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CLINTON COUNTY HAZARD MITIGATION PLAN NOVEMBER 2025

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1 | Introduction

1.1 Overview

With the 2021 Clinton County Hazard Mitigation Plan set to expire in March of 2025, Clinton 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 County 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 Clinton County. As such, a Core Planning Committee within Clinton County has been established with the goal of developing and implementing the 2025 Clinton County Hazard Mitigation Plan. Through cooperative efforts between local, county, state, and federal government agencies, this Plan is designed to minimize the adverse effects of hazardous events on the lives and properties of Clinton County residents.

This 2025 Clinton County Hazard Mitigation Plan is a multi-jurisdictional plan which considers the impacts of hazards on incorporated cities and villages and unincorporated townships. Clinton County's jurisdictions and townships are listed below in **Tables 1.1.1 and 1.1.2**. These areas are also displayed in **Figure 1.1.3** 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 be most important to the County, and establishes a timeline for the implementation of the actions.

Table 1.1.1: Clinton County Jurisdictions

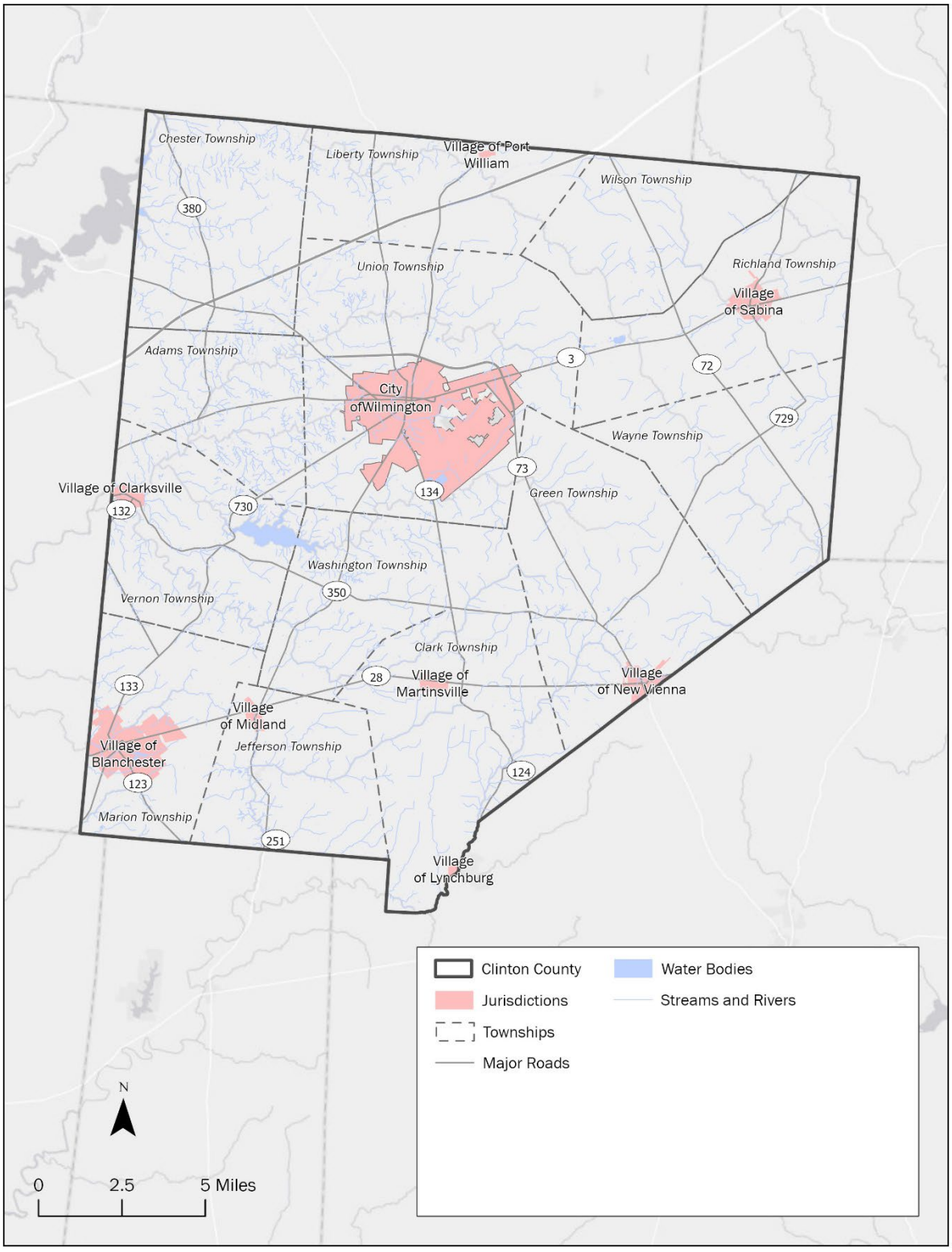
Jurisdictions	
City of Wilmington	Village of Midland
Village of Blanchester	Village of New Vienna
Village of Clarksville	Village of Port William
*(Village of Lynchburg)	Village of Sabina
Village of Martinsville	

Table 1.1.2: Clinton County Townships

Townships	
Adams Township	Richland Township
Chester Township	Union Township
Clark Township	Vernon Township
Green Township	Washington Township
Jefferson Township	Wayne Township
Liberty Township	Wilson Township
Marion Township	

*Please note: The Village of Lynchburg is located in Highland County on the southeastern border of Clinton County. The Village of Lynchburg previously annexed a parcel of a property out of Clinton County for the purpose of building a wastewater plant for the Village. There are two homes in this area which are included in the Clark Township area; however, these homes are included in the Highland County Hazard Mitigation Plan. The Village of Lynchburg continues to actively participate in the Highland County Hazard Mitigation Plan, which was recently updated in 2024.

Figure 1.1.3: Clinton County Jurisdictions Map



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

- This **Introduction** (Chapter 1) provides a discussion about the general purpose and goals that Clinton County wishes to achieve throughout the development and implementation of this Plan. This section also includes a summary of the Plan's contents.
- Chapter 2, **History and Demographics**, includes a description of Clinton County and each participating jurisdiction, including their history, population, and other general information.
- Chapter 3, **Planning Process**, details the process for the development of this Plan. 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.
- Chapter 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 Clinton 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.
- Chapter 5, **Hazard Mitigation**, outlines the goals, strategies, and actions for the County. 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.
- The final chapter (Chapter 6) of this Plan, **Schedule and Maintenance**, provides a summary of the proposed Plan adoption, integration, and maintenance schedule. This section describes how the County 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 to continue to be eligible for mitigation project grant funding.

The resulting Clinton County Hazard Mitigation Plan will be submitted to the Ohio Emergency Management Agency (Ohio EMA), 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 Clinton 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 Clinton 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

Clinton County is in the southwestern region of Ohio and has a total area of approximately 412 square miles. The County contains one city, eight villages, and thirteen townships (**Tables 1.1.1 and 1.1.2**). The City of Wilmington serves as the County seat. Clinton County is bounded by six Ohio counties: Greene County to the north, Fayette County to the northeast, Highland County to the southeast, Brown County to the south, Clermont County to the southwest, and Warren County to the west.

Land use patterns in Clinton County are shown in **Figure 1.2.1**. Land use types include residential, agricultural, industrial, commercial, parks/open space, transportation, public/semipublic land, and vacant. Land cover in Clinton County is shown in **Figure 1.2.2**. Land cover types include cultivated crops, forested, developed, wetlands, hay and pasture, herbaceous, open water, and shrub and scrub.

Figure 1.2.1: Clinton County Land Use Map

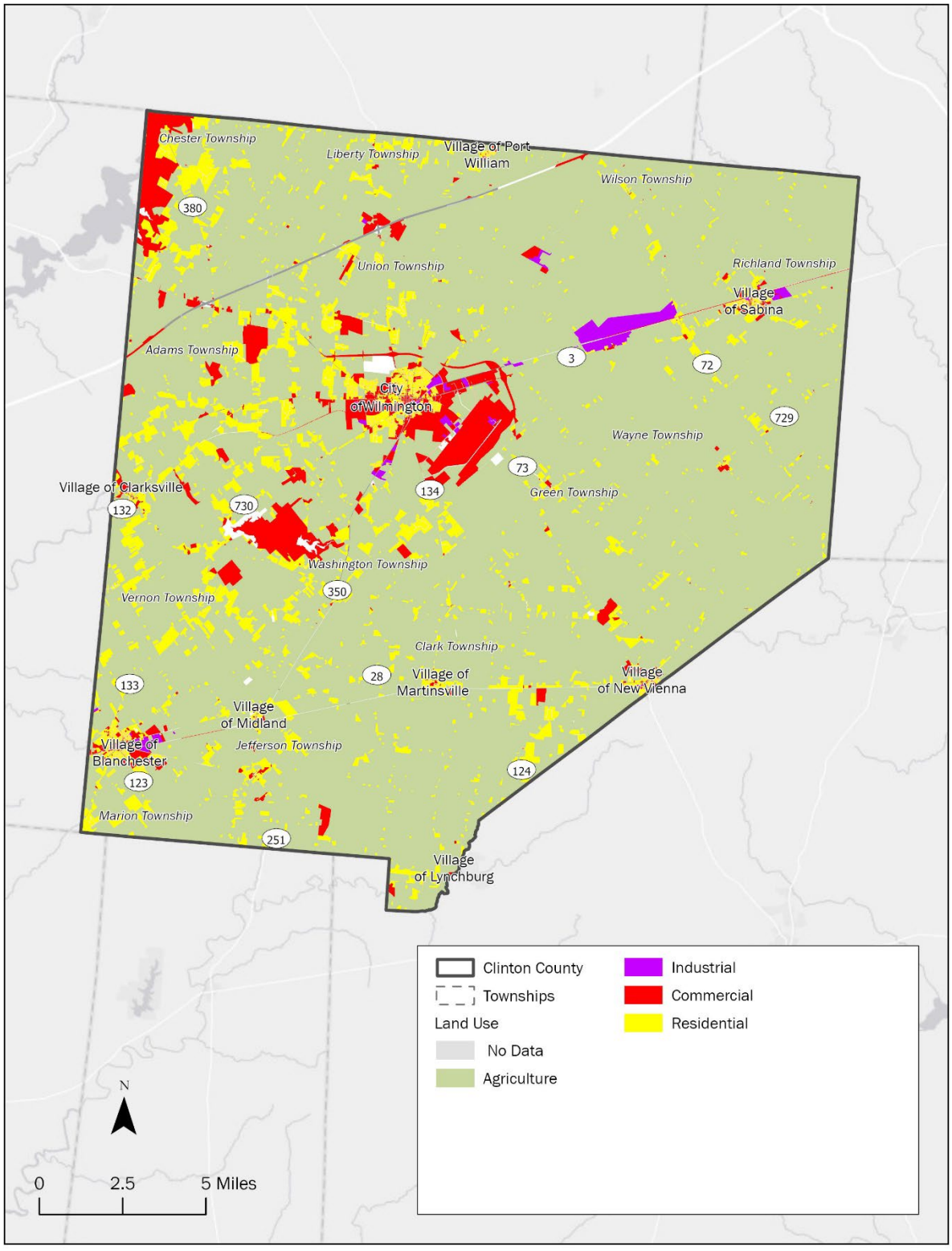
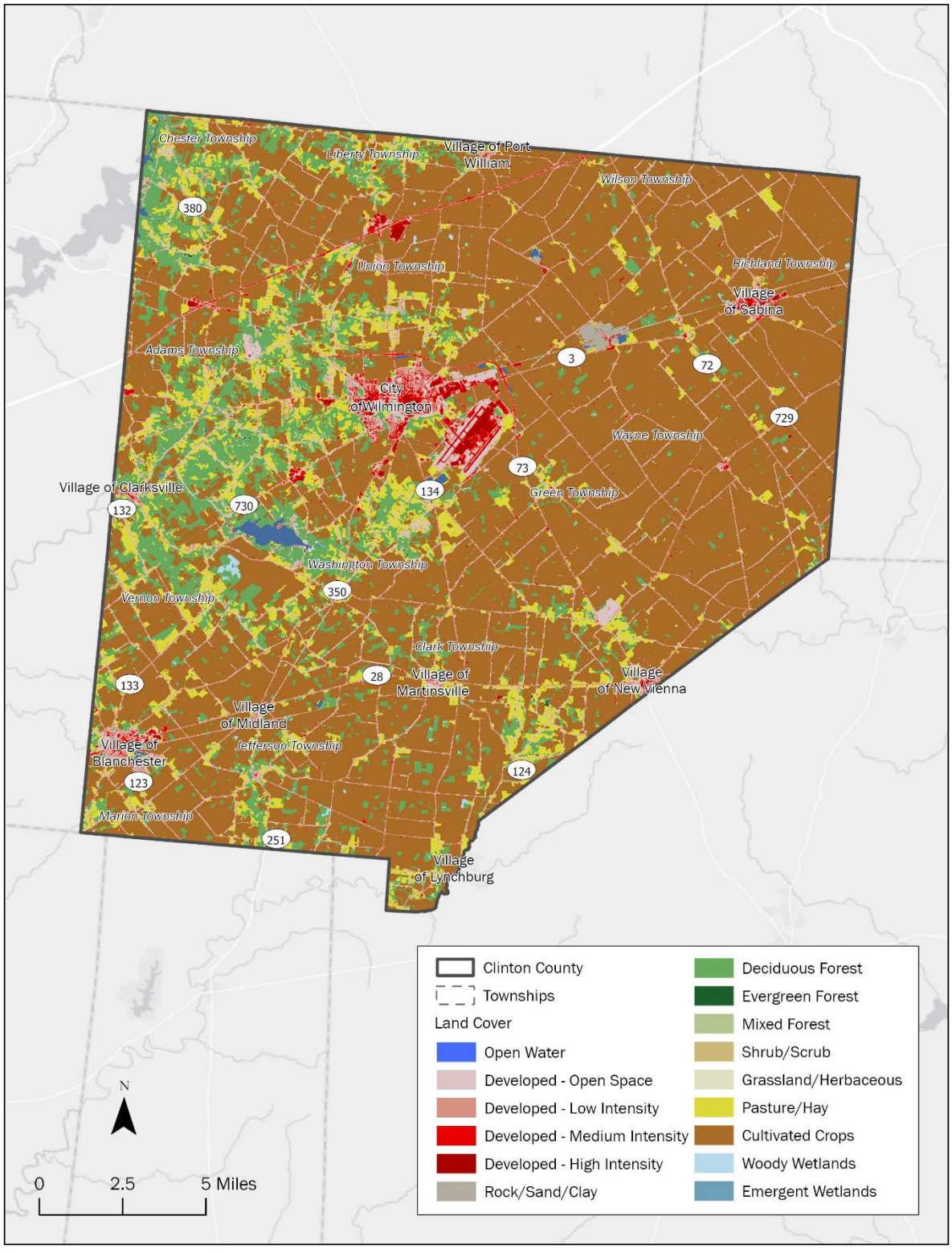


Figure 1.2.2: Clinton County Land Cover Map



1.3 Region Features

Transportation

Clinton County contains several major roadways, including several State Routes (SR), two U.S. Highway (US), and one Interstate (I). Major roadways in Clinton County include SR-28, SR-72, SR-73, SR-123, SR-133, SR-134, SR-350, SR-380, SR-729, SR-730, US-22, US-68, and I-71.

Clinton County has one public-use airport, Clinton County Regional Airport, which is located north of the City of Wilmington. Additional airfields include Wilmington Air Park, a logistics and cargo-oriented aviation business park.

Genesee & Wyoming, Inc. has two rail lines in Clinton County. Both lines enter as a single railroad in the southwest portion of the County through Blanchester and then diverge at Midland. The first line travels north through Wilmington and continues northeast through Sabina before exiting the County. The second line travels east along SR-28 near New Vienna until it exits the County.

Natural Features

Table 1.3.1, below, Clinton County has several parks and nature areas.

Table 1.3.1: Parks & Nature Areas in Clinton County, Ohio

Parks & Nature Areas	
Anliot Davidson Nature Preserve	Dr, Nathan Hale Woods & Preserve
Caeser Creek State Park	East Fork Riparian Nature Preserve
Collett Woods Nature Preserve	Galvin Park
Cowan Lake State Park	Lytle Creek Nature Preserve
Dean A. Culberson State Nature Preserve	Veterans Memorial Park
Denver Williams Park	Wilmington College Hazard Arboretum

Clinton County also has several streams and water bodies which are listed in Table 1.3.2 below.

Table 1.3.2: Clinton County Streams and Water Bodies

Water Bodies	
Anderson Fork	Indian Run
Baptist Foundation Lake	Lees Creek
Blanchester Reservoir Number Three	Little Creek
Blanchester Reservoir Number Four	Lytle Creek
Blanchester Upground Reservoir N	Moore Branch
Buck Run	Sewell Run
Caesar Creek Lake	Stokes Lake
Cowan Creek	Todd's Fork (either as a whole or by branch)
Cowan Lake	Turkey Run
Dry Run	West Fork East Fork Little Miami River

Water Bodies	
Dutch Creek	Whitakers Run
Glady Creek	Wilmington Reservoir Number One
Grassy Branch	Wilmington Reservoir Number Two
Grassy Run	Wilson Creek
Houston Upground Reservoir	

2 | History & Demographics

2.1 History

Clinton County is a rural county in south central Ohio. The County has a total area of 408.7 square miles, of which 405.1 square miles are land, and 3.6 square miles are water. Clinton County is the 64th largest county in Ohio. The County was established on February 19, 1810, and officially became a county with the passage of a law March 1, 1810. Clinton County was formed from both Highland and Warren Counties and is named after Governor George Clinton, of New York, who was the Vice President of the United States at that time.

Clinton County has 18 properties listed on the National Register of Historic Places, with the first property being entered in 1873. The Pansy Methodist Church and School (**Figure 2.1.1**,) was built in 1885 and the school opened in 1900. The school and church sit on the same property (2.1 acres) and are still in use today. The properties were added to the National Register on March 20, 1973.

Figure 2.1.1: Pansy Methodist Church (top) and School (bottom)

Source: National Archives Catalog (Left) and Aesopposea (Right)

2.2 Communication Outlets

Clinton County's primary communication outlets including websites, television, and social media are listed in **Table 2.2.1**, below:

Table 2.2.1: Communication Outlets and Social Media

Communication Type	Source
Website	Clinton County: https://co.clinton.oh.us/ Clinton County EMA: https://www.cc-ema.org/ Clinton County Health District: https://co.clinton.oh.us/departments/HealthDistrict Clinton County Sherriff's Office: https://clintonsheriff.com/ The American Red Cross Greater Cincinnati Tri-State Chapter: https://www.redcross.org/local/ohio/central-and-southern-ohio/about-us/locations/greater-cincinnati-tri-state-chapter.html
Social media	Clinton County: https://www.facebook.com/clintoncountyohio/ Clinton County EMA: https://www.facebook.com/ClintonEMA/?_rdr Clinton County Health District: https://www.facebook.com/ClintonCountyHealthOhio/ Clinton-Warren Joint Fire District: https://www.facebook.com/CWJFD
News/Newspaper	Wilmington News Journal: https://www.wnewsj.com/

2.3 Demographics Overview

This section provides select demographic information to help identify strategies to better serve the County residents during emergency hazard events. The information can be used to understand potential vulnerabilities in subgroups of the population. For example, knowing the number of senior citizens that live alone and who may require additional assistance during an emergency can help assistance organizations anticipate where additional services may be needed.

Table 2.3.1, below, provides a summary of the total population changes that have occurred in Clinton County between the 2010 U.S. Census and the 2023 5-Year American Community Survey (ACS) Estimates based on census data. According to the U.S. Census, Clinton County's population decreased by 26 people (-0.06 percent) between 2010 and 2023. For comparison, the U.S. population grew 9.04 percent and Ohio's population grew 2.49 percent during that period. Five Townships – Adams, Chester, Green, Marion, Union, and Vernon Townships – experienced population growth. Of the Townships experiencing population decline, Washington Township experienced the greatest population decline with a decrease of 526 people (-24.69 percent).

A more detailed description of population, housing, and income demographics for Clinton County and each city and village jurisdiction is provided on the following pages.

Table 2.3.1: County And Township Population Growth Estimates Between 2010 Census and 2023 5-Year ACS Estimates

County/Township	Total Population 2010 Census	Total Population 2023 Estimate	2010-2023	
			Population Change	Percent Change
Clinton County	42,040	42,014	-26	-0.06%
City of Wilmington	12,520	12,637	-117	-0.01%
Adams Township	2,091	2,609	518	24.77%
Chester Township	1,967	2,281	314	15.96%
Clark Township	2,123	1,916	-207	-9.75%
Green Township	2,473	2,510	37	1.50%
Jefferson Township	1,399	1,399	0	0.00%
Liberty Township	1,067	904	-163	-15.28%
Marion Township	5,394	5,514	120	2.22%
Richland Township	3,573	3,535	-38	-1.06%
Union Township	3,085	3,135	50	1.62%
Vernon Township	2,997	3,015	18	0.60%
Washington Township	2,130	1,604	-526	-24.69%
Wayne Township	716	573	-143	-19.97%
Wilson Township	505	382	-123	-24.36%

Social Vulnerability Index Score

The Social Vulnerability Index Score is a component of the Center for Disease Control and Prevention (CDC) and Agency for Toxic Substances and Disease Registry (ATSDR) Social Vulnerability Index (SVI) that measures the susceptibility (risk) of social groups to the adverse impacts of natural hazards that may result in disproportionate deaths, injury, loss, or disruption of livelihood. As FEMA explains, the "Social Vulnerability score considers the social, economic, demographic, and housing characteristics of a community that influence its ability to prepare for, respond to, cope with, recover from, and adapt to environmental hazards. The score and rating represent the relative level of a community's social vulnerability compared to all other communities at the same level (e.g., county level). A community's Social Vulnerability score is proportional to a community's risk. A higher Social Vulnerability score results in a higher Risk Index score."

According to the Center for Disease Control and Prevention (CDC) and Agency for Toxic Substances and Disease Registry (ATSDR) Social Vulnerability Index (SVI) Clinton County has a calculated Social Vulnerability Index of 0.47 (on scale of 0 to 1) on a state level, which is considered a low to medium susceptibility to the adverse impacts of natural hazards when compared to the rest of the U.S. For comparison, Ohio's average Social Vulnerability Index is 0.50 on a state level. Table 2.3.2 reports the SVI scores for Socioeconomic status, housing type and transportation, race and ethnic minority status, and household characteristics for Clinton County and Ohio at both the state and national levels.

The score is calculated using U.S. Census data for 16 social factors, which research literature suggests contributes to the reduction in a community's ability to prepare for, respond to, and recover from hazards, thus making the community more vulnerable. Each county is subdivided into census tracts and each census track is ranked on the 16 social factors. The 16 social factors are organized into four themes. Each census track is ranked separately for each theme and receives an overall ranking. The four themes and social factors are described below according to the CDC/ATSDR Social Vulnerability Index:

1. **Socioeconomic Status**: this theme covers socioeconomic status, such as households with income below the 150-percentile poverty level, employment status, housing cost burden, high school diploma status, and if the household has health insurance.
2. **Housing Type and Transportation:** this theme covers multi-unit structures, mobile homes, crowding within households, households without a vehicle, and group quarters.
3. **Race and Ethnic Minority Status:** this theme covers the percentage of Hispanic or Latino (of any race); Black and African American (not Hispanic or Latino); American Indian and Alaska Native (not Hispanic or Latino); Native Hawaiian and Other Pacific Islander (not Hispanic or Latino); Two or More Races (not Hispanic or Latino); Other Races (not Hispanic or Latino).
4. **Household Characteristics:** this theme covers the elderly population (65 and older), children under 17 years of age, civilians with a disability, single-parent households, and the household's English language proficiency.

Table 2.3.2: Social Vulnerability Score per Theme for Clinton County and Ohio

Theme	Clinton County (Statewide)	Ohio (Statewide)	Clinton County (Nationwide)	Ohio (Nationwide)
Socioeconomic Status	0.44	0.50	0.33	0.37
Housing Type and Transportation	0.51	0.50	0.50	0.42
Race and Ethnic Minority Status	0.38	0.50	0.18	0.28
Household Characteristics	0.55	0.50	0.50	0.40

2.4 Community Profiles

Clinton County

Clinton County is located in southwest Ohio, and it is part of the Cincinnati-Wilmington-Maysville, OH-KY-IN Combined Statistical Area. As of the 2023 5-Year ACS Estimates (census), the population was 42,014 making it the 59th most populated county in Ohio. The City of Wilmington is the largest city and serves as the County seat.

Tables 2.4.1 to 2.4.6 summarize Clinton County's population, housing statistics, and income statistics. There are 16,534 households of which 24.5 percent have at least one member under 18 years of age, and 34 percent have members 65 years and over. The largest percentage of households (17.7 percent) had an income between $50,000 to $74,999; approximately 5.0 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in Clinton County was the White (non-Hispanic) group, which makes up 92.6 percent of the population. Two or More Races is the second largest race (3.3 percent). Approximately 1.3 percent of the city's population speak Spanish at home. In addition, 0.66 percent speak another Indo-European language, 0.49 percent speak an Asian and Pacific Island language, and 0.07 percent speak another language.

Table 2.4.1: Clinton County Population by Age Statistics 2023 ACS 5-Year Estimates

Age	Number	Percentage
Total Population	42,014	100%
Under 18 Years	9,615	22.89%
18 to 24 Years	4,142	9.86%
25 to 34 Years	4,728	11.25%
35 to 44 Years	4,960	11.81%
45 to 54 Years	5,084	12.10%
55 to 64 Years	5,877	13.99%
65 Years and Over	7,608	18.11%

Table 2.4.2: Clinton County Housing Statistics 2023 ACS 5-Year Estimates

Housing Statistics	Number	Percentage
Total Housing Units	17,966	100%
Occupied Housing Units	16,534	92.03%
Housing Units - Mobile Homes	1,093	6.61%
Vacant Housing Units	1,432	7.97%

Table 2.4.3: Clinton County Household Statistics 2023 ACS 5-Year Estimates

Household Statistics	Number	Percentage
Total Households	24,306	-
Average Household Size	2.47	-
Households with People Under 18 Years	5,954	24.50%
Households with People 65+ Years	8,264	34.00%
Householder Living Alone 65+ Years	3,719	15.30%
No Vehicle Available	1,837	7.56%
With a Broadband Internet Subscription	21,053	86.62%

Table 2.4.4: Clinton County Population by Race and Ethnicity Statistics 2023 ACS 5-Year Estimates

Race and Ethnicity	Number	Percentage
Total Population	42,014	100%
White	38,701	92.11%
Black or African American	750	1.79%
American Indian and Alaska Native	23	0.05%
Asian	298	0.71%
Native Hawaiian and other Pacific Islander	8	0.02%
Some Other Race	107	0.25%
Two or More Races	1,258	2.99%
Hispanic or Latino (of any race)	869	2.07%

Table 2.4.5: Clinton County Language Spoken at Home Statistics 2023 ACS 5-Year Estimates

Language Statistics	Number	Percentage
Total Population (over 5 years old)	39,560	100%
English only	38,567	97.49%
Spanish	510	1.29%
Other Indo-European languages	263	0.66%
Asian and Pacific Island languages	192	0.49%
Other languages	28	0.07%

Table 2.4.6: Clinton County Household Income Statistics 2023 ACS 5-Year Estimates

Household Income Statistics	Percentage of Households
Less than $10,000	5.00%
$10,000 to $14,999	4.40%
$15,000 to $24,999	8.40%
$25,000 to $34,999	8.50%
$35,000 to $49,999	10.80%
$50,000 to $74,999	17.70%
$75,000 to $99,999	16.40%
$100,000 to $149,999	16.60%
$150,000 to $199,999	6.20%
$200,000 or more	6.10%
Median Household Income	$68,125
Mean Household Income	$84,570

City of Wilmington

Tables 2.4.7 to 2.4.12 summarize the City of Wilmington's population, housing statistics, and income statistics. There are 5,437 households of which 19.0 percent have at least one member under 18 years of age, and 34.4 percent have members 65 years and over. The largest percentage of households (18.8 percent) had an income between $50,000 to $74,999; approximately 7.7 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the City of Wilmington was the White (non-Hispanic) group, which makes up 86.0 percent of the population. Black or African American is the second largest race (4.9 percent). Approximately 1.8 percent of the city's population speak Spanish at home. In addition, 0.73 percent speak another Indo-European language, 1.4 percent speak an Asian and Pacific Island language, and 0.23 percent speak another language.

Table 2.4.7: City of Wilmington Population by Age 2023 ACS 5-Year Estimates

Age	Number	Percentage
Total Population	12,637	100%
Under 18 Years	2,643	20.91%
18 to 24 Years	1,902	15.05%
25 to 34 Years	1,590	12.58%
35 to 44 Years	1,169	9.25%
45 to 54 Years	1,349	10.68%
55 to 64 Years	1,506	11.92%
65 Years and Over	2,478	19.61%

Table 2.4.8: City of Wilmington Housing Statistics 2023 ACS 5-Year Estimates

Housing Statistics	Number	Percentage
Total Housing Units	5,880	100%
Occupied Housing Units	5,437	92.47%
Housing Units - Mobile Homes	204	3.75%
Vacant Housing Units	443	7.53%

Table 2.4.9: City of Wilmington Household Statistics 2023 ACS 5-Year Estimates

Household Statistics	Number	Percentage
Total Households	5,437	-
Average Household Size	2.14	-
Households with People Under 18 Years	1,033	19.00%
Households with People 65+ Years	1,870	34.40%
Householder Living Alone 65+ Years	1,028	18.90%
No Vehicle Available	291	5.35%
With a Broadband Internet Subscription	4,755	87.46%

Table 2.4.10: City of Wilmington Race and Ethnicity Statistics 2023 ACS 5-Year Estimates

Race and Ethnicity	Number	Percentage
Total Population	12,637	100%
White	10,863	85.96%
Black or African American	619	4.90%
American Indian and Alaska Native	23	0.18%
Asian	201	1.59%
Native Hawaiian and other Pacific Islander	0	0.00%
Some Other Race	65	0.51%
Two or More Races	574	4.54%
Hispanic or Latino (of any race)	292	2.31%

Table 2.4.11: City of Wilmington Language Spoken at Home Statistics 2023 ACS 5-Year Estimates

Language Statistics	Number	Percentage
Total Population (over 5 years old)	11,996	100%
English only	11,493	95.81%
Spanish	215	1.79%
Other Indo-European languages	88	0.73%
Asian and Pacific Island languages	172	1.43%
Other languages	28	0.23%

Table 2.4.12: City of Wilmington Income Statistics 2023 ACS 5-Year Estimates

Household Income Statistics	Percentage of Households
Less than $10,000	7.70%
$10,000 to $14,999	5.50%
$15,000 to $24,999	10.00%
$25,000 to $34,999	11.10%
$35,000 to $49,999	12.60%
$50,000 to $74,999	18.80%
$75,000 to $99,999	17.60%
$100,000 to $149,999	11.60%
$150,000 to $199,999	3.10%
$200,000 or more	2.20%
Median Household Income	$52,661
Mean Household Income	$64,291

Village of Blanchester

Tables 2.4.13 to 2.4.18 summarize the Village of Blanchester's population, housing statistics, and income statistics. There are 1,715 households of which 22.3 percent have at least one member under 18 years of age, and 30.4 percent have members 65 years and over. The largest percentage of households (16.2 percent) had an income between $100,000 to $149,999; approximately 10.4 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the Village of Blanchester was the White (non-Hispanic) group, which makes up 91.9 percent of the population. Hispanic or Latino (of any race) is the second largest race (4.6 percent). Approximately 4.1 percent of the city's population speak Spanish at home. In addition, 0.21 percent speak another Indo-European language.

Table 2.4.13: Village of Blanchester Population by Age 2022 ACS 5-Year Estimates

Age	Number	Percentage
Total Population	4,681	100%
Under 18 Years	1,195	25.53%
18 to 24 Years	724	15.47%
25 to 34 Years	371	7.93%
35 to 44 Years	722	15.42%
45 to 54 Years	487	10.40%
55 to 64 Years	439	9.38%
65 Years and Over	743	15.87%

Table 2.4.14: Village of Blanchester Housing Statistics 2023 ACS 5-Year Estimates

Housing Statistics	Number	Percentage
Total Housing Units	1,862	100%
Occupied Housing Units	1,715	92.11%
Housing Units - Mobile Homes	41	0.52%
Vacant Housing Units	147	7.89%

Table 2.4.15: Village of Blanchester Household Statistics 2023 ACS 5-Year Estimates

Household Statistics	Number	Percentage
Total Households	1,715	-
Average Household Size	2.67	-
Households with People Under 18 Years	382	22.27%
Households with People 65+ Years	521	30.40%
Householder Living Alone 65+ Years	232	13.50%
No Vehicle Available	88	5.13%
With a Broadband Internet Subscription	1,427	83.21%

Table 2.4.16: Village of Blanchester Race and Ethnicity Statistics 2023 ACS 5-Year Estimates

Race and Ethnicity	Number	Percentage
Total Population	4,681	100%
White	4,301	91.88%
Black or African American	21	0.45%
American Indian and Alaska Native	0	0.00%
Asian	0	0.00%
Native Hawaiian and other Pacific Islander	0	0.00%
Some Other Race	12	0.26%
Two or More Races	134	2.86%
Hispanic or Latino (of any race)	213	4.55%

Table 2.4.17: Village of Blanchester Language Spoken at Home Statistics 2023 ACS 5-Year Estimates

Language Statistics	Number	Percentage
Total Population (over 5 years old)	4,244	100%
English only	4,062	95.71%
Spanish	173	4.08%
Other Indo-European languages	9	0.21%
Asian and Pacific Island languages	0	0.00%
Other languages	0	0.00%

Table 2.4.18: Village of Blanchester Income Statistics 2023 ACS 5-Year Estimates

Household Income Statistics	Percentage of Households
Less than $10,000	10.40%
$10,000 to $14,999	6.00%
$15,000 to $24,999	6.80%
$25,000 to $34,999	15.50%
$35,000 to $49,999	12.80%
$50,000 to $74,999	12.80%
$75,000 to $99,999	9.10%
$100,000 to $149,999	16.20%
$150,000 to $199,999	7.00%
$200,000 or more	3.50%
Median Household Income	$45,179
Mean Household Income	$75,778

Village of Clarksville

Tables 2.4.19 to 2.4.24 summarize the Village of Clarksville's population, housing statistics, and income statistics. There are 191 households of which 43.5 percent have at least one member under 18 years of age, and 8.4 percent have members 65 years and over. The largest percentage of households (33.0 percent) had an income between $100,000 to $149,999; approximately 5.8 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the Village of Clarksville was the White (non-Hispanic) group, which makes up 95.7 percent of the population. Two or More Races is the second largest race (2.4 percent).

Table 2.4.19: Village of Clarksville Population by Age 2022 ACS 5-Year Estimates

Age	Number	Percentage
Total Population	509	100%
Under 18 Years	148	29.08%
18 to 24 Years	31	6.09%
25 to 34 Years	113	22.20%
35 to 44 Years	80	15.72%
45 to 54 Years	51	10.02%
55 to 64 Years	57	11.20%
65 Years and More	29	5.70%

Table 2.4.20: Village of Clarksville Housing Statistics 2023 ACS 5-Year Estimates

Housing Statistics	Number	Percentage
Total Housing Units	293	100%
Occupied Housing Units	191	65.19%
Housing Units - Mobile Homes	15	7.85%
Vacant Housing Units	102	34.81%

Table 2.4.21: Village of Clarksville Household Statistics 2023 ACS 5-Year Estimates

Household Statistics	Number	Percentage
Total Households	191	-
Average Household Size	2.66	-
Households with People Under 18 Years	83	43.46%
Households with People 65+ Years	16	8.40%
Householder Living Alone 65+ Years	0	0.00%
No Vehicle Available	3	1.57%
With a Broadband Internet Subscription	185	96.86%

Table 2.4.22: Village of Clarksville Race and Ethnicity Statistics 2023 ACS 5-Year Estimates

Race and Ethnicity	Number	Percentage
Total Population	447	100%
White	444	99.33%
Black or African American	0	0%
American Indian or Alaska Native	0	0%
Asian	0	0%
Native Hawaiian or Pacific Islander	0	0%
Some Other Race (One Race)	0	0%
Two or More Races	3	0.67%
Hispanic or Latino (of any race)	0	0%

Table 2.4.23: Village of Clarksville Language Spoken at Home Statistics 2023 ACS 5-Year Estimates

Language Statistics	Number	Percentage
Total Population (over 5 years old)	481	100%
English only	481	100.00%
Spanish	0	0.00%
Other Indo-European languages	0	0.00%
Asian and Pacific Island languages	0	0.00%
Other languages	0	0.00%

Table 2.4.24: Village of Clarksville Income Statistics 2023 ACS 5-Year Estimates

Household Income Statistics	Percentage of Households
Less than $10,000	5.80%
$10,000 to $14,999	0.00%
$15,000 to $24,999	8.90%
$25,000 to $34,999	1.60%
$35,000 to $49,999	20.90%
$50,000 to $74,999	16.80%
$75,000 to $99,999	9.90%
$100,000 to $149,999	33.00%
$150,000 to $199,999	1.60%
$200,000 or more	1.60%
Median Household Income	$68,393
Mean Household Income	$71,672

Village of Martinsville

Tables 2.4.25 to 2.4.30 summarize the Village of Martinsville's population, housing statistics, and income statistics. There are 159 households of which 20.8 percent have at least one member under 18 years of age, and 30.2 percent have members 65 years and over. The largest percentage of households (18.9 percent) had an income between $15,000 to $24,999; approximately 2.5 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the Village of Martinsville was the White (non-Hispanic) group, which makes up 96.5 percent of the population. Hispanic or Latino (of any race) is the second largest race (2.5 percent). Approximately 2.1 percent of the city's population speak Spanish at home. In addition, 0.53 percent speak an Asian and Pacific Island language.

Table 2.4.25: Village of Martinsville Population by Age 2022 ACS 5-Year Estimates

Age	Number	Percentage
Total Population	396	100%
Under 18 Years	85	21.46%
18 to 24 Years	15	3.79%
25 to 34 Years	64	16.16%
35 to 44 Years	35	8.84%
45 to 54 Years	57	14.39%
55 to 64 Years	77	19.44%
65 Years and More	63	15.91%

Table 2.4.26: Village of Martinsville Housing Statistics 2023 ACS 5-Year Estimates

Housing Statistics	Number	Percentage
Total Housing Units	174	100%
Occupied Housing Units	159	91.38%
Housing Units - Mobile Homes	14	8.81%
Vacant Housing Units	15	8.62%

Table 2.4.27: Village of Martinsville Household Statistics 2023 ACS 5-Year Estimates

Household Statistics	Number	Percentage
Total Households	159	-
Average Household Size	2.49	-
Households with People Under 18 Years	33	20.75%
Households with People 65+ Years	48	30.20%
Householder Living Alone 65+ Years	21	13.20%
No Vehicle Available	9	5.66%
With a Broadband Internet Subscription	129	81.13%

Table 2.4.28: Village of Martinsville Race and Ethnicity Statistics 2023 ACS 5-Year Estimates

Race and Ethnicity	Number	Percentage
Total Population	396	100%
White	382	96.46%
Black or African American	0	0.00%
American Indian or Alaska Native	0	0.00%
Asian	0	0.00%
Native Hawaiian or Pacific Islander	0	0.00%
Some Other Race (One Race)	0	0.00%
Two or More Races	4	1.01%
Hispanic or Latino (of any race)	10	2.53%

Table 2.4.29: Village of Martinsville Language Spoken at Home Statistics 2023 ACS 5-Year Estimates

Language Statistics	Number	Percentage
Total Population (over 5 years old)	375	100%
English only	365	97.33%
Spanish	8	2.13%
Other Indo-European languages	0	0.00%
Asian and Pacific Island languages	2	0.53%
Other languages	0	0.00%

Table 2.4.30: Village of Martinsville Income Statistics 2023 ACS 5-Year Estimates

Household Income Statistics	Percentage of Households
Less than $10,000	2.50%
$10,000 to $14,999	5.70%
$15,000 to $24,999	18.90%
$25,000 to $34,999	9.40%
$35,000 to $49,999	12.60%
$50,000 to $74,999	17.00%
$75,000 to $99,999	11.90%
$100,000 to $149,999	13.80%
$150,000 to $199,999	3.80%
$200,000 or more	4.40%
Median Household Income	$53,125
Mean Household Income	$68,519

Village of Midland

Tables 2.4.31 to 2.4.36 summarize the Village of Midland's population, housing statistics, and income statistics. There are 149 households of which 19.5 percent have at least one member under 18 years of age, and 20.1 percent have members 65 years and over. The largest percentage of households (25.5 percent) had an income between $15,000 to $24,999; approximately 4.7 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the Village of Midland was the White (non-Hispanic) group, which makes up 99.4 percent of the population. Two or More Races is the second largest race (.60 percent).

Table 2.4.31: Village of Midland Population by Age 2022 ACS 5-Year Estimates

Age	Number	Percentage
Total Population	331	100%
Under 18 Years	53	16.01%
18 to 24 Years	43	12.99%
25 to 34 Years	56	16.92%
35 to 44 Years	39	11.78%
45 to 54 Years	41	12.39%
55 to 64 Years	59	17.82%
65 Years and More	40	12.08%

Table 2.4.32: Village of Midland Housing Statistics 2023 ACS 5-Year Estimates

Housing Statistics	Number	Percentage
Total Housing Units	168	100%
Occupied Housing Units	149	88.69%
Housing Units - Mobile Homes	5	3.36%
Vacant Housing Units	19	11.31%

Table 2.4.33: Village of Midland Household Statistics 2023 ACS 5-Year Estimates

Household Statistics	Number	Percentage
Total Households	149	-
Average Household Size	2.22	-
Households with People Under 18 Years	29	19.46%
Households with People 65+ Years	30	20.10%
Householder Living Alone 65+ Years	15	10.10%
No Vehicle Available	11	7.38%
With a Broadband Internet Subscription	127	85.23%

Table 2.4.34: Village of Midland Race and Ethnicity Statistics 2023 ACS 5-Year Estimates

Race and Ethnicity	Number	Percentage
Total Population	331	100%
White	329	99.40%
Black or African American	0	0.00%
American Indian or Alaska Native	0	0.00%
Asian	0	0.00%
Native Hawaiian or Pacific Islander	0	0.00%
Some Other Race (One Race)	0	0.00%
Two or More Races	2	0.60%
Hispanic or Latino (of any race)	0	0.00%

Table 2.4.35: Village of Midland Language Spoken at Home Statistics 2023 ACS 5-Year Estimates

Language Statistics	Number	Percentage
Total Population (over 5 years old)	323	100%
English only	323	100%
Spanish	0	0.00%
Other Indo-European languages	0	0.00%
Asian and Pacific Island languages	0	0.00%
Other languages	0	0.00%

Table 2.4.36: Village of Midland Income Statistics 2023 ACS 5-Year Estimates

Household Income Statistics	Percentage of Households
Less than $10,000	4.70%
$10,000 to $14,999	9.40%
$15,000 to $24,999	25.50%
$25,000 to $34,999	3.40%
$35,000 to $49,999	10.10%
$50,000 to $74,999	20.80%
$75,000 to $99,999	22.80%
$100,000 to $149,999	3.40%
$150,000 to $199,999	0.00%
$200,000 or more	0.00%
Median Household Income	$44,792
Mean Household Income	$49,187

Village of New Vienna

Tables 2.4.37 to 2.4.42 summarize the Village of New Vienna's population, housing statistics, and income statistics. There are 483 households of which 37.7 percent have at least one member under 18 years of age, and 34.6 percent have members 65 years and over. The largest percentage of households (24.4 percent) had an income between $50,000 to $74,999; approximately 4.3 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the Village of New Vienna was the White (non-Hispanic) group, which makes up 87.7 percent of the population. Hispanic or Latino (of any race) is the second largest race (4.9 percent). Approximately 0.47 percent of the city's population speak Spanish at home. In addition, 0.47 percent speak another Indo-European language.

Table 2.4.37: Village of New Vienna Population by Age 2022 ACS 5-Year Estimates

Age	Number	Percentage
Total Population	1,130	100%
Under 18 Years	289	25.58%
18 to 24 Years	65	5.75%
25 to 34 Years	178	15.75%
35 to 44 Years	160	14.16%
45 to 54 Years	126	11.15%
55 to 64 Years	116	10.27%
65 Years and More	196	17.35%

Table 2.4.38: Village of New Vienna Housing Statistics 2023 ACS 5-Year Estimates

Housing Statistics	Number	Percentage
Total Housing Units	506	100%
Occupied Housing Units	483	95.45%
Housing Units - Mobile Homes	64	13.25%
Vacant Housing Units	23	4.55%

Table 2.4.39: Village of New Vienna Household Statistics 2023 ACS 5-Year Estimates

Household Statistics	Number	Percentage
Total Households	483	-
Average Household Size	2.34	-
Households with People Under 18 Years	182	37.68%
Households with People 65+ Years	167	34.60%
Householder Living Alone 65+ Years	106	21.90%
No Vehicle Available	52	10.77%
With a Broadband Internet Subscription	395	81.78%

Table 2.4.40: Village of New Vienna Race and Ethnicity Statistics 2023 ACS 5-Year Estimates

Race and Ethnicity	Number	Percentage
Total Population	1,130	100%
White	991	87.70%
Black or African American	24	2.12%
American Indian or Alaska Native	0	0.00%
Asian	0	0.00%
Native Hawaiian or Pacific Islander	0	0.00%
Some Other Race (One Race)	26	2.30%
Two or More Races	34	3.01%
Hispanic or Latino (of any race)	55	4.87%

Table 2.4.41: Village of New Vienna Language Spoken at Home Statistics 2023 ACS 5-Year Estimates

Language Statistics	Number	Percentage
Total Population (over 5 years old)	1,066	100%
English only	1,056	99.06%
Spanish	5	0.47%
Other Indo-European languages	5	0.47%
Asian and Pacific Island languages	0	0.00%
Other languages	0	0.00%

Table 2.4.42: Village of New Vienna Income Statistics 2023 ACS 5-Year Estimates

Household Income Statistics	Percentage of Households
Less than $10,000	4.30%
$10,000 to $14,999	6.60%
$15,000 to $24,999	12.00%
$25,000 to $34,999	9.90%
$35,000 to $49,999	3.90%
$50,000 to $74,999	24.40%
$75,000 to $99,999	19.50%
$100,000 to $149,999	14.10%
$150,000 to $199,999	4.60%
$200,000 or more	0.60%
Median Household Income	$58,523
Mean Household Income	$66,986

Village of Port William

Tables 2.4.43 to 2.4.48 summarize the Village of Port William's population, housing statistics, and income statistics. There are 120 households of which 37.5 percent have at least one member under 18 years of age, and 22.5 percent have members 65 years and over. The largest percentage of households (25.8 percent) had an income between $15,000 to $24,999; approximately 1.7 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the Village of Port William was the White (non-Hispanic) group, which makes up 97.3 percent of the population. Two or More Races is the second largest race (2.2 percent). Approximately 0.00 percent of the city's population speak Spanish at home. In addition, 2.4 percent speak another Indo-European language, 0.00 percent speak an Asian and Pacific Island language, and 0.00 percent speak another language.

Table 2.4.43: Village of Port William Population by Age 2022 ACS 5-Year Estimates

Age	Number	Percentage
Total Population	366	100%
Under 18 Years	141	38.52%
18 to 24 Years	25	6.83%
25 to 34 Years	49	13.39%
35 to 44 Years	37	10.11%
45 to 54 Years	31	8.47%
55 to 64 Years	49	13.39%
65 Years and More	34	9.29%

Table 2.4.44: Village of Port William Housing Statistics 2023 ACS 5-Year Estimates

Housing Statistics	Number	Percentage
Total Housing Units	130	100%
Occupied Housing Units	120	92.31%
Housing Units - Mobile Homes	22	18.33%
Vacant Housing Units	10	7.69%

Table 2.4.45: Village of Port William Household Statistics 2023 ACS 5-Year Estimates

Household Statistics	Number	Percentage
Total Households	120	-
Average Household Size	3.05	-
Households with People Under 18 Years	45	37.50%
Households with People 65+ Years	27	22.50%
Householder Living Alone 65+ Years	14	11.70%
No Vehicle Available	1	0.83%
With a Broadband Internet Subscription	103	85.83%

Table 2.4.46: Village of Port William Race and Ethnicity Statistics 2023 ACS 5-Year Estimates

Race and Ethnicity	Number	Percentage
Total Population	366	100%
White	356	97.27%
Black or African American	1	0.27%
American Indian or Alaska Native	0	0.00%
Asian	0	0.00%
Native Hawaiian or Pacific Islander	0	0.00%
Some Other Race (One Race)	0	0.00%
Two or More Races	8	2.19%
Hispanic or Latino (of any race)	1	0.27%

Table 2.4.47: Village of Port William Language Spoken at Home Statistics 2023 ACS 5-Year Estimates

Language Statistics	Number	Percentage
Total Population (over 5 years old)	340	100%
English only	332	97.65%
Spanish	0	0.00%
Other Indo-European languages	8	2.35%
Asian and Pacific Island languages	0	0.00%
Other languages	0	0.00%

Table 2.4.48: Village of Port William Income Statistics 2023 ACS 5-Year Estimates

Household Income Statistics	Percentage of Households
Less than $10,000	1.70%
$10,000 to $14,999	4.20%
$15,000 to $24,999	25.80%
$25,000 to $34,999	2.50%
$35,000 to $49,999	16.70%
$50,000 to $74,999	24.20%
$75,000 to $99,999	15.80%
$100,000 to $149,999	9.20%
$150,000 to $199,999	0.00%
$200,000 or more	0.00%
Median Household Income	$47,250
Mean Household Income	$52,179

Village of Sabina

Tables 2.4.49 to 2.4.54 summarize the Village of Sabina's population, housing statistics, and income statistics. There are 1,228 households of which 19.4 percent have at least one member under 18 years of age, and 34.4 percent have members 65 years and over. The largest percentage of households (22.0 percent) had an income between $50,000 to $74,999; approximately 5.3 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the Village of Sabina was the White (non-Hispanic) group, which makes up 95.2 percent of the population. Hispanic or Latino (of any race) is the second largest race (2.8 percent). Approximately 0.53 percent of the city's population speak Spanish at home. In addition, 0.95 percent speak another Indo-European language.

Table 2.4.49: Village of Sabina Population by Age 2022 ACS 5-Year Estimates

Age	Number	Percentage
Total Population	2,842	100%
Under 18 Years	577	20.30%
18 to 24 Years	99	3.48%
25 to 34 Years	282	9.92%
35 to 44 Years	452	15.90%
45 to 54 Years	282	9.92%
55 to 64 Years	523	18.40%
65 Years and More	627	22.06%

Table 2.4.50: Village of Sabina Housing Statistics 2023 ACS 5-Year Estimates

Housing Statistics	Number	Percentage
Total Housing Units	1,310	100%
Occupied Housing Units	1,228	93.74%
Housing Units - Mobile Homes	144	11.73%
Vacant Housing Units	82	6.26%

Table 2.4.51: Village of Sabina Household Statistics 2023 ACS 5-Year Estimates

Household Statistics	Number	Percentage
Total Households	1,228	-
Average Household Size	2.28	-
Households with People Under 18 Years	238	19.38%
Households with People 65+ Years	422	34.40%
Householder Living Alone 65+ Years	131	10.70%
No Vehicle Available	43	3.50%
With a Broadband Internet Subscription	1,036	84.36%

Table 2.4.52: Village of Sabina Race and Ethnicity Statistics 2023 ACS 5-Year Estimates

Race and Ethnicity	Number	Percentage
Total Population	2,842	100%
White	2,705	95.18%
Black or African American	0	0.00%
American Indian or Alaska Native	0	0.00%
Asian	0	0.00%
Native Hawaiian or Pacific Islander	0	0.00%
Some Other Race (One Race)	4	0.14%
Two or More Races	53	1.86%
Hispanic or Latino (of any race)	80	2.81%

Table 2.4.53: Village of Sabina Language Spoken at Home Statistics 2023 ACS 5-Year Estimates

Language Statistics	Number	Percentage
Total Population (over 5 years old)	2,636	100%
English only	2,597	98.52%
Spanish	14	0.53%
Other Indo-European languages	25	0.95%
Asian and Pacific Island languages	0	0.00%
Other languages	0	0.00%

Table 2.4.54: Village of Sabina Income Statistics 2023 ACS 5-Year Estimates

Household Income Statistics	Percentage of Households
Less than $10,000	5.30%
$10,000 to $14,999	6.10%
$15,000 to $24,999	12.00%
$25,000 to $34,999	12.00%
$35,000 to $49,999	19.40%
$50,000 to $74,999	22.00%
$75,000 to $99,999	7.40%
$100,000 to $149,999	14.60%
$150,000 to $199,999	0.00%
$200,000 or more	1.30%
Median Household Income	$45,957
Mean Household Income	$56,940

3 | Planning Process

3.1 Methodology

The Planning Process chapter describes the steps involved in the development of the 2025 Clinton 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 & Regulations

Clinton County and the State of Ohio maintain several plans and tools that were pertinent to reference in the development of the 2025 Hazard Mitigation Plan, including:

- 2021 Clinton County Natural Hazards Mitigation Plan
- 2024 State of Ohio Hazard Mitigation Plan (SOHMP)
- Zoning Regulations for all Townships
- Clinton County Subdivision Regulations

3.3 Clinton County Authority to Adopt Plan

The Clinton County Board of Commissioners are elected at large for four-year terms. The board members are the budgeting, appropriating, taxing, and purchasing authority. The Clinton County Planning Commission was established by the Clinton County Board of Commissioners in conformance with Section 713.21 of the Ohio Revised Code. The authority to adopt plans comes from statutory law and from Chapter 307 of the Ohio Revised Code. **Table 3.3.1** lists the existing authorities and regulations in place in Clinton County and its municipalities.

Through Titles 3 and 7 of the Ohio Revised Code, the county and all municipal corporations have the authority to establish, maintain, and improve a large number of jurisdictional capabilities listed in **Table 3.3.1.** However, their ability to establish, maintain, or improve upon these capabilities vary based on their respective need, political will, and financial capacity. Compared to larger communities, smaller jurisdictions may have the same authority enabled to them by the Ohio Revised Code, but have less ability to establish, maintain, or improve these capabilities.

Table 3.3.1: Existing Authorities and Regulations in Clinton County's Municipalities

Community	Planning Commission	Comprehensive Plan	Floodplain Regulation	Building Codes*	Zoning Codes	Capital Budget	Public Works Budget
Clinton County	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City of Wilmington	Yes	Yes	Yes	Yes	Yes	Yes	Limited in-kind wages only
Village of Blanchester	No	No	Yes	Yes	Yes	Yes	Limited in-kind wages only

Community	Planning Commission	Comprehensive Plan	Floodplain Regulation	Building Codes*	Zoning Codes	Capital Budget	Public Works Budget
Village of Clarksville	No	No	Yes	Yes	Yes	Yes	Limited in-kind wages only
Village of Martinsville	No	No	Yes	Yes	Yes	Yes	Limited in-kind wages only
Village of Midland	No	No	Yes	Yes	Yes	No	Limited in-kind wages only
Village of New Vienna	No	No	Yes	Yes	Yes	Yes	Limited in-kind wages only
Village of Port William	No	No	Yes	Yes	Yes	Yes	Limited in-kind wages only
Village of Sabina	No	No	Yes	Yes	Yes	Yes	Limited in-kind wages only

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

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 email notification. Representatives from the following entities were invited to participate in the planning process. Additionally, **Table 3.4.1** lists the participating jurisdictions and representatives and how they participated.

Clinton County

- Clinton County
- Clinton County EMA
- Clinton County Engineer's Office
- Clinton County Health District
- Clinton County History Center
- Clinton County Port Authority
- Clinton County Sheriff's Office
- Clinton County Solid Waste Management
- Clinton County Regional Planning Commission

City and Village Members

- City of Wilmington
- Village of Blanchester
- Village of Clarksville
- Village of Martinsville
- Village of Midland
- Village of New Vienna
- Village of Port William
- Village of Sabina

Township Members

- Adams Township
- Chester Township
- Clark Township
- Green Township
- Harrison Township
- Jefferson Township
- Liberty Township
- Marion Township
- Richland Township
- Union Township
- Vernon Township
- Washington Township
- Wayne Township
- Wilson Township

Local Schools and Universities

- Clinton-Massie Local School District
- Wilmington City Schools
- Wilmington College

Other Organizations

- AIM Media Midwest
- Alkermes
- American Red Cross
- Amazon
- Clinton Memorial Hospital
- Collet Services
- Council on Aging of SW Ohio
- Duke Energy
- Department of Public Safety Ohio
- Greene County EMA
- Help 4 Seniors
- Hitachi Astemo
- Kettering Health
- Laurel Health
- Local Emergency Planning Committee
- Nutrien Ag Solutions
- Ohio Emergency Management Agency
- Ohio School Safety Center
- Linde Gas & Equipment Inc.
- RL Carriers
- Sunrise Co-Op
- The Health Collaborative
- The Salvation Army
- Warren County EMA
- Wilmington Air Park
- Wilmington Transit System

Table 3.4.1: Participating Jurisdictions

Community/ Organization	Stakeholders	Surveys Completed				Meetings Attended		
		Goals	Hazard Priorities	Previous Mitigation Actions	New Mitigation Actions	1	2	Other
County								
Clinton County	Mary Ann Foland – Administrator Brenda Woods - Commissioner Mike McCarty – Commissioner	√	√	√	√	√	√	
Clinton County EMA	Thomas Breckel – Director	√	√	√	√	√	√	
Clinton County Engineer's Office	Adam Fricke – Deputy Engineer Jeff Linkous – County Engineer	√	√	√		√		
Clinton County Health District	Katie Burwinkel – Director Tonja Ruther – Special Projects Coordinator	√	√	√	√	√	√	
Clinton County History Center	Shelby Boatman – Executive Director	√	√			√		
Clinton County Port Authority	Elizabeth Huber – Chief Operating Officer					√	√	
Clinton County Regional Planning Commission	Anya Tipton - Planner	√	√	√		√		
Clinton County Solid Waste	Jeff Walls – Coordinator	√	√			√	√	
Clinton Memorial Hospital	Shuan Luther– Emergency Preparedness Matt Gunderman – Asst. Administrator of Clinical Operations						√	
Jurisdictions								
City of Wilmington	Robert Wilson – Police Chief Andy Mason – Fire Chief Mike Crowe – City Service Director Samantha Ison – Deputy Service Director	√	√	√	√	√	√	
Village of Blanchester	John Carman – Mayor	√	√	√	√	√	√	√

Community/ Organization	Stakeholders	Surveys Completed				Meetings Attended		
		Goals	Hazard Priorities	Previous Mitigation Actions	New Mitigation Actions	1	2	Other
Village of Clarksville	Nomi Woods - Mayor	√	√	√	√			√
Village of Martinsville	Jed Mountjoy - Mayor	√	√	√	√			√
Village of Midland	John Burris - Mayor	√	√	√	√			√
Village of New Vienna	Judy Havens – Mayor	√	√	√	√	√		√
Village of Port William	Robert Collins - Mayor	√	√	√	√			√
Village of Sabina	Joe Noland – Police chief	√	√	√	√	√		√
Other								
Adams Township	Kerry Steed – Commissioner	√	√	√		√		
Marion Township	Gregory Hefner – Trustee	√	√	√	√	√	√	

If representatives were unable to attend the virtual Core Planning Committee meetings, they participated via "Other" formats, including online surveys, as documented in **Appendix G**.

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 Meetings

Core Planning Committee Kick off

A kickoff announcement was emailed to stakeholders on October 30, 2024, inviting them to participate in the 2025 Clinton County Hazard Mitigation Plan update process as part of the Core Planning Committee. All kickoff materials were made available on the project's website (http://www.burtonplanning.com/Clinton-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 Clinton County Plan update
- The role of the Core Planning Committee in the update process
- Contact information for both Clinton County EMA and Burton Planning Services
- Dates, times, and Microsoft Teams links of upcoming Core Planning and Public Meetings

Core Planning Meeting and Public Meeting 1

The first meetings were open to both the core planning members and the public. They were held both virtually and in-person on Wednesday, January 15, 2025, at 1:00 P.M and at 5:00 P.M at the Clinton County Administrative Campus. The meetings began with a brief introduction from a Burton Planning

Services (BPS) representative. This introduction included a description of the in-person and virtual engagement process, including multiple options for participants to sign into the meeting. Participants who attended virtually were reminded multiple times throughout the course of the meeting to sign in using the online survey, via the chat function, or by sending an email to the County EMA or BPS. Participants who attended in person used the sign-in sheets to document attendance. The introduction 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.

A BPS representative then guided the attendees through a presentation which detailed the hazard mitigation planning process, including requirements of the planning process, potential hazards that could be addressed, benefits of hazard mitigation planning, and potential types of projects that could be federally funded because of the hazard mitigation plan. BPS also described the role that the Core Planning Committee would serve in the development of the 2025 Clinton County Hazard Mitigation Plan.

A total of 28 people attended the afternoon meeting, including the Clinton County EMA Director. Representatives from the City of Wilmington, Village of Blanchester, Village of Sabina, Adams Township, Clinton County Health District, Clinton County History Center, Clinton County Port Authority, Clinton County Regional Planning Commission, Clinton County Solid Waste Management District, Clinton County Engineer's Office, and Clinton County Commissioners were also in attendance. In addition, representatives from Alkermes, Amazon, the American Red Cross, Astemo, Department of Public Safety Ohio, Duke Energy, Clinton Massie Local Schools, and Wilmington City Schools attended this afternoon meeting.

A total of six people attended the evening meeting, including the Clinton County EMA Director as well as representatives from the City of Wilmington, Village of New Vienna, Marion Township, and Wilmington College. In addition, one member of the public attended the evening meeting. Another four members of the public participated by completing surveys online via Survey Monkey.

Following the completion of the presentation, a BPS representative guided the attendees through three surveys, detailed below. Each participant was provided with multiple methods of completing the survey, including a physical hard copy of the survey, a fillable PDF that could be completed on their computer, or an online version. Links to survey locations were provided throughout the meeting. Public input was requested using social media and news releases.

Goals Survey

The purpose of this survey was to reflect on the goals included in the 2020 Hazard Mitigation Plan to determine if they were still relevant to the 2025 Plan. Each attendee reviewed the previous goals and determined if they were still applicable, provided comments or edits to the goals that needed to be changed, and generated new goals to potentially be included in the 2025 Plan.

Discussion on the Goals Survey centered around the relevance of the goals. Attendees indicated a preference for adding a goal related to water treatment and water delivery systems. Other attendees mentioned the relevance of invasive species to the Plan.

Hazard Priority Survey

The purpose of this survey was to review all hazards that could be included in the 2025 Hazard Mitigation Plan and prioritize them. As such, attendees were asked to rate each hazard on a scale of zero to five, with five meaning the hazard poses the greatest possible threat to the County or their community and zero meaning the hazard should not be included in the 2025 Plan. Attendees rated hazards that were included in the 2025 Hazard Mitigation Plan, as well as all potential hazards that could be included in the 2025 Plan.

Following the completion of this survey, BPS guided a discussion on which hazards were deemed to be most important and which hazards attendees did not think needed to be included. As mentioned above, attendees emphasized invasive species during this part of the meeting.

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 2020 Hazard Mitigation Plan, reflect on the status of each action, and determine if that action should be included in the 2025 Hazard Mitigation Plan.

Core Planning Meeting and Public Meeting 2

The second meetings were open to both the core planning members and the public. They were held both virtually and in-person on Wednesday, March 5, 2025, at 1:00 P.M. and at 5:00 P.M. at the Clinton County Administrative Campus. The meetings began with a brief introduction from a Burton Planning Services (BPS) representative. This introduction included a description of the in-person and virtual engagement process, including multiple options for participants to sign into the meeting. Participants who attended virtually were reminded multiple times throughout the course of the meeting to sign in using the online survey, via the chat function, or by sending an email to the County EMA or BPS. Participants who attended in-person used the sign-in sheets for attendance. The introduction also informed online attendees that they could ask questions using the chat feature, or by unmuting themselves and asking their questions at any time throughout the meeting.

A BPS representative then guided the attendees through a presentation which detailed the hazard mitigation planning process, including requirements of the planning process, potential hazards that could be addressed, benefits of hazard mitigation planning, and potential types of projects that could be federally funded because of the hazard mitigation plan. BPS also described the role that the Core Planning Committee would serve in the development of the 2025 Clinton County Hazard Mitigation Plan.

A total of 19 people attended the afternoon meeting, including the Clinton County EMA Director, and representatives of the Clinton County Health District, Clinton County Solid Waste Management, City of Wilmington, Villages of Blanchester and Sabina, Clinton Memorial Hospital, Wilmington College, Hitachi-Astemo, and the Ohio School Safety Center. The director of the Greene County EMA and a representative of the Warren County EMA were also in attendance.

A total of four people attended the evening meeting, including the Clinton County EMA Director and representatives of Marion Township, Wilmington Air Park and Clinton Massie Schools.

Following the completion of the presentation, a BPS representative guided the attendees through a survey detailed below. Each participant was provided with multiple methods of completing the survey, including a physical hard copy of the survey, a fillable PDF that could be completed on their computer, or an online version. Links to survey locations were provided throughout the meeting. Public input was requested using social media.

Hazard Mitigation Action Scoring Matrix

The purpose of this survey was to reflect on the hazard mitigation actions included in the 2020 Hazard Mitigation Plan to determine if they were still relevant to the 2025 Plan. New mitigation actions were developed for the 2025 Plan, and these actions were presented to the Core Planning Committee. Participants were asked to score the actions based on their priority for their jurisdiction. Participants were also told that the wording for the mitigation actions may be altered to better align with the needs of their communities. The remainder of the meeting functioned as a working session, where participants were able to ask questions as they completed their surveys. Once complete, the meeting was adjourned.

3.6 Public Comment Period

The 2025 Clinton County Hazard Mitigation Plan was made available to the public and Core Planning Committee for review for a 30-day public comment period, ending on August 11, 2025. The Hazard Mitigation Plan was made available for review online on the project's website and paper copies were available at the Clinton County EMA's office. Comments from stakeholders were addressed in the plan. Clinton County's efforts to include the public and core planning members can be found in **Appendix G**.

4 | Risk Assessments

4.1 Dam/Levee Failure

Description

FEMA defines a dam as "any artificial barrier of at least a minimum size, including appurtenant works, which impounds or diverts water or liquid-borne solids on a temporary or long-term basis." Dam failure occurs when that impounded water is suddenly released in an uncontrollable manner. A dam/levee failure can result in the uncontrolled release of floodwater downstream of a facility, resulting in a flood wave that can cause significant damage to buildings and infrastructure downstream. The unexpected nature of dam collapse also increases the likelihood of loss of life in the impacted area due to reduced warning times.

Dam infrastructure can be affected by natural hazards, such as floods or man-made threats, such as sabotage. An imbalance between a dam's age and the amount of resources invested towards dam maintenance can be detrimental to the dam's condition. Maintenance issues include dam settlement and cracking, or movement of the dam's foundation. Dam failures can be caused by seepage, structural failure, or water overtopping the reservoir. Most dams in the U.S. are privately owned but regulated by the State or Federal government.

The National Flood Insurance Program (NFIP) defines a levee as "a man-made structure, usually an earthen embankment, designed and constructed in accordance with the sound engineering practice to contain, control, or divert the flow of water so as to reduce risk from temporary flooding." Levees are built parallel to waterways to reduce the risk of flood damage to neighboring infrastructure. Levee failure can occur from improper maintenance, erosion, seepage, subsidence, and when the man-made structure fails.

Common dam-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 designed to operate only 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 caused 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 the U.S. Army Corps of Engineers (USACE), dams can be classified by their hazard potential. The three hazard potential classes are:

- **High Hazard Potential**: During the event of a dam failure loss of life is probable, which is the primary attribute for assigning this designation to a dam. Economic losses, environmental damage, and lifeline impacts are also likely, but are not required for this designation.
- **Significant Hazard Potential**: No loss of life is expected during a dam failure, but economic losses, environmental damage, and lifeline impacts are likely.
- **Low Hazard Potential**: No loss of life is expected during a dam failure and no lifeline impacts are expected. Environmental damage and economic losses are expected to be limited to the dam owner's property.

Location

Dam properties of High to Low Hazard Potential are listed in **Table 4.1.1.** The status of each dam's Emergency Action Plan as of May 2025, is indicated in the table (Source: USACE). Dam locations can be seen in **Figure 4.1.2**. Condition assessments are further explained under probability.

Table 4.1.1: Dam Properties in Clinton County, Ohio

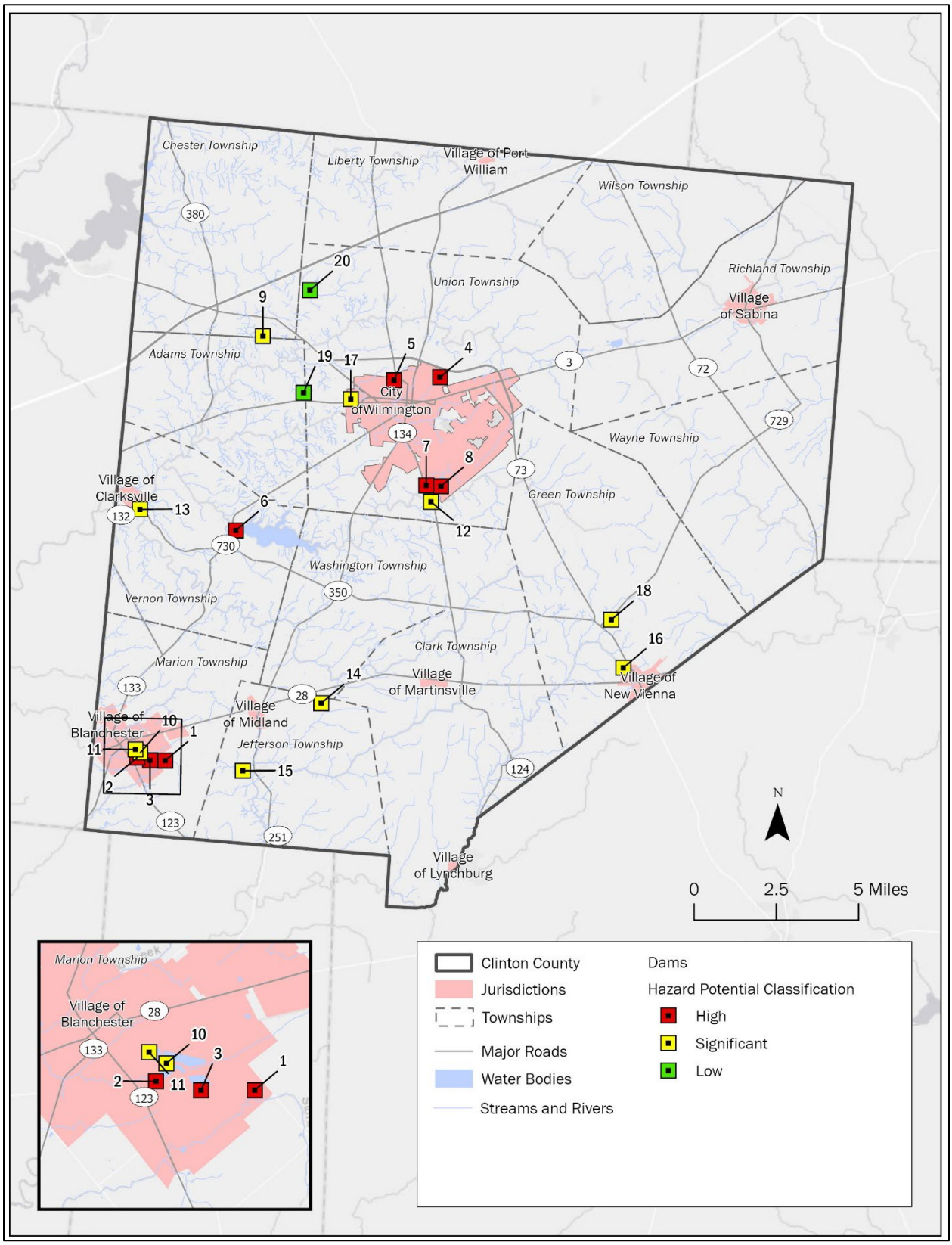
Index	Hazard Potential Classification	Dam Name	Owner Type	Distance to Nearest City (Miles)	Condition Assessment	EAP Prepared
1	High	Blanchester Reservoir No. 6 Dam	Local Government	0.4	Satisfactory	Yes
2	High	Blanchester Reservoir No. 3 Dam	Local Government	0.2	Poor	Yes
3	High	Blanchester Reservoir No. 4 Dam	Local Government	0.6	Unsatisfactory	No
4	High	Clinton County Tributary No. 1 Dam	Local Government	0.2	Satisfactory	Yes
5	High	Clinton County Tributary No. 4 Dam	Local Government	0.1	Satisfactory	Yes
6	High	Cowan Lake Dam	State	3.8	Poor	Yes
7	High	Wilmington Upground Reservoir No. 1	Local Government	0.4	Fair	Yes

Index	Hazard Potential Classification	Dam Name	Owner Type	Distance to Nearest City (Miles)	Condition Assessment	EAP Prepared
8	High	Wilmington Upground Reservoir No. 2	Local Government	0.4	Satisfactory	Yes
9	Significant	Baptist Foundation Lake Dam	Private	0.6	Fair	No
10	Significant	Blanchester Reservoir No. 5 Dam	Local Government	0.2	Fair	No
11	Significant	Blanchester Reservoirs No. 1 & 2 Dam	Local Government	0.2	Fair	Yes
12	Significant	Burtonville Lake Dam	Private	0.1	Fair	No
13	Significant	Clarksville Upground Reservoir	Local Government	0.1	Unsatisfactory	No
14	Significant	Clinton County Ww Lagoon	Local Government	4	Satisfactory	Yes
15	Significant	Houston Upground Reservoir	Local Government	0.6	Poor	No
16	Significant	New Vienna Wastewater Treatment Lagoons	Local Government	9.1	Fair	No
17	Significant	Roberts Lake Dam	Private	7	Poor	No
18	Significant	Snow Hill INC. Lake Dam	Private	9.1	Fair	Yes
19	Low	Ellis Lake Dam	Private	7.2	Fair	No

Index	Hazard Potential Classification	Dam Name	Owner Type	Distance to Nearest City (Miles)	Condition Assessment	EAP Prepared
20	Low	Stokes Lake Dam	Private	8.3	Fair	No

Source: U.S. Army Corps of Engineers

Figure 4.1.2: Dam Locations in Clinton County, Ohio



Extent

The Hazard Priority Dam classification system considers the effects of dam failure or mismanagement during both normal and flood flow conditions, as well as worse-case scenario situations. Dam classification may decrease with physical modifications to the dam or by eliminating downstream infrastructure. The classifications are justifiable, reasonable, and consistent with the federal guidelines for dam safety. The hazard potential classification may change depending on anticipated consequences of a dam failure, such as new development below a dam or within the dam breach floodplain. Hazard potential classification may decrease with physical modifications to the dam or by eliminating downstream infrastructure.

There are eight High Hazard Potential Dams in Clinton County, which are listed in **Table 4.1.1** and shown on **Figure 4.1.2**. Sudden failure of High Hazard dams could result in one of the following outcomes, depending on environmental conditions.

- Loss of human life.
- All items listed below for failure of Significant Hazard Potential Dams.

Sudden failures of Significant Hazard Potential Dams could 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.
- Damage to downstream dams or levees. 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.
- Damage or disruption to local roads including, but not limited to, roads not otherwise listed as major roads.
- Damage to agricultural crops and livestock.

Sudden failures of Low Hazard Potential Dams could result in property losses restricted mainly to the dam and rural lands, and the loss of human life is not probable.

History

There have been no known dam failures or incidents in Clinton County.

Probability

Dam failures are unlikely but not impossible. All dams, especially High and Significant Hazard Potential Dams, should have an Emergency Action Plan (EAP) in place. In addition, aging dam infrastructure could result in more frequent dam failures.

Dam conditions can provide insight into how likely it is that a dam will fail. The U.S. Army Corps of Engineers defines dam condition as follows:

Satisfactory

No existing or potential dam safety deficiencies are recognized. Acceptable performance is expected under all loading conditions (static, hydrologic, seismic) in accordance with the minimum applicable state or federal regulatory criteria or tolerable risk guidelines.

- No existing deficiencies or potentially unsafe conditions are recognized, with the exception of minor operational and maintenance items that require attention.
- Safe performance is expected under all loading conditions including the design earthquake and design flood.
- Permanent risk reduction measures (reservoir restrictions, spillway modifications, operating procedures, etc.) have been implemented to eliminate identified deficiencies.

Fair

No existing dam safety deficiencies are recognized for normal operating conditions. Rare or extreme hydrologic and/or seismic events may result in a dam safety deficiency. Risk may be in the range to take further action. Note: Rare or extreme events are defined by the regulatory agency based on their minimum applicable state of federal criteria.

- Lack of maintenance requires attention to prevent developing safety concerns.
- Maintenance conditions may exist that require remedial action greater than routine work and/or secondary studies or investigations.
- Interim or permanent risk reduction measures may be under consideration.

Poor

A dam safety deficiency is recognized for normal operating conditions which may realistically occur. Remedial action is necessary. 'Poor' may also be used when uncertainties exist as to critical analysis parameters which identify a potential dam safety deficiency. Investigations and studies are necessary.

- Dam has multiple deficiencies or a significant deficiency that requires remedial work.
- Lack of maintenance (erosion, sinkholes, settlement, cracking, unwanted vegetation, animal burrows, inoperable outlet gates) has affected the integrity or the operation of the dam under normal operational conditions and requires remedial action to resolve.
- Critical design information is needed to evaluate the potential performance of the dam. For example, a field observation or a review of the dam's performance history has identified a question that can only be answered by review of the design and construction history for the dam. Uncertainty arises when there is no design and/or construction documentation available for review and additional analysis is needed to better understand the risk associated with operation under normal operational conditions.
- Interim or permanent risk reduction measures may be under consideration.

Unsatisfactory

A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution.

- A critical component of the dam has deteriorated to unacceptable condition or failed.
- A safety inspection indicates major structural distress (excessive uncontrolled seepage, cracks, slides, sinkholes, severe deterioration, etc.), advanced deterioration, or operational

deficiencies which could lead to failure of the dam or its appurtenant structures under normal operating conditions.

- Reservoir restrictions or other interim risk reduction measures are required.
- A partial or complete reservoir drawdown may be mandated by the state or federal regulatory agency.

The State of Ohio Dam Safety Program focuses on deficient Class I dams (High Hazard Potential Dams) and dams in poor or unsatisfactory conditions. There are eight High Hazard Potential Dams in Clinton County, which are listed in **Table 4.1.1** and shown on **Figure 4.1.2**. One High Hazard Potential Dam in Clinton County does not have an emergency action plan (EAP) in place: Blanchester Reservoir No. 4 Dam. Two HHPDs are in poor condition: Cowan Lake Dam and Blanchester Reservoir No. 3 Dam. One HHPD is in unsatisfactory condition: Blanchester Reservoir No. 4 Dam, which does not have an EAP in place.

An inundation map is currently unavailable for Blanchester Reservoir No. 4 Dam in Clinton County. To calculate property exposure, a digital elevation model was used to calculate the elevation of the dams and their related reservoirs. Flood insurance studies were used to determine the flow of nearby waterways. Following the general downstream direction of the nearby waterways, a measurement of two miles (or to the County edge), as the crow flies, was taken from the dam and reservoir. This area was identified as the most at-risk area. There are several nearby waterways that could be impacted during a dam failure, and all nearby waterways were included in the analysis for Blanchester Reservoir No. 4 Dam. Parcels that were largely above the dam or reservoir by at least two feet were excluded from the analysis. All other parcels were included.

Table 4.1.3 summarizes the properties that may be exposed during a dam failure for Blanchester Reservoir No. 4 Dam. Note that this information is for general planning purposes only and should not be used in an Emergency Action Plan or any dam failure response. Inundation maps and Emergency Action Plans should be completed by following all industry standards and requirements.

Table 4.1.3: Blanchester Reservoir No. 4 Dam Property Exposure

Land Use	Count	Land Value	Improvement Value	Total Value
Agriculture	68	$5,719,250	$3,776,400	$9,495,650
Commercial	11	$760,900	$2,032,500	$2,793,400
Residential	475	$14,157,400	$71,423,800	$85,581,200
Total	**554**	**$20,637,550**	**$77,232,700**	**$97,870,250**

Vulnerability Assessment

Infrastructure Impact

Failures of Significant Hazard Potential Dams could flood roadways, including major routes and local roads. Utility infrastructure (wastewater, drinking water, and commercial and industrial waste lines) may be disrupted or destroyed.

Population Impact

The local population could be impacted by loss of utilities, including the local water supply. Health hazards may also be released into the flood waters during a dam failure which may cause indirect harm to the local population. The local population could be impacted economically as well.

Property Damage

At least one residential or commercial property is likely to face structural collapse during a High Hazard Potential Dam failure. Dam failure has the potential to damage high-value properties. Residential, commercial, industrial, and/or high-value properties may be damaged by a Significant Hazard Potential Dam failure, as well as publicly owned properties. Properties that are owned by the dam owner may be exempt from the property damage calculation.

Loss of Life

Loss of life because of a High Hazard Potential Dam failure is likely. Loss of life during a Significant or Low Hazard Potential Dam failure is not expected.

Economic Losses

Economic losses can include damage from flooding crops, flooding livestock, damaged goods, and the flooding of vital roadways.

Emergency Action Plans (EAPs) have been completed for all but one High Hazard Potential Dam (**Table 4.1.1**); However, the data is subject to agreements where it cannot be published publicly. The Ohio Department of Natural Resources (ODNR) holds a record of these EAPs.

Future Trends

Land Use and Development Trends

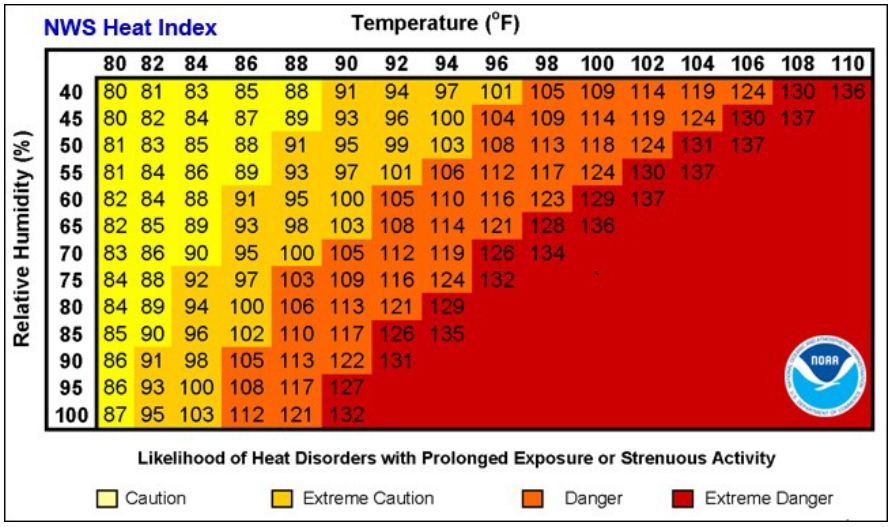
Development that has occurred in areas that will flood after a dam failure should be prepared for rapid flooding. Land use plans can limit development in these areas to prevent the increase of dam hazard potential. To better understand where development should be limited, dam failure inundation maps should be completed for as many dams as possible. If new residential construction units are within the inundation/breach areas of dams, it would increase property and population vulnerabilities despite countywide population loss.

4.2 Drought and Extreme Heat

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 precipitation over an extended period of time. Droughts are common throughout all climatic zones and can range in length from a couple of weeks to multiple years or decades in some areas.

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.

Location

Drought is a countywide hazard that can affect all locations and jurisdictions in Clinton County. More specifically, these hazards typically occur at a regional scale. Droughts most commonly occur in Ohio from spring through autumn; however, they may occur at any time throughout the year.

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 within the County may be affected in

a single drought event. In Clinton 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 soil 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 4.2.2**. 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 4.2.2: 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 -4.0 and +4.0, although extreme conditions can be greater in value (including 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 and 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.

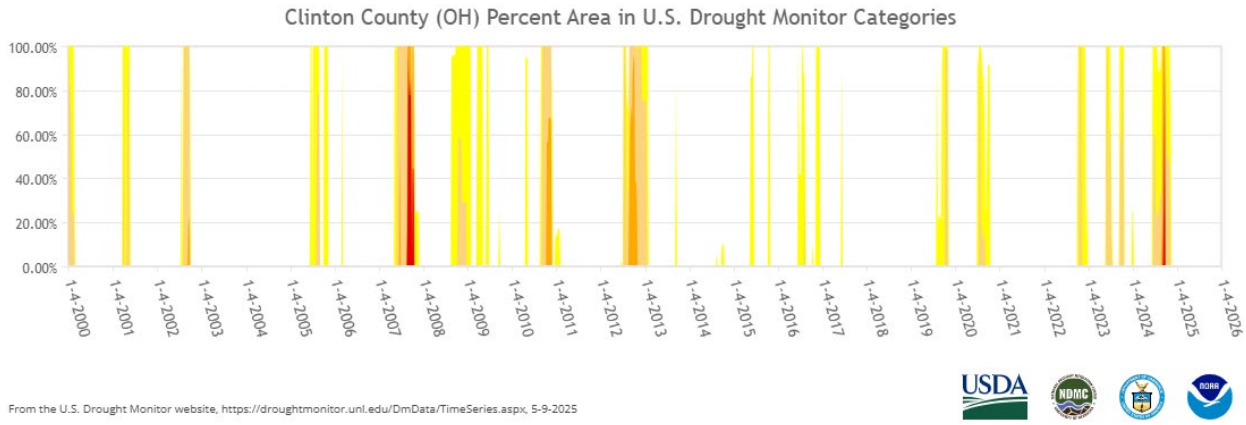
History

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 Clinton County has spent 275 weeks in abnormally dry conditions, 140 weeks in moderate drought, 36 weeks in severe drought, 10 weeks in extreme drought, and zero in exceptional drought since 2000 (**Table 4.2.3**) (Source: U.S. Drought Monitor). **Figure 4.2.4** depicts the drought monitor history for Clinton from 2000 through January 2025.

Table 4.2.3: Weeks in Drought per Year for Clinton County

Year	Abnormally Dry (D0)	Moderate Drought (D1)	Severe Drought (D2)	Extreme Drought (D3)	Exceptional Drought (D4)
2000	9	7	0	0	0
2001	9	4	0	0	0
2002	11	8	3	0	0
2003	0	0	0	0	0
2004	0	0	0	0	0
2005	15	4	0	0	0
2006	1	0	0	0	0
2007	29	21	11	8	0
2008	19	11	0	0	0
2009	15	0	0	0	0
2010	18	11	6	0	0
2011	7	0	0	0	0
2012	28	24	10	0	0
2013	6	3	0	0	0
2014	4	0	0	0	0
2015	6	0	0	0	0
2016	16	1	0	0	0
2017	1	0	0	0	0
2018	0	0	0	0	0
2019	14	6	0	0	0
2020	15	7	0	0	0
2021	0	0	0	0	0
2022	12	3	0	0	0
2023	15	10	0	0	0
2024	25	20	6	2	0
2025	0	0	0	0	0
Grand Total	**275**	**140**	**36**	**10**	**0**

Figure 4.2.4: Drought in Clinton County from 2000 to 2025



Source: U.S. Drought Monitor

Clinton County has not had a disaster declaration for extreme heat or droughts. However, the County has spent four weeks in an extreme drought and 24 weeks in severe drought since 2000. The droughts are detailed below.

Abnormally Dry to Extreme Drought (D0 – D3), June 18, 2024 – November 25, 2024:

On June 18, 2024, 100 percent of Clinton County was experiencing abnormally dry conditions. Within one week the drought conditions worsened and 60 percent of the County was experiencing moderate drought conditions. The moderate drought conditions lasted for eight weeks, worsening again on August 20, 2024. Within four weeks, 100 percent of the County was in a severe drought and on September 17, 2024, 27 percent of the County was in an extreme drought. A week later, 99 percent of the County was in an extreme drought. The drought conditions regressed to a moderate drought on October 1, 2024, lasting another eight weeks. The drought ended on November 25, 2024.

Abnormally Dry to Extreme Drought (D0 – D2), June 19, 2012 – February 4, 2013:

On June 19, 2012, approximately two percent of Clinton County was experiencing abnormally dry conditions. Within four weeks the drought conditions worsened and 100 percent of the County was experiencing moderate drought conditions. The moderate drought conditions lasted for six weeks, worsening again on August 28, 2012, and resulting in approximately 40 percent of the County experiencing a severe drought. The severe drought conditions lasted for 10 weeks before regressing back to a moderate drought. The County remained in a moderate drought for 11 more weeks, followed by two more weeks in abnormally dry conditions. The drought ended on February 4, 2013.

Abnormally Dry to Severe Drought (D0 – D2), August 31, 2010 – December 6, 2010:

On August 31, 2010, 100 percent of Clinton County was experiencing abnormally dry conditions. Within two weeks the drought conditions worsened and 100 percent of the County was experiencing moderate drought conditions. The moderate drought conditions lasted for five weeks, worsening again on October 19, 2010, and approximately 57 to 68 percent of the County was in a severe drought for six weeks. The drought ended a week later on December 6, 2010.

Abnormally Dry to Extreme Drought (D0 – D3), May 15, 2007 – December 3, 2007:

On May 15, 2007, approximately 98 percent of Clinton County was experiencing abnormally dry conditions. Within three weeks the drought conditions worsened and 100 percent of the County was experiencing moderate drought conditions. The moderate drought conditions lasted for 10 weeks, worsening again for one week on June 26, 2007, and then again on June 28, 2007. Approximately one percent of the County was in a severe drought and within two weeks it spread to 100 percent of

the County. On August 28, 2007, approximately 32 percent of the County was in an extreme drought. The extreme drought conditions lasted for eight weeks. On October 23, 2007, the extreme and severe drought conditions regressed back to a moderate drought. The drought conditions lasted for another five weeks before ending on December 3, 2007.

Abnormally Dry to Severe Drought (D0 – D2), July 23, 2002 – October 7, 2002:

On July 23, 2002, 100 percent of Clinton County was experiencing abnormally dry conditions. Within two weeks the drought conditions worsened and one percent of the County was experiencing moderate drought conditions. The moderate drought conditions lasted for four weeks, worsening again for one week on September 3, 2002, and for two weeks on September 17, 2002. The drought ended a week later on October 7, 2002.

Extreme Heat

There have been three excessive heat events and three heat events in Clinton County since January 1, 1995. All events are listed individually in Appendix A.

Excessive Heat Event, July 19 – July 20, 2019:

High temperatures and high humidity caused the heat index to rise into the triple digits for two days in July 2019. Some places in Clinton County reported temperatures of 105 degrees.

Heat Event, June 28 – July 7, 2012:

In late June 2012, a warm airmass traveled through southern Ohio, bringing high temperatures. Several locations reported triple digit temperatures. The heat wave lasted around two weeks.

Excessive Heat Event, August 7 – August 10, 2007:

High temperatures and high humidity caused the heat index to rise into the triple digits for three days in August 2007. Some places in Clinton County reported temperatures of 105 degrees.

Heat Event, July 20 – July 31, 1999:

High temperatures in the 90's across Clinton County and northern Ohio were recorded for the month of July 1999. Several counties reported temperatures in the 100's.

Probability

Clinton County has experienced droughts in the past, and the potential exists for the County to experience droughts in the future. Clinton County has spent 461 weeks in abnormally dry to extreme drought conditions since 2000. Clinton County has a 35 percent chance of having a drought and/or experiencing abnormally dry conditions each year based on historical data. Clinton County had three heat and three extreme heat events between 1995 and 2023. Heat events can occur during any year.

Seasons of drought and extreme heat have the potential to occur during any particular year when necessary conditions are met. According to the Midwest Chapter of the Fifth National Climate Assessment, the frequency of major heat waves in the Midwest has increased over the last six decades. In addition, it is predicted that as the climate gets warmer, there will be an associated increase in the number and severity of summer droughts and extreme heat events.

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 remain unchanged, warmer temperatures will amplify drought effects. Drought and warmer temperatures may increase risks of large-scale insect outbreaks and wildfires, in addition to accelerating tree and shrub death and 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.

Infrastructure Impact

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. For social vulnerability, the FEMA National Risk Index indicates that the agricultural (crop only) in Clinton County has a score of 52.4 (relatively low). This risk is only based on agricultural impacts and not population impact. The index indicates an expected annual loss of $33,000 due to drought events with two events occurring per year.

Population Impact

Populations most at risk during prolonged heat events include older adults, individuals with chronic health conditions, low-income households, and those with limited mobility or access to transportation. Clinton County's long-term care facilities—such as skilled nursing and assisted living centers—are of particular concern due to their concentration of high-risk individuals and reliance on mechanical cooling systems for health and safety.

The August 25, 2023, extreme heat event and power outage in Blanchester highlighted a critical vulnerability: HVAC systems in some long-term care facilities were not supported by emergency generator power. This created hazardous conditions for dozens of elderly residents. While neither facility exceeded the Ohio Department of Health's 81°F indoor threshold for mandatory relocation, multiple residents required close monitoring, and one was transported to the hospital for evaluation. In another facility, the backup generator failed due to overheating, emphasizing the fragility of contingency systems in a high-heat scenario. These events underscore the importance of assessing and upgrading emergency power systems to include HVAC functionality in healthcare and congregate care settings.

For social vulnerability, the National Risk Index indicates that the population in Clinton County has a score of 61.8 ("relatively moderate") for heat wave. The index indicates an expected annual loss of $153,000 due to heat wave events with 1.1 events occurring per year.

Property Damage

During extreme heat events, utility failure may occur due to overuse of electricity for cooling. Property damage is a possibility due to extreme heat. Vehicles are at risk of breaking down from excessive heat, as heat can reduce battery life and reduce the efficiency of the cooling system resulting in overheated engines. Extreme heat can also cause a home to dry out and prematurely age. Excessive heat in combination with lack of rainfall (drought) can cause soil to shrink and crack, which puts stress on a home's foundation that can be costly to fix. Drought and warmer temperatures may increase the risks of large-scale insect outbreaks and wildfires. Drought and warmer temperatures may also accelerate tree and shrub death, changing habitats and ecosystems in favor of drought-tolerant species.

Table 4.2.5 below shows the census tracts for Clinton County ranked from the highest total EAL (expected annual loss) for buildings, population ($11.6 million for each fatality or 10 injuries), and agriculture per census tract for heat wave. EAL rates, calculated by FEMA, identify the total value of loss expected each year for a particular community, in this case the census tracts for Clinton County.

Table 4.2.5: Structure and Population Vulnerability from Heat Wave

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39027964700	$70	$19,765	$253	$20,088
39027964400	$67	$17,765	$2,057	$19,889
39027964900	$34	$17,244	$263	$17,541

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39027964800	$34	$16,702	$734	$17,470
39027965100	$44	$14,640	$2,197	$16,881
39027965000	$32	$13,478	$1,443	$14,953
39027964300	$27	$12,658	$1,087	$13,772
39027964501	$22	$11,519	$96	$11,637
39027964502	$26	$10,232	$121	$10,379
39027964600	$20	$9,917	$0	$9,937
Grand Total	**$376**	**$143,920**	**$8,251**	**$152,547**

Source: FEMA National Risk Index

Loss of Life

Loss of life is possible during drought and extreme heat events, especially for young children, the elderly, and individuals with respiratory conditions.

While no fatalities were reported during the August 2023 event, the circumstances represent a clear near-miss scenario. The combination of extreme heat and loss of mechanical cooling presented a potentially life-threatening situation for over 80 residents across two facilities. Had the outage extended further into the evening or occurred later in the season when HVAC demand remains high but situational awareness may be lower, the risk of heat-related illness or death would have been significantly elevated. The lack of adequate backup power for cooling systems in high-risk settings represents a known gap in hazard mitigation and emergency preparedness.

Proactive mitigation—such as revising building codes, requiring HVAC coverage under backup systems, or providing rapid-deploy cooling assets—should be prioritized to reduce the future risk of preventable deaths in vulnerable populations.

Economic Losses

Economic losses are a threat from extreme heat and droughts in Clinton County. Crops and livestock may be compromised during prolonged extreme heat events. Human productivity can also be affected when working conditions become too hot. According to the 2022 Census of Agriculture developed by the U.S. Department of Agriculture (USDA), top crop items based on acreage for Clinton County include soybeans for beans, corn for grain, wheat for grain, forage-land used for all hay and haylage, and vegetables harvested. Based on data from the USDA, Clinton County's crop yields were not impacted from previous drought events. Acreage farmed for Corn (Grain), Soybeans, and Wheat increased, while acreage for Hay & Haylage decreased between 2017 and 2022. Yield per acre increased in 2022 versus 2017 for all crops except Hay & Haylage **(Table 4.2.6**). Agricultural land use can be seen on the land use map in Chapter 1 (**Figure 1.2.1).**

Table 4.2.6: Clinton County Crop Yields 2017 - 2022

Commodity	2017		2022	
	Acres	Crop Yield	Acres	Crop Yield
Corn, Grain	63,591	12,721,835 bushels	68,880	14,031,011 bushels
Hay & Haylage	5,071	13,360 tons	4,186	9,245 tons

Commodity	2017		2022	
	Acres	Crop Yield	Acres	Crop Yield
Soybeans	115,103	6,151,759 bushels	131,362	7,195,908 bushels
Wheat	2,758	183,502 bushels	4,766	395,238 bushels

Source: United States Department of Agriculture Census

Future Trends

Land Use and Development Trends

Drought and extreme heat are most likely to impact agriculture land uses and land uses that house or serve vulnerable populations, such as schools, daycares, hospitals, and nursing homes. Fewer people can mean generally fewer people vulnerable to extreme heat/drought events. However, the increase of people aged 65+ from 2017 (6,611) to 2023 (7,608) could mean more vulnerability to Extreme Heat for that population group. Increase of agricultural land use, crop yields, and livestock cash receipts can mean more vulnerability to drought in those areas.

Shifting Weather Patterns and Environmental Trends

Shifting weather patterns may increase the frequency and/or the severity of the impacts from drought and extreme heat events. As the weather changes, there could be an associated increase in the number and severity of droughts and extreme heat events. Warmer global temperatures may be associated with a prolonged growing season, but this trend may also increase the risk of crop stress due to excessive heat and crop damage due to increased pests and disease. The longer growing season may help some crops but crops like corn and soybean would be negatively affected by the severe heat in the summer, which would decrease these crops' yields. Additionally, increased frequency and severity may negatively impact infrastructure. For example, dams and levees may be compromised after a prolonged drought if drying, reduction of soil strength, erosion, subsidence, or ground cracking occurs. Shifting weather patterns are expected to increase the occurrence and duration of heat waves in the coming years.

4.3 Drug Misuse and Addiction

Description

The prevalence of drug misuse and addiction throughout Clinton County was raised at the first Core Planning Committee meeting on January 15, 2025. This section will detail the issue, along with how it impacts the County. Stakeholders in Clinton County opted to include this section in the report to stimulate conversation regarding the negative impacts associated with drug misuse and addiction on the County and its communities. While there is often widespread awareness and concern among policymakers and the public about substance use, there may not be an awareness of the evidence-based prevention and treatment strategies currently available. To effectively aid in the prevention of drug misuse, policymakers should remain up to date on the evidence-based prevention and treatment strategies that are available in the County and nearby.

Furthermore, it is important to note the personal nature of drug misuse and addiction. As such, government experts and civil society must recognize strategies and develop policies incorporating the most effective ways to support and deliver evidence-based substance use prevention and treatment services (Source: INCB, 2019).

A drug is a substance that affects the way the body functions. If a drug is classified as "illegal," this means that it is forbidden by law. Different drugs have different effects on people and these effects are influenced by many factors. This makes illegal use of drugs unpredictable and dangerous. The following circumstances can impact the effect of a drug:

- The type of drug
- How much of the drug is consumed
- Where the person is when the drug is being used
- What the person is doing while using the drug
- Individual characteristics such as body size and health vulnerabilities
- How many different drugs are taken at one time

The World Health Organization (WHO) defines drug misuse as "the use of a substance for a purpose not consistent with legal or medical guidelines." While many misused substances are illegal, some substances, such as many common opioids, are legally prescribed. **Table 4.3.1** describes commonly misused drugs, including those that are outright illegal and those whose improper use makes them illegal. Drug misuse can have a negative impact on health or functioning and may take the form of drug dependence or may be part of a wider spectrum of problematic or harmful behavior (Source: UK Department of Health, 2006).

Table 4.3.1: Commonly Misused Drugs

Drug Name	Description
Cocaine	A powerfully addictive stimulant drug made from the leaves of the coca plant native to South America
Heroin	An opioid drug made from morphine; a natural substance extracted from the seed pod of the various opium poppy plant
Benzodiazepines	A type of prescription sedative commonly prescribed for anxiety or to help with insomnia - these types of drugs work to calm or sedate a person by raising the level of inhibitory neurotransmitter GABA in the brain.

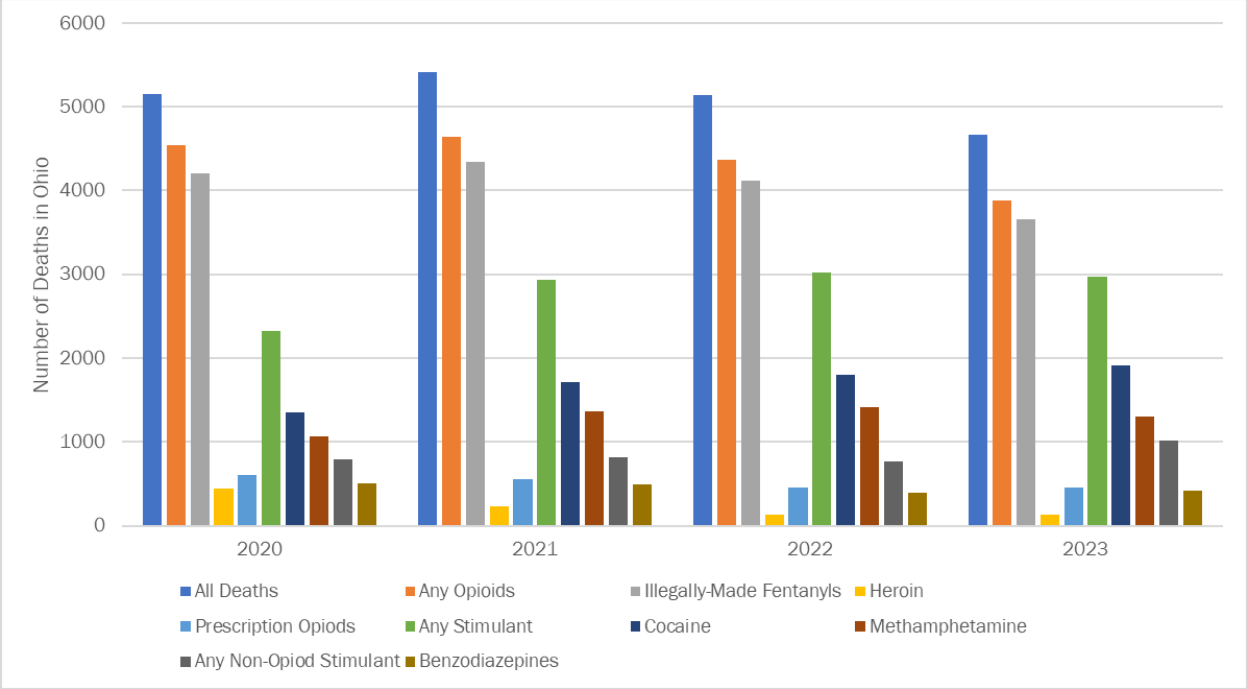
Drug Name	Description
Prescription Opioids	Pain relievers with an origin similar to that of heroin - opioids can cause euphoria and are often used nonmedically, leading to overdose deaths. Examples of prescription opioids include hydrocodone, oxycodone, morphine, codeine, and fentanyl.
Prescription Stimulants	Medications that increase alertness, attention, energy, blood pressure, heart rate, and breathing rate (Amphetamine and Methylphenidate)
Inhalants	Solvents, aerosols, and gases found in household products such as spray paints, markers, glues, and cleaning fluids; also, nitrites (e.g., amyl nitrite), which are prescription medications for chest pain
LSD	A hallucinogen manufactured from lysergic acid, which is found in ergot, a fungus that grows on rye and other grains, LSD is an abbreviation of the scientific name lysergic acid diethylamide.
GHB	Gamma-hydroxybutyrate (GHB) is a depressant approved for use in the treatment of narcolepsy, a disorder that causes daytime "sleep attacks."
MDMA (Ecstasy/Molly)	A synthetic, psychoactive drug that has similarities to both the stimulant amphetamine and the hallucinogen mescaline, MDMA is an abbreviation of the scientific name 3,4-methylenedioxymethamphetamine.
Methamphetamine	An extremely addictive stimulant amphetamine drug
PCP	A dissociative drug developed as an intravenous anesthetic that has been discontinued due to serious adverse effects, PCP is an abbreviation of the scientific name, phencyclidine. Dissociative drugs are hallucinogens that cause the user to feel detached from reality.
Synthetic Cannabinoids	A wide variety of herbal mixtures containing man-made cannabinoid chemicals related to THC in marijuana but often much stronger and more dangerous, they are sometimes misleadingly called “synthetic marijuana” and marketed as a “natural,” “safe,” legal alternative to marijuana.
Synthetic Cathinones (“Bath Salts”)	An emerging family of drugs containing one or more synthetic chemicals related to cathinone, a stimulant found naturally in the khat plant, examples of such chemicals include mephedrone, methylone, and 3,4-methylenedioxypyrovalerone (MDPV).
Ketamine	A dissociative drug used as an anesthetic in veterinary practice, Ketamine and other dissociative drugs are hallucinogens that cause the user to feel detached from reality.

Source: National Institute on Drug Abuse

Drug addiction, as described by the American Psychiatric Association (APA), is a complex condition “that is manifested by compulsive substance use despite harmful consequence.” Drug addiction can also be called substance use disorder. The Substance Abuse and Mental Health Services Administration (SAMHSA) defines substance use disorder as occurring “when the recurrent use of alcohol and/or drugs causes clinically significant impairment, including health problems, disability, and failure to meet major responsibilities at work, school, or home.” A person with substance use disorder may also experience mental and physical health issues.

Figure 4.3.2 shows the number of unintentional drug overdose deaths involving certain drugs from 2020-2023 in Ohio. The graph shows that the number of all overdose deaths has decreased since 2020.

Figure 4.3.2: Number of Unintentional Drug Overdose Deaths in Ohio by Drug, 2020-2023



Source: ODH

Location

Drug misuse and addiction has a countywide impact on Clinton County. The extent of these impacts is discussed in the next section. The Ohio Substance Abuse Monitoring Network (OSAM) released a "Surveillance of Drug Abuse Trends in the State of Ohio" report in June of 2023. For the purposes of this report, Clinton County was identified as part of the Cincinnati Region, which was assessed as a whole.

Extent

According to the National Drug Intelligence Center (NDIC), drug misuse can impact individuals as well as communities. At the individual level, users can experience overdoses, adverse reactions, psychotic episodes, and symptoms of infectious disease that can be transmitted through the sharing of needles, including diseases such as hepatitis B and C, HIV/AIDS, and tuberculosis.

At a community scale, drug misuse and addiction can have a significant impact on the environment, as well as the economy. Environmental impacts include significant environmental contamination from precursor chemicals required for the manufacturing of drugs and pharmaceuticals. Disposal of these chemicals results in the introduction of those substances into the environment in sewage, from where they can enter sediment, surface and ground water, and the tissues of vegetation and aquatic organisms (Source: INCB, 2013).

Furthermore, illicit drug cultivation and manufacturing in residential areas has the potential to reduce quality of life for residents, as well as contribute to neighborhood decay and property damage.

In 2024, the NDIC completed a National Drug Threat Assessment, which detailed the impact of drugs on society in the United States. The report highlights the dangerous shift in drug use to synthetic drugs,

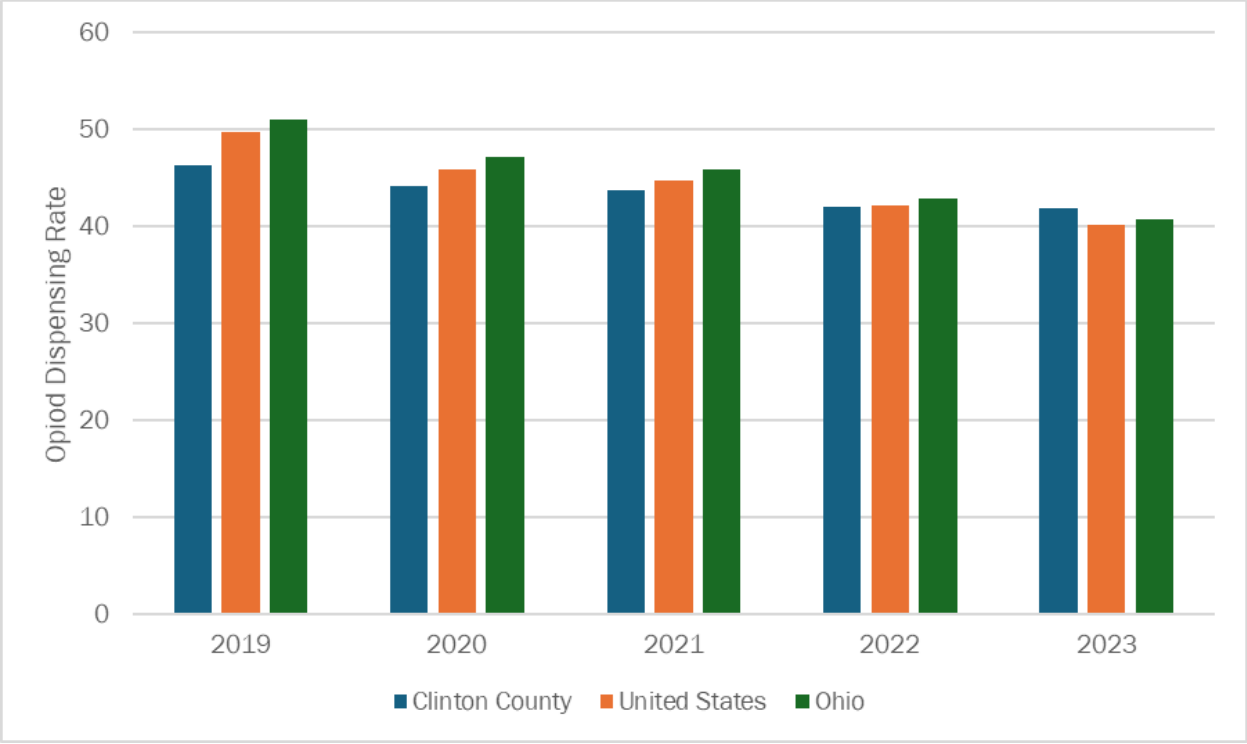
especially fentanyl. According to the White House, fentanyl has cost Americans an estimated $2.7 trillion as of December 2024. The cost is attributed to deaths, lost quality of life, healthcare, reduced labor productivity, and crime-related expenses.

While numbers like this are available at the national scale, it is more difficult to calculate these numbers at a local scale.

History

Figure 4.3.3 displays the prescribing rate of opioids, per 100 people, from 2019 through 2023 at the county, state, and national levels. Clinton County's prescribing rate remained consistently lower than the average rate for Ohio and the United States until 2023. Between 2019 and 2023, Clinton County's prescribing rate was less than 50 and has steadily decreased over time.

Figure 4.3.3: Opioid Prescribing Rates, Per 100 People, 2019-2023

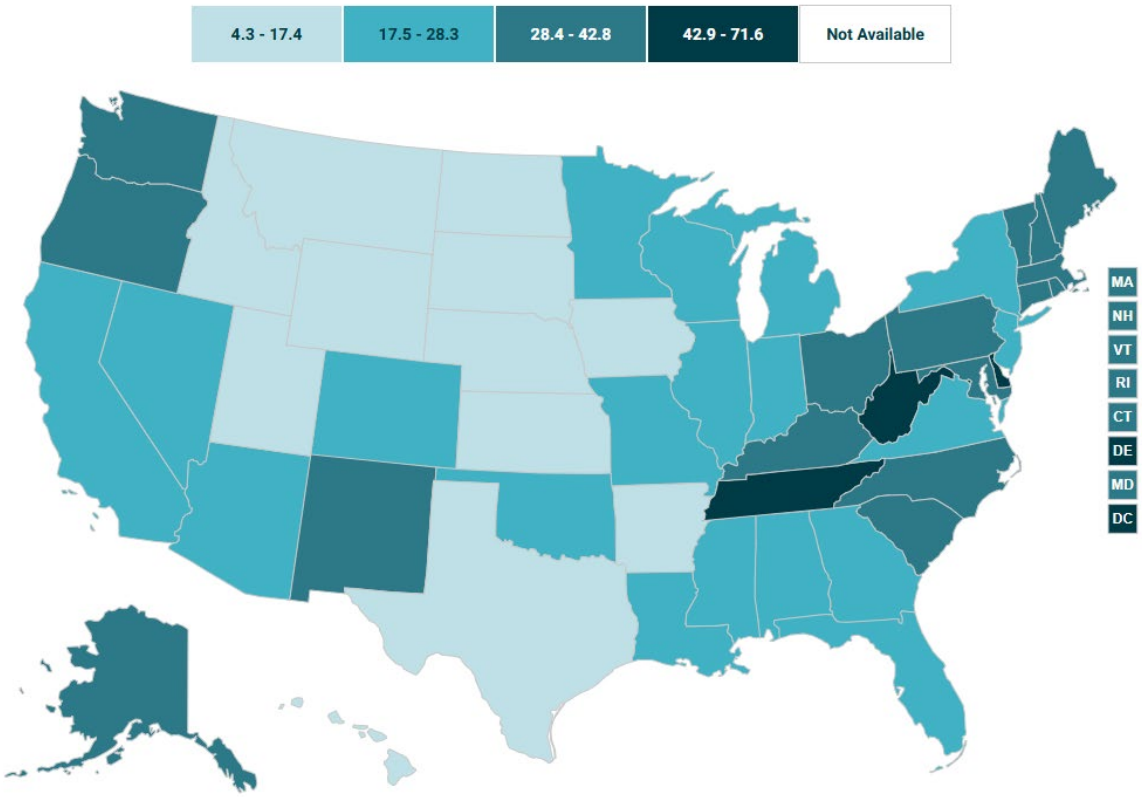


Source: ODH

In the United States, an estimated 107,543 Americans died from drug-involved overdose in 2023, including illicit drugs, prescription opioids, and synthetic opioids (fentanyl).

In 2023, the State of Ohio had the fifth highest drug overdose death rate in the U.S., with 4,557 deaths (Source: CDC, 2023; **Figure 4.3.4**).

Figure 4.3.4: Opioid and Other Drug Related Overdose Death Rates, 2023



Source: CDC

To combat misuse of prescription opioids and associated deaths, Ohio has made some changes to prescribing rules, with the support of physicians and other prescribers, such as dentists. The Governor's Cabinet Opiate Action Team (GCOAT) developed opioid prescribing guidelines for emergency departments (EDs) in 2012 and for the management of chronic pain in 2013. These prescribing guidelines are intended to supplement—not replace—clinical judgment (Source: OAFP). Additionally, regulations are in place to limit the quantity of opioids that can be prescribed at one time.

Probability

Drug misuse and addiction is a hazard that is already impacting Clinton County. In fact, the impacts of this hazard are prevalent enough that community leaders decided on including this hazard in this Plan Update.

In 2023, the prescribing rate for opioids in Clinton County was 40.7, meaning there were enough opioid prescriptions dispensed in 2023 for approximately 41 out of 100 people to have one.

Globally, the International Narcotics Control Board (INCB) estimates that drug-related deaths account for between 0.5 and 1.3 percent of all-cause mortality for people ages 15-64.

Vulnerability Assessment

Infrastructure Impact

There is likely to be little-to-no direct impact to infrastructure from drug misuse and addiction; however, it should be noted that main thoroughfares through Clinton County, such as I-71, can serve as trafficking routes for illicit drugs.

Population Impact

The population of Clinton County is likely to be significantly impacted, both at an individual level and at a larger community scale. Individuals can experience ill health, sickness, and possibly death (see *Loss of Life* section, below). Individuals who inject drugs have the potential to contract hepatitis, HIV/AIDS, or tuberculosis through needle use. Communities can also be impacted by the rampant misuse of drugs, such as experiencing discarded needles throughout their public space.

Property Damage

Property damage is possible due to drug misuse and addiction. Operation of motor vehicles while under the influence can lead to accidents resulting in damaged cars and property. Furthermore, property can exhibit damage in the form of neglect over time, becoming dilapidated and run down.

While many people suffering from drug addiction will not turn to crime to search for drugs, the unpredictable nature of addiction may influence some people to commit acts of theft or break and enter to find more drugs. This can result in property damage to homes or businesses.

Loss of Life

Loss of life is likely from drug misuse and addiction. Those who misuse drugs may overdose, while others may contract diseases from needles that will ultimately lead to their death.

Economic Losses

The economic impact of drug misuse can be significant, especially for businesses whose employees misuse drugs. This can be observed through absenteeism, lost productivity, and increased use of medical and insurance benefits by employees who misuse drugs. Locally, several businesses have experienced theft and damage related to drug misuse and addiction.

Economic losses can also be observed at the local, state, and federal government levels. As noted above, the White House estimated that the economic cost of drug abuse to the United States was $2.7 trillion as of December 2024.

Future Trends

Land Use and Development Trends

Land use and development trends can be impacted by drug misuse and addiction. When properties become dilapidated because of neglect over time, property values in the surrounding area may suffer as a result. This is likely to stall or halt development in those areas. Neighborhoods with multiple dilapidated properties can also experience a lack of investment.

4.4 Earthquakes

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 time. Earthquakes are measured using observations from seismometers. The Moment Magnitude Scale (MMS), which was developed in the 1970's, 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 on the local magnitude scale – also referred to as the Richter Scale. These two scales are numerically similar in 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 4.4.1**).

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.

Location

Earthquakes are countywide hazards and can affect all areas and jurisdictions within Clinton County. According to the Ohio Department of Natural Resources (ODNR), 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 in the 1800's. Additionally, seismic activity is concentrated in the western Ohio region known as the *western Ohio seismic zone* (also referred to as the *Fort Wayne (Anna) seismogenic zone*), where more than 40 earthquakes have been felt since 1875.

The Grenville Front Tectonic Zone in the Granite-Rhyolite Rift Province and East Continent Rift Basin travels through the middle of Clinton County (**Figure 4.4.2**).

Extent

Earthquakes pose a risk to life and property depending on severity. To monitor earthquakes, the State of Ohio and the ODNR Division of Geological Survey coordinates a 29-station network (**Figure 4.4.3**) of seismograph stations throughout the state 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.

According to the ODNR, there are two Ohio Seismic Network monitoring stations in neighboring Greene and Clermont Counties.

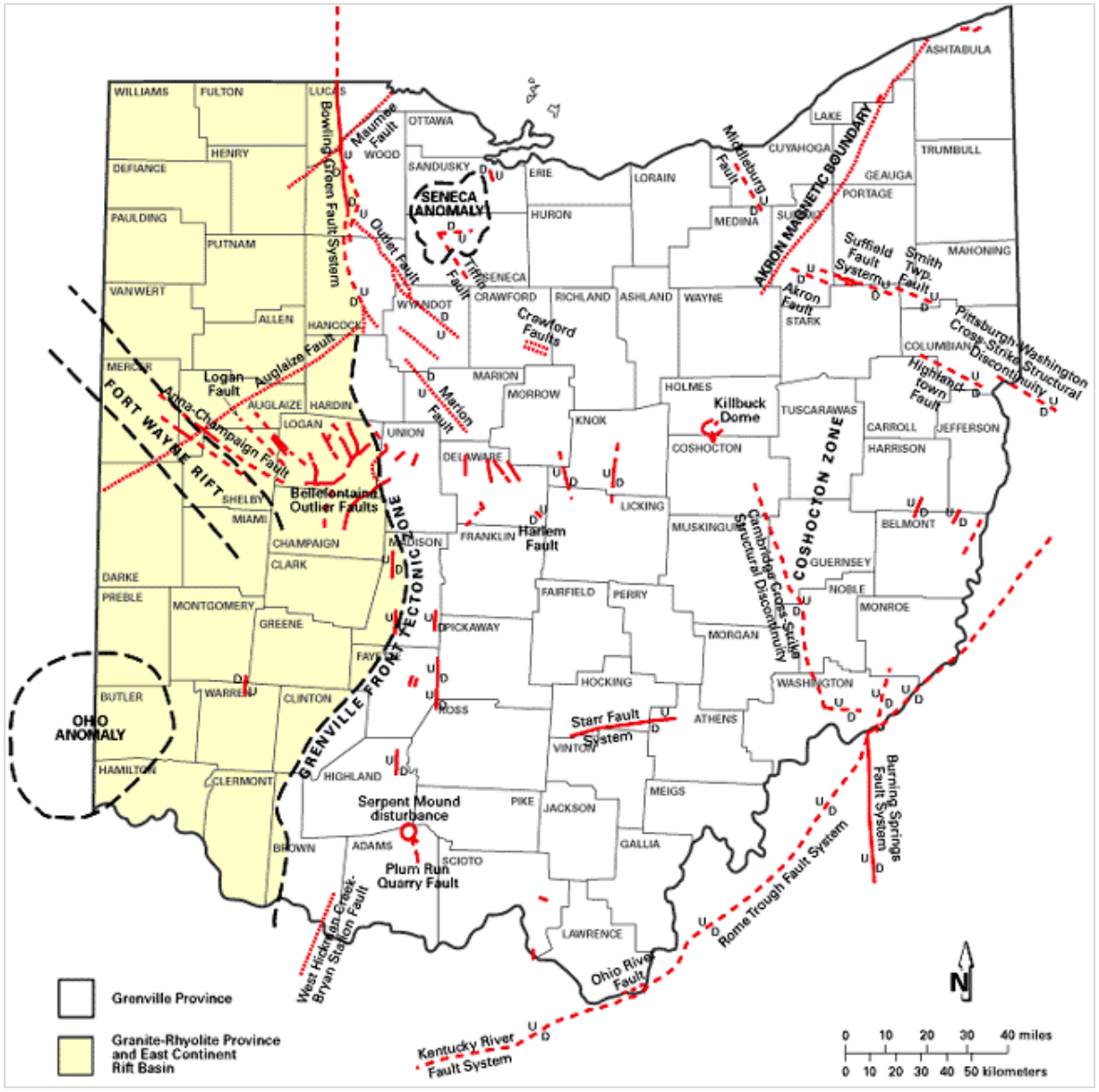
Earthquakes can yield a variety of different outcomes. With the ground shaking associated with earthquake events, buildings have a high potential to be impacted. If soil liquefaction, or the mixing of fine sediment and soil with groundwater occurs, buildings can sink into the ground. Earthquakes also 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 4.4.1: Modified Mercalli Intensity Scale

Modified Mercalli Intensity Scale		Magnitude
I	Detected only by sensitive instruments.	1.5
II	Felt by few people 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	Total damage; waves seen on ground surface, lines of sight and level distorted, objects thrown up into air.	7 7.5 8

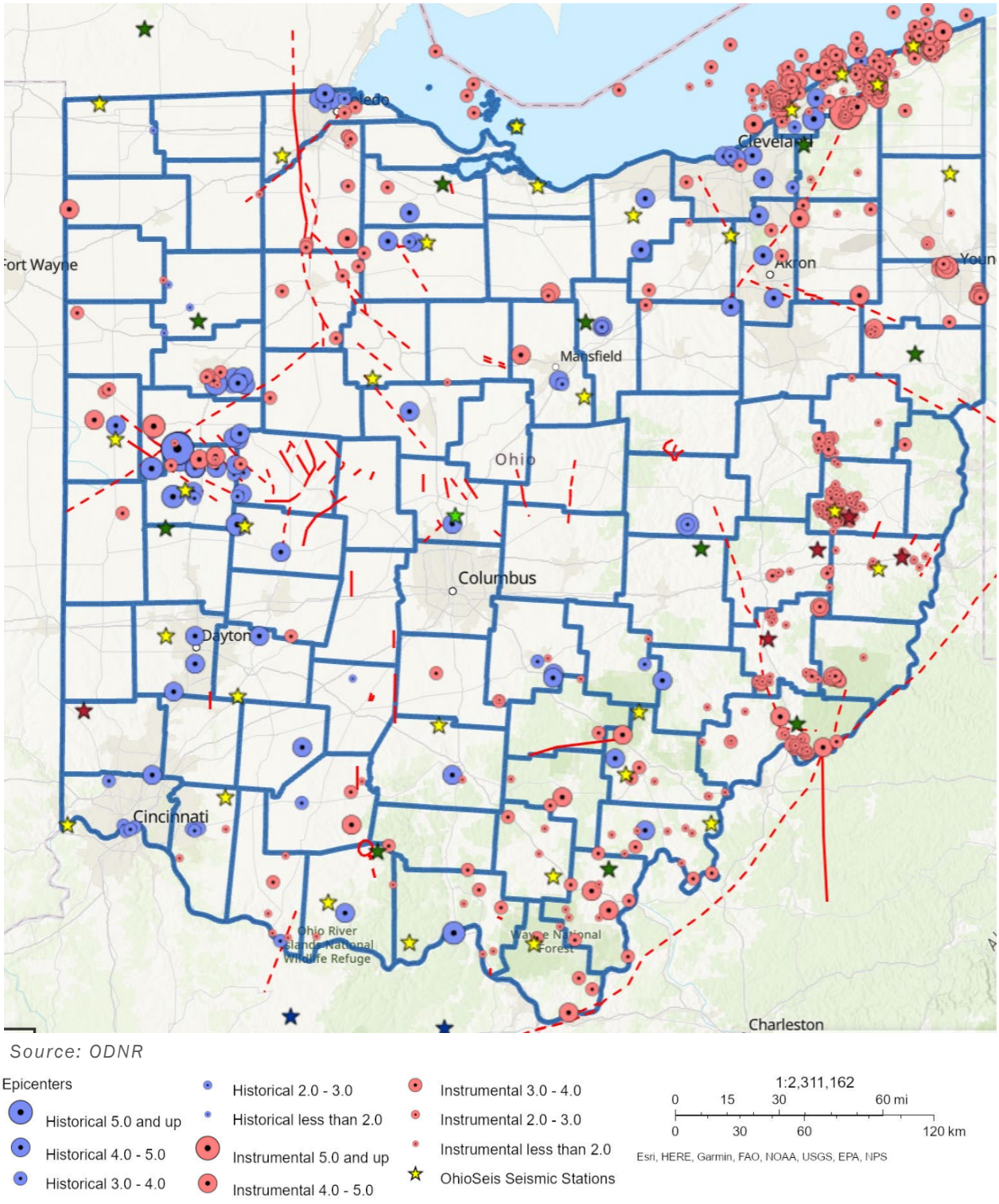
Source: ODNR

Figure 4.4.2: Ohio Faults and Seismic Zones



Source: ODNR

Figure 4.4.3: Earthquake Epicenters and Seismic Monitoring Stations in Ohio



Source: ODNR

History

More than 400 earthquakes of 2.0 magnitude or greater with epicenters in Ohio have occurred since 1776. Most of these events have been small, in the 2.0 to 3.0 magnitude range, while 18 earthquakes have had a magnitude of 4.0 or higher. No deaths are recorded in Ohio from earthquakes. According

to ODNR, Clinton County has had one recorded earthquake between 1854 and 2024, with a magnitude of 3.5. The earthquake occurred in the 1854 in southeast Clinton County. There is limited data available on any property damage.

Figure 4.4.4, below, displays epicenters of all historical earthquakes with a magnitude greater than 1.0. Locations and magnitudes of non-instrumental earthquakes correspond to felt area or maximum epicentral Modified Mercalli Intensities and may be in error by a considerable distance.

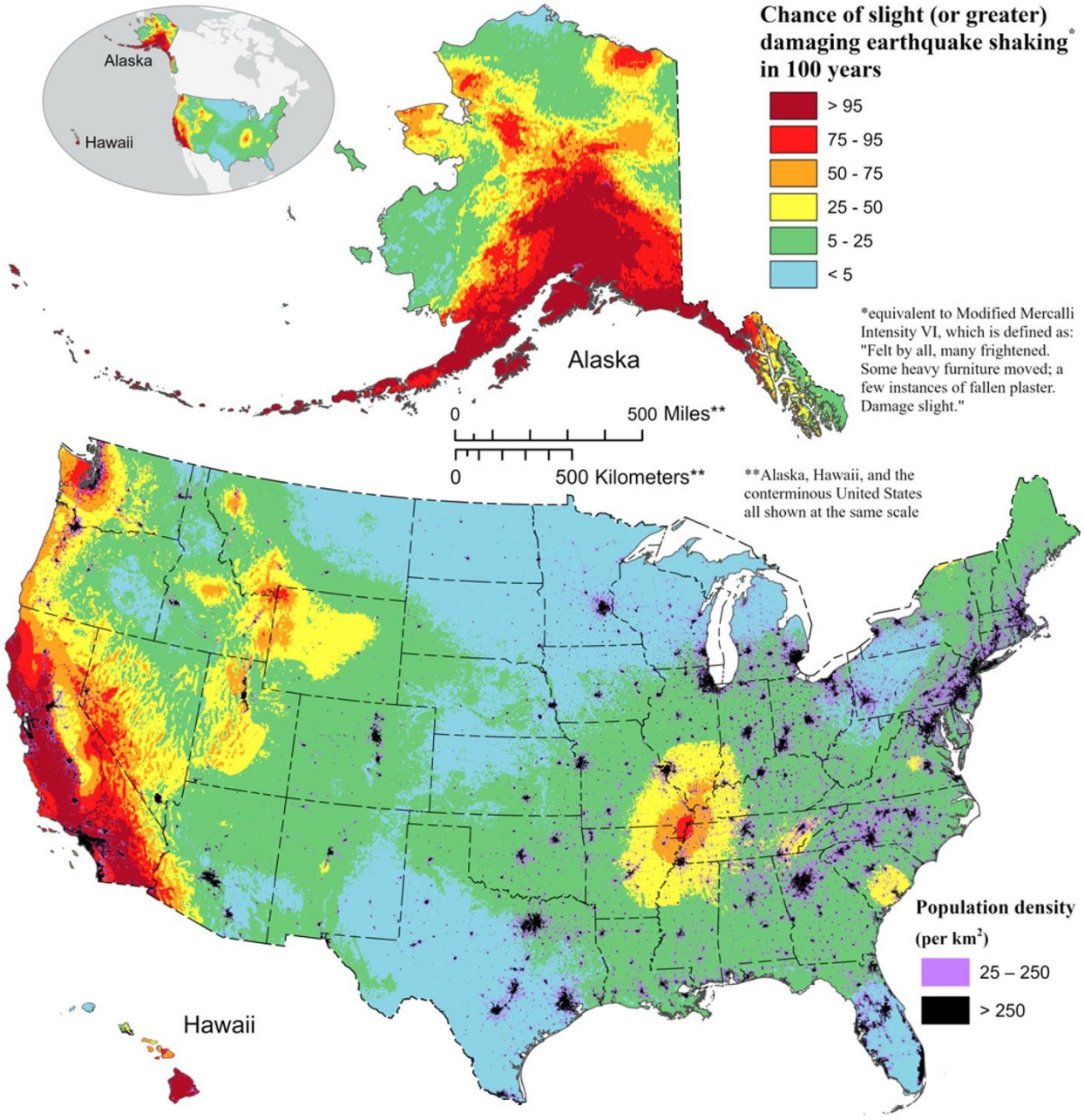
Probability

The USGS has both long-term and short-term probabilistic seismic hazard forecasts. In the 2024 one-hundred-year probabilistic seismic hazard forecast, the United States Geological Survey estimated that there is a 5 to 25 percent chance of potentially minor-damage ground shaking for Clinton County (**Figure 4.4.4**).

The USGS also prepared national seismic hazard maps (NSHMP) for the United States. These time-independent maps are shown for two percent and ten percent probability of earthquake ground-shaking exceedance levels at specified probabilities over a 50-year period at several hundred thousand sites across the United States. The map (**Figure 4.4.5)** identifies that Clinton County has an eight to ten percent peak ground acceleration for two percent probability of exceedance in 50 years.

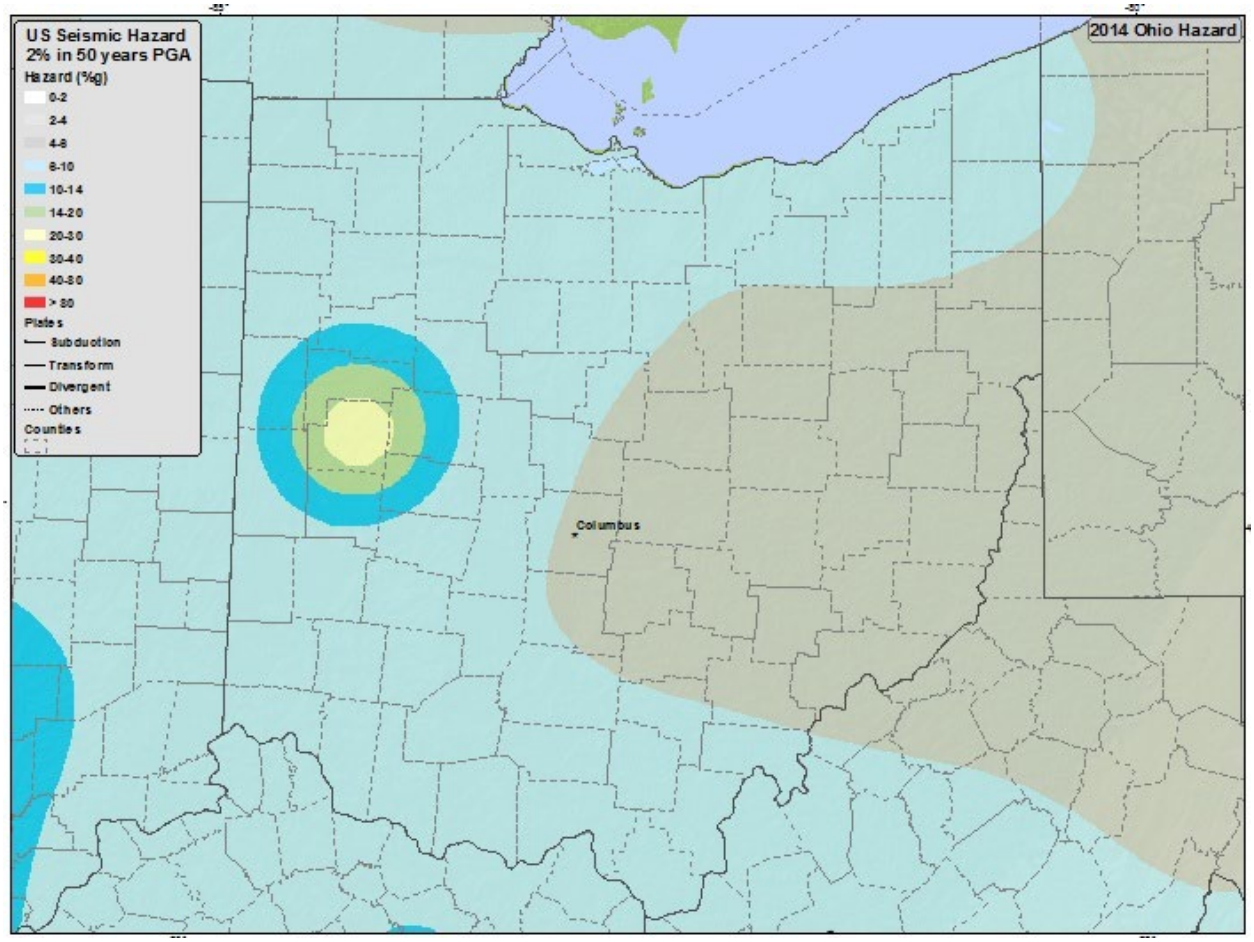
Furthermore, the ODNR indicates that the brief historic record of Ohio earthquakes suggests a risk of moderately damaging earthquakes in the western, northeastern, and southeastern parts of the State.

Figure 4.4.4: Earthquake Shaking and Seismic Design Categories



Source: USGS

Figure 4.4.5: 2014 Seismic Hazard Map of the State of Ohio



Source: USGS

Vulnerability Assessment

Infrastructure Impact

There has been one earthquake in Clinton County since 1854, with a magnitude of 3.5. There is no information on whether the earthquake caused any property damage. Magnitudes under three are not generally noticed by people and cause little, if any, damage. Buildings, roadways, gas and power lines have the potential to be affected. Since the probability of an earthquake occurring in Clinton County is less than one percent, there is a low risk of impact to infrastructure as a result.

Population Impact

There is a relatively low risk of earthquakes occurring in Clinton County. Accordingly, there is a low risk of impact to the population. If an earthquake occurs within the County, the population could be impacted by loss of homes, loss of utilities, and a potential reduction in quality of life.

According to the National Risk Index calculated by FEMA, Clinton County's risk was scored at 73.7 ("relatively low") to earthquakes, as compared to all other U.S. counties, due to its very low expected annual loss, relatively moderate social vulnerability, and relatively moderate community resilience scores. Earthquakes are unlikely to occur in Clinton County; therefore, the population is unlikely to be affected by earthquakes. Socially vulnerable populations may be more affected by earthquakes if they live in older housing units or apartment complexes that do not have adequate earthquake-resilient

infrastructure. The index indicates an expected annual loss of $565,000 due to earthquakes with a less than 0.055 percent chance of an event occurring per year.

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 4.4.6** lists the census tracts in Clinton County, ranked with the highest vulnerability to the lowest vulnerability in terms of total expected annual loss.

Loss of Life

Clinton County has no recorded earthquake events that have resulted in loss of life; however, if 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) are national public service campaigns designed to educate and empower the American people to prepare for, respond to, and mitigate disasters.

Economic Losses

Earthquakes have the potential to damage infrastructure, resulting in the economic burden of clean up and repairs. Potential economic losses and damage associated with Clinton County for earthquakes according to FEMA's National Risk Index are recorded in **Table 4.4.6** below. The table shows Clinton County's census tracts ranked in order from highest to lowest total EAL and broken down by expected losses for buildings, population ($11.6 million for each fatality or 10 injuries), and agriculture per census tract for earthquakes. EAL rates, calculated by FEMA, identify the total value of loss expected each year for a particular community, in this case the census tracts for Clinton County.

Table 4.4.6: Structure and Population Vulnerability from Earthquakes

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39027964400	$70,019	$23,402	$0	$93,421
39027964700	$76,133	$14,694	$0	$90,827
39027965000	$40,591	$34,238	$0	$74,829
39027965100	$47,172	$20,822	$0	$67,994
39027964900	$42,224	$14,085	$0	$56,309
39027964800	$35,380	$15,122	$0	$50,502
39027964502	$30,018	$7,768	$0	$37,786
39027964300	$28,948	$8,452	$0	$37,400
39027964600	$24,893	$6,722	$0	$31,615
39027964501	$16,815	$7,115	$0	$23,930
Total	**$424,193**	**$152,420**	**$0**	**$564,613**

Source: FEMA National Risk Index

Future Trends

Land Use and Development Trends

Because the incidence and likelihood of earthquakes is low in Clinton County, all communities have a 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.

In 2023, Clinton County authorized 101 new residential units at a total value of $25,454,000. Though there are more buildings slated for construction, Clinton County's population has decreased 80 individuals from 2020 to 2023. The decline is set to continue such that by 2030 the population will lose an additional 1,343 people (3.2 percent). More buildings but less people may potentially mean more property loss but less population vulnerability. However, with state-of-the-art engineering there is very little potential damage. Given these estimates, there are no known changes in risks associated with earthquakes in Clinton County.

Shifting Weather Patterns and Environmental Trends

Weather patterns have no known effect on the probability or extent of earthquakes.

4.5 Epidemic

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 the 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
- Factors that increase host exposure or involve introduction through new portals of entry

Table 4.5.1 lists the names of diseases, causes (bacteria, insect, virus, etc.), symptoms, and risk in Ohio. Diseases and epidemics 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. Zoonotic diseases can cause many different types of illnesses in people and animals, ranging from mild illness to sometimes death. 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 or drinking contaminated or unsafe food or drink, such as unpasteurized (raw) milk, undercooked meat or eggs, or fruits and vegetables that are contaminated with feces from an infected animal
- Waterborne from drinking or coming in contact with water that has been contaminated with feces from an infected animal

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 months or even years 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 4.5.2 indicates otherwise for COVID-19 showing that the winter months have been the deadliest. Poor living conditions and lack of hygiene where many people live in close proximity can also cause the incubation of pathogens that lead to diseases. An epidemic has the potential to affect the entire County but is more probable to occur in densely-populated areas, especially at facilities with large numbers of occupants.

Table 4.5.1: Zoonotic Diseases of Concern in Ohio

Name of the Disease	Pathogen Type	Carried by Animal	Method of Transmission to Humans	Affect/Impact	Risk in Ohio
Rabies	Virus	All livestock; sometimes pets and other stray animals	Animal bites	Affects both animals and humans	Low
Mad cow disease - Bovine spongiform encephalopathy (in cows) and variant Creutzfeldt-Jakob disease (in humans)	Prion protein	Cattle	Eating contaminated meat	Affects the brains of cattle and humans leading to death	Low
Brucellosis	Bacteria	All livestock	Contact with birthing materials, aborted fetuses/tissues or through consumption of raw milk and cheeses from infected animals	Causes abortion in livestock	Low
Campylobacteriosis	Bacteria	All livestock	Consumption of raw or undercooked meat, milk, or cheeses	Diarrhea in calves, abortion in sheep, udder infection in cattle	Low
Cryptosporidiosis	Protozoa	All livestock	Consumption of contaminated food or water or contact with animal feces	Diarrhea	Low
Ringworm - Dermatophytosis	Fungi	Cattle, sheep, goats	Contact with infected livestock or their environment	Scaly white lesions with hair loss leading to thick light brown scabs in calves	Low

Name of the Disease	Pathogen Type	Carried by Animal	Method of Transmission to Humans	Affect/Impact	Risk in Ohio
Shiga toxin-producing E. coli	Bacteria	Cattle	Consumption of contaminated food or water, unpasteurized milk, contact with cattle or their environment or contact with feces of an infected person	No impact on animals; people develop vomiting, diarrhea, and stomach cramps; sometimes hemolytic uremic syndrome (HUS)	Low
Swine Flu - Influenza A (swine triple reassorting (tr) H1N1 influenza virus, trH3N2 virus, and trH1N2 virus)	Virus	Pigs/Swine	Direct contact with pigs or their environment (slaughterhouses)	High levels of illness in pigs can cause few deaths; does not usually infect humans	Moderate
Bird Flu – Influenza A (H5N1)	Virus	Birds and Poultry (Other animals and sporadic human cases)	Direct contact or contaminated environments (contact with contaminated surfaces, feed, water)	Can cause high levels of mortality in poultry, raising egg prices and poultry prices; can cause mild flu-like symptoms in humans	Low
Leptospirosis	Bacteria	All livestock and domestic animals	Exposure to contaminated water or soil or through direct contact with the infected animals' urine	Fever, lethargy, and lack of appetite	Low
Scabby mouth - Orf	Virus	Goats and sheep	Direct contact with an infected animal or by touching contaminated equipment	Blisters and crusty scabs on lips, muzzle in the mouth of animals; people get infection and blisters on fingers	Low

Name of the Disease	Pathogen Type	Carried by Animal	Method of Transmission to Humans	Affect/Impact	Risk in Ohio
Q fever	Bacteria	Cattle, sheep, and goats	Inhalation of contaminated dust, contact with birthing materials, aborted fetuses and tissues, consumption of raw milk and cheeses from infected animals	Abortion in cattle, sheep, and goats; people experience mild flu-like illness; some develop atypical pneumonia - if untreated, may result in endocarditis and heart valve damage	Low
Salmonellosis	Bacteria	Cattle and pigs; less commonly, sheep and goats	Consumption of contaminated food	Diarrhea in animals	Moderate
Toxoplasmosis	Protozoa	Birds and mammals	Consumption of undercooked or contaminated meat; contact with contaminated objects and surfaces	Development of infective cysts in muscles and other organs in animals; affects pregnant women and their babies	Moderate
Yersiniosis	Bacteria	Pigs/Swine	Direct contact with infected pigs or consuming contaminated pork products	In children and adolescents, acute appendicitis	Low
West Nile Virus	Virus	Mosquitoes	Bite of an infected mosquito	In humans, mild fever; sometimes fatal affecting the central nervous system	Moderate

Name of the Disease	Pathogen Type	Carried by Animal	Method of Transmission to Humans	Affect/Impact	Risk in Ohio
La Crosse virus (LACV)	Virus	Mosquitoes, chipmunks, and squirrels	Bite of an infected mosquito	Fever, headache, nausea, vomiting, fatigue, and lethargy; severe cases affecting the nervous system occurs most frequently in children under the age of 16; fatal cases are rare	Low
Lyme disease, anaplasmosis, babesiosis	Parasites	Ticks	Bite of an infected tick	Red ring-like rash, flu-like symptoms, fever, chills, fatigue, muscle pain, headache, nausea, vomiting, diarrhea, dark urine	Low
Rocky Mountain spotted fever	Bacteria	Tick	Bite of an infected tick	Fever, headache, and rash	Low

History

Epidemics have impacted the United States including Ohio several times over the past several centuries. A brief description of these outbreaks and their impacts are summarized below:

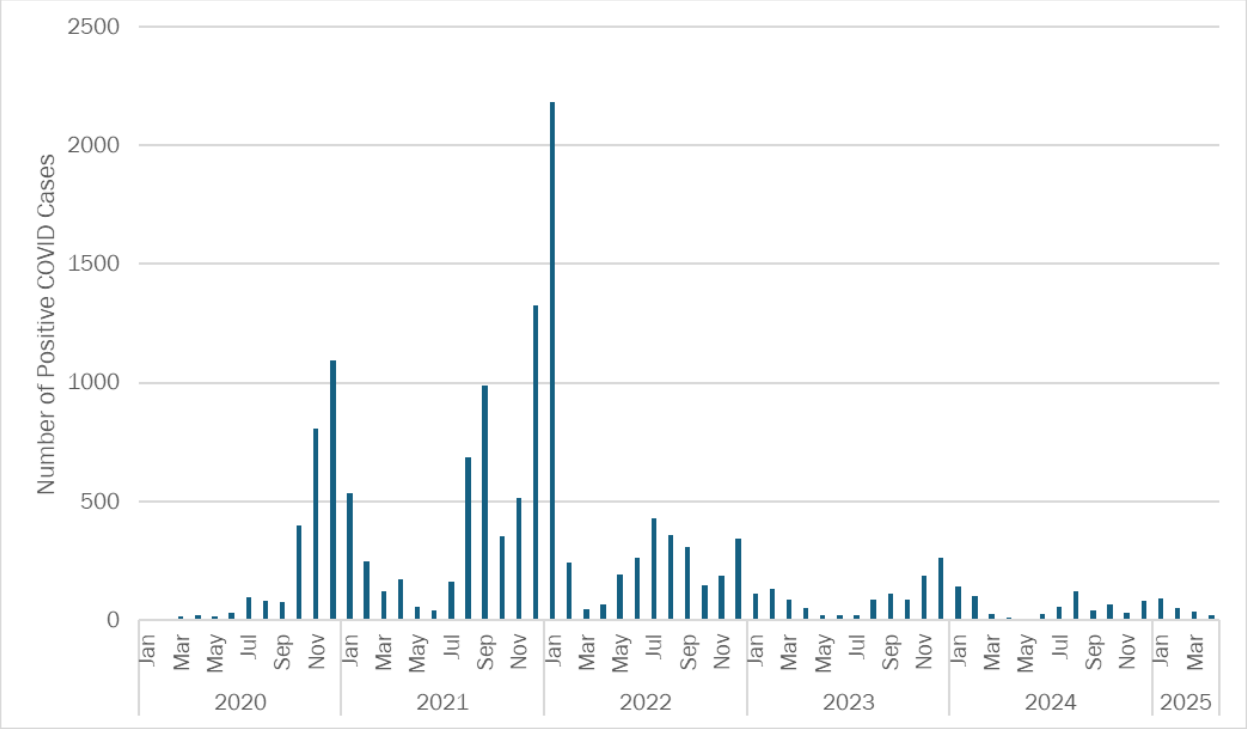
The Coronavirus (COVID-19) pandemic, March 2020 – May 11, 2023:

Most recently, the Coronavirus (COVID-19) pandemic has impacted the County, along with the rest of the world, beginning in March of 2020. 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 following 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. The COVID-19-related health orders 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 4.5.2** shows the winter months of December 2021 to January 2022 had the most cases.

Figure 4.5.2: Clinton County COVID-19 Cases by Month



Source: Ohio Department of Health

The U.S. 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 has been 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. In 2024, a subvariant called XEC started to spread. It became the dominant variant in the United States as of December 2024.

As of January 10, 2025, Clinton County had 14,716 total confirmed cases and 199 deaths attributed to COVID-19. Additionally, Clinton County has about 21,081 persons who have received at least one dose of a COVID vaccine and 19,782 persons who are fully vaccinated.

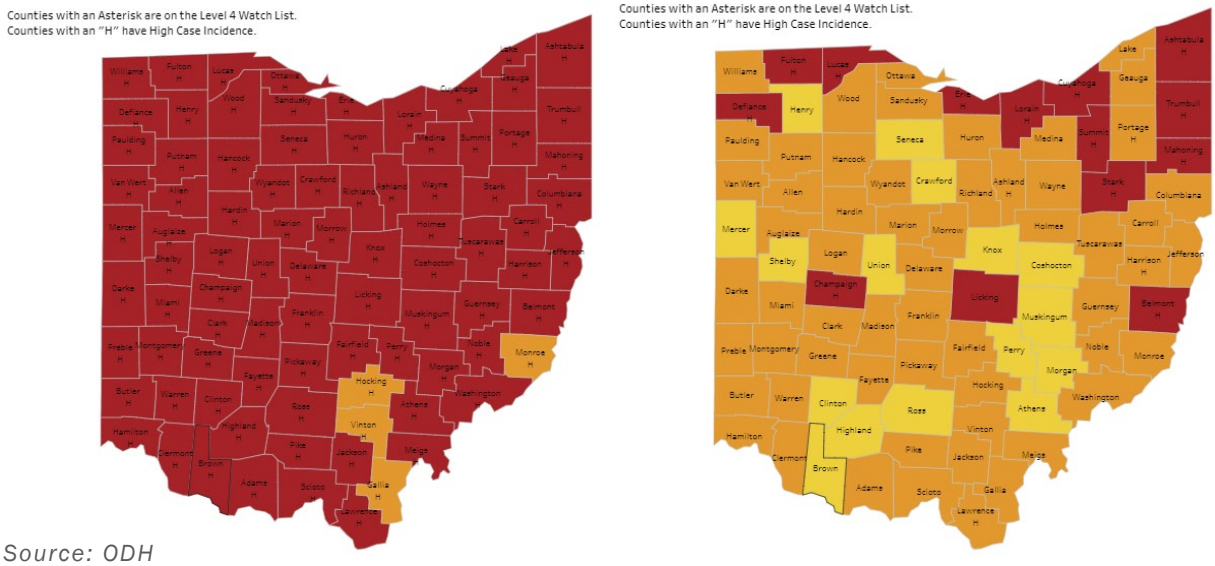
The Ohio Department of Health (ODH) maintained a Public Health Advisory Alert System to supplement existing statewide orders to assess the degree of the virus' spread. There are four levels, with designated colors to help visualize the risk, as described in **Table 4.5.3**. As of May 27, 2021, ODH cancelled the Ohio Public Health Advisory System but will continue to share COVID-19 cases, hospitalizations, deaths, current trends, key metrics, and vaccination data daily at coronavirus.ohio.gov. **Figure 4.5.4** shows the Public Health Advisory System as of December 31, 2020, in comparison to the status on May 20, 2021.

Table 4.5.3: Public Health Advisory Alert System

Color	Public Emergency Level	Risk Information
Yellow	Level 1 Public Emergency	Active exposure and spread.
Orange	Level 2 Public Emergency	Increased exposure and spread. Exercise high degree of caution.
Red	Level 3 Public Emergency	Very high exposure and spread. Limit activities as much as possible.
Purple	Level 4 Public Emergency	Severe exposure and spread. Only leave home for supplies and services.

Source: ODH

Figure 4.5.4: Public Health Advisory System on December 31, 2020 (left) and May 20, 2021 (right)



Source: ODH

The Spanish Influenza, 1918 – 1919:

Spanish flu, also known as the Great Influenza epidemic or the 1918 influenza pandemic, was an exceptionally deadly global influenza pandemic caused by the H1N1 influenza A virus.

After World War I, soldiers who were living in dirty and squalid conditions began falling sick of a flu-like disease. Spain first reported this disease. A strong case of the disease was observed in the United States in March 1918, when about 500 soldiers were hospitalized in a week at Fort Riley in the State of Kansas. Given the contagious nature of the flu, the disease was passed on to their family and friends. It caused soreness and tiredness, a cough, loss of appetite, and sweating, and was particularly deadly for people in their 20s and 30s.

By October, then-Governor of Ohio, James Cox, and ODH began making recommendations to close public gathering places, including schools, when the influenza arrived (**Figure 4.5.5 and Figure 4.5.6**). The prevention methodologies adopted by the officials and the citizens are reportedly like the COVID-19 pandemic including shortage of medical staff, wearing of masks, staying at home, maintaining social distancing, and isolating when infection was suspected (**Figure 4.5.7 and Figure 4.5.8**).

By early 1919, after three waves of the pandemic, Ohio came out of quarantine. By this time, the Spanish Flu had caused about 50 million deaths around the world and approximately 675,000 in the United States. In Ohio, Cleveland was the worst hit with a total death rate of 474 per 100,000, even more than New York City or Chicago. Toledo reported the lowest death rate, at about 311 deaths per every 100,000 people.

Figure 4.5.5: The news on October 11, 1918, related to the Spanish Flu

Ohio State Lantern

COLUMBUS, OHIO, FRIDAY, OCTOBER 11, 1918.

GIVE INSTRUCTIONS SO INFLUENZA MAY BE HELD IN CHECK

WEIRD FIGURES AND STRANGE ACTS HERALD CHAPTER INITIATIONS

QUARANTINE RULES WILL NOT AFFECT FOOTBALL GAME

Bulletin Board

C. E. SEDDON'S DEATH CANNOT BE CONFIRMED

UNIVERSITY CLOSES TODAY TO STOP SPREAD OF INFLUENZA

Act Is Precautionary Measure and Courses Will Be Resumed when State Board of Health Raises Ban on Meetings.

S. A. T. C. MEMBERS ATTEND CLASSES AS USUAL

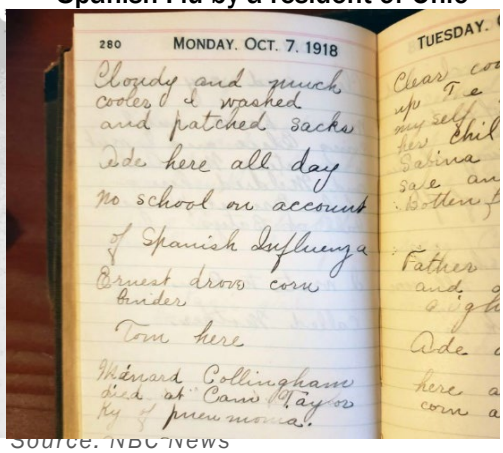
Military School Under Orders from War Department and State Acts Do Not Affect Inducted Men—Students Directed to Go Home.

NOTICE

WORLD WAR PROBLEMS SUBJECT OF NEW COURSE

Source: The Lantern

Figure 4.5.6: Diary written during the Spanish Flu by a resident of Ohio



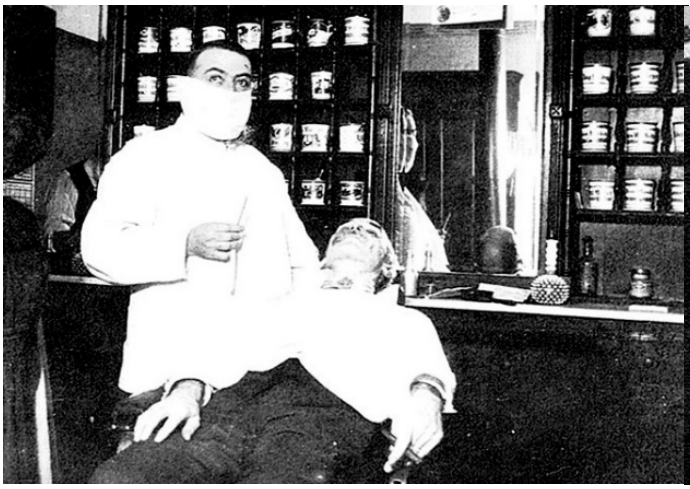
280 MONDAY. OCT. 7. 1918

Cloudy and much cooler I washed and patched sacks Ade here all day no school on account of Spanish Influenza Ernest drove corn binder Tom here Bernard Collingham died at Camp Sayre of pneumonia.

TUESDAY.

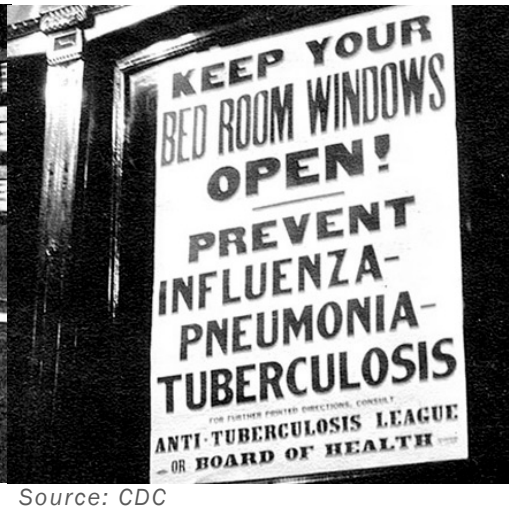
Source: NBC News

Figure 4.5.7: A Cincinnati barber wears a mask to help reduce the spread of the Flu in 1918



Source: CDC

Figure 4.5.8: Cincinnati Board of Health sign during the 1918 epidemic

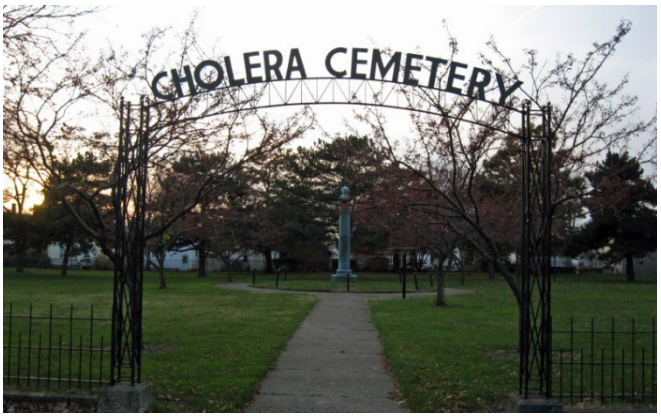


Source: CDC

The Cholera Epidemic/Pandemic, 19th century (Starting in the Unites States in 1832):

Cholera is an infectious disease caused by a bacterium called *Vibrio cholerae*. The bacteria typically live in waters that are salty and warm, such as waters along coastal areas. The disease is spread by drinking liquids or eating foods that are contaminated with bacteria. People who contract cholera generally suffer from severe diarrhea, vomiting, and cramps causing rapid loss of fluids and electrolytes. People with this illness can die from dehydration within a few hours or days after the symptoms first appear. A single diarrhea episode can cause a one-million-fold increase of bacterial numbers in the environment. Figure 4.5.9 is a Cemetery in Ohio dedicated to people who succumbed to cholera.

Figure 4.5.9: Cholera Cemetery in Ohio



Source: Travel 88

There have been seven cholera outbreaks since 1817. The first outbreak started in India in 1817, stemming from contaminated rice. The disease quickly spread to other countries in Asia. The pandemic dwindled out six years later, probably due to a severe winter in 1823, which may have killed the bacteria living in the water. The second cholera pandemic began around 1829. This time, it spread beyond Asia, into Europe and the Americas. In 1832, the disease made it to the Americas in a ship that arrived at Quebec. The bacteria spread along the St. Lawrence River and its tributaries, and the Ohio and Mississippi Rivers allowed the disease to spread across the United States in all directions.

Cleveland was the first place in Ohio to report cases. Cholera reached Ohio's interior through canals that provided stagnant water that allowed cholera to thrive. The same modes of transportation, that is, canals, railroads, and steamboats that benefited Ohioans economically, also brought disease. By late 1832, the illness had reached Cincinnati. Ohio was hit the worst in 1849 with about 8,000 deaths in Cincinnati alone. In Brown County, a small town named New Hope was swept by the cholera illness killing about 22 percent of the town's population.

Cholera tended to be most visible in cities with poor sanitation systems and contaminated community wells. It affected Ohio's working class first and most widely as they lived in close quarters with poor access to clean water, safe food, and opportunities to separate themselves from ill family members. The pandemic continued during the warm months for two decades until it subsided around 1851.

The third pandemic, stretching 1852–1859, was the deadliest. In 1854, a British physician named John Snow carefully mapped the disease to a public water pump, hence, confirming that cholera was waterborne bacteria. This eventually led to the improvement of sanitation practices that would help fight off cholera outbreaks more permanently.

The fourth (1863–1875) and fifth (1881–1896) cholera pandemics were less severe than the previous instances. By the fifth outbreak, the United States was mostly safe thanks to improved water supplies, including chlorination of water, and quarantine measures. Illness due to cholera continued in the United States till the early 1900s. By the sixth cholera pandemic (1899–1923) the United States remained unaffected, but the disease still impacted other places around the world. The seventh, and the latest, cholera pandemic started in 1961 and ended in 1975.

Today, cholera is treated through fluid replacement and antibiotics. Cholera vaccines are available, though they only offer roughly 65 precent immunity, according to WHO.

Disease in Songbirds, August 2021:

Songbirds in Ohio are being affected by a disease and developing symptoms of conjunctivitis. The primary species affected at this time are blue jays, common grackles, European starlings, American robins, and house sparrows. Ohio counties experiencing the bulk of the outbreak include Brown, Butler, Clark, Clermont, Delaware, Franklin, Greene, Hamilton, Montgomery, and Warren counties. Cause(s) of illness or death are under investigation currently. People are advised to stop feeding birds and clean their bird feeders.

The 2009 H1N1 Pandemic (H1N1) virus), June 11, 2009:

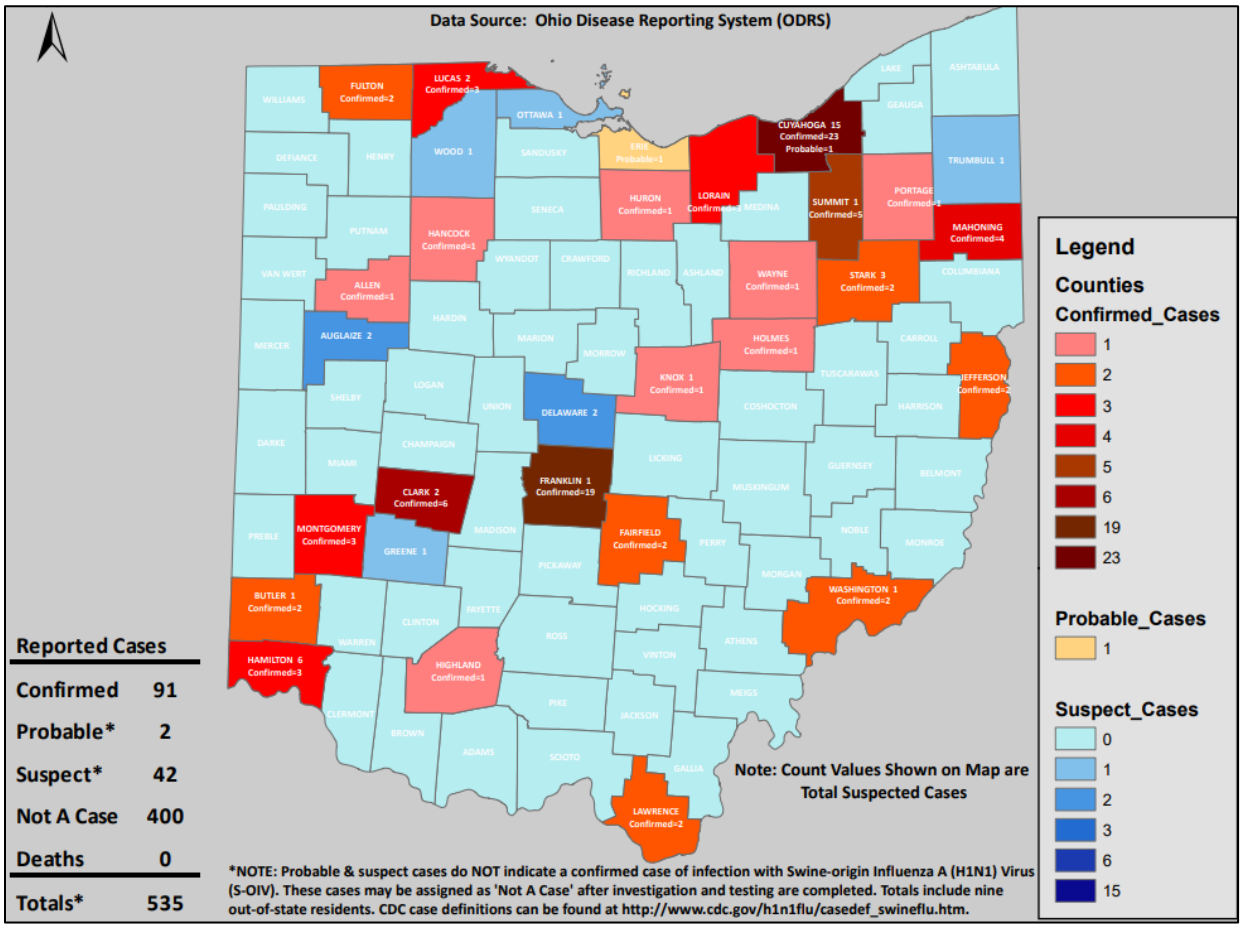
The swine flu was identified in humans in California in April 2009. On June 11, 2009, the WHO declared a pandemic. The new (H1N1) virus spread between humans through infected droplets from a cough or sneeze. Earlier strains of the H1N1 virus passed from animals to humans through close contact with infected meat, such as at slaughterhouses. By June 19, 2009, all 50 U.S. 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 (**Figure 4.5.10**). By February 2010, the state had recorded 51 deaths. From April 12, 2009, to April 10, 2010, the CDC estimated there were approximately 60.8 million cases (range: 43.3 - 89.3 million), 274,304 hospitalizations (range: 195,086 - 402,719), and 12,469 deaths (range: 8,868 - 18,306) in the United States due to the (H1N1) virus.

In September 2009, the FDA announced its approval of four vaccines, and in November, of a fifth vaccine to protect against the 2009 H1N1 flu virus. The first doses were administered on October 5, 2009. On August 10, 2010, the WHO declared an end to the global 2009 H1N1 influenza pandemic. However, the (H1N1) virus continues to circulate as a seasonal flu virus, and causes illness, hospitalization, and deaths every year.

To monitor large-scale outbreaks of Influenza A Viruses (IAV) 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. In 2012, out of 40 Ohio agricultural fairs, 10 pigs with H3N2 infection were found, and at many fairs with infected swine, people also caught the flu. In 2017, they identified sick pigs at fairs in Clinton and Franklin counties. The strain of the Influenza A flu detected in the pigs at Clinton County was H3N2, whereas the strain of the Influenza A flu detected in the pigs at Franklin County was H1N1. H3N2 is most spread to humans and that year about 11 individuals who had contact with the pigs tested positive for H3N2.

Figure 4.5.10: The spread of the Influenza A H1N1 virus in Ohio on June 24, 2009



Source: Ohio Disease Reporting System

The Bird Flu (H5N1) virus, 2024 – 2025:

The Bird flu was identified in humans in Texas in April 2024 when a dairy worker was exposed to infected cows. Since then, there have been at least 16,600 people monitored for exposure to Influenza A, 9,300 from dairy cows and 7,300 from birds and other animals including poultry. Of those, 880 persons were tested for novel Influenza A according to the CDC. In Ohio, there are 21 counties where a bird flu has been detected, including one case in Clinton County (**Table 4.5.11**).

Table 4.5.11: Bird Flu (H5N1) Detection in Ohio

County	Date Detected	Strain/Type/Source	Totals
Auglaize	4/15/2022	EA/AM H5N1	1
Clermont	11/28/2022	EA/AM H5N1	1
Clinton	4/15/2022	EA/AM H5N1	1
Cuyahoga	10/13/2022	EA/AM H5N1	6
Delaware	9/30/2022	EA H5N1	7
Erie	3/10/2022	EA/AM H5N1	1
Franklin	10/6/2022	EA H5N1	1

County	Date Detected	Strain/Type/Source	Totals
Greene	12/2/2023	EA H5N1	1
Guernsey	3/24/2022	EA/AM H5N1	1
Lake	3/20/2023	EA/AM H5N1	2
Mercer	1/21/2025	EA/AM H5N	1
Miami	4/13/2023	EA H5	1
Montgomery	4/15/2022	EA/AM H5N1	1
Muskingum	1/22/2025	EA/AM H5N1	7
Ottawa	3/25/2024	EA H5N1	136
Pickaway	1/30/2025	EA H5	1
Sandusky	3/25/2024	EA H5N1	10
Stark	1/24/2025	EA/AM H5N1	4
Summit	11/17/2023	EA H5N1	3
Wayne	11/3/2023	EA H5N1	3
Wood	2/29/2024	EA H5N1	1
Total			**190**

Source: CDC

Probability

Epidemics are rare, do not occur at regular intervals, and can begin without warning. However, various factors such as increasing urbanization, increased urban density, rapid globalization and mobility of people, demand for animal protein, 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).

The report - Disease Control Priorities: Improving Health and Reducing Poverty, 3rd edition – published by World Bank Group, states that "Influenza is the most likely pathogen to cause a severe pandemic. Exceedance Probability analysis indicates that in any given year, a 1 percent probability exists of an influenza pandemic that causes nearly 6 million pneumonia and influenza deaths or more globally."

Furthermore, as global weather patterns shift and permafrost in areas of the world melts, there will be more opportunity for diseases 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 from these diseases. In addition, the recent increase of disease emergence from animals associated with environmental change suggests a high probability of epidemics in the coming decades.

Vulnerability Assessment

Given the lack of historic epidemic events in the County, it is difficult to estimate potential damage. 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 Clinton County.

Infrastructure Impact

There is likely to be little-to-no impact to infrastructure in the event of an epidemic. However, hospitals 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 their 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 disruptions such as an epidemic. 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 and downtown areas to empty.

However, during the COVID-19 Pandemic, cities around the world reused their infrastructure systems in a variety of creative ways. For instance, parking lots were converted to drive-in test clinics and drive-in movie theaters, some cities reused their transit systems as medical supply units and mobile clinics, and with the drop in personal vehicle usage, certain urban areas saw a rise in pedestrian only spaces and bicycle lanes. While most of these measures were temporary, some cities have made it permanent.

Population Impact

The population of Clinton County is likely to be significantly impacted should an epidemic occur. Day-to-day life can be significantly interrupted, and people may lose their jobs or need to work from home. 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 rural areas without sufficient access to basic amenities (Source: CDC).

As described in **Chapter 2: Demographics**, approximately 9.5 percent of Clinton County's population has an annual income of less than $15,000 and approximately 7.5 percent do not have a vehicle. A lack of health insurance, transportation, childcare, and/or sick leave from work can make it more difficult to seek healthcare. 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. During the COVID-19 Pandemic, insurance companies such as Desjardins, dropped liability and property damage coverage related to communicable diseases stating that they will "not cover them (their clients) in the event they are sued for spreading a communicable disease, nor will it cover decontamination or property damage costs related to those diseases."

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).

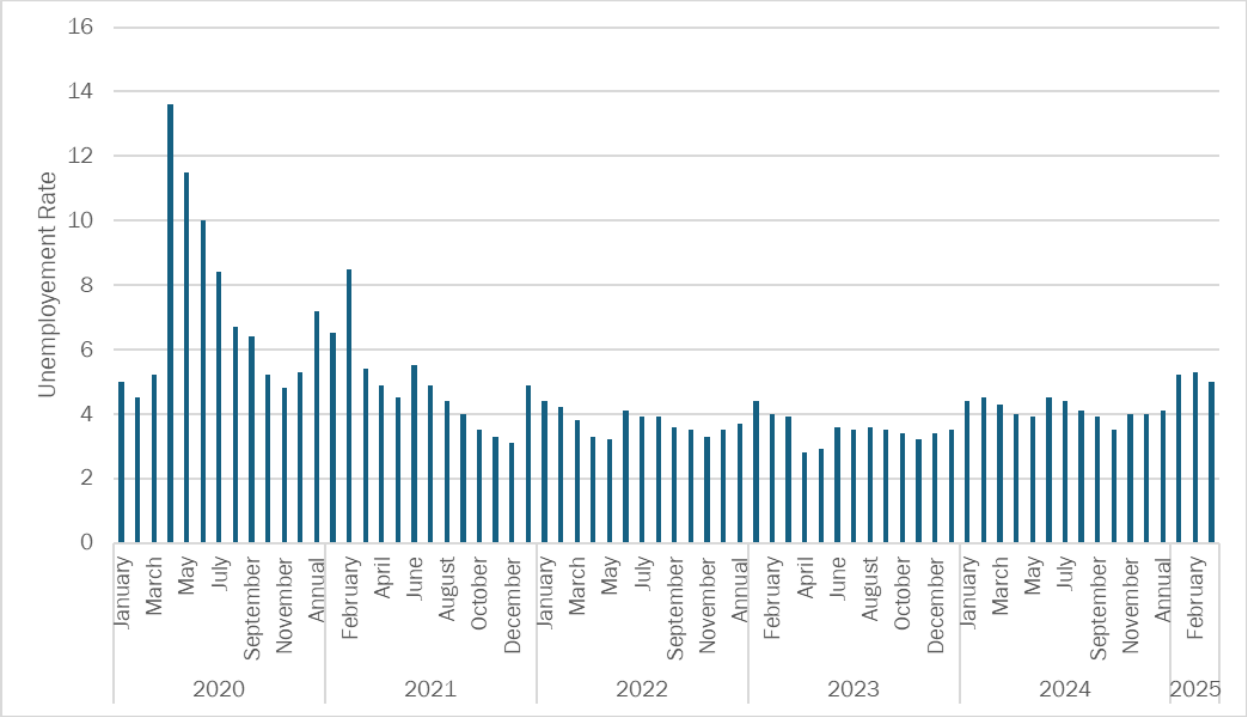
Economic Losses

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-year event resulting in ongoing losses. The full extent of this pandemic is still to be determined.

Figure 4.5.12 displays the unemployment rate for Clinton County from January 2020 through February 2025. This shows the significant increase in unemployment associated with COVID-19 and accompanying business closures mandated by the State of Ohio. Clintons County's unemployment percentage rose to 13.5 percent in March 2020.

Figure 4.5.12: Unemployment Rates in Clinton County January 2020 to February 2025



Source: Ohio Department of Job & Family Services

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

Future Trends

Land Use and Development Trends

Land use and development are not likely to be impacted by epidemics. However, development can halt in a pandemic due to increased social distancing, spread of the virus and/or bacteria, and increased cost of building materials. Building costs have skyrocketed after COVID-19 due to supply chain disruptions, labor shortages, and a construction demand increase.

4.6 Flood

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 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 of occurring each year. The 100-year floodplain can be seen in **Figure 4.6.1: 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. Flash floods can occur just about anywhere with enough rainfall and are not restricted to the 100-year floodplain. Development/restriction to drainage or increased impervious surfaces can contribute to flash flood frequency.

Location

Flooding can occur throughout Clinton County. Flash flooding is more likely to occur in developed areas or along lakes and rivers. **Figure 4.6.1** shows the location of the 100-year floodplain. Floods can and do occur outside the FEMA defined 100-year flood zone. Sometimes very small watersheds are not included in the FEMA analyses, but floods can occur in these smaller watersheds as well.

Extent

Clinton County currently has 36 flood insurance maps (see **Appendix F**). The most recent update is from November 2019.

Clinton County and five of its communities (City of Wilmington, Village of Blanchester, Village of Clarksville, Village of New Vienna, and Village of Sabina) participate in the National Flood Insurance Program (NFIP) **(Table 4.6.2)**. The Village of Port William does not participate in the NFIP and the Villages of Martinsville and Midland do not have the option.

Figure 4.6.1: Flood Hazard Map of Clinton County, Ohio

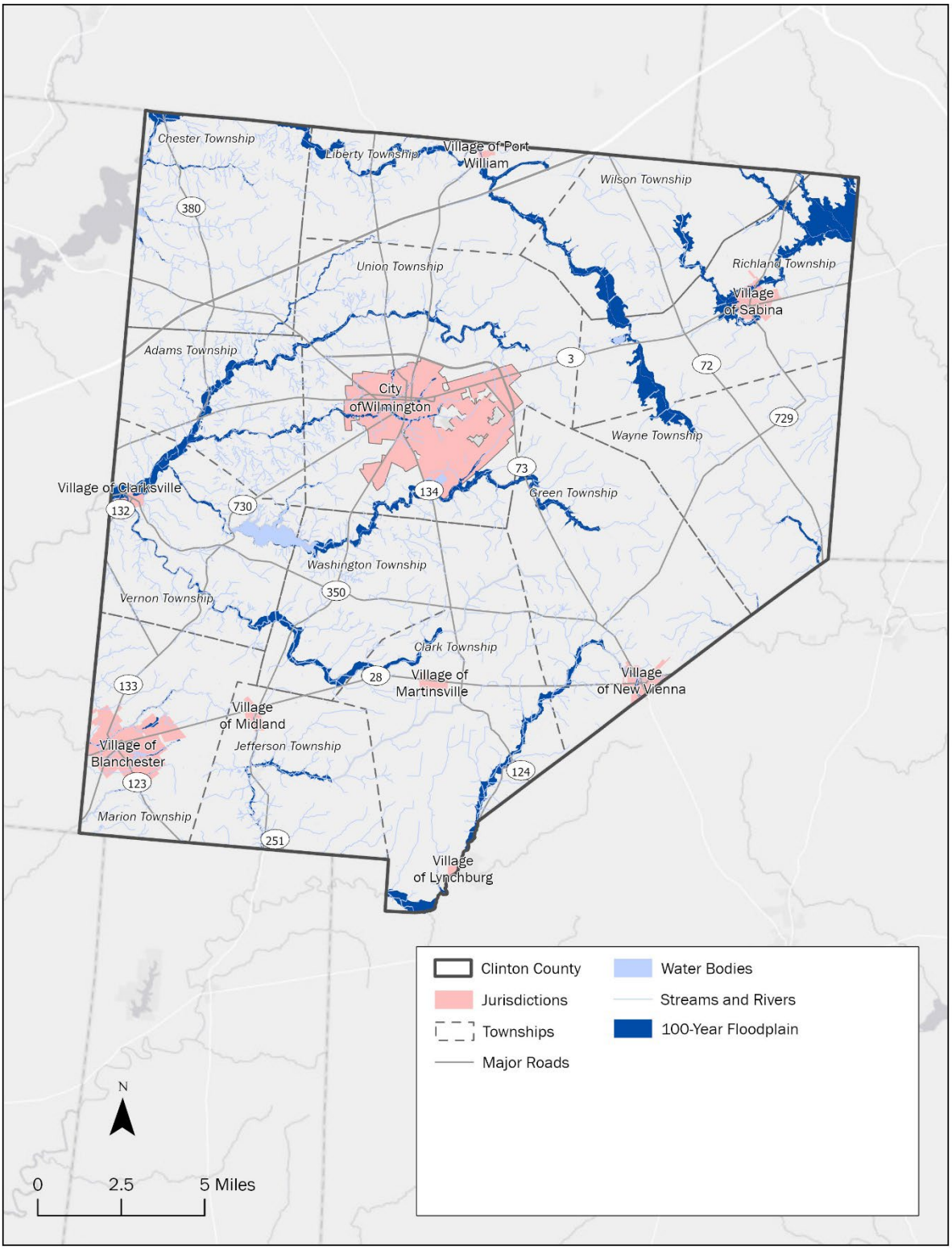


Table 4.6.2: National Flood Insurance Program Participation for Clinton County, Ohio

Community Name	County	NFIP Coordinator	Init FHBM Identified	Init FIRM Identified	Effective Map Date	Reg-Emer Date	Participating in NFIP
Clinton County*	Clinton	Jeff Linkous	12/09/77	09/16/88	11/19/21	09/16/88	Yes
City of Wilmington	Clinton	Eric Green	05/17/74	09/29/78	11/19/21	09/29/78	Yes
Village of Blanchester	Clinton	Jeffery Hurst	04/05/74	08/05/91	11/19/21	11/06/97	Yes
Village of Clarksville	Clinton	John D. Neeley	11/10/78	05/03/10	05/03/10(M)	05/03/10	Yes
Village of Martinsville	Clinton	Not Available					
Village of Midland	Clinton	Not Available					
Village of New Vienna	Clinton	Kathi Stone	01/12/79	05/03/10	05/03/10(M)	05/31/11	Yes
Village of Port William	Clinton	Stephan Jones	10/13/78	05/03/10	05/03/10	10/13/79	No
Village of Sabina	Clinton	Rob Dean	07/25/75	11/15/89	05/03/10	11/15/89	Yes

Source: NFIP Community Status Book

Repetitive Loss

There are two repetitive loss properties and zero severe repetitive loss properties in or near Clinton County, Ohio, detailed in Table 4.6.3. 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 claim 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.

Table 4.6.3: Repetitive Loss Properties in Clinton County, Ohio

Jurisdiction Occupancy	Total RL/SRL Structures	RL Structures	SRL Structures	Total Losses	Total Paid
Village of Sabina Single Family Residential	2	2	0	2	$52,931
Total	**2**	**2**	**0**	**2**	**$52,931**

Source: Ohio EMA

History

There have been 62 floods or flash floods in Clinton County between January 1995 and December 2023. These events have caused $131,000 in property and crop damage. There was one death on March 19, 2008, in the Clinton when a 54-year-old woman was swept away in a flooding stream. There has been one major disaster declaration related to flooding covering Clinton County since May 1953. The major disaster declaration for flooding, events that have caused the greatest amount of damage, and any events that have resulted in a death or injury are described below:

Flash Flood and Floods in Clinton County on May 6, 2022:

Slow moving thunderstorms brought heavy rainfall to the Ohio Valley on May 6, 2022. Clinton County recorded two floods and one flash flood. One flood was reported at S.R. 134 and Horseshoe Road. The other flood was reported at Mason Road, which was closed due to the high waters. The flash flood caused a road to collapse near Bailey and Gano Roads. Clinton County reported $20,000 in property damage. No deaths or injuries were reported.

Flood in Clinton County on March 19, 2008:

Low pressure systems moved across the Ohio Valley in March 2008 bringing an extended period of heavy rain. There were three to six inches of rain recorded in southwest and central Ohio. Several homes in Clinton County were evacuated due to high water. A 54-year-old woman was pulled into a flooded stream and drowned while trying to cross it. No other injuries or deaths were reported. Clinton County reported $10,000 in property damage.

Floods in Clinton County on January 5-6, 2005:

In early January 2005, Southern and Central Ohio received two to four inches of rain in a 24-hour period. The ground was already saturated from snowmelt, increasing flooding problems in Clinton County. There were several evacuations due to rising water and several roads were flooded. Clinton County reported $20,000 in property damage. No deaths or injuries were reported.

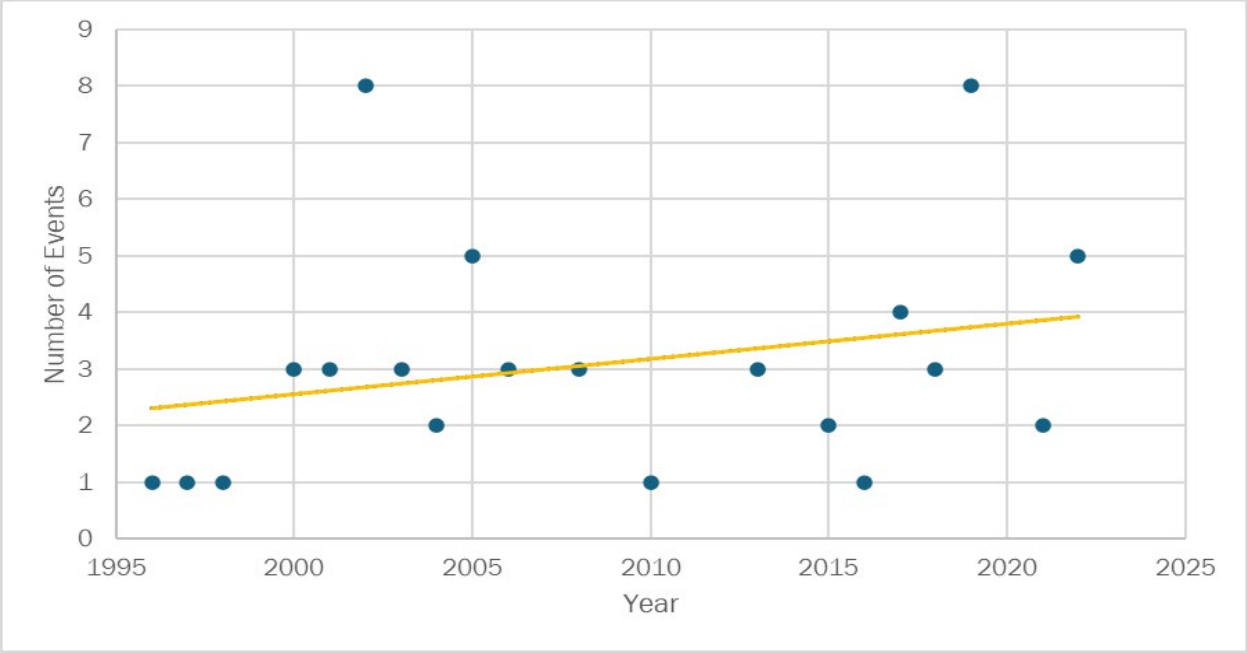
Major Disaster Declaration for Heavy Rains and Flooding, June 5, 1968:

On June 5, 1968, a major disaster declaration (DR-243-OH) was issued for 28 counties. Individual and public assistance was offered to each of the 28 counties, including Clinton County.

Probability

Figure 4.6.4 Between 1995 and 2023, Clinton County experienced 62 flooding events, including both floods and flash floods. Annually, this amounts to approximately two floods or flash floods per year. The yellow trendline of flood occurrences per year is increasing, which may suggest that Clinton County can expect an increased frequency of flood events each year. According to the State of Ohio Hazard Mitigation Plan (SOHMP), increased precipitation and variability from weather patterns could increase the likelihood and intensity of flood events.

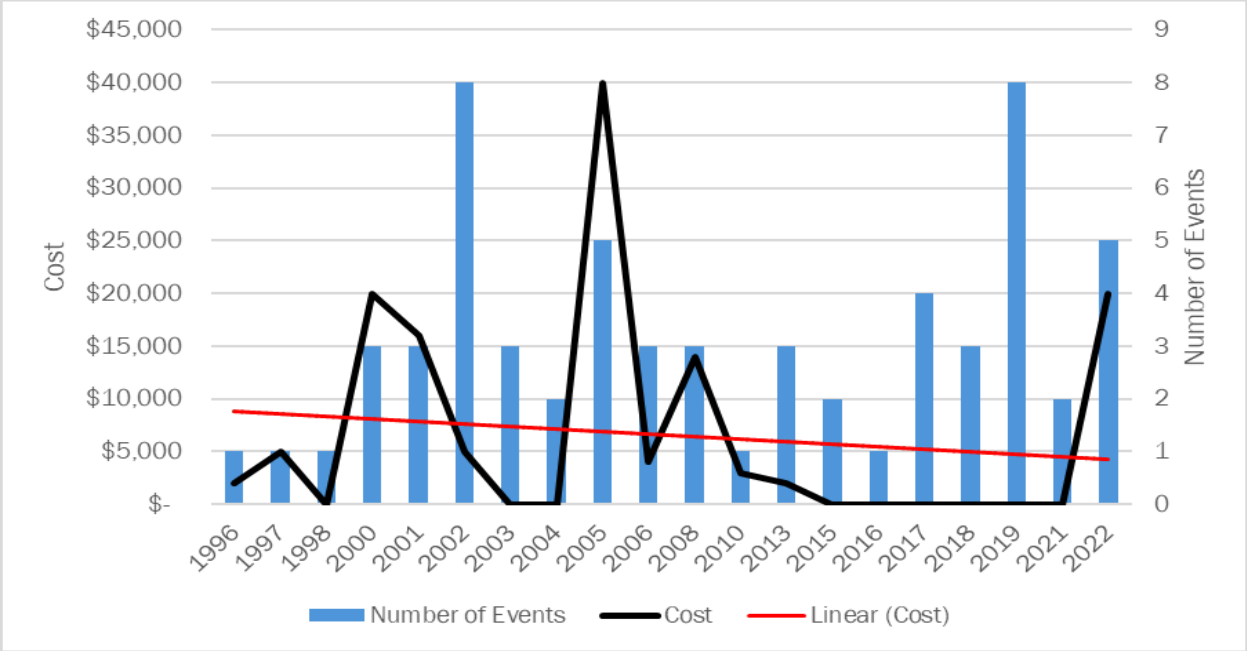
Figure 4.6.4: Probability of Flooding



Data Source: NOAA

Figure 4.6.5 shows both the trend of flood events and affiliated cost over time since January 1995. Between 1995 and 2023, floods or flash flood events have resulted in $130,000 in property damages and $1,000 in crop damages (Source: NCEI). Annually, this amounts to approximately $4,482 in property damages and $34 in crop damages. The trendline (shown in red) indicates that the expected property loss is decreasing.

Figure 4.6.5: Probability and Cost of Flooding



Data Source: NOAA

Vulnerability Assessment

Infrastructure Impact

Floods can impact roadways, including interstates and state routes, by blocking them due to high water, filling them with debris or washing away the road altogether.

Population Impact

Floods and flash floods have caused damage to occupied homes and businesses in the past. During flood events, shelter and temporary housing may need to be provided to those impacted by flooding.

For social vulnerability, in the National Risk Index, "riverine flooding" had a score of 44.1 ("Relatively Low"). People that are most vulnerable to flooding are those who live within the 100-year floodplain in structures that are not elevated above the base flood elevation. The index indicates an expected annual loss of $286,000 due to flood events with 1.8 events occurring per year.

Property Damage

Floods have the potential to damage infrastructure, resulting in the economic burden of clean up and repairs. Potential economic losses and damage associated with Clinton County for riverine flooding according to FEMA's National Risk Index are recorded in **Table 4.6.6** below, in order of highest EAL to lowest. Expected losses for buildings, population ($11.6 million for each fatality or 10 injuries), and agriculture per census tract for riverine flooding are listed below.

Table 4.6.6: Structure and Population Vulnerability from Riverine Flooding

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39027964300	$1,650	$121,984	$16	$123,650
39027964800	$930	$45,417	$4	$46,351

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39027964600	$1,225	$32,619	$0	$33,844
39027964900	$819	$19,871	$1	$20,691
39027964400	$508	$16,619	$14	$17,141
39027964700	$803	$14,585	$2	$15,390
39027964501	$129	$10,258	$0	$10,387
39027964502	$338	$7,311	$1	$7,650
39027965100	$139	$5,681	$12	$5,832
39027965000	$159	$5,354	$8	$5,521
Grand Total	**$6,700**	**$279,699**	**$58**	**$286,457**

Source: FEMA National Risk Index

Loss of Life

There was one reported death on March 19, 2008, when a 54-year-old woman attempted to cross a flooded stream and she was pulled into the water and drowned. Loss of life is possible in future floods or flash floods.

Economic Losses

Floods can halt economic activity, block roadways, and destroy agricultural crops. Businesses may need to shut down their operations due to flood water damage or road closures. Crop losses are also possible during floods or flash floods.

Future Trends

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.

More buildings but less people can mean more property loss but less population vulnerability to riverine flooding. Similarly, older structures could mean more vulnerability to properties and inhabitants. In 2023, Clinton County authorized 101 new residential units at a total value of $25,454,000. Though there are more buildings slated for construction, Clinton County's population has decreased 80 individuals from 2020 to 2023. The decline is set to continue such that by 2030 the population will lose an additional 1,343 people (3.2 percent). More buildings but less people may potentially mean more property loss but less population vulnerability. However, with state-of-the-art engineering there is very little potential damage. Given these estimates, there are no known changes in risks associated with earthquakes in Clinton County.

0. If construction practices, including the location of the new housing units, follow best practices for floodplain management, there are no known changes in the risks associated with riverine flooding.

Communities that are participating in the National Flood Insurance Program (NFIP) are required to adopt and enforce regulations and codes that apply to new developments in Special Flood Hazard Areas (SFHAs). These local floodplain management regulations must contain, at a minimum, NFIP requirements and standards that apply not only to new structures, but also to existing structures which

are Substantially Improved (SI), or Substantially Damaged (SD) from any cause, whether natural or human-induced hazards.

According to 44 CFR 59.1, substantial improvement means any reconstruction, rehabilitation, addition or other improvement to a structure, the total cost of which equals or exceeds 50 percent of the market value of the structure before the start of construction of the improvement. Likewise, substantial damage means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred. SI/SD requirements are also triggered when any combination of costs to repair and improvements to a structure in an SFHA equals or exceeds 50 percent of the structure's market value (excluding land value).

$$\frac{(Cost\ to\ Repair) + (Cost\ of\ Improvements)}{Market\ Value\ of\ Structure} \geq 50\ Percent$$

Enforcing the SI/SD requirements is a very important part of a community's floodplain management responsibilities. The purpose of the SI/SD requirements is to protect the property owner's investment and safety, and, over time, to reduce the total number of buildings that are exposed to flood damage, thus reducing the burden on taxpayers through the payment of disaster assistance. SD/SI requirements are enforced by the local floodplain administrator and monitored by the Ohio Department of Natural Resources (ODNR) Floodplain Management Program during Community Assistance Visits. If a local floodplain administrator is overwhelmed by the number of SD/SI inspections after a large event, ODNR has developed a network of building code officials that are trained in conducting SD/SI field determinations. Help with SD/SI inspections can be requested through the county emergency management agency director.

For more information regarding Substantial Improvement and Substantial Damage, please refer to FEMA's Substantial Improvement/Substantial Damage Desk Reference, P-758 or contact the ODNR Floodplain Management Program.

Shifting Weather Patterns and Environmental Trends

Shifting weather patterns and environmental trends have impacted human and natural systems. For example, infrastructure and stormwater systems in the Midwest are threatened by increased precipitation frequency and intensity induced by shifting weather patterns. According to the SOHMP, increased precipitation and variability could also increase the likelihood and intensity of flood events, which would mostly occur during the summer and fall months. These events would mainly occur from late summer to early winter, increasing the likelihood of cool season flood events in late autumn and early winter. Additionally, heavy precipitation events are projected to increase during winter and spring, causing flooding, sewer overflow, inundated roadways, delayed growing season and crop damage, and infrastructure damage. Emergency action plans, green infrastructure, and anticipating extreme events are important steps to prepare for any change in weather patterns.

4.7 Hazardous Materials

Description

According to the Ohio Environmental Protection Agency, 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 to its definition, 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 Ohio Environmental Protection Agency (Ohio EPA) indicates that there are five categories in which materials can be hazardous including acute, chronic, fire, reactive, or sudden release of pressure.

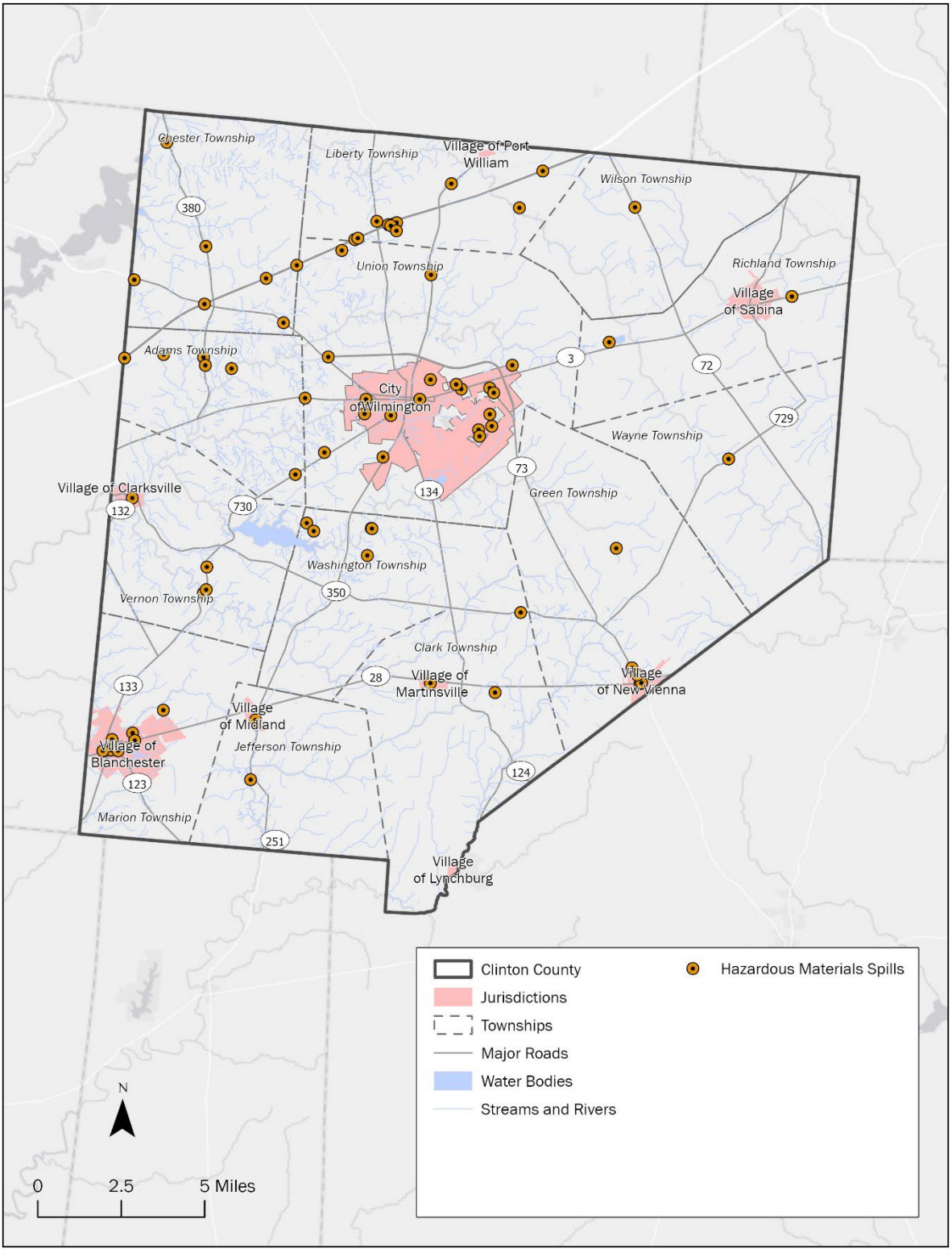
The U.S. Nuclear Regulatory Committee regulates materials that produce ionizing radiation, which includes by-product material and radioactive substances.

The Emergency Planning and 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 to notify their local and state emergency response organizations if they have "extremely hazardous substances" on site if the amounts are above a set threshold. This gives communities the "right to know" about potentially dangerous materials in their neighborhoods. This is also codified in the Ohio Revised Code (ORC) Chapter 3750 and the Ohio Administrative Code Chapter 3750.

Location

Hazardous material spills can occur wherever hazardous materials are stored and during shipment to these facilities. **Figure 4.7.1** shows 108 spills reported to the Ohio EPA from January 2017 through December 2023.

Figure 4.7.1: Location of Spills Reported to the Ohio EMA



Extent

The EPA keeps records for Extremely Hazardous Substance facilities because these facilities have a greater probability of spills due to the higher amounts of hazardous materials at their sites. Each potentially hazardous material has varying levels of toxicity. The concentration of these materials are 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 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 and dangerous environmental conditions. Corrosive, flammable, and/or explosive chemicals can damage infrastructure depending on the location, amount spilled, and the circumstances of the incident. In worst-case scenarios, large spills can trigger community evacuations and the closing of public roadways for hazardous materials transport, which affects residents.

History

There have been 108 reported hazardous material spills and releases in Clinton County between January 2017 and December 2023. Estimated property and crop damages were not recorded. **Figure 4.7.1** shows the locations of hazardous materials spills within Clinton County as recorded by the Ohio Environmental Protection Agency (OEPA). **Table 4.7.2** shows the reported product, amount, year, and impacted waterway, if recorded.

Table 4.7.2: Spills Reported to the Ohio EMA

Reported Product	Reported Amount	Year	Waterway
Fuel Jet / Kerosene (All)	75 Gal	11/22/2024	
Other / All Other / Trade Name / Mixture / Solution etc..	2000 Lbs.	11/7/2024	
Diesel Fuel (Vehicle on or off road)		7/15/2024	
Chemical(s) Unk	100 Gal	5/28/2024	
Diesel Fuel (Vehicle on or off road)	20 Gal	5/22/2024	
Other / All Other / Trade Name / Mixture / Solution etc.		2/24/2024	
Diesel Fuel (Vehicle on or off road)		1/27/2024	
Fuel Oil/ Home Heating / Heating Oil		1/27/2024	
Material Unknown		1/27/2024	
Diesel Fuel (Vehicle on or off road)		1/23/2024	
Diesel Fuel (Vehicle on or off road)	100 Gal	1/2/2024	
Water (H20)		11/24/2023	
Sewage, Human		10/5/2023	eask
Chemical(s) Unk		9/26/2023	
Diesel Fuel (Vehicle on or off road)		9/26/2023	
Other / All Other / Trade Name / Mixture / Solution etc.		9/26/2023	
Diesel Fuel (Vehicle on or off road)	100 Gal	9/15/2023	

Reported Product	Reported Amount	Year	Waterway
Fuel Jet / Kerosene (All)	55 Gal	8/15/2023	
Waste Water	130 Gal	8/11/2023	
Air Odor All Other		8/8/2023	
Manure, Horse		8/1/2023	East Fork Todd Fork
Manure, Nos (Not Specified)		8/1/2023	East Fork Todd Fork
Diesel Fuel (Vehicle on or off road)	150 Gal	7/28/2023	Dutch Creek
Other / All Other / Trade Name / Mixture / Solution etc.	150 Gal	6/22/2023	
Material White		6/13/2023	Wilson Creek
Waste Water		6/13/2023	Wilson Creek
Diesel Fuel (Vehicle on or off road)		5/21/2023	
Oil Motor / Lube Oil / Vehicle	2 Gal	5/21/2023	
Diesel Fuel (Vehicle on or off road)		5/4/2023	Second Creek
Oil Hydraulic Fluid(s)		5/4/2023	Second Creek
Diesel Fuel (Vehicle on or off road)		4/28/2023	
Oil Hydraulic Fluid(s)		4/28/2023	
Diesel Fuel (Vehicle on or off road)		4/25/2023	
Nothing Found / No Spill Noted / Issue Not Founded		4/25/2023	
Oil Motor / Lube Oil / Vehicle	65 Gal	4/17/2023	
Antifreeze Vehicle Cooling		1/4/2023	
Battery Acid (Dilute Sulfuric)		1/4/2023	
Fuel Jet / Kerosene (All)		1/4/2023	
Oil Motor / Lube Oil / Vehicle		1/4/2023	
Diesel Fuel (Vehicle on or off road)	50 Gal	1/3/2023	
Oil Petroleum Not Otherwise Specified (Nos)		9/20/2022	
Fish Kill		8/13/2022	
Oil Hydraulic Fluid(s)		6/24/2022	
Sheen Rainbow / Hydrocarbon		5/26/2022	

Reported Product	Reported Amount	Year	Waterway
Diesel Fuel (Vehicle on or off road)	25 Gal	5/14/2022	
Air Odor Gasoline / Hydrocarbon		3/5/2022	
Fish Kill		3/5/2022	
Diesel Fuel (Vehicle on or off road)		3/5/2022	
Other / All Other / Trade Name / Mixture / Solution etc.		3/5/2022	
Oil Transformer Non-PCB	100 Gal	2/22/2022	
Fuel Gasoline (25% Ethanol Not E85)		1/12/2022	
Material Unknown		1/12/2022	
Diesel Fuel (Vehicle on or off road)		11/1/2021	
Fish Kill		9/1/2021	Anderson Fork
Nitrogen Fertilizer 28%		9/1/2021	Anderson Fork
Diesel Fuel (Vehicle on or off road)	40 Gal	8/8/2021	
Diesel Fuel (Vehicle on or off road)	90 Gal	6/9/2021	
Fuel Jet / Kerosene (All)		5/11/2021	
Antifreeze Vehicle Cooling		4/12/2021	
Diesel Fuel (Vehicle on or off road)		4/12/2021	
Oil Hydraulic Fluid(s)		4/12/2021	
Waste Water		4/6/2021	
Oil Motor / Lube Oil / Vehicle		3/29/2021	
Air Odor Gasoline / Hydrocarbon	49 Gal	1/22/2021	
Oil Petroleum Not Otherwise Specified (Nos)		1/22/2021	
Oil Transformer Non-PCB		11/16/2020	
Oil Transformer PCB		11/16/2020	
Solid Waste, Nos (Not Specified)		11/8/2020	Cowan Creek
Diesel Fuel (Vehicle on or off road)		9/10/2020	
Oil Motor / Lube Oil / Vehicle		9/10/2020	
Oil Hydraulic Fluid(s)	20 Gal	7/14/2020	
Oil Transformer Non-PCB	100 Gal	6/19/2020	
Anhydrous Ammonia (Nh3)		4/7/2020	Todd Fork
Fish Kill		4/7/2020	Todd Fork

Reported Product	Reported Amount	Year	Waterway
Air Fire Open Burning		3/8/2020	
Air Fire Open Burning		3/6/2020	
Air Fire Open Burning		1/17/2020	
Diesel Fuel (Vehicle on or off road)	300 Gal	1/15/2020	
Oil Transformer Non-PCB	18 Gal	1/13/2020	
Diesel Fuel (Vehicle on or off road)		1/11/2020	
Material Unknown		1/11/2020	
Fuel Gasoline (25% Ethanol Not E85)		11/12/2019	
Material Undetermined / Other		11/12/2019	
Diesel Fuel (Vehicle on or off road)	200 Gal	9/17/2019	
Diesel Fuel (Vehicle on or off road)	50 Gal	7/14/2019	
Air Fire Open Burning		7/12/2019	
Air Fire Tires		7/12/2019	
Oil Hydraulic Fluid(s)	65 Gal	6/24/2019	Indian Run
Ink / Printing Ink	40 Gal	5/10/2019	
Other / All Other / Trade Name / Mixture / Solution etc.		5/10/2019	
Diesel Fuel (Vehicle on or off road)		5/3/2019	
Material Undetermined / Other		5/3/2019	
Sheen Rainbow / Hydrocarbon		3/1/2019	
Diesel Fuel (Vehicle on or off road)		2/9/2019	
Diesel Fuel (Vehicle on or off road)		2/9/2019	
Diesel Fuel (Vehicle on or off road)		1/13/2019	
Antifreeze Vehicle Cooling		1/8/2019	
Material Undetermined / Other		1/8/2019	
Antifreeze Vehicle Cooling		12/11/2018	
Ethylene Glycol (C2H6O2)	2 Gal	12/11/2018	
Diesel Fuel (Vehicle on or off road)	50 Gal	9/28/2018	
Fertilizer(s) Nos (Not Specified)		9/6/2018	
Fish Kill		9/6/2018	
Fuel Oil/ Home Heating / Heating Oil	100 Gal	8/21/2018	
Fish Kill		7/30/2018	
Antifreeze Vehicle Cooling	100 Gal	7/25/2018	

Reported Product	Reported Amount	Year	Waterway
Nitrogen Fertilizer 28%	800 Gal	6/18/2018	
Fuel Gasoline (25% Ethanol Not E85)	1 Gal	6/9/2018	
Mineral Spirits / Stoddard Solvent / Paint Thinner	10 Gal	2/12/2018	
Ink / Printing Ink	1 Gal	1/11/2018	
Manure, Swine		11/28/2017	East Fork Little Miami River
Orphan Container(s)	12 Items	10/17/2017	
Ink / Printing Ink		10/5/2017	
Boil Alert / Boil Advisory / Drinking Water Issue(s)		9/29/2017	
Solid Waste Nos (Not Specified)		9/15/2017	Lytle Creek
Sewage Human		9/4/2017	Moore Branch
Boil Alert / Boil Advisory / Drinking Water Issue(s)		7/29/2017	
Boil Alert / Boil Advisory / Drinking Water Issue(s)		6/30/2017	
Resin Solution, Flammable		5/24/2017	

Source: Ohio EPA

Probability

Due to their unpredictable nature and the influence of human error, the probability of hazardous materials spills is difficult to quantify. However, there have been 77 spills between 2017 and 2023, averaging an approximate 11 spills per year. Since hazardous material spills can occur at any time, they should be considered likely events.

Vulnerability Assessment

Infrastructure Impact

Roadways, waterways, and groundwater may be impacted 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. Hazardous material spills can lead to long-term impacts on the population, including future generations.

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 precautions 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.

Future Trends

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.

4.8 Invasive Species

Description

Harmful species are species that have potential negative impacts on the environment and economy of Clinton 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.

Location

Invasive species have the potential to impact any location within the County. The most invasive terrestrial species degrade the State's woodlands, wetlands, and prairies. Aquatic Invasive Species use rivers to spread. Ohio has more than 66,000 miles of streams, 312 miles of Great Lakes shoreline, nearly 2,000 inland lakes and reservoirs, and shares major watersheds with other states and Canada. Clinton 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.

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 Clinton County is the **Emerald Ash Borer (EAB) (Figure 4.8.1).** It is an exotic beetle that feeds on ash trees inhibiting the tree's 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. Since the EAB has been found in every county, there are no quarantines in effect within Ohio's borders. Ohio is still listed in the Federal quarantine boundary.

Figure 4.8.1: Emerald Ash Borer and Feeding Tunnels

Source: David Cappaert (Left) and National Park Services (Right)

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 invasive plant species in Ohio that have been banned and more under consideration (**Table 4.8.2**). 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 4.8.3**). With the exception of White Perch, it is unlawful to possess, import, or sell these species live.

Table 4.8.2: 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 4.8.3: 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*	Diploid Grass Carp - White Amur
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 Stalkleback
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

Type	Scientific Name	Common Name
Fish	*Mylopharyngodon piceus*	Black Carp
Fish	*Neogobius melanostomus*	Round Goby
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	*Scardinius erythrophthalmus*	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	*Eriocheir sinensis*	Chinese Mitten Crab
Crustaceans	*Faxonius virilis*	Virile Crayfish
Crustaceans	*Hemimysis anomala*	Bloody-red Shrimp
Crustaceans	*Procambarus clarki*	Red Swamp Crayfish

Type	Scientific Name	Common Name
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
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

Other invasive species that have the potential to impact Clinton County and the surrounding counties in Ohio include:

The **Gypsy Moth** has been migrating into Ohio from Pennsylvania and Michigan. In the caterpillar stage, the Gypsy Moth targets more than 300 different trees and shrubs. A healthy tree will typically die within two years of a Gypsy Moth infestation. Gypsy Moth eggs are laid during July and overwinter until late April to mid-May. An egg mass can contain up to 600 eggs. Before feeding, the larvae are dispersed by the wind to other trees or areas. The Gypsy Moth can lead to heavy defoliation and can make trees more susceptible to other invasive or harmful species. Preferred host plants include alder, aspen, gray birch, white birch, hawthorn, larch, linden, mountain ash, oaks, Lombardy poplar, willows, and witch hazel. Trees that are susceptible to older larvae only include beech, red cedar, chestnut, hemlock, plum, pine, and Colorado blue spruce.

Hemlock Wooly Adelgid are small invasive pests that can be found on the underside of hemlock needles. They feed on the sap causing the tree to dry up and die. It was first found in North America in the 1950s. Today, they are a huge problem in northeast Ohio.

Asian Long-Horned Beetles are wood-boring beetles native to Asia that were unintentionally introduced to North America, likely in wood packing material. Clermont County experienced an infestation in 2011.

They pose a significant threat to forested land. There are no known Asian Long-Horned Beetle infestations in Clinton County.

Mute Swans are non-native invasive species found on public lakes across Ohio, originally known as winter visitors with the first published record in the United States in 1936 and Ohio in 1987. 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.

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.

History

Clinton County has been impacted by the Emerald Ash Borer, with infestations starting as early 2010. The extent of this damage is unknown. Additionally, it is possible that any of the other species listed above have at one point affected the County and its residents.

Probability

Since there are many invasive species throughout Ohio, it is probable that Clinton County will experience some of the invasive species listed above (Tables 4.8.2 and 4.8.3).

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 because of invasive species is very unlikely. Some of these species consumed as food could lead to diseases and other health impacts in humans.

Economic Losses

Economic impacts can vary greatly depending on the target and the invasive species and their impacts on those targets. Agricultural and horticultural revenue losses may be experienced if crops and plants 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.

Future Trends

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. Future development may involve site investigation to identify any potential invasive species on the property.

4.9 Landslide and Mine Subsidence

Description

The Ohio Department of Natural Resources (ODNR) defines a landslide as "a variety of downslope movements of earth materials. Some slides are rapid, occurring in seconds, whereas others may take hours, weeks, or even longer to develop." Landslides are commonly triggered by human-induced vibrations, over-steepened slopes, increased weight on a slope, and removal of vegetation on areas with landslide-prone slopes. Landslides can also be caused by heavy precipitation.

Subsidence is the motion of the earth's surface as it shifts downward relative to a benchmark (often sea level) of the surrounding terrain. In Ohio, the two primary causes are abandoned underground mines (AUMs) and karst. Karst is a topographic feature formed when carbonate rock, such as limestone, dolomite, and gypsum, is eroded by water draining or moving from these areas. Karsts are commonly represented as caves.

According to the Ohio Administrative Code 3901-1-48, mine subsidence is loss caused by the collapse or lateral or vertical movement of structures resulting from the caving in of underground mines including coal mines, clay mines, limestone mines, and salt mines. Mine subsidence does not include loss caused by earthquakes, landslides, volcanic eruptions, or collapse of strip mines, storm and sewer drains, or rapid transit tunnels. Several factors determine the potential for mines to collapse including depth, mining technique used, types of rock and/or soils, and the development on the ground surface. Additionally, abandoned underground coal mines in Ohio have the potential to discharge acidic water which, if discharged into creeks or streams, can alter the chemical composition of the water habitat and cause considerable harm to sensitive aquatic life.

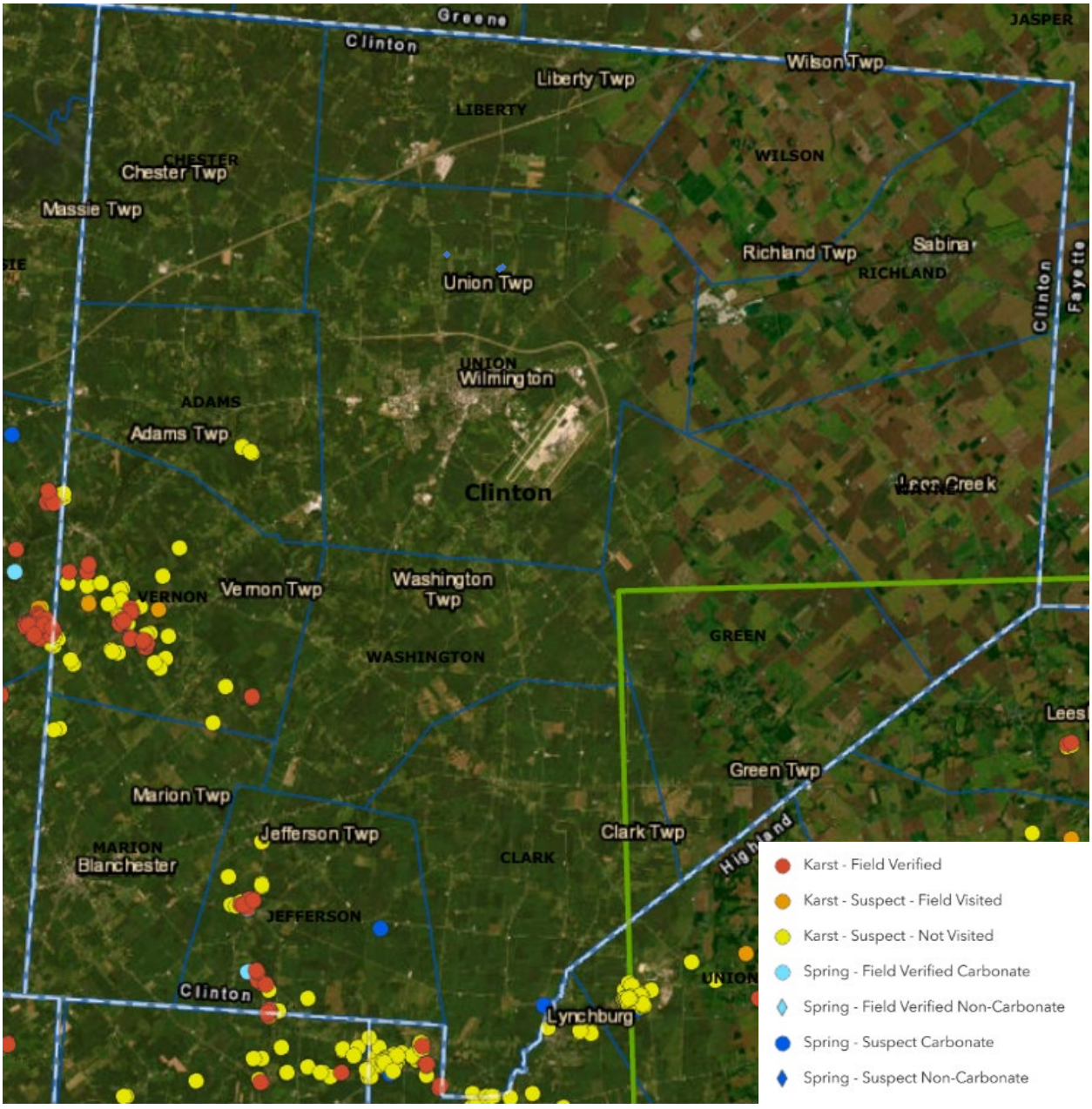
Location

Figure 4.9.1 is a snapshot of the ODNR Karst Interactive Map for Clinton County. The map shows areas of verified Karst fields, suspect karst fields (visited and not visited), and springs (suspect and verified). Several sink holes have been located in Vernon and Jefferson Townships. **Figure 4.9.2** shows the location of areas impacted by bedrock and glacial drift overlay.

Figure 4.9.3 shows the location of abandoned underground mines (UAMs) in Ohio and which counties have the option or are required to obtain mine subsidence insurance. The majority of abandoned underground mines can be found in region three or in nearby counties. All but six counties in region three require land subsidence insurance. Clinton County is located in region two where nine counties have the option to obtain insurance. Clinton County does not have any unabandoned underground mines.

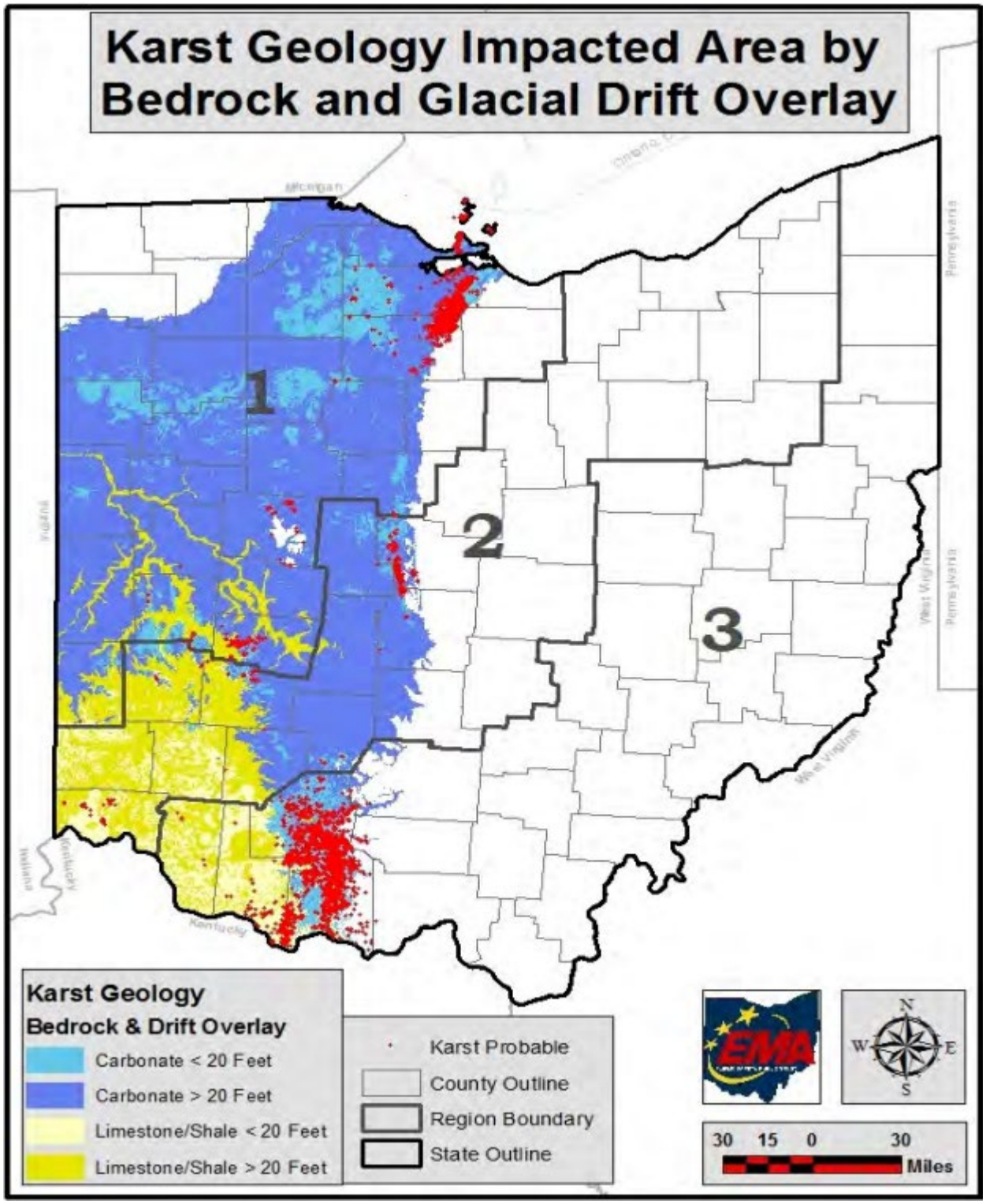
Figure 4.9.4 shows the location of areas at risk for landslides. Clinton County is in region two and has low incidence of landslides. The map displays both the incidence of landslides and susceptibility of the land surface to landslides. Briefly, the map was constructed by evaluating geologic units shown on the geologic map of the United States (King and Beikman, 1974) and classifying them as having high, medium, or low landslide incidence based on number of known landslides, and as having the high, medium, or low susceptibility to landslide. High incidence was assigned to map units (indicated in red on the map) having more than 15 percent of their area involved in landslide; moderate incidence (in tan) to those having between 15 and 1.5 percent; and low incidence (in yellow) to those having less than 1.5 percent.

Figure 4.9.1: ODNR Karst Interactive Map



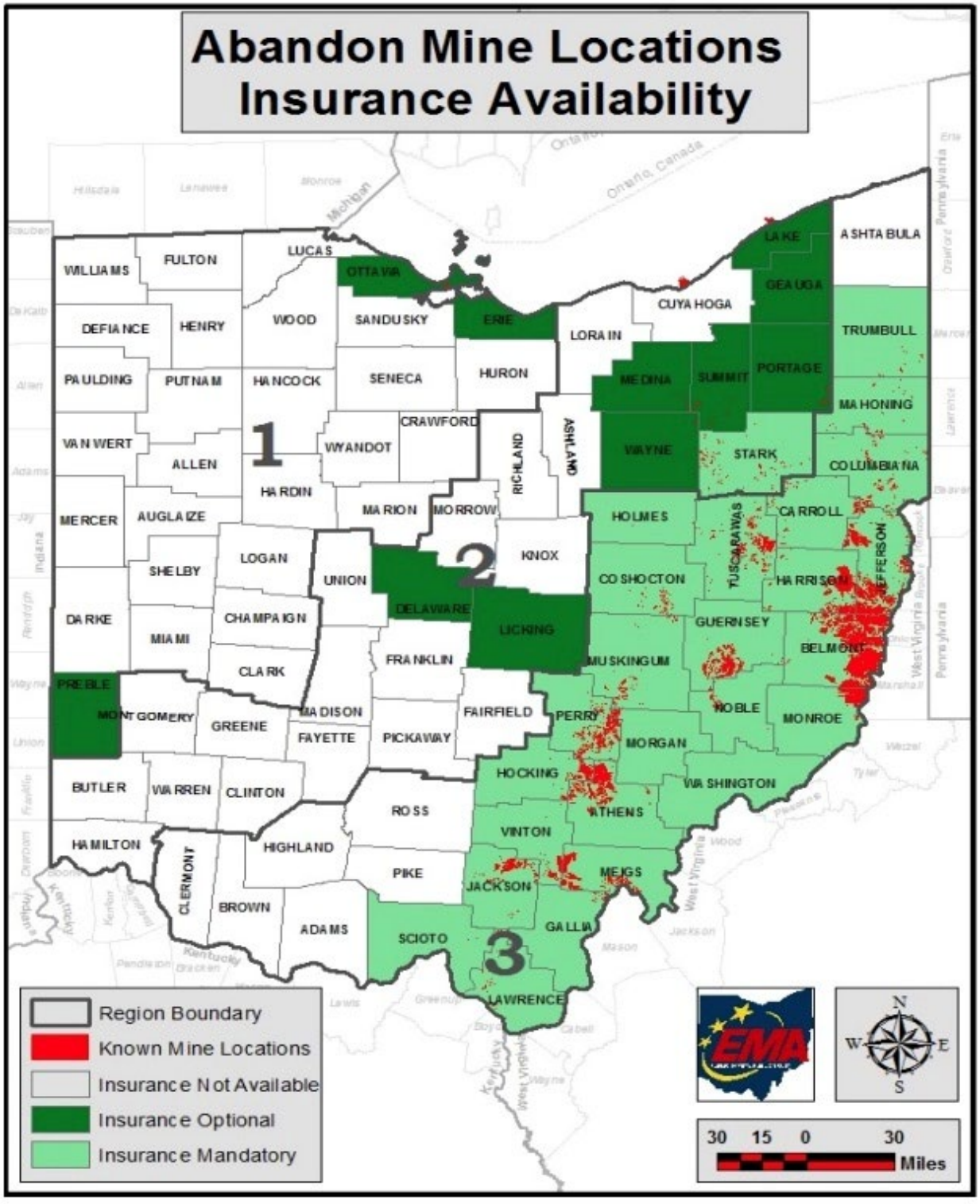
Source: Ohio Department of Ohio Natural Resources

Figure 4.9.2: Karst Geology Impacted Area by Bedrock and Glacial Drift Overlay



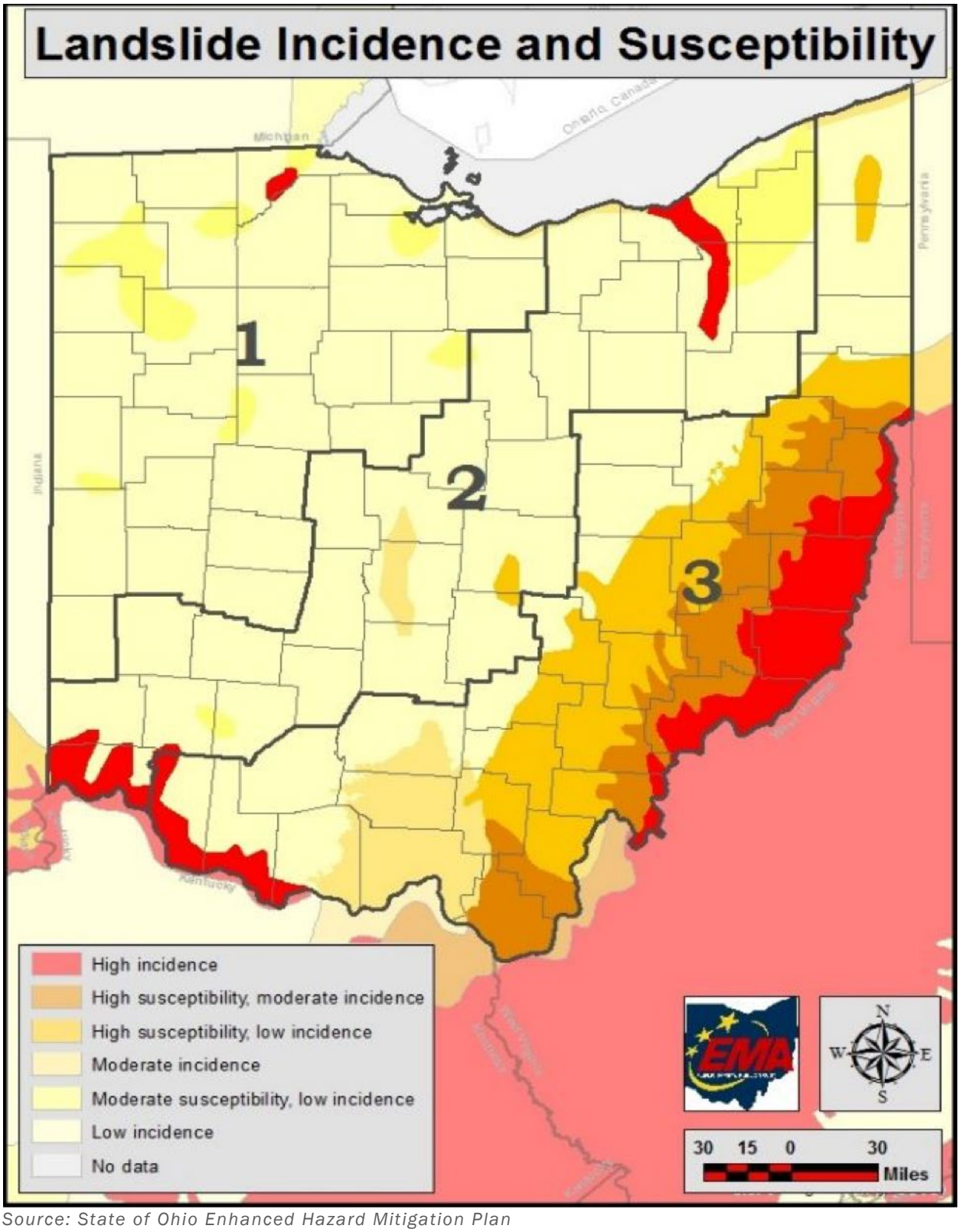
Source: State of Ohio Enhanced Hazard Mitigation Plan

Figure. 4.9.3: Abandon Mine Locations and Insurance Availability



Source: State of Ohio Enhanced Hazard Mitigation Plan

Figure 4.9.4: Landslide Incidence and Susceptibility Map



Source: State of Ohio Enhanced Hazard Mitigation Plan

Extent

According to ODNR Division of Geologic Survey, Clinton County is home to 11 bedrock formations: Drakes formation, Whitewater formation, and Liberty formation undivided; Drakes formation and Waynesville formation undivided; Grant Lake formation; Cedarville dolomite, Springfield dolomite, Euphemia dolomite, Massie shale, Laurel dolomite undivided; Estill shale; Dayton limestone, Noland formation and Brassfield undivided; Massie shale, Laurel dolomite, Osgood shale, Dayton limestone, and Brassfield limestone undivided; Drakes formation and Waynesville formation undivided; Cedarville dolomite, Springfield dolomite, Euphemia dolomite undivided; Arnheim formation; and Ordovician undivided. These formations include a mix of shale, limestone, and shale with interbedded dolomite.

There are three major types of landslides:

1. Rotational slump, or a mass of weak rock or sediment moving as a block unit along a slope. These are the largest types of landslides found in Ohio.
2. Earthflow, or a mass of rock or sediment flowing downslope. These are the most common landslides in Ohio.
3. Rock fall, or a rapid downslope movement of large blocks of bedrock. Most rockfalls in Ohio involve sandstone or limestone that have been weakened by surface water.

According to the Ohio Mine Subsidence Insurance Underwriting Association, mine subsidence is caused by the collapse of underground mines causing damage or movement to a property and/or structure located above. Mine Subsidence insurance is required in 26 counties and optional for 11 counties in Ohio. Insurance for the mandatory counties has an annual premium of $1.00, while optional counties have a premium of $5.00.

History

According to the Ohio Department of Transportation (ODOT), Clinton County has not had any rock slopes or landslides.

Probability

According to the ODNR, Clinton County falls within an area of low risk for slope failure and landslides and rock slopes should not be considered a likely event. The 1870 Ohio Mine Law required a mine be registered if it had more than ten employees and mined more than 200,000 tons of coal. This leaves an undocumented number of smaller mines that closed prior to 1870. There are a known 6,000 underground mines in Ohio. On February 08, 2022, the federal government granted the State of Ohio $46.4 million to reclaim abandoned coal mines. There haven't been any reports of UAMs in Clinton County.

Vulnerability Risk Assessment

Infrastructure Impact

Landslides can block or damage roadways, and damage existing utility infrastructure. Mine subsidence can occur under existing roadways or utility infrastructure causing anything from minor damage to complete destruction.

Population Impact

Landslides and mine subsidence can cause injury or death if a person is struck by or trapped under falling earthen material. Mine subsidence can cause sinkholes under occupied structures which could lead to injuries.

For social vulnerability, mine subsidence is not listed in the National Risk Index, but landslide is listed with a score of 25.7 (relatively low). The index indicates an expected annual loss of $22,000 due to landslides with zero events occurring per year.

Property Damage

Properties caught in the path of a landslide can be destroyed or severely damaged. Properties, including their structures, can be destroyed by mine subsidence.

Table 4.9.5 below shows the census tracts in Clinton County, ranked highest total EAL (expected annual loss) to lowest EAL from landslides, and is broken down by expected losses for buildings, population ($11.6 million for each fatality or 10 injuries), and agriculture. EAL rates, calculated by FEMA, identify the total value of loss expected each year for a particular community, in this case the census tracts for Clinton County.

Table 4.9.5: Structure and Population Vulnerability from Landslides

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39027964800	$1,838	$9,831	$0	$11,669
39027964400	$1,363	$5,367	$0	$6,730
39027964700	$1,027	$824	$0	$1,851
39027965000	$205	$1,035	$0	$1,240
39027964501	$33	$175	$0	$208
39027965100	$32	$145	$0	$177
39027964300	$3	$22	$0	$25
39027964502	$0	$0	$0	$0
39027964900	$0	$0	$0	$0
39027964600	$0	$0	$0	$0
Grand Total	**$4,501**	**$17,399**	**$0**	**$21,900**

Source: FEMA National Risk Index

Loss of Life

Loss of life is possible during sudden mine subsidence or landslides. However, there are no known fatalities in Clinton County due to mine subsidence or landslides.

Economic Losses

Landslides and mine subsidence can block or destroy sections of roadways vital to shipping. Stores, storage facilities, and other structures that are important to economic activity can also be severely damaged or destroyed. It can also be quite expensive to repair sinkholes when they occur.

Future Trends

Land Use and Development Trends

Uses that serve vulnerable populations, such as schools and hospitals, should not be placed in areas that are in high-risk zones for landslides. Development should be limited to areas with minimal slope to reduce potential losses during landslides. Development should also consider low-impact techniques to reduce the likelihood of runoff from precipitation and therefore reduce the risk of landslides. If new residential construction units are within areas with steep slopes, it would increase property and population vulnerabilities in those areas.

Using the United States Geological Survey Landslide Inventory and Susceptibility map as a resource for mapping, future land use changes can reduce the potential of property damage. The map depicts areas that have increasing susceptibility to landslides.

Shifting Weather Patterns and Environmental Trends

Due to shifts in weather patterns, the likelihood of precipitation has increased five to 15 percent, and the amount of rain falling during heavy precipitation events has increased by 45 percent on average between 1958 to 2021. Extreme precipitation could increase the likelihood of landslides in areas with steep slopes. Flooding caused by heavy precipitation could also increase the rate of runoff for acid mine drainage along rivers and streams. More frequent and intense rain events can also increase erosion rates and lead to greater amounts of sediment runoff into rivers, lakes, and streams (U.S. Environmental Protection Agency 2023).

4.10 Severe Summer Weather

Description

Severe summer weather events may include severe thunderstorms and thunderstorm winds, hail, and lightning. High winds, tornadoes, and flooding may also be related to severe summer storms, 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, Clinton 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, has 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 Cleveland, Ohio, is responsible for issuing Severe Thunderstorm Watches and Warnings for Clinton 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 weather 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).

The NWS can issue various types of wind advisories and warnings. A **Wind Advisory** is issued when sustained winds of 31 to 39 mph are reached for an hour or more and/or if there are wind gusts of 46 to 57 mph for any duration. A **High Wind Watch** indicates that sustained, strong winds are possible, and outdoor items should be secured. People should modify plans, so they are not caught outside. Additionally, a **High Wind Warning** indicates that sustained, strong winds (40 mph or greater) with even stronger gusts (greater than 58 mph) are happening. People should seek shelter, and those driving should keep both hands on the wheel and slow down. An **Extreme Wind Warning** is issued for surface winds of 115 mph or greater associated with non-convective, downslope, derecho (not associated with a tornado), or sustained hurricane winds that are expected to occur within one hour.

Location

Severe summer weather is a countywide hazard, and all of Clinton County is susceptible to severe summer weather.

Extent

Severe summer weather events have the potential to create large-scale damage in Clinton County. Specifically, lightning is responsible for approximately 20 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.

History

According to the National Centers for Environmental Information (NCEI), there have been 269 high-, strong-, or thunderstorm-wind events, 100 hail events, three heavy rain events, and two lightning events recorded in Clinton County between January 1995 and December 2023. These events resulted in $8,255,100 in property damage and $20,000 in crop damage. No deaths or injuries caused by summer storm events were reported in Clinton County since 1995. All severe storm events from 1995 to 2023 are summarized in **Table 4.10.1**, below:

Table 4.10.1: Thunderstorm-Related Events in Clinton County since 1995

Severe Storm Event Type	Number of Events	Injuries	Deaths	Property Damage	Crop Damages
Hail	100	0	0	$271,000	$0
Heat	0	0	0	$0	$0
Heavy Rain	3	0	0	$0	$0
High Wind	17	0	0	$5,144,000	$0
Lightning	2	0	0	$150,000	$0
Strong Wind	1	0	0	$8,000	$0
Thunderstorm Wind	251	0	0	$2,682,100	$20,000
Grand Total	**374**	**0**	**0**	**$8,255,100**	**$20,000**

Source: NOAA Storm Events Database

Clinton County has not had a disaster declaration for severe storms since the previous hazard mitigation plan in 2020. However, since January 1995, the County has been subject to two Major Disaster Declarations for severe storms and flooding and damage from the remnants of Hurricane Ike and one emergency declaration (EM) for severe storms. Several of the most damaging events, events with emergency or disaster declarations, and events that resulted in deaths and/or injuries are described in more detail below.

Thunderstorm Wind Event, March 14, 2019:

Thunderstorms, strong winds, and hail in March 2019 caused numerous downed powerlines and trees across Clinton County, damage to barns across the County, and downed trees on State Routh 730 between Blanchester and Wilmington. Wind gusts over 50 mph damaged the National Weather Service Building in Wilmington. Hail from 1 to 1.5 inches damaged the siding and roofs of several houses, broke a few windows, and caused damage to vehicles. Property damages reported for Clinton County totaled $215,000. No deaths or injuries were reported.

Thunderstorm Wind Event, June 26, 2015:

On June 26, 2015, a low-pressure system moved through the area from the west developing severe thunderstorms that downed trees and tree limbs on State Route 350 near Farmers Road, Bernard

Road in New Vienna, and on Leslie Drive in Burtonville. Several trailers sustained structural damage, and a wall was ripped from a home in New Vienna. Reported property damage reached $65,000 in Clinton County. No deaths were reported.

Emergency Declaration for Severe Storms, June 29, 2012 - July 2, 2012:

At the end of June 2012, a heatwave gripped much of the Mid-Atlantic, helping to fuel severe weather. A line of powerful thunderstorms brought derecho winds with gusts estimated to reach 80 mph causing extensive damage to the Ohio Valley and Mid-Atlantic states on the afternoon of June 29. Around four million residents lost power for almost a week and were at risk of heat-related illness or death across several states as the winds knocked down and uprooted trees, snapped power lines, and produced large hail in some areas. Ohio was one of the hardest hit states. In Clinton County property damage totaled $11,000, mostly from downed trees and powerlines due to thunderstorm wind gusts. New Vienna lost power due to multiple downed lines. The Wilmington Weather Forecast Office clocked winds over 50 mph. No injuries or deaths were reported.

Major Disaster Declaration for Severe Storms and Flooding, April 4, 2011 - May 15, 2011:

In the spring of 2011, widespread severe weather including heavy rainfall and thunderstorms resulted from an unstable airmass and warm front colliding over the region. Severe thunderstorm winds damaged two hangars at the Wilmington Air Park by ripping their roofs off and several area barns were damaged near New Antioch. Other parts of the County saw structural damage to barns and buildings. Property damage reported for Clinton County was $71,000. No injuries or deaths were reported from this event.

Thunderstorm Wind Event, October 26, 2010:

Severe storms, wind gusts, and tornadoes developed along a very cold front on October 26, 2010, that resulted in severe thunderstorm winds causing multiple downed trees and damage to several barns in Pansy, Sabina, and Wilmington. The roof of a house was torn off near Pansy and a chicken coop ended up 35 yards away due to winds around 65 miles per hour (MPH). Property damages totaled $105,000 for this event in Clinton County. No injuries were reported.

Major Disaster Declaration for Severe Storm Associated with Tropical Depression Ike, September 14, 2008:

The remnants of Hurricane Ike swept across the Midwest on September 14, 2008, causing widespread damage across Ohio from strong winds upwards of 40-50 mph, and wind gusts of 77 mph recorded north of Wilmington. Widespread power outages, downed trees and powerlines, roof and structural damage to homes and buildings, as well as crop losses were reported. The total property damage reported for Clinton County reached $5,100,000. No injuries or deaths were reported for this event.

Major Disaster Declaration for Severe Storms and Flooding, August 27, 2004 - September 27, 2004:

In late summer 2004, severe thunderstorms collided with the remnants of Hurricanes Frances and Ivan causing severe storms, high winds, and flooding across Ohio. No property or crop damage was reported in Clinton County. Likewise, no deaths or injuries were reported related to this event.

Thunderstorm Wind Event, April 9, 2002:

On April 9, 2002, several homes sustained wind and/or hail (0.75 – 1 inch) damage near the intersection of Farmers Road. and State Route 350, and a house had its roof taken off in New Vienna. In total, the event resulted in $137,000 of property damage, and no injuries or deaths were reported in Clinton County.

Thunderstorm Wind Event, April 9, 1999:

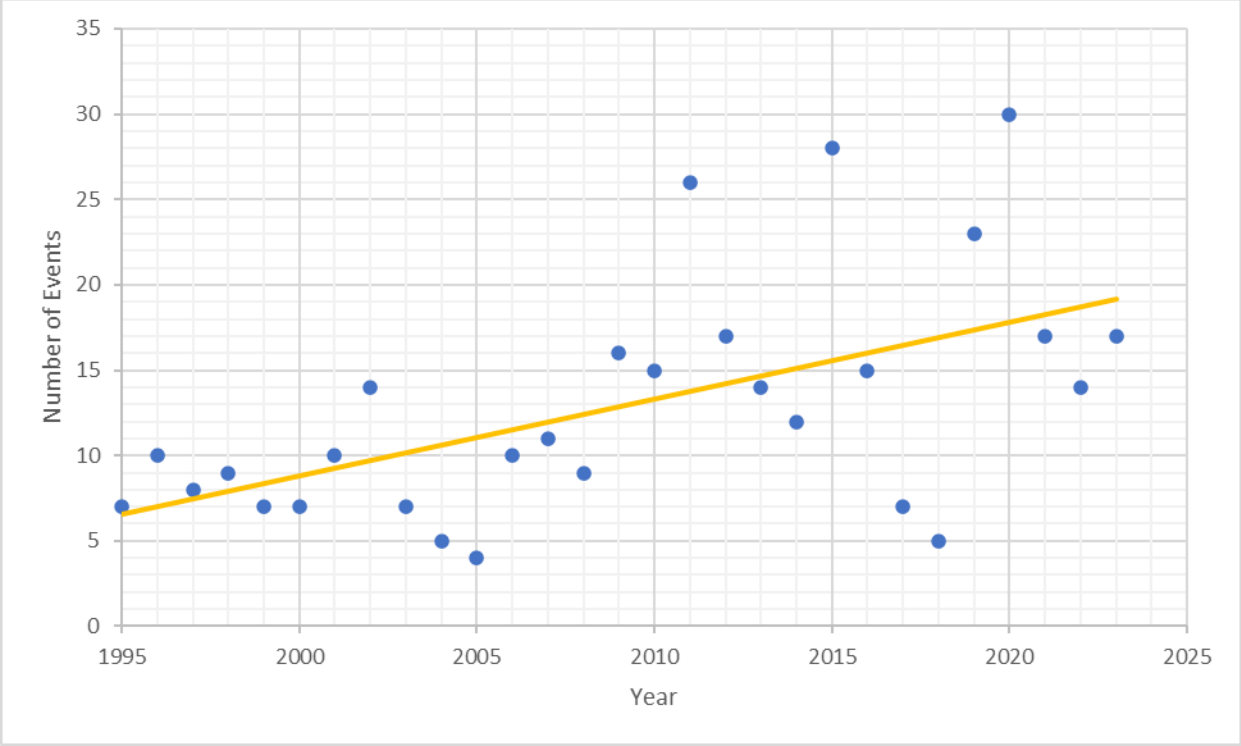
A line of severe thunderstorms moved through southern Ohio on April 9, 1999, producing tornadoes in southwest Clinton County and thunderstorm winds throughout. Multiple trees and powerlines were

damaged or downed by thunderstorm winds. Near Clarksville more than 20 structures were damaged, and three homes and a business were destroyed. There was a total of $1,000,000 in property damage reported for Clinton County. No injuries or deaths were reported.

Probability

According to the NCEI, there have been 374 severe summer storm events reported in Clinton County from January 1995 to December 2023 with total losses reaching $8,255,100 in property damage and $20,000 in crop damage. This amounts to around 12.9 severe summer storm events annually with an average annual total damage of approximately $285,356. **Figure 4.10.2** below shows the trend in number of severe summer weather events per year since 1995. The trendline (shown in yellow) indicates an increase in the number of summer storm events; however, the trendline may be skewed due to the spike in events in 2001 (26), 2015 (28), and 2020 (30).

Figure 4.10.2: Severe Summer Storm Probability



Source: NOAA

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 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 of 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

Summer storms are random in nature and affect the entire area of the County. Everyone within the County should be prepared during a storm event. Populations residing in mobile home parks are particularly vulnerable and should seek shelter.

According to FEMA's National Risk Index, Clinton County was scored a 38.24 ("very low") risk from the negative impacts of natural hazards, based on a relatively moderate social vulnerability, very low expected annual loss, and very high community resilience, compared to all other counties in the U.S. The risk for individual hazard events associated with severe summer weather are as follows: 49.7 ("relatively low") for hail, 63.5 ("relatively low") for lightning, and 61.2 ("relatively moderate") for strong wind. The index also calculates an expected annual loss of $97,897 due to hail events, $141,783 due to lightning events, and $479,320 due to strong wind events, with 3.7, 76.5, and 2.2 events occurring per year, respectively.

Property Damage

As described above, severe summer weather events have caused an average of $8,255,100 in average annual property damage from 1995 to 2023. Due to the non-site-specific nature of this hazard, **Tables 4.10.3 - 4.10.5** list all structures within Clinton County as having potential impacts from severe storms.

Loss of Life

There were no deaths or injuries in Clinton County between January 1995 to December 2023 as a result of severe summer weather. All of Ohio has the potential for injuries and fatalities during severe summer weather.

Economic Losses

Severe summer weather has the potential to damage infrastructure, resulting in the economic burden of clean up and repairs, as well as the economic loss from deaths and injuries. Expected annual loss (EAL) rates, calculated by FEMA, identify the total value of loss expected each year for a particular community, in this case Clinton County census tracts. Expected losses for buildings, population ($11.6 million for each fatality or 10 injuries), and agriculture per census tract from hail, lightning, and strong wind events are recorded in **Tables 4.10.3 - 4.10.5** below. The tables list the 10 census tracts in Clinton County in order of the highest total EAL (expected annual loss) from severe summer events to the lowest. The EAL Total column combines the buildings, population, and agricultural losses for each census tract.

Table 4.10.3: Structure and Population Vulnerability from Hail

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39027964400	$14,426	$238	$3,821	$18,485
39027964700	$14,945	$264	$470	$15,679
39027965100	$9,564	$196	$4,077	$13,837
39027965000	$6,837	$180	$2,679	$9,696
39027964800	$7,339	$224	$1,366	$8,929
39027964900	$7,269	$231	$489	$7,989
39027964300	$5,755	$169	$2,017	$7,941
39027964502	$5,528	$137	$225	$5,890

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39027964501	$4,673	$154	$178	$5,005
39027964600	$4,312	$133	$0	$4,445
Grand Total	**$80,650**	**$1,926**	**$15,322**	**$97,896**

Source: FEMA National Risk Index

Table 4.10.4: Structure and Population Vulnerability from Lightning

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39027964700	$2,294	$17,858	$0	$20,152
39027964900	$1,191	$16,374	$0	$17,565
39027964400	$2,133	$15,339	$0	$17,472
39027964800	$1,176	$15,557	$0	$16,733
39027965100	$1,487	$13,228	$0	$14,715
39027965000	$1,084	$12,328	$0	$13,412
39027964300	$811	$10,252	$0	$11,063
39027964501	$706	$10,084	$0	$10,790
39027964502	$859	$9,274	$0	$10,133
39027964600	$682	$9,066	$0	$9,748
Grand Total	**$12,423**	**$129,360**	**$0**	**$141,783**

Source: FEMA National Risk Index

Table 4.10.5: Structure and Population Vulnerability from Strong Winds

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39027964700	$73,524	$10,897	$136	$84,557
39027964400	$70,606	$9,751	$1,103	$81,460
39027965100	$47,055	$8,072	$1,181	$56,308
39027964800	$35,834	$9,152	$393	$45,379
39027964900	$35,359	$9,429	$140	$44,928
39027965000	$33,623	$7,429	$776	$41,828
39027964300	$28,316	$6,979	$584	$35,879
39027964502	$27,198	$5,642	$65	$32,905
39027964501	$22,992	$6,351	$52	$29,395
39027964600	$21,213	$5,468	$0	$26,681

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
Grand Total	**$395,720**	**$79,170**	**$4,430**	**$479,320**

Source: FEMA National Risk Index

Future Trends

Land Use and Development Trends

Severe summer storms can occur anywhere, bringing an entire community or region to a standstill, including commuter and emergency transportation and medical services. Any development that has occurred since the adoption of the previous plan, and any future development, has the potential to be impacted by severe summer storms. All land uses are equally impacted by severe summer weather.

In 2023, Clinton County authorized 101 new residential units at a total value of $25,454,000. Though there are more buildings slated for construction. Clinton County's population has decreased 80 individuals from 2020 to 2023. The decline is set to continue such that by 2030 the population will lose an additional 1,343 people (3.2 percent). More buildings but less people may potentially mean more property loss but less population vulnerability.

Building design and construction are also impacted by the intensity of summer storms. Areas prone to severe storms should have buildings designed to withstand high winds, heavy rainfall, and potential flooding to avoid structural damage. On the other hand, proper ventilation and cooling systems are essential to manage the heat and humidity that often accompany summer storms.

It is important to maintain consistency between emergency planning, financial plans and budgets, and development planning. Zoning codes should ensure that there is adequate greenspace in existing and new developments to foster drainage and provide space for water runoff. Locating emergency facilities, and partnering with emergency organizations during the planning process, will help develop improved contingency responses in cases where emergency transportation and services are cut off during an extreme weather event.

Shifting Weather Patterns and Environmental Trends

Shifting weather patterns and environmental trends may also increase the number of days with conditions conducive to a severe thunderstorm. Future modeling techniques could reveal additional information about the correlation between atmospheric changes and severe thunderstorm formation and intensity.

4.11 Severe Winter Weather

Description

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

A winter storm forms under the correct combination of three conditions:

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, lake effect storms, and snow squalls. Extreme cold events often accompany winter storms, bringing low temperatures and higher risks of frostbite and hypothermia.

- **Blizzards** are winter storms that are a combination of blowing snow and wind which lead to very low visibility. 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.
- **Lake Effect Storms** are cold, dry air masses that move over the Great Lakes regions and drop the moisture as snow in the northeastern portion of Ohio near the Great Lakes area.
- **Snow Squalls** are brief, intense snow showers accompanied by strong winds. Impacts may be significant.
- **Extreme Cold Events** occur when temperatures drop below normal for the given area, and they generally coincide with winter storms or are the lasting effect of a winter storm.

Location

Winter storms are typically large events that impact large areas at once. Winter storms will impact the entire County and have the potential to impact multiple counties.

Extent

The State of Ohio Hazard Mitigation Plan 2024 lists winter storms as one of the three highest threat hazards in Ohio. The average annual snowfall in Clinton County is 12-24 inches according to NOAA, which is less than the state average of about 27 inches. Snowfall typically occurs between November and April with January being the coldest month on average.

History

There have been at least 112 winter storm events, including cold/wind chill, extreme cold/wind chill, frost/freeze, heavy snow, ice storm, winter storm, and winter weather in Clinton County since January 1995. These events caused $525,000 in property damage and $540,000 in crop damage. No deaths or injuries were reported according to The National Centers for Environmental Information (NCEI). All

severe winter weather and extreme cold events from January 1995 to December 2023 are summarized in **Table 4.11.1,** below:

Table 4.11.1: Severe Winter Related Events in Clinton County since 1995

Severe Storm Event Type	Number of Events	Deaths	Injuries	Property Damage	Crop Damage
Cold/Wind Chill	1	0	0	$20,000	$0
Extreme Cold/Wind Chill	2	0	0	$0	$0
Frost/Freeze	1	0	0	$0	$540,000
Heavy Snow	11	0	0	$5,000	$0
Ice Storm	6	0	0	$0	$0
Winter Storm	43	0	0	$500,000	$0
Winter Weather	78	0	0	$0	$0
Total:	**142**	**0**	**0**	**$525,000**	**$540,000**

Source: NOAA Storm Events Database

Clinton County has had no disaster declarations or emergency declarations for severe winter storms since the last hazard mitigation plan was completed in 2020. Before 2020, there was one emergency declaration for winter storm events in 2008 for record/near record snow. There were no injuries or deaths reported between 1995-2023 due to severe winter storm events in Clinton County. Several of the most damaging events and/or events with emergency or disaster declarations are described in more detail below.

Winter Weather Event, November 22, 2014:

Due to a very cold ground, freezing rain developed along the line of rain showers in the wake of a warm front moving through the Ohio Valley on November 22, 2014. While temperature instruments recorded above freezing in most locations, the rain still froze on area roadways generating a slushy layer of ice on road surfaces. Numerous accidents and road closures occurred throughout the County as a result. No reports of property damage, injuries, or deaths were recorded for Clinton County.

Emergency Declaration for Record Snow and Near Record Snow, March 7, 2008 – March 9, 2008:

A low-pressure system along the Gulf Coast blanketed northeast and north-central Ohio with 5 to 20 inches of snow in March 2008, and Wilmington recorded 14 inches of snowfall. Wind gusts of 20-30 MPH led to intermittent blizzard conditions and snow drifts of three feet or more causing numerous accidents. There were no reports from Clinton County of property damage, injuries, or deaths because of this event.

Frost/Freeze Event, April 6, 2007:

Farmers across the Ohio Valley suffered crop losses from an unseasonably sudden drop in temperatures to the low 20s, in April 2007 after an abnormally warm March encouraged them to plant early. The state initially estimated almost 17 million in crop damage across 31 Ohio counties, with Clinton County reporting $540,000 in crop damage from this event. No injuries or deaths were reported.

Ice Storm Event, February 13, 2007:

Snowfall across southern Ohio reached one to five inches before warm temperatures moving in from the south turned snow to freezing rain and sleet. Ice accumulated between 0.5 to 1.0 inches on

structures, trees, and powerlines leading to significant damage from numerous downed trees and powerlines, power outages, and the collapse of a gas station canopy in Wilmington. However, no property damage was reported in Clinton County. Additionally, no injuries or deaths were reported for this event.

Winter Storm Event, March 19, 1996:

The interaction of a warm low pressure and unseasonably cold air from Canada combined with other weather conditions to create an intense winter storm with heavy, wet snow, sleet, and freezing rain across the Ohio Valley on March 19, 1996. Wind gusts of up to 40 MPH created snow drifts and low visibility, mimicking blizzard conditions. The heavy snow and sleet accumulated on highways causing numerous accidents, and on trees and powerlines knocking them down and causing power outages for over 10,000 customers in the Cincinnati area. There were no reports from Clinton County of property damage, injuries or deaths due to this event.

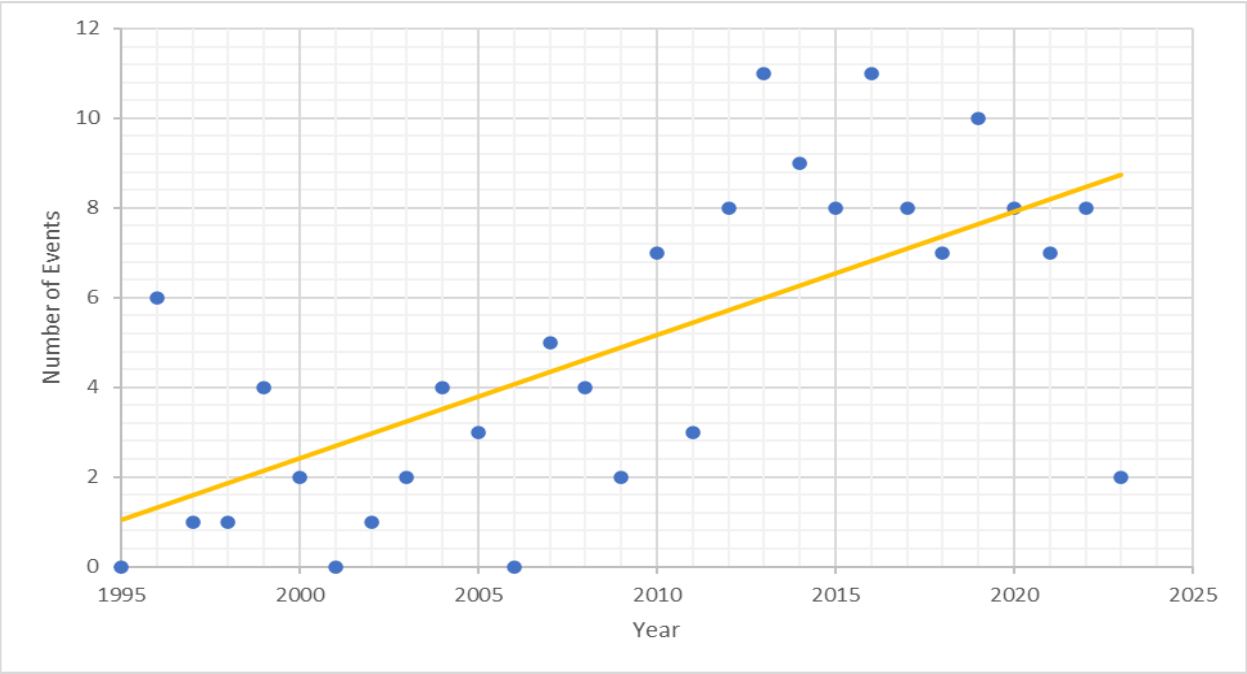
Winter Storm Event, January 6-8, 1996:

The January 1996 blizzard developed from a low-pressure system in the Gulf of Mexico and moved north up the East Coast dropping snow, sleet, and freezing rain over the region causing auto, air, and train traffic delays and power outages. The worst effects in Ohio were along the Ohio River and the I-70 corridor as wind gusts whipped up the dry, powdery snow into whiteout conditions. The weight of snow from this event, mixed with another snowstorm earlier in the week, caused the collapse and partial collapse of roofs of homes and businesses. The event caused a reported $500,000 in property damage in Clinton County, and $500,000,000 across the eastern U.S. No reports of injuries or deaths were reported in Clinton County from this event.

Probability

According to the NCEI, there have been a total of 142 severe winter storm events reported in Clinton County from January of 1995 to December 2023, with total losses amounting to $525,000 in property damage and $540,000 in crop damage. Averaged over that time period, there were approximately 4.9 winter storm events annually with average annual damage total of $36,724. **Figure 4.11.2** shows the number of severe winter events since 1995 has been increasing in Clinton County. According to the Fifth National Climate Assessment, due to the warming climate, extreme winter weather is expected to be less severe and less frequent in Ohio, and heavy snowfall will manifest as heavy rainfall in future years.

Figure 4.11.2: Severe Winter Weather Probability



Source: NOAA NCEI

Vulnerability Assessment

Infrastructure Impact

Winter storms can cause damage to overhead utilities. Wires can collapse under the weight of accumulated snow and ice leading to disruption in communication and power supply for days. Debris can block roadways or damage property as tree limbs can also collapse under the weight of accumulated snow and ice. Water pipes can freeze under extremely low temperatures that may accompany severe winter storms. Roads and sidewalks can be blocked by the accumulation of snow and can ice over. Bridges and overpasses are particularly dangerous because they freeze before other surfaces. Heavy snow fall and accumulation can cause business and private homes to have partial or full roof collapses. The State of Ohio Hazard Mitigation Plan 2024 estimates the annual probability of 5.8 severe winter storms annually for Clinton County.

Population Impact

All residents of Clinton County are expected to be affected by severe winter storms. Infants, older adults, sick people, and pets are more vulnerable to injuries and health conditions related to exposure to heavy snow, ice, and lasting extreme cold temperatures. It is advisable to equip vulnerable populations with indoor easy-to-read thermometers and heating devices in locations where they are highly visible.

According to FEMA's National Risk Index, Clinton County was scored a 38.2 or "very low" risk from the negative impacts of natural hazards, based on a relatively moderate social vulnerability, very low expected annual loss, and very high community resilience, compared to all other counties in the U.S. The risk for residents of Clinton County for individual hazard events associated with severe winter weather are as follows: 44.1 ("relatively low") for cold wave, 91.2 ("relatively high") for ice storm, and 69.4 ("relatively moderate") for winter weather events. The index also calculates an expected annual loss of $ 40,187 due to cold wave, $649,195 due to ice storm, and $112,706 due to winter weather events, with 0.4, 1.2, and 3.4 events occurring per year, respectively.

Property Damage

Property can be damaged by accumulated snow and ice, debris, and falling trees and utility poles. 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. The State of Ohio Hazard Mitigation Plan 2024 estimates potential annual losses caused by winter storms in Clinton County to be $124,564.

Property owners should weatherproof their homes and buildings and conduct regular inspections to eliminate impacts from extreme weather conditions. The Federal Emergency Management Agency (FEMA) suggests that individuals with damaged property should contact their insurance company and take photos of any damage. If individuals are uninsured or underinsured, they should seek assistance by visiting www.DisasterAssistance.gov.

Loss of Life

There were no reported deaths in Clinton County from severe winter events between January 1995 and December 2023. Most common causes of death from winter events are vehicular accidents from iced-over and dangerous roads, frostbite or hypothermia from prolonged exposure to cold, heart attacks from heavy snow shoveling, and carbon monoxide poisoning due to toxic fumes from heating sources.

A few ways to prepare and protect from extreme winter weather conditions include, but are not limited to, staying indoors during dangerous cold events, dressing warmly when outside, staying off icy and dangerous roads, equipping vehicles with an emergency supply kit, preparing for power outages and using heating devices intended for indoor use only, staying updated about emergency information and alerts, seeking medical assistance on signs of hypothermia or frostbite, and checking on neighbors.

Economic Losses

Economic losses can occur from businesses shutting down for potentially long periods of time, structural damage, and death and injury. Economic activity can be completely halted during winter storms including transportation of goods and people. Electricity outages may lead to spoiled goods. Since winter storms occur during the winter season, damage to crops is unlikely but possible. Damaged buildings and pipes, fallen trees and power lines, and costs to repair damages and remove snow further impact the economy of cities and towns. Additionally, deaths and injuries can lead to economic losses for a community. **Tables 4.11.3 - 4.11.5** show the total value of economic impacts expected in Clinton County from winter weather events.

Expected annual loss (EAL) rates, calculated by FEMA, identify the total value of loss expected each year for a particular community, in this case the census tracts for Clinton County. Expected losses are assessed for buildings, population ($11.6 million for each fatality or 10 injuries), and agriculture per census tract. The tables below show the 10 census tracts in Clinton County by order of the highest total EAL from severe winter events to the lowest, for cold wave, ice storm, and winter weather events. The EAL Total column combines the buildings, population, and agricultural losses for each census tract.

Table 4.11.3: Structure and Population Vulnerability from Cold Wave

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39027965100	$274	$281	$9,349	$9,904
39027964400	$413	$341	$8,754	$9,508
39027965000	$196	$259	$6,143	$6,598

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39027964300	$165	$243	$4,625	$5,033
39027964800	$210	$320	$3,125	$3,655
39027964700	$428	$379	$1,077	$1,884
39027964900	$208	$331	$1,119	$1,658
39027964502	$158	$196	$515	$869
39027964501	$134	$221	$408	$763
39027964600	$124	$190	$0	$314
Grand Total	**$2,310**	**$2,761**	**$35,115**	**$40,186**

Source: FEMA National Risk Index

Table 4.11.4: Structure and Population Vulnerability from Ice Storm

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39027964700	$115,574	$3,565	$0	$119,1398
39027964400	$111,403	$3,205	$0	$114,608
39027965100	$73,962	$2,641	$0	$76,603
39027964800	$56,642	$3,013	$0	$59,655
39027964900	$56,046	$3,111	$0	$59,157
39027965000	$52,865	$2,431	$0	$55,296
39027964300	$44,507	$2,283	$0	$46,790
39027964502	$42,750	$1,846	$0	$44,596
39027964501	$36,139	$2,078	$0	$38,217
39027964600	$33,344	$1,789	$0	$35,133
Grand Total	**$623,232**	**$25,962**	**$0**	**$649,194**

Source: FEMA National Risk Index

Table 4.11.5: Structure and Population Vulnerability from Winter Weather

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39027964700	$13,165	$5,656	$16	$18,837
39027964400	$12,690	$5,084	$132	$17,906
39027965100	$8,425	$4,189	$141	$12,755
39027964900	$6,384	$4,934	$17	$11,335
39027964800	$6,452	$4,779	$47	$11,278

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39027965000	$6,022	$3,857	$92	$9,971
39027964300	$5,070	$3,622	$70	$8,762
39027964502	$4,870	$2,928	$8	$7,806
39027964501	$4,117	$3,296	$6	$7,419
39027964600	$3,798	$2,838	$0	$6,636
Grand Total	**$70,993**	**$41,183**	**$529**	**$112,705**

Source: FEMA National Risk Index

Future Trends

Land Use and Development Trends

Winter storms can occur anywhere bringing an entire community or region to a standstill, including commuter and emergency transportation and medical services. Any development that has occurred since the adoption of the 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.

In 2023, Clinton County authorized 101 new residential units at a total value of $25,454,000. Though there are more buildings slated for construction, Clinton County's population has decreased 80 individuals from 2020 to 2023. The decline is set to continue such that by 2030 the population will lose an additional 1,343 people (3.2 percent). More buildings but less people may potentially mean more property loss but less population vulnerability.

Building design and construction is also impacted by the amount of snowfall. Areas that receive high snowfall should have buildings designed to withstand the weight of the snow to avoid sagging, cracking, and collapsing roofs. On the other hand, snow is a natural insulator, and snow accumulated on rooftops helps hold heat in buildings and, consequently, reduces heating costs.

It is important to maintain consistency between emergency planning, financial plans and budgets, and development planning. Zoning codes should ensure that there is adequate greenspace in existing and new developments to foster drainage and offers space to pile cleared snow. Locating emergency facilities, and partnering with emergency organizations during the planning process, will help develop improved contingency responses in cases where emergency transportation and services are cut off during an extreme weather event.

Shifting Weather Patterns and Environmental Trends

Due to shifting weather patterns, the average Midwest air temperature increased by more than 1.5 degrees Fahrenheit between 1900 and 2010. In recent years, however, warming has increased three times as quickly between 1980 and 2010. By the end of 2030, Ohio's climate may trend towards the climate of Southern Illinois.

4.12 Terrorism

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)" (Source: FBI). 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, terrorism (biological), and terrorism (chemical). 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 and 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, and circulatory system, 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.

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.

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 malfunction, causing additional hazards. Cyberterrorism may also include online wire fraud, which is often targeted at the elderly. This abusive practice often extorts the elderly and results in economic losses.
- **Agroterrorism**: Agroterrorism is a viable primary aspiration for terrorists, as agriculture is the largest single sector in the U.S. 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.
- **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 can cause 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 several 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.

History

There have been no reported terrorism events in Clinton 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 Clinton County, local officials have determined that the risk of such an incident occurring in Clinton County exists. The Homeland Security Unit in the Clinton County Sheriff's Office serves as the primary division responsible for domestic and/or foreign security issues serving as a liaison to other state and local organizations.

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 2,596,947 total attacks in 2021 versus the 470,029 attacks in 2016. The total estimated cost of cybercrime in 2021 was $6 trillion globally.

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. Cyberterrorism has 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 Clinton 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 impacts 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 Clinton 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 Clinton County. It is estimated that cybercrime will cost $10.5 trillion globally.

Transportation networks, such as air transportation, can be shut down because 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 Clinton County as well.

Future Trends

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.

4.13 Tornadoes and Severe Wind

Description

FEMA defines a tornado as "a violently rotating column of air extending from a thunderstorm to the ground." Tornadoes can generate wind speeds greater than 250 miles per hour. Tornado paths can be as large as one mile wide and 50 miles long. Nationally, an average of 800 tornadoes are 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, a dangerous type of thunderstorm which form from rotating thunderstorms, can cause the most destructive type of tornado.

Tornado Warnings are issued by the Wilmington, Ohio, Forecast Office 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 the communities 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 supercell 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).

Severe weather events 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.

The NWS can issue various types of wind advisories and warnings. A **Wind Advisory** is issued when sustained winds of 31 to 39 MPH are reached for an hour or more and/or if there are wind gusts of 46 to 57 MPH for any duration. A **High Wind Watch** indicates that sustained, strong winds are possible, and outdoor items should be secured. People should modify plans, so they are not caught outside. Additionally, a **High Wind Warning** indicates that sustained, strong winds (40 MPH or greater) with even stronger gusts (greater than 58 MPH) are happening. People should seek shelter, and those driving should keep both hands on the wheel and slow down. An **Extreme Wind Warning** is issued for surface winds of 115 MPH or greater associated with non-convective, downslope, derecho (not associated with a tornado), or sustained hurricane winds that are expected to occur within one hour.

Location

Severe wind events and tornadoes can occur anywhere in Clinton County. All areas and jurisdictions should be considered at risk for these events.

Extent

Tornadoes are measured by the amount of damage caused by a certain wind speed, assuming greater wind speeds will result in greater damage. The original Fujita Tornado Damage Scale (F-scale) was developed in 1971 without much consideration to a building or 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 retains with the original F-scale's F0 through F5 wind 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 through 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 along with the type of

construction affected within the tornado path will generally determine the EF scale rating given to the tornado. Table 4.13.1 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 actual measurements.

Neither NOAA or NWS have re-evaluated the historical tornado data using the enhanced scale; therefore, this assessment and subsequent plans will reference both scales until a complete switchover has occurred.

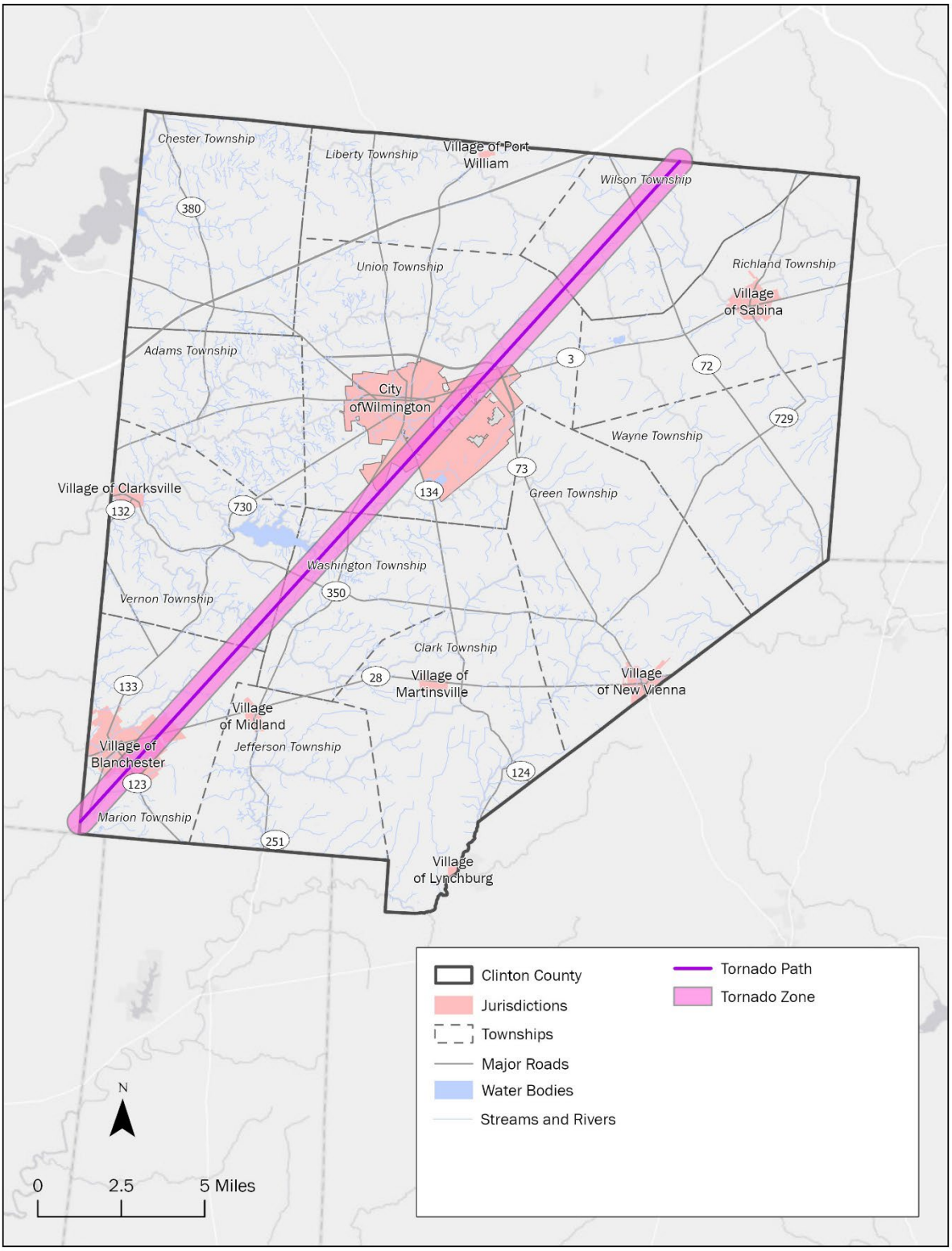
Table 4.13.1: Fujita and Enhanced Fujita Scale Classifications

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

Figure 4.13.2 simulates an extremely destructive, worst-case scenario EF5 tornado and its impacts on Clinton County assets and infrastructure.

Figure 4.13.2: Worst Case Tornado Scenario



History

There have been 15 tornado events, one event that resulted in four tornadoes, one that resulted in two tornadoes, and the other 13 events resulted in one tornado each in Clinton County between January 1995 and December 2023. There have been 269 High-, Strong-, and Thunderstorm-Wind events in Clinton County between January 1995 and December 2023. Clinton County has had one Major Disaster Declaration for Severe Windstorm Associated with Tropical Depression Ike in 2009. The tornadoes caused an estimated $260,000 in property damage and $16,000 in crop damage. The high-, strong-, and thunderstorm-wind events caused an estimated $7.8 million in property damage and $20,000 in crop damage. No deaths or injuries were reported. Several of the most damaging events, and events with major disaster declarations are described in more detail below.

An EF0 Tornado in Clinton County, March 23, 2012:

An EF0 tornado touched down in Clinton County in the Village of Clarksville on May 23, 2012. The tornado caused minor damage to numerous structures along 2nd Street. Many roofs, trees, fences, and windows were damaged. Winds were estimated at 70 miles per hour (mph). Clinton County reported approximately $50,000 in damage. No deaths or injuries were reported in the County.

An EF0 Tornado in Clinton County, October 26, 2010:

An EF0 tornado touched down in Clinton County on October 26, 2010, and traveled for 3.81 miles into Fayette County before lifting. The tornado was 200 yards wide and had winds of 85 mph. The tornado damaged a portion of a metal roof, four utility poles, several trees, and a horse trailer. Clinton County reported approximately $70,000 in property damage. No deaths or injuries were reported in the County.

A Major Disaster Declaration for Severe Windstorm associated with Tropical Depression Ike, September 14, 2008:

The remnants of Hurricane Ike moved northeast with a frontal boundary across the lower Ohio Valley in September 2008. Wind gusts of up to 70 mph were observed, causing significant damage and widespread power outages. Sustained winds were observed up to 50 mph and lasted for several hours. A Major Disaster Declaration (DR-1805-OH) was declared on October 24, 2008, offering public assistance to 33 counties, including Clinton County. The County reported approximately $5.1 million in property damage. No deaths of injuries were reported in Clinton County.

Thunderstorm Wind Event in Clinton County, April 9, 1999:

A thunderstorm moved through southwest Clinton County near the Village of Clarksville on April 9, 1999. The storm brought severe wind and tornadoes. Twenty properties were damaged and three homes and one business were destroyed. Clinton County reported approximately $1 million in property damage. No deaths or injuries were reported in the County.

Probability

There were 15 tornado events (19 tornadoes) in Clinton County between January 1995 and December 2023 resulting in a total of $260,000 in property damage and $16,000 in crop damage. There were 269 strong-, high-, and thunderstorm-wind events between January 1995 and December 2023, resulting in a total of $7.8 million in property damage and $20,000 in crop damage. On average, which is approximately 0.5 tornado events and nine wind events per year, with an average of $9,517 in property and crop damage for tornadoes and $270,831 in property and crop damage for wind events.

Although it is difficult to predict future tornado activity, a study completed in 2018 on spatial trends of tornadoes saw an eastward shift in tornado frequency. Two other studies (2015 and 2016) showed an increase in tornado frequency in the eastern United States and a decrease in tornado activity in central United States. The study published in 2016 on spatial redistribution of tornado activity stated that there is a documented increase in hazardous conductive weather (HCW) in the lower Ohio valley

regions. The studies do note that the number of tornadoes produced from a single storm are increasing. For instance, in 2020 there were 20 documented tornadoes in Ohio, seven tornadoes from one storm and five tornadoes from another.

Vulnerability Assessment

Infrastructure Impact

Above-ground infrastructure can be damaged by tornadoes. Debris lofted airborne by tornadoes as well as fallen trees can cause damage to buildings and infrastructure and lead to road closures. 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. Residents in mobile home parks are particularly vulnerable and should have a plan in place.

For social vulnerability, according to the National Risk Index, tornadoes and strong winds have a score of 58.2 ("relatively low") and 61.2 ("relatively moderate") in Clinton County. The index indicates an expected annual loss of $479,000 due to tornadoes and $1.4 million due to strong wind, with 2.2 and 0.2 events occurring per year, respectively.

Property Damage

Tornadoes that have occurred in Clinton County are generally weaker, rated EF-2 or lower; however, even weaker tornadoes can cause significant damage to property. In the last 29 years the property damage in Clinton County has included homes, businesses, mobile homes, roofs, windows, siding, powerlines, and tree damage.

Wind damage in Clinton County has included homes, businesses, roofs, siding, trees, and powerlines. Most of the wind events cause little to no damage, however, one event caused $5.1 million in property damage.

Loss of Life

Loss of life and injuries are always possible during tornadoes and strong wind events. Falling debris is the main cause of death in a tornado, along with becoming airborne.

Economic Losses

Tornadoes and strong wind have the potential to damage infrastructure, resulting in the economic burden of clean up and repairs, as well as the economic loss from deaths and injuries. Expected annual loss (EAL) rates, calculated by FEMA, identify the total value of loss expected each year for a particular community, in this case Clinton County census tracts. Expected losses for buildings, population ($11.6 million for each fatality or 10 injuries), and agriculture per census tract from tornadoes and strong wind are recorded in **Tables 4.13.3 and Table 4.13.4** below. The tables show the census tracts for Clinton County, listing them from highest total EAL to lowest.

Table 4.13.3: Structure and Population Vulnerability from Tornadoes

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39027964400	$195,102	$42,434	$261	$237,797
39027964700	$190,779	$43,408	$37	$234,224
39027965100	$121,967	$32,075	$256	$154,298
39027964900	$105,212	$44,102	$35	$149,349

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39027964800	$101,935	$41,070	$107	$143,112
39027965000	$87,610	$29,731	$174	$117,515
39027964300	$73,374	$27,727	$125	$101,226
39027964502	$70,570	$22,417	$15	$93,002
39027964501	$59,598	$25,236	$14	$84,848
39027964600	$54,966	$21,722	$0	$76,688
Grand Total	**$1,061,113**	**$329,922**	**$1,024**	**$1,392,059**

Source: FEMA National Risk Index

Table 4.13.4: Structure and Population Vulnerability from Strong Winds

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39027964700	$73,524	$10,897	$136	$84,557
39027964400	$70,606	$9,751	$1,103	$81,460
39027965100	$47,055	$8,072	$1,181	$56,308
39027964800	$35,834	$9,152	$393	$45,379
39027964900	$35,359	$9,429	$140	$44,928
39027965000	$33,623	$7,429	$776	$41,828
39027964300	$28,316	$6,979	$584	$35,879
39027964502	$27,198	$5,642	$65	$32,905
39027964501	$22,992	$6,351	$52	$29,395
39027964600	$21,213	$5,468	$0	$26,681
Grand Total	**$395,720**	**$79,170**	**$4,430**	**$479,320**

Source: FEMA National Risk Index

Future Trends

Land Use and Development Trends

Tornadoes can occur anywhere. Any development that has occurred since the previous plan and any future development has the potential to be impacted by tornadoes. While the location of development will not be impacted by tornadoes, shelters should be installed in high occupancy buildings, parks, fairs and festivals, mobile home parks, and similar developments.

In 2023, Clinton County authorized 101 new residential units at a total value of $25,454,000. Though there are more buildings slated for construction, Clinton County's population has decreased 80 individuals from 2020 to 2023. The decline is set to continue such that by 2030 the population will lose an additional 1,343 people (3.2 percent). More buildings but less people may potentially mean more property loss but less population vulnerability. However, with state-of-the-art engineering there is very little potential damage.

The vulnerability of structures and populations to tornado damage is related to the number and age of buildings and population density, such that older buildings with more people increases vulnerability, and fewer buildings and people reduces vulnerability. Much of Clinton County is nonresidential including rangeland, forest, cropland and pasture, with only eight percent either residential or industrial / commercial, reducing the risk of much of the County to tornado damage.

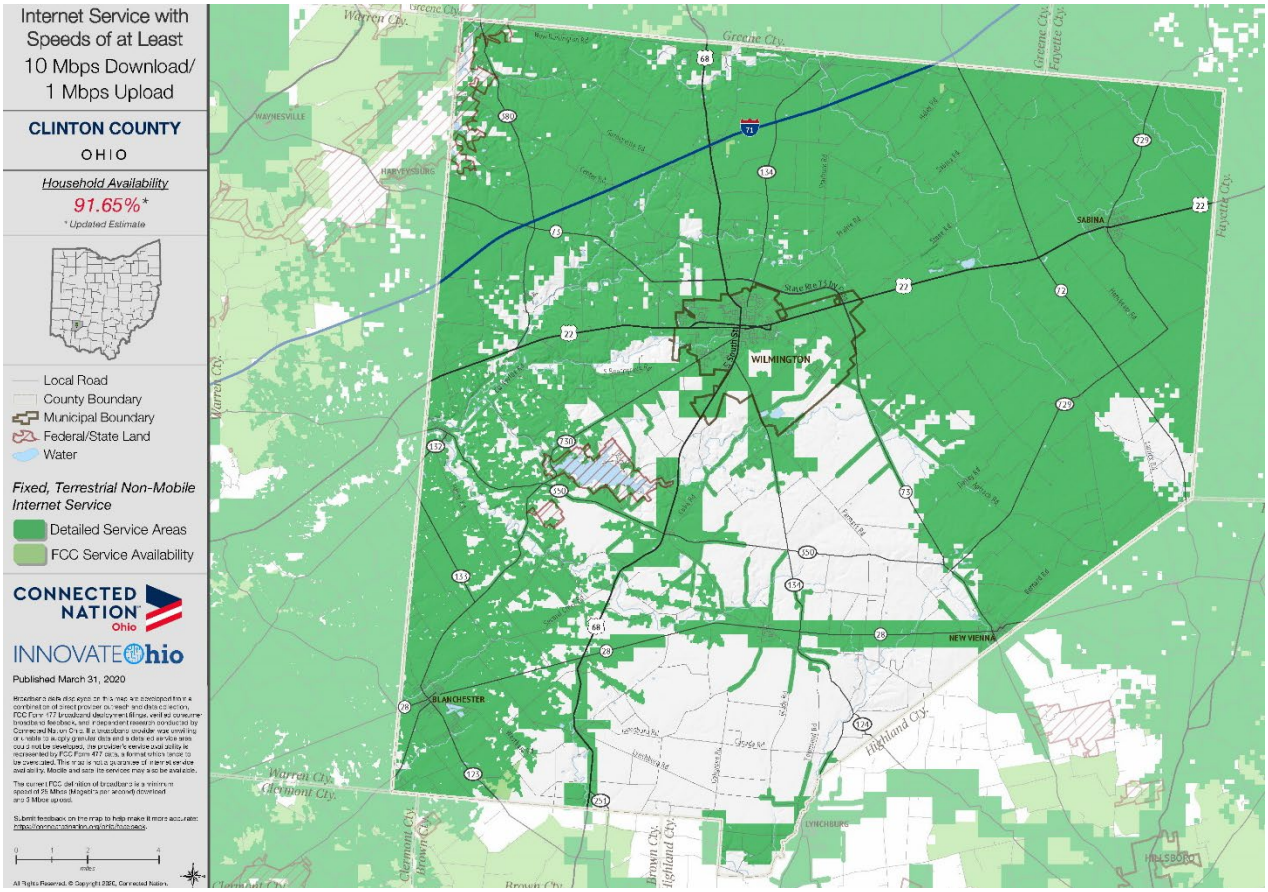
4.14 Utility Failure

Description

Utility failure refers to the loss of electric power (blackouts), water, sewage, natural gas or other utilities. These are primarily caused by system overload or lack of updated infrastructure. Power failures are generally caused by natural events such as severe storms, ice storms, tornadoes, and high winds. These power failures are common and cannot easily be predicted due to the random nature of storms; however, updates to infrastructure can reduce the amount and frequency of these power outages.

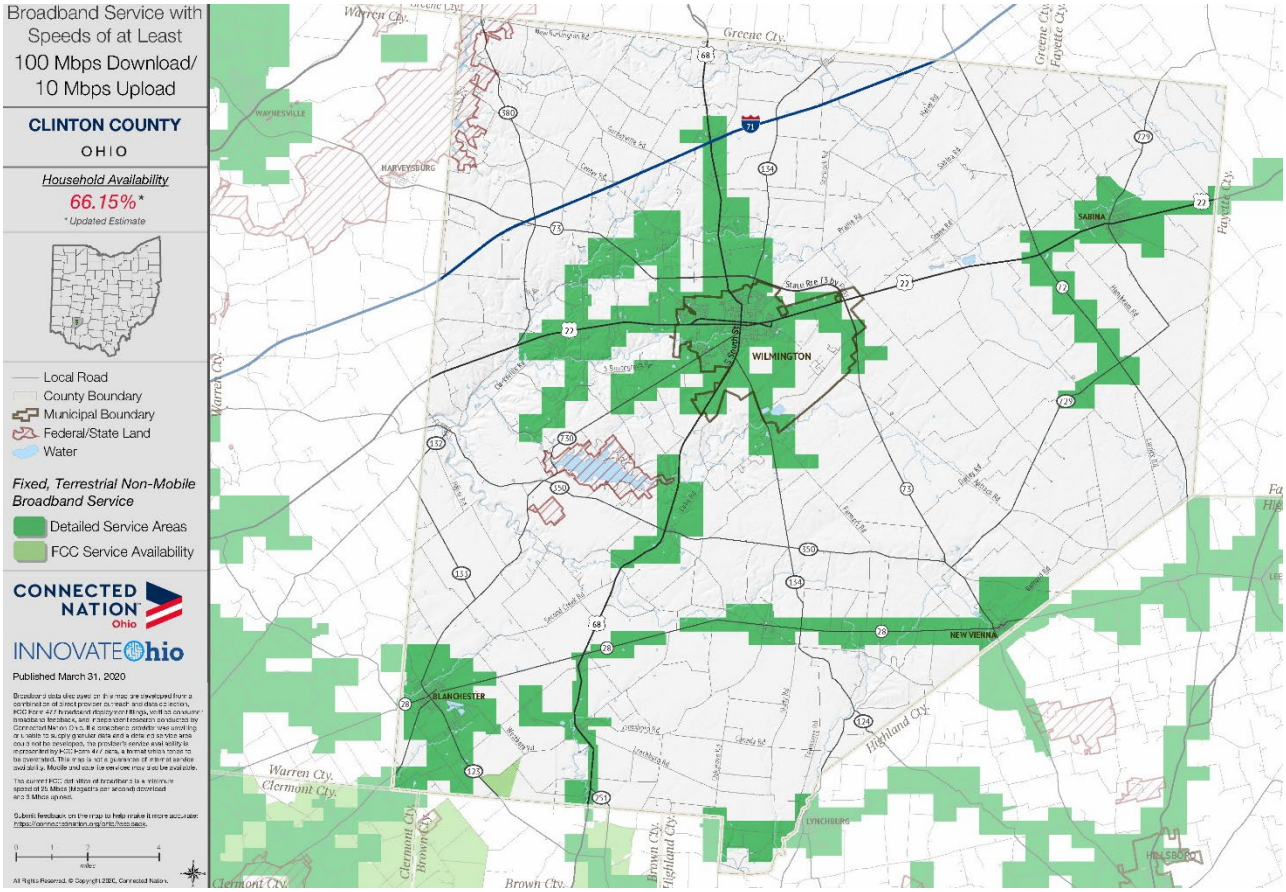
Residential internet providers include Spectrum and Frontier Communications. **Figures 4.14.1 and 4.14.2**, below, show the internet coverage in Clinton County. According to these images, which were provided by Connected Nation Ohio, 91.65 percent of Clinton County has access to internet service with speeds of at least 10 Mbps download and 1 Mbps upload. Additionally, only 66.11 percent of the County has broadband service with speeds of at least 100 Mbps download and 10 Mbps upload.

Figure 4.14.1: Internet Service with Speeds of at Least 10 Mbps Download/1 Mbps Upload



Source: Connected Nation Ohio

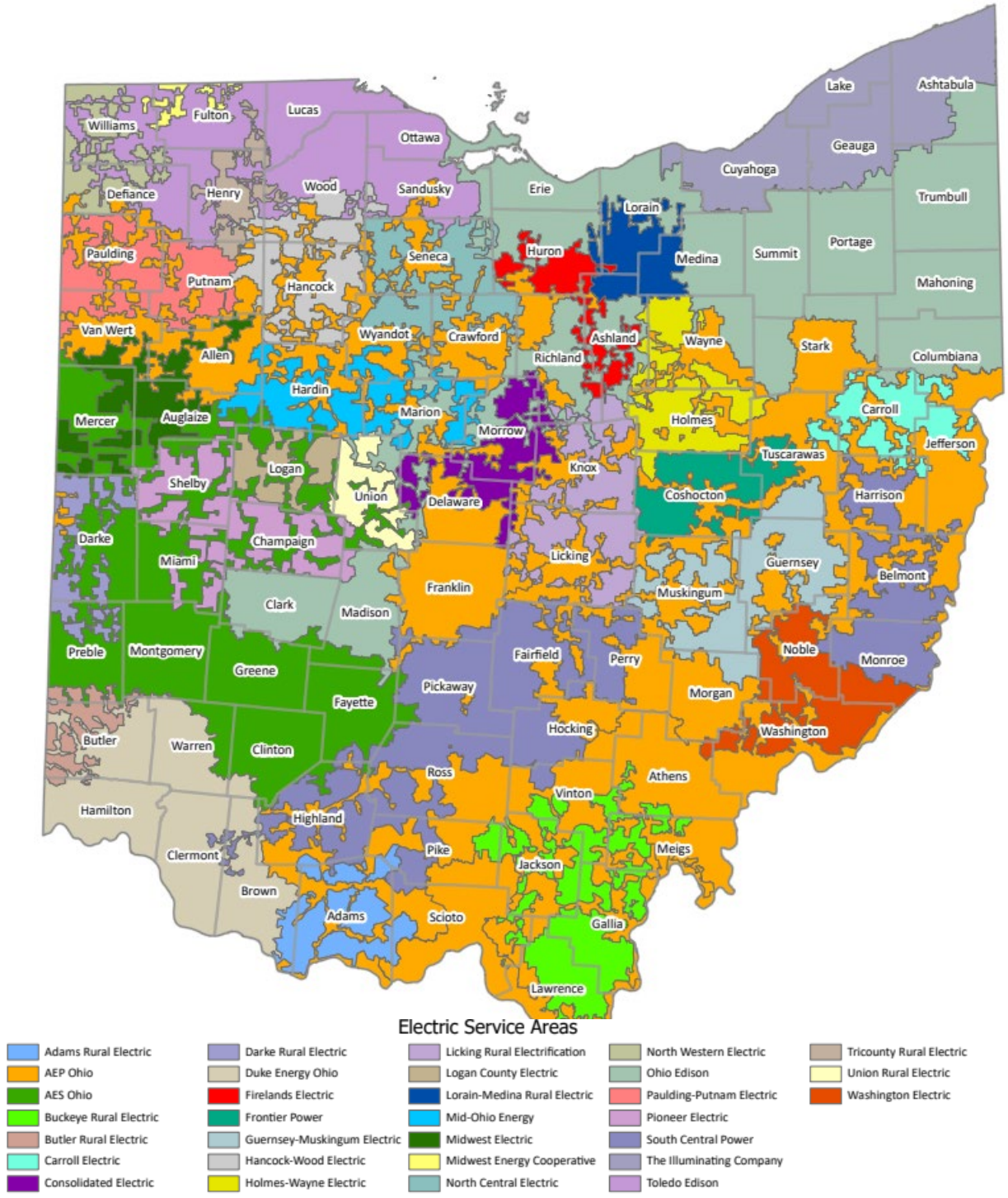
Figure 4.14.2: Internet Service with Speeds of at least 100 Mbps Download/10 Mbps Upload



Source: Connected Nation Ohio

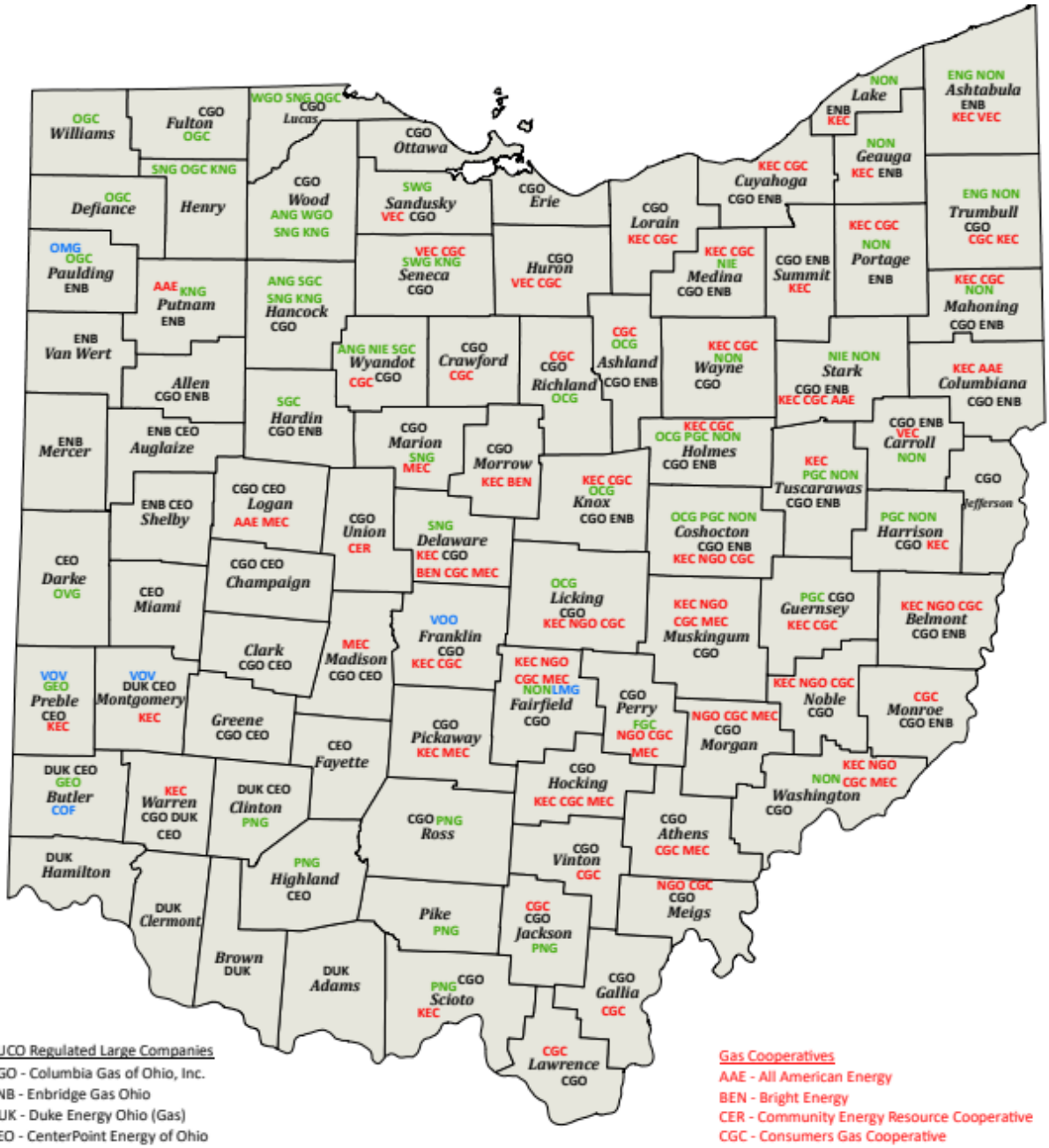
Clinton County residents receive electric services from American Electric Power (AEP), and Duke Energy (**Figure 4.14.3**). The Village of Blanchester then redistributes the power as a municipality under the Board of Public Affairs (BPA) to their residents. Residents are able to obtain services through the village of Blanchester's Board of Public Affairs. Natural gas is provided by Duke Energy Ohio (Gas), CenterPoint Energy of Ohio, Pike Natural Gas Company (**Figure 4.14.4**).

Figure 4.14.3: Ohio Electric Service Areas



Source: Ohio Public Utilities Commission

Figure 4.14.4: Ohio Natural Gas Service Providers



PUCO Regulated Large Companies
CGO - Columbia Gas of Ohio, Inc.
ENB - Enbridge Gas Ohio
DUK - Duke Energy Ohio (Gas)
CEO - CenterPoint Energy of Ohio

PUCO Regulated Small Companies
ANG - Arlington Natural Gas Company
ENG - Eastern Natural Gas
FGC - Foraker Gas Company
GEO - Glenwood Energy of Oxford, Inc.
KNG - KNG Energy, Inc.
NON - Northeast Ohio Natural Gas Corporation
NIE - Northern Industrial Energy Development
OCG - Ohio Cumberland Gas Company
OGC - Ohio Gas Company
OVG - Ohio Valley Gas Corporation
PGC - Piedmont Gas Company
PNG - Pike Natural Gas Company
SGC - Sheldon Gas Company
SNG - Suburban Natural Gas Company
SWG - Swickard Gas Company
WGO - Waterville Gas and Oil Company

Gas Cooperatives
AAE - All American Energy
BEN - Bright Energy
CER - Community Energy Resource Cooperative
CGC - Consumers Gas Cooperative
KEC - Knox Energy Cooperative Association, Inc.
MEC - Madison Energy Cooperative Association, Inc.
NGO - National Gas and Oil Cooperative
VEC - Village Energy Cooperative Association, Inc.

Municipal Gas Systems
COF - City of Hamilton
LMG - Lancaster Municipal Gas
OMG - Oakwood Municipal Gas
VOO - Village of Obetz
VOV - Village of Verona
VOW - Village of Williamsport

Notes: Data on operations by county is from the PUCO Gas Pipeline Safety database.

Source: Ohio Public Utilities Commission

According to the Ohio Environmental Protection Agency there are a total of 12 water systems for drinking water and ground water in Clinton County, six of which are still active (Table 4.14.5). Water services are provided by jurisdictional water departments, as well as the Western Water Company. Cowan Creek and Caesar Creek Lake are the two primary sources of water for Clinton County. The City of Wilmington also maintains an auxiliary connection with the Western Water Company to supply the City's outlying customers, as necessary, during main break repairs. Some residents in the County also utilize water haulers to provide drinking water.

The table below has the water system number, water system name, type of water system (Non-public and Public, with further descriptions), status (Active or Inactive), the county served, and the primary source (where the water comes from). If a water system is public, it is categorized into the following types: Community (C) – Serves at least 15 service connections used by year-round residents or regularly serves 25 year-round residents. Non-Transient Non-Community (NTNC) – Serves at least the same 25 non-residential individuals during six months of the year. Transient Non-Community (NC) – Regularly serves at least 25 non-residential individuals (transient) during 60 or more days per year. The primary source water type is either surface water (SW), groundwater (GW), or surface water protection program (SWP). SWP is surface water from protected sources, like rivers, streams, lakes, reservoirs, springs, and groundwater.

Table 4.14.5: Drinking and Ground Water in Clinton County

Water System No.	Water System Name	Type	Status	Principal County Served	Primary Source Water Type
OH1400111	Blanchester Village Pws	C	A	Clinton	SW
OH1400203	Clarksville Village Pws	C	A	Clinton	SWP
OH1432112	East Clinton High School	NTNC	A	Clinton	GW
OH1400815	New Vienna Village	C	A	Clinton	GW
OH1400912	Sabina Village Pws	C	A	Clinton	GW
OH1401211	Wilmington City Pws	C	A	Clinton	SW
OH1435012	Adventure Cove Pws	NC	I	Clinton	GW
OH1434012	Beechwood Acres	NC	I	Clinton	GW
OH1434812	Community Christian Church	NC	I	Clinton	GW
OH1432612	Maple Grove Campground	NC	I	Clinton	GW
OH1400512	Martinsville Village Pws	C	I	Clinton	GW
OH1430712	McCall's Grocery	NC	I	Clinton	GW

Source: Ohio Environmental Protection Agency

Location

Depending on the cause, blackouts can be isolated or countywide. Utility failures can occur in any area where the utility is provided.

Extent

Utility failures due to damaged infrastructure have the potential to impact large areas of the County through the loss of utilities that provide necessary services for the population. Loss of electric or gas can affect household temperatures, which can lead to severe dehydration or possibility of loss of life

if outdoor temperatures are extreme. Additionally, utility failure affecting the water service has the potential to lead to contamination of the water supply.

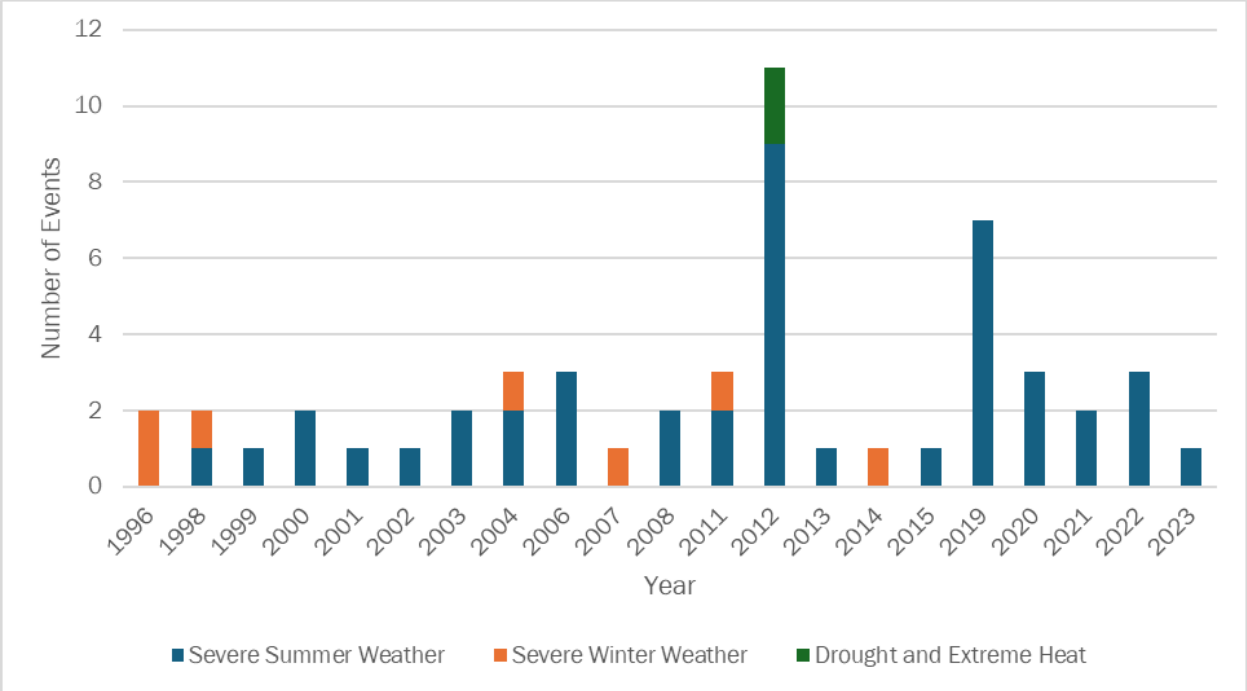
Furthermore, lack of utility access during a larger hazard event such as epidemic/pandemic, as seen with the COVID-19 pandemic, can result in an inability to perform work duties remotely, which has the potential to have negative economic impacts at both the individual and family levels, as well as at a larger scale.

History

Numerous utility failures have occurred within Clinton County in the form of power outages due to severe storms, severe winter weather, or other natural hazards. Events resulting in power outages can be referenced in the Risk Assessment sections of the appropriate hazard. **Table 4.14.6** below shows the number of events (53 in total) between 1995 and 2023 that have resulted in a power loss. In 2012, there were 11 events that resulted in a power loss. Severe Summer Weather is the leading cause of power loss in Clinton County. It should be noted that outages for individuals that have power through the Village of Blanchester BPA will not be included in the table as that data is not available through standard reporting means.

A notable example occurred on August 25, 2023, when a power outage in the Village of Blanchester during an active Heat Advisory impacted over 3,000 residents and multiple critical facilities, including two long-term care centers. These facilities were not equipped with HVAC-capable backup generators, resulting in rising indoor temperatures and elevated risk to medically vulnerable residents. One resident required hospital transport for evaluation. In another facility, the backup generator failed due to overheating. Although the event did not result in loss of life, it highlighted a significant gap in emergency power capacity for cooling systems in healthcare and assisted living settings. The incident prompted local review of facility preparedness and underscores the need to reassess utility failure contingencies during extreme weather events.

Table 4.14.6: Power Loss by Weather Event in Clinton County



Source: NCEI

Probability

As there are no previous indications that a widespread utility failure has occurred in Clinton County, there is less than one percent chance of a widespread utility failure within the County. However, it is likely that utility failures in the form of power outages will occur throughout any given year due to severe storms, ice storms, and other natural hazards. Probability of these natural hazards can be found in their respective sections.

Vulnerability Assessment

Infrastructure Impact

In the event of a utility failure caused by downed power lines, roads may be closed. Utility infrastructure may also suffer long-term damage as a result of such an event.

Population Impact

Extensive utility failures can threaten the health and safety of the public. During extreme temperature events, the impacts on residents are heightened. Loss of utilities that provide air conditioning or heat can create a safety hazard, especially for children and older populations. The County and/or communities should have a plan in place for how to notify and assist residents in case of utility failure. The HHS emPOWER Program provides federal data, mapping, and artificial intelligence tools to help communities nationwide at-risk Medicare beneficiaries who rely on electricity-dependent durable medical and assistive equipment and/or devices. Table 4.14.7 shows the type of services that require electricity that if electricity were to be lost would be at risk.

Table 4.14.7: HHS emPOWER Program Power Dependent Devices

Type of Devices	Number At-Risk
Cardiac Devices	33
Ventilators	55
BiPAPs	58
O2 Concentrators	521
Enteral Feeding	45
IV Infusion Pumps	48
Suction Pumps	33
At-Home ESRD Dialysis	44
# Motorized Wheelchairs or Scooters	71
Electric Beds	106
Grand Total	**1,104**

Source: HHS emPOWER Program

Property Damage

Direct damage to property may result directly from downed power lines. Fires may also occur because of downed power lines.

Loss of Life

Loss of life from the loss of electricity can occur. Those who depend on electricity for necessary medical treatment are at risk. Critical facilities such as hospitals and nursing homes should be prepared in the

event of a utility failure, as they manage sensitive populations that may be reliant on utilities. Downed power lines can also lead to unsafe environments with live electric lines that have the potential to lead to loss of life.

Economic Losses

Blackouts are often caused by systems that are aging and deteriorating, and updates to these systems may require additional funds. Economic loss can occur because of reduced commercial activity. Goods that need electricity or other utilities for preservation may also be lost. If widespread blackouts occur, people may not be able to work, and wages or income may be lost as a result.

Future Trends

Land Use and Development Trends

Utility failure can impact any development. All development that has occurred since the previous plan and all development in the future can be impacted by utility failure. To reduce potential power outages, power lines can be buried. This would reduce any potential damage caused by windstorms, downed trees, tornadoes, and snow weight.

4.15 Wildfire

Description

A wildfire is an uncontrolled fire that burns in a natural area of combustible vegetation such as a forest, grassland, or prairie, and typically occurs in rural areas. Non-wilderness fires are uncontrolled burning in residential or commercial development that are out of the scope of this plan. However, it is important to note that non-wilderness fires often accidentally cause wildfires. They can happen at any time or place, and more than half of the wildfires recorded have been started due to human activity. While wildfires can be caused by human activity or a natural phenomenon such as lightning, it is often the weather conditions that determine how much a wildfire grows.

Location

According to the State of Ohio Hazard Mitigation Plan (SOHMP), Clinton County is in Region 2 and falls outside the Ohio Department of Natural Resources (ODNR) Division of Forestry's Forest Fire Protection Area (**Figure 4.15.1**). All but eight counties in Region 2 fall outside the ODNR Division of Forestry wildfire protection area. Region 2 is home to the most developed metropolitan areas and has the highest population density. Due to the urban areas, grasslands and woodlands are not as abundant, reducing the potential for large scale wildfires.

Extent

Several factors can contribute to the escalation of risk for wildfires, including the prevalence of forests and agricultural lands and their proximity to homes, residences, and structures, as well as the distance between fire and emergency management services. In these cases, the presence of fire near structures causes fire departments to shift focus away from fire suppression and toward structure protection.

According to the SOHMP, 99.9 percent of wildfires in Ohio are caused by human action or accident. As such, many wildfires in Ohio burn in proximity to homes and structures. From 2018 to 2022, the main causes of wildfires in Ohio included debris burning, incendiary (arson), equipment, smoking, campfires, children (playing with matches), lightning, and railroad.

History

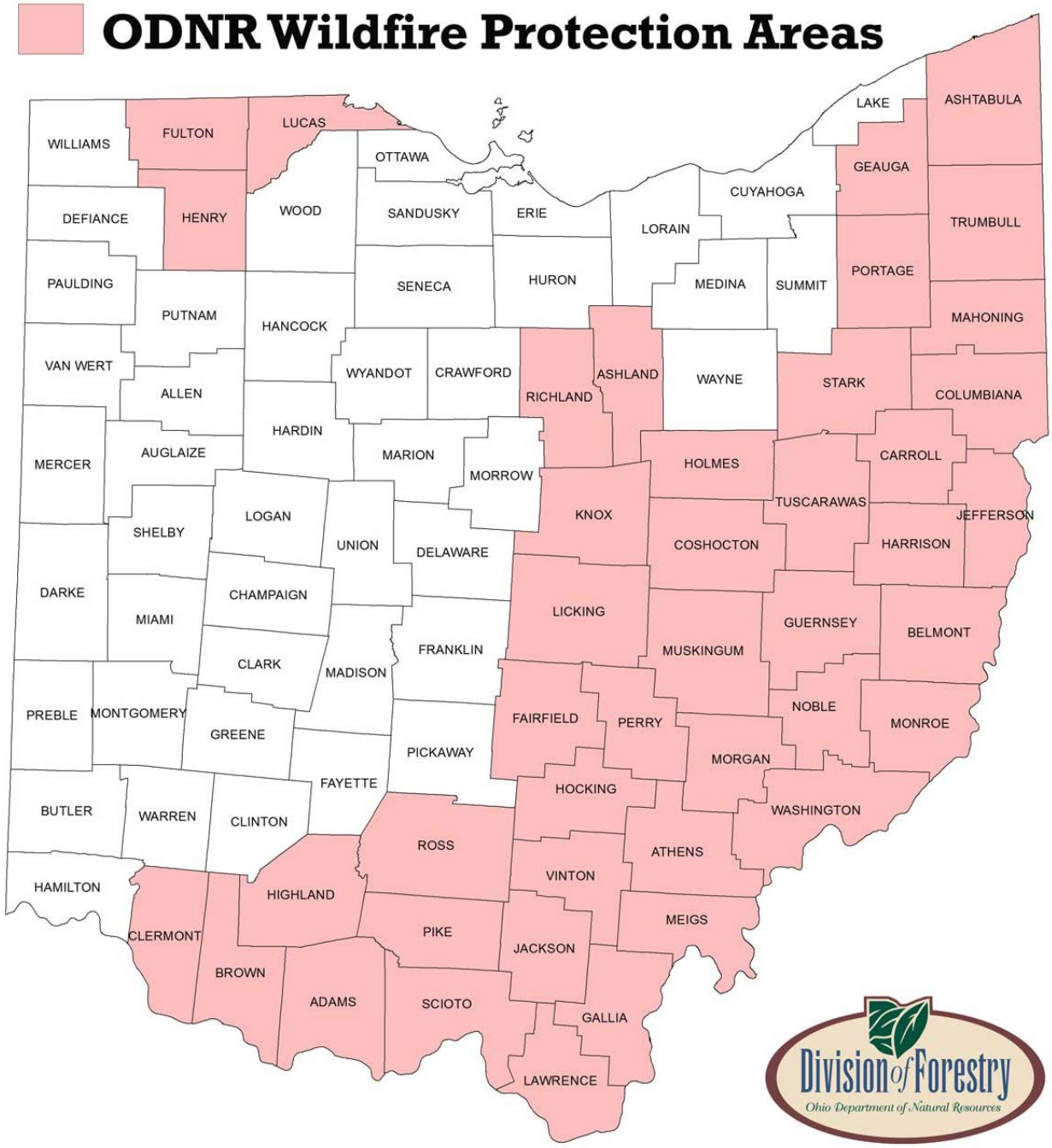
The SOHMP identifies 85 total fire events from 2018 to 2022, with an average of 1.34 acres burned per incident. These events burned a total of 139 acres. There were two structures threatened and one structure destroyed by wildfires. There were no deaths reported, however, there was one injury reported.

Estimating the monetary losses associated with wildfires is difficult because most of these events occur on open land or fields with monetary losses often not being recorded. This lack of data may result in inconsistencies if an analysis was done based on reported monetary loss. As such, acres burned per fire event is a more consistent method of analysis for this hazard.

Probability

According to the State of Ohio Hazard Mitigation Plan, there is a 100 percent probability that a wildfire will occur within any county in any given year. Based on the reported 85 fire events in Clinton County from 2018 to 2022, an average of approximately five fire events is estimated to occur annually in the County. In addition, according to the U.S. EPA, the average total area burned by wildfires has increased since the 1980s, and the record-breaking fires tend to occur during record-breaking warm years.

Figure 4.15.1: Ohio Wildfire Protection Areas



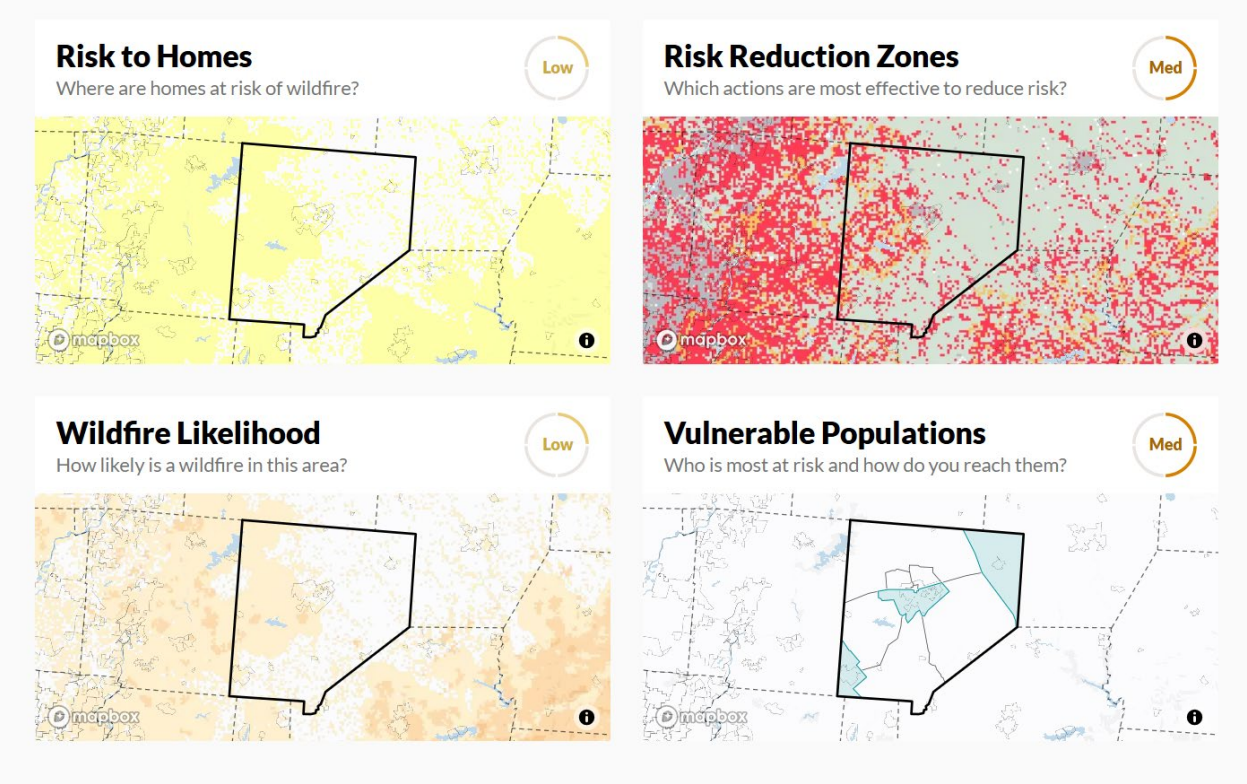
Source: ODNR Ohio Division of Forestry

Vulnerability Assessment

Infrastructure Impact

According to the USDA Forest Service Wildfire Risk to Communities, a free website with interactive maps and charts, Clinton County has a low risk of wildfire damage to homes (**Figure 4.15.2**).

Figure 4.15.2: Wildfire Risk for Clinton County



Source: USDA Forest Wildfire Risk to Communities

Population Impact

If a wildfire occurs within the County, the entire population could be impacted by the loss of homes, infrastructure, and crops. Large portions of Clinton County are used for agriculture, increasing the risk of economic loss to farms in spring, fall, and during drought. A growth in the number of houses in forested areas is expanding the Wildland Urban Interface (WUI), putting more structures within areas of continuous vegetation and increasing the potential for loss. Furthermore, some residents may be more vulnerable because they tend to experience more difficulty preparing for, responding to, and recovering from wildfire. The Vulnerable Populations map in **Figure 4.15.2** identifies areas that have a greater risk (medium) to wildfire. The vulnerable populations are children under the age of five and people who are living below poverty levels.

According to the National Risk Index, calculated by FEMA, Clinton County's risk score for wildfires is 21.1 ("very low") compared to all other U.S. counties, based on its relatively moderate social vulnerability and community resilience, and very low expected annual loss. The index indicates an expected annual loss of $7,600 due to wildfires with a less than 0.001 percent chance of a wildfire event occurring per year.

Property Damage

There were 85 recorded wildfire events between 2018 and 2022 in Clinton County, burning approximately 139 acres. There were two structures threatened and one structure destroyed. It is assumed that the County has experienced some crop damage because of wildfires, however that data was not available. Occasionally, in the event of a wildfire, fire engines belonging to local fire departments can be damaged while suppressing wildfires, although there are no reports of this in Clinton County. Potential economic losses and damage associated with Clinton County for wildfires are recorded in **Table 4.15.3** below.

The table shows the census tracts from highest total EAL to lowest total EAL from wildfires. EAL rates, calculated by FEMA, identify the total value of loss expected each year for a particular community, in this case the census tracts for Clinton County, and are broken down by expected losses for buildings, population ($11.6 million for each fatality or 10 injuries), and agriculture per census tract for wildfires.

Table 4.15.3: Structure and Population Vulnerability from Wildfires

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39027964400	$2,452	$161	$1	$2,614
39027964800	$1,038	$95	$0	$1,133
39027964501	$880	$87	$0	$967
39027964700	$714	$79	$0	$793
39027964502	$551	$32	$0	$583
39027964900	$507	$43	$0	$550
39027965000	$367	$33	$0	$400
39027965100	$291	$21	$0	$312
39027964300	$132	$11	$0	$143
39027964600	$55	$10	$0	$65
Grand Total	**$6,987**	**$572**	**$1**	**$7,560**

Source: FEMA National Risk Index

Loss of Life

Clinton County has no recorded wildfire-related loss of life. There is one recorded injury from wildfires, but more information is not available. Injuries caused by wildfires are not widely publicized, so information is limited. With any wildfire event, there is potential for loss of life. Advanced evacuation warnings can reduce the likelihood of death because of wildfires.

Economic Losses

According to the SOHMP, there are 27 state-owned or state-leased community lifelines (critical facilities) with a relatively low hazard risk. These facilities have a total replacement cost of $12,508,772. There are also four state-owned or state-leased community lifelines with a low hazard risk. These facilities have a total replacement cost of $941,745. No state-owned or state-leased critical facilities were considered to have a relatively moderate, relatively high, or very high-risk rating to wildfires.

Future Trends

Land Use and Development Trends

Communities should monitor areas that are especially susceptible to wildfires and avoid development in such areas. Slight increase in forested and pasture/hay areas can mean slightly more vulnerability to wildfire. Newer structures are being built in rural and wooded lots, expanding the WUI in the County, resulting in increased vulnerability to the structures and inhabitants. New developments in these areas should implement fire protective measures; however, the County hasn't implemented building codes that specifically address wildfire for either incorporated or unincorporated buildings or homes. Additionally, a rise in oil and gas infrastructure in the County further adds to the number of high-value infrastructure at risk from wildfire.

Figures 1.2.1 and 1.2.2 in **Chapter 1** show areas susceptible to drought and heatwaves. New construction should reference the figures and resources outlined in this plan in order to minimize risk of drought and heatwaves, which can increase wildfire spread