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ERIE COUNTY
HAZARD MITIGATION PLAN
FEBRUARY 2026

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1 | Introduction

1.1 Overview

With the 2021 Erie County Hazard Mitigation Plan set to expire in February 2026, Erie 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 Erie County. As such, a Core Planning Committee within Erie County has been established with the goal of developing and implementing the 2026 Erie 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 residents of Erie County.

This 2026 Erie County Hazard Mitigation Plan is a multi-jurisdictional plan which considers the impacts of hazards on incorporated cities and villages and unincorporated townships. Erie 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 the most important to the County and establishes a timeline for the implementation of the actions.

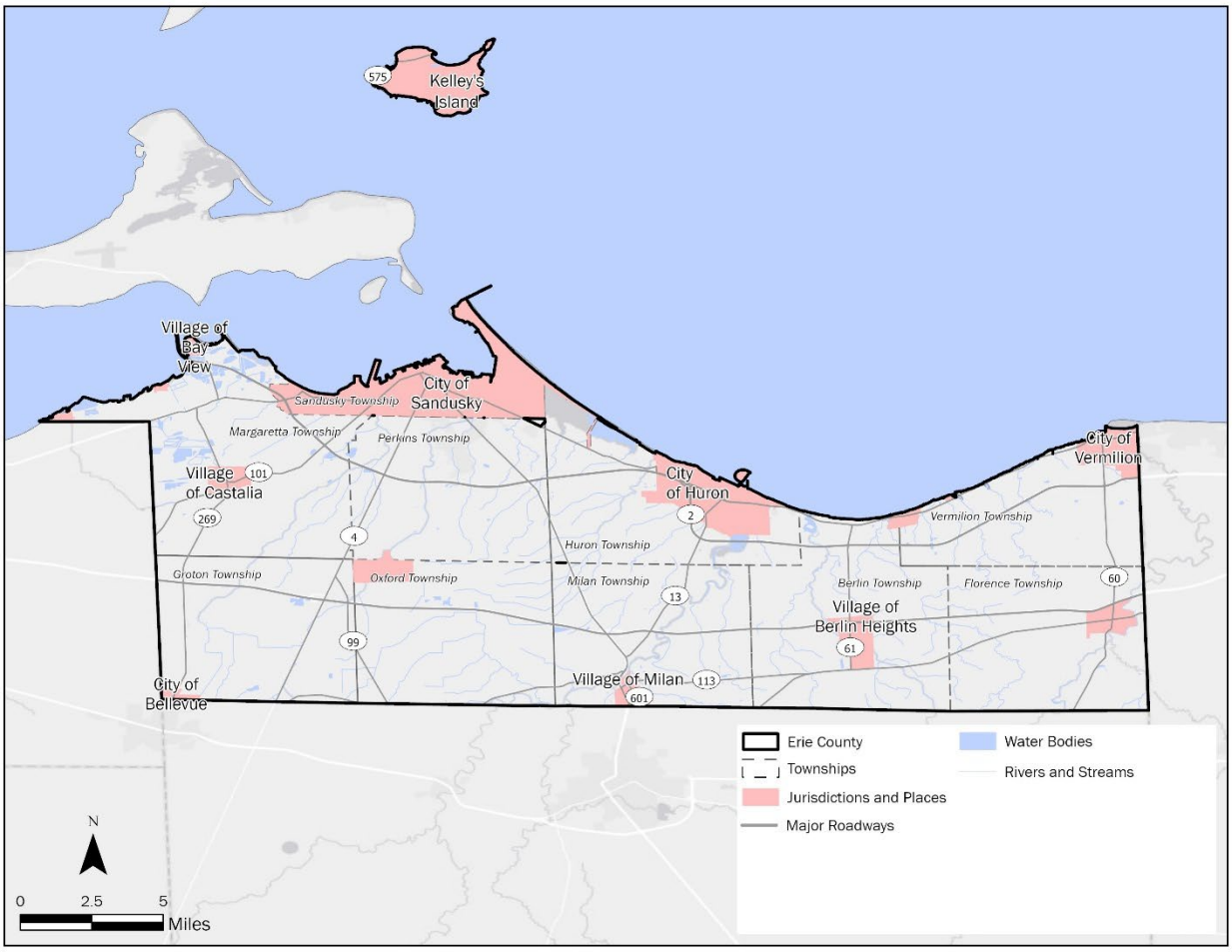
Table 1.1.1: Erie County Jurisdictions

Jurisdictions	
City of Bellevue (Part)	Village of Berlin Heights
City of Huron	Village of Castalia
City of Sandusky	Village of Kelleys Island
City of Vermilion (Part)	Village of Milan (Part)
Village of Bay View	

Table 1.1.2: Erie County Townships

Townships	
Berlin Township	Milan Township
Florence Township	Oxford Township
Groton Township	Perkins Township
Huron Township	Vermilion Township
Margaretta Township	

Figure 1.1.3: Erie County Jurisdictions Map



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

- This **Introduction** (Chapter 1) provides a discussion about the general purpose and goals that Erie 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 Erie 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 Erie 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 and each participating jurisdiction. The proposed actions are presented in tables, categorized by the associated hazard 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 Erie 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 Erie 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 Erie 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

Erie County is located in northern Ohio and has a total area of approximately 626 square miles. The County contains four cities, five villages, and nine townships (**Tables 1.1.1 and 1.1.2**). The City of Sandusky serves as the County seat. Erie County is bounded by four Ohio counties: Lorain County to the east, Huron County to the south, Sandusky County to the west, and Ottawa County to the northwest. Erie County has approximately 68 miles of Lake Erie and Sandusky Bay Shoreline.

Land use patterns in Erie County are shown in **Figure 1.2.1**. Land use types include residential, agricultural, industrial, commercial, and institutional/government. Land cover in Erie County is shown in **Figure 1.2.2**. Land cover types include developed space, rock/sand/clay, deciduous forest, evergreen forest, mixed forest, shrub/scrub, grassland, pasture/hay, cultivated crops, woody wetlands, emergent wetlands, and open water.

Figure 1.2.1: Erie County Land Use Map

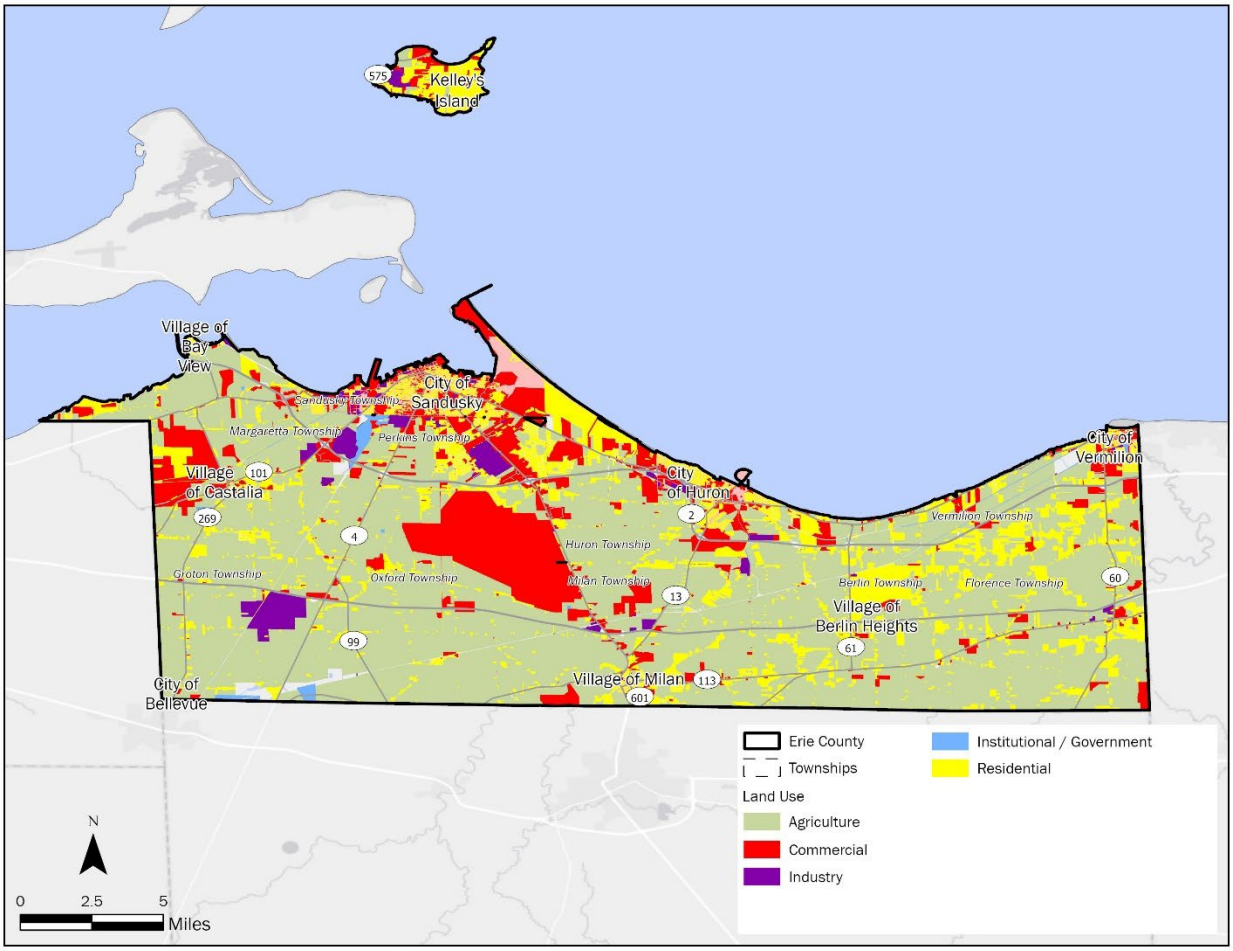
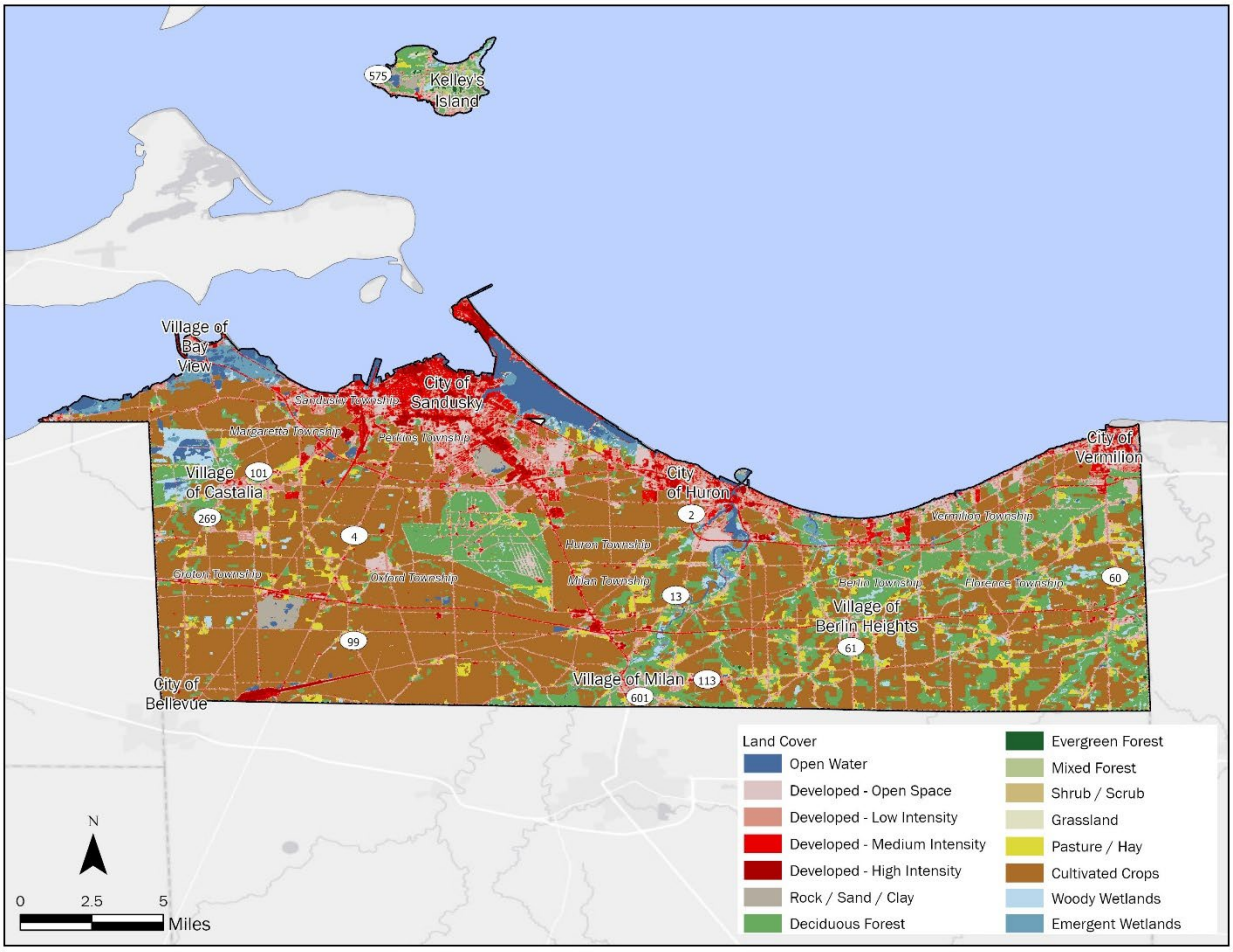


Figure 1.2.2: Erie County Land Cover Map



1.3 Region Features

Transportation

Erie County contains several major roadways, including several State Routes (SR), two U.S. Highways (US), and one Interstate (I). Major roadways in Erie County include SR-2, SR-4, SR-13, SR-60, SR-61, SR-101, SR-113, SR-269, US-6, US-250, I-80/90.

Erie County doesn't have an airport located within the County borders but is a co-owner of the Erie-Ottawa International Airport (KPCW) with Ottawa County, located in the City of Port William (Ottawa County).

Norfolk Southern Corporation has railway lines in Erie County. The Norfolk Southern Corporation lines run from the southwestern corner of Erie County north to the City of Sandusky and to the northeast corner of Erie County.

Natural Features

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

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

Parks & Nature Areas	
Birmingham School MetroPark	Linwood Park
Battery Park	Lions Park
Cable Park Historic District	Miami Park
Castalia Quarry MetroPark	Milan Historic District
Castalia Quarry Reserve	Milan Towpath MetroPark
Columbus Avenue Historic District	Mitchell Historic District
Community Foundation Preserve at Eagle Point	Nickleplate Park
Dupont Marsh State Nature Preserve	Old Woman Creek (NERR) State Nature Preserve
Edison Woods MetroPark	Osborn MetroPark
Edison Woods Reserve	Osborn Recreation Area
Erie Sand Barrens State Nature Preserve	Pelton Park
Fabens Park	Pipe Creek Wildlife Area
Firelands Community Park	Putman Marsh
Galpin Wildlife Area	Resthaven Wildlife Area
Glacial Grooves State Memorial	Sheldon Marsh State Nature Preserve
Hoffman Forest MetroPark	Sherod Park
Huron Park	The Coupling MetroPark
Huron River Path MetroPark	The Coupling Reserve
James H. McBride Arboretum	Thomas Williams MetroPark
Jaycee Park	Wakefield MetroPark

Parks & Nature Areas	
Joseph Steinen Wildlife Park	Washington Park
Kelleys Island South Shore Historic District	Willow Point Wildlife Area
Kelleys Island State Park	Wyandot MetroPark
Lake Park	

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

Table 1.3.2: Erie County Streams and Water Bodies

Water Bodies	
Nickel Plate Beach	Martin Point
Anchor Point	Mills Creek
Barnums Point	Moseley Channel
Beimiller's Cove	Mud Brook
Blue Hole	North Bay
Boos Ditch	North Pond
Carpenter Point	Old Woman Creek
Cedar Point	Olemacher Ditch
Chappel Creek	Ontario Lagoon
Cold Creek	Pipe Creek
Crab Apple Creek	Plum Brook
Cranberry Creek	Point of Woods
Dahs Ditch	Ransom Ditch
Darby Creek	Rattlesnake Creek
Dautch Ditch	Rockwell Spring
Dildine Ditch	Sadler Sailing Basin
Dock Channel	Sawmill Creek
East Fork Vermilion River	Scheid Ditch
East Turning Basin	Schlessman Ditch
Edson Creek	Sherer Ditch
Erie Lagoon	Sherod Creek
Gull Harbor	Snyders Ditch
Harbor North	South Bay
Harris Ditch	South Pond
Hemming Ditch	Sugar Creek

Water Bodies	
Huron Lagoon	Sulphur Brook
Huron Range	Superior Lagoon
Huron River	Taylor Ditch
Kuebelar Ditch	Tiber River
Liles Ditch	Upper Bay Channel
Lindsley Ditch	Upper Straight Channel
Little Cold Creek	Vermilion River
Little Pickerel Creek	West Bay
Long Point	West Turning Basin
Lower Bay Channel	Willow Point Marsh
Lower Straight Channel	Wolf Run
Main Street Beach	Zorn Beutal Ditch

2 | History & Demographics

2.1 History

Erie County is both an urban and rural county in northern Ohio, perched on the banks of Lake Erie. The County has a total area of 626 square miles, of which 251.3 square miles are land and 374 square miles consist of Lake Erie and Sandusky Bay waters. Erie County is the smallest county in Ohio by total area. The County was established on March 16, 1838, by an act of the Ohio Legislature. The County is named after the Erie Tribe who lived along Lake Erie.

Erie County has 181 properties listed on the National Register of Historic Places, with the first property being entered in 1966. The Thomas A. Edison Birthplace (**Figure 2.1.1**,) was built in 1841 and is located in the City of Milan on Edison Drive. The building is a one and one-half story brick house. The lot was purchased by Nancy Elliot Edison, Thomas Alva Edison's mother. Thomas Alva Edison was born in the house on February 11, 1847.

Figure 2.1.1: Thomas A. Edison's Birthplace in the City of Milan, Ohio

Source: National Archives Catalog (Left) and Mike Sharp (Right)

2.2 Communication Outlets

Erie 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	Erie County: https://www.eriecounty.oh.gov/ Erie County EMA: https://www.eriecounty.oh.gov/EmergencyManagement.aspx Erie County Health Department: https://eriecohealthohio.com/ Erie County Sherriff's Office: https://www.eriecounty.oh.gov/sheriffsoffice.aspx The American Red Cross Northern Ohio Region: https://www.redcross.org/local/ohio/northern-ohio.html?srsltid=AfmBOoq1116RjtRUnogEAOmSxrm8f8bAgQF3UMPSNadjjQ8StzZa5uOC
Social Media	Erie County EMA: https://www.facebook.com/ErieCountyEMA?ref=embed_page Erie County Public Health: https://www.facebook.com/ErieCoHealthOhio/ Erie County Sheriff: https://www.facebook.com/p/Erie-County-Ohio-Sheriffs-Office-100064719724748/ Erie County Firefighters Association: https://www.facebook.com/people/Erie-County-Firefighters-Association/100064719397479/
News/Newspaper	Sandusky Register: https://sanduskyregister.com/ News 5 Cleveland: https://www.news5cleveland.com/news/local-news/oh-erie The Morning Journal: https://www.morningjournal.com/tag/erie-county/

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 that 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 Erie 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, Erie County's population decreased by 2,141 people (-2.78 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. Three townships – Florence, Groton, and Perkins Townships – experienced population growth. Of the townships experiencing population decline, Margaretta Township experienced the greatest population decline by persons with a decrease of 398 people (-6.65 percent), while Oxford Township experienced the greatest population decline by percentage with a decrease of 385 people (-32.06 percent).

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

Table 2.3.1: County Subdivision 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
Erie County	77,079	74,938	-2,141	-2.78%
City of Bellevue	2	0	-2	-100%
Berlin township	3,723	3,427	-296	-7.95%
Florence township	2,448	2,638	190	7.76%
Groton township	1,427	1,498	71	4.98%
Huron township	10,697	10,608	-89	-0.83%
Village of Kelleys Island	312	198	-114	-36.54%
Margaretta township	5,981	5,583	-398	-6.65%
Milan township	3,606	3,587	-19	-0.53%
Oxford township	1,201	816	-385	-32.06%
Perkins township	12,202	12,401	199	1.63%
City of Sandusky	25,793	24,748	-1,045	-4.05%
City of Vermilion	4,742	4,618	-124	-2.61%
Vermilion township	4,945	4,816	-129	-2.61%

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) Erie County has a calculated Social Vulnerability Index of 0.56 (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 Erie 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 tract is ranked on the 16 social factors. The 16 social factors are organized into four themes. Each census tract 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 Erie County and Ohio

Theme	Erie County (Statewide)	Ohio (Statewide)	Erie County (Nationwide)	Ohio (Nationwide)
Socioeconomic Status	0.43	0.50	0.35	0.37
Housing Type and Transportation	0.36	0.50	0.33	0.42
Race and Ethnic Minority Status	0.89	0.50	0.51	0.28
Household Characteristics	0.79	0.50	0.60	0.40

2.4 Community Profiles

Erie County

Erie County is located in northwestern Ohio, and it is part of the Sandusky, Ohio Metropolitan Statistical Area. As of the 5-Year ACS Estimates (census), the population was 74,938, making it the 34th most populated county in Ohio. The City of Sandusky is the largest city and serves as the County seat.

Tables 2.4.1 to 2.4.6 summarize the Erie County's population, housing statistics, and income statistics. There are 32,122 households of which 22.9 percent have at least one member under 18 years of age, and 36.6 percent have members 65 years and over. The largest percentage of households (19.0 percent) had an income between $50,000 to $74,999; approximately 5.6 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the

Erie County was the White (non-Hispanic) group, which makes up 80.8 percent of the population. Black or African American is the second largest race (8.3 percent). Approximately 1.6 percent of the County's population speak Spanish at home. In addition, 1.1 percent speak another Indo-European language, 0.65 percent speak an Asian and Pacific Island language, and 0.22 percent speak another language.

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

Age	Number	Percentage
Total Population	74,938	100%
Under 18 Years	14,981	19.99%
18 to 24 Years	5,658	7.55%
25 to 34 Years	8,530	11.38%
35 to 44 Years	8,158	10.89%
45 to 54 Years	9,056	12.08%
55 to 64 Years	11,290	15.07%
65 Years and Over	17,265	23.04%

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

Housing Statistics	Number	Percentage
Total Housing Units	38,400	100%
Occupied Housing Units	32,122	83.65%
Housing Units - Mobile Homes	664	2.07%
Vacant Housing Units	6,278	16.35%

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

Household Statistics	Number	Percentage
Total Households	32,122	-
Average Household Size	2.27	-
Households with People Under 18 Years	7,347	22.87%
Households with People 65+ Years	11,757	36.60%
Householder Living Alone 65+ Years	4,658	14.50%
No Vehicle Available	2,142	6.67%
With a Broadband Internet Subscription	27,741	86.36%

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

Race and Ethnicity	Number	Percentage
Total Population	74,938	100%
White	60,555	80.81%
Black or African American	6,218	8.30%
American Indian and Alaska Native	85	0.11%
Asian	513	0.68%
Native Hawaiian and other Pacific Islander	14	0.02%
Some Other Race	615	0.82%
Two or More Races	3,639	4.86%
Hispanic or Latino (of any race)	3,299	4.40%

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

Language Statistics	Number	Percentage
Total Population (over 5 years old)	71,149	100%
English only	68,615	96.44%
Spanish	1,119	1.57%
Other Indo-European languages	798	1.12%
Asian and Pacific Island languages	463	0.65%
Other languages	154	0.22%

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

Household Income Statistics	Percentage of Households
Less than $10,000	5.60%
$10,000 to $14,999	4.20%
$15,000 to $24,999	7.60%
$25,000 to $34,999	7.70%
$35,000 to $49,999	10.30%
$50,000 to $74,999	19.00%
$75,000 to $99,999	14.10%
$100,000 to $149,999	18.30%
$150,000 to $199,999	7.00%
$200,000 or more	6.20%
Median Household Income	$68,431
Mean Household Income	$91,016

City of Bellevue

Tables 2.4.7 to 2.4.11 summarize the City of Bellevue's population, housing statistics, and income statistics. There are 3,524 households of which 31.1 percent have at least one member under 18 years of age, and 31.3 percent have members 65 years and over. The largest percentage of households (18.5 percent) had an income between $50,000 to $74,999; approximately 4.2 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the City of Bellevue was the White (non-Hispanic) group, which makes up 88.1 percent of the population. Hispanic or Latino (of any race) is the second largest race (7.9 percent). Approximately 2.5 percent of the city's population speak Spanish at home. In addition, 1.2 percent speak another Indo-European language, 0.94 percent speak an Asian and Pacific Island language, and 1.7 percent speak another language.

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

Age	Number	Percentage
Total Population	8,201	100%
Under 18 Years	2,004	24.44%
18 to 24 Years	642	7.83%
25 to 34 Years	1,091	13.30%
35 to 44 Years	755	9.21%
45 to 54 Years	935	11.40%
55 to 64 Years	1,186	14.46%
65 Years and Over	1,588	19.36%

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

Housing Statistics	Number	Percentage
Total Housing Units	3,750	100%
Occupied Housing Units	3,524	93.97%
Housing Units - Mobile Homes	157	4.46%
Vacant Housing Units	226	6.03%

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

Household Statistics	Number	Percentage
Total Households	3,524	-
Average Household Size	2.29	-
Households with People Under 18 Years	1,097	31.13%
Households with People 65+ Years	1,103	31.30%
Householder Living Alone 65+ Years	515	14.60%
No Vehicle Available	330	9.36%
With a Broadband Internet Subscription	3,069	87.09%

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

Race and Ethnicity	Number	Percentage
Total Population	8,201	100%
White	7,225	88.10%
Black or African American	63	0.77%
American Indian and Alaska Native	0	0 %
Asian	93	1.13%
Native Hawaiian and other Pacific Islander	0	0%
Some Other Race	55	0.67%
Two or More Races	114	1.39%
Hispanic or Latino (of any race)	651	7.94%

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

Language Statistics	Number	Percentage
Total Population (over 5 years old)	7,755	100%
English only	7,260	93.62%
Spanish	194	2.50%
Other Indo-European languages	93	1.20%
Asian and Pacific Island languages	73	0.94%
Other languages	135	1.74%

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

Household Income Statistics	Percentage of Households
Less than $10,000	4.20%
$10,000 to $14,999	7.50%
$15,000 to $24,999	11.70%
$25,000 to $34,999	8.10%
$35,000 to $49,999	14.40%
$50,000 to $74,999	18.50%
$75,000 to $99,999	13.20%
$100,000 to $149,999	15.00%
$150,000 to $199,999	2.60%
$200,000 or more	4.70%
Median Household Income	$57,534
Mean Household Income	$84,402

City of Huron

Tables 2.4.13 to 2.4.18 summarize the City of Huron's population, housing statistics, and income statistics. There are 3,143 households of which 18.6 percent have at least one member under 18 years of age, and 44.4 percent have members 65 years and over. The largest percentage of households (18.7 percent) had an income between $50,000 to $74,999; approximately 3.7 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the City of Huron was the White (non-Hispanic) group, which makes up 90.3 percent of the population. Two or More Races is the second largest race (5.9 percent). Approximately 0.81 percent of the city's population speak Spanish at home. In addition, 0.81 percent speak another Indo-European language.

Table 2.4.13: City of Huron Population by Age 2023 ACS 5-Year Estimates

Age	Number	Percentage
Total Population	6,824	100%
Under 18 Years	1,268	18.58%
18 to 24 Years	554	8.12%
25 to 34 Years	663	9.72%
35 to 44 Years	555	8.13%
45 to 54 Years	731	10.71%
55 to 64 Years	1,101	16.13%
65 Years and Over	1,952	28.60%

Table 2.4.14: City of Huron Housing Statistics 2023 ACS 5-Year Estimates

Housing Statistics	Number	Percentage
Total Housing Units	3,604	100%
Occupied Housing Units	3,143	87.21%
Housing Units - Mobile Homes	0	0%
Vacant Housing Units	461	12.79%

Table 2.4.15: City of Huron Household Statistics 2023 ACS 5-Year Estimates

Household Statistics	Number	Percentage
Total Households	3,143	-
Average Household Size	2.14	-
Households with People Under 18 Years	586	18.64%
Households with People 65+ Years	1,395	44.40%
Householder Living Alone 65+ Years	651	20.70%
No Vehicle Available	130	4.14%
With a Broadband Internet Subscription	2,702	85.97%

Table 2.4.16: City of Huron Race and Ethnicity Statistics 2023 ACS 5-Year Estimates

Race and Ethnicity	Number	Percentage
Total Population	6,824	100%
White	6,162	90.30%
Black or African American	64	0.94%
American Indian and Alaska Native	13	0.19%
Asian	0	0%
Native Hawaiian and other Pacific Islander	0	0 %
Some Other Race	91	1.33%
Two or More Races	404	5.92%
Hispanic or Latino (of any race)	90	1.32%

Table 2.4.17: City of Huron Language Spoken at Home Statistics 2023 ACS 5-Year Estimates

Language Statistics	Number	Percentage
Total Population (over 5 years old)	6,458	100%
English only	6,354	98.39%
Spanish	52	0.81%
Other Indo-European languages	52	0.81%
Asian and Pacific Island languages	0	0%
Other languages	0	0%

Table 2.4.18: City of Huron Income Statistics 2023 ACS 5-Year Estimates

Household Income Statistics	Percentage of Households
Less than $10,000	3.70%
$10,000 to $14,999	4.30%
$15,000 to $24,999	6.20%
$25,000 to $34,999	6.60%
$35,000 to $49,999	13.00%
$50,000 to $74,999	18.70%
$75,000 to $99,999	17.00%
$100,000 to $149,999	14.40%
$150,000 to $199,999	6.50%
$200,000 or more	9.80%
Median Household Income	$73,429
Mean Household Income	$96,931

City of Sandusky

Tables 2.4.19 to 2.4.24 summarize the City of Sandusky's population, housing statistics, and income statistics. There are 10,892 households of which 26.6 percent have at least one member under 18 years of age, and 26.4 percent have members 65 years and over. The largest percentage of households (18.3 percent) had an income between $50,000 to $74,999; approximately 8.9 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the City of Sandusky was the White (non-Hispanic) group, which makes up 62.4 percent of the population. Black or African American is the second largest race (21.9 percent). Approximately 2.8 percent of the city's population speak Spanish at home. In addition, 1.1 percent speak another Indo-European language, 0.28 percent speak an Asian and Pacific Island language, and 0.27 percent speak another language.

Table 2.4.19: City of Sandusky Population by Age 2023 ACS 5-Year Estimates

Age	Number	Percentage
Total Population	24,748	100%
Under 18 Years	5,603	22.64%
18 to 24 Years	2,257	9.12%
25 to 34 Years	4,221	17.06%
35 to 44 Years	2,465	9.96%
45 to 54 Years	2,891	11.68%
55 to 64 Years	3,119	12.60%
65 Years and More	4,192	16.94%

Table 2.4.20: City of Sandusky Housing Statistics 2023 ACS 5-Year Estimates

Housing Statistics	Number	Percentage
Total Housing Units	13,277	100%
Occupied Housing Units	10,892	82.04%
Housing Units - Mobile Homes	213	1.96%
Vacant Housing Units	2,385	17.96%

Table 2.4.21: City of Sandusky Household Statistics 2023 ACS 5-Year Estimates

Household Statistics	Number	Percentage
Total Households	10,892	-
Average Household Size	2.18	-
Households with People Under 18 Years	2,892	26.55%
Households with People 65+ Years	2,875	26.40%
Householder Living Alone 65+ Years	1,351	12.40%
No Vehicle Available	1,362	12.50%
With a Broadband Internet Subscription	9,002	82.65%

Table 2.4.22: City of Sandusky Race and Ethnicity Statistics 2023 ACS 5-Year Estimates

Race and Ethnicity	Number	Percentage
Total Population	24,748	100%
White	15,437	62.38%
Black or African American	5,430	21.94%
American Indian or Alaska Native	42	0.17%
Asian	115	0.46%
Native Hawaiian or Pacific Islander	0	0%
Some Other Race (One Race)	367	1.48%
Two or More Races	1,829	7.39%
Hispanic or Latino (of any race)	1,528	6.17%

Table 2.4.23: City of Sandusky Language Spoken at Home Statistics 2023 ACS 5-Year Estimates

Language Statistics	Number	Percentage
Total Population (over 5 years old)	23,175	100%
English only	22,143	95.55%
Spanish	659	2.84%
Other Indo-European languages	246	1.06%
Asian and Pacific Island languages	64	0.28%
Other languages	63	0.27%

Table 2.4.24: City of Sandusky Income Statistics 2023 ACS 5-Year Estimates

Household Income Statistics	Percentage of Households
Less than $10,000	8.90%
$10,000 to $14,999	7.00%
$15,000 to $24,999	12.20%
$25,000 to $34,999	11.70%
$35,000 to $49,999	11.70%
$50,000 to $74,999	18.30%
$75,000 to $99,999	14.00%
$100,000 to $149,999	11.30%
$150,000 to $199,999	2.50%
$200,000 or more	2.30%
Median Household Income	$47,827
Mean Household Income	$60,700

City of Vermilion

Tables 2.4.25 to 2.4.30 summarize the City of Vermilion's population, housing statistics, and income statistics. There are 4,573 households of which 23.4 percent have at least one member under 18 years of age, and 41.6 percent have members 65 years and over. The largest percentage of households (20.9 percent) had an income between $100,000 to $149,999; approximately 3.0 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the City of Vermilion was the White (non-Hispanic) group, which makes up 93.2 percent of the population. Hispanic or Latino (of any race) is the second largest race (4.6 percent). Approximately 0.44 percent of the city's population speak Spanish at home. In addition, 0.54 percent speak another Indo-European language, 0.47 percent speak an Asian and Pacific Island language, and 0.31 percent speak another language.

Table 2.4.25: City of Vermilion Population by Age 2023 ACS 5-Year Estimates

Age	Number	Percentage
Total Population	10,451	100%
Under 18 Years	1,929	18.46%
18 to 24 Years	636	6.09%
25 to 34 Years	1,194	11.42%
35 to 44 Years	961	9.20%
45 to 54 Years	1,127	10.78%
55 to 64 Years	1,995	19.09%
65 Years and More	2,609	24.96%

Table 2.4.26: City of Vermilion Housing Statistics 2023 ACS 5-Year Estimates

Housing Statistics	Number	Percentage
Total Housing Units	5,249	100%
Occupied Housing Units	4,573	87.12%
Housing Units - Mobile Homes	33	0.72%
Vacant Housing Units	676	12.88%

Table 2.4.27: City of Vermilion Household Statistics 2023 ACS 5-Year Estimates

Household Statistics	Number	Percentage
Total Households	4,573	-
Average Household Size	2.25	-
Households with People Under 18 Years	1,070	23.40%
Households with People 65+ Years	1,902	41.60%
Householder Living Alone 65+ Years	704	15.40%
No Vehicle Available	132	2.89%
With a Broadband Internet Subscription	4,010	87.69%

Table 2.4.28: City of Vermilion Race and Ethnicity Statistics 2023 ACS 5-Year Estimates

Race and Ethnicity	Number	Percentage
Total Population	10,451	100%
White	9,745	93.24%
Black or African American	12	0.11%
American Indian or Alaska Native	10	0.10%
Asian	56	0.54%
Native Hawaiian or Pacific Islander	0	0%
Some Other Race (One Race)	0	0 %
Two or More Races	151	1.44%
Hispanic or Latino (of any race)	477	4.56%

Table 2.4.29: City of Vermilion Language Spoken at Home Statistics 2023 ACS 5-Year Estimates

Language Statistics	Number	Percentage
Total Population (over 5 years old)	9,985	100%
English only	9,809	98%
Spanish	44	0.44%
Other Indo-European languages	54	0.54%
Asian and Pacific Island languages	47	0.47%
Other languages	31	0.31%

Table 2.4.30: City of Vermilion Income Statistics 2023 ACS 5-Year Estimates

Household Income Statistics	Percentage of Households
Less than $10,000	3.00%
$10,000 to $14,999	2.30%
$15,000 to $24,999	10.20%
$25,000 to $34,999	6.80%
$35,000 to $49,999	8.70%
$50,000 to $74,999	19.70%
$75,000 to $99,999	13.10%
$100,000 to $149,999	20.90%
$150,000 to $199,999	9.40%
$200,000 or more	5.90%
Median Household Income	$73,052
Mean Household Income	$106,927

Village of Bay View

Tables 2.4.31 to 2.4.36 summarize the Village of Bay View's population, housing statistics, and income statistics. There are 278 households of which 12.9 percent have at least one member under 18 years of age, and 45.7 percent have members 65 years and over. The largest percentage of households (23.0 percent) had an income between $75,000 to $99,999; approximately 1.8 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the Village of Bay View was the White (non-Hispanic) group, which makes up 96.3 percent of the population. Hispanic or Latino (of any race) is the second largest race (1.9 percent).

Table 2.4.31: Village of Bay View Population by Age 2023 ACS 5-Year Estimates

Age	Number	Percentage
Total Population	625	100%
Under 18 Years	74	11.84%
18 to 24 Years	34	5.44%
25 to 34 Years	71	11.36%
35 to 44 Years	48	7.68%
45 to 54 Years	88	14.08%
55 to 64 Years	150	24.00%
65 Years and More	160	25.60%

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

Housing Statistics	Number	Percentage
Total Housing Units	340	100%
Occupied Housing Units	278	81.76%
Housing Units - Mobile Homes	0	0.00%
Vacant Housing Units	62	18.24%

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

Household Statistics	Number	Percentage
Total Households	278	-
Average Household Size	2.25	-
Households with People Under 18 Years	36	12.95%
Households with People 65+ Years	127	45.70%
Householder Living Alone 65+ Years	27	9.70%
No Vehicle Available	30	10.79%
With a Broadband Internet Subscription	229	82.37%

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

Race and Ethnicity	Number	Percentage
Total Population	625	100%
White	602	96.32%
Black or African American	2	0.32%
American Indian or Alaska Native	0	0%
Asian	3	0.48%
Native Hawaiian or Pacific Islander	0	0 %
Some Other Race (One Race)	0	0 %
Two or More Races	6	0.96%
Hispanic or Latino (of any race)	12	1.92%

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

Language Statistics	Number	Percentage
Total Population (over 5 years old)	614	100%
English only	614	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 Bay View Income Statistics 2023 ACS 5-Year Estimates

Household Income Statistics	Percentage of Households
Less than $10,000	1.80%
$10,000 to $14,999	4.00%
$15,000 to $24,999	8.60%
$25,000 to $34,999	3.60%
$35,000 to $49,999	10.40%
$50,000 to $74,999	14.40%
$75,000 to $99,999	23.00%
$100,000 to $149,999	15.80%
$150,000 to $199,999	10.80%
$200,000 or more	7.60%
Median Household Income	$87,500
Mean Household Income	$106,538

Village of Berlin Heights

Tables 2.4.37 to 2.4.42 summarize the Village of Berlin Heights's population, housing statistics, and income statistics. There are 261 households of which 41.0 percent have at least one member under 18 years of age, and 26.4 percent have members 65 years and over. The largest percentage of households (30.3 percent) had an income between $100,000 to $149,999; approximately 4.2 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the Village of Berlin Heights was the White (non-Hispanic) group, which makes up 90.9 percent of the population. Two or More Races is the second largest race (5.0 percent). Approximately 1.3 percent of the city's population speak Spanish at home. In addition, 0.90 percent speak an Asian and Pacific Island language.

Table 2.4.37: Village of Berlin Heights Population by Age 2023 ACS 5-Year Estimates

Age	Number	Percentage
Total Population	878	100%
Under 18 Years	325	37.02%
18 to 24 Years	65	7.40%
25 to 34 Years	140	15.95%
35 to 44 Years	119	13.55%
45 to 54 Years	78	8.88%
55 to 64 Years	59	6.72%
65 Years and More	92	10.48%

Table 2.4.38: Village of Berlin Heights Housing Statistics 2023 ACS 5-Year Estimates

Housing Statistics	Number	Percentage
Total Housing Units	266	100%
Occupied Housing Units	261	98.12%
Housing Units - Mobile Homes	0	0%
Vacant Housing Units	5	1.88%

Table 2.4.39: Village of Berlin Heights Household Statistics 2023 ACS 5-Year Estimates

Household Statistics	Number	Percentage
Total Households	261	-
Average Household Size	3.36	-
Households with People Under 18 Years	107	41.00%
Households with People 65+ Years	69	26.40%
Householder Living Alone 65+ Years	27	10.30%
No Vehicle Available	1	0.38%
With a Broadband Internet Subscription	238	91.19%

Table 2.4.40: Village of Berlin Heights Race and Ethnicity Statistics 2023 ACS 5-Year Estimates

Race and Ethnicity	Number	Percentage
Total Population	878	100%
White	798	90.89%
Black or African American	5	0.57%
American Indian or Alaska Native	3	0.34%
Asian	0	0%
Native Hawaiian or Pacific Islander	0	0%
Some Other Race (One Race)	0	0%
Two or More Races	44	5.01%
Hispanic or Latino (of any race)	28	3.19%

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

Language Statistics	Number	Percentage
Total Population (over 5 years old)	780	100%
English only	763	98%
Spanish	10	1.28%
Other Indo-European languages	0	0%
Asian and Pacific Island languages	7	0.90%
Other languages	0	0 %

Table 2.4.42: Village of Berlin Heights Income Statistics 2023 ACS 5-Year Estimates

Household Income Statistics	Percentage of Households
Less than $10,000	4.20%
$10,000 to $14,999	3.40%
$15,000 to $24,999	3.80%
$25,000 to $34,999	3.10%
$35,000 to $49,999	13.00%
$50,000 to $74,999	11.50%
$75,000 to $99,999	16.50%
$100,000 to $149,999	30.30%
$150,000 to $199,999	10.70%
$200,000 or more	3.40%
Median Household Income	$94,250
Mean Household Income	$101,329

Village of Castalia

Tables 2.4.43 to 2.4.48 summarize the Village of Castalia's population, housing statistics, and income statistics. There are 466 households of which 42.1 percent have at least one member under 18 years of age, and 23.2 percent have members 65 years and over. The largest percentage of households (28.5 percent) had an income between $50,000 to $74,999; approximately 16.1 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the Village of Castalia was the White (non-Hispanic) group, which makes up 67.7 percent of the population. Two or More Races is the second largest race (25.3 percent). Approximately 0.56 percent of the city's population speak Spanish at home. In addition, 0.32 percent speak another Indo-European language and 0.96 percent speak an Asian and Pacific Island language.

Table 2.4.43: Village of Castalia Population by Age 2023 ACS 5-Year Estimates

Age	Number	Percentage
Total Population	1,348	100%
Under 18 Years	465	34.50%
18 to 24 Years	123	9.12%
25 to 34 Years	193	14.32%
35 to 44 Years	103	7.64%
45 to 54 Years	180	13.35%
55 to 64 Years	134	9.94%
65 Years and More	150	11.13%

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

Housing Statistics	Number	Percentage
Total Housing Units	511	100%
Occupied Housing Units	466	91.19%
Housing Units - Mobile Homes	0	0.00%
Vacant Housing Units	45	8.81%

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

Household Statistics	Number	Percentage
Total Households	466	-
Average Household Size	2.89	-
Households with People Under 18 Years	196	42.06%
Households with People 65+ Years	108	23.20%
Householder Living Alone 65+ Years	45	9.70%
No Vehicle Available	9	1.93%
With a Broadband Internet Subscription	427	91.63%

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

Race and Ethnicity	Number	Percentage
Total Population	1,348	100%
White	912	67.66%
Black or African American	17	1.26%
American Indian or Alaska Native	0	0 %
Asian	12	0.89%
Native Hawaiian or Pacific Islander	0	0%
Some Other Race (One Race)	0	0 %
Two or More Races	341	25.30%
Hispanic or Latino (of any race)	66	4.90%

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

Language Statistics	Number	Percentage
Total Population (over 5 years old)	1,248	100%
English only	1,225	98.16%
Spanish	7	0.56%
Other Indo-European languages	4	0.32%
Asian and Pacific Island languages	12	0.96%
Other languages	0	0%

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

Household Income Statistics	Percentage of Households
Less than $10,000	16.10%
$10,000 to $14,999	2.60%
$15,000 to $24,999	3.40%
$25,000 to $34,999	5.80%
$35,000 to $49,999	13.30%
$50,000 to $74,999	28.50%
$75,000 to $99,999	6.70%
$100,000 to $149,999	16.50%
$150,000 to $199,999	3.90%
$200,000 or more	3.20%
Median Household Income	$51,798
Mean Household Income	$71,583

Village of Kelleys Island

Tables 2.4.49 to 2.4.54 summarize the Village of Kelleys Island's population, housing statistics, and income statistics. There are 92 households of which zero percent have at least one member under 18 years of age, and 57.6 percent have members 65 years and over. The largest percentage of households (19.6 percent) had an income between $200,000 or more; approximately zero percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the Village of Kelleys Island was the White (non-Hispanic) group, which makes up 93.4 percent of the population. Hispanic or Latino (of any race) is the second largest race (6.6 percent). Approximately 1.0 percent of the city's population speak Spanish at home. In addition, 8.1 percent speak another Indo-European language.

Table 2.4.49: Village of Kelleys Island Population by Age 2023 ACS 5-Year Estimates

Age	Number	Percentage
Total Population	198	100%
Under 18 Years	2	1.01%
18 to 24 Years	16	8.08%
25 to 34 Years	18	9.09%
35 to 44 Years	4	2.02%
45 to 54 Years	10	5.05%
55 to 64 Years	52	26.26%
65 Years and More	96	48.48%

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

Housing Statistics	Number	Percentage
Total Housing Units	966	100%
Occupied Housing Units	92	9.52%
Housing Units - Mobile Homes	0	0%
Vacant Housing Units	874	90.48%

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

Household Statistics	Number	Percentage
Total Households	92	-
Average Household Size	2.10	-
Households with People Under 18 Years	0	0.00%
Households with People 65+ Years	53	57.60%
Householder Living Alone 65+ Years	12	13.00%
No Vehicle Available	0	0.00%
With a Broadband Internet Subscription	72	78.26%

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

Race and Ethnicity	Number	Percentage
Total Population	198	100%
White	185	93.43%
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	0	0%
Hispanic or Latino (of any race)	13	6.57%

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

Language Statistics	Number	Percentage
Total Population (over 5 years old)	198	100%
English only	180	90.91%
Spanish	2	1.01%
Other Indo-European languages	16	8.08%
Asian and Pacific Island languages	0	0%
Other languages	0	0%

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

Household Income Statistics	Percentage of Households
Less than $10,000	0%
$10,000 to $14,999	0 %
$15,000 to $24,999	4.30%
$25,000 to $34,999	13.00%
$35,000 to $49,999	8.70%
$50,000 to $74,999	13.00%
$75,000 to $99,999	16.30%
$100,000 to $149,999	15.20%
$150,000 to $199,999	9.80%
$200,000 or more	19.60%
Median Household Income	$91,875
Mean Household Income	$150,497

Village of Milan

Tables 2.4.55 to 2.4.60 summarize the Village of Milan's population, housing statistics, and income statistics. There are 507 households of which 31.4 percent have at least one member under 18 years of age, and 37.9 percent have members 65 years and over. The largest percentage of households (29.4 percent) had an income between $100,000 to $149,999; approximately 2.8 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the Total Population was the White (non-Hispanic) group, which makes up 95.0 percent of the population. Hispanic or Latino (of any race) is the second largest race (2.4 percent). Approximately 0.29 percent of the city's population speak Spanish at home.

Table 2.4.55: Village of Milan Population by Age 2023 ACS 5-Year Estimates

Age	Number	Percentage
Total Population	1,591	100%
Under 18 Years	482	30.30%
18 to 24 Years	94	5.91%
25 to 34 Years	114	7.17%
35 to 44 Years	263	16.53%
45 to 54 Years	137	8.61%
55 to 64 Years	154	9.68%
65 Years and More	347	21.81%

Table 2.4.56: Village of Milan Housing Statistics 2023 ACS 5-Year Estimates

Housing Statistics	Number	Percentage
Total Housing Units	559	100%
Occupied Housing Units	507	90.70%
Housing Units - Mobile Homes	0	0%
Vacant Housing Units	52	9.30%

Table 2.4.57: Village of Milan Household Statistics 2023 ACS 5-Year Estimates

Household Statistics	Number	Percentage
Total Households	507	-
Average Household Size	2.96	-
Households with People Under 18 Years	159	31.36%
Households with People 65+ Years	192	37.90%
Householder Living Alone 65+ Years	62	12.20%
No Vehicle Available	4	0.79%
With a Broadband Internet Subscription	473	93.29%

Table 2.4.58: Village of Milan Race and Ethnicity Statistics 2023 ACS 5-Year Estimates

Race and Ethnicity	Number	Percentage
Total Population	1,591	100%
White	1,512	95.03%
Black or African American	4	0.25%
American Indian or Alaska Native	0	0%
Asian	2	0.13%
Native Hawaiian or Pacific Islander	0	0%
Some Other Race (One Race)	0	0%
Two or More Races	35	2.20%
Hispanic or Latino (of any race)	38	2.39%

Table 2.4.59: Village of Milan Language Spoken at Home Statistics 2023 ACS 5-Year Estimates

Language Statistics	Number	Percentage
Total Population (over 5 years old)	1,388	100%
English only	1,384	99.71%
Spanish	4	0.29%
Other Indo-European languages	0	0%
Asian and Pacific Island languages	0	0%
Other languages	0	0%

Table 2.4.60: Village of Milan Income Statistics 2023 ACS 5-Year Estimates

Household Income Statistics	Percentage of Households
Less than $10,000	2.80%
$10,000 to $14,999	2.20%
$15,000 to $24,999	1.40%
$25,000 to $34,999	4.50%
$35,000 to $49,999	10.50%
$50,000 to $74,999	12.60%
$75,000 to $99,999	27.40%
$100,000 to $149,999	29.40%
$150,000 to $199,999	5.30%
$200,000 or more	3.90%
Median Household Income	$95,566
Mean Household Income	$116,446

3 | Planning Process

3.1 Methodology

The Planning Process chapter describes the steps involved in the development of the 2026 Erie 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

Erie County and the State of Ohio maintain several plans and tools that were pertinent to reference in the development of the 2026 Hazard Mitigation Plan, including:

- 2021 Erie County Natural Hazards Mitigation Plan
- 2024 State of Ohio Hazard Mitigation Plan (SOHMP)
- Zoning Regulations for all Townships
- Erie County Subdivision Regulations
- ERPC MPO 2045 Long Range Transportation Plan
- Comprehensive Economic Development Strategy for Erie and Huron Counties, Ohio (2025-2029)

3.3 Erie County Authority to Adopt Plan

The Erie County Board of Commissioners are elected at large for four-year terms. The board members are the budgeting, appropriating, taxing, and purchasing authority. The Erie Regional Planning Commission was established by the Erie County Board of Commissioners (ERPC) in conformance with Section 713.21 of the Ohio Revised Code. In addition, the Metropolitan Planning Organization (MPO) was established under the ERPC in conformance with the Section 23 U.S.C 134 of the U.S. Code. This code states that for each urbanized area with a population greater than 50,000 a metropolitan planning organization shall be designated. 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 Erie 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 varies based on their respective needs, 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 Erie County's Municipalities

Community	Planning Commission	Comprehensive Plan	Floodplain Regulation	Building Codes*	Zoning Codes	Capital Budget	Public Works Budget
Erie County	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City of Bellevue	Yes	Yes	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
City of Huron	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City of Sandusky	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City of Vermilion	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Village of Bay View	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Village of Berlin Heights	Yes	No	Yes	Yes	Yes	Yes	Limited in-kind wages only
Village of Castalia	Yes	No	Yes	Yes	Yes	Yes	Limited in-kind wages only
Village of Kelleys Island	Yes	Yes	Yes	Yes	Yes	Yes	Limited in-kind wages only
Village of Milan	Yes	Yes	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.

Erie County

- Erie County Commissioners
- Erie County Soil and Water Conservation District

- Erie County EMA
- Erie County Engineer
- Erie County GIS
- Erie County Sheriff's Office
- Erie County Health Department
- Erie County Board of Developmental Disabilities
- Ohio Department of Transportation (ODOT) – Erie County

City and Village Members

- City of Bellevue
- City of Huron
- City of Sandusky
- City of Vermilion
- Village of Bay View
- Village of Berlin Heights
- Village of Castalia
- Village of Kelleys Island
- Village of Milan

Township Members

- Berlin Township
- Florence Township
- Groton Township
- Huron Township
- Margaretta Township
- Milan Township
- Oxford Township
- Perkins Township
- Vermilion Township

Local Schools and Universities

- Huron City Schools
- North Point Educational Service Center (ESC)
- Vermilion Local Schools

Other Organizations

- Firelands Health
- First Energy
- Greater Sandusky Partnership
- Care and Share Erie County
- Ashland County EMA
- Huron County EMA
- Ohio Department of Natural Resources
- Ohio Emergency Management Agency
- Lorain County EMA
- Second Harvest Foodbank
- Seneca County EMA
- Shores & Island Ohio
- Wood County EMA
- NASA Glenn Research Center (GRC)
- Ottawa County EMA
- The American Red Cross

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								
Erie County Board of Developmental Disabilities	Diane Corso – Director of Strategic Initiatives	√	√	√		√	√	
Erie County Care and Share	Anita Kromer – Director					√		
Erie County EMA	Tim Jonovich – Director Kim Johnson – Admin. Assistant Gary Wobser – 911/Communications					√	√	
Erie County Engineer	Eric Dodrill – County Engineer	√	√	√		√	√	
Erie County GIS	Mark Wroblewski – GIS Director					√		
Erie County Health Department	Taylor Kula – EPI/ERC Bob England – Chief and Lead Hazard Control & Health Homes Officer	√	√	√	√	√	√	
Erie County Job & Family Services	AJ Lill – Director						√	
Erie Regional Planning Commission	Kevin Cannon – Transportation Planner						√	
Erie County Sheriff	Paul Sigsworth – Sheriff	√				√	√	
Erie Soil and Water Conservation District	Breann Hohman - Director	√	√			√		
Firelands Health	Sydney Cmar – Representative	√	√			√		
ODOT – Erie County	Brendan Schlachter – County Manager					√		
Jurisdictions								
City of Bellevue	William J. Brugnone – Safety-Service Director	√	√	√	√			√
City of Huron	Terry Graham – Police Chief James Tatman – Superintendent	√	√	√	√	√	√	√
City of Sandusky	Arin Blair – Chief Planner Brad Wilson – Lieutenant, Patrol Commander Mario D'Amico III – Fire Chief Alan (A.J.) Alt – Police Chief	√	√	√	√	√	√	√
City of Vermilion	Wes Weaver – Superintendent William Brown – Fire Chief	√	√	√	√	√	√	√

Community/ Organization	Stakeholders	Surveys Completed				Meetings Attended		
		Goals	Hazard Priorities	Previous Mitigation Actions	New Mitigation Actions	1	2	Other
Village of Bay View	Eria Gedridge – Fire Chief		√	√	√			√
Village of Berlin Heights	Charity Schafer – Police Chief	√	√	√	√	√	√	√
Village of Castalia	Jacob Smith – Council Member		√	√	√			√
Village of Kelleys Island	Ronald Ehrbar – Mayor	√	√	√	√			√
Village of Milan	Brian Rospect – Administrator Corey Ream – Superintendent	√	√	√	√	√		
Other								
Berlin Township	Andrew Smith – Fire Chief					√		
Perkins Township	Arielle Blanca – CD Director David Murphy – Fire Chief	√	√	√	√	√	√	√
Ashland County EMA	Anne Strouth – Director Scott Englehardt – EM Specialist	√				√		
FirstEnergy	Nick Katsaros – Area Representative	√	√			√	√	
Greater Sandusky Partnership	Jeff Kerr – Director of Planning and Policy					√	√	
Groton Township	Kerry D. Jett – Chief	√	√					√
Huron County EMA	Kye Stevens – Deputy Director	√				√		
Lorain County EMA	Dave Freeman – Director					√		
Milan Township	Dave Jenkins – Director of Operations	√	√					√
NASA GRC	Allen Turner – EM Specialist					√	√	
North Point ESC	Hal Gregory – Asst. Superintendent of Programs					√		
ODNR – Division of Wildlife	Matthew Liebengood – Lake Erie Law Enforcement Supervisor					√		
OEMA	Luan Nguyen – Mitigation Planner					√		
ONDR – Old Woman Creek	Janic Kerns – Reserve Manager Emily Kuzmick – Training & Engagement Coordinator	√	√			√	√	
Ottawa County EMA	Fred Peterson – Director					√		
Ability Works	Doreen Ehlert - CEO						√	
American Red Cross	Lora Taylor – Disaster Program Manger					√		
OSU Extension Office	Thomas Dehaas – Agrigultural & Natural Resources Educator						√	

Community/ Organization	Stakeholders	Surveys Completed				Meetings Attended		
		Goals	Hazard Priorities	Previous Mitigation Actions	New Mitigation Actions	1	2	Other
Sandusky County EMA	Lisa Kuelling - Director					√	√	
Second Harvest Foodbank	Linda Todi – Representative					√		
Seneca County	John Spahr – Director	√	√			√		
Shores & Island Ohio	Larry Fletcher – President Dawn Weinhardt – VP Operations					√	√	
Wood County	Erin Konecki – Deputy Director Jeff Klein – Director Suzette Hall – Admin. Assistant					√	√	

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 September 23, 2025, inviting them to participate in the 2026 Erie 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/Erie-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 Erie County Plan update
- The role of the Core Planning Committee in the update process
- Contact information for both Erie County EMA and Burton Planning Services
- Dates, times, and Microsoft Teams links of upcoming Core Planning Committee and Public Meetings

Core Planning Committee Meeting and Public Meeting 1

The first meetings were open to both the Core Planning Committee members and the public. They were held both virtually and in-person on Wednesday, October 15, 2025, at 2:00 P.M. and at 5:00 P.M. at the Erie County Office Buildings in the Commission Chambers. 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 that 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 that 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 2026 Erie County Hazard Mitigation Plan.

A total of 40 people attended the afternoon meeting, including the Erie County EMA Director. Out of the 40 attendees, 20 attended through the online platform. Representatives from the City of Huron, City of Sandusky, Village of Berlin Heights, Village of Milan, Berlin Township, Perkins Township, Vermilion Local Schools, Huron City Schools, Erie County Health Department, Erie County GIS, Erie County Engineer, Care and Share for Erie County, Erie County Soil and Water Conservation District, Firelands Health, First Energy, Greater Sandusky, North Point ESC, Ottawa County, Ohio Department of Natural Resources, Ohio Emergency Management Agency, NASA GRC, Redcross, Shores & Islands Ohio, Huron County, Lorain County, Wood County, Seneca County, and Ashland County attended the afternoon meeting.

A total of six people attended the evening meeting, including the County EMA Director. Representatives from Perkins Township, Erie County Health Department, and Erie County Sheriff's Office also attended the evening meeting. No members of the public were present.

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.

Goals Survey

The purpose of this survey was to reflect on the goals included in the 2021 Hazard Mitigation Plan to determine if they were still relevant to the 2026 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 2026 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.

Hazard Priority Survey

The purpose of this survey was to review all hazards that could be included in the 2026 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 2026 Plan. Attendees rated hazards that were included in the 2021 Hazard Mitigation Plan, as well as all potential hazards that could be included in the 2026 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.

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 2021 Hazard Mitigation Plan, reflect on the status of each action, and determine if that action should be included in the 2026 Hazard Mitigation Plan.

Core Planning Committee Meeting and Public Meeting 2

The first meetings were open to both the Core Planning Committee members and the public. They were held both virtually and in-person on Thursday, November 13, 2025, at 2:00 P.M. and at 5:00 P.M. at the Erie County Office Buildings in the Commission Chambers. 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 that 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 that 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 2026 Erie County Hazard Mitigation Plan.

A total of 27 people attended the afternoon meeting in person including the Erie County EMA Director, as well as representatives of the City of Huron, City of Sandusky, Village of Berlin Heights, Vermilion Local School District, ODNR Old Woman Creek National Estuarine Research Reserve, Wood County EMA, Erie County Board of Developmental Disabilities, Shores & Islands Ohio, Ohio State University, Sandusky County, Ability Works, Perkins Township, Erie Regional Planning Commission, Erie County Job & Family Services, Erie County Health Department, First Energy, NASA GRC, Greater Sandusky Partnership, and Erie County EMA.

The evening meeting was open to both the public and stakeholders. Four people attended the evening meeting, including the Erie County EMA representatives and the Erie County Sheriff. No members of the community attended.

Hazard Mitigation Action Scoring Matrix

The purpose of this survey was to reflect on the hazard mitigation actions included in the 2021 Hazard Mitigation Plan to determine if they were still relevant to the 2026 Plan. New mitigation actions were developed for the 2026 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.

4 | Risk Assessments

4.1 Coastal Flooding and Erosion

Description

FEMA describes a coastal flood as "an inundation of normally dry coastal land by water from high or rising tides or storm surges." Coastal flooding can be caused by storm surge and seiche. Storm surge is when a storm system moves across a lake, disturbing the water in the lake and causing it to move in the same direction of the storm. The wind velocity (strength of the wind) and the barometric pressure (weight of air above a location) are the main contributors to the magnitude of storm surge. Storm surge magnitude is also determined by orientation of the lake. For Lake Erie, storms traveling northeast to southwest can cause a higher storm surge due to the orientation of Lake Erie.

NOAA defines a seiche as "a standing wave oscillating in a body of water." Seiches are caused by strong winds and rapid changes in barometric pressure. The rapid change in pressure and strong winds push water one end of the Lake to the other end. Seiches in Lake Erie are very common.

The zones V, VE, V1-30, A, AE, A1-30, AH, A0, and A99 are located in the Special Flood Hazard Area (SFHA). They are at a high risk or coastal high risk of flooding and will be inundated by a 100-year flood. Flood insurance is required for the zones. The flood zones B (shaded), X (shaded), C, (unshaded) and X (unshaded) are in a Non-Special Flood Hazard Area (NSFHA). Flood insurance is not required but recommended for moderate risk flood zones. FEMA defines areas by their risk of flooding using flood zones (**Table 4.1.1**).

Table 4.1.1: Flood Zones per FEMA

Flood Zone	Inundation	Risk	Flood Insurance Required
V	Inundated by the 100-year flood	Coastal High Risk	Yes
VE	Inundated by the 100-year flood	Coastal High Risk	Yes
V1-30	Inundated by the 100-year flood	Coastal High Risk	Yes
A	Inundated by the 100-year flood	High Risk	Yes
AE	Inundated by the 100-year flood	High Risk	Yes
A1-30	Inundated by the 100-year flood	High Risk	Yes
AH	Inundated by the 100-year flood	High Risk	Yes
AO	Inundated by the 100-year flood	High Risk	Yes
A99	Inundated by the 100-year flood	High Risk	Yes
B (Shaded)	Inundated between the 100-year flood and 500-year flood	Moderate Risk	No*
X (Shaded)	Inundated between the 100-year flood and 500-year flood	Moderate Risk	No*
C (Unshaded)	Inundated by the 500-year flood	Low Risk	No
X (Unshaded)	Inundated by the 500-year flood	Low Risk	No
D	Undetermined	Undetermined Risk	No

Source: FEMA **Not required but recommended. Certain federally funded mortgages may require it.*

Ohio's Department of Natural Resources (ODNR) defines erosion as "the wearing away of rock, soil, and other material." It is a natural process that can also be exacerbated by human activities (removing

land-stabilizing vegetation, building close to shorelines, boat wakes, shoreline hardening, and dredging).

Levee's are human made embankments to prevent overflow of a river or lake. Levee failures are covered separately in **4.2 Dam/Levee Failure.**

Location

Erie County has approximately 68 miles of Lake Erie and Sandusky Bay Shoreline. The Village of Kelleys Island is an island on Lake Erie, with 100 percent of shoreline. Coastal flooding and erosion can occur at any location along the shoreline. Due to the orientation of Lake Erie and the shallowness of the western basin, storms moving northeast to southwest produce higher storm surges. Erie County is located in the western basin of Lake Erie. **Table 4.1.2** is the list of communities that have a flood zone that requires flood insurance and what flood zones can be found in that community.

Table 4.1.2: Erie County Flood Zones per Community

Community	Flood Zone(s)
Erie County (Unincorporated Areas)	A, AE, AO, VE, X
City of Huron	A, AE, AO, VE, X
City of Sandusky	A, AE, AO, VE, X
Village of Bay View	AE, X
Village of Berlin Heights	A, X
Village of Castalia	X
Village of Kelleys Island	AE, AO, VE, X
Village of Milan	A, X

Source: FEMA

Extent

Erie County currently has 74 flood insurance maps (see **Appendix F**). The most recent update is from September 2022.

Coastal erosion occurs naturally and can be worsened through human activities. Mitigating coastal erosion is an ongoing process and includes a wide array of methods. Hardening the shoreline with human-made structures like bulkheads, seawalls, jetties, and revetments have been used throughout the shoreline of Lake Erie. More natural methods such as living shorelines, sand bypassing, plant revegetation, and dune construction are other potential mitigation efforts.

Erie County has utilized hardening to mitigate coastal erosion and natural methods of dune building and revegetation. A dataset completed in 2019 by NOAA can be utilized to see all mitigation efforts on the Great Lakes, including Lake Erie (**Appendix D**).

History

There have been 10 lakeshore floods, one seiche, and six storm surge/tides in Erie County between January 1995 and December 2023. These events have caused $2.4 million in property damage. No deaths or injuries were reported. Several of the most damaging events are described in more detail below.

Lakeshore Flood, May 16 – 19, 2020:

Northeast winds across Lake Erie increased water levels in the western basin for a period of three days, with a peak of 88.2 inches above normal water levels. The high water resulted in lakeshore flooding at Sandusky Bay. Street flooding on Parker Drive, Bimini Drive, and 1st Street were reported.

Homes along the causeway and the Cedar Point parking lot flooded, resulting in erosion. Erie County reported $250,000 in property damage. No deaths or injuries were reported.

Lakeshore Flood, June 5, 2019:

Northeast winds up to 20 knots were reported on Lake Erie. The wind produced waves up to five feet, resulting in lakeshore flooding at the Lake Erie Islands and along the shoreline from the City of Toledo to the City of Vermilion. Erie County reported $300,000 in property damage. No deaths or injuries were reported.

Lakeshore Flood, April 9, 1998:

Northeast gales of 35 knots were reported on Lake Erie. The wind produced waves up to 14 feet, causing major damage along the lakeshore. The strength of the wind and waves brought rocks and other debris onto the roads. Evacuations took place in Erie County. Erie County reported $300,000 in property damage. Erie County reported $1 million in property damage. No deaths or injuries were reported.

Lakeshore Flood, February 17, 1998:

Northeast gales of 34 knots were reported on Lake Erie. The water levels rose, causing flooding at the homes located in Whites Landing. Erie County reported $500,000 in property damage. No deaths or injuries were reported.

Coastal erosion areas are defined by years, CEA III for 2004 to 2015, CEA IV for 2015 to 2020. The years for each CEA are used to calculate average recession distance, recession rate, shore length affected and average encroachment. The two locations pulled are Erie County (lake facing) and Sandusky Bay, which is not lake facing. The levels of Lake Erie rose very little during the years of CEA III, and rapidly during the years of CEA IV. Table 4.1.3 is the summary data for coastal recession distance and rates.

Table 4.1.3: Coastal Recession Distance and Rates for Erie County

Location	Average recession distance, ft		Average recession rate, ft/yr		Average 30-year anticipated recession distance, ft		Average shore length affected by a CEA, miles		Average CEA encroachment depth, ft	
	CEA III	CEA IV	CEA III	CEA IV	CEA III	CEA IV	CEA III	CEA IV	CEA III	CEA IV
Erie County	0.3	3.3	0.0	0.7	0.7	20	0.06	2.8	17	136
Sandusky Bay	0.6	6.4	0.1	1.3	1.5	38	0.3	3.2	49	128

Source: ODNR

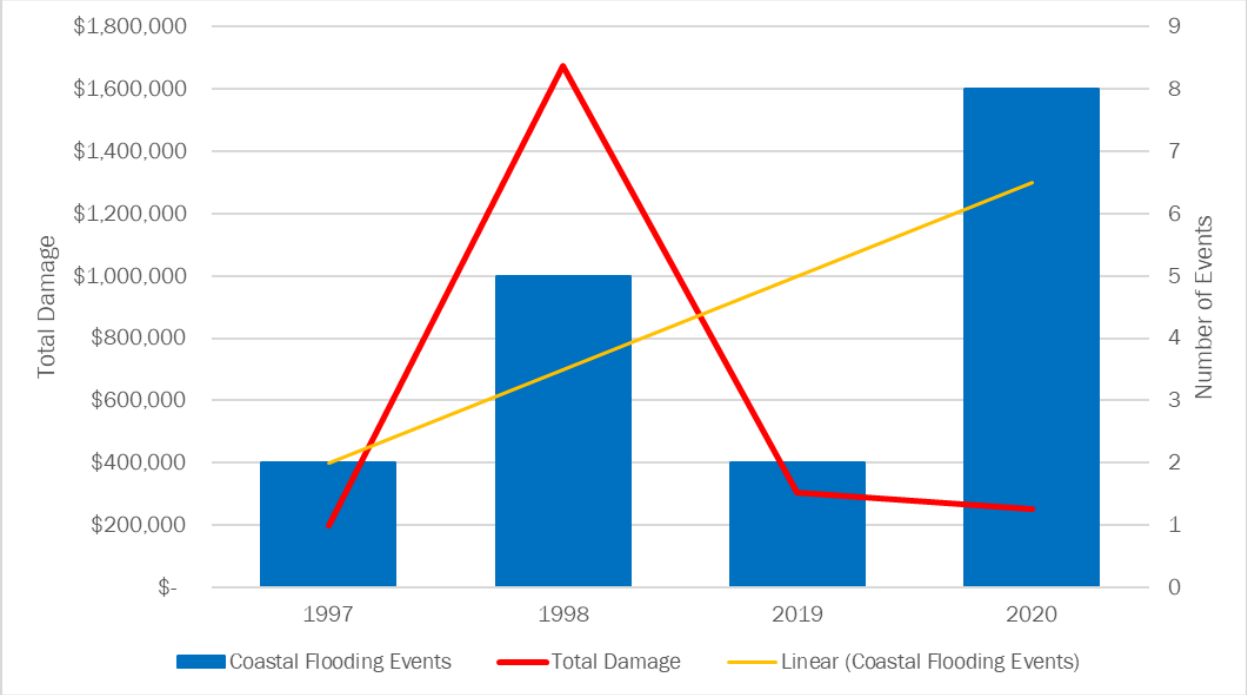
Probability

Figure 4.1.4 shows the number of coastal flood events and affiliated cost over time since January 1995. Between 1995 and 2023, Erie County experienced 17 flooding events, including 10 lakeshore floods, one seiche, and six storm surge/tides. Annually, this amounts to less than one flood per year, however, in 2020 Erie County reported eight coastal flooding events. The yellow trendline of flood occurrences per year is increasing, which may suggest that Erie County can expect an increased frequency of flood events each year. The Shifting Weather Patterns section in Future Trends discusses weather patterns further.

Coastal erosion is a continuing issue that is expected to increase as water levels in Lake Erie increase and storm events increase. According to ODNR, 95% of Lake Erie's shoreline is eroding. Table 4.1.3

anticipates that Erie County (lake facing) shoreline will recede by 20 feet and Sandusky Bay's shoreline will recede by 38 feet in the next 30 years.

Figure 4.1.4: Probability and Cost of Coastal 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. Waterfront properties are an increased risk of damage due to shoreline erosion and storm surge.

Population Impact

Coastal flooding and coastal erosion have caused damage to occupied homes and businesses in the past. During coastal flood events, shelter and temporary housing may need to be provided to those impacted by flooding. Evacuations may need to occur as well in low-lying areas or Islands. Erosion can cause home foundations to slip, resulting in the need for temporary housing.

In the National Risk Index, "coastal flooding" had a score of 60.0 "Relatively Low"). People that are most vulnerable to flooding are those who live within the 100-year floodplain in structures that are not elevated about the base flood elevation. The index indicates an expected annual loss of $283,000 due to coastal flood events with 0 events occurring per year on average. Based on historical data, coastal floods occur every 1.7 years in Erie County.

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 Erie County for coastal flooding according to FEMA's National Risk Index are recorded in **Table 4.1.5** below. This table shows Erie County's expected losses for buildings, population ($11.6 million for each fatality or ten injuries), and agriculture per census tract. The EAL Total column combines the buildings, population, and agricultural

losses for each census tract and are sorted most vulnerable census tract to least vulnerable census tract.

Table 4.1.5: Structure and Population Vulnerability from Coastal Flooding

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39043041900	$180,719	$145	$0	$180,864
39043040100	$34,001	$144	$0	$34,145
39043040700	$19,240	$119	$0	$19,358
39043041702	$13,053	$67	$0	$13,120
39043040802	$11,968	$41	$0	$12,009
39043040400	$8,154	$46	$0	$8,200
39043040500	$4,685	$30	$0	$4,715
39043040900	$3,911	$15	$0	$3,926
39043040200	$3,038	$8	$0	$3,046
39043040300	$2,936	$25	$0	$2,962
39043041200	$890	$5	$0	$894
39043041600	$0	$0	$0	$0
39043041400	$0	$0	$0	$0
39043041701	$0	$0	$0	$0
39043041100	$0	$0	$0	$0
39043040801	$0	$0	$0	$0
39043041800	$0	$0	$0	$0
39043041300	$0	$0	$0	$0
39043041000	$0	$0	$0	$0
Grand Total	**$282,595**	**$645**	**$0**	**$283,240**

Source: FEMA National Risk Index

Loss of Life

There are no reported deaths from coastal flood events in Erie County between January 1995 through December 2023. Loss of life is possible in coastal flood events.

Economic Losses

Coastal floods can halt economic activity, block roadways, and cause coastal erosion. Businesses may need to shut down their operations due to flood water damage or road closures. Coastal erosion caused by waves can result in the loss of sediment and the steepening of the beach due to scarping. Coastal erosion mitigation actions such as beach nourishment are not only expensive, but finding the correct sediment is important.

Future Trends

Land Use and Development Trends

Approximately 23.85% of Erie County is developed, with shoreline municipalities such as Sandusky, Huron, and Vermilion accounting for approximately 45% of the County's population. Although Erie County's population has declined by approximately 2.4% since 2020, redevelopment and tourism-related investment continue to occur along the Lake Erie shoreline. The median year of construction for housing units is 1966, indicating that more than half of the County's structures were built prior to the adoption of modern wind- and flood-resistant building standards. As a result, older housing stock combined with increased impervious surfaces associated with waterfront redevelopment contributes to heightened exposure to wave action, shoreline erosion, and nuisance flooding.

Shoreline areas remain the primary focus of economic and residential redevelopment, while approximately 76.15% of Erie County remains in agricultural or natural land cover, limiting large-scale expansion into new hazard-prone areas. Although overall development growth is limited, coastal hazard exposure has gradually increased as redevelopment concentrates higher-value structures and infrastructure within shoreline areas already experiencing erosion and flooding pressures.

Shifting Weather Patterns and Environmental Trends

Shifting weather patterns 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 these changes (NCA 2025). According to the SOHMP, increased precipitation and weather variability will also increase the likelihood and intensity of flood events, which will mostly occur during the summer and fall months. These events will mainly occur from late summer to early winter, increasing the likelihood of cool season flood events in the late autumn and early winter. Additionally, heavy precipitation events and precipitation 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 these shifting weather patterns.

4.2 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 amount of resources invested toward 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 only designed to operate during periods of increased water inflow or high reservoir levels.
- **Structural failure**: Caused by foundation defects such as settlement and slope instability or earthquakes.
- **Mechanical failure**: Dam failure due to malfunctioning gates, conduits, or valves.
- **Hydraulic failure**: Occurs when water overtops the dam, usually 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 damages, 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 damages, 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 damages and economic losses are expected to be limited to the dam owner's property.

Location

There is one dam property located in Erie County (**Table 4.2.1**). The status of the dam's Emergency Action Plan as of September 25, 2025, is indicated in the table (Source: USACE). The dam's location can be seen in **Figure 4.2.2**.

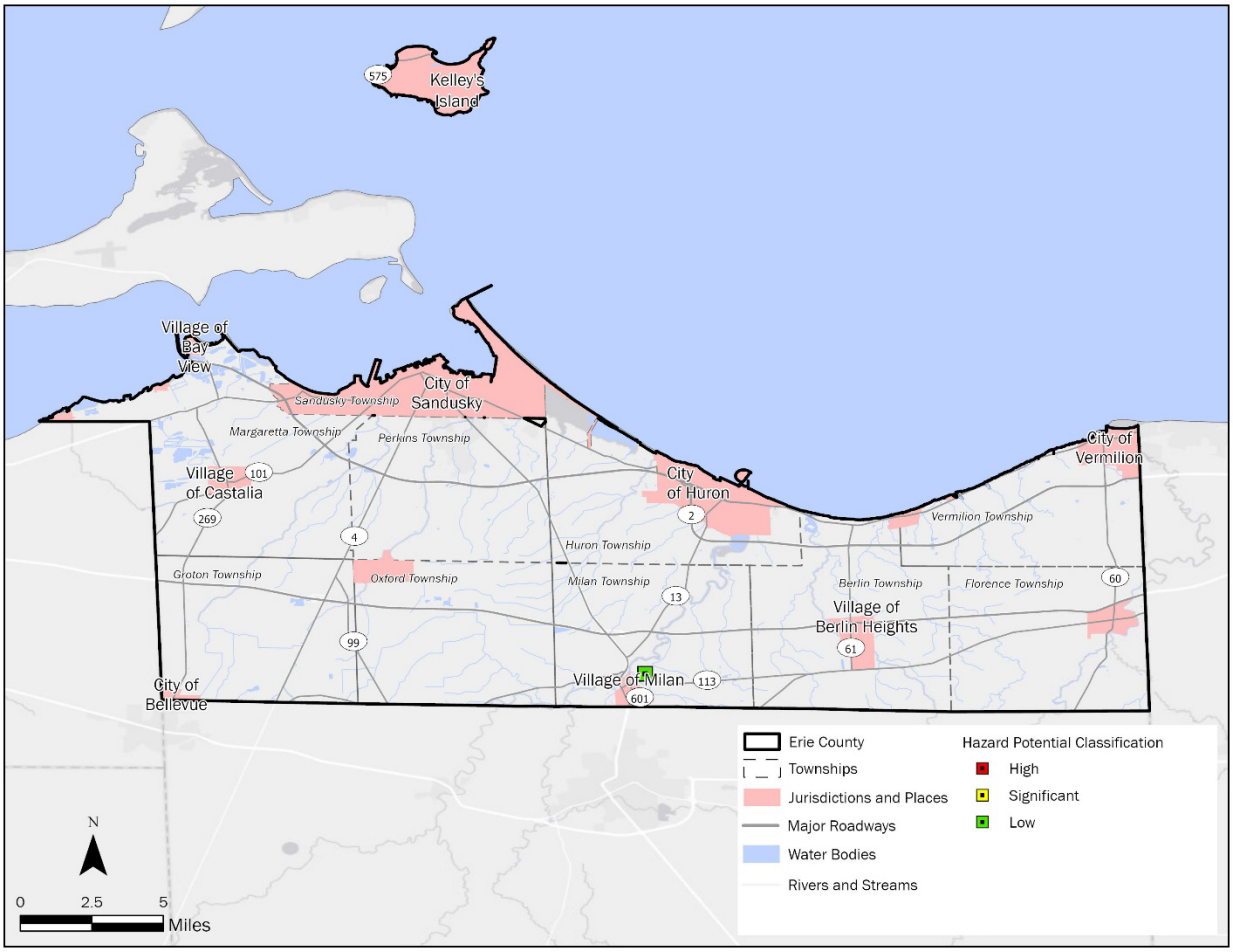
Table 4.2.1: Dam Properties in Erie County, Ohio

Hazard Potential Classification	Dam Name	Owner Type	Distance to Nearest City (Miles)	Condition Assessment	EAP Prepared
Low	Work Lake No. 2 Dam	Private	7.6	Poor	No

Source: U.S. Army Corps of Engineers

There is one levee system located in Erie County. The Whites Landing levee system was constructed by the United States Army Corp of Engineers (USACE) in 2001 to manage flood risk from Sandusky Bay. The levee starts near the intersection of Hill Road and Wahl Road, continuing east along the shoreline and wraps around the Edgewater Trailer Park, ending on Wahl Road. The levee is 0.79 miles long and has average height of six feet. It has a total area of 396.2 acres.

Figure 4.2.2: Dam Locations in Erie 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 worst-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 zero High Hazard Potential dams in Erie County. Sudden failure of High Hazard Potential 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.
- 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 in Erie County, Ohio. There have been no known levee failures in Erie County, however, the Whites Landing levee system has had minimal testing and has not been fully loaded. There is uncertainty that the levee will be able to withstand flood waters of a 500-year flood. Since the levee system was built, it has prevented an estimated $501,700 of flood damages.

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 coupled with shifting weather patterns could result in more frequent dam failures. The Shifting Weather Patterns and Environmental Trends section in Future Trends discusses these changes further.

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

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.

The Whites Landing levee system protects 99 buildings and 112 acres of farmland. Overtopping or failure of the levee system could result in extensive damage.

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. The Whites Landing levee system protects 240 people from flood waters.

Dam failure is not listed in the National Risk Index as it is not a natural disaster. However, natural disasters like flooding can occur due to or because of dam failure. In the National Risk Index, "riverine flooding" had a score of 87.6 ("Relatively Moderate"). People that are most vulnerable to flooding are those who live within the 100-year floodplain in structures that are not elevated about the base flood elevation. The index indicates an expected annual loss of $3.1 million due to flood events with two events occurring per year.

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. The Whites Landing levee system protects $21 million in property value.

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

The levee system protects 112 acres of farmland. Economic losses can include damage from flooding crops, flooding livestock, damaged goods, and the flooding of vital roadways.

The dam located in Erie County is a private dam and does not have an Emergency Operations Plan (EAP) published (**Table 4.2.1**). The data is subjected 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 within areas subject to inundation following a dam failure should be prepared for rapid-onset flooding, which allows little time for warning or evacuation. Land use planning measures can help limit future development in these areas to prevent increases in dam hazard potential. To better inform land use decisions and emergency planning, dam failure inundation maps should be completed for as many dams as possible. Any new residential construction occurring within mapped inundation or breach areas would increase both property and population vulnerability, despite overall Countywide population decline.

Development trends indicate minimal expansion into potential dam or levee inundation zones. Erie County's population decreased from 75,622 in 2020 to 73,841 in 2024, and housing growth has been limited, with approximately 3.8% of homes constructed between 2010 and 2019 and only 0.2% added since 2020. The County's developed footprint, estimated at 23.85%, has remained relatively stable for more than a decade and has not resulted in new concentrations of development within known inundation areas. However, approximately 52% of the housing stock was constructed prior to 1970, and many older structures may be more vulnerable to rapid flooding due to outdated construction practices and lower finished-floor elevations.

Redevelopment within older neighborhoods generally maintains existing exposure rather than expanding development into new areas. As a result, overall vulnerability to dam or levee failure is expected to remain relatively unchanged unless redevelopment increases structural density or value within inundation areas.

In Erie County, buildings constructed within the 100-year floodplain are required to obtain permits and comply with local floodplain management regulations, including construction above the Base Flood

Elevation (BFE). Future flood-related damages associated with dam or levee failure are therefore conditional, provided new construction and substantial improvements adhere to these standards. However, planners should also consider the cumulative effects of impervious surface expansion, as increased runoff can exacerbate flooding impacts downstream of dams.

Shifting Weather Patterns and Environmental Trends

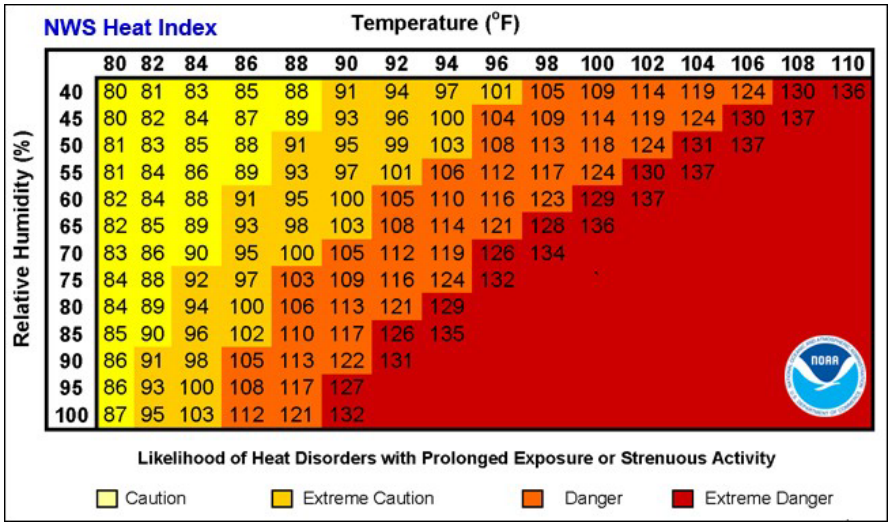
Shifting weather patterns may increase the frequency and/or the severity of the impacts from a dam failure event. Shifting weather patterns are having an uneven effect on precipitation (rain and snow) in the U.S. – some areas are experiencing increased precipitation and flooding, while others suffer from drought. If Erie County experiences effects of these changes related to heavy rainfall, more frequent and severe flooding could occur, which could lead to or be caused by dam failure. Aging dam infrastructure coupled with shifting weather patterns could result in more frequent dam failures. According to the Fifth National Climate Assessment, dams and levees can fail after moderate or extreme rainfall. If Erie County experiences the effects of these changes related to more frequent droughts, dams and levees can be compromised because of the ground cracking due to drying, reduced soil strength, erosion, and subsidence. As drought or precipitation frequency and intensity increase with these changes, the probability and severity of dam failure may increase as well, especially if this infrastructure is not maintained, upgraded, or, if necessary, redesigned.

4.3 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 4.3.1**.

Figure 4.3.1: 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. In 2002 and 2003, Erie County experienced its longest drought, which lasted 38 weeks, 27 of which were either moderate or severe.

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 Erie 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 Erie 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 4.3.2**. 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 4.3.2: 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 -4.10	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 (includes federal drought categories). Negative values indicate drought conditions while positive values represent wet conditions. Values around zero represent near normal conditions.

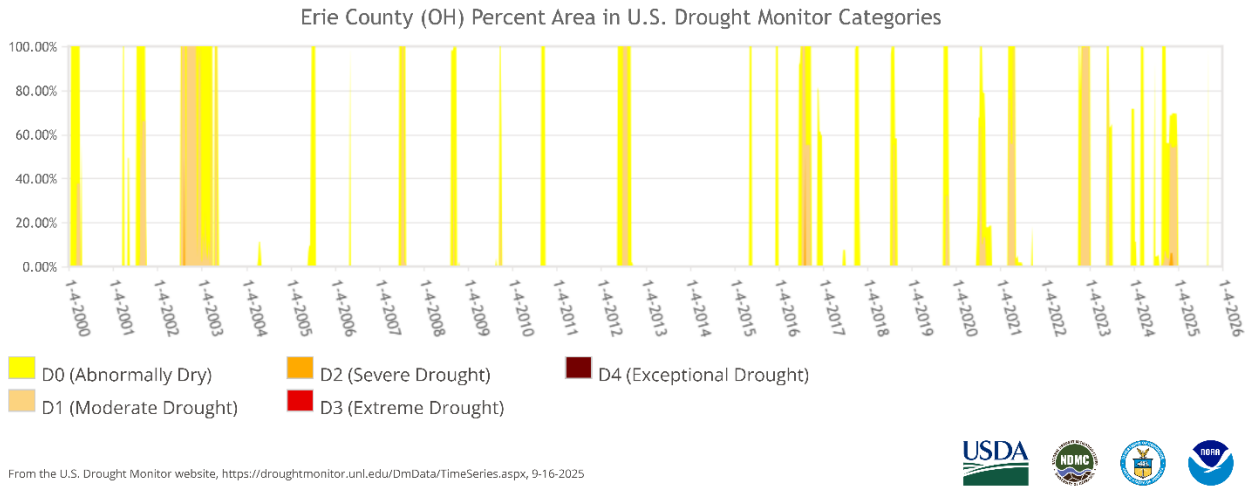
Abnormally dry (D0) and moderate drought (D1) conditions occur frequently and typically do not adversely affect agricultural activities unless conditions are sustained in nature. Severe and extreme drought (D2 and D3, respectively) conditions begin to impact agricultural crops, leading to potential economic 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

Drought

The 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 Erie County has spent 273 weeks in abnormally dry conditions, 128 weeks in moderate drought, six weeks in severe drought, and zero weeks in extreme or exceptional drought since 2000. **Figure 4.3.3** depicts the drought monitor history for Erie from 2000 through January 2026. The most extensive periods of moderate drought specific to Erie County are provided in **Table 4.3.4** (Source: U.S. Drought Monitor). Following the table, severe droughts and extreme heat events are summarized.

Figure 4.3.3: Drought in Erie County from 2000 to 2025



Source: U.S. Drought Monitor

Table 4.3.4: Periods of Moderate Drought in Erie County, Ohio, 2000-2025

Start Date	End Date	# of Consecutive Weeks
9/3/2024	12/30/2024	17
6/6/2023	6/19/2023	2
11/1/2022	1/9/2023	10
3/16/2021	5/10/2021	8
7/21/2020	10/26/2020	14
10/15/2019	11/4/2019	3
7/31/2018	8/20/2018	3
7/19/2016	9/26/2016	10
7/3/2012	8/13/2012	6
7/10/2007	8/13/2007	5
4/29/2003	5/12/2003	2
3/18/2003	3/31/2003	2
9/3/2002	3/10/2003	27
7/23/2002	8/26/2002	5
8/14/2001	10/1/2001	7
3/14/2000	4/10/2000	4

*Source: U.S. Drought Monitor *Two weeks or more are considered Periods*

Severe and Extreme Drought

There have been three drought events since January 1, 2000, in which a portion of Erie County was in a Severe Drought. The droughts will normally start off as abnormally dry and progress to more severe drought conditions. The three events are detailed below.

Severe Drought (D2), August 2024 – January 2025:

Starting in August 2024, Erie County was experiencing abnormally dry and moderate drought conditions. The drought intensified and by September 3, 2024, 1.3 percent or approximately 998 residents of Erie County were in a moderate drought. On October 29, 2024, the drought progressed to a severe drought for 2.55 percent or approximately 1,969 residents of Erie County. The severe drought lasted four weeks, effecting an average of 5.21 percent or 4,010 residents of Erie County. The drought continued as a moderate drought for five more weeks before conditions regressed to abnormally dry conditions only.

Severe Drought (D2), June 2002 – October 2002:

Starting on July 16, 2002, 100 percent or approximately 77,078 residents of Erie County were experiencing abnormally dry conditions. Within a week the drought intensified to a moderate drought. After three weeks of a moderate drought, 48.96 percent or approximately 37,741 residents of Erie County were in a severe drought. The severe drought lasted one week. The moderate drought and abnormally dry conditions lasted another 33 weeks.

Severe Drought (D2), June 2016 – October 2016:

Starting in June 2016, 91.43 percent or approximately 70,471 residents of Erie County were experiencing abnormally dry conditions. After four weeks, the drought intensified to a moderate drought and during the week of August 9, 2016, 51.61 percent or approximately 39,784 residents of Erie County were in a severe drought. The severe drought lasted just one week before reducing back to a moderate drought. The drought conditions lasted another eight weeks, ending on October 3, 2016.

Extreme Heat

There have been two heat events in Erie County reported to the NCEI.

Heat Event, July 1 – July 31, 1999:

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

Heat Event, June 6 – June 12, 1999:

High temperatures in the 90's across Erie County were reported for the second week of June 1999. Thunderstorms in late June 1999 brought cooler temperatures, but they did not last. Temperatures increased again in July 1999.

Probability

Erie County has experienced droughts in the past, and the potential exists for the County to experience droughts in the future. Erie County has spent 273 weeks in abnormally dry conditions, 128 weeks in moderate drought, six weeks in severe drought, and zero weeks in extreme or exceptional drought since 2000. Based off historical data, Erie County has a 21 percent chance of any given week being abnormally dry, which averages out to nearly 11 weeks per year. The probability of a moderate drought is 9.8 percent, resulting in an average of about five weeks per year. Lastly, the probability of a severe drought is significantly lower at 0.46 percent, which historically averages out to just about one week every four years.

Erie County had two reported heat events between 1995 and 2024. Erie County has a low chance of having a heat event each year based on historical data.

Seasons of drought and extreme heat have the potential to occur during any particular year, when necessary conditions are met, and 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.

Population Impact

Extreme heat can have an impact on the population of the entire County. Groups who live in areas with minimal tree cover or urban areas may experience higher temperatures relative to outlying areas due to the urban heat island effects. Groups that are particularly vulnerable to extreme heat, such as older adults and people with chronic health conditions may experience illness or injury, such as heat cramps, heat exhaustion, and heat stroke.

For social vulnerability, the National Risk Index indicates that the population in Erie County has a score of 47.3 (“relatively low”) for heat wave. The index indicates an expected annual loss of $71,000 due to heat wave events with 0.5 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 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 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.

Potential economic losses and damage associated with Erie County for Heat Wave according to FEMA’s National Risk Index are recorded in **Table 4.3.5** below. 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 Erie County. Expected losses are assessed for buildings, population ($11.6 million for each fatality or ten injuries), and agriculture per census tract. All 19 census tracts for Erie County are listed in the table for Heat Wave. The EAL Total column combines the buildings, population, and agricultural losses for each census tract and are sorted most vulnerable census tract to least vulnerable census tract.

Table 4.3.5: 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)
39043041800	$100	$5,417	$1,049	$6,566
39043040300	$74	$5,260	$599	$5,933
39043040400	$92	$5,243	$204	$5,539
39043041600	$85	$5,051	$171	$5,307
39043040100	$68	$4,969	$18	$5,055
39043041900	$138	$4,109	$11	$4,259
39043040500	$55	$3,987	$4	$4,045
39043040200	$55	$3,466	$143	$3,663
39043041100	$27	$3,600	$0	$3,627
39043040700	$49	$3,381	$0	$3,429
39043041701	$50	$3,127	$244	$3,421
39043041300	$34	$3,185	$1	$3,220
39043040900	$49	$2,932	$16	$2,997
39043041400	$41	$2,546	$1	$2,588
39043041702	$33	$2,425	$126	$2,584
39043041000	$19	$2,532	$0	$2,551
39043040801	$24	$2,297	$0	$2,320
39043041200	$24	$2,196	$0	$2,221
39043040802	$28	$1,443	$0	$1,471
Grand Total	**$1,045**	**$67,165**	**$2,586**	**$70,796**

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.

Economic Losses

Economic losses are a threat from extreme heat and droughts to Erie 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 Erie County include soybeans for beans, corn for grain, wheat for grain, forage-land used for all hay and haylage, and popcorn. Based on data from the U.S. Department of Agriculture, Erie County's crop yields may have been impacted from previous drought events, however, it is difficult to determine the loss based on census data. Census data was collected for 2017 and 2022 which are two years with zero to minimal drought events for Erie County. Acreage used for crops was reduced by 4,388 acres between 2017

and 2022. Though the acreage decreased, yield per acre increased for every crop (**Figure 4.3.6**). Agricultural land use can be seen on the land use map in Chapter 1 (**Figure 1.2.1).**

Table 4.3.6: Erie County Crop Yields 2017 - 2022

Commodity	2017		2022	
	Acres	Crop Yield	Acres	Crop Yield
Corn, Grain	24,619	4,470,458 Bushels	23,665	4,437,779 Bushels
Hay & Haylage	2,005	5,793 Tons	1,372	6,831 Tons
Popcorn	2,251	10,692,734 Pounds	1,057	6,039,876 Pounds
Soybeans	37,825	1,874,648 Bushels	33,197	1,913,293 Bushels
Wheat	4,082	307,249 Bushels	7,103	583,841 Bushels

Source: United States Department of Agriculture Census

Future Trends

Land Use and Development Trends

Nearly half of Erie County's land area (49.09 percent) is used for cultivated crops, and approximately 77,157 acres of farmland create ongoing vulnerability to drought conditions that can affect soil health and agricultural productivity. Although population decline has reduced pressure on overall water demand, the County's reliance on surface water resources and its extensive agricultural base continue to influence drought exposure.

Extreme heat vulnerability is strongly shaped by existing land use and development patterns, particularly the County's aging housing stock. The median year of construction for housing units is 1966, and only 91 new residential units have been constructed since 2020. Older homes are more likely to lack modern cooling systems, energy-efficient insulation, and heat-resistant building materials, increasing indoor heat exposure.

Demographic characteristics further contribute to heat vulnerability. Approximately 27 percent of Erie County residents are between the ages of 45 and 64, and 23 percent are aged 65 and older, increasing the prevalence of heat-sensitive populations. The combination of aging housing stock and an aging population indicates a gradual increase in heat-related vulnerability, even as overall development and population growth remain stable.

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 climate gets warmer, there will 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 will be negatively affected by the severe heat in the summer, which will 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 decades.

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 Erie 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.

There are no known faults in Erie County. The closest fault line is an unnamed fault in Sandusky 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 coordinate 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 Erie County, the first in the Village of Kelleys Island and the second in Huron Township. There are also stations in Lorain County to the east of Erie County and Sandusky County to the west of Erie County.

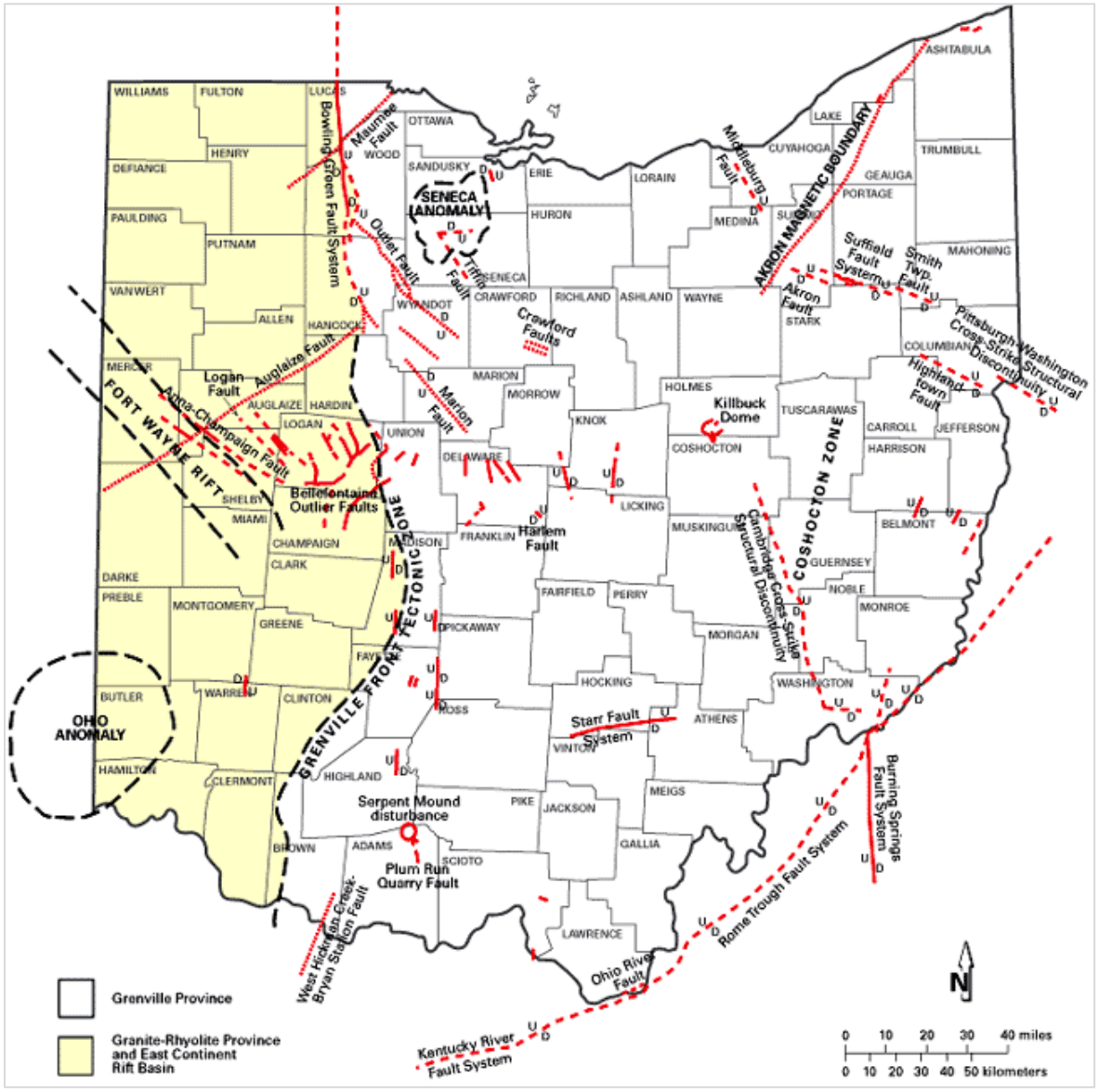
Earthquakes can yield a variety of different outcomes. With the ground shaking associated with earthquake events, buildings have a high potential to be impacted. If soil liquefaction, the response of water-saturated loose sediment to strong ground shaking, occurs, buildings can sink into the ground. 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.	4.6
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

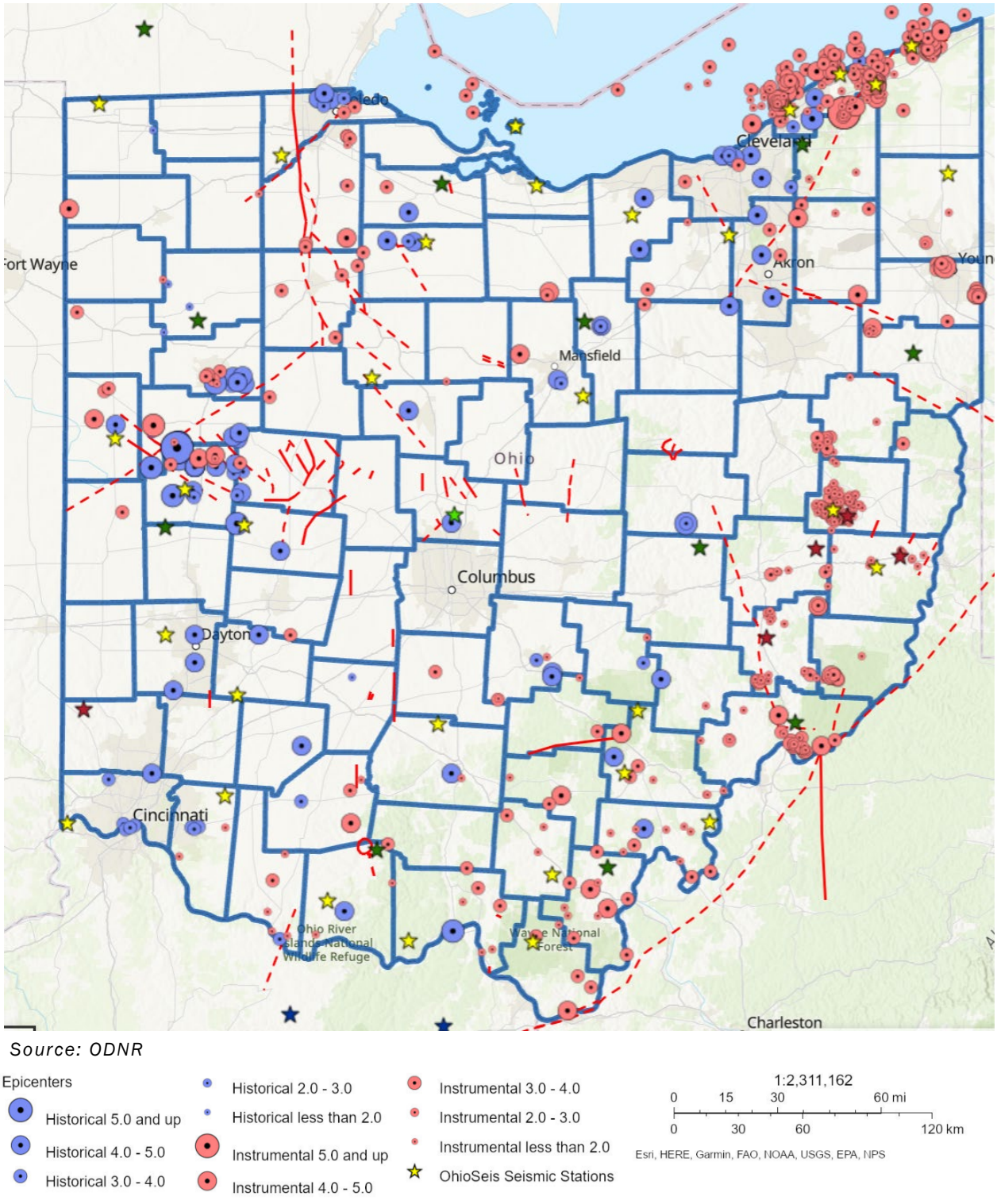
Source: ODNR

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 300 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 15 earthquakes

have caused minor-to-moderate damage and no recorded deaths. Erie County has had no recorded earthquakes, according to data at ODNR.

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.

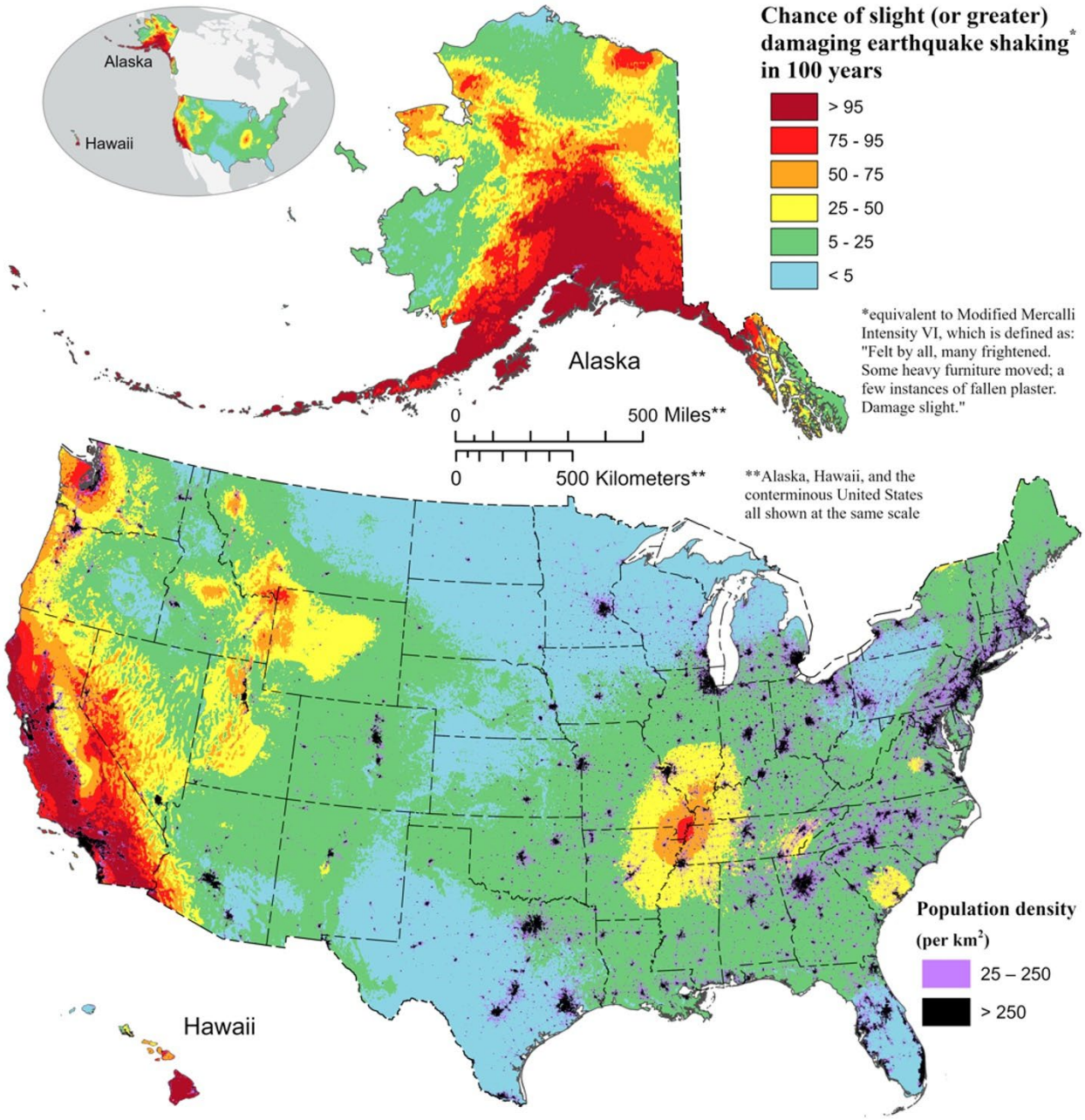
Probability

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 five to 25 percent chance of potentially minor-damage ground shaking for Erie 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 Erie County has an eight percent to ten percent peak ground acceleration for two percent probability of exceedance in 50 years.

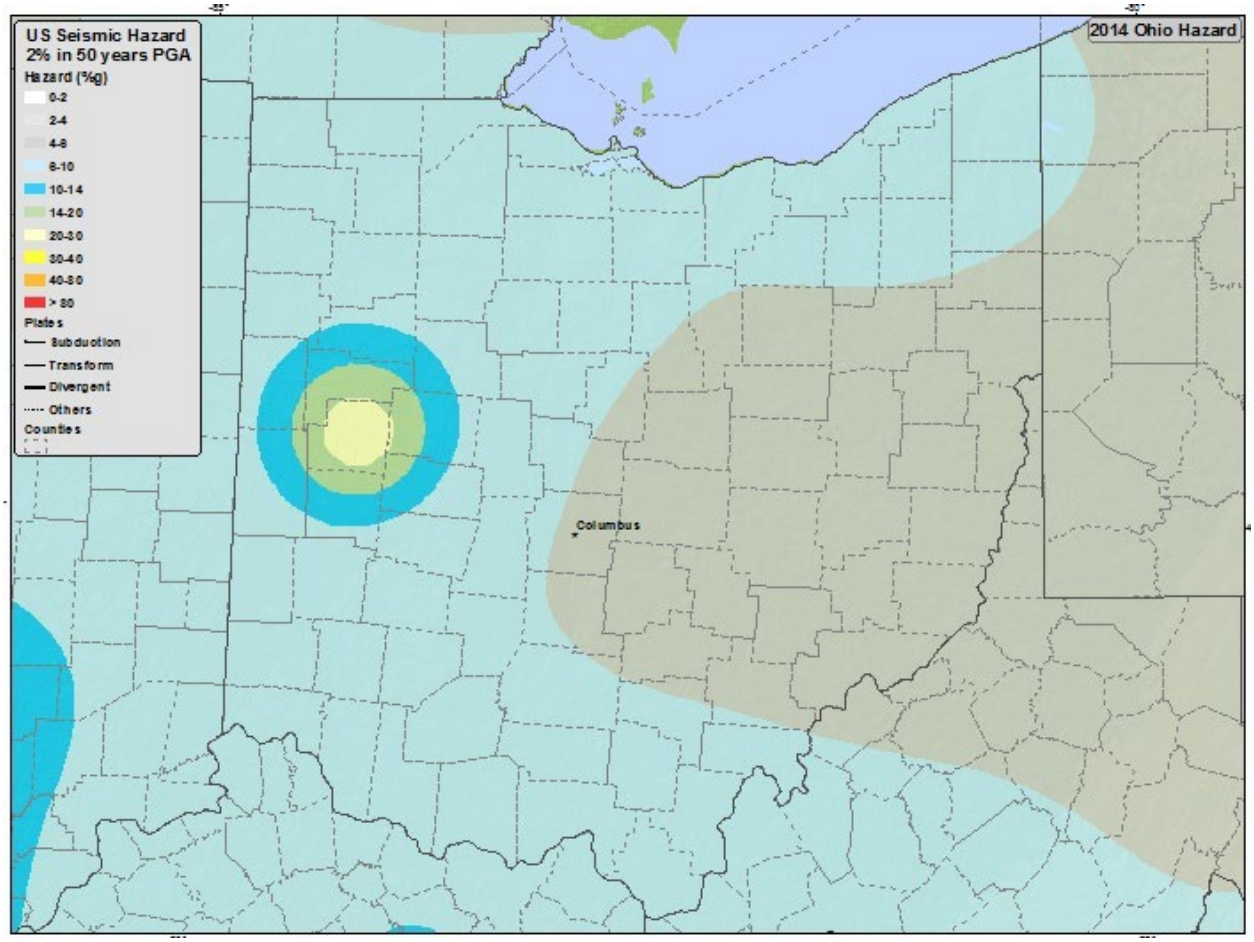
Furthermore, the ODNR indicates that the brief historic record of Ohio earthquakes suggests a risk of moderately damaging earthquakes in the western, northeastern, and southeastern parts of the State.

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

Based on recorded data at ODNR, there have been no earthquakes recorded in Erie County. 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 Erie is less than one percent, there is a low risk of impact on infrastructure as a result.

Population Impact

There is a relatively low risk of earthquakes occurring in Erie County. Accordingly, there is a low risk of impact on the population; however, if an earthquake were to occur within Erie, the population could be impacted by loss of homes, loss of utilities, and a potential reduction of air quality.

According to the National Risk Index calculated by FEMA, Erie County's risk to earthquakes was scored at 54.8 ("very low"), as compared to all other U.S. counties, due to its very low expected annual loss, and very high community resilience scores. Earthquakes are not likely to occur in Erie County; therefore, the population is unlikely to be affected. Some 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 $193,000 due to earthquakes with a less than 0.045 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 Erie County, ranked with the highest vulnerability to the lowest vulnerability.

Loss of Life

Erie County has no recorded earthquake events that have resulted in death; 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 Erie County for earthquakes according to FEMA's National Risk Index are recorded in **Table 4.4.6** below.

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 Erie County. Expected losses are assessed for buildings, population ($11.6 million for each fatality or ten injuries), and agriculture per census tract. All 19 census tracts for Erie County are listed in the table for earthquakes. The EAL Total column combines the buildings, population, and agricultural losses for each census tract and is sorted most vulnerable census tract to least vulnerable census tract.

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)
39043041900	$26,074	$3,840	$0	$29,914
39043041800	$16,599	$2,989	$0	$19,588
39043040400	$14,913	$2,652	$0	$17,565
39043041600	$14,658	$2,517	$0	$17,174
39043040500	$8,201	$2,901	$0	$11,103
39043040300	$8,773	$1,984	$0	$10,757
39043040900	$8,757	$1,679	$0	$10,437
39043040100	$7,297	$2,041	$0	$9,338
39043041701	$7,568	$1,441	$0	$9,009
39043041400	$6,833	$1,265	$0	$8,098
39043040200	$6,502	$1,249	$0	$7,752
39043040700	$6,006	$930	$0	$6,935
39043041702	$5,211	$1,066	$0	$6,277
39043040802	$4,981	$950	$0	$5,930

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39043041300	$3,919	$1,211	$0	$5,130
39043041100	$3,895	$1,180	$0	$5,075
39043041200	$3,852	$874	$0	$4,726
39043040801	$3,639	$975	$0	$4,614
39043041000	$2,783	$1,121	$0	$3,904
Grand Total	**$160,459**	**$32,866**	**$0**	**$193,324**

Source: FEMA National Risk Index

Future Trends

Land Use and Development Trends

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

According to the Comprehensive Economic Development Strategy for Erie and Huron Counties, the number one goal is to "Foster an environment that promotes the retention, expansion and attraction of business investment." Through their goals, Erie County has several objectives including promoting revitalization of traditional downtown areas, promoting development of outdoor recreational amenities to optimize natural assets, increasing business retention and expansion visits, communicating vision to broaden support for economic development efforts, and aggressively pursuing grant funding for infrastructure development projects.

Erie County has experienced very limited new development, with only 113 residential permits issued in 2024 and a projected 0.8% population decline by 2028. The County remains 23.85% developed and 76.15% non-developed, and development has not expanded into areas with heightened seismic concern. Structural vulnerability is primarily tied to the age of the building stock, as more than 52% of all homes were built before 1970 and roughly 21.4% were built before 1940, predating modern seismic-resistant design practices.

The County's stable development pattern maintains existing levels of earthquake exposure, resulting in no meaningful change in overall earthquake vulnerability.

4.5 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.

Similarly, erosion is the process of the wearing-away or removal of soil by large storms, flooding, strong wave action, sea level rise, fluvial (riverine) currents, and human activities. Erosion can lead to downstream sedimentation, causing water quality impacts (USEPA 2024). Erosion can occur at the bottom of a streambed or riverbed, deepening the body of water. It can also occur outward, wearing away at the banks of the stream or river and causing damage to nearby structures. Wind erosion is an additional concern for farmland and rangeland.

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. There are many karst features in Erie County. Location of karst features can be found at: https://ohiodnr.gov/discover-and-learn/safety-conservation/geologic-hazards/karst.

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 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.

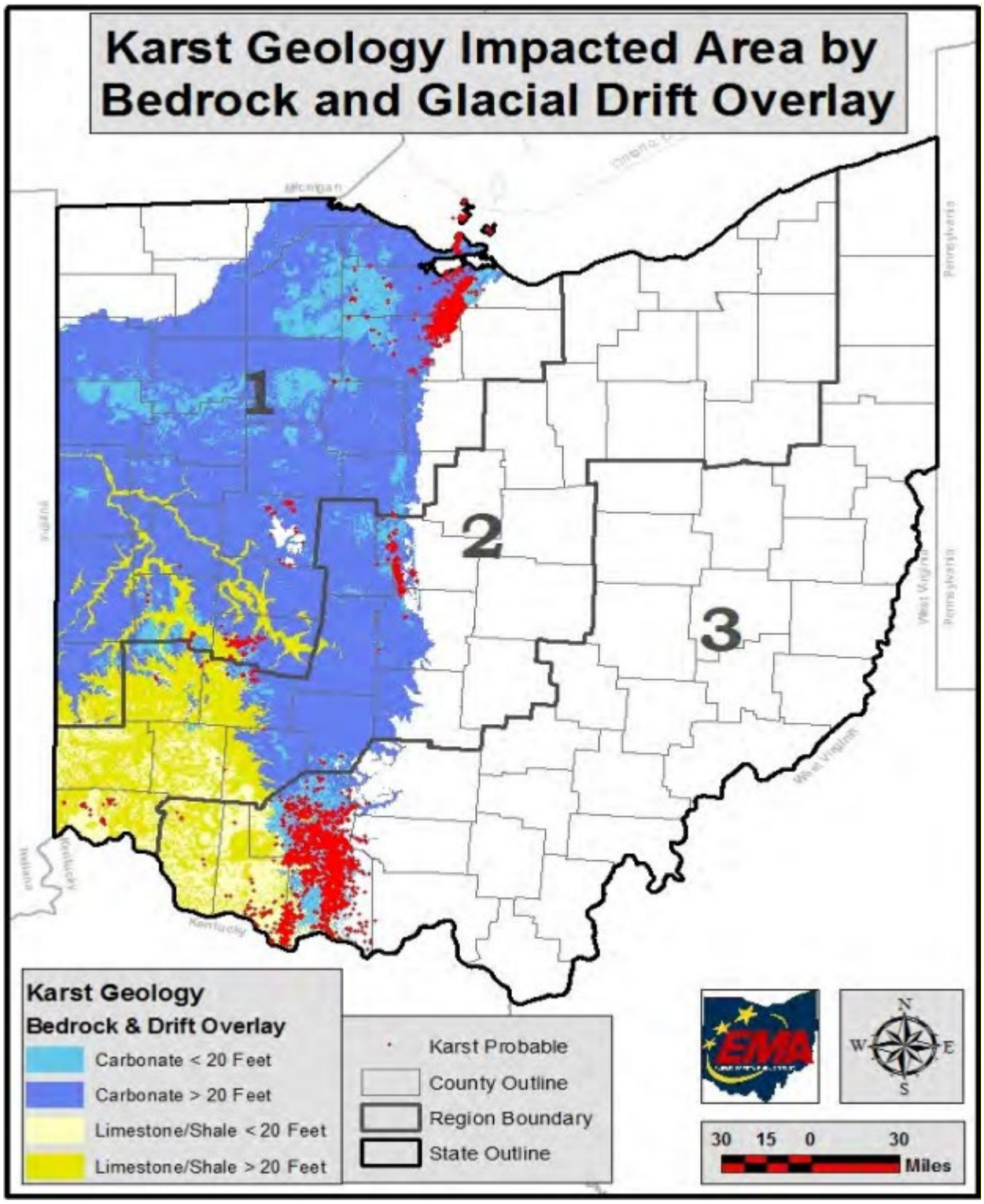
Location

Figure 4.5.1 shows the location of areas impacted by bedrock and glacial drift overlay. The map shows that the glacial drift overlay is west and south and of Erie County.

Figure 4.5.2 shows the location of abandoned underground mines 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 3 or in nearby counties. However, there are two abandoned underground mines located in Erie County and residents have the option of obtaining insurance.

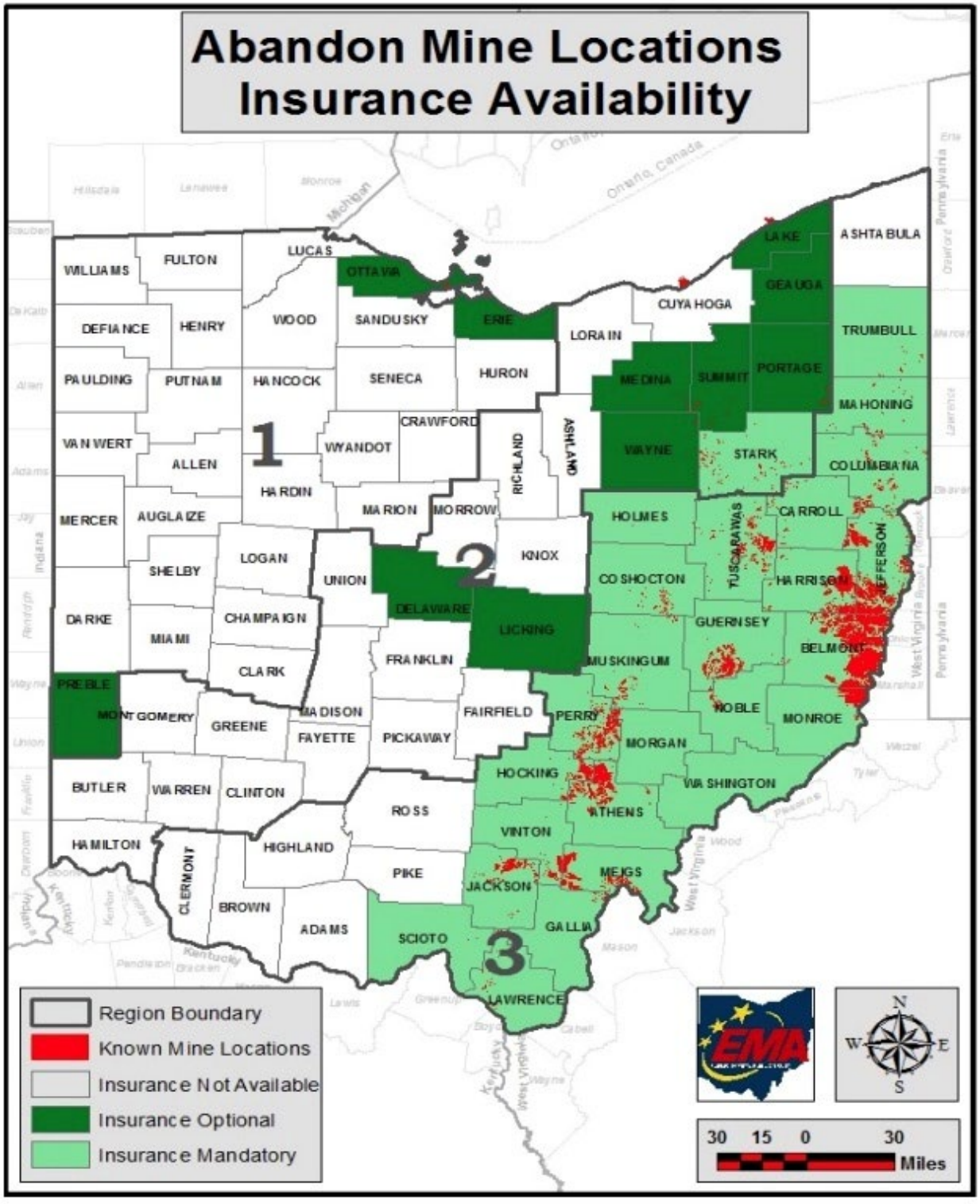
Figure 4.5.3 shows the location of areas at risk for landslides. Erie County is in Region One and has low to medium incidence of landslides. The medium incidence to landslides is located along Lake Erie. The map displays both the incidence of landslides and susceptibility of the land surface to landslides. 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 4.5.1: Karst Geology Impacted Area by Bedrock and Glacial Drift Overlay



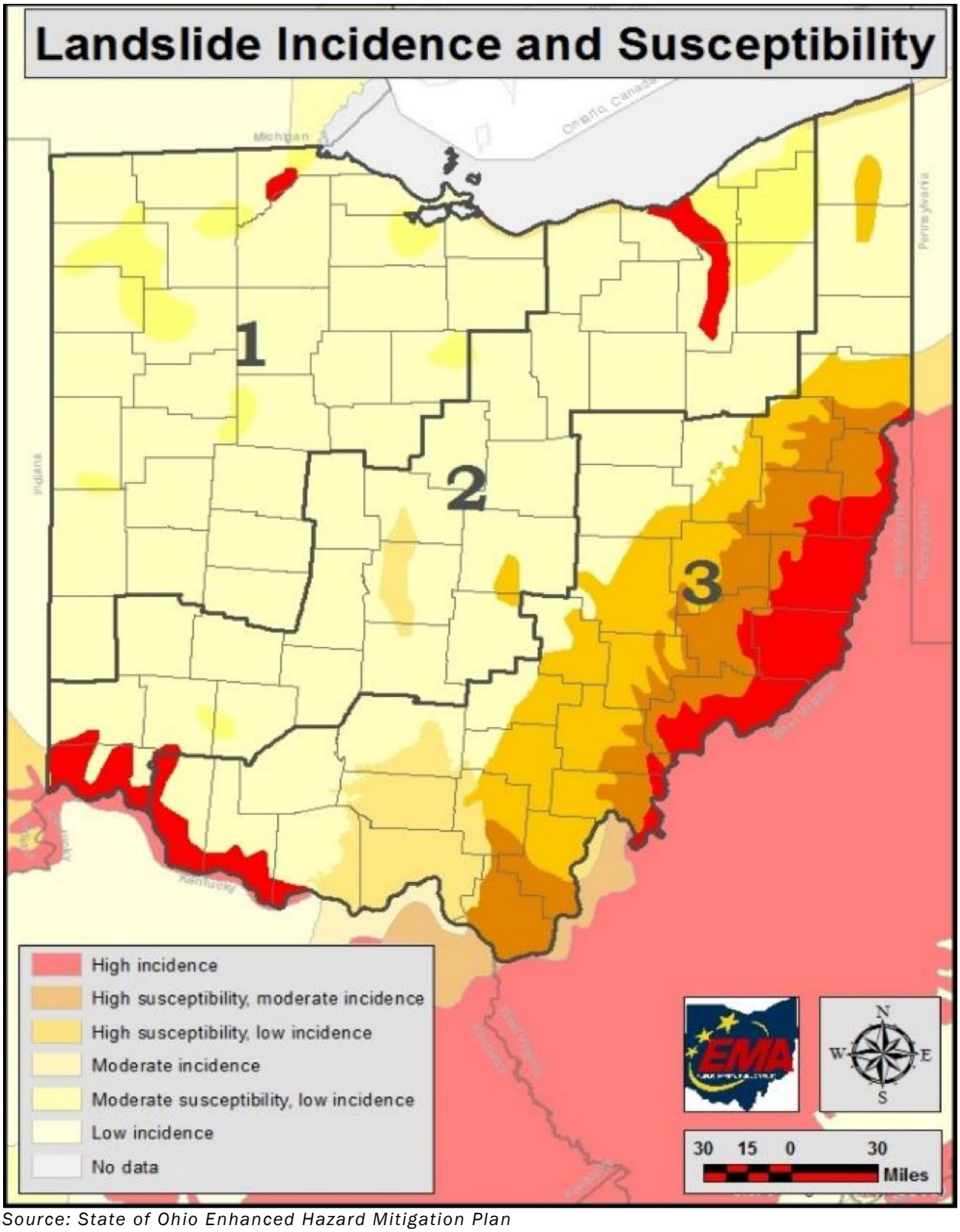
Source: Ohio Emergency Management Agency

Figure 4.5.2: Abandoned Mine Locations and Insurance Availability



Source: State of Ohio Enhanced Hazard Mitigation Plan

Figure 4.5.3: Landslide Incidence and Susceptibility Map



Source: State of Ohio Enhanced Hazard Mitigation Plan

Extent

According to ODNR Division of Geologic Survey, Erie County is home to seven bedrock formations: Brea Sandstone and Bedford Shale Undivided, Ohio Shale, Prout Limestone Member, Plum Brook Shale Member, Delaware Limestone, Columbus Limestone, and Bass Islands Dolomite. These formations have fossiliferous limestone, dolomite, argillaceous, cherty, carbonaceous limestone, shale, argillaceous limestone, limestone, carbonaceous shale with carbonate/siderite concretions, and interbedded siltstone and sandstone.

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 for 26 counties and optional for 11 counties in Ohio. Insurance for the mandatory counties has an annual premium of $1.00, while the premium for optional counties is $5.00. Erie County residents do have the option of enrolling in Mine Subsidence Insurance. According to the ODNR there are two abandoned underground mines in Erie County.

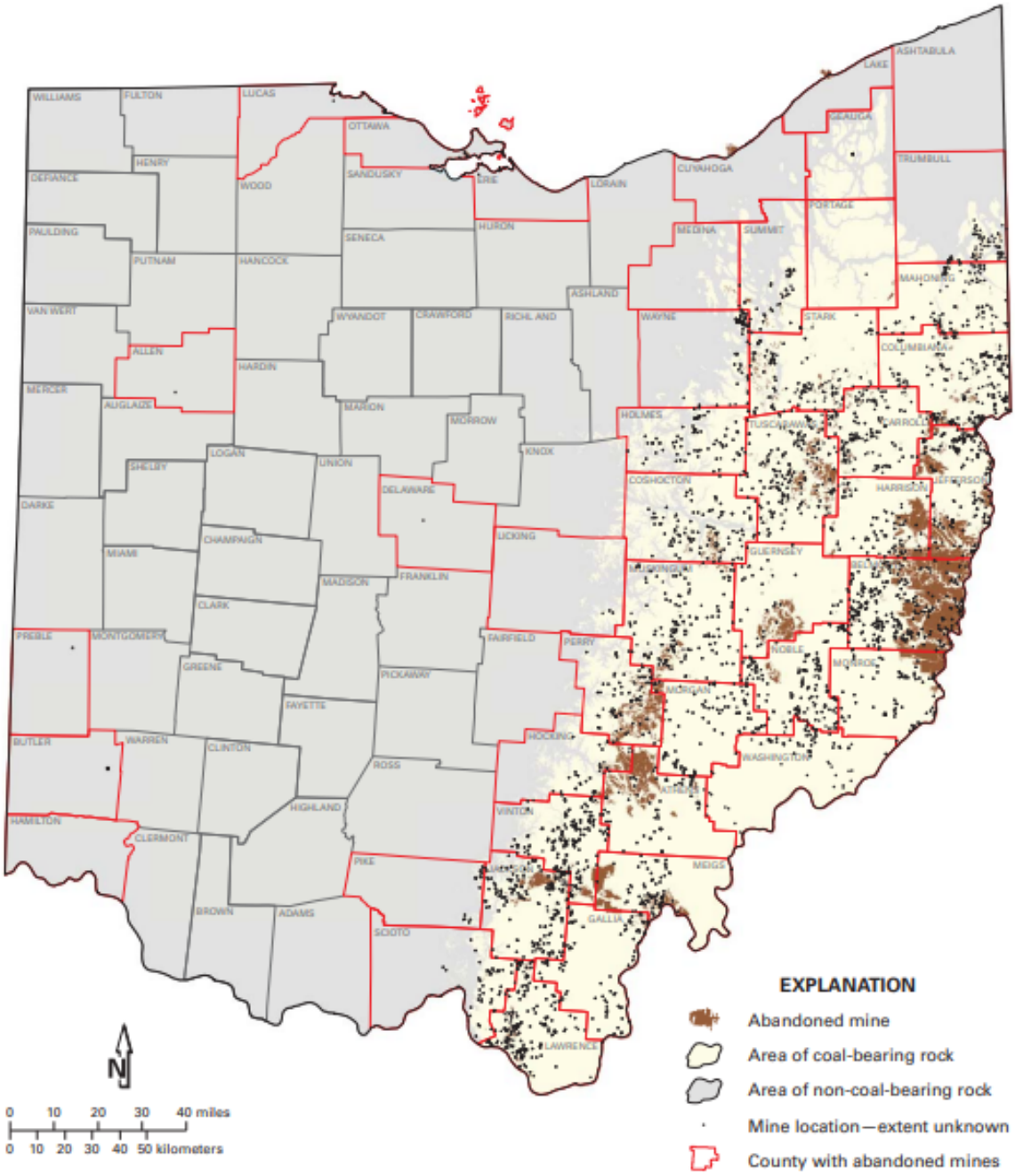
Table 4.5.4 shows insurance claims, claim payments, and policies for Erie County. There haven't been any open claims in the past six years. The number of policies fluctuates throughout the years with an average of 10,305 policies held each year. **Figure 4.5.5** maps the AUMs in Ohio, and the area of coal-bearing rock. Counties outlined in red are counties with AUMs. There are two AUMs located in western Erie County.

Table 4.5.4: Insurance Claims and Payments

Year	Open Claims	Closed Claims	Claim Payments	Policies
2023	0	0	$0	2,468
2022	0	0	$0	2,257
2021	0	0	$0	2,461
2020	0	0	$0	2,082
2019	0	0	$0	2,023
2018	0	0	$0	1,863
2017	0	0	$0	1,754

Source: Ohio Mine Subsidence Insurance Underwriting Association

Figure 4.5.5: Abandoned Underground Mines in Ohio

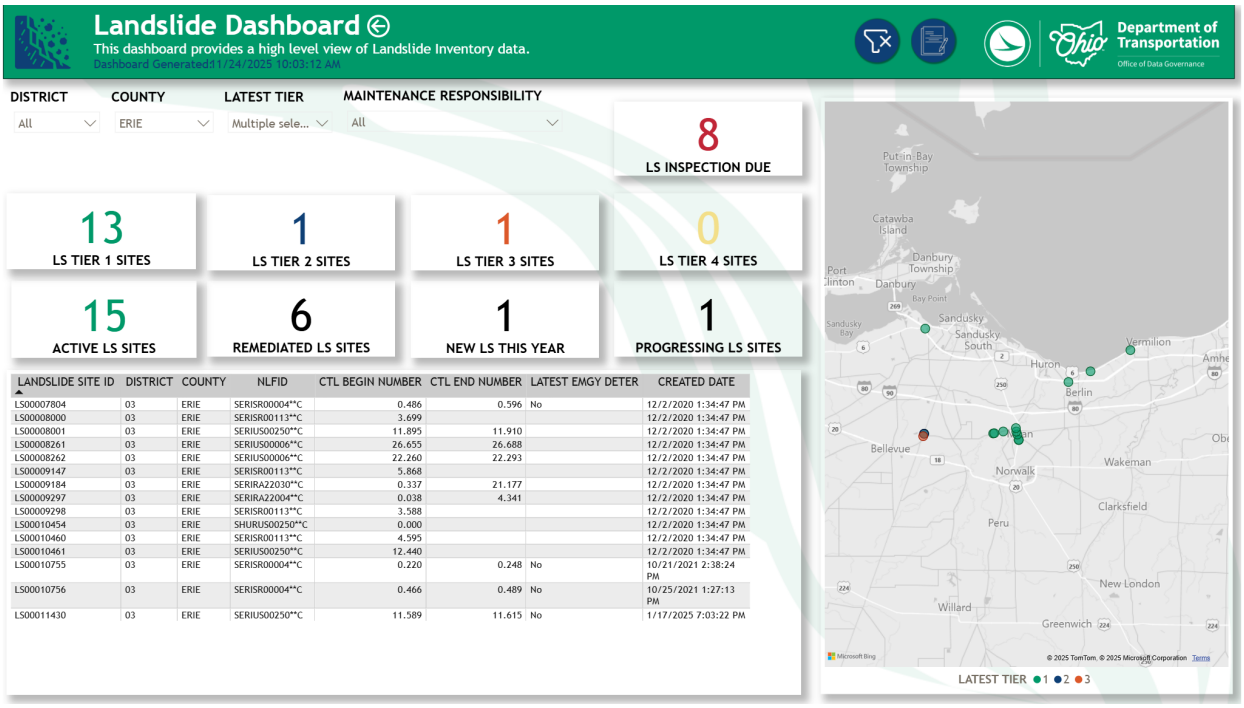


Source: ODNR and Ohio Mine Subsidence Insurance Underwriting Association

History

According to the Ohio Department of Transportation (ODOT) there have been 16 landslides in Erie County, with 15 active. Four landslides have occurred along US Highway 250 N, four along SR-113, two on US Highway 2, three on SR-4, and two on SR-6 (**Figure 4.5.6**). No rockslides have been reported in Erie County. Of the 16 landslides, 13 were rated Tier 1. Tier 1 ratings do not require a detailed rating and have a low probability of additional movement and a low probability of significant impact to an ODOT asset or adjacent property.

Table 4.5.6: Landslide Inventory



Source: Ohio Department of Transportation Geohazards Dashboard

Table 4.5.7 shows the most up-to-date probability of landslide occurrences, AUMs, and rockslides in Erie County. "Tier" refers to the probability of an event occurring at a given site, with Tier 1 being low probability and Tier 4 being very high probability. The most common tier in the County is Tier 1, with 13 Tier 1 sites out of a total of 18 total sites. Since incidents of landslides and rockslides often go unreported, individual sites are an accurate way to discuss both past problem areas and future probability of events.

Table 4.5.7: Landslide and Rockfall Sites

Tier	Abandoned Underground Mines (AUM)	Landslides	Rockslides	Total
Tier 1	0	13	0	13
Tier 2	0	1	0	1
Tier 3	2	1	0	3
Tier 4	0	1	0	1
Total	**2**	**16**	**0**	**18**

Source: Ohio Department of Transportation Geohazards Dashboard

Probability

According to the ODNR, Erie County falls within an area of low risk for slope failure, however, landslides should be considered a likely event. The 1870 Ohio Mine Law required a mine to 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 6,000 known underground mines in Ohio. On February 8, 2022, the federal government granted the State of Ohio $46.4 million to reclaim abandoned coal mines. There are no documented mine collapses in Erie County, and mine subsidence should be considered an unlikely event.

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.

Mine subsidence is not listed in the National Risk Index, but landslide is listed with a score of 18.5 (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.

Potential economic losses and damage associated with Erie County for Landslides according to FEMA's National Risk Index are recorded in **Table 4.5.8** below.

Expected annual loss (EAL) rates, calculated by FEMA, identify the total value of loss expected each year for a particular community, in this case Erie County census tracts. Expected losses for buildings, population ($11.6 million for each fatality or ten injuries), and agriculture per census tract from landslides is recorded in **Table 4.5.8** below. The EAL Total column combines the buildings, population, and agricultural losses for each census tract and are sorted most vulnerable census tract to least vulnerable census tract.

Table 4.5.8: 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)
39043041800	$1,789	$7,339	$0	$9,128
39043040300	$706	$3,593	$0	$4,299
39043040400	$760	$1,818	$0	$2,578
39043041900	$661	$1,638	$0	$2,299
39043041600	$210	$1,446	$0	$1,656
39043040200	$239	$765	$0	$1,004
39043041701	$123	$683	$0	$806

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39043041702	$11	$117	$0	$128
39043040500	$1	$0	$0	$1
39043041300	$0	$0	$0	$0
39043040801	$0	$0	$0	$0
39043041400	$0	$0	$0	$0
39043040802	$0	$0	$0	$0
39043040700	$0	$0	$0	$0
39043041200	$0	$0	$0	$0
39043040100	$0	$0	$0	$0
39043041100	$0	$0	$0	$0
39043040900	$0	$0	$0	$0
39043041000	$0	$0	$0	$0
Grand Total	**$4,500**	**$17,400**	**$0**	**$21,900**

Source: FEMA National Risk Index

Loss of Life

Loss of life and injuries are possible during sudden mine subsidence or landslides. However, there are no known deaths or injuries in Erie 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

Erie County has not expanded development into steep-slope or historic mining areas, and only 23.85% of the County is developed. Development activity has largely consisted of renovation or infill, and only 2.6% of homes have been built since 2010, which limits the introduction of new structures into areas susceptible to landslides or subsidence. Older structures remain a concern, with 8,202 homes (21.4%) built before 1940, when foundation and geotechnical standards were less robust.

The absence of outward development into susceptible areas means that landslide and subsidence vulnerability remains unchanged, sustained primarily by the age of existing structures rather than new development.

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.

4.6 Natural Biohazards

Description

Natural Biohazards are defined as invasive species and algae blooms. Invasive species are non-native species which have potential negative impacts on the environment and economy of Erie County. Harmful algae blooms (HAB) are caused by a rapid increase in algae populations, causing a discoloration of water, harmful impacts on human health, and negative impacts on aquatic life.

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.

According to the National Institute of Environmental Health Sciences, a harmful algae bloom (HAB) occurs when toxin-producing algae grow excessively in a body of water. There are numerous types of algae responsible for HABs and once an excess of algae are present in the water, the blooms can be identified by their color: green, blue-green, red, or brown. HABs are caused by warming water temperatures and excess nutrients (phosphorus and nitrogen) in the water. Excess nutrients can come from fertilizer runoff and sewage waste brought by runoff. The cause of HABs are attributed to warmer water temperatures in the summer and excess nutrients from sewage waste or fertilizer runoff. HABs cause oxygen-deprived water, killing fish and other living creatures, blocking sunlight from organisms deeper in the water, and can cause illness in humans from consuming contaminated fish or drinking contaminated water.

The phytoplankton cyanobacteria, are the main cause of HABs in Lake Erie. Cyanobacteria are known to cause a blue-green algae bloom and are a type of bacteria. Cyanobacteria produce a toxin-like microcystin, which is a known liver toxin.

Location

Invasive species have the potential to impact any location within the County. The most invasive terrestrial species degrades the state's woodlands, wetlands, and prairies. Aquatic invasive species use rivers to spread. Ohio has over 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. Erie County is part of the Western Lake Erie Basin, which is an ecologically diverse river system, and is susceptible to invasions through the Detroit River, Maumee River, Raisin River, Sandusky River, Huron River, St. Clair River, and their tributaries. Erie County is part of the largest watershed in the world, the Great Lakes-St. Lawrence River Basin, which is ecologically diverse and susceptible to both terrestrial and aquatic invasions from human activities like the complex system of human-built locks and canals, tourism activities, and the release of ballast water from seafaring vessels carrying trade items from around the world.

Lake Erie is the shallowest of the Great Lakes and warms quickly in the spring and summer months. It has an average depth of 62 feet; however, the western basin has an average depth of 24 feet. The western basin warms quicker in the summer months due to the shallowness. Algae blooms can occur anywhere in Lake Erie, however, the shallowness and high nutrient runoff from the Maumee River has led to more frequent algae blooms in the western basin.

Extent

Invasive Species

Once invasive species become widely established, controlling their spread is both technically difficult and expensive, making eradication nearly impossible. Invasive species can alter species diversity and natural wildlife habitat in regions where they become established. State and federal quarantine programs aim to prevent the further spread of various invasives. While the federal invasive species quarantine program attempts to control numerous species across all 50 states and territories, Ohio has two insects in quarantine programs, the spotted lantern fly and the box tree moth. Invasive species in Erie County that are of particular concern and / or species with federal or state quarantine programs are described in more detail below.

A common invasive species in Erie County is the **Emerald Ash Borer (EAB) (Figure 4.6.1)**. 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. The EAB was first discovered in Erie County in 2005. 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 4.6.1: Emerald Ash Borer

Source: National Park Services

Another invasive species in Erie County is the **Spotted Lanternfly (SLF)** (**Figure 4.6.2**). The SLF was first discovered in Ohio in 2020 and has now been reported in 54 counties within the state, including Erie County. Of the 54 counties, 18 are under quarantine to reduce the spread of SLF, including Erie County. SLF damage plants such as grapevines, black walnut saplings, and the tree of heaven. SLF are not known to sting or bite, but they do jump when they are approached. To control infestations, the Department of Agriculture suggests removing host plants, destroying egg masses, and using low-toxicity insecticides.

Figure 4.6.2: Spotted Lanternfly and Eggs

Source: Stephen Ausmus

Approximately 2,300 plant species occur in the wild in Ohio. Of these, about 78 percent are native, that is, they existed in the region before 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 4.6.3**). These plants cannot be sold, distributed, or imported.

Table 4.6.3: 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 watermilfoil
Nymphoides peltata	Yellow floating heart
Phragmites australis	Common reed
Potamogeton crispus	Curley-leaved pondweed
Pueraria montana var. lobate	Kudzu
Pyrus calleryana (effective January 7, 2023)	Callery pear
Ranunculus ficaria	Fig buttercup, lesser celandine

Scientific Name	Common Name
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

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 4.6.4**). With the exception of white perch, it is unlawful to possess, import, or sell these species live.

Table 4.6.4: 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-spined stickleback
Fish	*Gymnocephalus cernuus*	Ruffe
Fish	*Hypophthalmichthys harmandi*	Large-scale silver carp
Fish	*Hypophthalmichthys molitrix*	Silver carp
Fish	*Hypophthalmichthys nobilis*	Bighead carp
Fish	*Lates niloticus*	Nile perch
Fish	*Leuciscus idus*	Ide
Fish	*Morone americana*	White perch
Fish	*Mylopharyngodon piceus*	Black carp
Fish	*Neogobius melanostomus*	Round goby

Type	Scientific Name	Common Name
Fish	*Osmerus mordax*	Rainbow smelt
Fish	*Perca fluviatilis*	European perch
Fish	*Perccottus glenii*	Amur sleeper
Fish	*Petromyzon marinus*	Sea lamprey
Fish	*Phoxinus phoxims*	Eurasian minnow
Fish	*Proterorhinus marmoratus*	Tubenose goby
Fish	*Pseudorasbora parva*	Stone moroko
Fish	*Rhodeus sericeus*	Bitterling
Fish	*Rutilus sericeous*	Roach
Fish	*Sander lucioperca*	Zander
Fish	*Scardinius erythrophthalmus*	European rudd
Fish	*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 mud snail
Crustaceans	*Bythotrephes longimanus*	Spiny water flea
Crustaceans	*Cercopagis pengoi*	Fishhook water flea
Crustaceans	*Cherax destructor*	Yabby
Crustaceans	*Cherax tenuimanus*	Marron
Crustaceans	*Dikerogammarus villosus*	Killer shrimp
Crustaceans	*Eriocheir sinensis*	Chinese mitten crab
Crustaceans	*Faxonius virilis*	Virile crayfish
Crustaceans	*Hemimysis anomala*	Bloody-red shrimp
Crustaceans	*Procambarus clarki*	Red Swamp crayfish
Plant	*Butomus umbellatus*	Flowering-rush
Plant	*Egeria densa*	Brazilian waterweed
Plant	*Hydrilla verticillata*	Hydrilla

Type	Scientific Name	Common Name
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
Plant	*Pistia stratiotes*	Water lettuce
Plant	*Potamogeton crispus*	Curly-leaf pondweed
Plant	*Trapa natans*	Water chestnut
Plant	*Typha angustifolia*	Narrow-leafed cattail
Plant	*Typha x glauc*	Hybrid cattails (cross of invasive and common)

Another invasive species that has the potential to impact Erie County and the surrounding counties in Ohio is the Mute Swan.

Mute Swans are 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 and will attack humans and pets. 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.

Harmful Algae Blooms

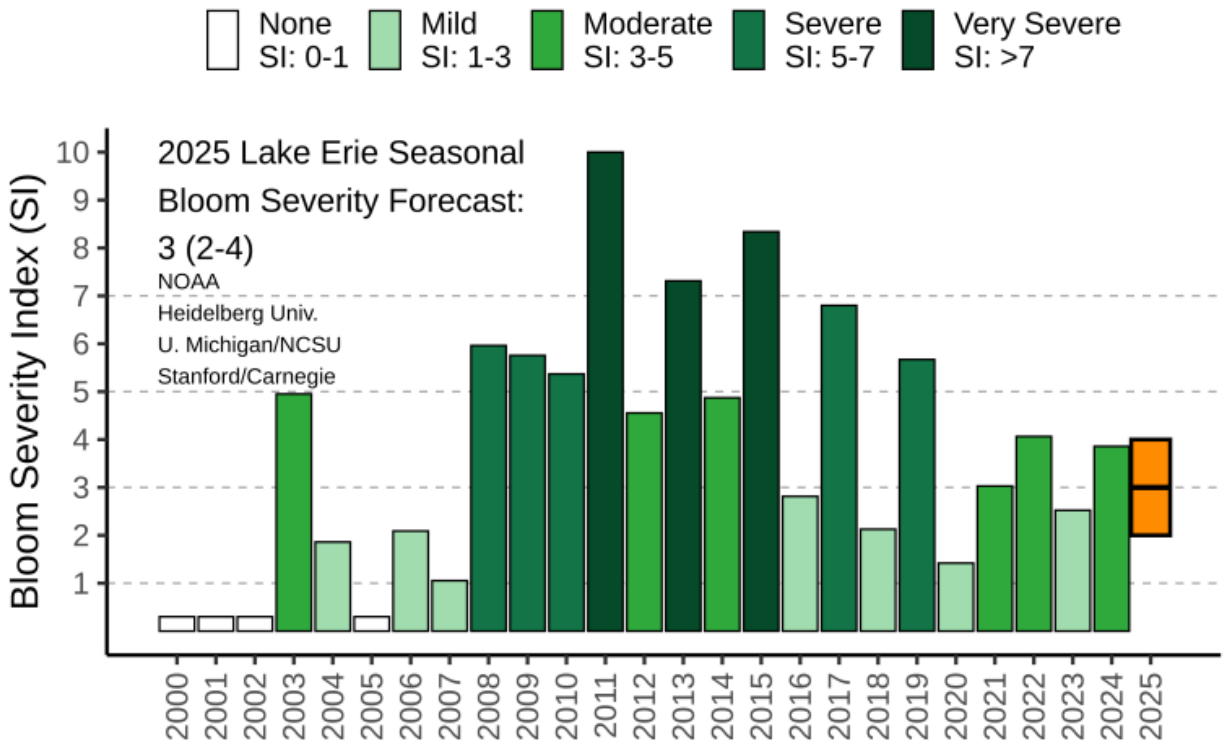
The extent of a HAB is determined by the HAB severity index, which is based on the algae bloom's biomass during the peak 30 days of the bloom. The index has a range of zero to greater than seven, where zero is no algae bloom and greater than seven is very severe.

HABs in the western basin are generally caused by an excess of the algae cyanobacteria, which causes blue-green blooms. On August 13, 2024, the western basin was experiencing a HAB which covered approximately 320 square miles (**Figure 4.6.5**). Algae blooms have occurred annually in the western basin of Lake Erie each summer, except for in 2000, 2001, 2002, and 2005 (**Figure 4.6.6**). NOAA and its research partners have forecasted a mild to moderate HAB, measuring three on the severity index, but can range from two to four on the severity index.

Figure 4.6.5: Algae Bloom in Lake Erie

Source: Wanmei Liang

Figure 4.6.6: Harmful Algae Bloom History and Severity



Source: NOAA

History

Beyond invasive species already identified as established in Erie County, it is possible that any of the other species listed above have at one point affected the County and its residents. As of August 18, 2025, Erie County has reported a growing threat from the invasive spotted lanternfly. Erie County is currently one of 18 counties in Ohio that is under quarantine for the Spotted Lanternfly. In addition, Erie County, along with every county in Ohio, is under quarantine for the Emerald Ash Borer.

As seen in **Figure 4.6.6,** Lake Erie has had a HAB every year except for 2000, 2001, 2002, and 2005. The severity of the HABs varies throughout the years, with the most severe being in 2011, then 2015, and then 2013. The HAB of 2011 was the largest HAB in recorded history for Lake Erie, and was due

to record-breaking nutrient loading of phosphorus, weak lake circulation, and warming waters (3 degrees warmer than 1995-2011). These conditions led to reduced vertical lake missing and minimal flushing of the system, allowing the bloom to spread. The HAB in 2015 was the second worst HAB in recorded history for Lake Erie. It was mainly caused by excessive spring rainfall that caused large amounts of agricultural nutrient runoff. The HAB in 2013 was less severe than the HABs in 2011 and 2015 but was still an eight on the severity index. The HAB in 2013 was caused by excess agricultural nutrient runoff into the western basin.

Probability

Since there are many invasive species throughout Ohio, it is probable that Erie County will experience one or more of the invasive species listed above (**Tables 4.6.2 and 4.6.3**).

Since 2000, Lake Erie has experienced a HAB in 21 of the 25 years. The probability of Lake Erie experiencing a HAB in any given year is 84 percent.

Vulnerability Assessment

Infrastructure Impact

There are no likely impacts to public roadways or utilities due to invasive species. 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.

HABs can impact plant operations on Lake Erie by clogging intake filters and foul membrane surfaces. HABs can also impact drinking water supplies. The algal toxins (microcystin) is a result of the HABs and can poison the drinking water.

Population Impact

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

The local population can be impacted by HABs through drinking water if the algal toxin is above the safety threshold. There is no history of Erie County's drinking water being contaminated by the algal toxin, however, in 2014 the City of Toledo's water supply had algal toxins above the safety threshold resulting in 500,000 people without drinking water for three days and 110 people sickened by the drinking water.

In addition to the drinking water, local fish can become contaminated with the algal toxin, sickening people who eat the fish. By reducing oxygen in the water, the HABs can also cause large fish die offs.

Property Damage

Property damage, in the form of reduced values from impacts on landscaping, is possible due to invasive species. Damage to water plants on Lake Erie can be damaged due to clogging of intake filters.

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. Loss of life because of HABs is rare and not well documented but can happen. The algal toxin from cyanobacteria affects the liver and can cause liver damage in humans when consumed in large quantities.

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.

HABs have caused approximately $142 million in economic losses to tourism, restaurants, seafood, drinking water, falling housing values, and more annually. HABs decrease the amount of fish caught by commercial and private fishing, reduce access to the water for tourists, and can close beaches.

Future Trends

Land Use and Development Trends

Agricultural land uses, including 49% cultivated crops, 4.55% pasture, and 3.71% wetlands, strongly influence vulnerability to natural biohazards such as harmful algal blooms and vector-borne disease. Although Erie County's development footprint has not expanded significantly, shoreline communities continue to experience HAB-related impacts on property values, recreation, and water treatment. Long-term fertilizer reductions of about 33% over 30 years and declining phosphorus trends contribute to gradual water-quality improvement. Seasonal population surges from tourism temporarily increase exposure in high-use shoreline locations, even though permanent population has decreased.

These mixed trends indicate a slight overall reduction in environmental drivers of natural biohazards but continued seasonal exposure in waterfront communities, resulting in vulnerability that is generally stable with modest improvement.

In 2019 the H2Ohio initiative was launched to help improve water quality across Ohio by funding real, on-the-ground solutions. This initiative funds projects to improve agriculture practices, restore wetlands along the coastline of Lake Erie, update wastewater infrastructure, and improve drinking water treatment plant technology.

Erie County has two projects currently underway that were funded by H2Ohio. The projects are the Moxley Wildlife Area Westland Reconnection Project and the Sanford Agricultural Drainage Treatment Train Project.

Shifting Weather Patterns and Environmental Trends

Shifting weather patterns and environmental conditions continue to influence the occurrence and severity of natural biohazards in Erie County. Warmer average temperatures, shifting precipitation patterns, and longer growing seasons contribute to conditions favorable for vector-borne diseases such as tick- and mosquito-borne illnesses. More frequent periods of heavy rainfall increase nutrient runoff from agricultural areas, which can intensify harmful algal bloom activity in Lake Erie. At the same time, periods of extended warmth followed by rapid temperature swings place additional stress on surface waters and wetlands that help filter nutrients and support ecological stability.

Environmental trends also show gradual changes in land cover that affect biohazard conditions. Nearly half of the County's land remains in cultivated crops, and 4.55 percent in pasture, while 3.71 percent consists of wetlands that help buffer nutrient runoff. Reductions in fertilizer use over the past 30 years and ongoing wetland restoration projects have contributed to improvements in phosphorus levels entering Lake Erie, although harmful algal blooms still occur during warm, stagnant late-summer periods. These combined weather and environmental trends indicate that exposure to natural biohazards remains a recurring issue, with slight fluctuations from year to year depending on bloom conditions, rainfall intensity, and seasonal temperature patterns.

4.7 Riverine Flooding and Erosion

Description

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

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

Landslides are an additional flood type; however, landslides are covered separately in **4.6 Landslide and Mine Subsidence**.

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 4.8.1: 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 Erie County. Flash flooding is more likely to occur in developed areas or along lakes and rivers. **Figure 4.7.1** 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

Erie County currently has 74 flood insurance maps (see **Appendix F**). The most recent update is from September 2022.

Erie County and all communities within the County, except for the Village of Kelleys Island, participate in the National Flood Insurance Program (NFIP) **(Table 4.7.2)**.

Figure 4.7.1: Flood Hazard Map of Erie County, Ohio

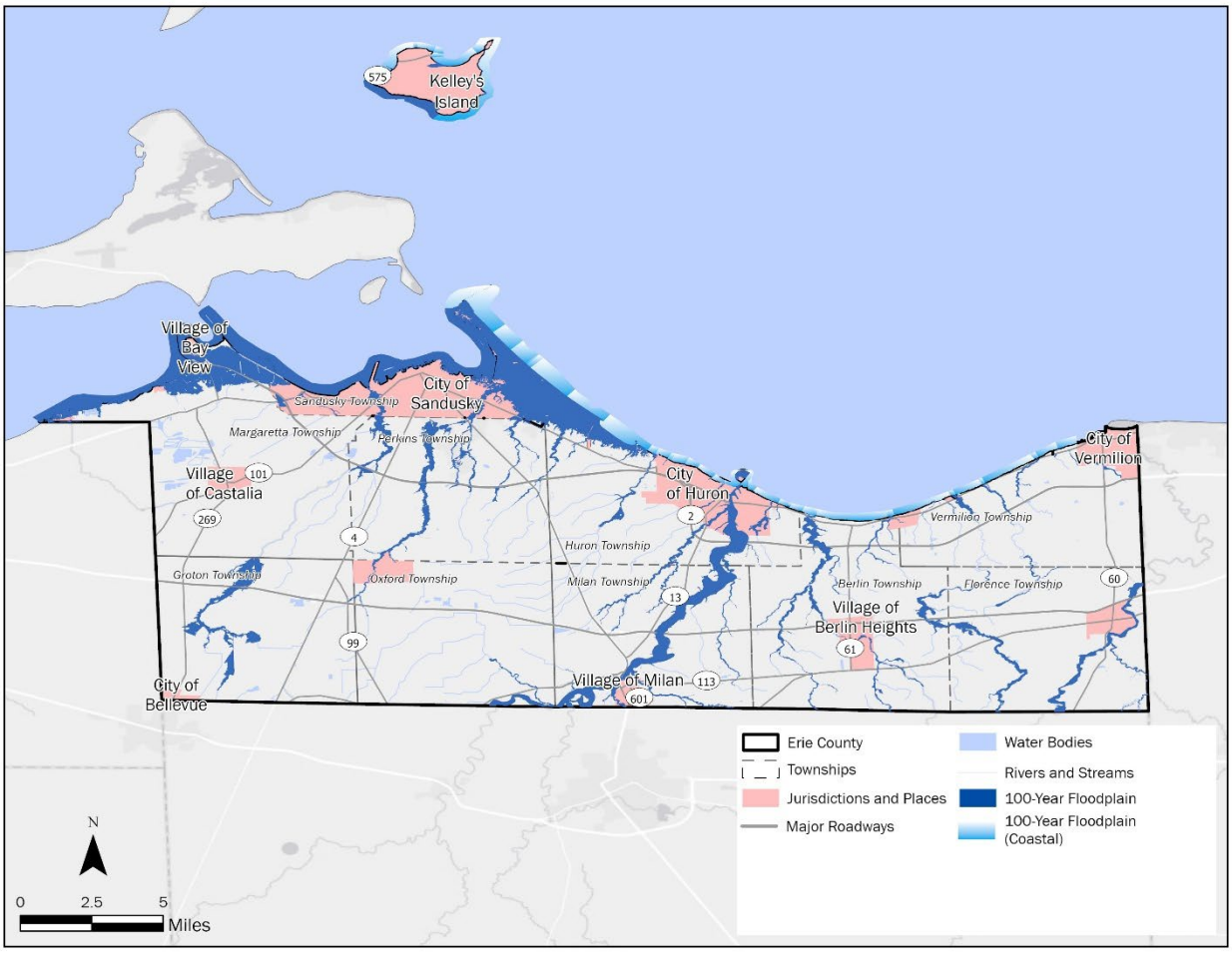


Table 4.7.2: National Flood Insurance Program Participation for Erie County, Ohio

Community Name	County	NFIP Coordinator	Init FHBM Identified	Init FIRM Identified	Effective Map Date	Reg-Emer Date	Participating in NFIP
Erie County	Erie County	Tim King	01/31/75	01/16/81	09/01/22	01/16/81	Yes
City of Bellevue	Erie County Huron County	Kevin Scagnetti	03/15/74	10/17/78	01/19/11	10/17/78	Yes
City of Huron	Erie County	Christin Gibboney	02/01/74	04/03/78	09/01/22	04/03/78	Yes
City of Sandusky	Erie County	Aaron Klein	06/21/74	07/05/77	09/01/22	07/05/77	Yes
City of Vermilion	Erie County Lorain County	Chistopher Howard	05/05/70	12/31/70	03/09/21	12/31/70	Yes
Village of Bay View	Erie County	Larry Gwinner	03/22/74	09/15/77	09/01/22	09/15/77	Yes
Village of Berlin Heights	Erie County	Linda Phillips	04/05/74	08/28/08	11/19/14(M)	01/17/13	Yes
Village of Castalia	Erie County	Randy Whyde	03/29/74		(NSFHA)	05/25/78	Yes
Village of Kelleys Island	Erie County	William Minshall	04/18/75	08/17/81	09/01/22	01/29/86(W)	No
Village of Milan	Erie County	Brian Rospert	04/12/74	09/01/78	11/19/14(M)	09/01/1978	Yes

Source: NFIP Community Status Book

Repetitive Loss

There are 73 repetitive loss properties and 316 total losses (non-repetitive) in or near Erie County, Ohio, detailed in **Table 4.7.3**. 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 claims payments have been paid under flood insurance coverage, with the amount of each claim payment exceeding $5,000 and with cumulative amount of such claims payments exceeding $20,000; or for which at least two separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property.

Table 4.7.3: Repetitive Loss Properties in Erie County, Ohio

Jurisdiction Occupancy	Total RL/SRL Structures	RL Structures	SRL Structures	Total Losses	Total Paid
Erie County (Unincorporated) Other – Non-Residential	2	2	0	7	$209,467
Erie County (Unincorporated) Single Family Residential	20	19	1	46	$496,351
City of Huron Single Family Residential	14	9	5	58	$668,386

Jurisdiction Occupancy	Total RL/SRL Structures	RL Structures	SRL Structures	Total Losses	Total Paid
City of Sandusky Other Residential	1	1	0	3	$19,505
City of Sandusky Business Non-Residential	1	0	1	7	$84,113
City of Sandusky Single Family Residential	22	20	2	63	$498,882
City of Vermilion Other – Non-Residential	6	3	3	25	$650,611
City of Vermilion Business Non-Residential	1	1	0	3	$16,323
City of Vermilion Single Family Residential	21	17	4	102	$674,608
Brownhelm Township Single Family Residential	1	1	0	2	$5,502
Total	**89**	**73**	**16**	**316**	**$3,323,748**

Source: Ohio EMA

History

There have been 61 floods or flash floods in Erie County between January 1995 and December 2023. These events have caused $31.7 million in property damage and $5 million in crop damage. No deaths or injuries were reported. There have been four major disaster declarations since 1969 related to flooding in Erie County. Several of the most damaging events and any major disaster declarations are described in more detail below.

Flash Flood, August 23, 2023:

A warm and moist air mass moved across the Midwest, producing tropical-like precipitation. In just a few hours, 4.75 inches of rain fell in Erie County. A Flash Flood warning was put in place. Flooding was reported in the City of Sandusky, the City of Huron, Margaretta Township, Oxford Township, Perkins Township, and Huron Township. Basement flooding occurred in hundreds of homes and many roads were flooded. Huron High School and an apartment complex in south Sandusky sustained flood damage. The animal shelter and residents near Pipe Creek were evacuated due to flooding. Erie County reported $2.5 million in property damage. No deaths or injuries were reported.

Major Disaster Declaration for Severe Storms, Tornadoes, Straight Line Winds, and Flooding, June 21–June 23, 2006:

Thunderstorms brought rainfall that exceeded three inches per hour in June 2006. Nickle- and penny-sized hail was reported in the City of Sandusky. The storm brought widespread flooding in Erie County on June 21, 2006. Urban areas had several feet of flood waters on streets and roads due to filled storm sewers and drainage ditches. On June 22, 2006, the area streams and rivers rose, resulting in several evacuations in the Village of Milan, Perkins Township, the City of Vermilion, and throughout the County in flood-prone areas. A total of 573 people were evacuated by emergency personnel. A Major Disaster Declaration (DR-1651-OH) was issued on July 2, 2006, offering individual assistance

to six counties in Ohio, including Erie County. Erie County reported $26.5 million in property damage and $5 million in crop damage. No deaths or injuries were reported.

Major Disaster Declaration for Severe Storms, and Flooding, April 9, 1973:

On April 9, 1973, a severe storm resulted in Lake Erie flooding in Erie and surrounding counties. Many homes were damaged or destroyed. A Major Disaster Declaration (DR-377-OH) was issued on April 27, 1973, offering public and individual assistance to eight counties in Ohio, including Erie County. No exact amount of property damage was reported. No injuries or deaths were reported.

Major Disaster Declaration for Severe Storms, and Flooding, November 13–14, 1972:

On November 13, 1972, a severe thunderstorm moved across Lake Erie, which was already two feet above its average when the storm hit. The wind came from the northeast continuously for 28 hours, causing the water levels in the western basin to rise above the November average. Many of the homes on the shoreline were badly damaged, if not completely destroyed. A Major Disaster Declaration (DR-362-OH) was issued on November 24, 1972, offering individual and public assistance to five counties in Ohio, including Erie County. Estimated property damage for Ohio was $22 million. No injuries or deaths were reported.

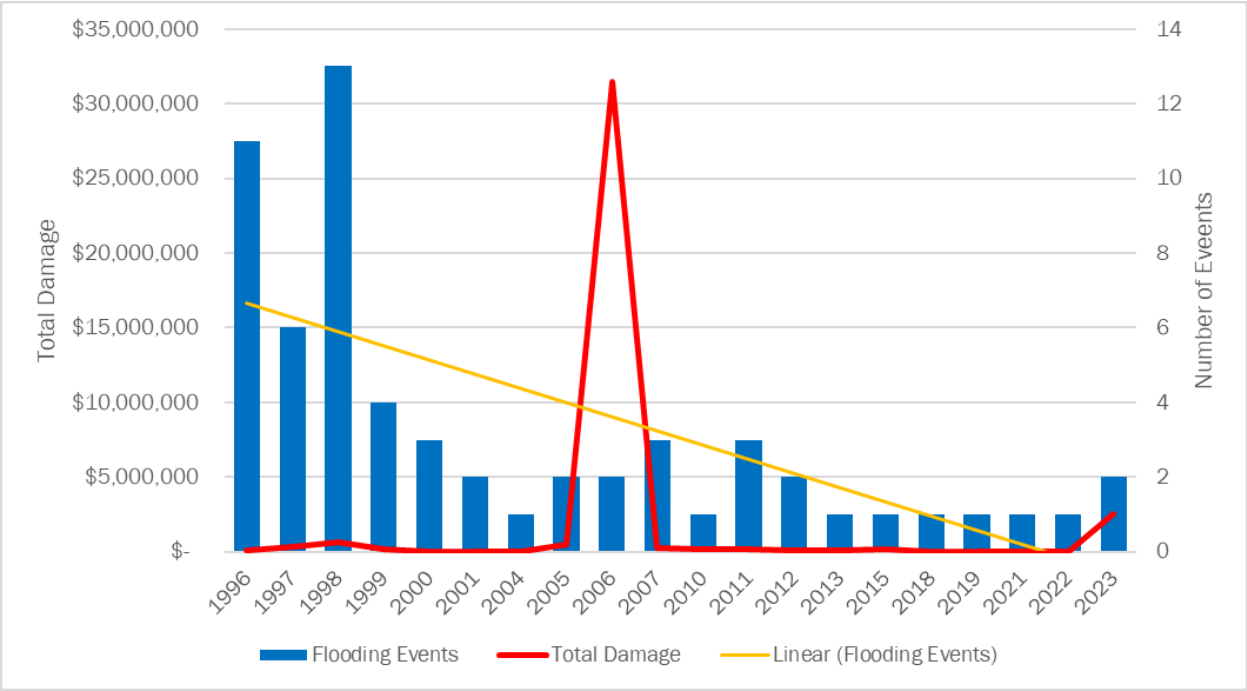
Major Disaster Declaration for Tornadoes, Severe Storms, and Flooding, July 4–5, 1969:

On July 4, 1969, severe thunderstorms moved across Lake Erie, causing devastating flooding and tornadoes. The severity of the storm resulted in substantial property damage and loss of life in northern Ohio. There were more than 40 deaths reported in Northern Ohio. A Major Disaster Declaration (DR-266-OH) was issued on July 16, 1969, offering public and individual assistance to 50 counties in Ohio, including Erie County. Estimated property damage for Ohio was $65 million.

Probability

Figure 4.7.4 shows the number of flood events and affiliated cost over time since January 1995. Between 1995 and 2023, Erie County experienced 61 flooding events, including both floods and flash floods. Annually, this amounts to 2.1 flood events per year. The yellow trendline of flood occurrences per year is decreasing, which may suggest that Erie County can expect a similar or slightly less frequency of flood events each year. On average, Erie County has had three flood events a year since 1995 and should expect at least one flood event yearly. The Shifting Weather Patterns section in Future Trends discusses these changes further.

Figure 4.7.4: 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.

In the National Risk Index, “riverine flooding” had a score of 87.6 “Relatively Moderate”). People that are most vulnerable to flooding are those who live within the 100-year floodplain in structures that are not elevated about the base flood elevation. The index indicates an expected annual loss of $3.1 million due to flood events with two 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 Erie County for riverine flooding according to FEMA’s National Risk Index are recorded in **Table 4.7.5** below. 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 Erie County. Expected losses are assessed for buildings, population ($11.6 million for each fatality or ten injuries), and agriculture per census tract. All 19 census tracts for Erie County are listed in the table for earthquakes. The EAL Total column combines the buildings, population, and agricultural losses for each census tract and are sorted most vulnerable census tract to least vulnerable census tract.

Table 4.7.5: 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)
39043041900	$793,287	$88,725	$971	$882,983
39043040700	$316,737	$156,542	$0	$473,280
39043041600	$176,891	$123,908	$14,248	$315,047
39043040100	$180,958	$85,375	$583	$266,916
39043041702	$149,162	$93,509	$12,068	$254,739
39043041800	$138,339	$35,956	$40,877	$215,171
39043041400	$95,320	$45,391	$62	$140,773
39043040802	$92,666	$42,744	$0	$135,410
39043040400	$68,154	$39,985	$4,488	$112,627
39043040500	$42,714	$32,714	$107	$75,535
39043040900	$35,755	$18,167	$351	$54,273
39043040300	$16,446	$18,347	$14,033	$48,826
39043041300	$16,586	$23,593	$149	$40,328
39043040200	$16,972	$6,633	$843	$24,448
39043041200	$9,922	$6,000	$11	$15,933
39043041000	$4,512	$1,098	$0	$5,610
39043040801	$0	$0	$0	$0
39043041701	$0	$0	$0	$0
39043041100	$0	$0	$0	$0
Grand Total	**$2,154,421**	**$818,688**	**$88,791**	**$3,061,900**

Source: FEMA National Risk Index

Loss of Life

There are no reported deaths from flood events in Erie County between January 1995 through December 2023. Loss of life is possible in future floods or flash floods.

Economic Losses

Erie County reported $5 million in crop damages due to flood events. 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 flashfloods.

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.

Riverine flood exposure is concentrated in older neighborhoods and business districts near the Sandusky and Huron Rivers, where much of the development predates modern stormwater and floodplain requirements. Over 52% of homes were built before 1970, and many early residential areas include aging drainage systems and impervious surfaces that contribute to localized flooding. Although 49% of the County remains in agricultural use and population has declined by 2.4% since 2020, redevelopment within legacy neighborhoods creates incremental increases in runoff.

The County's limited new construction, combined with infill in already developed flood-susceptible areas, has led to a slight increase in localized flood vulnerability.

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 in Erie County have contributed to more frequent high-intensity rainfall events, which place increased strain on streams, tributaries, and older stormwater systems. Heavy rainfalls occurring over shorter periods can exceed the capacity of existing drainage networks, especially in older developed areas built before modern stormwater standards. Shifts toward warmer winters and earlier spring thaws also affect river levels by producing rapid snowmelt, which can

combine with rainfall to elevate runoff volumes. These seasonal changes contribute to higher peak flows in the Sandusky and Huron River systems and can increase the likelihood of localized flash flooding.

Environmental conditions also influence riverine flood behavior. Nearly 49 percent of Erie County's land is in cultivated crops, and large agricultural fields can generate substantial runoff when soils are compacted or left bare during planting cycles. Wetlands account for about 3.71 percent of County land and help store and slow stormwater, but their limited extent reduces the overall buffering capacity during extreme rain events. Redevelopment in legacy neighborhoods adds impervious surfaces in areas that already experience drainage challenges. These combined trends suggest continued variability in riverine flooding, with higher water levels and faster runoff contributing to increased stress on waterways and flood-prone areas.

4.8 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, Erie 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 is responsible for issuing Severe Thunderstorm Watches and Warnings for Erie 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 4.6 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 Erie County is susceptible to severe summer weather.

Extent

Severe summer weather events have the potential to create large-scale damage in Erie 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 at least 323 severe summer weather events, including hail, heavy rain, high wind, lightning, strong wind, and thunderstorm wind in Erie County since January 1995. These events caused over $16 million in property damage and $854,480 in crop damage. Additionally, four injuries caused by summer storm events were reported in Erie County since 1995. All severe storm events from 1995 to 2023 are summarized in **Table 4.8.1**, below:

Table 4.8.1: Severe Summer Weather Events in Erie County since 1995

Severe Storm Event Type	Number of Events	Injuries	Deaths	Property Damage	Crop Damages
Hail	89	0	0	$1,217,000	$0
Heavy Rain	2	0	0	$0	$34,480
High Wind	43	0	0	$6,702,000	$820,000
Lightning	7	0	1	$447,000	$0
Strong Wind	6	0	0	$87,000	$0
Thunderstorm Wind	176	0	3	$7,658,005	$0
Total:	**323**	**0**	**4**	**$16,111,005**	**$854,480**

Source: NOAA Storm Events Database

Erie County has not had a disaster declaration for severe storms since the previous hazard mitigation plan was completed in 2021. However, since 1992, the County has been subject to two Major Disaster Declarations and one Emergency Declaration for severe storms. Several of the most damaging events, events that resulted in deaths and/or injuries, and events with emergency or disaster declarations are described in more detail below.

Thunderstorm Wind, August 23, 2023:

In late August 2023, a warm front traveled northeast as a cold front moved southeast over Lake Erie. The convergence of the two fronts resulted in straight-line convective wind damage in Northern Ohio. Sustained wind gusts of 55 miles per hour (MPH) were reported in the City of Sandusky. The strong winds caused a large tree to fall onto a house and injure the two inhabitants of the house. No public property was reported damaged. No deaths were reported.

Thunderstorm Wind, June 5, 2016:

A thunderstorm downburst caused wind gusts up to 80 MPH in early June 2016. Approximately 30 power poles were downed on the causeway to Cedar Point, trapping 15 to 20 people in their cars. Several trees and limbs were downed across the City of Sandusky, resulting in roof damage to several buildings. Large trees were also downed at the Marina and Battery Park. Erie County reported $2 million in property damage. No deaths or injuries 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 hail, heavy rain, and derecho winds with gusts estimated at 80 MPH, causing extensive damage across the Ohio Valley and Mid-Atlantic states on the afternoon of June 29. Around four million residents lost power for almost a week in several states and were at risk of heat-related illness or death 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. An emergency declaration (EM-3346-OH) was issued on June 30, 2012, offering public assistance for every county in Ohio. Erie County reported $15,000 in property damage. No deaths or injuries were reported.

High Wind, September 14, 2008:

A low-pressure system, a remnant of Hurricane Ike, caused high winds throughout the State of Ohio in September 2008, with the highest sustained wind measured at 54 MPH and the highest wind gust at 74 MPH. Wind gusts over 60 MPH were reported in Erie County. The winds caused extensive damage to utilities, properties, and crops throughout Ohio. Erie County experienced widespread power outages. Crop losses were significant across northern Ohio. Corn yields were reduced by three to five percent on average and soybean losses were more variable, ranging from zero to 10 percent. Erie County reported $2.5 million in property damage and $750,000 in crop damage. No deaths or injuries were reported.

Major Disaster Declaration for Severe Storms, Tornadoes, Straight Line Winds, and Flooding, June 21 – June 23, 2006:

In late June 2006, thunderstorms brought rainfall that exceeded three inches per hour in Erie County. Nickle- and penny-sized hail was reported in the City of Sandusky. The storms also downed several trees in Erie County. A Major Disaster Declaration (DR-1651-OH) was issued on July 2, 2006, offering individual assistance to six counties in Ohio, including Erie County. Most of the damage reported was due to flooding, however, Erie County reported $1,000 in property damage due to the downed trees. (More details about the widespread flooding can be found in the history section of **4.7 Flooding**). No deaths or injuries were reported.

Lightning, April 9, 1998:

On April 9, 1998, a man was struck by lightning in the Village of Berlin Heights and was taken to the hospital. No damage or deaths were reported.

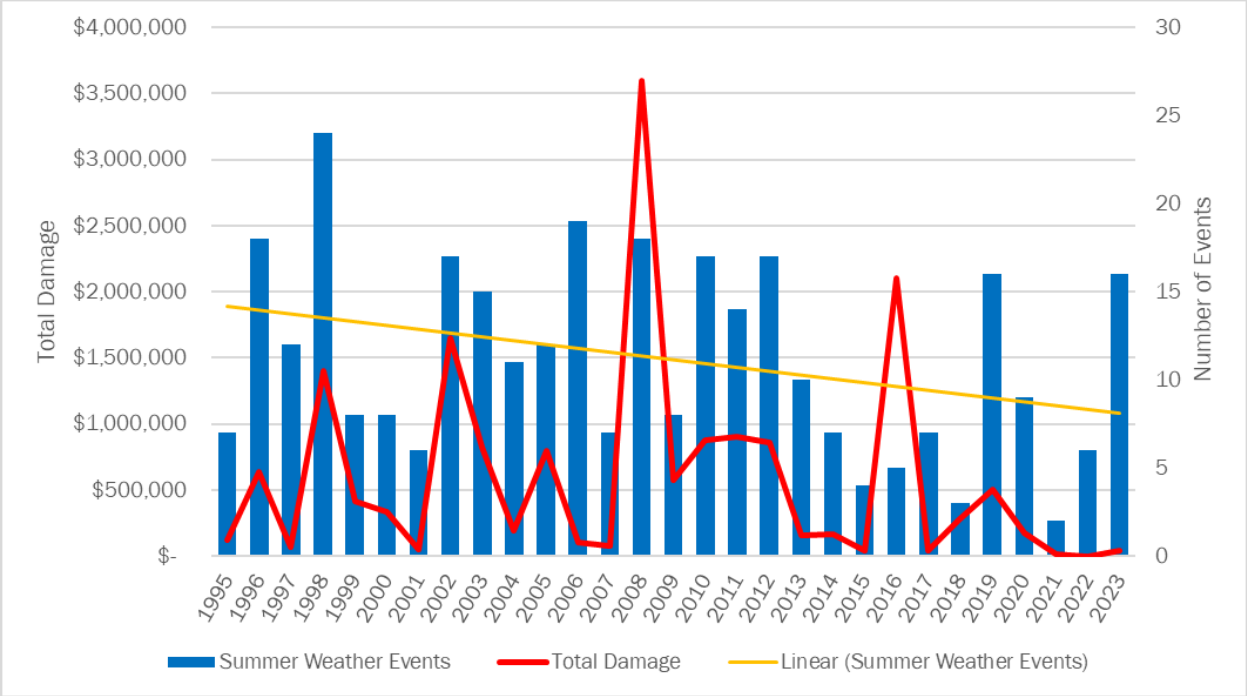
Major Disaster Declaration for Severe Storms and Flooding, August 7 – 18, 1995:

Following severe storms in mid-August 1995, a Major Disaster Declaration (DR-1065-OH) was issued on August 25, 1995, offering individual assistance to 11 counties in Ohio, including Erie County. The storms caused multiple downed trees in Erie County. The County reported $2,000 in property damage. No deaths or injuries were reported.

Probability

According to the NCEI, there have been 323 severe summer storm events reported in Erie County from January 1995 to December 2023 with total losses reaching $16.1 million in property damage and $854,480 in crop damage. This amounts to around 11.1 severe summer storm events annually with an average annual total damage of approximately $585,016. **Figure 4.8.2** below shows the trend in the number of severe summer weather events per year since 1995. The trendline (shown in yellow) indicates a decrease in the number of summer storm events.

Figure 4.8.2: 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 the National Risk Index calculated by FEMA, Erie County's risks associated with severe summer weather are as follows: 67.0 ("relatively low") for hail, 50.0 ("relatively low") for lightning, and 63.6 ("relatively moderate") for strong wind. The index also calculates an expected annual loss to the County of $241,000 due to hail, $105,000 due to lightning, and $570,000 due to strong wind, with 4.3, 56.2, and 2.7 events occurring per year, respectively.

Property Damage

Severe summer weather events can result in property damage by damaging trees, utilities, and structures. High wind events can down trees onto roofs and down utility poles causing power outages.

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 two injuries and one death in Erie 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 Erie County census tracts. Expected losses for buildings, population ($11.6 million for each fatality or ten injuries), and agriculture per census tract from hail, lightning, and strong wind events are recorded in **Tables 4.8.3 - 4.8.5** below. The EAL Total column combines the buildings, population, and agricultural losses for each census tract and are sorted most vulnerable census tract to least vulnerable census tract.

Table 4.8.3: 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)
39043041900	$29,606	$659	$26	$30,291
39043041800	$21,525	$869	$2,402	$24,796
39043040400	$19,773	$841	$467	$21,081
39043041600	$18,188	$810	$391	$19,389
39043040300	$15,931	$842	$1,370	$18,143
39043040100	$14,580	$792	$40	$15,412
39043040200	$11,679	$555	$326	$12,560
39043040500	$11,751	$639	$9	$12,399
39043041701	$10,706	$501	$560	$11,767
39043040900	$10,578	$470	$37	$11,085
39043040700	$10,446	$542	$0	$10,988
39043041400	$8,822	$408	$2	$9,232
39043041702	$7,122	$389	$288	$7,799
39043041300	$7,203	$511	$2	$7,716
39043041100	$5,835	$577	$0	$6,412

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39043040802	$5,966	$231	$0	$6,198
39043041200	$5,186	$352	$0	$5,539
39043040801	$5,045	$368	$0	$5,414
39043041000	$4,106	$406	$0	$4,512
Grand Total	**$224,048**	**$10,762**	**$5,921**	**$240,732**

Source: FEMA National Risk Index

Table 4.8.4: 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)
39043041900	$7,026	$3,224	$0	$10,250
39043041800	$5,318	$4,397	$0	$9,715
39043041600	$4,459	$4,009	$0	$8,467
39043040400	$4,513	$3,921	$0	$8,433
39043040300	$3,708	$4,044	$0	$7,752
39043040100	$3,040	$3,366	$0	$6,406
39043040500	$2,616	$2,895	$0	$5,510
39043041701	$2,652	$2,527	$0	$5,179
39043040200	$2,595	$2,551	$0	$5,146
39043040700	$2,385	$2,522	$0	$4,906
39043040900	$2,569	$2,318	$0	$4,886
39043041300	$1,806	$2,619	$0	$4,425
39043041400	$2,248	$2,122	$0	$4,370
39043041100	$1,410	$2,844	$0	$4,254
39043041702	$1,810	$2,018	$0	$3,828
39043041000	$1,017	$2,047	$0	$3,064
39043040801	$1,220	$1,815	$0	$3,035
39043041200	$1,199	$1,668	$0	$2,867
39043040802	$1,428	$1,123	$0	$2,551
Grand Total	**$53,017**	**$52,028**	**$0**	**$105,046**

Source: FEMA National Risk Index

Table 4.8.5: 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)
39043041900	$71,468	$1,360	$89	$72,917
39043041800	$51,962	$1,793	$8,122	$61,877
39043040400	$47,733	$1,735	$1,579	$51,046
39043041600	$43,905	$1,672	$1,323	$46,900
39043040300	$35,608	$1,620	$4,385	$41,612
39043040500	$28,367	$1,319	$29	$29,716
39043040200	$26,940	$1,073	$1,005	$29,018
39043041701	$25,844	$1,035	$1,893	$28,771
39043040100	$27,123	$1,299	$129	$28,552
39043040900	$25,535	$970	$125	$26,630
39043040700	$25,216	$1,119	$0	$26,335
39043041400	$21,295	$843	$7	$22,145
39043041702	$17,193	$802	$973	$18,969
39043041300	$17,387	$1,054	$7	$18,449
39043041100	$14,085	$1,191	$0	$15,277
39043040802	$14,402	$478	$0	$14,880
39043041200	$12,519	$727	$2	$13,248
39043040801	$12,179	$760	$0	$12,939
39043041000	$9,911	$838	$0	$10,749
Grand Total	**$528,674**	**$21,687**	**$19,667**	**$570,029**

Source: FEMA National Risk Index

Future Trends

Land Use and Development Trends

Severe summer storms affect the entire County regardless of land use, yet structural vulnerability is strongly influenced by the age of the building stock. More than half of all homes in Erie County were built before 1970, and only 3.8% of the housing stock was built between 2010 and 2019. These older structures remain more susceptible to high winds, hail damage, and tree-related impacts. The County's development footprint has remained stable at 23.85%, but seasonal population increases from tourism elevate the number of people present during peak storm months. As a result, vulnerability to severe summer storms has increased slightly.

Shifting Weather Patterns and Environmental Trends

Preliminary research suggests that the frequency and intensity of severe thunderstorms could increase, according to the National Climate Assessment. A warming trend 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. According to the Fifth National Climate Assessment, repetitive losses are trending upwards due to extreme storms across the Midwest region. Even when storms are not classified as a Major Disaster or Emergency Disaster, property owners are seeing damage due to extreme storms and heavy rainfall.

4.9 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. Moisture is needed in the atmosphere to form clouds and precipitation. Air gathering evaporation as it blows across a body of water is a common source of moisture.
2. Lift pushes moist air up, causing it to cool and form clouds and precipitation. Warm air colliding with cold air and forced to rise over the cold is an example of lift.
3. Below freezing temperatures in the clouds and near the ground are necessary to make snow and ice.

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 can 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 Erie County is approximately 32.5 inches according to NOAA, which is higher than the state average of about 29 inches. The closest NOAA station to Erie County is the Norwalk Station located south of Erie County in Huron County. Snowfall typically occurs between November and April with January being the coldest month on average.

History

There have been at least 49 winter storm events, including blizzard, dense fog, extreme cold/wind chill, heavy snow, ice storm, winter storm, and winter weather in Erie County since January 1995. These events caused $8.2 million in property damage. Additionally, there were over 32 injuries

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 4.9.1,** below:

Table 4.9.1: Severe Winter Related Events in Erie County since 1995

Severe Storm Event Type	Number of Events	Deaths	Injuries	Property Damage	Crop Damage
Blizzard	1	0	0	$0	$0
Cold/Wind Chill	2	0	0	$55,000	$0
Extreme Cold/Wind Chill	9	0	0	$200,000	$0
Heavy Snow	5	0	0	$650,000	$0
Ice Storm	1	0	0	$600,000	$0
Winter Storm	28	0	>24	$6,712,000	$0
Winter Weather	3	0	8	$15,000	$0
Grand Total	**49**	**0**	**>32**	**$8,232,000**	**$0**

Source: NOAA Storm Events Database

Erie County has had two emergency declarations for winter weather since 1978. Several of the most damaging events are described in more detail below.

Emergency Declaration for Snow, December 22 – 24, 2004:

A winter storm brought two bursts of heavy snow to the Ohio Valley region between December 22 and 24, 2004. The storm dumped up to 30 inches in some areas of the Ohio Valley and southern Indiana. Snowfall northeast of Erie County was measured at up to 18 inches. On January 11, 2005, an emergency declaration (EM-3198-OH) was declared, offering public assistance to 27 counties, including Erie County. Approximately $8.6 million in public assistance grants were made available. The Ohio Insurance Institute estimated over $25 million in property damage and $85 million in total damage for all of Ohio. Erie County reported $3.8 million in property damage. No deaths or injuries were reported.

Winter Storm, January 2, 1999:

On January 2, 1999, snowfall turned to freezing rain and then back to snow. Temperatures rose slightly above freezing but then fell into the teens resulting in icy conditions. Windchills reached 30 degrees below zero throughout the first week of January. There were many minor car accidents and injuries due to slipping on the ice. There is an unknown exact number of injuries caused by this winter storm; however, dozens were reported. Erie County reported $15,000 in property damage. No deaths were reported.

Winter Weather, January 13, 1998:

On January 13, 1998, the combination of rain, freezing rain, sleet, and snow resulted in ice on roads, bridges, and sidewalks. Eight people sustained injuries from slipping on icy surfaces. Salt trucks had difficulty navigating the roads and two tipped over on their side. No property or crop damage was reported. No deaths were reported.

Emergency Declaration for Blizzard, January 26, 1978:

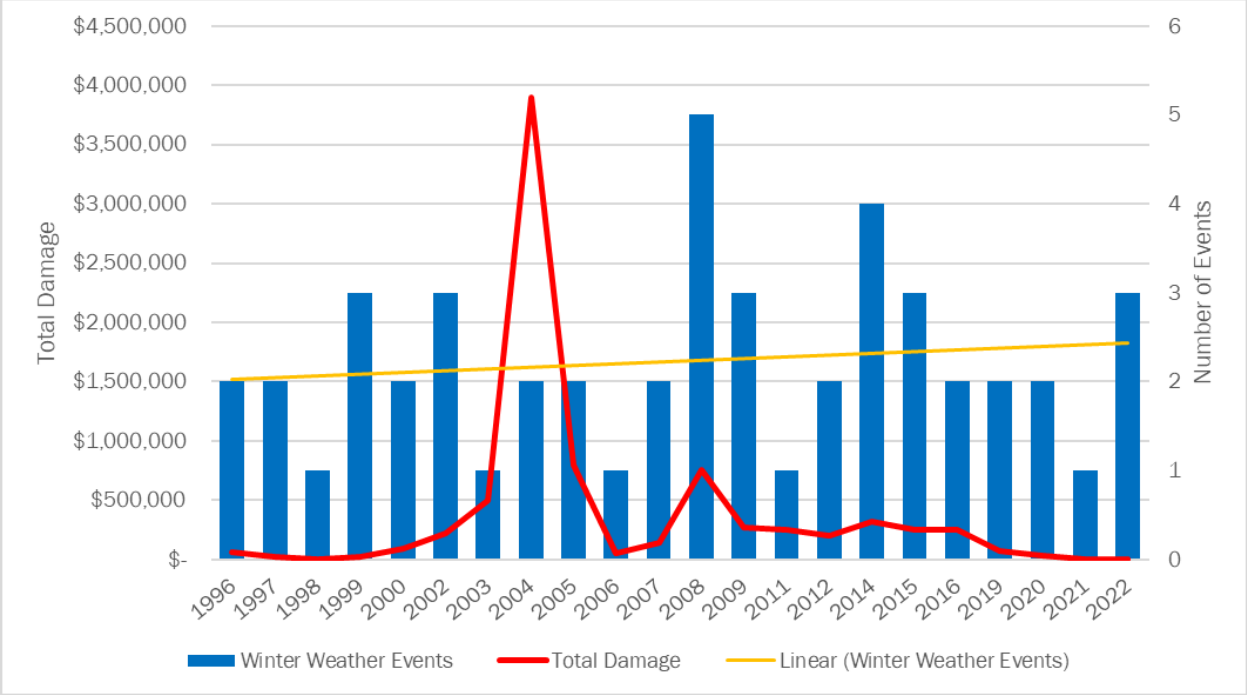
An extremely severe blizzard impacted all Ohio counties including Erie County on January 26, 1978. An emergency declaration (EM-3055-OH) was issued on January 26, 1978, for every county in Ohio. A total of $3,546,669 in public assistance was available for emergency work and for the repair or

replacement of disaster-damaged facilities. There were over 70 deaths across the region, with 51 of those in Ohio, three of which occurred in Erie County. Agriculture losses were approximately $73 million and property damage was at least $100 million in Ohio.

Probability

According to the NCEI, there have been a total of 49 severe winter weather events reported in Erie County from January 1995 to December 2023, with total losses amounting to $8.3 million in property damage. This amounts to approximately 1.7 severe winter weather events annually with average annual damages of $287,000. **Figure 4.9.2** shows the number of severe winter events since 1995 has been increasing in Erie County. The trend line (yellow) increases over the 29-year period. Indicating an expected increase in severe winter weather events in the future. According to the Fifth National Climate Assessment, 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. The Shifting Weather Patterns section in Future Trends discusses these changes further.

Figure 4.9.2: 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, as well as develop a layer of ice. Bridges and overpasses are particularly dangerous because they freeze before other surfaces and become slippery. Heavy snowfall and accumulation can cause businesses and private homes to have partial or full roof collapses.

Population Impact

All residents of Erie County are expected to be affected by severe winter storms. Infants, older adults, people who are ill, and pets tend to be 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 the National Risk Index calculated by FEMA, Erie County's risks associated with severe winter weather are as follows: 43.9 ("relatively low") for cold wave, 83.5 ("relatively moderate") for ice storm, and 93.5 ("relatively high") for winter weather events. The index also calculates an expected annual loss to the County of $39,000 due to cold wave, $367,000 due to ice storm, and $588,000 due to winter weather events, with 0.8, 0.7, and 2.8 events occurring per year, respectively.

Property Damage

Accumulated snow and ice, debris, and falling trees and utility poles can damage property. Extreme low temperatures can freeze the water in pipes and 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 Erie County to be $600,375.

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 Erie 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 halt during winter storms including the 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 4.9.3 - 4.9.5** show the total value of economic impacts expected in Erie 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 Erie County. Expected losses are assessed for buildings, population ($11.6 million for each fatality or ten injuries), and agriculture per census tract. All 19 census tracts for Erie County are listed in the tables for cold wave, ice storm, and winter weather events. The EAL Total column combines the buildings, population, and agricultural

losses for each census tract and are sorted most vulnerable census tract to least vulnerable census tract.

Table 4.9.3: 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)
39043041800	$527	$2,680	$192	$3,399
39043040400	$484	$2,594	$37	$3,116
39043040300	$391	$2,603	$110	$3,103
39043041600	$445	$2,499	$31	$2,976
39043040100	$359	$2,459	$3	$2,821
39043041900	$725	$2,033	$2	$2,760
39043040500	$288	$1,973	$1	$2,261
39043040200	$286	$1,715	$26	$2,027
39043040700	$256	$1,673	$0	$1,929
39043041100	$143	$1,781	$0	$1,924
39043041701	$262	$1,547	$45	$1,854
39043041300	$176	$1,576	$0	$1,753
39043040900	$259	$1,451	$3	$1,713
39043041400	$216	$1,260	$0	$1,476
39043041702	$174	$1,200	$23	$1,397
39043041000	$101	$1,253	$0	$1,353
39043040801	$124	$1,136	$0	$1,260
39043041200	$127	$1,087	$0	$1,214
39043040802	$146	$714	$0	$860
Grand Total	**$5,490**	**$33,234**	**$473**	**$39,197**

Source: FEMA National Risk Index

Table 4.9.4: 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)
39043041900	$47,372	$18	$0	$47,390
39043041800	$34,496	$24	$0	$34,519
39043040100	$31,628	$28	$0	$31,656
39043040400	$31,370	$22	$0	$31,392
39043041600	$29,137	$22	$0	$29,159

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39043040300	$28,464	$25	$0	$28,489
39043040200	$19,865	$16	$0	$19,882
39043040500	$18,832	$17	$0	$18,850
39043041701	$17,157	$14	$0	$17,171
39043040900	$16,900	$13	$0	$16,913
39043040700	$15,916	$14	$0	$15,929
39043041400	$13,836	$11	$0	$13,846
39043041300	$11,543	$14	$0	$11,557
39043041702	$11,414	$11	$0	$11,424
39043041100	$9,351	$16	$0	$9,367
39043041200	$8,275	$9	$0	$8,284
39043040801	$7,950	$10	$0	$7,959
39043040802	$6,804	$5	$0	$6,809
39043041000	$6,531	$11	$0	$6,542
Grand Total	**$366,839**	**$300**	**$0**	**$367,139**

Source: FEMA National Risk Index

Table 4.9.5: 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)
39043041900	$68,989	$4,022	$1	$73,012
39043041800	$50,159	$5,302	$122	$55,583
39043040400	$46,077	$5,131	$24	$51,232
39043041600	$42,382	$4,943	$20	$47,345
39043040300	$37,195	$5,148	$70	$42,413
39043040100	$34,181	$4,863	$2	$39,046
39043040500	$27,383	$3,902	$0	$31,286
39043040200	$27,247	$3,392	$17	$30,656
39043041701	$24,947	$3,060	$29	$28,036
39043040700	$24,341	$3,309	$0	$27,650
39043040900	$24,649	$2,870	$2	$27,521
39043041400	$20,556	$2,492	$0	$23,048

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39043041300	$16,784	$3,117	$0	$19,901
39043041702	$16,596	$2,373	$15	$18,984
39043041100	$13,597	$3,523	$0	$17,120
39043040802	$13,903	$1,412	$0	$15,315
39043041200	$12,085	$2,150	$0	$14,235
39043040801	$11,757	$2,248	$0	$14,004
39043041000	$9,568	$2,478	$0	$12,046
Grand Total	**$522,396**	**$65,735**	**$302**	**$588,433**

Source: FEMA National Risk Index

Future Trend

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.

Building design and construction are 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.

Roughly 52% of homes were built before 1970, and older homes commonly experience heating inefficiencies, roof limitations under heavy snow load, and aging mechanical systems. Only 91 new housing units have been built since 2020, meaning the proportion of winter-vulnerable structures remains largely unchanged. Winter storms affect all parts of the County, and emergency response challenges increase in older neighborhoods with narrow roadways or higher concentrations of senior residents.

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 offer 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. Development trends have not added new exposure, and winter-weather vulnerability has generally remained the same.

Changing Weather Patterns and Environmental Trends

According to the Midwest Chapter of the Fifth National Climate Assessment, annual temperatures have increased by 1.0 to 2.0 degrees Fahrenheit for the present day (2002 - 2021) compared to the first half of the last century (1901 - 1960). If this trend continues, by the end of 2030, Ohio's climate may trend toward the climate of Southern Illinois. By 2100, Ohio could feel like Arkansas or Texas. As a result, this warming trend suggests that extreme winter weather will be less severe and less frequent in Ohio, and heavy snowfall will manifest as heavy rainfall in future years. Rising temperatures lead to early snowmelt, which increases flood chances.

4.10 Tornadoes and Waterspouts

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 MPH. Tornado paths can be as large as one mile wide and 50 miles long. Nationally, there is an average of 800 tornadoes reported annually across all 50 states.

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

Tornado Warnings are issued by the Cleveland 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).

NOAA defines a waterspout as either a fair-weather waterspout or a tornadic waterspout. The fair-weather waterspout is not associated with thunderstorms, forming along the dark flat base of a line of developing cumulus clouds. A tornadic waterspout is associated with severe thunderstorms, forms over the water, and is often accompanied with large hail, dangerous lightning, and high winds and sea. Both types of waterspouts can travel onto land, however, fair-weather waterspouts tend to dissipate quickly once they hit land. A tornadic waterspout has a higher probability of becoming a tornado once it comes onshore. The Cleveland Forecast Office will issue a tornado warning if a waterspout moves onshore.

Location

Tornadoes can occur anywhere in Erie County. All areas and jurisdictions should be considered at risk for a tornado. Waterspouts will occur on Lake Erie and can move onshore.

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 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 by 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 4.10.1** 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.

Fair-weather waterspouts generally exhibit winds less than 73 MPH and are classified no higher than EF0 on the Enhanced Fujita Scale. Tornadic waterspouts are generally much stronger and can have an intensity up to EF1 (winds up to 112 MPH) on the Enhanced Fujita Scale.

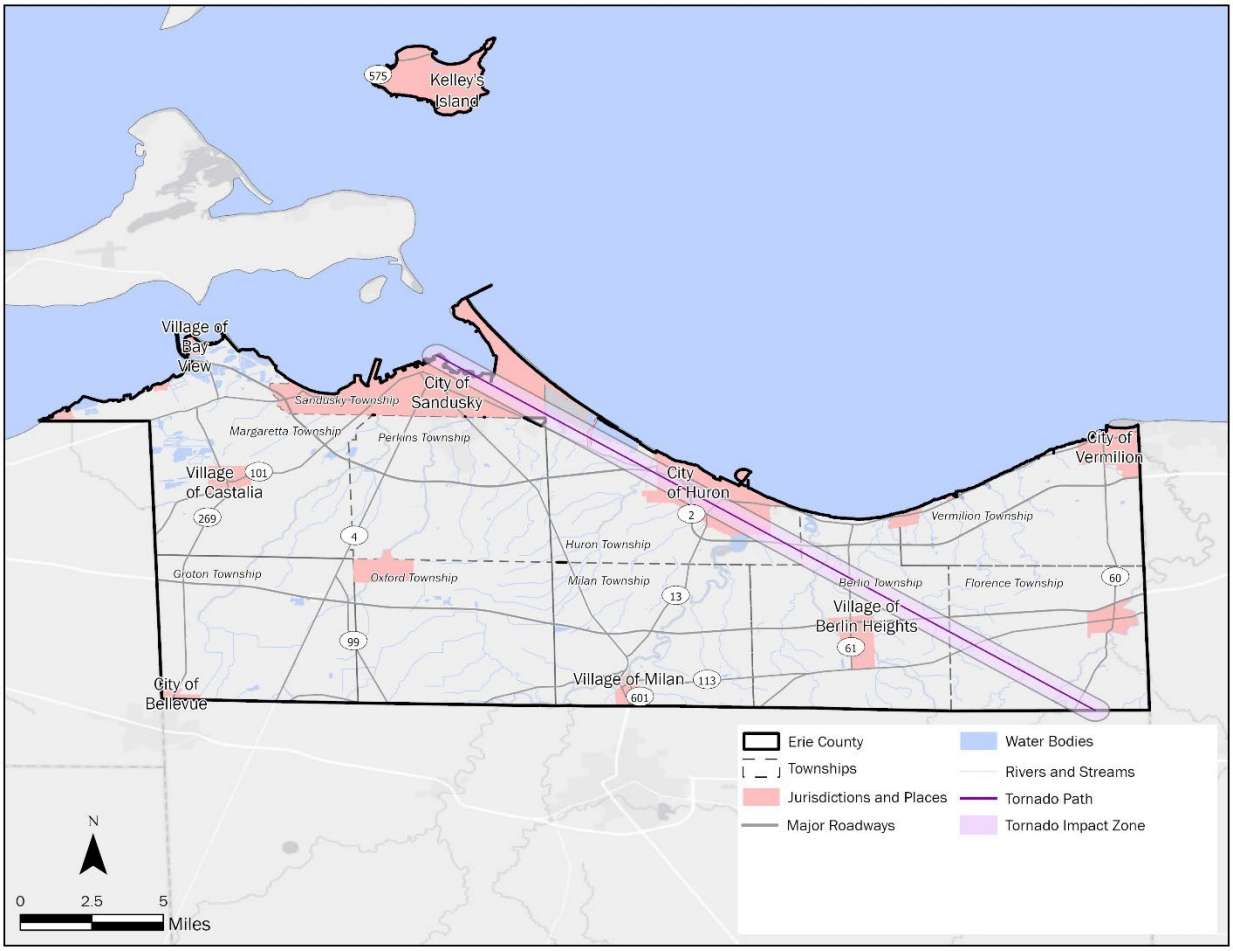
Figure 4.10.2 simulates an extremely destructive, worst-case-scenario EF5 tornado and its impacts on Erie County assets and infrastructure. The worst-case scenario is simulated by running the EF5 tornado on a straight path through the most populated areas of the County to determine maximum potential damage and identify the County's potential vulnerability to tornadoes (**Table 4.10.3).**

Table 4.10.1: 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 4.10.2: Worst Case Tornado Scenario



History

Two funnel clouds, six tornadoes, and seven waterspouts were reported in Erie County between January 1995 and December 2023 resulting in a total of $830,000 in property damage and $10,000 in crop damage. There were no reported injuries or deaths in Erie County due to the events, however, several of the storms that produced tornadoes caused deaths in other Ohio counties and other states. There has been one Major Disaster Declaration in Erie County for Tornadoes since 1992. The tornadoes that caused the most damage or resulted in a death or injury and any major disaster declarations are detailed below.

F1 Tornado in Erie County, November 5, 2017:

On November 5, 2017, a cold front moved across the Ohio Valley, meeting with a warm front resulting in severe weather across the Ohio Valley. The severe weather produced at least 13 tornadoes in Ohio. The tornado in Erie County touched down in Oxford Township on open farmland. It traveled northeast for a mile and a quarter before lifting. It damaged a home on Mason Road, leveled a small barn, and flipped a trailer. Trees were downed along the path. Erie County reported $125,000 in property damage. No deaths or injuries were reported.

F1 Tornado in Erie County, November 10, 2002:

On November 10, 2002, severe weather and tornadoes occurred across Ohio spawning 75 tornadoes throughout the 13 states affected. One tornado touched down in Huron County and traveled north into

Erie County. The tornado destroyed several barns, damaged a few homes and several high voltage transmission poles, and downed many trees along its path. The tornado was 50 feet wide and traveled for five miles before dissipating. No injuries or deaths were reported in Erie County. However, there were 36 reported deaths throughout the 13 states affected due to the severe weather. Ohio reported five deaths, two in Van Wert County, two in Putman County, and one in Meigs County. There were 30 injuries reported in Ohio. Erie County reported $500,000 in property damage.

F2 Tornado in Erie County, September 20, 2000:

On September 20, 2000, a tornado touched down in Huron County and traveled north into southern Erie County. The tornado was 100 feet wide and traveled for one and a half miles. The tornado destroyed a farmhouse and ripped a home off its foundation. The tornado also slightly damaged another house and small barn. Trees were downed along the path. Erie County reported $175,000 in property damage. No deaths or injuries were reported.

Major Disaster Declaration for Severe Storm, Tornadoes, and Flooding, July 12 – August 01, 1992:

On August 08, 1992, a major disaster declaration (DR-951-OH) was issued for events that occurred between July 12 and August 1, 1992. Individual assistance was offered to eight counties and public assistance was offered to 24 counties in Ohio. Erie County was offered public assistance. No deaths or injuries were reported in Erie County. No information is available for Erie County's property or crop damage.

Probability

Two funnel clouds, six tornadoes, and seven waterspouts were reported in Erie County between January 1995 and December 2023 resulting in a total of $830,000 in property damage and $10,000 in crop damage. The annual property damage from 1995 to 2023 when averaged over that timeframe, and not adjusted for inflation, is approximately $28,620. There is a 20 percent chance of a tornado, 24 percent chance of a waterspout, and six percent chance of a funnel cloud occurring in any given year based off of historical data.

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. One storm had seven tornadoes and another storm had five tornadoes.

Vulnerability Assessment

Infrastructure Impact

Aboveground infrastructure can be damaged by tornadoes. Debris caught in tornadoes as well as fallen trees can cause damage to buildings and infrastructure and lead to road closures. Aboveground 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.

The National Risk Index indicates an expected annual loss of $3 million due to tornado events with 0.1 events occurring per year.

Property Damage

The tornados that occur in Erie County are generally weak, rated F1 and below; however, even weaker tornadoes can cause significant damage to buildings and properties. In the last 29 years, the property damage in Erie County included home roofs, barns, and tree damage, resulting in a loss of $830,000.

Waterspouts spotted off the coast of Lake Erie have mostly dissipated before coming onto land. One waterspout came onto land, turning into a tornado, but no property damage was reported.

Loss of Life

There have been no reported deaths or injuries since 1995 because of tornadoes in Erie County. Loss of life and injuries are always possible during tornadoes, most commonly caused by flying debris picked up and blown around by strong winds, and more severe storms can cause the person to become airborne. The most common cause of death due to tornadoes is from head injuries.

Economic Losses

Tornadoes can cause major damage to structures and roads. Higher severity tornadoes have the potential to destroy structures. Debris also has the potential to cause damage to structures by breaking windows, damaging walls, or falling directly onto buildings and aboveground infrastructure. Potential economic losses and damage associated with Erie County for tornadoes are recorded in **Table 4.10.3** below.

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 Erie County. Expected losses are assessed for buildings, population ($11.6 million for each fatality or ten injuries), and agriculture per census tract. The EAL Total column combines the buildings, population, and agricultural losses for each census tract and are sorted most vulnerable census tract to least vulnerable census tract.

Table 4.10.3: 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)
39043041900	$254,194	$68,746	$4	$322,944
39043041800	$184,761	$90,624	$239	$275,625
39043040400	$169,722	$87,710	$48	$257,480
39043041600	$156,100	$84,500	$41	$240,640
39043040300	$125,872	$79,862	$145	$205,878
39043040500	$100,852	$66,693	$1	$167,546
39043040100	$94,333	$59,962	$4	$154,298
39043040200	$95,463	$52,987	$35	$148,486
39043040700	$89,820	$56,558	$0	$146,378
39043041701	$92,035	$52,306	$57	$144,398
39043040900	$90,782	$49,050	$3	$139,836
39043041400	$75,708	$42,599	$0	$118,307
39043041300	$61,815	$53,286	$0	$115,101
39043041100	$50,077	$60,227	$0	$110,304

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39043041702	$61,260	$40,567	$32	$101,860
39043040801	$43,299	$38,422	$0	$81,722
39043041200	$44,509	$36,743	$0	$81,252
39043041000	$35,237	$42,361	$0	$77,599
39043040802	$51,203	$24,138	$0	$75,342
Grand Total	**$1,877,044**	**$1,087,342**	**$609**	**$2,964,995**

Source: FEMA National Risk Index

Future Trends

Land Use and Development Trends

Tornadoes can occur anywhere. Tornado and waterspout hazards affect all developed areas of Erie County, and vulnerability is closely connected to the County's aging housing stock. Over 52% of homes were built before 1970, and approximately 21.4% were built before 1940, predating modern wind-resistant construction standards. New development has been minimal, with only 2.6% of housing built after 2010, meaning older structures continue to dominate the built environment. Coastal municipalities, home to more than 33,000 residents, also experience localized exposure to waterspouts due to Lake Erie's influence.

The combination of limited new construction and a large share of older buildings indicates a slight increase in tornado and waterspout vulnerability where redevelopment has intensified in populated coastal areas.

Shifting Weather Patterns and Environmental Trends

While rainfall, heat, and drought demonstrate clear trends over time, tornado records in the United States typically only go back as far as the 1950s, making it difficult to compare trends over long periods of time. Additionally, tornado reporting was not fully standardized until 2007, when the Enhanced Fujita Scale was released.

However, some short trends have been identified. The number of days with tornadoes in the United States has fallen, but tornado outbreaks, or the number of tornadoes in one day, have increased. The intensity and strength of tornadoes has also increased as tornado distribution has shifted eastward, increasing tornado risk for Ohio (Center for Climate and Energy Solutions).

According to the Fifth National Climate Assessment, severe storms are brief and cover small areas, thus are difficult to measure. Research suggests tornado activity has become more variable, with a decrease in the number of days per year with tornadoes but an increase in the number of tornadoes that occur on these days. In general, there is some indication that the frequency and intensity of thunderstorms may increase.

4.11 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), Erie County is within Region 1 and lies just outside the Ohio Department of Natural Resources (ODNR) Division of Forestry's Forest Fire Protection Area. Counties within Region 1 are generally unforested and predominantly agricultural land, meaning the risk of wildfire is low. The ODNR requires wildfire data from fire departments in Region 1. The Ohio Wildfire Protection Areas are shown in **Figure 4.11.1**.

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

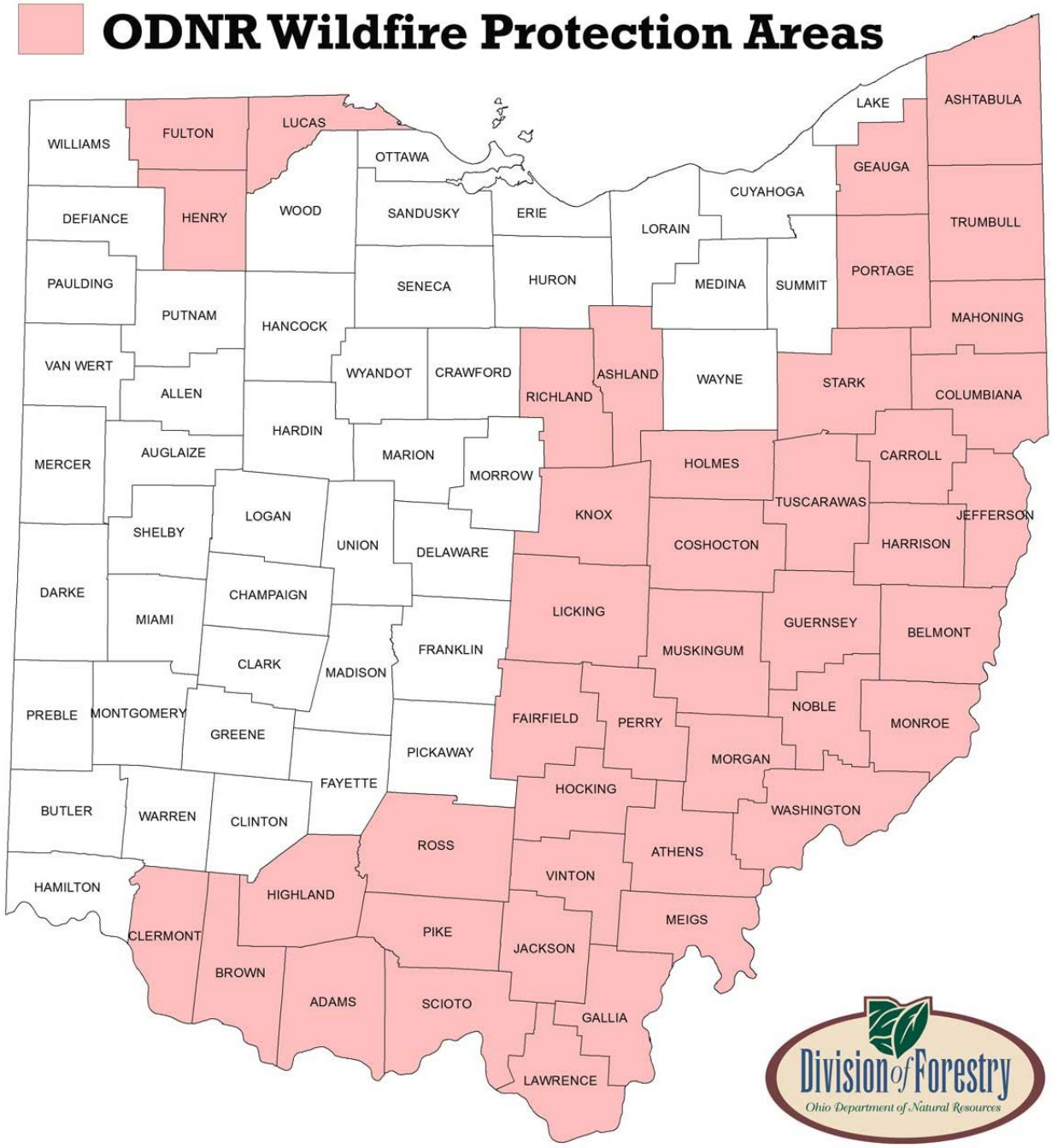
The SOHMP identified a total of eight fire events in Erie County between 2018 to 2022, with an average of 4.61 acres burned per incident. These events burned a total of 37 acres. There were three structures threatened due to the wildfires. There were no deaths or injuries reported.

Estimating the monetary losses associated with wildfires is difficult because most of these events occur on open land or fields with monetary losses often unrecorded. This lack of data might 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 eight fire events in Erie County from 2018 to 2022, an average 1.6 fire events are estimated to occur annually in the County. In addition, according to the U.S. Environmental Protection Agency (EPA), the average total area burned by wildfires has increased since the 1980s, and record-breaking fires tend to occur during record-breaking warm years.

Figure 4.11.1: Ohio Wildfire Protection Areas



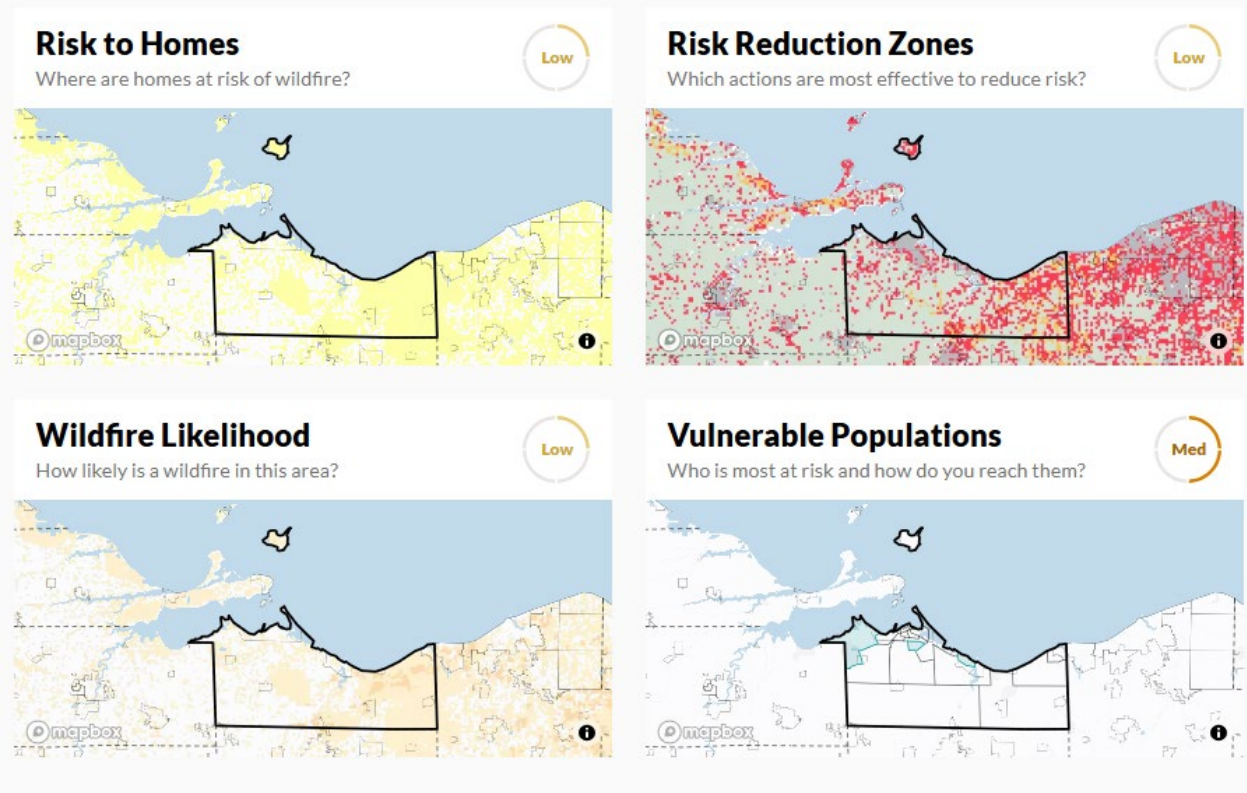
Source: ODNR Ohio Division of Forestry

Vulnerability Assessment

Infrastructure Impact

According to the USDA Forest Service Wildfire Risk to Communities, a free website with interactive maps and charts, Erie County has a low risk of wildfire damage to infrastructure (**Figure 4.11.2**).

Figure 4.11.2: Wildfire Risk for Erie County



Source: USDA Forest Wildfire Risk to Communities

Population Impact

The Vulnerable Populations map in **Figure 4.11.2** shows areas (highlighted in blue) where some residents may be more vulnerable because they tend to experience more difficulty preparing for, responding to, and recovering from wildfire. The polygons identify areas that have a high risk to wildfire because of the number of residents who are 65 years or older and do not have a car. Overall, Erie County residents have a low risk of wildfire; however, if a wildfire were to occur in the County, the population could be impacted by loss of homes and crops.

According to the National Risk Index, calculated by FEMA, Erie County's risk score for wildfires is 34.1 ("very low") compared to all other U.S. counties, based on its very low expected annual lossand very high community resilience. The index indicates an expected annual loss of $17,000 due to wildfires.

Property Damage

There were eight recorded wildfire events between 2018 and 2022 in Erie County, and three structures were threatened due to wildfires. 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 Erie County. Potential economic losses and damage associated with Erie County for wildfires are recorded in **Table 4.11.3** below.

The table has the expected annual loss (EAL) rates, calculated by FEMA, which identify the total value of loss expected each year for a particular community, in this case the census tracts for Erie County. Expected losses are assessed for buildings, population ($11.6 million for each fatality or ten injuries), and agriculture per census tract. The EAL Total column combines the buildings, population, and agricultural losses for each census tract and is sorted most vulnerable census tract to least vulnerable census tract.

Table 4.11.3: Structure and Population Vulnerability from Wildfire

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39043040300	$2,386	$217	$1	$2,605
39043040400	$2,300	$167	$0	$2,467
39043041800	$2,244	$157	$1	$2,402
39043041900	$2,014	$82	$0	$2,097
39043040200	$1,820	$166	$0	$1,987
39043041600	$1,316	$82	$0	$1,398
39043040100	$1,027	$104	$0	$1,131
39043041701	$607	$50	$0	$657
39043040500	$522	$50	$0	$572
39043041702	$385	$31	$0	$416
39043040900	$358	$29	$0	$387
39043041400	$350	$28	$0	$378
39043040700	$233	$24	$0	$257
39043041000	$77	$5	$0	$82
39043041200	$55	$4	$0	$59
39043041300	$38	$7	$0	$45
39043041100	$7	$1	$0	$7
39043040801	$0	$0	$0	$0
39043040802	$0	$0	$0	$0
Grand Total	**$15,738**	**$1,204**	**$3**	**$16,945**

Source: FEMA National Risk Index

Loss of Life

Erie County has no recorded wildfire events resulting in loss of life. 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

Wildfires have the potential to damage agricultural crops and tree plantations, which can result in economic losses. According to the SOHMP, there are 54 state-owned or state-leased community

lifelines (critical facilities) that were scored a “relatively low” hazard risk rating for wildfire. These facilities have a total replacement cost of $150,111,057.

Future Trends

Land Use and Development Trends

Wildfire risk in Erie County is inherently low, but land-use patterns still influence vulnerability. The County contains 16.21% forest, 4.55% pasture or hay, and other vegetated areas that could support fire spread under dry or drought conditions. Development has not expanded into wildland-urban interface areas, and 76.15% of the County remains non-developed, which limits widespread exposure. However, some rural structures, particularly older homes using propane or wood heat, remain susceptible to ignition.

Development trends have not increased exposure to wildfire, and overall vulnerability remains low and stable. **Figures 1.2.1 and 1.2.2** show areas susceptible to drought and heatwaves. New construction should reference the figures and resources outlined in this plan to minimize risk of drought and heatwaves, which can increase wildfire spread.

Shifting Weather Patterns and Environmental Trends

According to the U.S. EPA and National Climate Assessment, the national average total area burned by wildfires has increased since the 1980s, and record-breaking fires tend to occur during record-breaking warm years. Combustion from wildfires also releases carbon dioxide into the atmosphere, negatively impacting human health. If increases in the frequency and intensity of drought occur in the region, then the risk of wildfire can also increase.

5 | Hazard Mitigation

5.1 Hazard Mitigation Strategy

Hazard Priorities

Potential hazards, including natural, geological, and human-caused hazards, were rated by members of the Core Planning Committee, which included representatives from each jurisdiction in Erie County. Each potential hazard was rated on a scale of zero to five, with zero indicating the hazard should not be studied and five indicating the most significant threat to the representative's jurisdiction. A priority score was developed for each hazard by averaging the representatives' ratings. The hazards were then ranked by their priority score, where the highest priority score was given a hazard rank of one for each jurisdiction within the County and for the County itself. The resulting hazard rank and associated priority score for each hazard are shown in **Tables 5.1.1 –5.1.10**.

Table 5.1.1: Erie County Hazard Priorities

Hazard	Priority Score	Hazard Rank
Multiple Hazards	5.00	1
Riverine Flooding and Erosion	3.88	2
Severe Summer Weather	3.88	2
Severe Winter Weather and Extreme Cold	3.88	2
Tornadoes and Waterspouts	3.88	2
Damaging Winds	3.67	6
Natural Biohazards	3.38	7
Drought and Extreme Heat	3.25	8
Coastal Flooding and Erosion	3.00	9
Dam/Levee Failure	1.83	10
Wildfire	1.79	11
Landslides and Land Subsidence	1.71	12

Table 5.1.2: City of Bellevue Hazard Priorities

Hazard	Priority Score	Hazard Rank
Multiple Hazards	5.00	1
Dam/Levee Failure	5.00	1
Riverine Flooding and Erosion	5.00	1
Severe Summer Weather	4.00	4
Severe Winter Weather and Extreme Cold	4.00	4
Tornadoes and Waterspouts	4.00	4
Natural Biohazards	3.00	7
Drought and Extreme Heat	2.00	8
Landslides and Land Subsidence	2.00	8
Wildfire	2.00	8

Hazard	Priority Score	Hazard Rank
Earthquakes	1.00	11
Coastal Flooding and Erosion	Do Not Include	

Table 5.1.3: City of Huron Hazard Priorities

Hazard	Priority Score	Hazard Rank
Multiple Hazards	5.00	1
Severe Summer Weather	3.00	2
Drought and Extreme Heat	2.00	3
Riverine Flooding and Erosion	2.00	3
Severe Winter Weather and Extreme Cold	2.00	3
Tornadoes and Waterspouts	2.00	3
Coastal Flooding and Erosion	1.00	7
Dam/Levee Failure	Do Not Include	
Earthquakes	Do Not Include	
Landslides and Land Subsidence	Do Not Include	
Natural Biohazards	Do Not Include	
Wildfire	Do Not Include	

Table 5.1.4: City of Sandusky Hazard Priorities

Hazard	Priority Score	Hazard Rank
Multiple Hazards	5.00	1
Coastal Flooding and Erosion	3.50	2
Riverine Flooding and Erosion	3.50	2
Severe Winter Weather and Extreme Cold	3.50	2
Tornadoes and Waterspouts	3.00	5
Natural Biohazards	2.50	6
Severe Summer Weather	2.50	6
Drought and Extreme Heat	2.00	8
Earthquakes	1.50	9
Wildfire	1.50	9
Dam/Levee Failure	1.00	11
Landslides and Land Subsidence	1.00	11

Table 5.1.5: City of Vermilion Hazard Priorities

Hazard	Priority Score	Hazard Rank
Multiple Hazards	5.00	1
Riverine Flooding and Erosion	4.50	2
Coastal Flooding and Erosion	4.00	3
Drought and Extreme Heat	3.00	4
Tornadoes and Waterspouts	3.00	4
Severe Summer Weather	2.50	6
Severe Winter Weather and Extreme Cold	2.50	6
Landslides and Land Subsidence	1.50	8
Natural Biohazards	1.50	8
Wildfire	1.50	8
Dam/Levee Failure	1.00	11
Earthquakes	0.50	12

Table 5.1.6: Village of Bay View Hazard Priorities

Hazard	Priority Score	Hazard Rank
Multiple Hazards	5.00	1
Natural Biohazards	5.00	1
Riverine Flooding and Erosion	5.00	1
Coastal Flooding and Erosion	4.00	4
Severe Summer Weather	4.00	4
Severe Winter Weather and Extreme Cold	4.00	4
Drought and Extreme Heat	2.00	7
Tornadoes and Waterspouts	2.00	7
Wildfire	2.00	7
Dam/Levee Failure	1.00	10
Earthquakes	1.00	10
Landslides and Land Subsidence	1.00	10

Table 5.1.7: Village of Berlin Heights Hazard Priorities

Hazard	Priority Score	Hazard Rank
Multiple Hazards	5.00	1
Drought and Extreme Heat	5.00	1
Severe Summer Weather	5.00	1

Hazard	Priority Score	Hazard Rank
Severe Winter Weather and Extreme Cold	5.00	1
Natural Biohazards	3.00	5
Riverine Flooding and Erosion	3.00	5
Tornadoes and Waterspouts	3.00	5
Wildfire	3.00	5
Earthquakes	1.00	9
Landslides and Land Subsidence	1.00	9
Dam/Levee Failure	Do Not Include	
Coastal Flooding and Erosion	Do Not Include	

Table 5.1.8: Village of Castalia Hazard Priorities

Hazard	Priority Score	Hazard Rank
Multiple Hazards	5.00	1
Drought and Extreme Heat	3.00	2
Severe Summer Weather	3.00	2
Severe Winter Weather and Extreme Cold	3.00	2
Earthquakes	1.00	6
Landslides and Land Subsidence	1.00	6
Natural Biohazards	1.00	6
Riverine Flooding and Erosion	1.00	6
Tornadoes and Waterspouts	1.00	6
Wildfire	1.00	6
Dam/Levee Failure	Do Not Include	
Coastal Flooding and Seiche	Do Not Include	

Table 5.1.9: Village of Kelleys Island Hazard Priorities

Hazard	Priority Score	Hazard Rank
Multiple Hazards	5.00	1
Coastal Flooding and Seiche	5.00	1
Flooding	4.00	3
Landslides and Land Subsidence	4.00	3
Wildfire	4.00	3
Drought and Extreme Heat	3.00	6
Severe Summer Weather	3.00	6

Hazard	Priority Score	Hazard Rank
Severe Winter Weather and Extreme Cold	3.00	6
Tornadoes and Waterspouts	3.00	6
Natural Biohazards	2.00	10
Dam/Levee Failure	Do Not Include	
Earthquakes	Do Not Include	

Table 5.1.10: Village of Milan Hazard Priorities

Hazard	Priority Score	Hazard Rank
Multiple Hazards	5.00	1
Severe Summer Weather	4.50	2
Severe Winter Weather and Extreme Cold	4.50	2
Drought and Extreme Heat	4.00	4
Riverine Flooding and Erosion	3.50	5
Tornadoes and Waterspouts	3.50	5
Wildfire	3.50	5
Coastal Flooding and Erosion	3.00	8
Natural Biohazards	3.00	8
Dam/Levee Failure	3.00	8
Earthquakes	2.50	11
Landslides and Land Subsidence	2.00	12

Hazards Not Assessed

Below is a discussion covering hazards that were not included in this Plan update, as compared to the hazards included in the SOHMP and in Erie County's previous 2021 HMP.

Coastal Flooding and Erosion

The City of Bellevue, City of Castalia, and Village of Berlin Heights have opted to not include any mitigation actions for the hazard due to their inland location.

Dam/Levee Failure

The City of Huron, City of Castalia, Village of Berlin Heights, and Village of Kelleys Island have opted to not include any mitigation actions for the hazard due to their lack of dams and levees.

Earthquakes

The City of Huron and Village of Kelleys Island have opted to not include any mitigation actions for the hazard.

Natural Biohazards

The City of Huron has opted to not include any mitigation actions for this hazard.

Hurricanes/Tropical Storms

Hurricanes/tropical storms are hazards that are not directly applicable to Erie County due to the County's inland location, so they were not assessed. However, if remnants of hurricanes or tropical storms were experienced as thunderstorms, thunderstorm winds, or high/severe winds, those events were included in the severe summer storms and/or tornado assessments.

Landslides and Land Subsidence

The City of Huron has opted to not include any mitigation actions for the hazard.

Wildfire

The City of Huron has opted to not include any mitigation actions for this hazard.

5.2 Hazard Mitigation Goals

Developing achievable goals forms the foundation for all mitigation actions and activities that will aid Erie County in attaining the overall mission of the Core Planning Committee. As such, the Core Planning Committee and participating jurisdictions assessed the goals of the 2021 Hazard Mitigation Plan and updated them for this Plan update. Goals were established and reviewed based upon their relationship to the hazard priorities and potential adverse impact of those hazards upon the community. The goals, as well as the hazards assessed for this Plan, informed the development of actions that the County and participating jurisdictions can take to mitigate the impacts of the hazards. The goals of the Erie County Hazard Mitigation Plan are as follows:

- Increase awareness of and preparedness for flooding and lake level rise to save lives and reduce property damage and their impacts on the community. Minimize human, economic, and environmental disruption from natural hazards.
- Identify, monitor, and evaluate high risk areas of ice jam concern.
- Increase awareness of and preparedness for severe summer weather to reduce loss of life and property damage, examining current means of response to identify gaps in planning and response. Encourage hazard mitigation planning and incorporate that planning into other related plans.
- Evaluate and implement measures to prepare the community for severe summer weather.
- Evaluate and implement measures to protect lives, property and the environment impacted by lake and stream bank erosion.
- Educate residents and businesses on the dangers of damaging winds as well as techniques to mitigate their impacts.
- Proactively evaluate and enact measures to reduce the effects of Harmful Algae Blooms.
- Increase awareness and monitoring of invasive species to reduce harm to infrastructure, crops and the native ecology.
- Increase awareness of and preparedness for severe winter weather to reduce loss of life and property damage, examining current means of response to identify gaps in planning and response.
- Evaluate and implement measures to prepare the community for severe winter weather.
- Evaluate and implement measures designed to warn residents and provide safe shelter during tornadoes and waterspouts.
- Identify, monitor, and evaluate high risk areas of concern.

- Increase awareness and fire prevention strategies.
- Increase awareness of and implement measures to decrease loss of life and property damage from earthquake events.
- Create traffic control strategies in the event of a major disaster.
- Identify and educate the community on water safety, swimming and ways to avoid drownings and on water safety.
- Evaluate potential hazards from wildfire smoke transfer .

Hazard Mitigation Actions & Priorities

Members of the Core Planning Committee completed a Previous Mitigation Action Status survey, which indicated the status of mitigation actions included in the 2021 Hazard Mitigation Plan. This survey asked representatives to indicate whether the mitigation actions from the previous plan were completed, deleted, or ongoing. It also asked the representative if the mitigation action should be included in this Plan update. The results are included in **Appendix B**. In addition, new mitigation actions were developed and considered for inclusion in this Plan update that address gaps in the previous plan or new issues that have arisen since the 2021 Plan.

All new and previous mitigation actions were reviewed and rated by members of the Core Planning Committee and local jurisdictions based on five criteria: cost-effectiveness, technical feasibility, environmental soundness, immediate need, and total risk reduction. For each action, each of the five criteria were rated on a scale of one to five (low to high). All of the surveys were collected and the individual criteria for each mitigation action were averaged and then added together to develop a single raw score for each individual mitigation action per jurisdiction. The raw score for each action was used in combination with the rankings of the associated hazard, as determined by the Hazard Priority Survey (**Tables 5.1.1 – 5.1.10**), to develop a score for each mitigation action. The scores were then ranked to indicate the priority of each specific action. The mitigation action with the highest score was given a priority of one, indicating that it received the highest priority. Hazard Mitigation Action priorities are organized by hazard in **Table 5.2.1 – Table 5.2.10**. Each table is specific to the jurisdiction. The information used to develop the priorities from the jurisdictions' surveys and comments can be found in **Appendix G**, along with all completed surveys that were used to prioritize the hazards and develop the goals.

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

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

Table 5.2.1: Mitigation Actions Priority Table by Hazard for Erie County

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
Coastal Flooding and Erosion								
1	Implement comprehensive shoreline stabilization and roadway hardening measures along East Bayview Drive in the Village of Bay View, a vital coastal roadway segment directly adjacent to Sandusky Bay/Lake Erie that functions as the primary egress and access route for local residential areas and connects to broader regional connections.	Erie County	9	47	County EMA, Engineer's Office	United States Army Corps of Engineers (USACE) Flood Control Program	2026 - 2031	New
Dam/Levee Failure								
2	Ensure all high-hazard potential dams have updated Emergency Action Plans (EAPs) in place.	Erie County, Perkins Township	10	48	County EMA, Engineer's Office	National Dam Safety Program State Assistance Grant	2026 - 2031	New
3	Obtain or create inundation maps for all dams.	Erie County, Perkins Township	10	49	County EMA, Engineer's Office	Staff Time	2026 - 2031	New
Drought & Extreme Heat								
4	Develop a public education program for restrictions on water usage during drought conditions.	Erie County, Perkins Township	8	45	County EMA	General Operating Budget	2026 - 2031	Previous
5	Develop a public education program on the hazards associated with droughts and extreme heat.	Erie County, Perkins Township	8	44	County EMA	General Operating Budget	2026 - 2031	Previous
6	Develop educational program for restrictions on water usage during fire events.	Erie County, Perkins Township	8	46	County EMA	General Operating Budget	2026 - 2031	Previous
Earthquakes								
7	Develop a public education program on the dangers of earthquakes.	Erie County, Perkins Township	13	52	County EMA	General Operating Budget	2026 - 2031	Previous
8	Develop and enforce appropriate building codes for structures to be constructed in seismic areas.	Erie County, Perkins Township	13	50	County EMA	Staff Time	2026 - 2031	Previous
9	Evaluate the potential association of injection wells and how that is affected by earthquakes.	Erie County, Perkins Township	13	51	County EMA	Staff Time	2026 - 2031	Previous
Landslides and Mine Subsidence (Included with Multiple Hazards)								
Multiple Hazards								

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
10	Conduct a feasibility study followed by reconstruction of the approximately 2,000-foot missing steel roadway section of the decommissioned Sandusky Bay Bridge (removed in 1985), utilizing the existing causeways and fishing piers to establish a resilient, redundant transportation corridor between Bay View in Erie County and the Catawba Peninsula in Ottawa County.	Erie County	1	2	County EMA	United States Army Corps of Engineers (USACE) Flood Control Program	2026 - 2031	New
11	Construct designated safe shelters that would provide protection from severe weather throughout the County.	Erie County, Perkins Township	1	11	County EMA, County Commissioners, Incorporated Jurisdictions	General Operating Budget	2026 - 2031	Previous
12	Create a stronger system of outside sirens throughout the County in additional locations for severe weather and tornado purposes.	Erie County	1	13	County EMA, Engineer's Office	Next Generation Warning System Grant	2026 - 2031	New
13	Develop a tree maintenance program to prune or remove those trees recognized to be hazards.	Erie County, Perkins Township	1	12	County EMA	General Operating Budget	2026 - 2031	Previous
14	Develop and provide outreach on the unique weather patterns in Erie County.	Erie County, Perkins Township	1	9	County EMA	Staff Time	2026 - 2031	Previous
15	Develop and provide outreach program for County residents and those in the sensitive and/or special needs population covering the dangers associated with severe storms.	Erie County, Perkins Township	1	8	County EMA, County Commissioners	Staff Time	2026 - 2031	Previous
16	Evaluate the need for shelters for marinas and for tourist areas within the County.	Erie County, Perkins Township	1	15	County EMA	Staff Time	2026 - 2031	Previous
17	Evaluate the potential to develop a Countywide Program for pre-wiring structures to accept generators.	Erie County, Perkins Township	1	14	County EMA, Incorporated Jurisdictions	Staff Time	2026 - 2031	Previous
18	Identify high risk areas and evaluate land-use planning techniques to mitigate future events.	Erie County, Perkins Township	1	3	County EMA	Staff Time	2026 - 2031	Previous
19	Increase awareness and education on hazards by sharing information at established public meetings.	Erie County, Perkins Township	1	6	County EMA, Erie County Regional Planning Commission	Staff Time	2026 - 2031	Previous
20	Provide additional interoperable sirens to provide early warnings to citizens of approaching severe weather.	Erie County, Perkins Township	1	4	County EMA, Incorporated Jurisdictions	Staff Time	2026 - 2031	Previous

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
21	Provide back-up generators (both temporary and permanent) for pumping and lift stations in sanitary sewer systems.	Erie County, Perkins Township	1	10	County EMA, Engineer's Office	Capital Improvement Budgets	2026 - 2031	Previous
22	Provide more NOAA radios in critical facilities to move toward achieving a “Storm Ready” community status. Provide additional NOAA radios for other facilities such as private businesses.	Erie County, Perkins Township	1	5	County EMA, Incorporated Jurisdictions	Next Generation Warning System Grant	2026 - 2031	Previous
23	Utilize Erie County’s Facebook Page and Twitter Account to conduct a social media campaign to increase education and awareness of hazards.	Erie County, Perkins Township	1	7	Erie County Regional Planning Commission	General Operating Budget	2026 - 2031	Previous
24	Work with all jurisdictions on filling in gaps and strengthening capabilities in enacting mitigation strategies.	Erie County, Perkins Township	1	1	County EMA, Incorporated Jurisdictions	Staff Time	2026 - 2031	New
Natural Biohazards								
25	Create a public education campaign targeted at landowners to encourage ECO-Farming techniques aimed at reducing nutrient loads in Lake Erie.	Erie County, Perkins Township	7	43	County EMA	General Operating Budget	2026 - 2031	Previous
26	Evaluate the types and effects of Invasive Species on Erie County and its residents.	Erie County, Perkins Township	7	42	County EMA	Staff Time	2026 - 2031	Previous
27	Work with state officials to make more digestible information available to the public on invasive species. Public awareness can help identify problems earlier and lessen impacts.	Erie County	7	41	County EMA, County Commissioners	General Operating Budget	2026 - 2031	New
Riverine Flooding and Erosion								
28	Assess and inventory problems with roadways susceptible to flooding within Erie County.	Erie County, Perkins Township	2	17	County EMA, Engineer's Office	United States Army Corps of Engineers (USACE) Flood Control Program	2026 - 2031	Previous
29	Assess and inventory problems with undersized culverts within Erie County.	Erie County, Perkins Township	2	21	County EMA, Engineer's Office	United States Army Corps of Engineers (USACE) Flood Control Program	2026 - 2031	Previous

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
30	Develop and provide educational information and promotion of urban and agricultural impacts of stormwater.	Erie County, Perkins Township	2	20	County EMA, Engineer's Office	Hazard Mitigation Assistance (HMA)	2026 - 2031	Previous
31	Eliminate cross contamination of storm and sanitary sewers by eliminating CSO and SSO systems.	Erie County, Perkins Township	2	24	County EMA, Engineer's Office	Staff Time	2026 - 2031	Previous
32	Ensure all eligible jurisdictions are participating in the NFIP.	Erie County, Perkins Township	2	27	County EMA, Engineer's Office	Staff Time	2026 - 2031	New
33	Establish program to acquire and demolish or retrofit existing flood prone properties within the County and Incorporated Jurisdictions.	Erie County, Perkins Township	2	29	County EMA, Incorporated Jurisdictions	United States Army Corps of Engineers (USACE) Flood Control Program	2026 - 2031	Previous
34	Evaluate the need to consider Ice Jams as concern for those communities that are affected directly from these winter flooding hazard.	Erie County, Perkins Township	2	32	County EMA	Hazard Mitigation Grant Program (HMGP)	2026 - 2031	Previous
35	Foster inter-agency coordination of floodplain management (Round Table).	Erie County, Perkins Township	2	19	Planning Commission	General Operating Budget	2026 - 2031	Previous
36	Identify a flood notification system and a river gauge system.	Erie County, Perkins Township	2	31	County EMA	General Operating Budget	2026 - 2031	Previous
37	Identify and assess Chapel Creek watershed to benefit Berlin Heights-Florence Twp.	Erie County, Perkins Township	2	37	County EMA, Engineer's Office	Emergency Management Performance Grant (EMPG) Special Project Grants	2026 - 2031	Previous
38	Identify and assess culverts and undersized drainage pipe property and drainage affected on Kelleys Island.	Erie County, Perkins Township	2	30	County EMA, Engineer's Office	Staff Time	2026 - 2031	Previous
39	Identify and assess other localized flooding areas and direct tributaries to the Bay and Lake.	Erie County, Perkins Township	2	23	County EMA	General Operating Budget	2026 - 2031	Previous
40	Identify and assess Pipe Creek Watershed to identify actual hazard.	Erie County, Perkins Township	2	22	County EMA, Engineer's Office	General Operating Budget	2026 - 2031	Previous
41	Identify and evaluate areas and tributaries impacted by stormwater.	Erie County, Perkins Township	2	36	County EMA, Engineer's Office	General Operating Budget	2026 - 2031	Previous

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
42	Identify and evaluate Best Management Practices for stormwater and localized stream and lake bank erosion.	Erie County, Perkins Township	2	18	County EMA, Engineer's Office	General Operating Budget	2026 - 2031	Previous
43	Increase capacity of sanitary sewer lift stations to avoid overflow.	Erie County, Perkins Township	2	25	County EMA, Water and Sewer Department	Capital Improvement Budgets	2026 - 2031	Previous
44	Conduct a detailed horizontal and vertical alignment assessment of roadway elevations relative to historic and projected flood levels, followed by targeted drainage enhancements, roadway elevation adjustments and widening as well as additional or improved culvert upgrades along Barrett Road—one of only two critical connectors linking Bay View community and serving as one of the Village's evacuation and access routes.	Erie County	2	16	County EMA, Engineer's Office	United States Army Corps of Engineers (USACE) Flood Control Program	2026 - 2031	New
45	Provide additional monitoring of water levels in streams and rivers with stream gauges.	Erie County, Perkins Township	2	35	County EMA, USGS	Hazard Mitigation Grant Program (HMGP)	2026 - 2031	Previous
46	Provide maintenance for ditches and waterways to avoid overflow due to sediment and debris build up.	Erie County, Perkins Township	2	26	County EMA, Incorporated Jurisdictions	General Operating Budget	2026 - 2031	Previous
47	Re-evaluate Franklin Flats neighborhood for a buyout program.	Erie County, Perkins Township	2	28	County EMA	Hazard Mitigation Assistance (HMA)	2026 - 2031	Previous
48	Revise County Regulations after the FEMA Coastal Maps become official.	Erie County, Perkins Township	2	33	Erie County Regional Planning Commission	Staff Time	2026 - 2031	Previous
49	Update flood insurance rate maps (FIRMs).	Erie County, Perkins Township	2	34	County EMA, Erie County Regional Planning Commission	Hazard Mitigation Grant Program (HMGP)	2026 - 2031	Previous
Severe Summer Weather (Included with Multiple Hazards)								
Severe Winter Weather and Extreme Cold								
50	Provide additional communication strategies to increase public awareness of notifications regarding severe winter weather.	Erie County	4	38	County EMA, County Commissioners	Staff Time	2026 - 2031	New

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
Tornadoes and Waterspouts								
51	Create a public education campaign encouraging homeowners and private businesses to install safe rooms and provide information about Ohio's Safe Room Rebate Program.	Erie County, Perkins Township	5	39	County EMA	General Operating Budget	2026 - 2031	Previous
52	Evaluate the need for multi-use shelters for marinas and for high tourist areas within the County.	Erie County, Perkins Township	5	40	County EMA, Incorporated Jurisdictions	General Operating Budget	2026 - 2031	Previous
Wildfire (Included with Multiple Hazards)								

Table 5.2.2: Mitigation Actions Priority Table by Hazard for City of Bellevue

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
Coastal Flooding and Erosion (Not Included)								
Dam/Levee Failure								
1	Ensure all high-hazard potential dams have updated Emergency Action Plans (EAPs) in place.	City of Bellevue	2	5	County EMA, Engineer's Office	General Operating Budget	2026 - 2031	New
2	Obtain or create inundation maps for all dams.	City of Bellevue	2	6	County EMA, Engineer's Office	General Operating Budget	2026 - 2031	New
Drought & Extreme Heat (Included with Multiple Hazards)								
Earthquakes (Included with Multiple Hazards)								
Landslides and Mine Subsidence (Included with Multiple Hazards)								
Multiple Hazards								
3	Construct designated safe shelters that would provide protection from severe weather throughout the County.	City of Bellevue	1	2	County EMA, County Commissioners, Incorporated Jurisdictions	General Operating Budget	2026 - 2031	Previous
4	Develop and provide outreach program for County residents and those in the sensitive and/or special needs population covering the dangers associated with severe storms.	City of Bellevue	1	3	County EMA, County Commissioners	General Operating Budget	2026 - 2031	Previous
5	Identify high risk areas and evaluate land use planning techniques to mitigate future events.	City of Bellevue	1	4	Mayor or Administrator of City of Bellevue	General Operating Budget	2026 - 2031	Previous
6	Work with all jurisdictions on filling in gaps and strengthening capabilities in enacting mitigation strategies.	City of Bellevue	1	1	County EMA, Incorporated Jurisdictions	General Operating Budget	2026 - 2031	New
Natural Biohazards (Included with Multiple Hazards)								
Riverine Flooding and Erosion								
7	Develop and provide educational information and promotion of urban and agricultural impacts of stormwater.	City of Bellevue	3	7	County EMA, Engineer's Office	General Operating Budget	2026 - 2031	Previous
8	Ensure all eligible jurisdictions are participating in the NFIP.	City of Bellevue	3	8	County EMA, Engineer's Office	General Operating Budget	2026 - 2031	New
9	Evaluate the need to consider Ice Jams as concern for those communities that are affected directly from these winter flooding hazard.	City of Bellevue	3	9	County EMA	General Operating Budget	2026 - 2031	Previous
Severe Summer Weather (Included with Multiple Hazards)								
Severe Winter Weather and Extreme Cold (Included with Multiple Hazards)								

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
Tornadoes and Waterspouts (Included with Multiple Hazards)								
Wildfire (Included with Multiple Hazards)								

Table 5.2.3: Mitigation Actions Priority Table by Hazard for City of Huron

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
Coastal Flooding and Erosion (Included with Multiple Hazards)								
Dam/Levee Failure (Not Included)								
Drought & Extreme Heat (Included with Multiple Hazards)								
Earthquakes (Not Included)								
Landslides and Mine Subsidence (Not Included)								
Multiple Hazards								
1	Identify high risk areas and evaluate land-use planning techniques to mitigate future events.	City of Huron	1	1	County EMA, Mayor or Administrator of City of Huron	General Operating Budget	2026 - 2031	Previous
2	Work with all jurisdictions on filling in gaps and strengthening capabilities in enacting mitigation strategies.	City of Huron	1	2	County EMA, Mayor or Administrator of City of Huron	General Operating Budget	2026 - 2031	New
Natural Biohazards (Not Included)								
Riverine Flooding and Erosion								
3	Ensure all eligible jurisdictions are participating in the NFIP.	City of Huron	4	3	County EMA, Engineer's Office	General Operating Budget	2026 - 2031	New
Severe Summer Weather (Included with Multiple Hazards)								
Severe Winter Weather and Extreme Cold (Included with Multiple Hazards)								
Tornadoes and Waterspouts								
4	Create a public education campaign encouraging homeowners and private businesses to install safe rooms and provide information about Ohio's Safe Room Rebate Program.	City of Huron	6	4	County EMA, Mayor or Administrator of City of Huron	General Operating Budget	2026 - 2031	Previous
Wildfire (Not Included)								

Table 5.2.4: Mitigation Actions Priority Table by Hazard for City of Sandusky

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
Coastal Flooding and Erosion (Included with Multiple Hazards)								
Dam/Levee Failure (Included with Multiple Hazards)								
Drought & Extreme Heat (Included with Multiple Hazards)								
Earthquakes (Included with Multiple Hazards)								
Landslides and Mine Subsidence (Included with Multiple Hazards)								
Multiple Hazards								
1	Develop and provide outreach program for County residents and those in the sensitive and/or special needs population covering the dangers associated with severe storms.	City of Sandusky	1	1	County EMA, County Commissioners	General Operating Budget	2026 - 2031	Previous
2	Identify high risk areas and evaluate land-use planning techniques to mitigate future events.	City of Sandusky	1	2	County EMA, Mayor or Administrator of City of Sandusky	General Operating Budget	2026 - 2031	Previous
Natural Biohazards (Included with Multiple Hazards)								
Riverine Flooding and Erosion								
3	Develop erosion control plans.	City of Sandusky	3	3	County EMA, Mayor or Administrator of City of Sandusky	General Operating Budget	2026 - 2031	Previous
Severe Summer Weather (Included with Multiple Hazards)								
Severe Winter Weather and Extreme Cold								
4	Provide education for vulnerable populations regarding city operated warming centers during events of extreme cold.	City of Sandusky	4	4	County EMA, Mayor or Administrator of City of Sandusky	General Operating Budget	2026 - 2031	Previous
Tornadoes (Included with Multiple Hazards)								
Wildfire (Included with Multiple Hazards)								

Table 5.2.5: Mitigation Actions Priority Table by Hazard for City of Vermilion

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
Coastal Flooding and Erosion (Included with Multiple Hazards)								
Dam/Levee Failure								
1	Ensure all high-hazard potential dams have updated Emergency Action Plans (EAPs) in place.	City of Vermilion	11	14	County EMA, Engineer's Office	National Dam Safety Program State Assistance Grant	2026 - 2031	New
2	Obtain or create inundation maps for all dams.	City of Vermilion	11	15	County EMA, Engineer's Office	Staff Time	2026 - 2031	New
Drought & Extreme Heat (Included with Multiple Hazards)								
Earthquakes (Included with Multiple Hazards)								
Landslides and Mine Subsidence (Included with Multiple Hazards)								
Multiple Hazards								
3	Construct designated safe shelters that would provide protection from severe weather throughout the County.	City of Vermilion	1	4	County EMA, County Commissioners, Mayor or Administrator of City of Vermilion	General Operating Budget	2026 - 2031	Previous
4	Develop and provide outreach program for County residents and those in the sensitive and/or special needs population covering the dangers associated with severe storms.	City of Vermilion	1	3	County EMA, County Commissioners	Staff Time	2026 - 2031	Previous
5	Identify high risk areas and evaluate land-use planning techniques to mitigate future events.	City of Vermilion	1	1	County EMA, Mayor or Administrator of City of Vermilion	Staff Time	2026 - 2031	Previous
6	Work with all jurisdictions on filling in gaps and strengthening capabilities in enacting mitigation strategies.	City of Vermilion	1	2	County EMA, Mayor or Administrator of City of Vermilion	Staff Time	2026 - 2031	New
Natural Biohazards								
7	Create a public education campaign targeted at landowners to encourage ECO-Farming techniques aimed at reducing nutrient loads in Lake Erie.	City of Vermilion	9	13	County EMA, Mayor or Administrator of City of Vermilion	General Operating Budget	2026 - 2031	Previous
Riverine Flooding and Erosion								
8	Communicate with current and new residents the possibility of water rising and entering their basement, or lower level limiting or eliminating access to their home.	City of Vermilion	2	8	Mayor or Administrator of City of Vermilion	General Operating Budget	2026 - 2031	Previous

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
9	Develop and provide educational information and promotion of urban and agricultural impacts of stormwater.	City of Vermilion	2	6	County EMA, Engineer's Office	Hazard Mitigation Assistance (HMA)	2026 - 2031	Previous
10	Ensure all eligible jurisdictions are participating in the NFIP.	City of Vermilion	2	7	County EMA, Engineer's Office	Staff Time	2026 - 2031	New
11	Evaluate the need to consider Ice Jams as concern for those communities that are affected directly from these winter flooding hazard.	City of Vermilion	2	5	County EMA, Mayor or Administrator of City of Vermilion	Hazard Mitigation Grant Program (HMGP)	2026 - 2031	Previous
Severe Summer Weather (Included with Multiple Hazards)								
Severe Winter Weather and Extreme Cold								
12	Consider drilling holes in ice cover to reduce the strength of the ice. This method has been used in areas of Canada to break up ice jams.	City of Vermilion	7	10	Mayor or Administrator of City of Vermilion	Hazard Mitigation Grant Program (HMGP)	2026 - 2031	New
13	Consider the use of earth and stone groins which can stabilize border ice and reduce the amount of ice flowing downstream.	City of Vermilion	7	11	Mayor or Administrator of City of Vermilion	Staff Time	2026 - 2031	New
14	Consider using amphibious vehicles when clearing ice jams in wide rivers to reduce risk to workers.	City of Vermilion	7	12	Mayor or Administrator of City of Vermilion	Hazard Mitigation Assistance (HMA)	2026 - 2031	New
15	Identify rivers and streams that should be prioritized for ice jam clearing.	City of Vermilion	7	13	Mayor or Administrator of City of Vermilion	Hazard Mitigation Grant Program (HMGP)	2026 - 2031	New
16	Inspect rivers in streams by assigned priority and perform regular ice breaking and ice jam clearing.	City of Vermilion	7	14	Mayor or Administrator of City of Vermilion	Staff Time	2026 - 2031	New
17	Prioritize sewer line replacement that will reduce soil intrusion and downstream issues.	City of Vermilion	7	15	Mayor or Administrator of City of Vermilion	Hazard Mitigation Assistance (HMA)	2026 - 2031	New
18	Seek funding for ice jam clearing gear, equipment, and training.	City of Vermilion	7	16	Mayor or Administrator of City of Vermilion	Staff Time	2026 - 2031	New
19	Set up monitoring stations in downstream rivers to identify drops in velocity to help locate potential upstream blockages.	City of Vermilion	7	17	Mayor or Administrator of City of Vermilion	Staff Time	2026 - 2031	New

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
Tornadoes and Waterspouts								
20	Create a public education campaign utilizing the Village's social media accounts, to notify homeowners and private businesses to install safe rooms and provide information about Ohio's Safe Room Rebate Program and encourage the removal of diseased and damaged trees.	City of Vermilion	5	9	County EMA, Mayor or Administrator of City of Vermilion	General Operating Budget	2026 - 2031	Previous
Wildfire (Included with Multiple Hazards)								

Table 5.2.6: Mitigation Actions Priority Table by Hazard for Village of Bay View

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
Coastal Flooding and Erosion (Included with Multiple Hazards)								
Dam/Levee Failure								
1	Ensure all high-hazard potential dams have updated Emergency Action Plans (EAPs) in place.	Village of Bay View	10	11	County EMA, Engineer's Office	National Dam Safety Program State Assistance Grant	2026 - 2031	New
2	Obtain or create inundation maps for all dams.	Village of Bay View	10	12	County EMA, Engineer's Office	Staff Time	2026 - 2031	New
Drought & Extreme Heat (Included with Multiple Hazards)								
Earthquakes (Included with Multiple Hazards)								
Landslides and Mine Subsidence (Included with Multiple Hazards)								
Multiple Hazards								
3	Construct designated safe shelters that would provide protection from severe weather throughout the County.	Village of Bay View	1	4	County EMA, Administrator or Mayor of Village of Bay View, County Commissioners	General Operating Budget	2026 - 2031	Previous
4	Develop and provide outreach program for County residents and those in the sensitive and/or special needs population covering the dangers associated with severe storms.	Village of Bay View	1	3	County EMA, County Commissioners	Staff Time	2026 - 2031	Previous
5	Identify high risk areas and evaluate land-use planning techniques to mitigate future events.	Village of Bay View	1	2	County EMA, Administrator or Mayor of Village of Bay View	Staff Time	2026 - 2031	Previous
6	Work with all jurisdictions on filling in gaps and strengthening capabilities in enacting mitigation strategies.	Village of Bay View	1	1	County EMA, Administrator or Mayor of Village of Bay View	Staff Time	2026 - 2031	New
Natural Biohazards								
7	Create a public education campaign targeted at landowners to encourage ECO-Farming techniques aimed at reducing nutrient loads in Lake Erie.	Village of Bay View	2	5	County EMA, Administrator or Mayor of Village of Bay View	General Operating Budget	2026 - 2031	Previous
Riverine Flooding and Erosion								
8	Construct a lift station or pumping station on the Bayfront to prevent lake water from entering the storm water system, which causes flooding.	Village of Bay View	3	8	County EMA, Engineer's Office	General Operating Budget	2026 - 2031	Previous

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
9	Develop and provide educational information and promotion of urban and agricultural impacts of stormwater.	Village of Bay View	3	7	County EMA, Engineer's Office	Hazard Mitigation Assistance (HMA)	2026 - 2031	Previous
10	Ensure all eligible jurisdictions are participating in the NFIP.	Village of Bay View	3	6	County EMA, Engineer's Office	Staff Time	2026 - 2031	New
Severe Summer Weather (Included with Multiple Hazards)								
Severe Winter Weather and Extreme Cold (Included with Multiple Hazards)								
Tornadoes and Waterspouts								
11	Create a public education campaign encouraging homeowners and private businesses to install safe rooms and provide information about Ohio's Safe Room Rebate Program.	Village of Bay View	8	10	County EMA, Administrator or Mayor of Village of Bay View	General Operating Budget	2026 - 2031	Previous
12	Cut down and remove dead/rotted trees that have the potential to cause property damage, injury, and power outages.	Village of Bay View	8	9	Administrator or Mayor of Village of Bay View	Staff Time	2026 - 2031	Previous
Wildfire (Included with Multiple Hazards)								

Table 5.2.7: Mitigation Actions Priority Table by Hazard for Village of Berlin Heights

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
Coastal Flooding and Erosion (Included with Multiple Hazards)								
Dam/Levee Failure								
1	Ensure all high-hazard potential dams have updated Emergency Action Plans (EAPs) in place.	Village of Berlin Heights	11	13	County EMA, Engineer's Office	National Dam Safety Program State Assistance Grant	2026 - 2031	New
2	Obtain or create inundation maps for all dams.	Village of Berlin Heights	11	14	County EMA, Engineer's Office	Staff Time	2026 - 2031	New
Drought & Extreme Heat (Included with Multiple Hazards)								
Earthquakes (Included with Multiple Hazards)								
Landslides and Mine Subsidence (Included with Multiple Hazards)								
Multiple Hazards								
3	Construct designated safe shelters that would provide protection from severe weather throughout the County.	Village of Berlin Heights	1	3	County EMA, County Commissioners, Incorporated Jurisdictions	General Operating Budget	2026 - 2031	Previous
4	Develop and provide outreach program for County residents and those in the sensitive and/or special needs population covering the dangers associated with severe storms.	Village of Berlin Heights	1	4	County EMA, County Commissioners	Staff Time	2026 - 2031	Previous
5	Identify high risk areas and evaluate land-use planning techniques to mitigate future events.	Village of Berlin Heights	1	2	County EMA, Village of Berlin Heights	Staff Time	2026 - 2031	Previous
6	Work with all jurisdictions on filling in gaps and strengthening capabilities in enacting mitigation strategies.	Village of Berlin Heights	1	1	County EMA, Village of Berlin Heights	Staff Time	2026 - 2031	New
Natural Biohazards								
7	Create a public education campaign targeted at landowners to encourage ECO-Farming techniques aimed at reducing nutrient loads in Lake Erie.	Village of Berlin Heights	6	10	County EMA, Village of Berlin Heights	General Operating Budget	2026 - 2031	Previous
Riverine Flooding and Erosion								
8	Assess and inventory problems with undersized culverts within Erie County.	Village of Berlin Heights	5	6	County EMA, Engineer's Office	General Operating Budget	2026 - 2031	Previous
9	Develop and provide educational information and promotion of urban and agricultural impacts of stormwater.	Village of Berlin Heights	5	7	County EMA, Engineer's Office	Hazard Mitigation Assistance (HMA)	2026 - 2031	Previous

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
10	Ensure all eligible jurisdictions are participating in the NFIP.	Village of Berlin Heights	5	8	County EMA, Engineer's Office	Staff Time	2026 - 2031	New
11	Mitigate flooding of homes on Berlin Rd.	Village of Berlin Heights	5	9	County EMA, Village of Berlin Heights	United States Army Corps of Engineers (USACE) Flood Control Program	2026 - 2031	New
12	Resolve flooding of homes at main and Memorial Drive.	Village of Berlin Heights	5	5	County EMA, Village of Berlin Heights	United States Army Corps of Engineers (USACE) Flood Control Program	2026 - 2031	New
Severe Summer Weather (Included with Multiple Hazards)								
Severe Winter Weather and Extreme Cold (Included with Multiple Hazards)								
Tornadoes and Waterspouts								
13	Create a public education campaign encouraging homeowners and private businesses to install safe rooms and provide information about Ohio's Safe Room Rebate Program.	Village of Berlin Heights	7	12	County EMA, Village of Berlin Heights	General Operating Budget	2026 - 2031	Previous
14	Inspect trees in road ROW and remove as necessary.	Village of Berlin Heights	7	11	County EMA, Village of Berlin Heights	Hazard Mitigation Assistance (HMA)	2026 - 2031	Previous
Wildfire (Included with Multiple Hazards)								

Table 5.2.8: Mitigation Actions Priority Table by Hazard for Village of Castalia

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
Coastal Flooding and Erosion (Not Included)								
Dam/Levee Failure (Not Included)								
Drought & Extreme Heat (Included with Multiple Hazards)								
Earthquakes (Included with Multiple Hazards)								
Landslides and Mine Subsidence (Included with Multiple Hazards)								
Multiple Hazards								
1	Identify high risk areas and evaluate land-use planning techniques to mitigate future events.	Village of Castalia	1	2	County EMA, Mayor of Administrator of Village of Castalia	Staff Time	2026 - 2031	Previous
2	Work with all jurisdictions on filling in gaps and strengthening capabilities in enacting mitigation strategies.	Village of Castalia	1	1	County EMA, Mayor of Administrator of Village of Castalia	Staff Time	2026 - 2031	Previous
Natural Biohazards (Included with Multiple Hazards)								
Riverine Flooding and Erosion								
3	Assess and inventory problems with undersized culverts within Erie County.	Village of Castalia	6	3	County EMA, Engineer's Office	General Operating Budget	2026 - 2031	Previous
4	Communicate with the Ohio Division of Wildlife in attempt to clean debris and sediment from drainage area of nearly half the Village's stormwater lines.	Village of Castalia	6	6	County Engineer's Office, Mayor of Administrator of Village of Castalia	Hazard Mitigation Assistance (HMA)	2026 - 2031	New
5	Develop and provide educational information and promotion of urban and agricultural impacts of stormwater.	Village of Castalia	6	7	County EMA, Engineer's Office	Hazard Mitigation Assistance (HMA)	2026 - 2031	Previous
6	Ensure all eligible jurisdictions are participating in the NFIP.	Village of Castalia	6	5	County EMA, Engineer's Office	Staff Time	2026 - 2031	Previous
7	Survey and identify sewer lines in the Village that require replacement, prioritizing sewer line replacement that will reduce soil intrusion and downstream issues.	Village of Castalia	6	4	County Engineer's Office, Mayor of Administrator of Village of Castalia	United States Army Corps of Engineers (USACE) Flood Control Program	2026 - 2031	New
Severe Summer Weather (Included with Multiple Hazards)								
Severe Winter Weather and Extreme Cold (Included with Multiple Hazards)								
Tornadoes and Waterspouts (Included with Multiple Hazards)								
Wildfire (Included with Multiple Hazards)								

Table 5.2.9: Mitigation Actions Priority Table by Hazard for Village of Kelleys Island

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
Coastal Flooding and Erosion								
1	Develop and provide educational information and promotion of urban and agricultural impacts of stormwater.	Village of Kelleys Island	2	7	County EMA, Engineer's Office	Hazard Mitigation Assistance (HMA)	2026 - 2031	Previous
2	Encourage the Village of Kelleys Island to participate in the National Flood Insurance Program.	Village of Kelleys Island	2	8	County EMA, Administrator or Mayor of Village of Kelleys Island	General Operating Budget	2026 - 2031	Previous
3	Ensure all eligible jurisdictions are participating in the NFIP.	Village of Kelleys Island	2	6	County EMA, Administrator or Mayor of Village of Kelleys Island	Staff Time	2026 - 2031	New
4	Evaluate the need for multi-use shelters for marinas and for high tourist areas within the County.	Village of Kelleys Island	2	9	County EMA, Administrator or Mayor of Village of Kelleys Island	General Operating Budget	2026 - 2031	Previous
5	Repair shoreline and Lakeshore Drive sustainably, to resist future damage from erosion and flooding associated with high lake levels.	Village of Kelleys Island	2	5	County EMA, Administrator or Mayor of Village of Kelleys Island	United States Army Corps of Engineers (USACE) Flood Control Program	2026 - 2031	Previous
Dam/Levee Failure (Not Included)								
Drought & Extreme Heat (Included with Multiple Hazards)								
Earthquakes (Included with Multiple Hazards)								
Landslides and Mine Subsidence (Included with Multiple Hazards)								
Multiple Hazards								
6	Assess and inventory problems with roadways susceptible to flooding within Erie County.	Village of Kelleys Island	1	1	County EMA, Engineer's Office	United States Army Corps of Engineers (USACE) Flood Control Program	2026 - 2031	Previous
7	Develop and provide outreach program for County residents and those in the sensitive and/or special needs population covering the dangers associated with severe storms.	Village of Kelleys Island	1	3	County EMA, County Commissioners	Staff Time	2026 - 2031	Previous
8	Provide NOAA radios in critical facilities to move forward on the “Storm Ready” Community status.	Village of Kelleys Island	1	2	County EMA, Administrator or Mayor of Village of Kelleys Island	Hazard Mitigation Assistance (HMA)	2026 - 2031	Previous

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
9	Work with all jurisdictions on filling in gaps and strengthening capabilities in enacting mitigation strategies.	Village of Kelleys Island	1	4	County EMA, Administrator or Mayor of Village of Kelleys Island	Staff Time	2026 - 2031	New
Natural Biohazards (Included with Multiple Hazards)								
Riverine Flooding and Erosion (Included with Multiple Hazards)								
Severe Summer Weather (Included with Multiple Hazards)								
Severe Winter Weather and Extreme Cold (Included with Multiple Hazards)								
Tornadoes and Waterspouts								
10	Create a public education campaign encouraging homeowners and private businesses to install safe rooms and provide information about Ohio's Safe Room Rebate Program.	Village of Kelleys Island	9	10	County EMA	General Operating Budget	2026 - 2031	Previous
Wildfire (Included with Multiple Hazards)								

Table 5.2.10: Mitigation Actions Priority Table by Hazard for Village of Milan

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
Coastal Flooding and Erosion (Included with Multiple Hazards)								
Dam/Levee Failure								
1	Ensure all eligible jurisdictions are participating in the NFIP.	Village of Milan	10	10	County EMA, Engineer's Office	Staff Time	2026 - 2031	New
Drought & Extreme Heat (Included with Multiple Hazards)								
Earthquakes (Included with Multiple Hazards)								
Landslides and Mine Subsidence (Included with Multiple Hazards)								
Multiple Hazards								
2	Construct designated safe shelters that would provide protection from severe weather throughout the County.	Village of Milan	1	3	County EMA, County Commissioners, Incorporated Jurisdictions	General Operating Budget	2026 - 2031	Previous
3	Develop and provide outreach program for County residents and those in the sensitive and/or special needs population covering the dangers associated with severe storms.	Village of Milan	1	4	County EMA, County Commissioners	Staff Time	2026 - 2031	Previous
4	Identify high risk areas and evaluate land-use planning techniques to mitigate future events.	Village of Milan	1	2	County EMA, Village of Milan	Staff Time	2026 - 2031	Previous
5	Work with all jurisdictions on filling in gaps and strengthening capabilities in enacting mitigation strategies.	Village of Milan	1	1	County EMA, Village of Milan	Staff Time	2026 - 2031	New
Natural Biohazards								
6	Create a public education campaign targeted at landowners to encourage ECO-Farming techniques aimed at reducing nutrient loads in Lake Erie.	Village of Milan	9	9	County EMA, Village of Milan	General Operating Budget	2026 - 2031	Previous
Riverine Flooding and Erosion								
7	Assess and inventory problems with undersized culverts within Erie County.	Village of Milan	5	5	County EMA, Engineer's Office	General Operating Budget	2026 - 2031	Previous
8	Develop and provide educational information and promotion of urban and agricultural impacts of stormwater.	Village of Milan	5	6	County EMA, Engineer's Office	Hazard Mitigation Assistance (HMA)	2026 - 2031	Previous
Severe Summer Weather (Included with Multiple Hazards)								
Severe Winter Weather and Extreme Cold (Included with Multiple Hazards)								

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
Tornadoes and Waterspouts								
9	Create a public education campaign encouraging homeowners and private businesses to install safe rooms and provide information about Ohio's Safe Room Rebate Program.	Village of Milan	6	7	County EMA, Village of Milan	General Operating Budget	2026 - 2031	Previous
10	Inspect trees in road ROW and remove as necessary.	Village of Milan	6	8	County EMA, Village of Milan	General Operating Budget	2026 - 2031	Previous
Wildfire (Included with Multiple Hazards)								

6| Schedule & Maintenance

6.1 Participation Overview

The Erie County Hazard Mitigation Plan will be adopted by all jurisdictions in Erie County.

6.2 Continued Public Involvement

Because local government plays a key role in the execution and implementation of mitigation strategies, each community will be responsible for understanding which items they are accountable for implementing. Annually, jurisdictions and responsible agencies should provide a status update for each mitigation action that is under their purview. This meeting will be where the jurisdictions and responsible parties assess the implementation and effectiveness of the hazard mitigation plan. This meeting should coincide with the budget process so that future funding sources can be determined and set aside for actions slated for that particular year. This meeting will also be available to the public. Additionally, each jurisdiction and the County will review the Hazard Mitigation Plan during other planning processes, such as development of comprehensive plans or capital improvement plans and incorporate appropriate goals and mitigation actions into such documents.

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

6.3 Previous Integration Efforts

Local governments and public entities, such as hospitals, play a major role in enforcing and implementing mitigation strategies because their daily operations guide the development of the communities in Erie County. The Erie Conservation District has incorporated the previous Hazard Mitigation plan into Erie County's Stormwater Management Plan by designating the organization that is the lead and supporting agency for certain illicit discharges, hazardous spills, landowner technical assistance for erosion issues, etc. The previous plan has also been incorporated into the Emergency Operations Plan. The 2021 HMP is integrated into the overview and background of the Erie County Health Department Emergency Response Plan to reference specific emergencies regarding outbreaks, chemical spills, and other hazards responses for the health department. In addition, the 2021 Hazard Mitigation Plan was integrated into the ERPC MPO 2050 Long Range Transportation Plan.

6.4 Future Integration Efforts

Erie County and its participating jurisdictions will make a concerted effort to integrate the Hazard Mitigation Plan and its mitigation actions into existing plans and regulations, such as comprehensive plans, capital improvement plans, zoning codes and subdivision regulations, parks and open space plans, active shooter plans, and emergency operations plans. Every village in Erie County has a planning commission or a zoning board that deals with development and growth issues in their jurisdiction, referencing regulations, development plans, and mitigation strategies as they make decisions. These jurisdictions are small and have limited full-time staff, so the County as an organization provides strong leadership and oversight of economic development, community development, and land use planning. Many local officials wear numerous hats as they guide, direct, and facilitate local growth and development through regulation. Mitigation efforts are considered simultaneously with building code enforcement, zoning regulations, and land use rules at the County

level. There is significant overlap between County officials when it comes to growth and development, including plan approval, issuance of permits, and occupancy approval responsibilities.

For the Erie County Emergency Operations Plan, the EOP should facilitate integration of mitigation into response and recovery activities where appropriate, so key staff responsible for administering and updating the EOP should coordinate with the Core Planning Committee to identify integration areas and perform them. For the jurisdictions with floodplain regulations (Erie County and all jurisdictions), this Plan includes an action to "develop a floodplain management plan and update it regularly" so as floodplain regulations are reviewed and updated, the local floodplain coordinator(s) should continue to participate in the National Flood Insurance Program and should keep their maps updated. The Core Planning Committee should also engage the local floodplain coordinators and include them in their annual meetings for coordination, support, and to ensure this action is being implemented. For the zoning and land use regulations, this plan can be integrated in several ways. When zoning and/or land use regulations are reviewed and updated, potential impact areas related to flooding and dam failure should be designated for limited to no development; with regard to landslides and land subsidence, land bordering waterways should either be left free of development or be reinforced to resist erosion. The Core Planning Committee should also engage the staff involved in administering and updating zoning codes and land use regulations and include them in their annual meetings for coordination, support, and assistance in integrating these recommendations from the plan.

Erie County also has a Floodplain Manager who works with the Erie County Engineer to help plan, approve, modify, and regulate new facilities, subdivisions, and neighborhoods not only in the context of building codes, but also with consideration for flood risk. They also collaborate to be sure that new structures are not placed within flood risk zones without taking appropriate measures, like increasing elevation, as early as the site development stage of construction. The Erie County Engineer works with the Erie County Auditor to manage the floodplain mapping and parcel identification and documentation by developing and maintaining GIS mapping. The Erie County Engineer also ensures that mitigation actions, like elevating properties, are properly included in the submitted building and occupancy permits during the approval process. The Erie County Engineer is also responsible for County ditch maintenance, which ties the County Engineer's office to the Erie County Soil & Water Conservation District, as well as the Farm Service Agency director, as agricultural drainage concerns are shared and resolved. These officials work with the Floodplain Manager to check and evaluate the floodplain maps as introduced by FEMA to ensure accuracy through the map adoption process.

In addition, Erie County EMA and the Core Planning Committee, consisting of leadership from participating jurisdictions, will work with the top elected officials and authorities within their jurisdictions to integrate the hazard mitigation plan into the relevant existing and future planning mechanisms and capabilities as listed in **Table 3.4.1** of the Plan.

6.5 Updating the Plan

The Hazard Mitigation Plan must be updated within five years and re-adopted by the County and all participating jurisdictions to maintain compliance with federal regulations and ensure eligibility for certain federal mitigation grant funds. Erie County will be meeting HHPD requirements for the 2026 Hazard Mitigation Plan. Erie County will identify any necessary modifications to the Plan, including changes to mitigation goals and actions that should be incorporated into the next update. The Erie County EMA Director and the County Commissioners will initiate the process of updating the Pan in accordance with federal guidelines in sufficient time to meet state and federal deadlines.