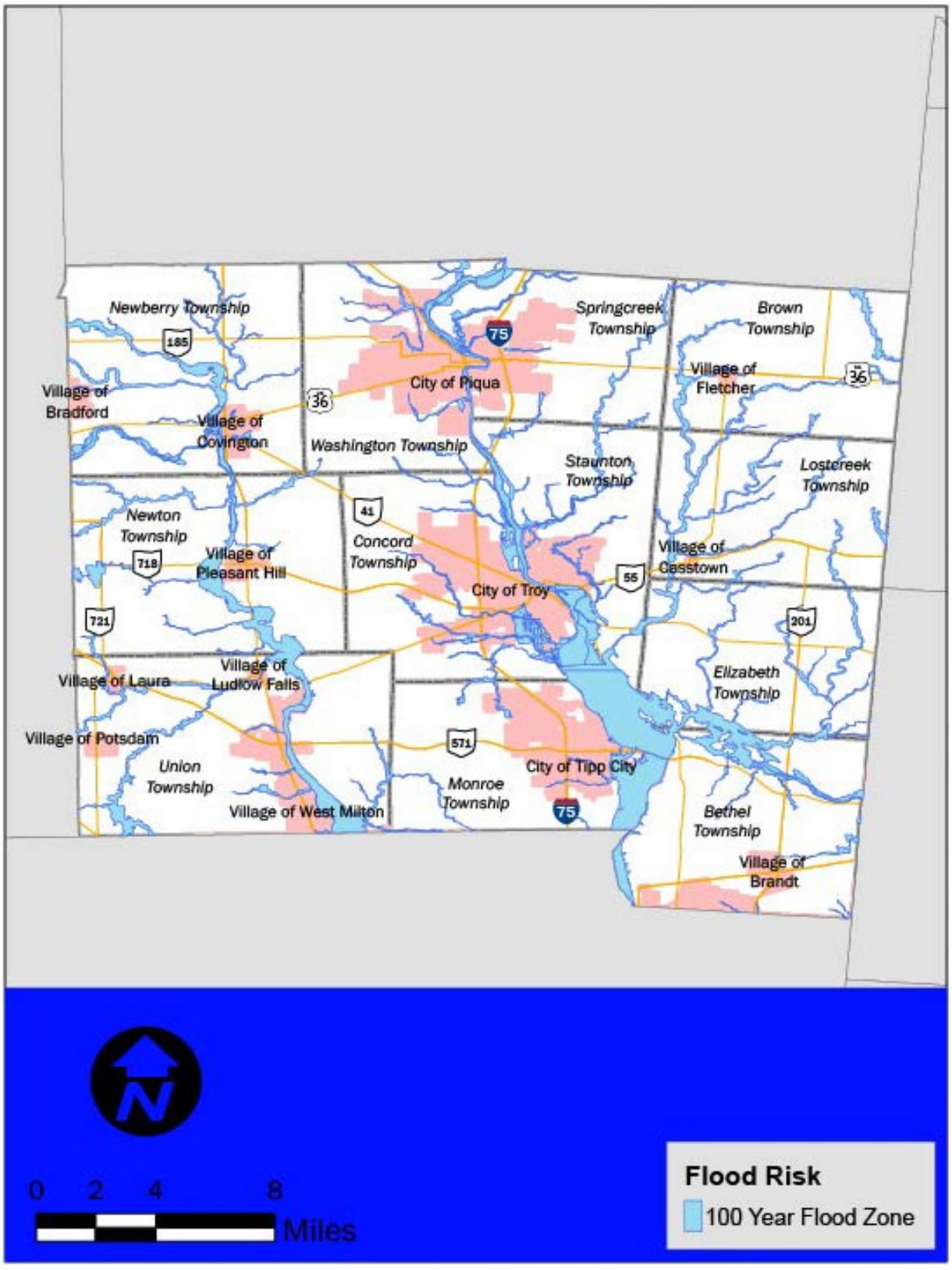
Flooding can occur throughout Miami County. Flash flooding is more likely to occur in developed areas. **Figure 4.5.1** shows the location of the 100-year floodplain.

4.5.3 Extent

Miami County currently has 68 flood insurance maps (see **Appendix F**). The most recent update is from June 2020.

Miami County and twelve communities within the County participate in the National Flood Insurance Program (NFIP). These communities include the Villages of Bradford, Casstown, Covington, Fletcher, Laura, Ludlow Falls, Pleasant Hill, and West Milton, and the Cities of Huber Heights, Piqua, Tipp City, and Troy. The City of Huber Heights is also a part of Greene and Montgomery counties. The Village of Potsdam is outside of FEMA floodplains and therefore does not participate in the NFIP. The Village of Brandt has a small floodplain in the northeast but does not participate in the NFIP. (**Figure 4.5.1**).

Figure 4.5.1: 100-Year Flood Zone in Miami County, Ohio



There are 17 repetitive loss properties and one severe repetitive loss property in Miami County, Ohio. FEMA defines a repetitive loss property as an insurable building for which two or more claims of more than $1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978. FEMA defines a severe repetitive loss property as a single family property that is covered under flood insurance by the NFIP and has incurred flood-related damage for which four or more separate claims payments have been paid under flood insurance coverage, with the amount of each claim payment exceeding $5,000 and with cumulative amount of such claims payments exceeding $20,000; or for which at least two separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property.

4.5.4 History

There have been 63 floods or flashfloods in Miami County between January 1996 and October 2021. These events have caused $1,488,000 in property damages. There are no recorded crop losses. Average annual damage from floods and flashfloods amounts to around $60,000. There are no reported injuries or deaths from floods and flash floods in Miami County. Described below are the three most damaging events, by property damage, over the past two decades. All events are listed individually in **Appendix A**.

Flash Flooding in Miami County on May 21, 2014
Thunderstorms developed in an unstable air mass ahead of a cold front. These thunderstorms were capable of producing large hail, damaging winds, heavy rainfall, flooding, and flash flooding. Some of the flooding lingered into the morning of May 22, 2014.

Water rescues were performed across the County, but especially in the City of Troy and the City of Tipp City areas for people being trapped in cars stranded by flash flooding. The flash flooding was caused by heavy rainfall.

This event caused $1,300,000 in property damage.

Flooding in the Town of Covington on December 22, 2013
Low pressure drew an unseasonably warm and moist air mass across the region. Convection organized ahead of the low pressure and brought heavy rainfall and damaging winds to the area from the evening of December 21 into the morning of December 22. Some of the flooding lingered into December 25. High standing water up to three feet deep covered roads around the Town of Covington and submerged cars.

This event caused $50,000 in property damage.

Flooding in Miami County on July 7, 2003
Several clusters of heavy thunderstorms continued to move across western Ohio during the early morning, and again in the afternoon. An additional two to four inches of rain fell from the thunderstorms, exacerbating flooding in water-logged areas. Throughout the region, roads were flooding and creeks and streams overflowed. Evacuations were necessary along the Great Miami River.

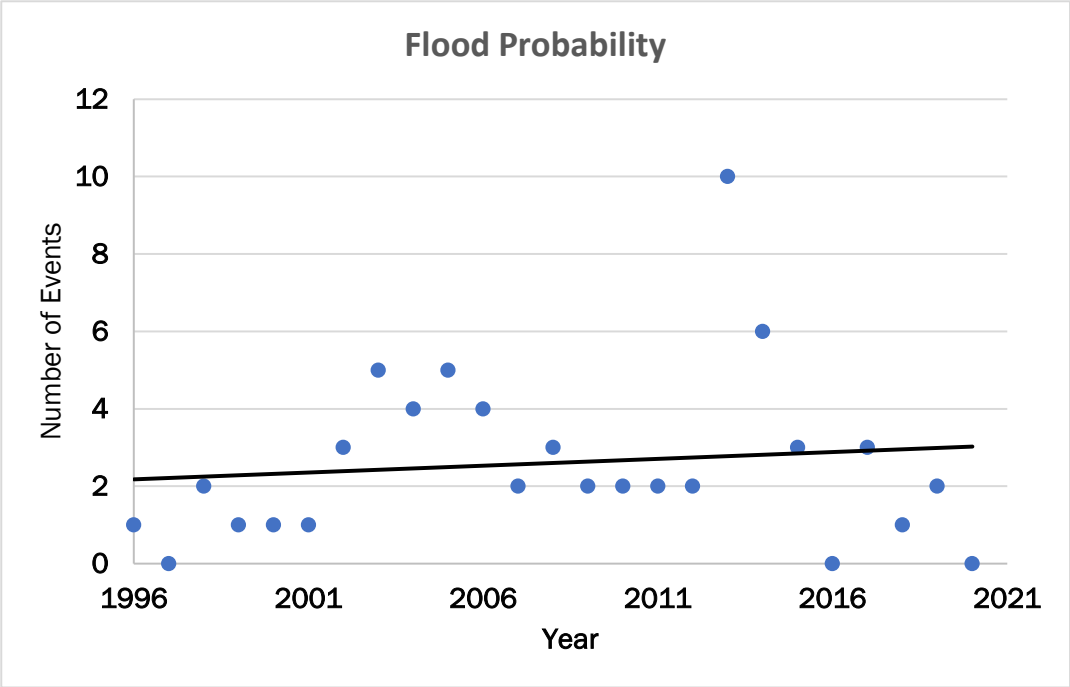
This event caused $30,000 in property damage.

4.5.5 Probability

Figure 4.5.2 shows the trend of flood events over time since January 1996, as this is the earliest year with complete data from the NCDC. The trend of flood occurrences per year increases slightly over

time, which means Miami County can expect to have more annual flood events than have occurred in the recent past.

Figure 4.5.2 Flood Probability



4.5.6 Vulnerability Assessment

Infrastructure Impact
Floods can impact roadways, including interstates and state routes by blocking them due to high water or by filling them with debris.

Population Impact
Floods and flash floods have caused damages to occupied homes in the past. During flood events, shelter may need to be provided to those impacted by flooding.

Property Damage
Property damage is likely during floods, to both residential and non-residential properties. **Table 4.5.1** lists the value of all the properties that are exposed to 100-Year floods.

Table 4.5.1: Structure Vulnerability from Flooding

Structure Type	Value *(in $1000)*	Percent of Total
Residential	$9,105,244	70.0%
Commercial	$1,746,757	13.4%
Industrial	$1,509,377	11.6%
Agriculture	$106,040	0.8%
Religious	$257,972	2.0%
Government	$88,371	0.7%
Education	$195,283	1.5%

Loss of Life

There is one reported death from a flood event on March 19, 2008. Loss of life is possible in future floods or flashfloods.

Economic Losses

Floods can halt economic activity, block roadways, and destroy agricultural crops. Building contents up to $25,000 are expected to be exposed during a 100-Year flood event. Crop losses are also expected during floods or flashfloods.

4.5.7 Land Use and Development Trends

Any development that occurs in flood zones will be at risk. Development in these areas should be limited. Flash flooding is more likely to occur in areas with a high percentage of impervious surfaces. Future land use practices should limit the percentage of impervious surfaces. Chapter 5 contains mitigation actions that address these issues.

4.6 Hazardous Materials

4.6.1 Description

According to the Ohio Environmental Protection Agency (OEPA), hazardous materials can be defined in different ways depending on the law or regulation administered by the Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), the Department of Transportation (DOT), and the U.S. Nuclear Regulatory Commission (NRC).

- The Institute for Hazardous Materials Management defines hazardous materials as "any item or agent (biological, chemical, radiological, and/or physical), which has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors."
- OSHA's definition includes any substance or chemical which is a health hazard or a physical hazard, including carcinogens, toxic agents, irritants, corrosives, and sensitizers, as well as agents that interact to be harmful to the human body, explosive, or flammable.
- The Environmental Protection Agency's definition includes the Occupational Safety and Health Administration definition. It also adds any item or chemical which can cause harm to people, plants, or animals when released into the environment.
- The Department of Transportation defines hazardous materials as any item or chemical which, when being transported or moved in commerce, is a risk to public safety or the environment.

The OEPA indicates that there are five categories in which materials can be hazardous, including acute, chronic, fire, reactive, or sudden release of pressure. The U.S. Nuclear Regulatory Committee regulates materials that produce ionizing radiation, which includes by-product material and radioactive substances.

The Emergency Planning and Community Right to Know Act, or EPCRA, was passed as Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA), which requires a facility that processes, uses, or stores extremely hazardous substances or hazardous substances as classified by the Occupational Safety and Health Administration hazard communication standard. This is also codified in the Ohio Revised Code (ORC) Chapter 3750 and the Ohio Administrative Code Chapter 3750.

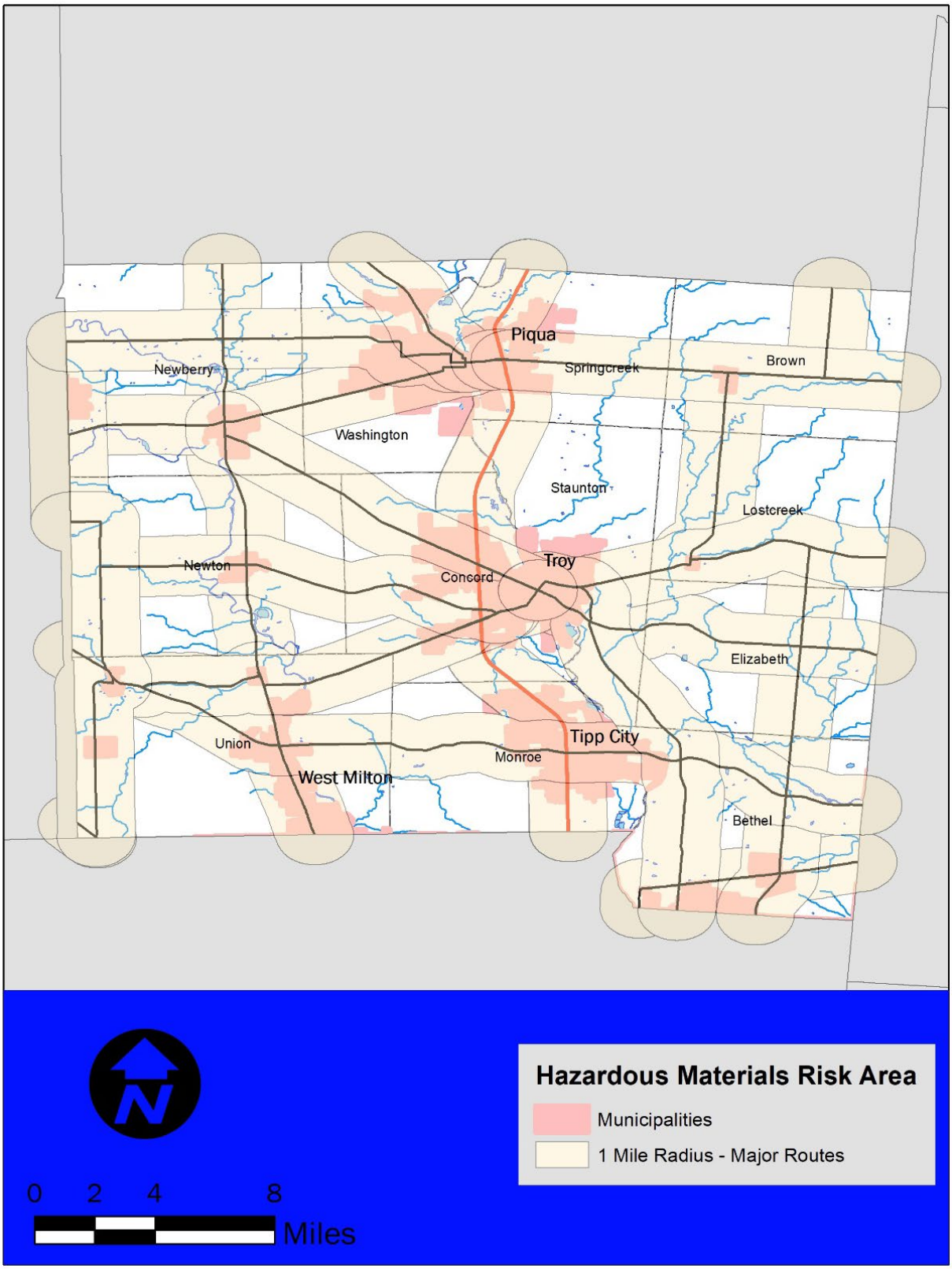
4.6.2 Location

Hazardous material spills can occur wherever hazardous materials are stored and during shipment to these facilities. **Figure 4.6.1** shows the areas which are at the highest risk of being impacted by hazardous materials spills. These areas were calculated by identifying normal shipping routes and placing a one-mile buffer around these routes.

4.6.3 Extent

The Environmental Protection Agency keeps records for Extremely Hazardous Substance facilities because these facilities have a higher probability of spills due to the higher amounts of hazardous materials at their sites. Each potential hazardous material has varying levels of toxicity. The concentration of these materials should be measured in parts-per-million to determine whether they present a threat. Many chemicals are safe at low amounts and low concentrations but can become dangerous and even toxic at high amounts and concentrations. Additionally, some chemicals can be flammable and can become more volatile when exposed to oxygen. In ground spills, untreated chemical and waste spills can contaminate the soil and drinking water, creating toxic environmental conditions. Corrosive, flammable, or explosive chemicals can create infrastructure damage depending on the location, amount spilled, and the circumstances of the incident. In worst case scenarios, large

Figure 4.6.1: Hazardous Materials Risk Area



spills can trigger evacuations of residents and close transportation routes used for hazardous materials transportation, which can also affect local residents.

4.6.4 History

There have been 92 recorded hazardous material spills and releases in Miami County from January 2017 through December 2021. Estimated property and crop damages have not been recorded. **Figure 4.6.1** shows the locations and types of hazardous materials spills in Miami County as recording by the Ohio Environmental Protection Agency (OEPA). A table containing all recorded hazardous materials spills can be found in **Appendix A**.

4.6.5 Probability

Due to their unpredictable nature and the influence of human error, the probably of hazardous materials spills are difficult to quantify. Since hazardous material spills can occur at any time and they should be considered likely events.

4.6.6 Vulnerability Assessment

Infrastructure Impact

Roadways, waterways, and groundwater may be impact by hazardous materials spills. Road closures may occur as a direct or indirect result of hazardous materials spills.

Population Impact

The local population may be directly exposed to hazardous materials. If a large spill occurs, some residents may need to be evacuated and given shelter elsewhere.

Property Damage

Depending on the chemical, property damage is likely. Properties near Extremely Hazardous Substance facilities are likely to be damaged during a spill.

Loss of Life

While some hazardous materials can be toxic, loss of life from hazardous materials spills is unlikely. It is possible, however, and extreme precaution should be taken in the event of a spill.

Economic Losses

Economic losses can occur from the loss of hazardous materials that may be needed in manufacturing or for other processes. Road closures may lead to slowed commerce, and businesses impacted by hazardous materials spills may suffer property damage, damage to goods, or be required to close. **Table 4.6.1** provides property values for all structures at risk during hazardous materials spills.

Table 4.6.1: Structure Vulnerability from Hazardous Materials Spills

Structure Type	Number of Properties Exposed	Value of Vulnerable Structures		
		Land	Building	Total
Residential	39,898	$460,101,580	$1,433,100,460	$1,893,202,040
Non-Residential	9,025	$584,072,330	$723,838,680	$1,307,911,010
Critical Facilities	35	$1,324,940	$21,769,940	$23,094,880
Total	48,923	$1,044,173,910	$2,156,939,140	$3,201,113,050

4.6.7 Land Use and Development Trends

Development that has occurred since the previous plan and any future development near hazardous materials storage facilities may be impacted by hazardous materials spills. All land uses are equally impacted by potential hazardous materials spills.

4.7 Invasive Species

4.7.1 Description

Harmful species are species that have potential negative impacts on the environment and economy of Miami County. Harmful species are both native and invasive. The National Oceanic and Atmospheric Administration (NOAA) defines an invasive species as "an organism that causes ecological or economic harm in a new environment and is not native." Harmful species are species that are native to a region, but that also cause significant ecological, public health, or economic harm. Their growth is often encouraged through human activity.

Invasive species can be terrestrial (land dwelling) or aquatic (water dwelling). Terrestrial species include plants, trees, shrubs, animals, birds, and insects, as well as fungi, bacteria, molds, and viruses. Aquatic species include aquatic plants and algae, fish, mollusks, amphibians, and insects, as well as fungi, bacteria, molds, and viruses.

4.7.2 Location

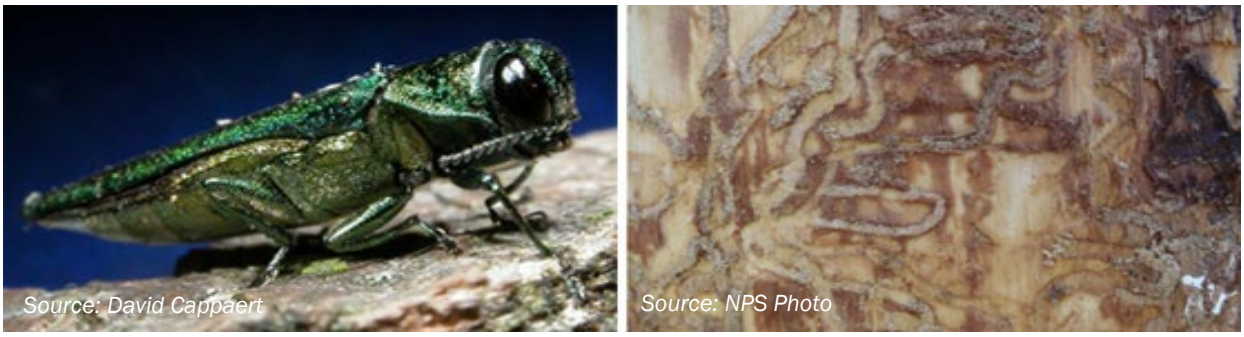
Invasive species have the potential to impact any location within the County. The most invasive of terrestrial species degrade the State's woodlands, wetlands, and prairies. Aquatic Invasive Species use rivers to spread. Ohio has over 66,000 miles of streams, 262 miles of Great Lakes shoreline, nearly 2,000 inland lakes and reservoirs, and shares major watersheds with other states and Canada. Miami County lies in the Mississippi River basin, which is an ecologically diverse river system, and is susceptible to invasions through the Ohio River and its tributaries.

4.7.3 Extent

Once invasive species become widely established, controlling their spread is both technically difficult and expensive, making eradication nearly impossible. Invasive species can usually overtake native species and alter the natural wildlife habitat.

The most common invasive species in Miami County is the **Emerald Ash Borer (EAB) (Figure 4.7.1).** The Emerald Ash Borer is an exotic beetle that feeds on ash trees inhibiting its ability to transport water and nutrients. This insect was first found in Ohio in 2002 and has since been found in every county in the State. Ash trees within 15 miles of a confirmed Emerald Ash Borer infestation are at risk of attack. Since the EAB has been found in every county, there are no quarantines in effect with Ohio's borders. Ohio is still listed in the Federal quarantine boundary.

Figure 4.7.1: Emerald Ash Borer and Feeding Tunnels



Approximately 2,300 plant species occur in the wild in Ohio. Of these, about 78 percent are native, that is, they were found in the region before the times of European settlement. Of the remaining 22 percent, fewer than 100 have been identified to be problems in natural areas. According to the Ohio

Invasive Plants Council, there are 38 banned invasive plant species in Ohio and more under consideration (**Table 4.7.1**). These plants cannot be sold, distributed, or imported.

Studies conducted by Ohio Department of Natural Resources, Ohio Sea Grant, and the Ohio State University have identified over 70 invasive aquatic species in Ohio (**Table 4.7.2**). With the exception of White Perch, it is unlawful to possess, import, or sell these species live.

Table 4.7.1: Plant Invasive Species in Ohio as of January 7, 2018

Scientific Name	Common Name
Ailanthus altissima #	Tree-of-heaven
Alliaria petiolate #	Garlic mustard
Berberis vulgaris	Common barberry
Butomus umbellatus	Flowering rush
Celastrus orbiculatus	Oriental bittersweet
Centaurea stoebe ssp. Micranthos	Spotted knapweed
Dipsacus fullonum #	Common teasel
Dipsacus laciniatus #	Cutleaf teasel
Egeria densa	Brazilian elodea
Elaegnus angustifolia #	Russian olive
Elaegnus umbellate #	Autumn olive
Epilobium hirsutum	Hairy willow herb
Frangula alnus #	Glossy buckthorn
Heracleum mantegazzianum	Giant hogweed
Hesperis matronlis	Dame's rocket
Hydrilla verticillata	Hydrilla
Hydrocharis morsus-ranae	European frog-bit
Lonicera japonica #	Japanese honeysuckle
Lonicera maackii #	Amur honeysuckle
Lonicera morrowii #	Morrow's honeysuckle
Lonicera tatarica #	Tatarian honeysuckle
Lythrum salicaria	Purple loosestrife
Lythrum virgatum (effective January 7, 2019)	European wand loosestrife
Microstegium vimineum	Japanese stiltgrass
Myriophyllum aquaticum	Parrotfeather
Myriophyllum spicatum	Eurasian water-milfoil
Nymphoides peltata	Yellow floating heart
Phragmites australis #	Common reed

Scientific Name	Common Name
Potamogeton crispus	Curley-leaved pondweed
Pueraria montana var. lobate	Kudzu
Pyrus calleryana (effective January 7, 2023)	Callery pear
Ranunculus ficaria	Fig buttercup, lesser celandine
Rhamnus cathartica #	Common Buckthorn
Rosa multiflora #	Multiflora rose
Trapa natans	Water chestnut
Typha angustifolia	Narrow-leaved cattail
Typha x glauca	Hybrid cattail
Vincetoxicum nigrum	Black Swallow-Wort

Table 4.7.2: Aquatic Invasive Species in Ohio

Type	Scientific Name	Common Name
Fish	*Alosa pseudoharengus*	Alewife
Fish	*Carassius auratus* #	Goldfish
Fish	*Carassius Carassius*	Crucian Carp
Fish	*Carassius gibelio*	Prussian Carp
Fish	*Channa app. and Parachanna app.*	Snakeheads
Fish	*Claris batrachus*	Walking Catfish
Fish	*Ctenopharyngodon Idella*	Grass Carp
Fish	*Cyprinus carpio* #	Common Carp
Fish	*Fundulus catenatus*	Northern Studfish
Fish	*Fundulus diaphanus*	Eastern Banded Killifish
Fish	*Gambusia holbrooki and Gambusia affinis*	Eastern & Western Mosquitofish
Fish	*Gasterosteus aculeatus*	Three Spine Stickleback
Fish	*Gymnocephalus cernuus*	Ruffe
Fish	*Hypophthalmichthys harmandi*	Large-scale Silver Carp
Fish	*Hypophthalmichthys molitrix*	Silver Carp
Fish	*Hypophthalmichthys nobilis*	Bighead Carp
Fish	*Lates niloticus*	Nile Perch
Fish	*Leuciscus idus*	Ide
Fish	*Morone americana*	White Perch
Fish	*Mylopharyngodon piceus*	Black Carp
Fish	*Neogobius melanostomus*	Round Goby

Type	Scientific Name	Common Name
Fish	*Osmerus mordax*	Rainbow Smelt
Fish	*Perca fluviatilis*	European Perch
Fish	*Perccottus glenii*	Amur Sleeper
Fish	*Petromyzon marinus*	Sea Lamprey
Fish	*Phoxinus phoxims*	Eurasian Minnow
Fish	*Proterorhinus marmoratus*	Tubenose Goby
Fish	*Pseudorasbora parva*	Stone Moroko
Fish	*Rhodeus sericeus*	Bitterling
Fish	*Rutilus sericeous*	Roach
Fish	*Sander lucioperca*	Zander
Fish	*Scardinius erythrophthalmus*	European Rudd
Fish	*Silurus glanis*	Wels Catfish
Fish	*Tinca tinea*	Tench
Mollusks	*Bellamya (Cipangopaludina)*	Mystery Snails
Mollusks	*Bithynia tentaculata*	Faucet Snail
Mollusks	*Corbicula fluminea* #	Asian Clam
Mollusks	*Dreissena bugensis*	Quagga Mussel
Mollusks	*Dreissena polymorpha*	Zebra Mussel
Mollusks	*Limnoperna fortune*	Golden Mussel
Mollusks	*Potamopyrgus antipodarum*	New Zealand Mudsnail
Crustaceans	*Bythotrephes longimanus*	Spiny Waterflea
Crustaceans	*Cercopagis pengoi*	Fishhook Waterflea
Crustaceans	*Cherax destructor*	Yabby
Crustaceans	*Cherax tenuimanus*	Marron
Crustaceans	*Dikerogammarus villosus*	Killer Shrimp
Crustaceans	*Eriocheir sinensis*	Chinese Mitten Crab
Crustaceans	*Faxonius virilis*	Virile Crayfish
Crustaceans	*Hemimysis anomala*	Bloody-red Shrimp
Crustaceans	*Procambarus clarki*	Red Swamp Crayfish
Plant	*Butomus umbellatus*	Flowering-rush
Plant	*Egeria densa*	Brazilian Waterweed
Plant	*Hydrilla verticillata*	Hydrilla
Plant	*Hydrocharis morsus-ranae*	European Frog-bit
Plant	*Iris pseudacorus*	Yellow Iris

Type	Scientific Name	Common Name
Plant	*Ludwigia peploides*	Creeping Water-primrose
Plant	*Lysimachia nummularia* #	Moneywort
Plant	*Lythrum salicaria*	Purple Loosestrife
Plant	*Marsilea quadrifolia*	European Water Clover
Plant	*Myriophyllum aquaticum*	Parrotfeather
Plant	*Myriophyllum spicatum*	Eurasian Watermilfoil
Plant	*Najas minor*	Brittle Naiad
Plant	*Nelumbo nucifera*	Pink Lotus
Plant	*Nitellopsis obtusa*	Starry Stonewort
Plant	*Nymphoides peltata*	Yellow Floating Heart
Plant	*Phalaris arundinacea*	Reed Canary Grass
Plant	*Phragmites australis*	Common Reed (Phragmites)
Plant	*Pistia stratiotes*	Water Lettuce
Plant	*Potamogeton crispus*	Curly-Leaf Pondweed
Plant	*Trapa natans*	Water Chestnut
Plant	*Typha angustifolia, Typha x glauc*	Narrowleaf and Hybrid Cattails

#*Species most likely found in Miami County*

Other invasive species that have the potential to impact Ohio and Miami County include:

Asian Long-Horned Beetles are wood-boring beetles native to Asia that were unintentionally introduced to North America, likely in wood packing material. A southern Ohio county experienced an infestation in 2011. They pose a significant threat to forested land.

The **Gypsy Moth** is a non-native, invasive species whose larval form feeds on over 300 species of trees and shrubs, especially oak trees. The first Gypsy Moth was trapped in Ashtabula County in 1971, and has since been found across the entire state. The Ohio Department of Agriculture and the USDA Forest Service have run three separate programs since 1989 to suppress and slow the spread of the species. While Miami County is not a quarantined county, Gypsy Moths pose a threat to foliage in the area.

Mute Swans are non-native invasive species found on public lakes across Ohio. During the breeding season, March through May, adult mute swans become highly territorial and will fight to push native birds out of their nesting area. Mute swans have attacked humans and pets during this time as well. Mute swans can consume submerged aquatic vegetation and usually uproot the whole plant leaving nothing behind. This takes away natural habitat from fish and leaves little food source for native waterfowl. The removal of aquatic vegetation can also cause water quality issues and erosion problems.

Two-spotted Spider Mites are closely related to arachnids. They are a mite that thrives in the warmer temperatures of summertime, affecting over 180 species of plants from field crops to houseplants through both consumption of the foliage and damage from their webs. Forested and agricultural areas are especially susceptible to this pest's detrimental effects.

White Nose Syndrome is a fungal disease infecting and killing bats. Bats provide several ecological benefits such as plant pollination, seed dispersal, pest control, and contributions to the medical field. In Ohio, there are 11 species of bats that consume tons of nocturnal insects each year including moths, beetles, flies, true bugs, and hoppers. A White Nose Syndrome case was confirmed in Ohio in 2011.

4.7.4 History

There are no known impacts of invasive species particular to Miami County except the Emerald Ash Borer, which has spread to all 88 counties in Ohio. Additionally, it is possible that any of the species listed above have at one point affected the County and its residents.

4.7.5 Probability

Since there are many invasive species throughout Ohio, it is probable that Miami County will experience some of the invasive species listed above, especially those noted as most likely to be found in the County (**Tables 4.7.1 and 4.7.2**).

4.7.6 Vulnerability Assessment

Infrastructure Impact

There are no likely impacts to public roadways or utilities. Public trees may be destroyed or impacted by various invasive species. Aquatic invasive species could destroy water quality, make poor habitat for fish, and clog water intake pipes. Some species also increase fire potential and can be problematic to levees, dams, and irrigation systems.

Population Impact

There are no likely impacts on the local population. Recreational activities such as boating and fishing may be mildly impacted.

Property Damage

Property damage, in the form of reduced values from impacts on landscaping, is likely.

Loss of Life

Loss of life due to the effects of invasive species is unlikely. Some of these species consumed as food could lead to diseases and other health impact in humans.

Economic Losses

Economic impacts can vary greatly depending on the target and the invasive species and their impacts on those targets. Agricultural revenue losses may be experienced if crops are affected by an invasive species. Also, there may be indirect economic losses with degradation of forested lands and tree canopies. Examples include reduction in viable lumber for construction, increased heating and cooling costs, and reduced property value.

4.7.7 Land Use and Development Trends

There could be slight impacts on development and land use due to invasive species. Some invasive species can be particularly damaging to crops, agricultural land, and wetlands.

4.8 Severe Summer Weather

4.8.1 Description

Severe summer weather events may include severe thunderstorms and thunderstorm-induced wind events, hail, and lightning. Non-thunderstorm high wind events, tornadoes, and flooding may also be related to severe summer weather and due to the potential threat of these events, they are each discussed in separate risk assessments. While tropical storms and hurricanes are also forms of severe storms, Miami County does not have any record of such events affecting the County; therefore, the County has not deemed tropical storms and hurricanes to be a threat, and these specific types of weather will not be addressed further.

According to the National Weather Service (NWS), a severe thunderstorm is a thunderstorm that produces a tornado, winds of at least 58 MPH, and/or hail at least one inch in diameter. A Severe Thunderstorm Watch is issued by the NWS if conditions are favorable for the development of severe thunderstorms. A watch is usually in place for four to eight hours, during which time people should be prepared to move to a safe place if threatening weather approaches.

A Severe Thunderstorm Warning is issued if either the WSR-88D radar indicates a severe thunderstorm or if a spotter reports a storm producing hail or winds meeting the criteria outlined in the description above. The WSR-88D radar is an advanced Weather Surveillance Doppler Radar utilized by the NWS to generate a radar image. The NWS recommends that people in the affected area seek safe shelter immediately, as severe thunderstorms have the potential to produce tornadoes with little-to-no advance warning. Lightning frequency is not a criterion for issuing a severe thunderstorm warning. The warnings are usually issued for one hour and can be issued without a Severe Thunderstorm Watch already in effect. The National Weather Service Forecast Office in Wilmington, Ohio is responsible for issuing Severe Thunderstorm Watches and Warnings for Miami County.

Lightning is caused by a rapid discharge of electrical energy that has built up in the atmosphere between clouds, the air, or the ground. Lightning strikes can be either direct or indirect. A direct strike is when lightning strikes a building or a specific zone, which can result in fusion points melting holes of varying sizes at the point of impact of materials with high resistivity. An indirect lightning strike is when lightning causes power surges that disrupt electrical equipment.

Severe summer storms can also create strong winds – often called “straight-line” winds – to differentiate thunderstorm winds from tornadic winds. These winds, which have the potential to cause damage, are caused by an outflow generated by a thunderstorm downdraft.

Hail is a type of frozen precipitation that occurs when thunderstorm updrafts carry raindrops upward into extremely cold atmospheric zones where they freeze before falling to the ground. The resulting hailstones can fall at speeds greater than 100 MPH and range in size from smaller than 0.50 inches (the size of a pea) to 4.5 inches (the size of a softball) (Source: National Weather Service).

4.8.2 Location

Severe summer storms are generally a regional (Midwest) hazard and all of Miami County is susceptible to severe summer weather.

4.8.3 Extent

Severe summer storm events have the potential to create large-scale damage in Miami County. Specifically, lightning is responsible for approximately 50 deaths annually across the United States, as well as hundreds of injuries (Source: NOAA). Winds associated with severe summer storms have the

potential to cause damage by bringing down tree limbs and generating widespread power outages. Additionally, hail can result in property damage.

Severe summer storms can lead to flooding, downed trees and power lines, and other dangerous conditions.

4.8.4 History

According to the National Centers for Environmental Information (NCEI), there have been 169 thunderstorm wind events, 58 hail events, three heavy rain events, and five lightning events recorded in Miami County from March 1990 to December 2020. According to the Federal Emergency Management Agency, five of these events were declared federal disasters. These events resulted in over $1.5 million in property damage and $50,000 in crop damage. These events were responsible for one death and seven injuries. These events are summarized in **Table 4.8.1**, below:

Table 4.8.1: Thunderstorm-Related Events in Miami County since 1990

Severe Storm Event Type	Number of Events	Injuries	Deaths	Property Damages	Crop Damages
Thunderstorm Wind	169	3	0	$1,456,700	$0
Hail	58	0	0	$25,250	$50,000
Heavy Rain	3	0	0	$1,000	$0
Lightning	5	4	1	$24,000	$0
Total	**235**	**7**	**1**	**$1,506,950**	**$50,000**

Miami County has been associated with one severe summer weather disaster declaration (2019) since the previous hazard mitigation plan.

Thunderstorm Wind Event, May 19, 2019
During a severe thunderstorm, trees were toppled by thunderstorm-induced high winds. Two people were injured when a tree fell onto a house in Arapaho Trail. This event cause $100,000 in damages throughout the County.

Thunderstorm Wind Event, June 29, 2012
A very hot and unstable airmass interacted with northwesterly flow aloft to produce a derecho across northern Illinois. This derecho then moved rapidly east southeast across the Ohio Valley producing widespread straight line wind damage. This rare derecho affected nearly every county in southeast Indiana, northern Kentucky, and Ohio with severe winds. This caused widespread power outages that lasted several days in some locations. Isolated large hail also occurred with the stronger portions of the system. In Miami County, a tree fell on a pickup truck due to thunderstorm winds. One person in the truck was injured.

Severe Thunderstorm, September 4, 2011
Severe thunderstorms caused damage to numerous large trees that were either sheared or uprooted. Nineteen loaded semi-trailers were overturned, and two air conditioning units were blown off a roof at a distribution center. Eight wooden high voltage electric poles were snapped. Another semi-trailer was overturned on a highway. These occurrences were due to damaging thunderstorm winds. Total damage estimates were approximately $250,000.

Lightning, June 2, 2007
During a thunderstorm, lightning caused the injuries of a man and his two sons taking cover under a tree in Troy during the Troy Strawberry Festival. Injuries were non-life threatening.

Lightning, April 9, 2001
During an early spring thunderstorm, lightning caused the death of a man taking cover near a tree in a city park in the City of Piqua.

Lightning, June 3, 1996
Lightning was reported to have stricken a woman doing dishes inside of her home near a window.

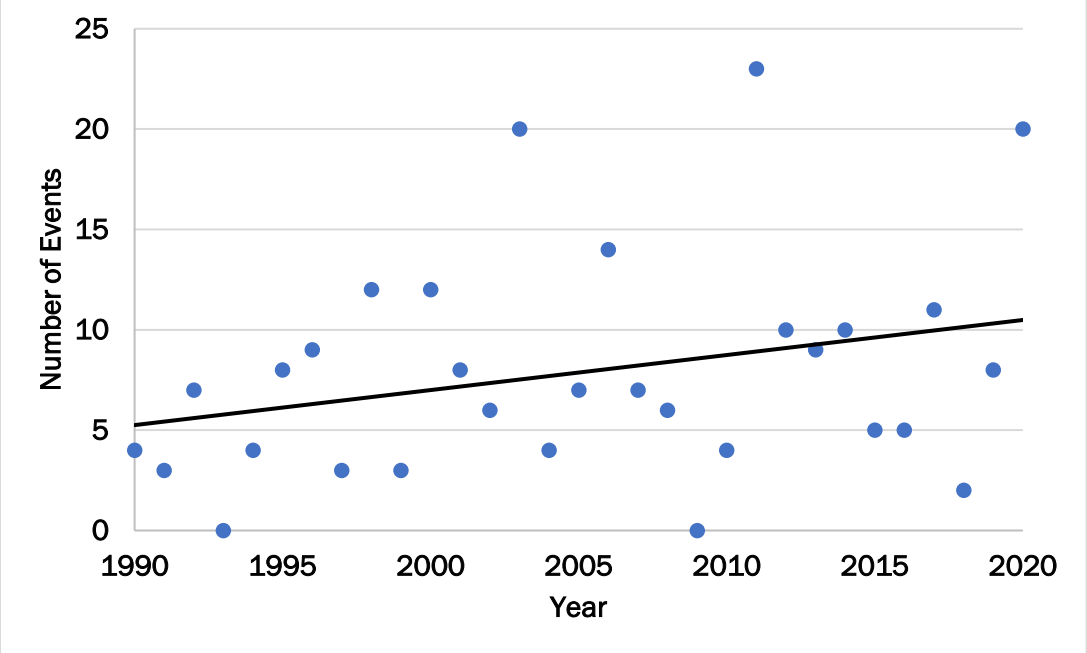
Hailstorm, June 6, 1994
Severe thunderstorms created large hail, impacting the southern portion of the County, near the City of Tipp City. This hailstorm caused $50,000 in crop damages, the largest such event between 1990 and 2020.

4.8.5 Probability

According to the NCEI, there have been 235 severe summer storm events reported in Miami County from March 1990 to December 2020 with total losses reaching more than $1.5 million in property damage and $50,000 in crop damage. This amounts to between seven and eight severe storm events annually with average annual damages of $50,000.

Furthermore, **Figure 4.8.1** below shows the trend in number of thunderstorm events per year since 1990. The trend line has a positive slope, which indicates that the number of severe summer storms has increased over the last 30 years and is projected to increase over the next five years. Years prior to 1990 are excluded from the probability calculation due to missing and/or unreliable data reporting.

Figure 4.8.1: Severe Summer Storm Probability



4.8.6 Vulnerability Assessment

Infrastructure Impact

Above-ground infrastructure is at risk for storm damage by wind and falling debris. For infrastructure, high winds and hail are the most damaging part of a severe storm. Thunderstorm winds can strip bark from trees and detach limbs. If large branches fall, they can damage buildings and supporting above-ground infrastructure. In the most severe storms with high winds, large trees can be uprooted and have the potential to fall on buildings including houses, which can cause harm or death.

Utilities are at risk for damage by severe summer storms as well. Electrical lines are spread throughout the County connecting homes, businesses, and other facilities. Severe storms are likely to down tree limbs and generate other debris that can affect above-ground electrical lines causing power outages. Downed power lines that are still live are extremely hazardous and can cause death by electrocution.

Population Impact

According to the US Census 2020 population estimates, the population of Miami County is 108,774. Summer storms are random in nature and affect the entire area of the County. Everyone should be prepared during a storm event. Populations residing in mobile home parks are particularly vulnerable and should seek out shelters.

Property Damage

As described above, these events have caused an average of $50,000 in property damages annually. Due to the non-site-specific nature of this hazard, **Table 4.8.2** lists all structures within Miami County as having potential impacts from severe storms.

Loss of Life

One fatality occurred during an early spring thunderstorm in April 2001. A man took shelter under a tree in a city park in Piqua. Lightning struck the tree, killing the man. Due to widespread destructive potential of severe summer weather, there is always potential for injuries and fatalities during severe weather.

Economic Losses

Severe summer weather usually causes minor damage to structures, such as blowing shingles off roofs and downed branches breaking windows or falling onto buildings and above-ground infrastructure. More severe damage may also result, such as structural damage to high profile buildings during derecho events. Of the 235 severe summer storm events since 1990, 33 events resulted in property damage of $10,000 or more.

Table 4.8.2: Structure Vulnerability from Severe Storms

Structure Type	Number of Properties Exposed	Value of Vulnerable Structures		
		Land	Building	Total
Residential	43,384	$524,073,200	$1,577,825,860	$2,101,899,060
Non-Residential	10,049	$584,072,330	$723,838,680	$1,307,911,010
Critical Facilities	35	$1,324,940	$21,769,940	$23,094,880
Total	53,433	$1,108,145,530	$2,301,664,540	$3,409,810,070

**Note: Critical Facilities are non-residential structures and their value is incorporated into the non-residential totals as well. Calculated totals are determined by summing the residential and non-residential values.*

4.8.7 Land Use and Development Trends

Severe summer weather can occur anywhere. Any development that has occurred since the previous plan and any future development has the potential to be impacted by severe summer weather.

4.9 Severe Winter Weather

4.9.1 Description

Severe winter weather includes winter storms, heavy snow, ice storms, and extreme cold/wind chills. Winter storms are events that have snow, sleet, ice, or freezing rain as their primary type of precipitation. While the precipitation itself is typically not dangerous, frozen roads, damaged infrastructure, and exposure to cold can cause death and injury.

A winter storm forms under the right combination of three causes:

1. Below freezing temperatures in the clouds and near the ground, which are necessary to make snow and ice.
2. Lift, which raises the moist air from the clouds and causes precipitation. Warm air colliding with cold air and being forced to rise over the cold is an example of lift.
3. Moisture is needed to form clouds and precipitation. Air blowing across a body of water is a common source of moisture.

Winter storms are categorized by their type: blizzards, ice storms, and snow squalls.

- **Blizzards** are winter storms that are a combination of blowing snow and winds greater than 35 mph which lead visibility of ¼ mile or less for at least three hours. Heavy snowfalls and severe cold often accompany blizzards, but this is not required. Ground blizzards occur when strong winds pick up snow that has already fallen.
- **Ice Storms** occur when at least a quarter inch of ice accumulates on exposed surfaces. Roads and sidewalks can become dangerously slick, and trees and powerlines can easily break under the weight of accumulated ice.
- **Snow Squalls** are brief, intense snow showers accompanied by strong winds. Impacts may be significant.

4.9.2 Location

Winter storms are typically large events that will impact the entire County and have the potential to impact surrounding counties at the same time.

4.9.3 Extent

The average annual snowfall in Miami County is approximately 16 inches. Snowfall typically occurs between November and March, though snow has been recorded in October and April. January is the coldest month on average.

4.9.4 History

There have been 114 winter weather events including blizzards, heavy snow, extreme cold/wind chills, and ice storms in Miami County since January 1996. These events caused a total of $651,000 in property damage, resulting one death according to the National Centers for Environmental Information (NCEI).

There has been one emergency declaration related to winter storms covering Miami County. The public assistance amount for each emergency declaration was divided between all jurisdictions impacted by the events.

Table 4.9.1: Severe Winter Weather Events in Miami County since 1996

Severe Storm Event Type	Number of Events	Injuries	Deaths	Property Damages
Blizzard	1	0	0	$0
Extreme Cold/Wind Chill	2	0	0	$20,000
Heavy Snow	13	0	0	$81,000
Ice Storm	4	0	0	$0
Winter Storm	94	0	1	$550,000
Total	**114**	**0**	**1**	**$651,000**

Major Winter Storms, January 2-11, 1996
Over multiple days between January 2 and January 11, 1996, three waves of winter storms and snow impacted the area. In the first wave, up to a foot of snow fell in some parts of the region before more heavy snow produced the most accumulation since the Blizzard of 1978. Then, in a third wave, ice and snow mixed for difficult conditions. This storm caused one death of a 47-year-old man from exposure to the elements and $500,000 in property damages.

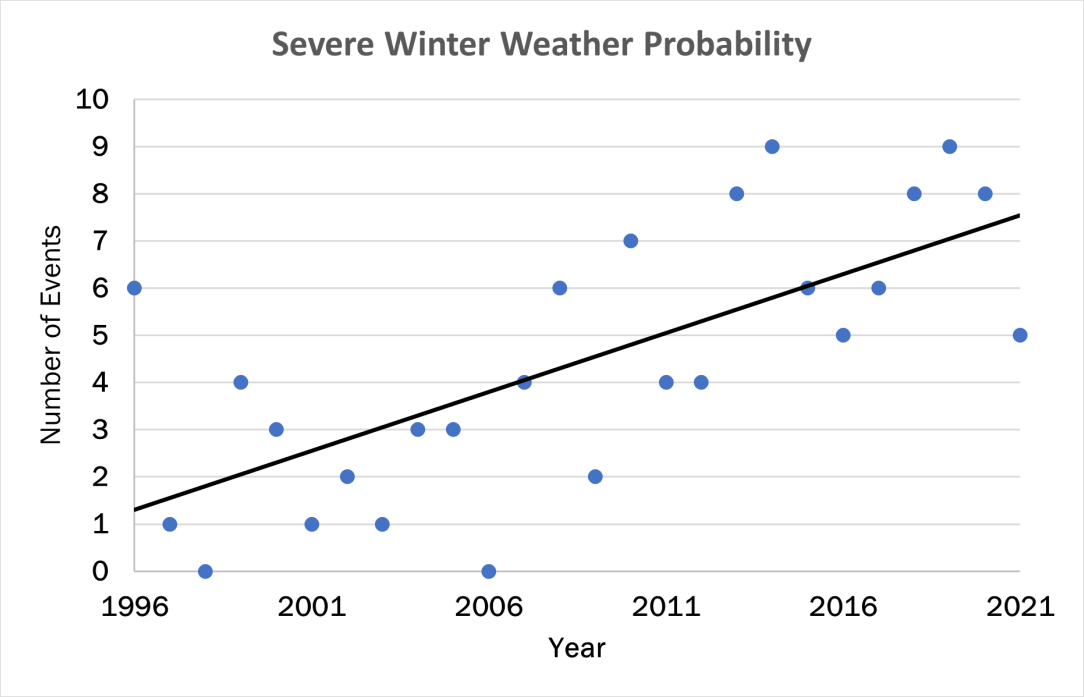
Major Winter Storm, December 22, 2004
Starting December 22, 2004, what has become known as the "Christmas snowstorm of 2004" blew through the region and buried the area. Piqua recorded 20 inches of snow by 9am on December 23, 2004. The temperature dropped to -10 degrees by December 25th, and winds blew up to 36 miles per hour creating blizzard and ground blizzard conditions. This storm was responsible for $25,000 in property damages.

Major Winter Storm, January 1-13, 1999
In three weather events from January 1-13, 1999, a mix of snow, freezing rain and low temperatures led to nearly two weeks of difficult weather conditions. In some parts of the area, up to one inch of ice accumulated.

4.9.5 Probability

According to the NCEI, there have been a total of 114 winter storm and winter weather events reported in Miami County from January of 1996 to December 2021, with total losses amounting to $651,000 in property damage. This amounts to approximately four winter storm events annually with average annual damages of $26,000. **Figure 4.9.1** shows the trend of severe winter weather events over time between January 1996 and December 2021. The trend line increasing over time showing that winter storm events are becoming more common each year.

Figure 4.9.1: Severe Winter Weather Probability



4.9.6 Vulnerability Assessment

Infrastructure Impact

Winter storms can cause damage to overhead utilities. Wires in particular can collapse under the weight of accumulated snow and ice. Debris can block roadways or damage property as tree limbs can also collapse under the weight of accumulated snow and ice. Water pipes can be frozen under extreme low temperatures that may accompany severe winter storms. Roads and sidewalks can be blocked by the accumulation of snow, as well as being iced over.

Population Impact

All residents of Miami County are expected to be impacted by severe winter storms. The elderly and children may be more severely impacted by extreme cold.

Property Damage

Property can be damaged by accumulated snow and ice, debris, and falling wires. Extreme low temperatures can also freeze the water in pipes which could cause them to explode. All buildings in the County are exposed and vulnerable to winter storms.

Loss of Life

There is one reported direct or indirect deaths from severe winter weather events in Miami County. This death was due to exposure to the elements during the 1996 snowstorm. During any severe winter weather event, there is a potential for loss of life. Deaths may occur during the event due to exposure, structural failure from heavy snow, or vehicle accidents.

Economic Losses

Economic losses can occur from businesses shutting down for potentially long periods of time. Economic activity can be completely halted during winter storms including transportation of goods.

Electricity outages may lead to spoiled goods. Since winter storms occur during the winter season, damages to crops are unlikely.

4.9.7 Land Use and Development Trends

Winter storms can occur anywhere. Any development that has occurred since that previous plan and any future development has the potential to be impacted by winter storms. All land uses are equally impacted by severe winter weather.

4.10 Terrorism

4.10.1 Description

The Terrorism hazard is assessed as a way to monitor different types of terrorism and acts of violence inflicted on a civilian population. Terrorism is defined as "the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives" (28 CFR, Section 0.85). Tools used to conduct acts of terrorism include Weapons of Mass Destruction (WMD), biological, chemical, nuclear, and radiological weapons, arson, incendiary, explosives, armed attacks, industrial sabotage, intentional hazardous materials release, and cyberterrorism.

The Federal Bureau of Investigations (FBI) produces an annual terrorism report, which contains profiles and chronologies of terrorism incidents in the United States. Terrorism can be both International and Domestic, where International Terrorism is defined as acts "perpetrated by individuals and/or groups inspired by or associated with designated foreign terrorist organizations or nations (state-sponsored)". The second is Domestic Terrorism, which is defined as acts "perpetrated by individuals and/or groups inspired by or associated with primarily U.S.-based movements that espouse extremist ideologies of a political, religious, social, racial, or environmental nature" (Source: FBI).

Types of terrorism include cyberterrorism, agroterrorism, biological terrorism, chemical terrorism, or an active aggressor situation. Stakeholders have also requested discussion on active aggressors as part of this hazard assessment. These types of terrorism and other complex/coordinated events are defined below:

- **Cyberterrorism:** Cyberterrorism is an electronic attack using one computer system against another, and attacks can be directed towards computers, networks, or entire systems. A cyber-attack may last minutes to days. Homeland Security, the FBI, and the Federal Communications Commission Department of Justice are often involved in developing countermeasures that focus on reducing the threat, vulnerability, and likelihood of attack.
- **Agroterrorism:** Agroterrorism is a direct, generally covert contamination of food supplies or the introduction of pests and/or disease agents to crops and livestock. An agricultural-based terror attack can last days to months.
- **Biological Terrorism**: Biological terrorism includes use of bacteria, viruses, or toxins to incite terror. This mode of terrorism can last minutes to months.
- **Chemical Terrorism**: Chemical terrorism includes use of nerve agents, choking agents, blood agents, or blister agents to attack normal bodily functions of the nervous, respiratory, circulatory, and skin respectively. Usually, an act of chemical-based terror lasts only minutes.
- **Active Aggressor:** An active aggressor is an armed individual or group of individuals that is intending to cause harm or inflict terror on a civilian population. An active aggressor (or group) may be armed with guns, knives, bombs, or any other weapon/implement that may be used to inflict harm.

4.10.2 Location

Terrorism events have generally been localized within a single jurisdiction. Coordinated events have occurred historically, greatly expanding the number of affected jurisdictions. Based on the nature of the event, several jurisdictions may respond to an incident.

4.10.3 Extent

The extent of each of these terrorism events includes:

- **Cyberterrorism**: Typically, the built environment is unaffected by a cyber-attack. Inadequate security can facilitate access to critical computer systems allowing them to be used to conduct attacks. Though the infrastructure may not be destroyed, it may be made to malfunction, causing additional hazards. Cyberterrorism may also include online wire fraud, which is often targeted to the elderly. This abusive practice often extorts the elderly and results in economic losses.
- **Agroterrorism**: Agro-terrorism is a viable primary aspiration for terrorists, as agriculture is the largest single sector in the US economy. It lacks the traditional shock factor of attacks, but its extent could be large and longer lasting. The extent of the effects varies by type of incident. Inadequate security can facilitate the adulteration of food and introduction of pests and disease agents to crops and livestock resulting in animal suffering, loss of valuable animals, cost of containment of outbreaks, and lost trade and other economic effects. With agriculture being the most common land use and top industry in Miami County, farmers must be vigilant and prepared to respond to acts of terrorism.
- **Biological Terrorism**: A biological attack could cause illness and even kill hundreds of thousands of people, overwhelm public health capabilities, and create significant economic, societal, and political consequences. Public health infrastructure must be prepared to prevent illness and injury that would result from biological terrorism.
- **Chemical Terrorism**: Most chemical agents are capable of causing serious injuries or death, and their often-rapid course of action means there is very little time to act when an act of chemical terrorism occurs. Public health infrastructure must be prepared to prevent illness and injury that would result from chemical terrorism. Terrorism events that are caused due to chemicals impact the environment as well. Impacts can be large and felt by the environment in several different ways such as altering the quality of air and water, affecting sewage and wastewater systems, and displacing aquatic ecosystems and soils that sustain wildlife.
- **Active Aggressor**: Active aggressor incidents often occur in areas where a number of people gather regularly. This may be a place of employment, a neighborhood gathering area (church, recreational center, school, etc.), or other location.

Terrorist threats may also occur among school districts within the County. Threats can last several hours or even days and cause multiple problems such as disturbing a school's order, causing traffic jams, and inducing civil panic. Individuals, groups, and institutions should be aware of and understand how to react to such potential threats immediately and appropriately.

4.10.4 History

There have been no reported terrorism events in Miami County. Although events such as the World Trade Center Bombings (1993 & 2001) did not occur in Ohio, there is an implied threat in this state. In 1995, an Ohio resident was able to order samples of Plague bacilli. Although this attempt was thwarted, it indicates viability of bio-terrorist threats. Terrorist plots have been thwarted in Columbus, Dayton, Cincinnati, and Cleveland, among other locations. Mass shootings, such as a school shooting, are an example of an Active Aggressor situation.

While there are no recorded school shootings or terrorism incidents in Miami County, local officials have determined that the risk of such an incident occurring in Miami County exists. The Miami County Sheriff's Office Special Response Team serves as the primary division responsible for domestic and/or foreign security issues serving as a liaison to other state and local organizations.

4.10.5 Probability

Terrorism-related events have a low probability and are not predictable. As these events are man-made, they should be considered unlikely, but not impossible. Cyberattacks are becoming more likely with 42,068 incidents across all sectors occurring nationwide in 2016 according to the U.S. Council of Economic Affairs. Of this, 21,239 were public sector attacks and utility systems experienced 32 attacks nationwide in 2016.

4.10.6 Vulnerability Assessment

Infrastructure Impact

Above ground structures such as utility systems, government buildings, churches, libraries, and schools, as well as below-ground infrastructure such as natural gas pipelines, are at risk for terrorism damage. Acts of cyberterrorism have the potential to target systems that may influence or control infrastructure. The Homeland Security Unit conducts vulnerability assessments on critical infrastructure and other key resources in the County.

Population Impact

The population of Miami County is likely to be impacted should an act of terror occur. It is important that public health organizations are prepared to prevent illness and injury that may result from acts of terror.

Property Damage

Since coordinated incidents can occur anywhere within the County, property damage is a possible outcome of such an event. Agroterrorism may result in damage to crops, and an active aggressor situation may result in minimal property damage.

Loss of Life

Acts of terror are likely to result in loss of life and cause long-term impact to health. It is important that public health and healthcare organizations are prepared to act quickly should an act of terror occur.

Economic Losses

Since the probability of a coordinated attack happening in Miami County is very low, local terrorism-related economic losses are estimated at zero. However, terror attacks occurring in other locations have the potential to have economic impacts in Miami County. A 2016 nationwide estimate indicates that a cyber-attack may cost the U.S. economy between $57 billion and $109 billion.

Transportation networks, such as air transportation, can be shut down as a result of terrorism impeding profits and resulting in economic losses to organizations within the County. Any nationwide complex/coordinated attack or act of terror that results in a temporary freeze of goods or services has the potential to limit or suspend economic activity in Miami County as well.

4.10.7 Land Use and Development Trends

Terrorism-related events can occur anywhere. Non-residential land uses are more likely to be targeted for terror events or active shooters. Schools and government buildings should have active shooter plans in place. Farmers must be prepared for agroterrorism by locking certain areas of their farms or using cameras to monitor who is on their fields.

4.11 Tornadoes and High Winds

4.11.1 Description

FEMA defines a tornado as "a violently rotating column of air extending from a thunderstorm to the ground." Tornadoes can generate wind speeds of greater than 250 MPH. Tornado paths can be as large as one-mile-wide and 50 miles long. Nationally, there is an average of 800 tornadoes reported annually across all 50 states.

In general, the midsection of the United States experiences a higher rate of tornadoes than other parts of the country because of the recurrent collision of moist, warm air moving north from the Gulf of Mexico with colder fronts moving east from the Rocky Mountains. Supercells, which form from rotating thunderstorms, are the most destructive variety of tornado.

Tornado Warnings are issued when a tornado is indicated by the WSR-88D radar or sighted in person by spotters. The WSR-88D radar is an advanced Weather Surveillance Doppler Radar utilized by the NWS to generate a radar image. Once a warning has been issued, people in the warning area should seek shelter immediately. Warnings will include the location of the tornado, as well as what communities will be in its path. A tornado warning can be issued without a tornado watch, and they are typically issued for 30 minutes at a time. If the thunderstorm responsible for the formation of the tornado is also producing large volumes of rain, the tornado warning may be combined with a Flash Flood Warning. The NWS Office will follow up any Tornado Warnings with Severe Weather Statements to provide up-to-date information on the tornado and inform the public when the warning is no longer in effect (Source: NWS). The National Weather Service Forecast Office in Wilmington, Ohio is responsible for issuing Tornado Watches /Warnings and Wind Advisories for Miami County.

4.11.2 Location

Tornadoes and non-thunderstorm induced high wind events are countywide hazards and all of Miami County is susceptible to tornadoes and non-thunderstorm induced high wind events. **Figure 4.11.1** shows the location of a worst-case scenario tornado in Miami County.

4.11.3 Extent

Tornadoes are measured by damage scale for their winds with greater damage equating greater wind speed. The original Fujita Tornado Damage Scale (F-scale) was developed in 1971 without much consideration to a structure's integrity or condition as it relates to the wind speed required to damage it. The Enhanced Fujita-scale (EF-Scale) took effect on February 1, 2007. This scale starts with the original F-scale's F0-F5 ratings and classifies tornado damage across 28 different types of damage indicators. These indicators mostly involve building/structure type and are assessed at eight damage levels from 1-8. Therefore, construction types and their relative strengths and weaknesses are incorporated into the EF classification given to a particular tornado. The most intense damage within the tornado path will generally determine the EF scale given the tornado. **Table 4.11.1** lists the classifications under the EF- and F-scale. It should be noted that the wind speeds listed in this table are estimates based on damage rather than measurements.

There are no plans by the National Oceanic Atmospheric Administration (NOAA) or the National Weather Service to re-evaluate the historical tornado data using the enhanced scale. Therefore, this Plan and subsequent plans will reference both scales until a complete switchover is deemed necessary.

Figure 4.11.1: Worst-Case Scenario Tornado

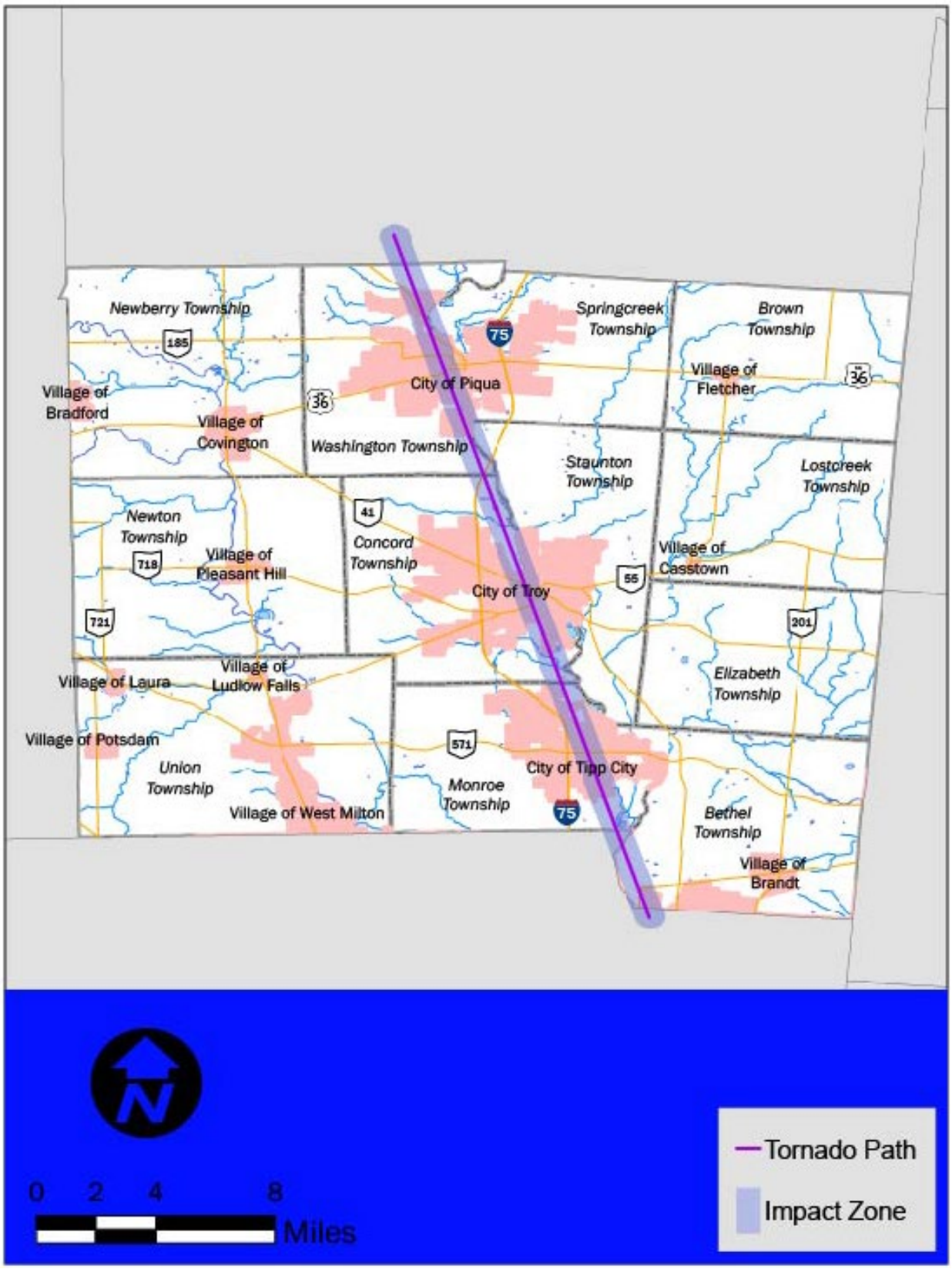


Table 4.11.1 Fujita and Enhanced Fujita Scale Classifications

Fujita Scale 3-Second Wind Gust (MPH)		Damage Levels	Enhanced Fujita Scale 3-Second Wind Gust (MPH)	
F0	45-78	**Light Damage**: Tree branches down.	EF-0	65-85
F1	79-117	**Moderate damage**: Roof damage.	EF-1	86-110
F2	118-161	**Considerable damage**: Houses damaged.	EF-2	111-135
F3	162-209	**Severe damage**: Buildings damaged.	EF-3	136-165
F4	210-261	**Devastating damage**: Structures leveled.	EF-4	166-200
F5	262-317	**Incredible damage**: Whole towns destroyed.	EF-5	Over 200

Source: SOHMP

4.11.4 History

According to the National Centers for Environmental Information (NCEI), there have been 19 tornado events, and 12 high wind events recorded in Miami County from January 1990 to December 2020. According to the Federal Emergency Management Agency, one of these events was declared a federal disaster. These events resulted in over $23 million in property damage and $3,000 in crop damage. These events were responsible for one death and one injury. These events are summarized in **Table 4.11.2**, below:

Table 4.11.2: Tornado & High Wind Events in Miami County since January 1990

Severe Storm Event Type	Number of Events	Injuries	Deaths	Property Damages	Crop Damages
Tornadoes	20	1	0	$11,380,000	$3,000
High Wind	12	0	1	$12,105,000	$0
Total	**32**	**1**	**1**	**$23,485,000**	**$3,000**

Miami County has been associated with one tornado disaster declaration (2019) since the previous hazard mitigation plan.

High Wind Event, September 14, 2008

The remnants of Hurricane Ike merged with a frontal boundary across the Ohio Valley. Abundant sunshine promoted significant daytime heating, causing an unstable atmosphere. Warm, dry air aloft translated down to the surface with gusty winds in excess of 70 mph persisting for a period of several hours, causing significant damage and widespread power outages. This event was the costliest high wind event, causing $12 million in damages.

Tornado, May 27, 2019
A tornado outbreak began late in the evening on May 27, with a Tornado Watch being issued at 8:26pm for areas north of Interstate 70 (including Miami County). At 10:12pm, the second Ohio tornado touched down in Darke County to the east, heading for the Village of Potsdam. This tornado was rated an EF-3. Another tornado touched down in northern Montgomery County and briefly hit undeveloped, rural areas in extreme southern Miami County. These tornadoes caused $10 million in property damages. One injury was reported by an individual in a mobile home that was overturned by the passing tornado. This event was deemed a major disaster by FEMA.

High Wind Event, January 10, 2000
A high wind event occurred with the passage of cold front on January 10, 2000. A man was walking back to his house from getting his newspaper when a 30 feet tall tree fell on him. He was killed from the impact of the tree.

Tornado, June 8, 2022
A tornado formed west of the Village of West Milton and traveled east, loosely in contact with the ground through the village. The tornado remained on the ground east of the village and strengthened as it approached Nashville and Tipp City. As the tornado neared Interstate 75, it intensified and struck several large warehouses, with the complete collapse of an external wall at the Meijer distribution center. Winds were estimated at 120 mph. Due to the recent nature of the disaster, no property damage estimates are available. However, no fatalities or injuries were recorded.

Tornado, July 24, 2022
A tornado formed in the city of Troy near the intersection of Dorset Road and Cheshire Road (immediately east of I-75). The tornado remained on the ground for approximately 1.8 miles, with damaged limited to branches and trees downed. Minor roof damage and ancillary structures (signs) were damaged, as well as one vehicle that was struck by a falling tree. Due to the recent nature of the disaster, no property damage estimates are available. However, no fatalities or injuries were recorded.

4.11.5 Probability

According to the NCEI, there have been 32 tornado and high wind events reported in Miami County from January 1990 to June 2022 with total losses reaching more than $23 million in property damage and $3,000 in crop damage. This amounts to one tornado and high wind event annually with average annual damages of $783,000. **Figure 4.11.2** below shows the trend in number of tornado events per year since 1990. The trend line has a positive slope, which indicates that the number of tornado events has increased over the last 32 years and is projected to increase over the next five years. Years prior to 1990 are excluded from the probability calculation due to missing and/or unreliable data reporting.

Figure 4.11.2: Tornado Event Probability

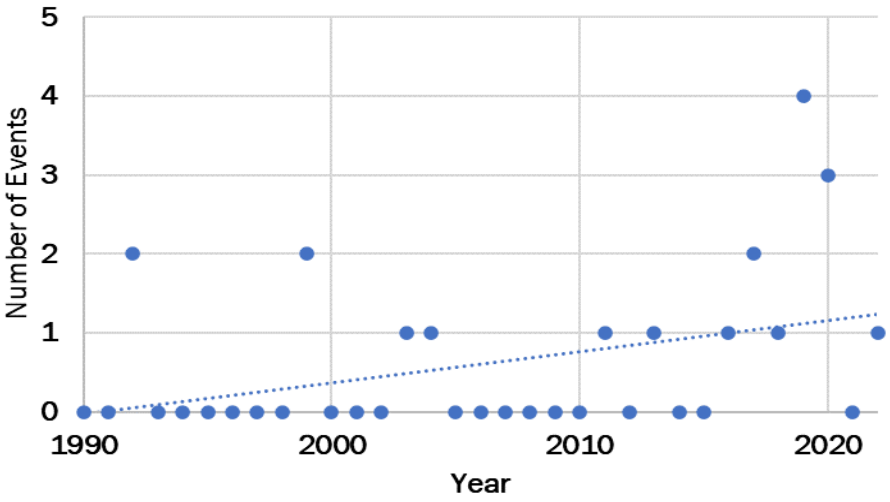
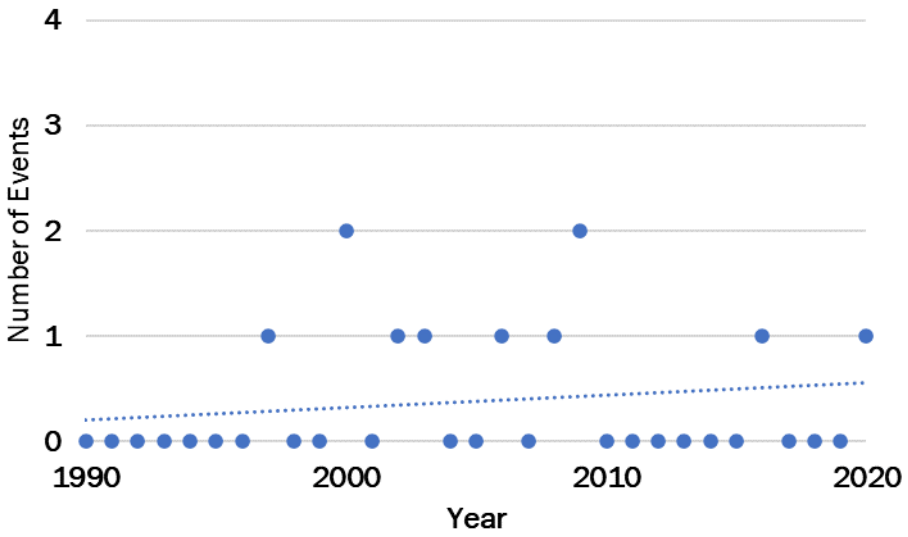


Figure 4.11.3 below shows the trend in number of high wind events per year since 1990. The trend line has a positive slope, which indicates that the number of high wind events has increased over the last 30 years and is projected to increase over the next five years. Years prior to 1990 are excluded from the probability calculation due to missing and/or unreliable data reporting.

Figure 4.11.3: High Wind Event Probability



4.11.6 Vulnerability Assessment

Infrastructure Impact

Above-ground infrastructure can be damaged by high winds and tornadoes. Debris caught in the high winds as well as fallen trees can also cause damage to buildings and infrastructure including road closure. Above ground utility infrastructure can be damaged or destroyed, which can cause service outages.

Population Impact
Tornadoes are random in nature and have the potential to occur anywhere in the County. Everyone within the County should be prepared for a tornado and high wind events. Residents in mobile home parks are particularly vulnerable and should have a plan in place. High wind events are widespread and may impact the entire County.

Property Damage
Tornadoes can cause significant damage to buildings and properties. There have been 19 tornadoes and 12 high wind events in Miami County which have caused more than $11.3 million in property damage. Annually, this amounts to $783,000 in damages. **Table 4.11.3**. details the structural vulnerability from the worst-case scenario for Miami County which is demonstrated in **Figure 4.11.1**.

Loss of Life
One fatality occurred during a high wind event in January 2000. A man was struck by a falling tree while returning to his house from retrieving a newspaper. Due to the widespread nature of high wind events and the short warning time for tornadoes, the potential for loss of life exists. People located near large trees, in mobile/manufactured homes, or exposed directly to the elements may be at a higher risk for injury or loss of life.

Economic Losses
Tornadoes can cause major damage to structures and roads. Higher severity tornadoes have the potential to destroy structures. Debris also has the potential to cause damage to structures by breaking windows, damaging walls, or falling directly onto buildings and above-ground infrastructure.

Damages to utilities and roadways may also cause economic damage due to business closures, destruction of goods that require electricity, and halting economic activity. The following table (**Table 4.11.3**) projects the vulnerability to structures in Miami County based on the worst-case scenario tornado depicted in **Figure 4.11.1.** This modeling is completed only to demonstrate potential damages associated with an EF-5 tornado that tracks through the most populated areas of the County.

Table 4.11.3: Structure Vulnerability from Severe Storms

Structure Type	Number of Properties Exposed	Value of Vulnerable Structures		
		Land	Building	Total
Residential	7,920	$67,211,100	$205,336,610	$272,547,710
Non-Residential	1,793	$48,586,880	$191,737,120	$240,324,000
Critical Facilities	0	$0	$0	$0
Total	**26,806**	**$672,033,450**	**$732,353,540**	**$1,404,386,990**

**Note: Critical Facilities are non-residential structures and their value is incorporated into the non-residential totals as well. Calculated totals are determined by summing the residential and non-residential values.*

4.11.7 Land Use and Development Trends

Tornadoes can occur anywhere and are common in western Ohio. Tornadoes may happen at any time of the year, though they statistically are more common in spring and autumn. Any development that has occurred since the previous plan and any future development has the potential to be impacted by tornadoes.

4.12 Transportation

4.12.1 Description

Hazards relating to modes of transportation and the failure of transportation systems may result in accidents and emergencies as well as other secondary effects such as fires, explosions, and release of hazardous materials. Transportation hazards can arise from aviation, marine/waterborne, public transit, rail, and road and highway systems. The Ohio Department of Transportation (ODOT) is the primary emergency support agency responsible for transportation emergencies for Miami County.

4.12.2 Location

Transportation hazards can occur anywhere within or around the County with immediate impacts limited to the site of the accident, but secondary impacts can have a wider scope. Ohio has an extensive transportation network of roads and highways, rail lines, waterways, and air travel that supports the State's economy.

Miami County contains many major roadways, including approximately 20 miles of interstate routes (I-75), 21.7 miles of US routes (US 36), and over 200 miles of state routes. Additionally, the County contains 423.37 miles of county roads and 268 miles of township roads.

The Federal Aviation Administration (FAA) has record of 16 aviation facilities in Miami County, including 14 airports or airstrips and two heliports. The Ohio Department of Transportation (ODOT) has record of one active rail line in Miami County, which transports freight.

4.12.3 Extent

Several factors, from mechanical failure to a collision with an animal, can cause a transportation incident. Immediate impacts of transportation emergencies can result in loss of human life or wildlife, structural damage, and disruptions in transportation system and traffic. Risk is further escalated by secondary impacts such as, fires, explosion, air pollution, and chemical incidents, that may extend beyond the site of the accident. Some of these may lead to severe impact on public and environmental health.

4.12.4 History

According to the Bureau of Transportation Statistics, the United States averaged 6,073,472 transportation accidents a year including air, highway, railroad, transit, waterborne, and pipeline accidents; and 36,626 transportation fatalities a year from 2010-2018. Fatalities in 2018 by type of transportation mode in United States and Ohio are listed in **Table 4.12.1**. Roadway crash statistics are available for Miami County as listed in **Table 4.12.2**.

A privately managed database called Plane Crash Map provides plane crash information in the United States including crashes occurred during training. They have a record of 781 fatal crashes in Ohio since 1969 of which four are in Miami County (**Table 4.12.3**).

Table 4.12.1: Transportation-related Fatalities by mode in United States and Ohio, 2018

Type/Measure	United States	Ohio
Air Fatalities	394	33
Water Fatalities (including recreational boating)	684	17
Highway Fatalities	36,560	1,068
Rail Fatalities	831	24
Transit Fatalities	251	2

Table 4.12.2: ODOT 5-year Crash Statistics, Miami County, 2017-2021

Year	2017	2018	2019	2020	2021
Total Crashes	2451	2518	2741	2052	2538
Total Injured	705	617	643	552	697
Total Killed	12	11	15	11	20
Animal Related	310	282	365	279	316
Bicycle Related	26	18	14	10	14
Motorcycle Related	29	19	30	32	30
Pedestrian Related	18	10	16	14	11

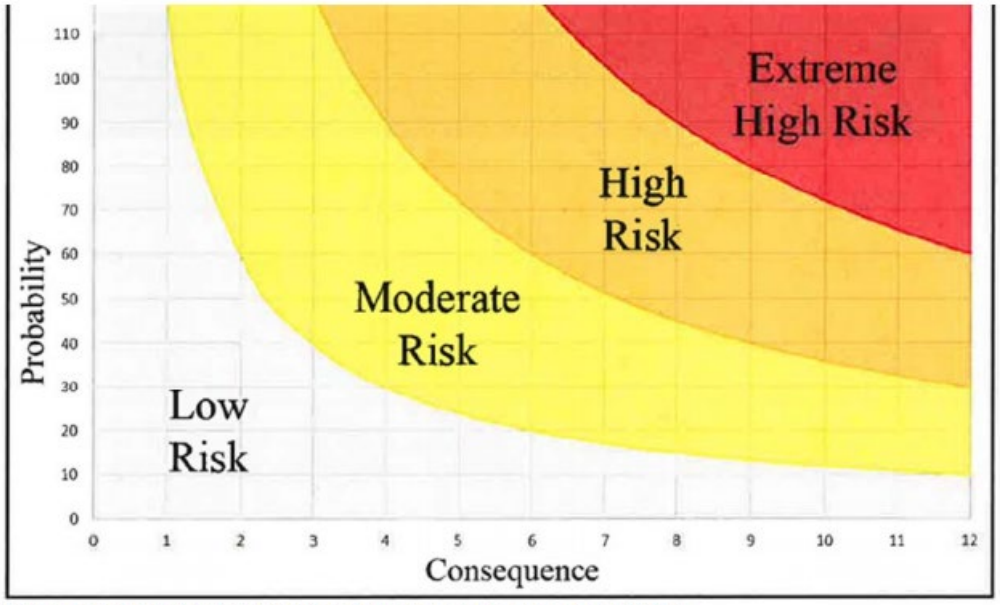
Table 4.12.3: All Plane Crashes in Miami County since 1985

Year	Nearest City	Aircraft Type	Loss of life
1989	Tipp City	Hawker Siddeley	None
1996	West Milton	Piper PA 34-220T	Pilot & Passenger
2001	Piqua	Beech BE-200	Pilot
2017	Piqua	Cessna 182M	None

4.12.5 Probability

Like other hazards, transportation events may not occur regularly, have little to no predictability, and may last a few hours. Authorities in areas with a high density of highway, air, or rail traffic should assess risks and take preventive measures accordingly. To calculate the total risk of transportation system failure, a Threat/Hazard Value (T) must be derived from the duration of the event, speed of onset, frequency, and magnitude. A Vulnerability rating (V) should be calculated by adding the risk of business, human, property, and environment) and dividing this total by 2.2. The final factor is the Consequence Value (C) which sums the seven factors in the Consequence Analysis section of the *Ohio Hazard Identification and Risk Assessment 2018*. Based on these calculations, Ohio places transportation hazards in Ohio in the moderate to high-risk zone (**Figure 4.12.1**).

Figure 4.12.1: Total Risk Graph



Source: FEMA Critical Asset Risk Management MGT-315, October 2016

4.12.6 Vulnerability Assessment

Infrastructure Impact

Infrastructure disruption due to transportation hazards are usually due to a direct impact of the accident. Hazards are primarily linked to bridge/structure collapse, and bridges are the most common type of collapse in the State. Secondary impacts such as limited access to other infrastructure like health services as well as widespread disruptions in roadway system may be seen.

Population Impact

Transportation hazards may lead to structure failure or environmental damages through hazardous materials releases. Environmental impacts may lead to long-term consequences. Everyone should be prepared, including individuals relying on these systems to get around.

Property Damage

Properties can be vulnerable to transportation incidents and crashes; especially those in proximity of the incident.

Loss of Life

Transportation incidents can result in fatalities or injuries for those on or within the immediate vicinity of an incident, and if involved in a collision. Highway accidents are the most common, however no fatalities have been recorded since 2015 in Miami County.

Economic Losses

Transportation hazards could result in large economic impacts that extend beyond the limits of the affected area, to the connected communities including their ability to get to work and participate in local economies. Miami County has four transportation related critical facilities owned by the State with total value of $12,374,292.

4.12.7 Land Use and Development Trends

Availability of transportation infrastructure such as railroad and airports could make the surrounding area attractive for further development. Such land development may result in transportation hazards, for example, construction of a railroad or highway through a wooded area may result in collision with wildlife. A transportation incident could result in water or air pollution, particularly from the chemicals released during impact or combustion resulting in harm to humans, animal, and aquatic life. All land uses in proximity of transportation infrastructure are equally impacted.

05 | Hazard Mitigation

HAZARD MITIGATION

5.1 Hazard Mitigation Strategy

Each potential hazard, including natural, geological, and human-caused hazards, were rated by members of the Core Planning Committee, which included representatives from each jurisdiction in Miami County. Each potential hazard was rated on a scale of zero to five, with zero indicating the hazard should not be studied and five indicating the most significant threat to the representative's community. **Table 5.1** displays the average of the representatives' ratings as a Priority Score for each hazard. The hazard that scored the highest was Severe Wind and Tornadoes, (4.42). Utility failure was not considered a hazard by most of the participants, but it received a high score on a small number of surveys. The mitigation goals follow the ranking of hazards as established by the representatives of the participating jurisdictions.

Table 5.1: Hazard Priorities

Hazard	Priority Score	Rank
Utility Failure	5	1
Tornadoes & High Winds	4.42	2
Epidemic/Pandemic	4.02	3
Severe Winter Weather	3.94	4
Flooding	3.87	5
Severe Thunderstorms	3.75	6
Non-hazardous transportation incidents	3.6	7
Hazardous Materials Incident	3.52	8
Cyber attacks	3	9
Terrorism	2.98	10
Dam/Levee Failure	2.94	11
Extreme Heat	2.44	12
Invasive Species/Infestation	2.19	13
Drought	2.1	14
Earthquakes	1.58	15
Wildfire	1	16
Landslides	0.8	17

Coastal erosion and hurricanes/tropical storms are hazards that are not applicable to Miami County and were not assessed; however, if remnants of hurricanes or tropical storms were experienced as

thunderstorms, thunderstorm winds, or high/severe winds, those events were included in the severe summer weather and/or severe wind and tornadoes assessments. Several new hazards were included in this Plan that were not included in the 2018 Plan. These hazards include epidemic/pandemic, cyberattacks, and terrorism (both of which are covered under the 'Terrorism' risk assessment).

Utility failure was rated highly by a minority of participants, while the majority of participants provided no rating. Utility failure was considered throughout the risk assessments in Chapter 4, but did not receive its own risk assessment. Wildfires and Landslides had an average score of one or below, and therefore were considered not applicable to Miami County,

Mitigation projects will only be implemented if the benefits outweigh the associated cost of the proposed project. The Core Planning Committee, in coordination with the Miami County Emergency Management Agency, performed a general assessment of each action that would require FEMA funding as part of the planning process. A detailed cost-benefit analysis of each mitigation action will be required during the project planning phase in order to determine the economic feasibility of each action. Projects will also be evaluated for social and environmental impact-related feasibility, as well as technical feasibility and any other criteria that evaluate project effectiveness. This evaluation of each project will be performed during the pre-application phase of a grant request. Project implementation will be subject to the availability of FEMA grants and other funding sources, as well as local resources.

Projects that are determined to be infeasible during this review process will be re-evaluated by members of the Core Planning Committee for re-scheduling or deletion.

5.2 Hazard Mitigation Goals and Mitigation Actions

Developing achievable goals forms the foundation for all mitigation actions and activities that will aid Miami County in attaining the overall mission of the Core Planning Committee. As such, the Core Planning Committee assessed the goals of the 2018 Miami County Hazard Mitigation Plan and had the opportunity to develop new goals for the 2023 update. Goals were reviewed and established based upon their relationship to the potential adverse impact upon the community.

The goals, as well as the hazards assessed for this Plan, informed the development of actions that the Region and participating jurisdictions can take to mitigate the impacts of each of the hazards. The goals of the 2023 Miami County Hazard Mitigation Plan are as follows:

- **Goal 1:** Build community resiliency against the negative impacts of all-hazard events including, but not limited to, severe weather events, cyber threats, and health emergencies in order to reduce loss of life, property damage, and economic loss.
- **Goal 2:** Strengthen community partnerships and cooperation between public and private entities in order efficiently share resources and collectively respond to emergencies.
- **Goal 3:** Deliver programs for public information and education of manmade and natural hazards for citizens, private property owners, public agencies, businesses, industry and schools.
- **Goal 4:** Implement and promote up-to-date hazard warning and communication systems and increase awareness of and ability to support vulnerable populations.
- **Goal 5:** Strengthen the capability of facilities across the County to resist disaster and remain available to support impacted populations during disaster events; increase redundancy in utility and communication systems.
- **Goal 6:** Promote the continued preservation of open space, floodplains, wetlands, woodlands, and recreation areas along the Great Miami River and tributaries.

- **Goal 7:** Reduce the impact of urban and small stream flooding and surface drainage problems and promote ongoing maintenance and improvement to storm drainage systems and flood control structures.
- **Goal 8:** Maintain hazardous materials incident response capability by fostering active Local Emergency Planning Committee and sustaining countywide Type II Hazmat team.

5.3 Hazard Mitigation Action Priority

Members of the Core Planning Committee completed a Previous Mitigation Action Status survey, which indicated the status of mitigation actions included in the 2018 Hazard Mitigation Plan. This survey asked representatives to indicate whether the mitigation action from the previous plan was completed, deleted, deferred, unchanged, or ongoing. It also asked the representative if the action should be included in the updated Plan.

Once all mitigation actions from the previous plan were reviewed and their status indicated (**Appendix B**), all mitigation actions for the 2022 Miami County Hazard Mitigation Plan were reviewed and rated on a scale of one to five by members of the Core Planning Committee based on the several criteria, including whether the action was cost-effective, technically feasible, environmentally sound, needed immediately, and the action's total risk reduction.

All of the surveys collected were tabulated to develop a single raw score for each individual mitigation action. These scores are indicated on the Hazard Mitigation Action Priority Table on the following pages. Overall, the score was determined by two factors:

1. The rankings of the hazard, as determined by the Hazard Priority Survey (**Table 5.1**, above).
2. The ratings received from the Core Planning Committee and the public on each of the mitigation actions.

The raw scores were then ranked, and each mitigation action was assigned a number (1-61) to indicate the priority of that specific action, according to the survey responses. The lower the action priority, the higher the priority. For example, an action assigned a priority of "1" should be prioritized higher than an action assigned a priority score of "38".

Hazard Mitigation Action priorities are organized by hazard in **Table 5.2**. The information used to develop the priorities can be found in the Matrix Score Spreadsheet, which is located in **Appendix C**. Comments from the jurisdictions responsible for each action can be found in **Appendix G**, along with all completed surveys that were used to make **Table 5.2**.

Table 5.2: Mitigation Actions Priority Table by Hazard

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/ End	Status
Multiple Hazards								
1	Complete special needs assessment of the County.	Miami County	1	5	Miami County EMA	Emergency Management Performance Grant (EMPG) Special Project Grants	1/1/23-12/31/27	Ongoing
2	Promote public awareness of manmade and natural hazards at public events and hold workshops to educate the public. Distribute appropriate mitigation publications.	Miami County	1	6	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	Ongoing
3	Provide power line for emergency backup power generator for the Village of Laura from the wastewater treatment facilities to the water treatment facilities.	Village of Laura	1	2	Mayor/ Administrator of Village of Laura	General Operating Budget	1/1/23-12/31/27	Ongoing
4	Adopt the International Building Code (IBC) and International Residential Code (IRC).	Miami County	1	8	Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
5	Distribute information and locations of public shelters with utility bills and other mailings.	Miami County & Municipalities	1	2	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/ End	Status
6	Create a database to identify the regions where individuals at high risk of death and injury, such as the elderly or homeless reside in high concentrations.	Miami County	1	1	Miami County EMA, Miami County Health Department	Staff Time	1/1/23-12/31/27	New
7	Increase canopy coverage in the area by planting more trees.	Miami County & Municipalities	1	7	Miami County Commissioner, Mayors/ Administrators of Jurisdictions	General Operating Budget	1/1/23-12/31/27	New
8	Install backup generators in public buildings and critical facilities.	Miami County	1	2	Miami County EMA, Mayors/ Administrators of Jurisdictions	Emergency Management Performance Grant (EMPG) Special Project Grants	1/1/23-12/31/27	New
Dam Failure								
9	Promote continued maintenance and improvement. Ongoing levee system maintenance.	Miami County	9	52	Miami County EMA, Mayors/ Administrators of Jurisdictions	General Operating Budget	1/1/23-12/31/27	Ongoing
10	Levee repairs along Miami River within City of Tipp City (Phase 2).	City of Tipp City	9	53	Miami County EMA, Mayor/ Administrator of Tipp City	Emergency Management Performance Grant (EMPG) Special Project Grants	1/1/23-12/31/27	Ongoing
11	Map inundation areas for all Class I and Class II dams.	Miami County	9	50	Miami County EMA	Staff Time	1/1/23-12/31/27	New
12	Rehabilitate high hazard potential dams.	Miami County	9	51	Miami County EMA, Mayors/ Administrators of Jurisdictions	Emergency Management Performance Grant (EMPG) Special Project Grants	1/1/23-12/31/27	New

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/ End	Status
				Drought				
13	Identify local drought indicators, such as precipitation, temperature, surface water levels, soil moisture, etc.	Miami County	12	56	Miami County EMA	Staff Time	1/1/23-12/31/27	New
14	Establish a regular schedule to monitor and report conditions on at least a monthly basis.	Miami County	12	57	Miami County EMA	Staff Time	1/1/23-12/31/27	New
15	Regularly (monthly, bimonthly, twice annually, annually, etc.) check for leaks in the water supply to minimize losses.	Miami County	12	54	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
16	Hold a regular meeting (annual or as needed) with local farmers to identify potential drought issues.	Miami County	12	55	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
				Earthquakes				
17	Educate homeowners on safety techniques to follow during and after an earthquake.	Miami County	13	58	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
				Epidemic/Pandemic				
18	Complete a plan with the Public Health Department to better prepare for an epidemic or pandemic.	Miami County	3	12	Miami County EMA, Miami County Health Dept.	Staff Time	1/1/23-12/31/27	New
				Flooding				
19	Buyout of additional flood prone residences, businesses, and structures in Concord Township, north of Troy along scenic Great Miami River.	Concord Township & Miami County	5	37	Miami County EMA, Mayor/ Administrator of Jurisdiction	Emergency Management Performance Grant (EMPG) Special Project Grants	1/1/23-12/31/27	Ongoing

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/ End	Status
20	Increase communication, coordination, and collaboration between community leaders, property owners, local and county building regulations, floodplain managers and zoning authorities to address risk and to provide uniformity and consistency in implementing sound mitigation practices.	Miami County	5	21	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	Ongoing
21	Improve the Kerns/Alexander ditch along Fenner Road west of Barnhart Road to eliminate flooding of the land around the homes in that area.	City of Troy	5	34	Mayor/ Administrator of City of Troy	General Operation Budget	1/1/23-12/31/27	Ongoing
22	Preserve floodplain areas along river corridors as natural open space areas. Provide for wetlands and woodlands protection.	Miami County	5	29	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	Ongoing
23	Improve the Schaurer and Ziegenfelder ditches along State Route 718 (west and east of Washington Road) and McKaig Ave to eliminate continued standing surface water issues around homes and on agriculture land and to eliminate periodic flooding of other land in the area.	City of Troy	5	34	Mayor/ Administrator of City of Troy	General Operation Budget	1/1/23-12/31/27	Ongoing

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/ End	Status
24	Update and complete an inventory of buildings and building data within the 100-year flood plain boundaries of Miami County. Coordinate with recently completed GIS flood plain maps.	Miami County	5	22	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	Ongoing
25	Improve the Clayton ditch in and around Beechwood Drive in the Lakeshore subdivision to eliminate flooding of homes and land in this area.	City of Troy	5	38	Mayor/ Administrator of City of Troy	General Operation Budget	1/1/23-12/31/27	Ongoing
26	Identify and reduce the impact of urban and small stream flooding. General storm water evaluation for the Covington community.	Miami County	5	27	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	Ongoing
27	Ensure that all communities that fall within a FEMA designated floodway participate in the National Flood Insurance Program.	Miami County	5	24	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
28	Prohibit or limit floodplain development through regulatory and/or incentive-based measures.	Miami County	5	20	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
29	Avoid or limit the density of development in the floodplain.	Miami County & Municipalities	5	18	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
30	Require that floodplains be kept as open space.	Miami County & Municipalities	5	19	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
31	Limit the percentage of allowable impervious surface within developed parcels.	Miami County & Municipalities	5	32	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/ End	Status
32	Prepare and adopt a community-wide stormwater management master plan.	Municipalities	5	26	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
33	Require a drainage study with new development.	Miami County & Municipalities	5	23	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
34	Complete a stormwater drainage study for known problem areas.	Municipalities	5	24	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
35	Raise utilities or other mechanical devices above expected flood levels.	Miami County & Municipalities	5	33	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
36	Routinely clean and repair stormwater drains	Municipalities	5	28	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
37	Require all critical facilities to meet requirements of Executive Order 11988 and be built 1 foot above the 500-year flood elevation.	Miami County & Municipalities	5	36	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
38	Develop an open space acquisition, reuse, and preservation plan targeting hazard areas.	Miami County & Municipalities	5	31	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
39	Encourage homeowners to purchase flood insurance.	Miami County & Municipalities	5	30	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
Hazardous Materials								
40	Complete a commodity flow study.	Miami County	7	43	Miami County EMA, Mayors/ Administrators of Jurisdictions	Hazardous Materials Emergency Planning Grant (HMEP)	1/1/23-12/31/27	New
Invasive Species								
41	Compile a list of known active invasive species within Miami County (or appropriate jurisdiction).	Miami County	7	44	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/ End	Status
42	Maintain a countywide report on impacts from invasive species.	Miami County	7	46	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
43	Map or otherwise identify ash trees.	Miami County	7	44	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
44	Identify and apply the appropriate Emerald Ash Borer treatment method.	Miami County	7	47	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
Severe Summer Weather								
45	Post warning signage at local parks, county fairs, and other outdoor venues about the dangers of hail, severe wind, and lightning.	Miami County & Municipalities	6	41	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
46	Teach school children about the dangers of hail, severe wind, and lightning and how to take safety precautions.	Miami County & Municipalities	6	40	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
47	Review building codes and structural policies to ensure they are adequate to protect older structures from hail, lightning, and wind damage.	Miami County & Municipalities	6	42	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
48	Install lightning protection devices and methods, such as lightning rods and grounding, on communications infrastructure and other critical facilities.	Miami County & Municipalities	6	39	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/ End	Status
			Severe Wind & Tornadoes					
49	Encourage the construction and use of safe rooms in critical facilities, schools, hospitals, and government buildings.	Miami County & Municipalities	2	10	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
50	Require mobile home parks to have a designated tornado safe room or shelter.	Miami County & Municipalities	2	10	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
51	Conduct tornado drills in schools and public buildings and encourage private entities also.	Miami County & Municipalities	2	9	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
			Severe Winter Weather					
52	Educate elderly residents on the dangers of snow shoveling and available resources to reach out for assistance.	Miami County	4	16	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
53	Identify at risk communities, particularly the elderly, and prioritize these communities for snow removal.	Miami County & Municipalities	4	15	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
54	Install heating units in public shelters.	Miami County & Municipalities	4	17	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
55	Work with places of worship, schools, hotels, and other large buildings to serve as public heating stations during extreme cold events.	Miami County & Municipalities	4	14	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/ End	Status
56	Use snow fences or "living snow fences" (e.g., rows of trees or other vegetation) to limit blowing and drifting of snow over critical roadway segments.	Miami County	4	13	Mayors/ Administrators of Jurisdictions	General Operating Budget	1/1/23-12/31/27	New
Terrorism								
57	Coordinate with law enforcement, fire, EMS, and the Ohio Department of Public Safety to identify potential risks (including cyberterrorism risks).	Miami County	8	49	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
58	Create a jurisdiction-wide response plan for cyber-attacks, active shooters, and other identified potential risks.	Miami County	8	48	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
Non-Hazardous Transportation Incident								
59	Identify at risk properties along rail lines.	Miami County	14	61	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
60	Coordinate with law enforcement, fire, EMS, and nearby airports/helipads to create an emergency response plan for train derailments.	Miami County	14	60	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
61	Develop and implement an emergency response plan for all transportation hazards (road, rail, and air).	Miami County	14	59	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New

06 | Schedule and Maintenance

SCHEDULE AND MAINTENANCE

6.1 Participation Overview

The 2021 Miami County Hazard Mitigation Plan will be adopted by all jurisdictions in Miami County, including the County, all townships, and the city and villages. After the jurisdictions have adopted the plan, their signed resolutions or ordinances will be added to the plan as an Appendix.

6.2 Continued Public Involvement

The public will continue to be able to provide feedback on the Plan, as the Plan will be available through the Miami County Emergency Management Agency and Ohio Emergency Management Agency websites. The Miami County Emergency Management Agency will provide access to the Plan to all County, municipality, and township offices, and will make the Plan available in hardcopy and electronic format to the public as appropriate. The Miami County Emergency Management Agency Director will post notices of any meetings for updating and evaluating the Plan, using the usual methods for posting meeting announcements in the Region to invite the public to participate. All meetings will be open to the general public. The Miami County Emergency Management Agency will publicly announce the mitigation action items that are slated for development in the current year, as well as any updates to the Plan as part of the annual review process.

6.3 Plan Integration and Annual Review

6.3.1 Previous Integration Efforts

An important aspect of the hazard mitigation planning process is to integrate recommendations, the underlying principles, and actions of the Hazard Mitigation Plan into other essential planning and development mechanisms in the community such as comprehensive land use plans, emergency operations plan, sustainability and climate action plans, capital improvement plans, and general area plans.

The Miami County Emergency Management Agency and Local Emergency Planning Committee (LEPC) have worked to integrate the previous Hazard Mitigation Plan into planning processes in the County. The LEPC has representatives from numerous organizations, including elected officials, law enforcement, firefighting, first aid, hospital, public health, local environmental, transportation, news media, emergency management, community groups, owners/operators of subject facilities, educational, hazardous materials, and communications.

The first step in plan integration efforts is to identify existing plans in Miami County. Miami County maintains several plans and tools, including:

- 2017 Miami County Hazard Mitigation Plan
- Addendum to Miami County Hazard Mitigation Plan, Resolution No. 20-11-1439
- 2019 Commodity Flow Study of Hazardous Materials, Miami County
- Miami County Comprehensive Plan 2006 Update
- Miami County Emergency Operations Plan, 2019
- Miami County Flood Damage Reduction Resolution
- Miami County Subdivision Regulations
- County-wide Zoning Resolutions

In addition, Miami Valley Regional Planning Commission (MVRPC) that is responsible for transportation planning in Miami County maintains several plans including long-range and short-range transportation plans, active transportation plans, bike plans, and many other transportation plans.

Some examples of integrating hazard mitigation principles into existing plans are as follows:

2006 Miami County Comprehensive Plan Update

The Comprehensive Plan is a resource which creates an inventory of existing land use conditions and growth trends in Miami County. The Plan informs the public of anticipated development, outlines planning areas, and serves as a vision for environmental, social, and economic stability. This plan is an excellent platform for identifying hazards and mitigation strategies in *Section IX: Goals, Objectives, Policies*. For example, the Plan includes a goal to manage surface and groundwater to protect residents from flood hazards. New policies, such as a limit for new impervious surfaces or a restriction of new construction in flood-prone areas that require retrofitting or demolition of existing properties, could help Miami County protect residents from flood hazards.

2019 Miami County Emergency Operations Plan

The Miami County Emergency Operations Plan is designed to develop and implement response strategies for countywide emergencies, including natural, technological, and man-made events. This plan ensures continuity of government operations in the wake of an emergency situations by assigning predetermined responsibilities and actions governing members must take. Integrating hazard mitigation principles could benefit this plan by providing resources and response strategies for first responders or similar government entities. For example, in *Section IV.C: Roles and Responsibilities*, designate a Group to communicate with citizens and businesses to coordinate recovery assistance and other post-disaster strategies. Details would be elaborated upon in *Section VI.B: Logistics.*

Miami County Subdivision Regulations

The Miami County Subdivision Regulations accomplishes a few objectives, including establishing standards for development, eliminating traffic hazards through coordinated streets and highways, maintaining adequate utilities and public services, and planning provisions for schools, recreation, light, and air. Integrating certain hazard mitigation measures would support these objectives. For example, encouraging a “snow fence” of trees along streets (Section 524) or rear plat boundaries, or encouraging the placement of utility lines underground at new development (Section 560).

During the Planning Process, the members of the Core Planning Committee indicated that they are pursuing efforts associated with previous mitigation actions, such as studies on several dams have been completed, City of Piqua worked on operations improvement of high hazard dams, and the Miami Conservancy District updated the Emergency Action Plan for a dam. In addition, City of Troy removed a low dam to mitigate flooding and conducted an EPA site cleanup for drinking water, Park District/US Fish and Wildlife Service made channel improvements, City of Tipp City made wetland improvements, and some communities worked on improving access to limited mobility, language barrier reduction, as well as improving constant power for medical needs of vulnerable populations.

6.3.2 Future Integration Efforts

Local government plays a major role in the execution and implementation of mitigation strategies. This happens in large part during the daily operations that guide the development and priorities of the communities attempting to implement risk reducing actions. As such, the various departments in the communities will be responsible for networking, understanding, and highlighting the mitigation activities and opportunities they are accountable for implementing. This collaborative effort is also important to monitor funding opportunities which can be leveraged to implement the mitigation actions.

The Core Planning Committee may meet annually in order to monitor and evaluate the Miami County Hazard Mitigation Plan. During the annual meeting, a status update should be provided for each mitigation action by the responsible agency. All participating jurisdictions will be encouraged to attend this yearly plan update meeting. The meeting will coincide with the budget process so that future funding sources can be determined and set aside for actions slated for that particular year. This meeting will also be available to the public. Additionally, each jurisdiction and the County will review the Hazard Mitigation Plan during other planning processes, such as development of comprehensive plans or capital improvement plans and incorporate appropriate goals and mitigation actions into such documents.

Furthermore, the County and its participating jurisdictions will make a concerted effort to integrate the hazard mitigation plan and its mitigation actions into existing plans and regulations, such as comprehensive plans, subdivision regulations, zoning resolutions, zoning maps, parks and open space plans, and emergency operations plans. Specifically, the County will strengthen and streamline its Emergency Operations Plan and identify means for jurisdictions to come together, proactively and on an annual basis, to discuss preparedness and response in the event of a hazard. For example, establishing communications with organizations that provide essential resources such as generators during a tornado, working closely with the Dayton Airport to reduce and mitigate crashes of planes that fly over Miami County, and incorporate actions for roadway crashes along I-75 and US-36. The County will also update its 2019 Commodity Flow Study to reduce hazmat spills and include air cargo hazardous material shipments.

The County will also update its Comprehensive Plan. The Miami County Planning & Zoning Department will coordinate with the selected consultant to integrate mitigation actions identified in this Plan into the Comprehensive Plan. Additionally, participating jurisdictions may incorporate mitigation strategies into their local area plans, zoning codes, and subdivision regulations.

6.4 Updating the Plan

The Plan must be updated within five years and re-adopted by the County and all participating jurisdictions to maintain compliance with federal regulations and ensure eligibility for certain federal mitigation grant funds. The Miami County Emergency Management Agency will identify any necessary modifications to the Plan, including changes in mitigation goals and actions that should be incorporated into the next update. The Miami County Emergency Management Agency Director and the County Commissioners will initiate the process of updating the plan in accordance with federal guidelines in sufficient time to meet state and federal deadlines.