GREENE COUNTY
HAZARD MITIGATION PLAN
AUGUST 2025

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1.1 Overview

With the 2020 Greene County Hazard Mitigation Plan set to expire in December 2025, Greene 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 Greene County. As such, a Core Planning Committee within Greene County has been established with the goal of developing and implementing the 2025 Greene 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 Greene County.

This 2025 Greene County Hazard Mitigation Plan is a multi-jurisdictional plan which considers the impacts of hazards on incorporated cities and villages and unincorporated townships. Greene 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: Greene County Jurisdictions

Jurisdictions	
City of Beavercreek	Village of Bowersville
City of Bellbrook	Village of Cedarville
City of Centerville*	Village of Clifton*
City of Dayton*	Village of Jamestown
City of Fairborn	Village of Spring Valley
City of Kettering*	Village of Yellow Springs
City of Xenia	

Table 1.1.2: Greene County Townships

Townships	
Bath Township	New Jasper Township
Beavercreek Township	Ross Township
Caesarscreek Township	Silvercreek Township
Cedarville Township	Spring Valley Township
Jefferson Township	Sugarcreek Township
Miami Township	Xenia Township

The Cities of Centerville, Dayton and Kettering, and the Village of Clifton are located primarily within adjacent counties and elected to participate in and adopt their respective county hazard mitigation plans.

Figure 1.1.3: Greene County Jurisdictions Map

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

- This **Introduction** (Chapter 1) provides a discussion about the general purpose and goals that Greene 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 Greene 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 Greene County. The nature, location, extent, historical impact, vulnerability, and likelihood of occurrence for each hazard are provided for each hazard. These analyses include the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas; an estimate of the potential dollar losses to vulnerable structures; and a general description of land uses and development trends within the community.

- Chapter 5, **Hazard Mitigation**, outlines the goals, strategies, and actions for the County. The proposed actions are presented in tables, categorized by the associated hazard and community, and then ranked from highest to lowest priority based on feedback received from County officials and participating jurisdictions and stakeholders. Excluded hazards are also documented in this section, along with the rationale for exclusion from the Plan.

- The final chapter (Chapter 6) of this Plan, **Schedule and Maintenance**, provides a summary of the proposed Plan adoption, integration, and maintenance schedule. This section describes how the County will review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within five years to continue to be eligible for mitigation project grant funding.

The resulting Greene 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 Greene 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 Greene 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

Greene County is located in southwest Ohio and has a total area of approximately 416 square miles. The County contains five cities, six villages, and twelve townships (**Tables 1.1.1 and 1.1.2**). The City of Xenia serves as the County seat. Greene County is bounded by six Ohio counties: Clark County to the north, Madison County to the northeast, Fayette County to the east, Clinton County to the southeast, Warren County to the southwest, and Montgomery County to the west.

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

Figure 1.2.1: Greene County Land Use Map

Figure 1.2.2: Greene County Land Cover Map
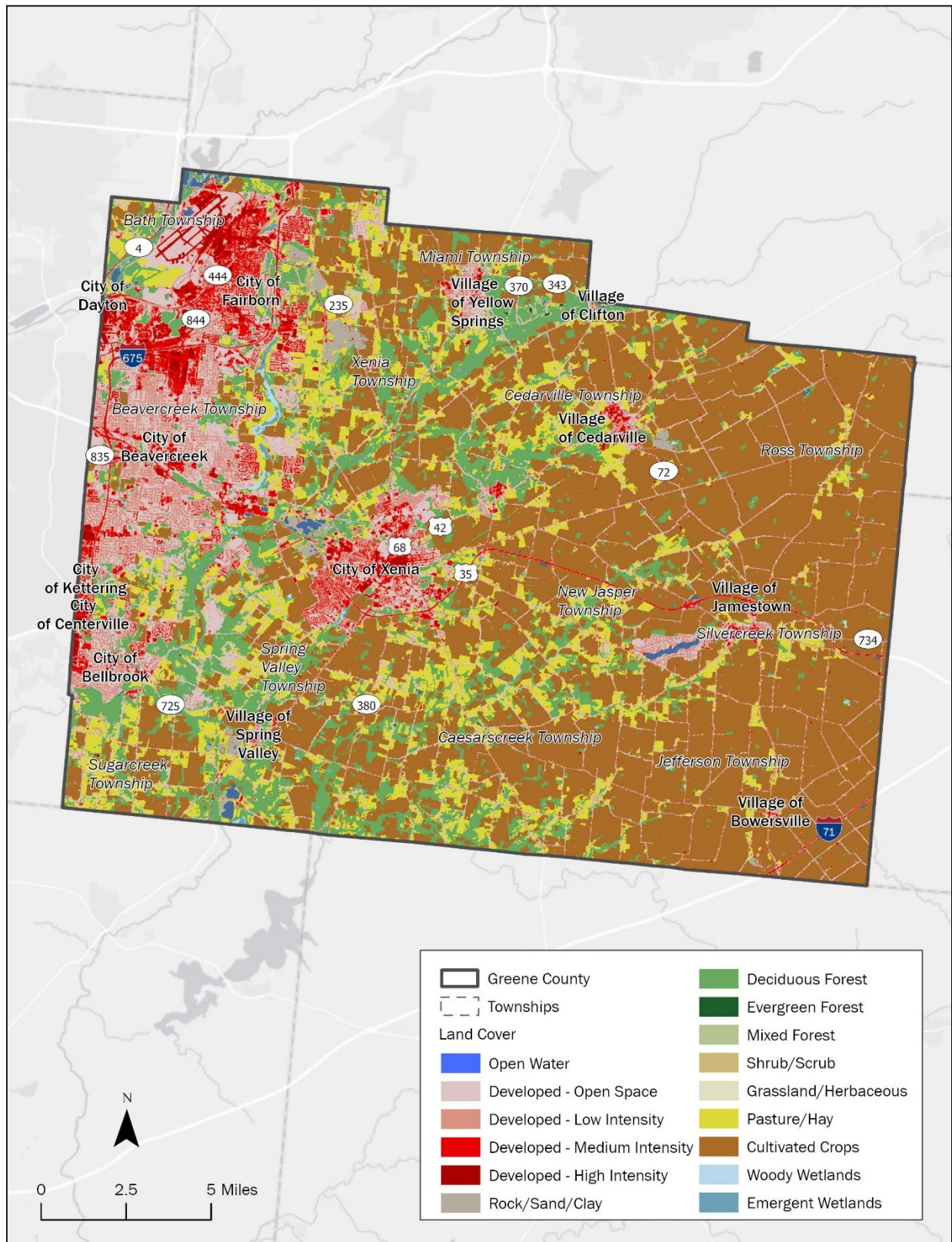
Transportation

Greene County contains several major roadways, including several State Routes (SR), U.S. Highways (US), and two Interstates (I). Major roadways in Greene County include SR-4, SR-72, SR-235, SR-343, SR-370, SR-380, SR-444, SR-725, SR-835, SR-844, US-35, US-42, US-68, I-71, and I-675.

Greene County has one public use airport, the Greene County Lewis A Jackon Regional Airport, located approximately 5 miles to the west of the City of Xenia.

Norfolk Southern Corporation has one railway line that runs through the northwest corner of the County past Wright State university and through the City of Fairborn.

Natural Features

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

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

Parks & Nature Areas	
Beaver Creek Wetlands Reserve	Constitution Park
Caesar Creek State Park	Creekside Reserve
Caesar Ford Park	Fairgrounds Recreation Center
Cemex Reserve	Frank Seaman Park
Clifton George State Nature Preserve	Glenn Thompson Reserve
Clifton Reserve & Lodge	Hebble Creek Reserve
Hobson Freedom Park	Narrows Reserve
Huffman Metropark	Old Town Reserve
Indian Mound Reserve	Pearl's Fen
Jacoby Road Canoe Launch	Phillips Park
James Ranch Park	Pierce Park
John Bryan State Park	Russ Nature Reserve
Karohl Park	Sara Lee Arnovitz Nature Preserve
Kinsey Road Mound	Spring Lakes Park
Koogler Wetland Prairie Reserve	Twin Towers Park
McCalmont Park	Zimmerman Prairie State Natural Area
Mill Bridge Launch	

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

Table 1.3.2: Greene County Streams and Water Bodies

Water Bodies	
Bartley Pond	Jacoby Branch
Bass Lake	Little Beaver Creek
Bear Branch	Little Miami River

Water Bodies	
Beaver Creek	Love Run
Blue Hole	Ludlow Creek
Bullskin Run	Little Sugar Creek
Captain Nathan Lammes Creek	Massies Creek
Cascade Branch	Medway Lake
Cedarville Reservoir	Mud Run
Clark Run	North Branch Caesar Creek
Conner Branch	North Fork Massies Creek
Flacks Pond	Oldtown Creek
Glady Run	Painters Run
Greene Co. Fish and Game Assn. Reservoir	Shawnee Creek
Grog Run	Shawnee Lake
Hebble Creek	Shawnee Run
Huffman Reservoir	South Branch Caesar Creek
South Form Massies Creek	Twist Run
Starrett Lackey Ditch	Yellow Springs Creek
Sugar Creek	

2| History & Demographics

2.1 History

Greene County is a rural county in southwestern Ohio. The County has a total area of 416.5 square miles, of which 414 square miles are land, and 2.5 square miles are water. Greene County is the 18th largest county in Ohio. The County was established on May 1, 1803, and named after General Nathanael Greene, an officer from the Revolutionary War.

Greene County has 47 properties listed on the National Register of Historic Places, with the first property being entered in 1971. The Ohio SP Huffman Field, now Huffman Prairie Flying Field, (**Figure 2.1.1**) is an 84-acre meadow on which the Wright Brothers erected a hanger and developed the world's first practical airplane between 1904 and 1905. The Wright Brothers made more than 100 flights during this time, experimenting with the airplane. In 1909, a training school hangar was built on the property. This training school was utilized by World War I Army pilots and the first cargo shipment was made from the Huffman Filed to Columbus in 1910.

Figure 2.1.1: Huffman Prairie Flying Field

Source: National Register of Historic Places (Left) and Craig Baker (Right)

2.2 Communication Outlets

Greene 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	Greene County: https://www.greenecountyohio.gov/ Greene County EMA: https://www.greenecountyohio.gov/191/Emergency-Management-Agency Greene County Public Health: https://www.gcph.info/ Greene County Sherriff's Office: https://www.greenecountyohio.gov/486/Sheriff The American Red Cross of Miami Valley Chapter: https://www.redcross.org/local/ohio/
Social media	Greene County: https://www.facebook.com/p/Greene-County-Ohio-Government-100064343033295/ Greene County Public Health: https://www.facebook.com/GreeneCoPH/ Greene County Sheriff: https://www.facebook.com/OH29SO/
News/Newspaper	Dayton Daily News: https://www.daytondailynews.com/community/greene-county/ The Xenia Gazette: https://www.xeniagazette.com/ WHIO TV: https://www.whio.com/news/greene-county/uznv68xw97hqWp6s0CzjKM/

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 Greene 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, Greene County's population increased by 6,958 people (4.31 percent) between 2010 and 2023. For comparison, the U.S. population grew 7.66 percent and Ohio's population grew 2.11 percent during that period. Nine townships – Bath, Beavercreek, Caesarscreek, Cedarville, Miami, New Jasper, Silvercreek, Sugarcreek, and Xenia Townships experienced population growth. Of the townships experiencing population decline, Jefferson Township experienced the greatest population decline with a decrease of 92 people (-7.34 percent).

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

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

County/Township	Total Population 2010 Census	Total Population 2023 Estimate	2010-2023	
			Population Change	Percent Change
Greene County	161,573	168,531	6,958	4.31%
Bath Township	39,392	39,493	101	0.26%
Beavercreek Township	52,156	56,277	4,121	7.90%
Caesarscreek Township	1,137	1,160	23	2.02%
Cedarville Township	5,500	5,883	383	6.96%
Jefferson Township	1,254	1,162	-92	-7.34%
Miami Township	4,790	4,949	159	3.32%
New Jasper Township	2,568	2,639	71	2.76%
Ross Township	750	745	-5	-0.67%
Silvercreek Township	3,738	3,753	15	0.40%
Spring Valley Township	2,581	2,492	-89	-3.45%
Sugarcreek Township	8,041	9,562	1,521	18.92%
Xenia Township	6,537	6,722	185	2.83%

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) Greene County has a calculated Social Vulnerability Index of 0.18 (on scale of 0 to 1) on a state level, which is considered a low 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 Greene County and Ohio at both the state and nation levels.

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

1. **Socioeconomic Status**: this theme covers socioeconomic status, such as households with income below the 150-percentile poverty level, employment status, housing cost burden, high school diploma status, and if the household has health insurance.

2. **Housing Type and Transportation**: this theme covers multi-unit structures, mobile homes, crowding within households, households without a vehicle, and group quarters.

3. **Race and Ethnic Minority Status**: this theme covers the percentage of Hispanic or Latino (of any race); Black and African American (not Hispanic or Latino); American Indian and Alaska Native (not Hispanic or Latino); Native Hawaiian and Other Pacific Islander (not Hispanic or Latino); Two or More Races (not Hispanic or Latino); Other Races (not Hispanic or Latino).

4. **Household Characteristics**: this theme covers the elderly population (65 and older), children under 17 years of age, civilians with a disability, single-parent households, and the household's English language proficiency.

Table 2.3.2 Social Vulnerability Score per Theme for Greene County and Ohio

Theme	Greene County (Statewide)	Ohio (Statewide)	Greene County (Nationwide)	Ohio (Nationwide)
Socioeconomic Status	0.24	0.50	0.17	0.37
Housing Type and Transportation	0.37	0.50	0.35	0.42
Race and Ethnic Minority Status	0.86	0.50	0.49	0.28
Household Characteristics	0.02	0.50	0.08	0.40

2.4   Community Profiles

Greene County

Greene County is located in southwestern Ohio, and it is part of the Dayton-Springfield-Kettering combined statistical area. As of the 2023 5-Year ACS Estimates (census), the population was 168,531 making it the 18th most populated county in Ohio. The City of Xenia serves as the County seat and the City of Beavercreek is the largest city.

Tables 2.4.1 to 2.4.6 summarize Greene County's population, housing statistics, and income statistics. There are 67,478 households of which 25.3 percent have at least one member under 18 years of age, and 31.5 percent have members 65 years and over. The largest percentage of households (18.2 percent) had an income between $100,000 to $149,999; approximately 4.1 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the Greene County was the White (non-Hispanic) group, which makes up 81.7 percent of the population. Black or African American is the second largest race (5.8 percent). Approximately 1.4 percent of the city's population speak Spanish at home. In addition, 2.1 percent speak another Indo-European language, 1.5 percent speak an Asian and Pacific Island language, and 0.62 percent speak another language.

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

Age	Number	Percentage
Total Population	168,531	100%
Under 18 Years	34,894	20.70%
18 to 24 Years	19,199	11.39%
25 to 34 Years	21,981	13.04%
35 to 44 Years	20,789	12.34%
45 to 54 Years	18,620	11.05%
55 to 64 Years	22,383	13.28%
65 Years and Over	30,665	18.20%

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

Housing Statistics	Number	Percentage
Total Housing Units	71,925	100%
Occupied Housing Units	67,478	93.82%
Housing Units - Mobile Homes	550	0.82%
Vacant Housing Units	4,447	6.18%

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

Household Statistics	Number	Percentage
Total Households	67,478	-
Average Household Size	2.39	-
Households with People Under 18 Years	17,095	25.33%
Households with People 65+ Years	21,256	31.50%
Householder Living Alone 65+ Years	7,490	11.10%
No Vehicle Available	3,022	4.48%
With a Broadband Internet Subscription	4,702	6.97%

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

Race and Ethnicity	Number	Percentage
Total Population	168,531	100%
White	137,754	81.74%
Black or African American	9,719	5.77%
American Indian and Alaska Native	126	0.07%
Asian	4,782	2.84%
Native Hawaiian and other Pacific Islander	118	0.07%
Some Other Race	1,140	0.68%
Two or More Races	9,474	5.62%
Hispanic or Latino (of any race)	5,418	3.21%

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

Language Statistics	Number	Percentage
Total Population (over 5 years old)	159,574	100%
English only	150,635	94.40%
Spanish	2,286	1.43%
Other Indo-European languages	3,283	2.06%
Asian and Pacific Island languages	2,388	1.50%
Other languages	982	0.62%

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

Household Income Statistics	Number of Households
Less than $10,000	4.10%
$10,000 to $14,999	2.60%
$15,000 to $24,999	6.00%
$25,000 to $34,999	6.20%
$35,000 to $49,999	10.70%
$50,000 to $74,999	14.30%
$75,000 to $99,999	13.40%
$100,000 to $149,999	18.20%
$150,000 to $199,999	11.70%
$200,000 or more	12.80%
Median Household Income	$85,218
Mean Household Income	$108,932

City of Beavercreek

Tables 2.4.7 to 2.4.12 summarize the City of Beavercreek's population, housing statistics, and income statistics. There are 19,097 households of which 26.3 percent have at least one member under 18 years of age, and 32.8 percent have members 65 years and over. The largest percentage of households (22.9 percent) had an income between $100,000 to $149,999; approximately 2.7 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the City of Beavercreek was the White (non-Hispanic) group, which makes up 81.6 percent of the population. Two or More Races is the second largest race (5.7 percent). Approximately 1.7 percent of the city's population speak Spanish at home. In addition, 2.7 percent speak another Indo-European language, 2.0 percent speak an Asian and Pacific Island language, and 0.59 percent speak another language.

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

Age	Number	Percentage
Total Population	46,787	100%
Under 18 Years	9,867	21.09%
18 to 24 Years	3,550	7.59%
25 to 34 Years	5,981	12.78%
35 to 44 Years	6,400	13.68%
45 to 54 Years	5,339	11.41%
55 to 64 Years	6,010	12.85%
65 Years and Over	9,640	20.60%

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

Housing Statistics	Number	Percentage
Total Housing Units	20,157	100%
Occupied Housing Units	19,097	94.74%
Housing Units - Mobile Homes	62	0.32%
Vacant Housing Units	1,060	5.26%

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

Household Statistics	Number	Percentage
Total Households	19,097	-
Average Household Size	2.42	-
Households with People Under 18 Years	5,019	26.28%
Households with People 65+ Years	6,264	32.80%
Householder Living Alone 65+ Years	1,910	10.00%
No Vehicle Available	458	2.40%
With a Broadband Internet Subscription	842	4.41%

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

Race and Ethnicity	Number	Percentage
Total Population	46,787	100%
White	38,166	81.57%
Black or African American	1,324	2.83%
American Indian and Alaska Native	24	0.05%
Asian	2,212	4.73%
Native Hawaiian and other Pacific Islander	50	0.11%
Some Other Race	337	0.72%
Two or More Races	2,681	5.73%
Hispanic or Latino (of any race)	1,993	4.26%

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

Language Statistics	Number	Percentage
Total Population (over 5 years old)	44,498	100%
English only	41,422	93.09%
Spanish	752	1.69%
Other Indo-European languages	1,183	2.66%
Asian and Pacific Island languages	878	1.97%
Other languages	263	0.59%

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

Household Income Statistics	Percentage of Households
Less than $10,000	2.70%
$10,000 to $14,999	1.10%
$15,000 to $24,999	3.60%
$25,000 to $34,999	3.40%
$35,000 to $49,999	5.60%
$50,000 to $74,999	13.90%
$75,000 to $99,999	13.70%
$100,000 to $149,999	22.90%
$150,000 to $199,999	15.50%
$200,000 or more	17.70%
Median Household Income	$110,064
Mean Household Income	$127,341

City of Bellbrook

Tables 2.4.13 to 2.4.18 summarize the City of Bellbrook's population, housing statistics, and income statistics. There are 3,018 households of which 29.3 percent have at least one member under 18 years of age, and 28.5 percent have members 65 years and over. The largest percentage of households (24.2 percent) had an income between $100,000 to $149,999; approximately 1.0 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the City of Bellbrook was the White (non-Hispanic) group, which makes up 91.6 percent of the population. Asian is the second largest race (3.2 percent). Approximately 0.67 percent of the city's population speak Spanish at home. In addition, 1.2 percent speak another Indo-European language and 3.0 percent speak an Asian and Pacific Island language.

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

Age	Number	Percentage
Total Population	7,344	100%
Under 18 Years	1,436	19.55%
18 to 24 Years	470	6.40%
25 to 34 Years	930	12.66%
35 to 44 Years	994	13.53%
45 to 54 Years	846	11.52%
55 to 64 Years	1,323	18.01%
65 Years and Over	1,345	18.31%

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

Housing Statistics	Number	Percentage
Total Housing Units	3,029	100%
Occupied Housing Units	3,018	99.64%
Housing Units - Mobile Homes	0	0.00%
Vacant Housing Units	11	0.36%

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

Household Statistics	Number	Percentage
Total Households	3,018	-
Average Household Size	2.43	-
Households with People Under 18 Years	884	29.29%
Households with People 65+ Years	860	28.50%
Householder Living Alone 65+ Years	232	7.70%
No Vehicle Available	64	2.12%
With a Broadband Internet Subscription	115	3.81%

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

Race and Ethnicity	Number	Percentage
Total Population	7,344	100%
White	6,729	91.63%
Black or African American	27	0.37%
American Indian and Alaska Native	0	0%
Asian	236	3.21%
Native Hawaiian and other Pacific Islander	0	0%
Some Other Race	50	0.68%
Two or More Races	162	2.21%
Hispanic or Latino (of any race)	140	1.91%

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

Language Statistics	Number	Percentage
Total Population (over 5 years old)	7,049	100%
English only	6,707	95.15%
Spanish	47	0.67%
Other Indo-European languages	82	1.16%
Asian and Pacific Island languages	213	3.02%
Other languages	0	0%

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

Household Income Statistics	Percentage of Households
Less than $10,000	1.00%
$10,000 to $14,999	1.70%
$15,000 to $24,999	2.50%
$25,000 to $34,999	3.20%
$35,000 to $49,999	10.40%
$50,000 to $74,999	12.70%
$75,000 to $99,999	17.40%
$100,000 to $149,999	24.20%
$150,000 to $199,999	16.00%
$200,000 or more	10.90%
Median Household Income	$101,455
Mean Household Income	$124,214

City of Fairborn

Tables 2.4.19 to 2.4.24 summarize the City of Fairborn's population, housing statistics, and income statistics. There are 15893 households of which 22.5 percent have at least one member under 18 years of age, and 26.3 percent have members 65 years and over. The largest percentage of households (17.3 percent) had an income between $35,000 to $49,999; approximately 5.3 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the City of Fairborn was the White (non-Hispanic) group, which makes up 77.5 percent of the population. Two or More Races is the second largest race (9.0 percent). Approximately 1.3 percent of the city's population speak Spanish at home. In addition, 2.4 percent speak another Indo-European language, 1.2 percent speak an Asian and Pacific Island language, and 1.2 percent speak another language.

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

Age	Number	Percentage
Total Population	34,506	100%
Under 18 Years	6,567	19.03%
18 to 24 Years	4,392	12.73%
25 to 34 Years	6,302	18.26%
35 to 44 Years	4,495	13.03%
45 to 54 Years	3,210	9.30%
55 to 64 Years	4,074	11.81%
65 Years and More	5,466	15.84%

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

Housing Statistics	Number	Percentage
Total Housing Units	17,007	100%
Occupied Housing Units	15,893	93.45%
Housing Units - Mobile Homes	216	1.36%
Vacant Housing Units	1,114	6.55%

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

Household Statistics	Number	Percentage
Total Households	15,893	-
Average Household Size	2.13	-
Households with People Under 18 Years	3,568	22.45%
Households with People 65+ Years	4,180	26.30%
Householder Living Alone 65+ Years	1,573	9.90%
No Vehicle Available	1,006	6.33%
With a Broadband Internet Subscription	1,846	11.62%

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

Race and Ethnicity	Number	Percentage
Total Population	34,506	100%
White	26,728	77.46%
Black or African American	3,007	8.71%
American Indian or Alaska Native	1	0.00%
Asian	514	1.49%
Native Hawaiian or Pacific Islander	0	0.00%
Some Other Race (One Race)	103	0.30%
Two or More Races	3,120	9.04%
Hispanic or Latino (of any race)	1,033	2.99%

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

Language Statistics	Number	Percentage
Total Population (over 5 years old)	32,293	100%
English only	30,351	93.99%
Spanish	413	1.28%
Other Indo-European languages	772	2.39%
Asian and Pacific Island languages	372	1.15%
Other languages	385	1.19%

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

Household Income Statistics	Percentage of Households
Less than $10,000	5.30%
$10,000 to $14,999	4.30%
$15,000 to $24,999	8.80%
$25,000 to $34,999	9.40%
$35,000 to $49,999	17.30%
$50,000 to $74,999	14.90%
$75,000 to $99,999	13.30%
$100,000 to $149,999	13.90%
$150,000 to $199,999	8.10%
$200,000 or more	4.70%
Median Household Income	$55,966
Mean Household Income	$77,626

City of Xenia

Tables 2.4.25 to 2.4.30 summarize the City of Xenia's population, housing statistics, and income statistics. There are 10691 households of which 24.2 percent have at least one member under 18 years of age, and 33.6 percent have members 65 years and over. The largest percentage of households (17.9 percent) had an income between $50,000 to $74,999; approximately 6.7 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the City of Xenia was the White (non-Hispanic) group, which makes up 80.5 percent of the population. Black or African American is the second largest race (7.6 percent). Approximately 1.9 percent of the city's population speak Spanish at home. In addition, 0.83 percent speak another Indo-European language, 0.73 percent speak an Asian and Pacific Island language, and 0.42 percent speak another language.

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

Age	Number	Percentage
Total Population	25,555	100%
Under 18 Years	5,629	22.03%
18 to 24 Years	1,913	7.49%
25 to 34 Years	3,921	15.34%
35 to 44 Years	2,722	10.65%
45 to 54 Years	2,921	11.43%
55 to 64 Years	3,209	12.56%
65 Years and More	5,240	20.50%

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

Housing Statistics	Number	Percentage
Total Housing Units	11,703	100%
Occupied Housing Units	10,691	91.35%
Housing Units - Mobile Homes	38	0.36%
Vacant Housing Units	1,012	8.65%

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

Household Statistics	Number	Percentage
Total Households	10,691	-
Average Household Size	2.32	-
Households with People Under 18 Years	2,591	24.24%
Households with People 65+ Years	3,592	33.60%
Householder Living Alone 65+ Years	1,689	15.80%
No Vehicle Available	903	8.45%
With a Broadband Internet Subscription	1,051	9.83%

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

Race and Ethnicity	Number	Percentage
Total Population	25,555	100%
White	20,575	80.51%
Black or African American	1,932	7.56%
American Indian or Alaska Native	79	0.31%
Asian	227	0.89%
Native Hawaiian or Pacific Islander	53	0.21%
Some Other Race (One Race)	311	1.22%
Two or More Races	1,597	6.25%
Hispanic or Latino (of any race)	781	3.06%

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

Language Statistics	Number	Percentage
Total Population (over 5 years old)	24,087	100%
English only	23,144	96.09%
Spanish	467	1.94%
Other Indo-European languages	199	0.83%
Asian and Pacific Island languages	175	0.73%
Other languages	102	0.42%

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

Household Income Statistics	Percentage of Households
Less than $10,000	6.70%
$10,000 to $14,999	4.70%
$15,000 to $24,999	10.80%
$25,000 to $34,999	10.20%
$35,000 to $49,999	13.40%
$50,000 to $74,999	17.90%
$75,000 to $99,999	14.20%
$100,000 to $149,999	12.80%
$150,000 to $199,999	6.60%
$200,000 or more	2.70%
Median Household Income	$54,616
Mean Household Income	$70,521

Village of Bowersville

Tables 2.4.31 to 2.4.36 summarize the Village of Bowersville's population, housing statistics, and income statistics. There are 89 households of which 29.2 percent have at least one member under 18 years of age, and 21.3 percent have members 65 years and over. The largest percentage of households (23.6 percent) had an income between $35,000 to $49,999; approximately 1.1 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the Village of Bowersville was the White (non-Hispanic) group, which makes up 99.6 percent of the population. Two or More Races is the second largest race (.42 percent). Approximately 0.88 percent of the city's population speak an Asian and Pacific Island language at home.

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

Age	Number	Percentage
Total Population	237	100%
Under 18 Years	63	26.58%
18 to 24 Years	21	8.86%
25 to 34 Years	8	3.38%
35 to 44 Years	56	23.63%
45 to 54 Years	25	10.55%
55 to 64 Years	35	14.77%
65 Years and More	29	12.24%

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

Housing Statistics	Number	Percentage
Total Housing Units	101	100%
Occupied Housing Units	89	88.12%
Housing Units - Mobile Homes	5	5.62%
Vacant Housing Units	12	11.88%

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

Household Statistics	Number	Percentage
Total Households	89	-
Average Household Size	2.66	-
Households with People Under 18 Years	26	29.21%
Households with People 65+ Years	19	21.30%
Householder Living Alone 65+ Years	6	6.70%
No Vehicle Available	0	0%
With a Broadband Internet Subscription	2	2.25%

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

Race and Ethnicity	Number	Percentage
Total Population	237	100%
White	236	99.58%
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	1	0.42%
Hispanic or Latino (of any race)	0	0%

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

Language Statistics	Number	Percentage
Total Population (over 5 years old)	228	100%
English only	226	99.12%
Spanish	0	0%
Other Indo-European languages	0	0%
Asian and Pacific Island languages	2	0.88%
Other languages	0	0%

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

Household Income Statistics	Percentage of Households
Less than $10,000	1.10%
$10,000 to $14,999	2.20%
$15,000 to $24,999	7.90%
$25,000 to $34,999	3.40%
$35,000 to $49,999	23.60%
$50,000 to $74,999	18.00%
$75,000 to $99,999	16.90%
$100,000 to $149,999	18.00%
$150,000 to $199,999	9.00%
$200,000 or more	0.00%
Median Household Income	$54,432
Mean Household Income	$76,522

Village of Cedarville

Tables 2.4.37 to 2.4.42 summarize the Village of Cedarville's population, housing statistics, and income statistics. There are 579 households of which 22.3 percent have at least one member under 18 years of age, and 27.5 percent have members 65 years and over. The largest percentage of households (22.3 percent) had an income between $35,000 to $49,999; approximately 7.6 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the Village of Cedarville was the White (non-Hispanic) group, which makes up 74.3 percent of the population. Black or African American is the second largest race (15.6 percent). Approximately 1.5 percent of the city's population speak Spanish at home. In addition, 2.4 percent speak another Indo-European language, 2.2 percent speak an Asian and Pacific Island language, and 0.92 percent speak another language.

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

Age	Number	Percentage
Total Population	3,759	100%
Under 18 Years	292	7.77%
18 to 24 Years	2,547	67.76%
25 to 34 Years	230	6.12%
35 to 44 Years	145	3.86%
45 to 54 Years	180	4.79%
55 to 64 Years	164	4.36%
65 Years and More	201	5.35%

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

Housing Statistics	Number	Percentage
Total Housing Units	639	100%
Occupied Housing Units	579	90.61%
Housing Units - Mobile Homes	0	0%
Vacant Housing Units	60	9.39%

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

Household Statistics	Number	Percentage
Total Households	579	-
Average Household Size	2.47	-
Households with People Under 18 Years	129	22.28%
Households with People 65+ Years	159	27.50%
Householder Living Alone 65+ Years	70	12.10%
No Vehicle Available	28	4.84%
With a Broadband Internet Subscription	69	11.92%

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

Race and Ethnicity	Number	Percentage
Total Population	3,759	100%
White	2,793	74.30%
Black or African American	586	15.59%
American Indian or Alaska Native	0	0.00%
Asian	117	3.11%
Native Hawaiian or Pacific Islander	15	0.40%
Some Other Race (One Race)	0	0%
Two or More Races	160	4.26%
Hispanic or Latino (of any race)	88	2.34%

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

Language Statistics	Number	Percentage
Total Population (over 5 years old)	3,694	100%
English only	3,431	92.88%
Spanish	57	1.54%
Other Indo-European languages	89	2.41%
Asian and Pacific Island languages	83	2.25%
Other languages	34	0.92%

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

Household Income Statistics	Percentage of Households
Less than $10,000	7.60%
$10,000 to $14,999	4.80%
$15,000 to $24,999	6.40%
$25,000 to $34,999	5.90%
$35,000 to $49,999	22.30%
$50,000 to $74,999	17.40%
$75,000 to $99,999	14.50%
$100,000 to $149,999	11.90%
$150,000 to $199,999	6.20%
$200,000 or more	2.90%
Median Household Income	$53,304
Mean Household Income	$68,721

Village of Clifton

Tables 2.4.43 to 2.4.48 summarize the Village of Clifton's population, housing statistics, and income statistics. There are 59 households of which 8.5 percent have at least one member under 18 years of age, and 35.6 percent have members 65 years and over. The largest percentage of households (33.9 percent) had an income between $50,000 to $74,999. In 2023, the largest racial group in the Village of Clifton was the White (non-Hispanic) group, which makes up 83.8 percent of the population. Two or More Races is the second largest race (8.8 percent). Approximately 9.6 percent of the city's population speak Spanish at home.

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

Age	Number	Percentage
Total Population	136	100%
Under 18 Years	6	4.41%
18 to 24 Years	13	9.56%
25 to 34 Years	33	24.26%
35 to 44 Years	20	14.71%
45 to 54 Years	17	12.50%
55 to 64 Years	24	17.65%
65 Years and More	23	16.91%

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

Housing Statistics	Number	Percentage
Total Housing Units	78	100%
Occupied Housing Units	59	75.64%
Housing Units - Mobile Homes	0	0%
Vacant Housing Units	19	24.36%

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

Household Statistics	Number	Percentage
Total Households	59	-
Average Household Size	2.31	-
Households with People Under 18 Years	5	8.47%
Households with People 65+ Years	21	35.60%
Householder Living Alone 65+ Years	12	20.30%
No Vehicle Available	0	0%
With a Broadband Internet Subscription	0	0%

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

Race and Ethnicity	Number	Percentage
Total Population	136	100%
White	114	83.82%
Black or African American	2	1.47%
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	12	8.82%
Hispanic or Latino (of any race)	8	5.88%

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

Language Statistics	Number	Percentage
Total Population (over 5 years old)	136	100%
English only	123	90.44%
Spanish	13	9.56%
Other Indo-European languages	0	0%
Asian and Pacific Island languages	0	0%
Other languages	0	0%

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

Household Income Statistics	Percentage of Households
Less than $10,000	0.00%
$10,000 to $14,999	0.00%
$15,000 to $24,999	0.00%
$25,000 to $34,999	1.70%
$35,000 to $49,999	11.90%
$50,000 to $74,999	33.90%
$75,000 to $99,999	25.40%
$100,000 to $149,999	13.60%
$150,000 to $199,999	6.80%
$200,000 or more	6.80%
Median Household Income	$79,375
Mean Household Income	$93,439

Village of Jamestown

Tables 2.4.49 to 2.4.54 summarize the Village of Jamestown's population, housing statistics, and income statistics. There are 900 households of which 29.8 percent have at least one member under 18 years of age, and 35.8 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 3.3 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the Village of Jamestown was the White (non-Hispanic) group, which makes up 97.8 percent of the population. Two or More Races is the second largest race (1.4 percent). Approximately 0.96 percent of the city's population speak Spanish and 0.29 percent speak another Indo-European language at home.

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

Age	Number	Percentage
Total Population	2,241	100%
Under 18 Years	565	25.21%
18 to 24 Years	187	8.34%
25 to 34 Years	348	15.53%
35 to 44 Years	172	7.68%
45 to 54 Years	272	12.14%
55 to 64 Years	296	13.21%
65 Years and More	401	17.89%

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

Housing Statistics	Number	Percentage
Total Housing Units	985	100%
Occupied Housing Units	900	91.37%
Housing Units - Mobile Homes	28	3.11%
Vacant Housing Units	85	8.63%

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

Household Statistics	Number	Percentage
Total Households	900	-
Average Household Size	2.45	-
Households with People Under 18 Years	268	29.78%
Households with People 65+ Years	322	35.80%
Householder Living Alone 65+ Years	107	11.90%
No Vehicle Available	22	2.44%
With a Broadband Internet Subscription	80	8.89%

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

Race and Ethnicity	Number	Percentage
Total Population	2,241	100%
White	2,191	97.77%
Black or African American	10	0.45%
American Indian or Alaska Native	2	0.09%
Asian	0	0%
Native Hawaiian or Pacific Islander	0	0%
Some Other Race (One Race)	0	0%
Two or More Races	32	1.43%
Hispanic or Latino (of any race)	6	0.27%

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

Language Statistics	Number	Percentage
Total Population (over 5 years old)	2,076	100%
English only	2,050	98.75%
Spanish	20	0.96%
Other Indo-European languages	6	0.29%
Asian and Pacific Island languages	0	0%
Other languages	0	0%

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

Household Income Statistics	Percentage of Households
Less than $10,000	3.30%
$10,000 to $14,999	4.20%
$15,000 to $24,999	10.10%
$25,000 to $34,999	11.00%
$35,000 to $49,999	15.40%
$50,000 to $74,999	18.30%
$75,000 to $99,999	14.00%
$100,000 to $149,999	17.60%
$150,000 to $199,999	3.70%
$200,000 or more	2.30%
Median Household Income	$59,028
Mean Household Income	$73,017

Village of Spring Valley

Tables 2.4.55 to 2.4.60 summarize the Village of Spring Valley's population, housing statistics, and income statistics. There are 207 households of which 29.0 percent have at least one member under 18 years of age, and 34.3 percent have members 65 years and over. The largest percentage of households (21.3 percent) had an income between $100,000 to $149,999; approximately 8.7 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the Village of Spring Valley was the White (non-Hispanic) group, which makes up 69.2 percent of the population. Some Other Race is the second largest race (28.6 percent). Approximately 0.90 percent of the city's population speak Spanish at home.

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

Age	Number	Percentage
Total Population	598	100%
Under 18 Years	146	24.41%
18 to 24 Years	5	0.84%
25 to 34 Years	79	13.21%
35 to 44 Years	25	4.18%
45 to 54 Years	84	14.05%
55 to 64 Years	74	12.37%
65 Years and More	185	30.94%

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

Housing Statistics	Number	Percentage
Total Housing Units	224	100%
Occupied Housing Units	207	92.41%
Housing Units - Mobile Homes	2	0.97%
Vacant Housing Units	17	7.59%

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

Household Statistics	Number	Percentage
Total Households	207	-
Average Household Size	2.89	-
Households with People Under 18 Years	60	28.99%
Households with People 65+ Years	71	34.30%
Householder Living Alone 65+ Years	29	14.00%
No Vehicle Available	7	3.38%
With a Broadband Internet Subscription	24	11.59%

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

Race and Ethnicity	Number	Percentage
Total Population	598	100%
White	414	69.23%
Black or African American	0	0.00%
American Indian or Alaska Native	6	1.00%
Asian	0	0%
Native Hawaiian or Pacific Islander	0	0%
Some Other Race (One Race)	171	28.60%
Two or More Races	6	1.00%
Hispanic or Latino (of any race)	1	0.17%

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

Language Statistics	Number	Percentage
Total Population (over 5 years old)	557	100%
English only	552	99.10%
Spanish	5	0.90%
Other Indo-European languages	0	0%
Asian and Pacific Island languages	0	0%
Other languages	0	0%

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

Household Income Statistics	Percentage of Households
Less than $10,000	8.70%
$10,000 to $14,999	3.90%
$15,000 to $24,999	6.30%
$25,000 to $34,999	4.80%
$35,000 to $49,999	13.50%
$50,000 to $74,999	19.30%
$75,000 to $99,999	17.90%
$100,000 to $149,999	21.30%
$150,000 to $199,999	3.40%
$200,000 or more	1.00%
Median Household Income	$66,696
Mean Household Income	$72,113

Village of Yellow Springs

Tables 2.4.61 to 2.4.66 summarize the Village of Yellow Springs's population, housing statistics, and income statistics. There are 1,871 households of which 15.3 percent have at least one member under 18 years of age, and 49.8 percent have members 65 years and over. The largest percentage of households (18.8 percent) had an income between $100,000 to $149,999; approximately 5.0 percent of households had an annual income of less than $10,000. In 2023, the largest racial group in the Village of Yellow Springs was the White (non-Hispanic) group, which makes up 82.6 percent of the population. Black or African American is the second largest race (9.7 percent). Approximately 1.4 percent of the city's population speak Spanish and 0.54 percent speak another Indo-European language at home.

Table 2.4.61: Village of Yellow Springs Population by Age 2023 ACS 5-Year Estimates

Age	Number	Percentage
Total Population	3,655	100%
Under 18 Years	529	14.47%
18 to 24 Years	278	7.61%
25 to 34 Years	292	7.99%
35 to 44 Years	320	8.76%
45 to 54 Years	516	14.12%
55 to 64 Years	528	14.45%
65 Years and More	1,192	32.61%

Table 2.4.62: Village of Yellow Springs Housing Statistics 2023 ACS 5-Year Estimates

Housing Statistics	Number	Percentage
Total Housing Units	2,016	100%
Occupied Housing Units	1,871	92.81%
Housing Units - Mobile Homes	0	0.00%
Vacant Housing Units	145	7.19%

Table 2.4.63: Village of Yellow Springs Household Statistics 2023 ACS 5-Year Estimates

Household Statistics	Number	Percentage
Total Households	1,871	-
Average Household Size	1.89	-
Households with People Under 18 Years	286	15.29%
Households with People 65+ Years	932	49.80%
Householder Living Alone 65+ Years	548	29.30%
No Vehicle Available	122	6.52%
With a Broadband Internet Subscription	98	5.24%

Table 2.4.64: Village of Yellow Springs Race and Ethnicity Statistics 2023 ACS 5-Year Estimates

Race and Ethnicity	Number	Percentage
Total Population	3,655	100%
White	3,019	82.60%
Black or African American	353	9.66%
American Indian or Alaska Native	0	0%
Asian	0	0%
Native Hawaiian or Pacific Islander	0	0%
Some Other Race (One Race)	3	0.08%
Two or More Races	168	4.60%
Hispanic or Latino (of any race)	112	3.06%

Table 2.4.65: Village of Yellow Springs Language Spoken at Home Statistics 2023 ACS 5-Year Estimates

Language Statistics	Number	Percentage
Total Population (over 5 years old)	3,502	100%
English only	3,435	98.09%
Spanish	48	1.37%
Other Indo-European languages	19	0.54%
Asian and Pacific Island languages	0	0%
Other languages	0	0%

Table 2.4.66: Village of Yellow Springs Income Statistics 2023 ACS 5-Year Estimates

Household Income Statistics	Percentage of Households
Less than $10,000	5.00%
$10,000 to $14,999	1.10%
$15,000 to $24,999	10.80%
$25,000 to $34,999	7.70%
$35,000 to $49,999	10.20%
$50,000 to $74,999	17.40%
$75,000 to $99,999	10.40%
$100,000 to $149,999	18.80%
$150,000 to $199,999	9.10%
$200,000 or more	9.50%
Median Household Income	$67,477
Mean Household Income	$92,446

3 | Planning Process

3.1 Methodology

The Planning Process chapter describes the steps involved in the development of the 2025 Greene 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

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

- 2016 Floodplain Regulations
- Greene County Zoning Regulations
- Greene County Master Trail Plan
- 2020 Greene County Natural Hazards Mitigation Plan
- Greene County Farmland Preservation Plan
- Perspectives 2040 The Greene County Future Land Use Plan
- 2024 State of Ohio Hazard Mitigation Plan (SOHMP)

3.3 Greene County Authority to Adopt Plan

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

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

Community	Planning Commission	Comprehensive Plan	Floodplain Regulation	Building Codes*	Zoning Codes	Capital Budget	Public Works Budget
Greene County	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City of Beavercreek	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City of Bellbrook	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City of Fairborn	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Community	Planning Commission	Comprehensive Plan	Floodplain Regulation	Building Codes*	Zoning Codes	Capital Budget	Public Works Budget
City of Xenia	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Village of Bowersville	No	No	Yes	Yes	Yes	No	Limited in-kind wages only
Village of Cedarville	No	No	Yes	Yes	Yes	No	Limited in-kind wages only
Village of Clifton	Yes	No	Yes	Yes	Yes	No	Limited in-kind wages only
Village of Jamestown	No	Yes	Yes	Yes	Yes	No	Limited in-kind wages only
Village of Spring Valley	Yes	No	Yes	Yes	Yes	No	Limited in-kind wages only
Village of Yellow Springs	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.

Greene County
- Greene County Auditor
- Greene County Building Regulations
- Greene County Commissioners
- Greene County Dept. of Development
- Greene County Educational Services Center
- Greene County Engineer
- Greene County EMA

- Greene County Job and Family Services
- Greene County Parks and Trails
- Greene County Public Health
- Greene County Regional Planning
- Greene County Risk Management

- Greene County Sanitary Engineering
- Greene County Services Department
- Greene County Sheriff's Office
- Greene County Soil & Water Conservation

City and Village Members

- City of Beavercreek
- City of Bellbrook
- City of Fairborn
- City of Xenia
- Village of Bowersville

- Village of Cedarville
- Village of Clifton
- Village of Jamestown
- Village of Spring Valley
- Village of Yellow Springs

Township Members

- Bath Township
- Beavercreek Township
- Caesarscreek Township
- Cedarville Township
- Jefferson Township
- Miami Township

- New Jasper Township
- Ross Township
- Silvercreek Township
- Spring Valley Township
- Sugarcreek Township
- Xenia Township

Local Schools and Universities

- Beavercreek City School District
- Bellbrook Sugarcreek Schools
- Cedar Cliff Local Schools
- Cedarville University
- Central State University
- Fairborn City School District

- Greeneview School District
- Wilberforce University
- Wright State University
- Xenia City School District
- Yellow Springs School District

Other Organizations

- Beavercreek CERT
- Butler County EMA
- Champaign County EMA
- Clark County EMA
- Clinton County EMA
- Darke County EMA
- Fayette County EMA
- FISH Food Pantry
- Greater Dayton Area Hospital Association
- Kettering Health Network
- Madison County EMA

- Miami Conservancy District
- Miami County EMA
- Montgomery County EMA
- Morris & Bean Company
- Ohio EMA
- OSU Extension Office
- Preble County EMA
- Premier Health
- Shelby County EMA
- The American Red Cross
- Warren County EMA
- Wright Patterson Air Force Base

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								
Greene County	Brandon Huddleson – Administrator Jason Foster – Development Director DeAndra Navratil – Regional Planning Director Lisa Hale – Director of Risk Management Dana Doll – Environmental Services Manager Al Kuzma – Director/Chief Building Official	√	√	√	√	√	√	
Greene County EMA	Ethan Raby – Director		√		√	√	√	√
Greene County Engineering	Eric Miller – Highway Superintendent	√	√					
Greene County Sanitary Engineering	Mark Chandler – Director					√		
Greene County Highway Department	Jerrod Pickens – Equipment Superintendent	√	√					
Greene County Job and Family Services	Beth Rubin – Director	√	√	√		√	√	
Regional Planning and Coordinating Commission of Greene County (RPCC)	Michelle Hudnell – Associate Planner	√	√	√	√		√	
Greene County Public Health	Kim Caudill – Emergency Preparedness Coordinator	√				√	√	
Greene County Sheriff	Dan Funk – Captain Brad Balonier – Major	√		√	√	√	√	
Jurisdictions								
City of Beavercreek	Don Adams – Mayor Joey Shope – Assistant Director Nick Amato – Captain	√	√	√	√	√	√	√
City of Bellbrook	Anthony Bizzarro – Fire Chief Steve Carmin – Police Chief	√	√	√	√		√	√

Community/ Organization	Stakeholders	Surveys Completed				Meetings Attended		
		Goals	Hazard Priorities	Previous Mitigation Actions	New Mitigation Actions	1	2	Other
City of Fairborn	Michael Gebhart – City Manager Tana Stanton – Town Councilwoman James Hern – Captain	√	√	√	√	√	√	√
City of Xenia	Brent Merriman – City Manager Jeffrey Bruggeman – Captain Eric Henry – Asst. City Manager/ Dev. Services Director	√	√	√	√	√	√	√
Village of Bowersville	Gary Ellison – Mayor	√	√	√	√			√
Village of Cedarville	James Kannedy – Administrator Brady Smith – Chief	√	√	√	√			√
Village of Clifton	Sue Chasnov - Treasurer	√	√	√	√			√
Village of Jamestown	Brian Noah – Chief	√	√	√	√	√	√	√
Village of Spring Valley	Rusty Cross – Fire Chief Brett Bonecutter – Administrator	√	√	√	√			√
Village of Yellow Springs	Brian Housh – Council Member Johnie Burns - Village Manager	√	√	√	√	√	√	√
Other								
Bath Township	Michelle Clements – Trustee	√	√	√		√		
Beavercreek Township	Nathan Hiester – Division Chief Kate Hone – Auxiliary Leader	√	√	√	√		√	√
Cedarville Township	Kyle Miller – Fire Chief	√	√	√	√	√		
New Jasper Township	Mike Horsley – Trustee Dough McDaniel – Fire Chief						√	
Spring Valley Township	Rusty Cross – Fire Chief			√	√		√	√
Sugarcreek Township	Marvin Moeller – Trustee					√	√	
Xenia Township	Scott Miller – Trustee Alan Stock – Administrator		√			√	√	
Miami Conservancy District	Emma Allington – Engineering Associate					√		

Community/ Organization	Stakeholders	Surveys Completed				Meetings Attended		
		Goals	Hazard Priorities	Previous Mitigation Actions	New Mitigation Actions	1	2	Other
Bellbrook Sugarcreek Schools	Jeff Eckley – Manager of Business Paul Otten – Superintendent	√	√			√		
Cedar Cliff Local Schools	Brian Masser - Superintendent	√	√			√		
Wright State University	David Cox – Emergency Manager					√		

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 February 12, 2025, inviting them to participate in the 2025 Greene 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/Greene-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 Greene County Plan update
- The role of the Core Planning Committee in the update process
- Contact information for both Greene County EMA and Burton Planning Services
- Dates, times, and Microsoft Teams links of upcoming Core Planning and Public Meetings

Core Planning Meeting and Public Meeting 1

The first meetings were open to both the core planning members and the public. They were held both virtually and in-person on Tuesday, March 11, 2025, at 2:00 P.M and at 5:00 P.M at the Greene County Media Room. 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 for attendance. The introduction also informed attendees that they could ask questions using the chat feature, or by un-muting themselves and asking their questions at any time throughout the meeting.

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

A total of 39 people attended the afternoon meeting, including the Greene County EMA Director. Representatives from the Greene County Engineer, Greene County Public Health, Greene County Sheriff's Office, Greene County Sanitary Engineering, Greene County Regional Planning, Greene County Development, Greene County Environmental Services, City of Beavercreek, City of Fairborn, City of Xenia, Village of Jamestown, Village of Yellow Springs, Cedarville Township, and Xenia Township attended. In addition, representatives of other organizations such as Cedar Cliff Local Schools, Wright State University, Miami Conservancy District, Bellbrook Sugarcreek School District, Greater Dayton Area Hospital Association, Ohio EMA, and Madison County EMA attended the afternoon meeting. No members of the public attended the meeting.

A total of seven people attended the evening meeting, including the Greene County EMA Director. Representatives from Greene County Jobs and Family Services, City of Fairborn, City of Xenia, Bath Township, and Sugarcreek Township also attended the evening meeting. No members of the public attended the meeting.

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

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

Hazard Priority Survey

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

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

Previous Mitigation Actions Status Survey

The purpose of the Previous Mitigation Actions Status Survey was to have attendees review the mitigation actions that were included in the 2020 Hazard Mitigation Plan, reflect on the status of each action, and determine if that action should be included in the 2025 Hazard Mitigation Plan.

Core Planning Meeting and Public Meeting 2

The second meetings were open to both the core planning members and the public. They were held both virtually and in-person on Wednesday, April 16, 2025, at 2:00 P.M and at 5:00 P.M at the Soin Medical Center. 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 for attendance. The introduction also informed attendees that they could ask questions using the chat feature, or by unmuting themselves and asking their questions at any time throughout the meeting.

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

A total of 30 people attended the afternoon meeting, including the Greene County EMA Director, as well as the County Administrator, the Director of Greene County Jobs and Family Services, a County Commissioner, and representatives of the County Sheriff's Department, the Public Health Department and Engineer's Office. Also in attendance were representatives of the Cities of Bellbrook, Beavercreek, Fairborn, and Xenia, the Villages of Cedarville, Jamestown, Spring Valley and Yellow Springs, as well as the Townships of Beavercreek, Cedarville, New Jasper, Spring Valley, Sugarcreek and Xenia. Two representatives of the Ohio EMA, the Clinton County EMA Director, and a representative of Cedar Cliff Local Schools also attended the afternoon meeting. No members of the public were in attendance.

A total of 6 people attended the evening meeting, including the Greene County EMA Director and two representatives of the Ohio EMA. Representatives of New Jasper Township, the Village of Clifton, and the Greene County Building Department also attended. No members of the public attended the evening meeting.

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

Hazard Mitigation Action Scoring Matrix

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

4 | Risk Assessments

4.1 Dam/Levee Failure

Description

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

Dam infrastructure can be affected by natural hazards, such as floods, or man-made threats, such as sabotage. An imbalance between a dam's age and the amount of resources invested 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, and subsidence when the man-made structure fails.

Common dam-related terms include:

- **Spillway**: A structure that is part of a dam or found beside a dam which allows the controlled release of water from a reservoir.

- **Outlet works:** Used to regulate or release water flow from a dam. An outlet works is a device which consists of one or more pipes or tunnels which move water through the dam.

- **Auxiliary spillway**: Also known as an emergency spillway, the auxiliary spillway is a secondary spillway designed to operate only during periods of increased water inflow or high reservoir levels.

- **Structural failure**: Caused by foundation defects such as settlement and slope instability or earthquakes.

- **Mechanical failure**: Dam failure due to malfunctioning gates, conduits, or valves.

- **Hydraulic failure**: Occurs when water overtops the dam, usually caused by inadequate spillway design, blockages in spillways, or dam crest settlement.

- **Levee System:** A flood protection system which consists of a levee or other structures, such as closure or drainage devices.

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

According to the U.S. Army Corps of Engineers (USACE), dams can be classified by their hazard potential. The three hazard potential classes are:

- **High Hazard Potential**: During the event of a dam failure, loss of life is probable, which is the primary attribute for assigning this designation to a dam. Economic losses, environmental 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

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

Table 4.1.1: Dam Properties in Greene County, Ohio

Hazard Potential Classification	Dam Name	Owner Type	Distance to Nearest City (Miles)	Condition Assessment	EAP Prepared
High	Cedarville Upground Reservoir	Local Government	0.02	Poor	No
High	Dominick Lofino Park Lake Dam	Local Government	1.1	Fair	No
High	Huffman Dam	Local Government	1.1	Fair	Yes
High	Lake Shawnee Dam	Private	0.1	Fair	Yes
Significant	Bayberry Cove Development Dam	Local Government	0.2	Poor	No
Significant	Cedarville University Lake Dam	Private	0.2	Fair	No
Significant	Fisher Lake Dam	Private	25	Poor	No
Significant	Greene Town Center Dam	Private	0	Fair	Yes

Hazard Potential Classification	Dam Name	Owner Type	Distance to Nearest City (Miles)	Condition Assessment	EAP Prepared
Significant	Tara Lake Dam	Private	4.9	Poor	No
Low	Greene Co. Fish & Game Pond No. 1 Dam	Private	7.6	Fair	No
Low	Mystic Lake Dam	Private	5.1	Poor	No
Low	Spring Lake Dam	Private	11	Fair	No

Source: U.S. Army Corps of Engineers

Figure 4.1.2: Dam Locations in Greene County, Ohio
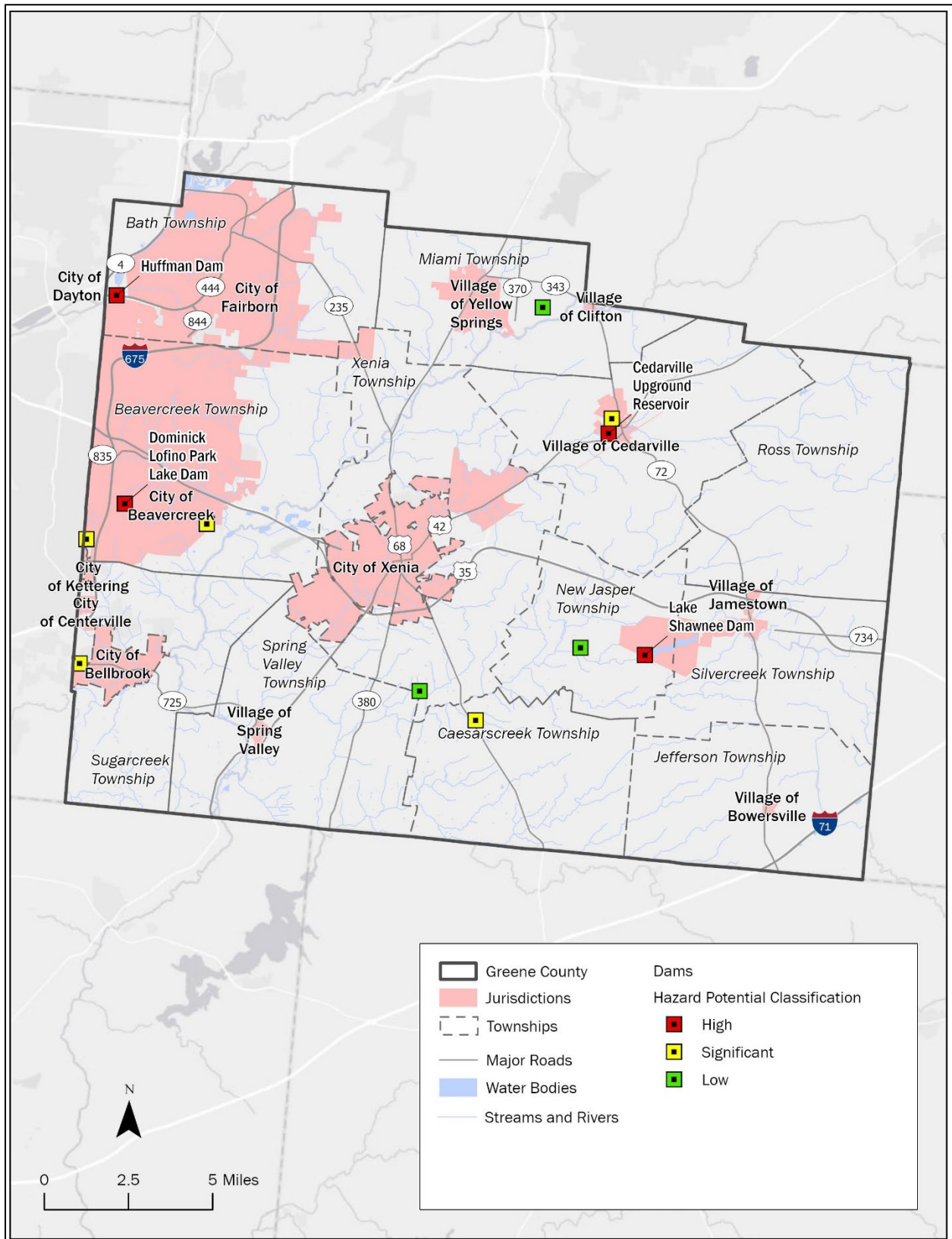
Extent

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 four High Hazard Potential Dams in Greene County, which are listed in **Table 4.1.1** and shown on **Figure 4.1.2**. 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 as determined by the chief.
- Damage or disruption to railroads or public utilities.
- Damage to downstream dams or levees. Damage to dams or levees can include, but is not limited to, overtopping of the structure. At the request of the dam owner, the chief may exempt dams from the criterion of this paragraph if the dam owner owns the potentially 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 Dams could result in property losses restricted mainly to the dam and rural lands, and the loss of human life is not probable.

History

Spring Lake Dam Non-Failure Incident, April 6, 2019:

A sinkhole developed because of a bad joint in the principal spillway outlet. The spillway was replaced. No incident report was produced.

Fisher Lake Dam Non-Failure Incident, January 28, 2019:

Fisher Lake Dam's principal spillway riser failed because of corrosion and poor dam condition. Overall water levels were lowered. No incident report was provided.

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 climate change could result in more frequent dam failures. The Climate Change section in Future Trends discusses climate change 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.

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Unsatisfactory

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

- A critical component of the dam has deteriorated to unacceptable condition or failed.

- A safety inspection indicates major structural distress (excessive uncontrolled seepage, cracks, slides, sinkholes, severe deterioration, etc.), advanced deterioration, or operational deficiencies which could lead to failure of the dam or its appurtenant structures under normal operating conditions.

- Reservoir restrictions or other interim risk reduction measures are required.

- A partial or complete reservoir drawdown may be mandated by the state or federal regulatory agency.

The State of Ohio Dam Safety Program focuses on deficient Class I dams (High Hazard Potential Dams) and dams in poor or unsatisfactory condition. There are four High Hazard Potential Dams in Greene County, which are listed in **Table 4.1.1** and shown on **Figure 4.1.2**. Two High Hazard Potential Dams in Greene County do not have emergency action plants (EAPs) in place: Cedarville Upground Reservoir and Dominick Lofino Park Lake Dam. Cedarville Upground Reservoir is also in 'poor' condition, meaning there is at least one known dam safety deficiency. This dam is owned by a local government entity.

Vulnerability Assessment

Infrastructure Impact

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

Population Impact

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

Property Damage

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

Loss of Life

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

Economic Losses

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

Emergency Action Plans (EAPs) have been completed for two of the four High Hazard Potential Dams in Greene County (**Table 4.1.1**). However, 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.

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Future Trends

Land Use and Development Trends

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

The current total value of taxable real estate in Greene County is $4,704,063,560. In 2022 and 2023, Greene County authorized a total of 949 new residential units at a total value of $433,290,000. The population is expected to increase by 2.2 percent, or 3,640 people between 2020 and 2030. An additional increase of 259 people (less than 1%) is expected between 2030 and 2040. The increased population and the increase in residential units could lead to additional risks. Future development should be placed outside of dam inundation areas and outside of FEMA-designated floodplains to reduce risks.

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4.2   Drought and Extreme Heat

Description

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

Figure 4.2.1: Heat Index Chart
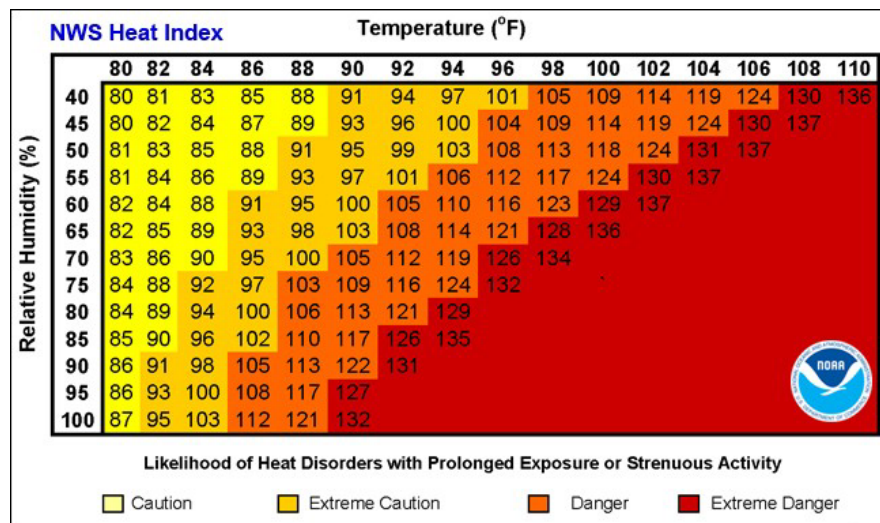
Source: National Weather Service

Extreme heat events are often accompanied by drought conditions when the events are prolonged. A drought is a shortage in precipitation over an extended period of time. Droughts are common throughout all climatic zones and can range in length from a couple of weeks to multiple years or decades in some areas.

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

Location

Drought is a countywide hazard that can affect all locations and jurisdictions in Greene 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 Greene County, droughts are often linked to prolonged periods of above average temperatures and little to no precipitation.

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

The extent of the drought is determined by the Palmer Drought Severity Index (PDSI), shown below in **Table 4.2.2**. In this way, the Index can be utilized as a tool to help define disaster areas and indicate the availability of irrigation water supplies, reservoir levels, range conditions, amount of stock water, and potential for forest fires. The Palmer Drought Severity Index depicts prolonged (in months or years) abnormal dryness or wetness and is slow to respond, changing little from week to week. It also reflects long-term moisture runoff, recharge, and deep percolation, as well as evapotranspiration.

Table 4.2.2: Palmer Drought Severity Index Classifications and Federal Drought Categories

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

The Palmer Drought Severity Index is a standardized index with values typically falling between -4.0 and +4.0, although extreme conditions can be greater in value (including federal drought categories). Negative values indicate drought conditions while positive values represent wet conditions. Values around zero represent near normal conditions.

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

History

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 Greene County has spent 292 weeks in abnormally dry conditions, 135 weeks in moderate drought, 24 weeks in severe drought, 4 weeks in extreme drought, and zero in exceptional drought since 2000 (**Table 4.2.3**) (Source: U.S. Drought Monitor). **Figure 4.2.4** depicts the drought monitor history for Greene from 2000 through January 2025.

Table 4.2.3: Weeks in Drought per Year for Greene County

Year	Abnormally Dry (D0)	Moderate Drought (D1)	Severe Drought (D2)	Extreme Drought (D3)	Exceptional Drought (D4)
2000	14	9	0	0	0
2001	9	3	0	0	0
2002	11	8	0	0	0
2003	0	0	0	0	0
2004	0	0	0	0	0
2005	17	0	0	0	0
2006	1	0	0	0	0
2007	24	20	7	1	0
2008	19	0	0	0	0
2009	15	0	0	0	0
2010	18	11	4	0	0
2011	7	0	0	0	0
2012	28	25	9	1	0
2013	6	3	0	0	0
2014	1	0	0	0	0
2015	6	0	0	0	0
2016	15	1	0	0	0
2017	1	0	0	0	0
2018	0	0	0	0	0
2019	14	8	0	0	0
2020	15	7	0	0	0
2021	5	0	0	0	0
2022	13	10	0	0	0
2023	26	8	0	0	0
2024	27	22	4	2	0
2025	0	0	0	0	0
Grand Total	**292**	**135**	**24**	**4**	**0**

Figure 4.2.4: Drought in Greene County from 2000 to 2025

From the U.S. Drought Monitor website, https://droughtmonitor.unl.edu/DmData/TimeSeries.aspx, 4-23-2025
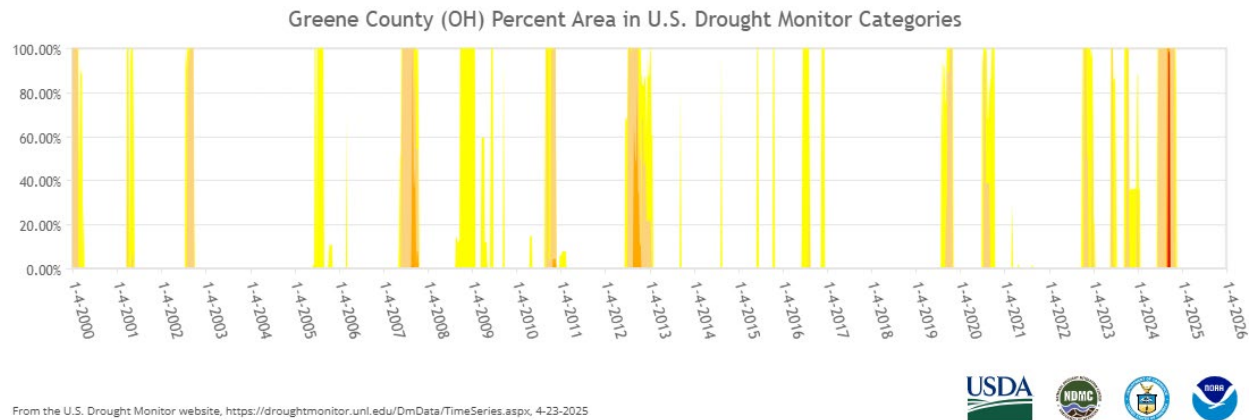
D0 = Abnormally Dry, D1 = Moderate Drought, D2 = Severe Drought, D3 = Extreme Drought, D4= Exceptional Drought

Source: U.S. Drought Monitor

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

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

On June 18, 2024, 100 percent of Greene County was experiencing abnormally dry conditions. Within one week the drought conditions worsened and 100 percent of the County was experiencing moderate drought conditions. The moderate drought condition lasted for 10 weeks, worsening again on September 3, 2024. The whole County spent four weeks in a severe drought and two weeks in an extreme drought before going back to a moderate drought on October 1, 2024. The drought continued for eight weeks, ending on November 25, 2024.

Abnormally Dry to Extreme Drought (D0 – D3), June 19, 2012 – February 4, 2013:

On June 19, 2012, approximately 68 percent of Greene County was experiencing abnormally dry conditions. Within three weeks the drought conditions worsened, and 61 percent of the County was experiencing moderate drought conditions. The moderate drought condition lasted for seven weeks, worsening again on August 28, 2012. Approximately 67 percent of the County was in a severe drought and less than one percent was in an extreme drought. The extreme drought conditions only lasted one week, though a portion of the County remained in a severe drought for nine weeks. The moderate drought lasted through the Fall and Winter months of 2012. Greene County entered 2013 in a moderate drought. The drought ended on February 4, 2013.

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

On August 31, 2010, 100 percent of Greene County was experiencing abnormally dry conditions. Within two weeks the drought conditions worsened and 100 percent of the County was experiencing moderate drought conditions. The moderate drought condition lasted for seven weeks, worsening again on November 2, 2010. Approximately four percent of the County was in a severe drought for four weeks. The drought ended a week later on December 6, 2010.

Abnormally Dry to Extreme Drought (D0 – D3), May 15, 2007 – October 29, 2007:

On May 15, 2007, approximately 10 percent of Greene County was experiencing abnormally dry conditions. Within four weeks the drought conditions worsened and 63 percent of the County was experiencing moderate drought conditions. The moderate drought condition lasted for 12 weeks,

worsening again on August 28, 2007. Approximately 50 percent of the County was in a severe drought and within a week it extended to 100 percent of the County. On September 4, 2007, approximately one percent of the County was in an extreme drought. The extreme drought conditions lasted one week. A severe drought continued for three more weeks before going back down to a moderate drought. On October 9, 2007, approximately eight percent of the County was back in a severe drought which lasted two weeks. The drought lasted one more week before ending on October 29, 2007.

Extreme Heat

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

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

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

Heat Event, June 28 – July 7, 2012:

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

Heat Event, July 20 – July 31, 1999:

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

Probability

Greene County has experienced droughts in the past, and the potential exists for the County to experience droughts in the future. Greene County has spent 455 weeks in abnormally dry to extreme drought conditions since 2000. Greene County has a 34 percent chance of having a drought and/or experiencing abnormally dry conditions each year based on historical data. The County had two heat and two extreme heat events between 1995 and 2023. Heat events can occur during any year.

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

Vulnerability Assessment

Drought projections suggest that some regions of the U.S. will become drier and that most will have more extreme variations in precipitation. Even if current drought patterns remain unchanged, warmer temperatures will amplify drought effects. Drought and warmer temperatures may increase risks of large-scale insect outbreaks and wildfires, in addition to accelerating tree and shrub death and changing habitats and ecosystems in favor of drought-tolerant species. Forest and rangeland managers can mitigate some of these impacts and build resiliency in forests through appropriate management actions.

Infrastructure Impact

Drought does not have a significant impact on infrastructure or structures. The greatest impacts of drought are on agricultural interests, as crops may fail, and livestock may not have sufficient water resources. For social vulnerability, the FEMA National Risk Index indicates that the agricultural (crop only) in Greene County has a score of 16.0 (very low). This risk is only based on agricultural impacts and not population impact. The index indicates an expected annual loss of $97 due to drought events with 0.1 events occurring per year.

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 Greene County has a score of 76.1 ("relatively moderate") for heat wave. The index indicates an expected annual loss of $454,000 due to heat wave events with 0.9 events occurring per year. All Census Tracts can be found in **Appendix E**.

Property Damage

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

Table 4.2.5 below shows the 20 census tracts with the highest total EAL (expected annual loss) from heat. 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 Greene County. Expected losses for buildings, population ($11.6 million for each fatality or 10 injuries), and agriculture per census tract for heat wave.

Table 4.2.5: Structure and Population Vulnerability from Heat Wave

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39057210603	$48	$21,138	$135	$21,321
39057260100	$38	$17,921	$1,421	$19,380
39057210500	$43	$16,787	$50	$16,880
39057210604	$31	$14,813	$8	$14,851
39057240600	$29	$13,836	$253	$14,118
39057210402	$25	$14,034	$0	$14,059
39057210401	$28	$13,943	$0	$13,971
39057210602	$34	$13,836	$0	$13,870
39057200104	$33	$13,468	$25	$13,526
39057200500	$15	$12,940	$0	$12,955
39057220102	$32	$12,582	$166	$12,780
39057240200	$18	$12,310	$7	$12,335
39057210201	$20	$12,091	$0	$12,112
39057240500	$26	$11,947	$57	$12,030

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39057220201	$27	$11,937	$0	$11,964
39057240303	$12	$11,560	$4	$11,577
39057200700	$10	$11,438	$0	$11,448
39057240304	$14	$11,406	$28	$11,447
39057200901	$21	$11,077	$28	$11,127
39057220101	$29	$10,949	$38	$11,016
Grand Total	**$532**	**$270,013**	**$2,221**	**$272,766**

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 in Greene 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 Greene County include soybeans for beans, corn for grain, wheat for grain, forage-land used for all hay and haylage, and sod. Based on data from the U.S. Department of Agriculture, Greene County's crop yields were not impacted from previous drought events. Acreage farmed for Corn (Grain), Hay & Haylage, and Soybeans decreased, while acreage for wheat increased between 2017 and 2022. Yield per acre increased in 2022 versus 2017 for all crops except Hay & Haylage and Soybeans (**Table 4.2.6**). Corn for grain had the largest yield decrease per acre (-0.7 tons/acre). Agricultural land use can be seen on the land use map in Chapter 1 (**Figure 1.2.1**).

Table 4.2.6: Greene County Crop Yields 2017 - 2022

Commodity	2017		2022	
	Acres	Crop Yield	Acres	Crop Yield
Corn, Grain	61,780	11,752,507 bushels	50,907	10,245,708 bushels
Hay & Haylage	5,547	15,948 tons	5,306	11,326 tons
Soybeans	73,062	4,040,523 bushels	65,907	3,780,879 bushels
Wheat	2,689	206,731 bushels	4,448	406,113 bushels

Source: United States Department of Agriculture Census

Future Trends

Land Use and Development Trends

Drought and extreme heat are most likely to impact agriculture land uses and land uses that house or serve vulnerable populations, such as schools, daycares, hospitals, and nursing homes. The increase of people aged 65+ from 2017 (26,204) to 2023 (30,665) could mean more vulnerability to Extreme Heat for that population group. Increase of agricultural land use, crop yields, and livestock cash receipts can mean more vulnerability to drought in those areas.

Climate Change

Climate change 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. Climate change is expected to increase the occurrence and duration of heat waves in the coming decades.

4.3   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 4.3.1**).

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

Location

Earthquakes are countywide hazards and can affect all areas and jurisdictions within Greene 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.

Greene County is just west of the Grenville Front Tectonic Zone in the Granite-Rhyolite Rift Province and East Continent Rift Basin (**Figure 4.3.2**).

Extent

Earthquakes pose a risk to life and property depending on severity. To monitor earthquakes, the State of Ohio and the ODNR Division of Geological Survey coordinates a 29-station network (**Figure 4.3.3**) 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 is one Ohio Seismic Network monitoring station in Greene County and one in the neighboring Montgomery County.

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

Table 4.3.1: 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 a passing truck.	2.5
IV	Felt indoors by many, outdoors by few, at night some awaken; dishes, windows, doors disturbed; standing autos rock noticeably.	3
V	Felt by most people; some breakage of dishes, windows, and plaster; disturbance of tall objects.	3.5
VI	Felt by all, many frightened and run outdoors, falling plaster and chimneys, damage small.	4
VII	Everybody runs outdoors; damage to buildings varies depending on quality of construction; noticed by drivers of autos.	4.5
VIII	Panel walls thrown out of frames; walls, monuments, chimneys fall; sand and mud ejected; drivers of autos disturbed.	5
IX	Buildings shifted off foundations, cracked, thrown out of plumb; ground cracked; underground pipes broken.	5.5
X	Most masonry and frame structures destroyed; ground cracked, rails bent, landslides.	6
XI	Few structures remain standing; bridges destroyed, fissures in ground, pipes broken, landslides, rails bent.	6.5
XII	Total damage; waves seen on ground surface, lines of sight and level distorted, objects thrown up into air.	7 7.5 8

Source: ODNR

Figure 4.3.2: Ohio Faults and Seismic Zones
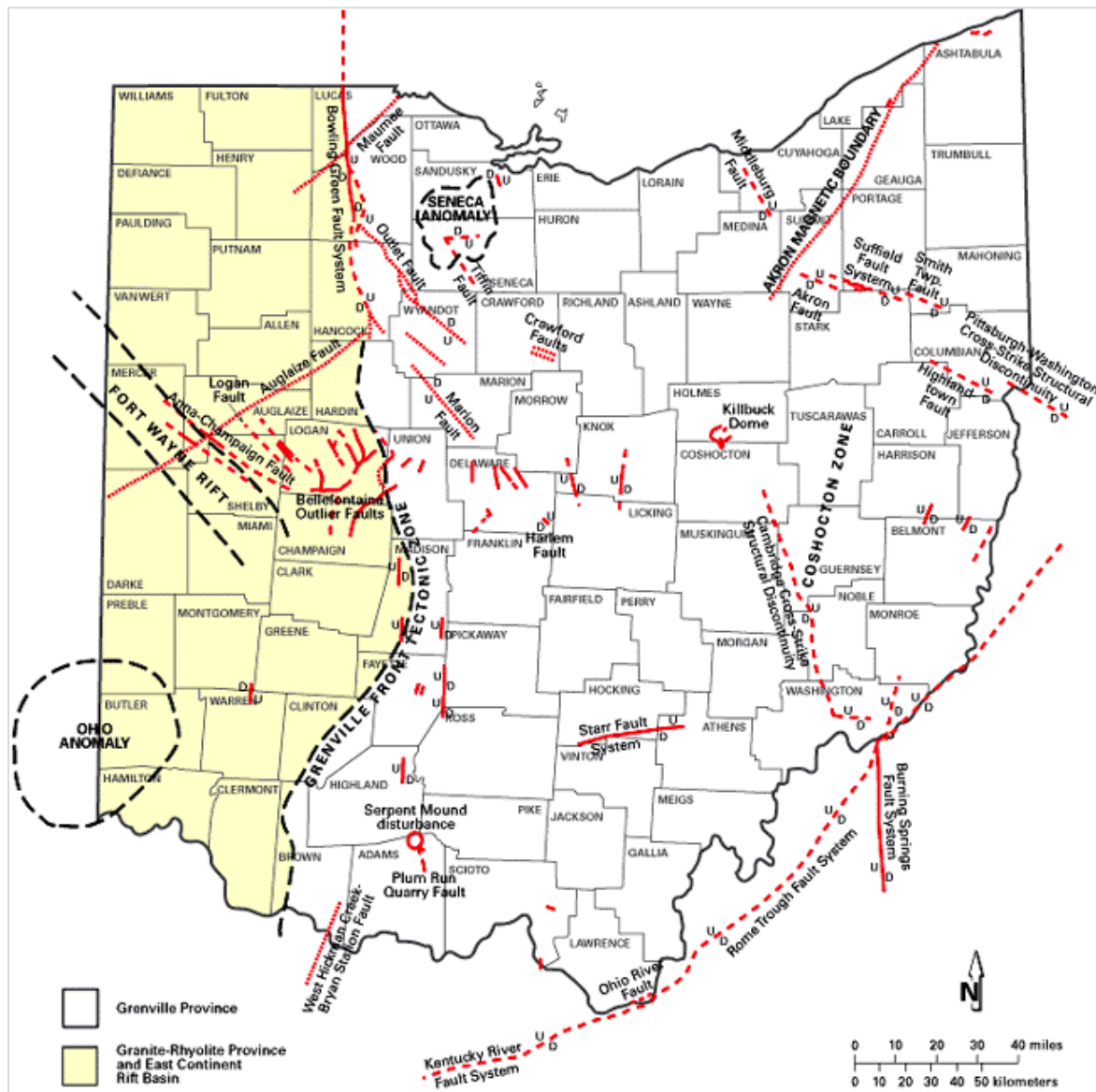
Source: ODNR

Figure 4.3.3: Earthquake Epicenters and Seismic Monitoring Stations in Ohio
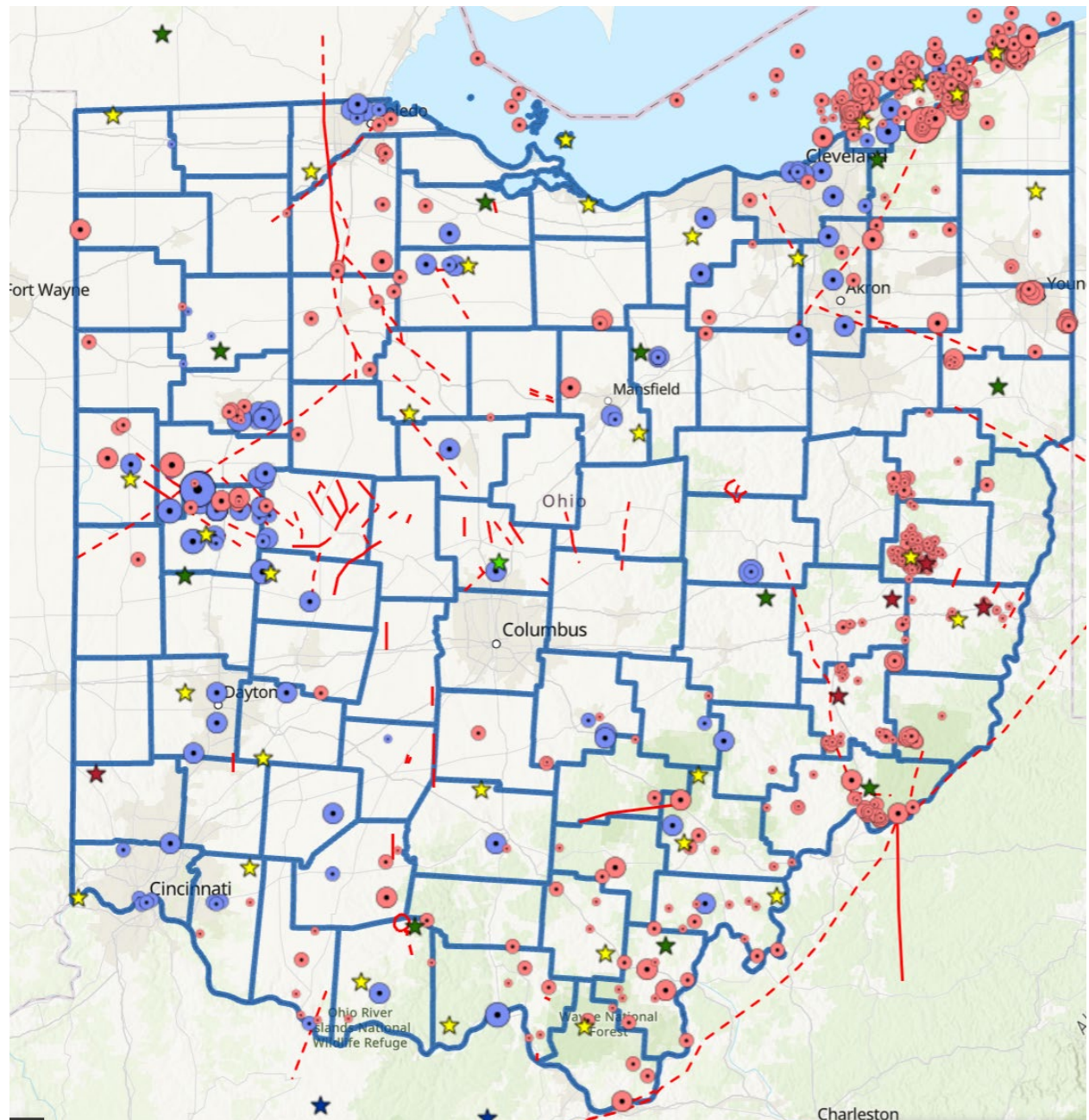
Source: ODNR
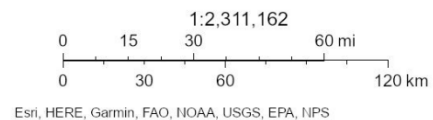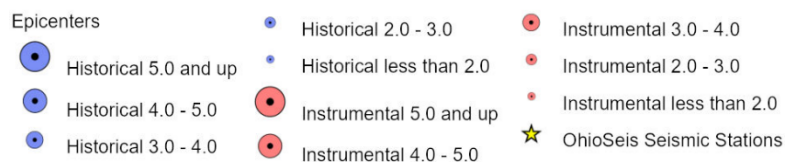
History

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

to ODNR, Greene County has had one recorded earthquake between 1886 and 2024, with a magnitude of 3.5. The earthquake occurred in the Village of Yellow Springs in 1925. There is limited data available on any property damage.

Figure 4.3.4, below, displays epicenters of all historical earthquakes with a magnitude greater than 1.0. Locations and magnitudes of non-instrumental earthquakes correspond to felt area or maximum epicentral Modified Mercalli Intensities and may be in error by a considerable distance.

Probability

The USGS has both long-term and short-term probabilistic seismic hazard forecasts. In the 2024 one-hundred-year probabilistic seismic hazard forecast, the United States Geological Survey estimated that there is a 5 to 25 percent chance of potentially minor-damage ground shaking for Greene County (**Figure 4.3.4**).

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 4.3.5**) identifies that Greene County has a four to eight 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 4.3.4: Earthquake Shaking and Seismic Design Categories

Source: USGS

GREENE
COUNTY
OHIO
History, Innovation &
Natural Beauty

Greene County Hazard Mitigation Plan
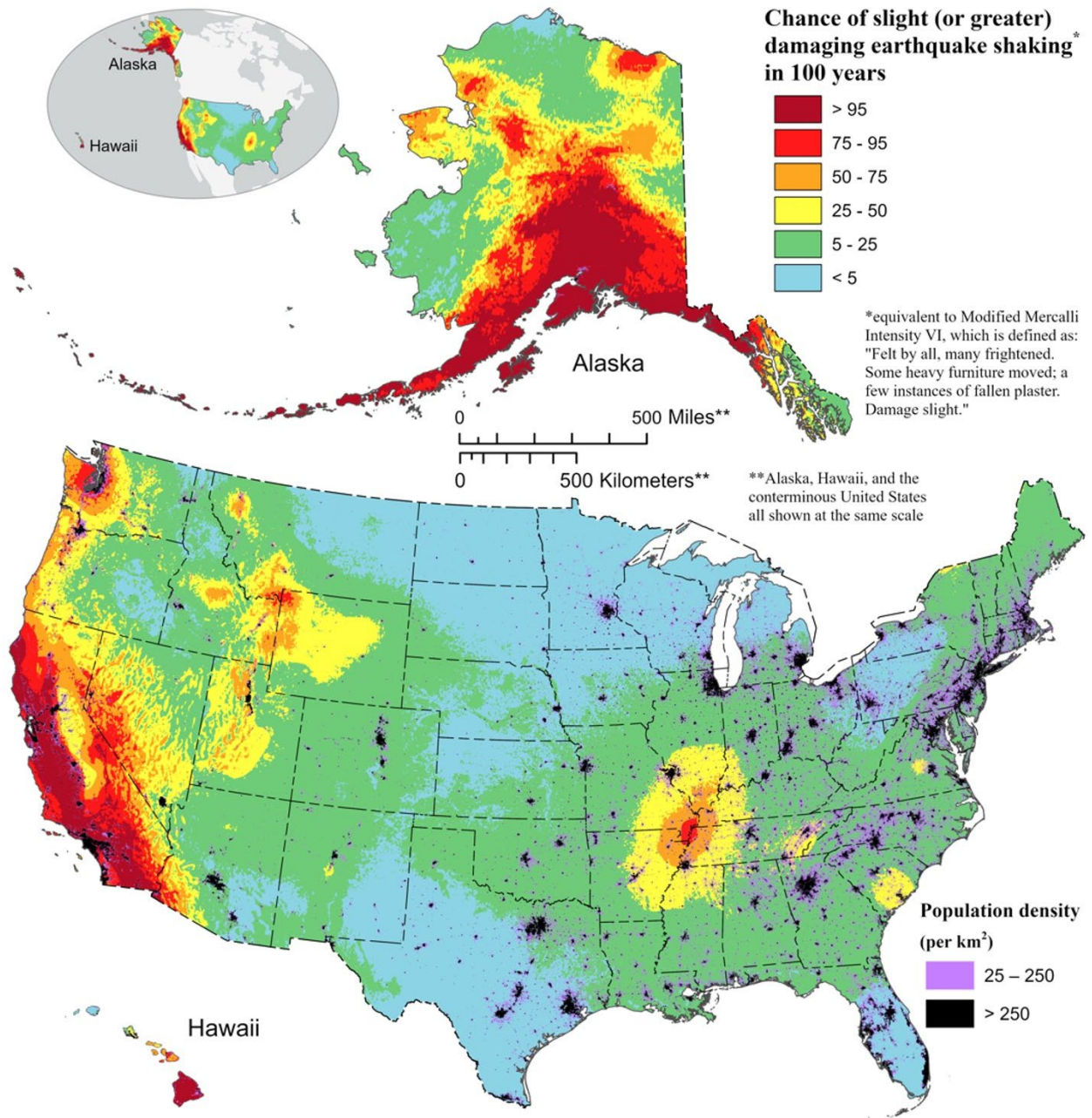
Figure 4.3.5: 2014 Seismic Hazard Map of the State of Ohio
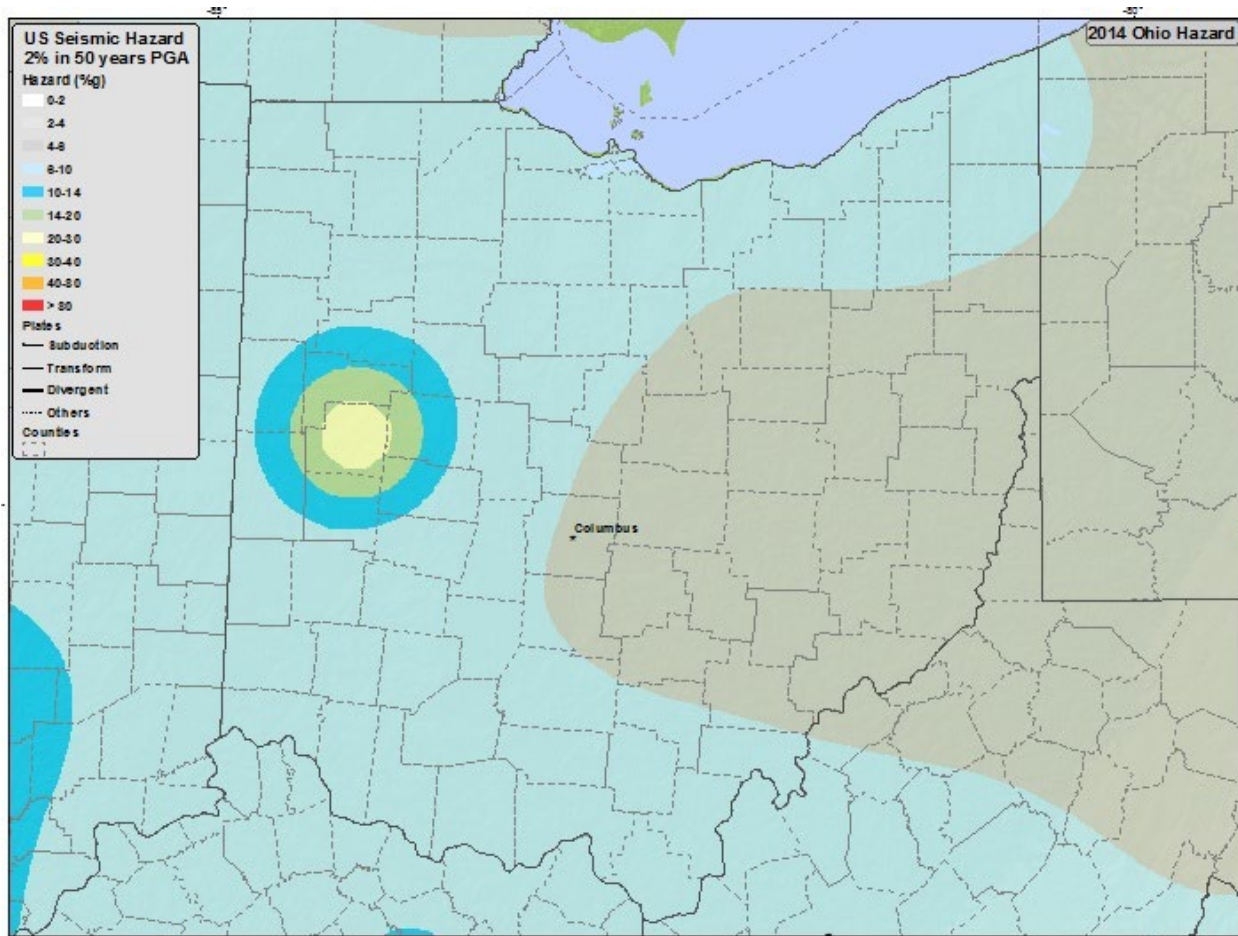
Source: USGS

Vulnerability Assessment

Infrastructure Impact

There has been one earthquake in Greene County since 1886, with a magnitude of 3.5. There is no information on whether the earthquake caused any property damage. Magnitudes under three are not generally noticed by people and cause little, if any, damage. Buildings, roadways, gas and power lines have the potential to be affected. Since the probability of an earthquake occurring in Greene County is less than one percent, there is a low risk of impact to infrastructure as a result.

Population Impact

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

According to the National Risk Index calculated by FEMA, Greene County's risk was scored at 79.1 ("relatively low") to earthquakes, as compared to all other U.S. counties, due to its very low expected annual loss, relatively moderate social vulnerability, and relatively moderate community resilience scores. Earthquakes are unlikely to occur in Greene County; therefore, the population is unlikely to be affected by earthquakes. Socially vulnerable populations may be more affected by earthquakes if they live in older housing units or apartment complexes that do not have adequate earthquake-resilient

infrastructure. The index indicates an expected annual loss of $1.1 million 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 4.3.6** lists the census tracts in Greene County, ranked with the highest vulnerability to the lowest vulnerability.

Loss of Life

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

Economic Losses

Earthquakes have the potential to damage infrastructure, resulting in the economic burden of clean up and repairs. Potential economic losses and damage associated with Greene County for earthquakes according to FEMA's National Risk Index are recorded in **Table 4.3.6** below. The table shows the 20 census tracts with the highest total EAL (expected annual loss) from earthquakes. EAL rates, calculated by FEMA, identify the total value of loss expected each year for a particular community, in this case the census tracts for Greene County. Expected losses for buildings, population ($11.6 million for each fatality or 10 injuries), and agriculture per census tract for earthquakes are listed in the table below, ordered by highest to lowest total EAL (expected annual loss) from earthquakes.

Table 4.3.6: 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)
39057260100	$52,577	$26,909	$0	$79,486
39057210101	$41,830	$8,832	$0	$50,662
39057240600	$33,802	$13,290	$0	$47,092
39057280102	$29,752	$16,336	$0	$46,088
39057200104	$31,248	$13,796	$0	$45,043
39057210602	$29,541	$11,299	$0	$40,840
39057270100	$28,444	$9,777	$0	$38,220
39057255000	$27,238	$7,468	$0	$34,707
39057210500	$27,598	$7,083	$0	$34,681
39057240500	$24,807	$7,929	$0	$32,736
39057280300	$27,277	$3,715	$0	$30,992
39057210603	$24,215	$4,707	$0	$28,922
39057240302	$22,164	$5,795	$0	$27,959

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39057210604	$21,974	$5,637	$0	$27,611
39057240200	$20,609	$6,529	$0	$27,139
39057240700	$19,598	$6,260	$0	$25,858
39057210401	$20,061	$4,800	$0	$24,862
39057220102	$18,479	$5,470	$0	$23,949
39057220201	$18,619	$4,093	$0	$22,712
39057280200	$16,307	$6,338	$0	$22,646
Total	**$536,141**	**$176,063**	**$0**	**$712,204**

Source: FEMA National Risk Index

Future Trends

Land Use and Development Trends

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

Greene County's Perspectives 2040 Goals are to focus on strategically balanced land development, protect farmland, expand and diversify the local economy, revitalize existing communities, preserve natural resources, and enhance quality of life. The Perspectives 2040 offers zone recommendations for natural and open spaces, agriculture, rural living, suburban living, urban living, community centers, commercial and employment centers, and institutional campuses. The developmental framework describes the developmental intent for each zone and will serve as a foundation for future regulatory policies.

Climate Change

Climate change has no known effect on the probability or extent of earthquakes.

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Greene County Hazard Mitigation Plan

4.4   Flood

Description

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

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

Common flood-related terms include:

- **100-Year Flood:** A flood that has a one percent chance of occurring each year. The 100-year floodplain can be seen in **Figure 4.4.1: 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 Greene County. Flash flooding is more likely to occur in developed areas or along lakes and rivers. **Figure 4.4.1** 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

Greene County currently has 57 flood insurance maps (see **Appendix F**). The most recent update is from March 2022.

Greene County and nine of its communities, including the City of Beavercreek, City of Bellbrook, City of Fairborn, City of Xenia, Village of Cedarville, Village of Clifton, Village of Jamestown, Village of Spring Valley, and the Village of Yellow Springs, participate in the National Flood Insurance Program (NFIP) **(Table 4.4.2)**. The Village of Bowersville is not in the NFIP flood hazard area and does not participate in the NFIP.

Figure 4.4.1: Flood Hazard Map of Greene County, Ohio
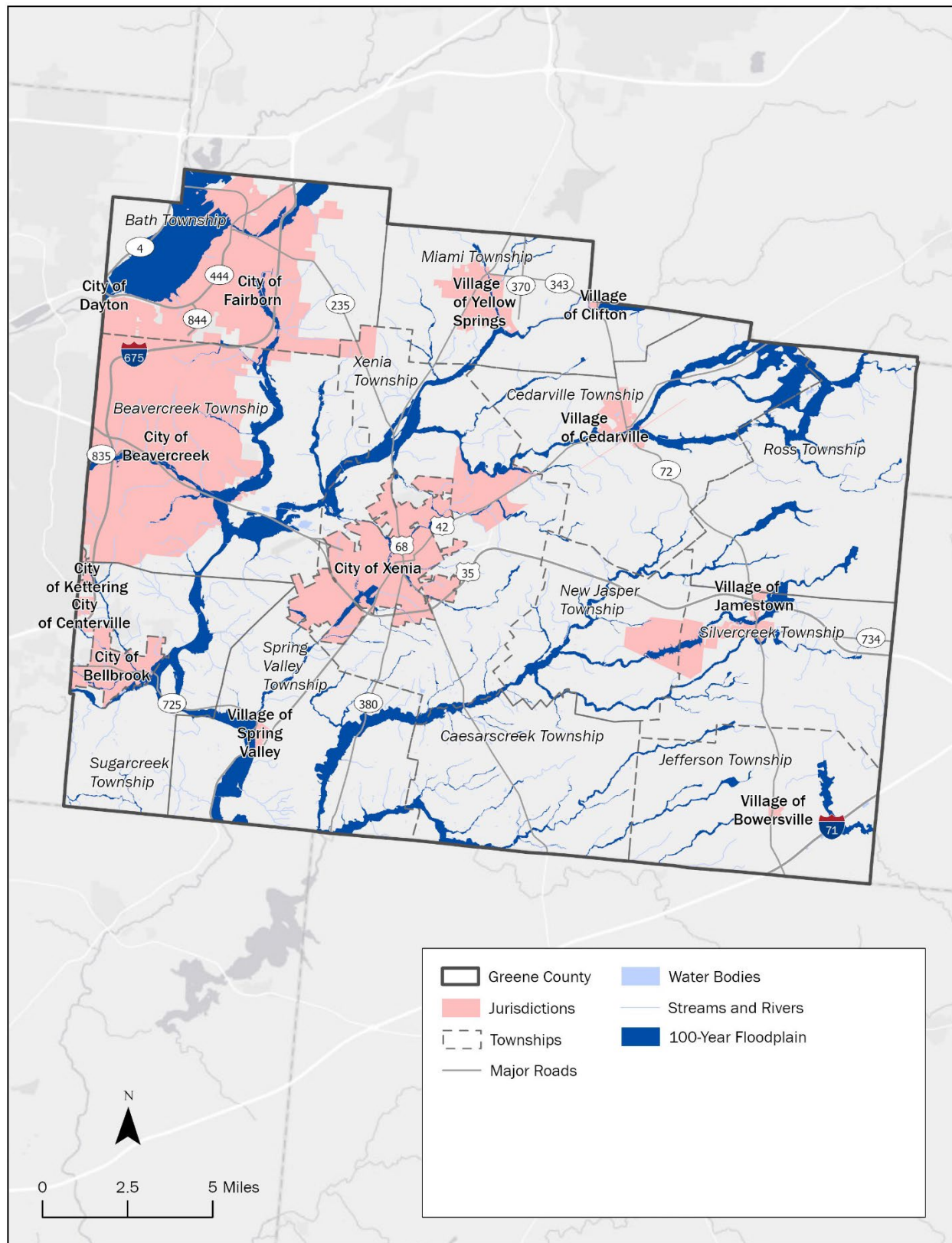
Table 4.4.2: National Flood Insurance Program Participation for Greene County, Ohio

Community Name	County	NFIP Coordinator	Init FHBM Identified	Init FIRM Identified	Effective Map Date	Reg-Emer Date	Participating in NFIP
Greene County*	Greene	Scott Young	07/07/78	04/01/81	03/08/22	04/01/81	Yes
City of Beavercreek	Greene	Sandra Pereira	09/04/81	08/02/82	03/08/22	08/02/82	Yes
City of Bellbrook	Greene	Jason Foster	11/02/74	06/01/77	03/08/22	06/01/77	Yes
City of Xenia	Greene	Chris Berger	12/23/77	01/02/81	03/08/22	01/02/81	Yes
Village of Cedarville	Greene	Diane Porter	01/10/75	07/02/80	03/08/22	02/24/81	Yes
Village of Clifton	Greene Clark	J. Alex Bieri	08/08/75	07/02/80	03/08/22	07/08/80	Yes
City of Fairborn	Greene	Mike Gebhart		02/01/84	03/08/22	02/01/84	Yes
Village of Jamestown	Greene	Joshua Bradley	09/29/78	05/16/95	04/04/11	05/16/95	Yes
City of Kettering	Greene Montgomery	Steve Bergstresser	05/31/74	10/15/80	10/27/22	10/15/80	Yes
Village of Spring Valley	Greene	Dennis Painter	11/16/73	08/01/80	03/08/22	08/01/80	Yes
Village of Yellow Springs	Greene	Denise Swinger	10/18/74	09/04/85	03/08/22	09/04/85	Yes

Source: NFIP Community Status Book

Repetitive Loss

There are 13 repetitive loss properties and zero severe repetitive loss properties in or near Greene County, Ohio, detailed in **Table 4.4.3**. FEMA defines a repetitive loss property as an insurable building for which two or more claims of more than $1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period since 1978. FEMA defines a severe repetitive loss property as a single family property that is covered under flood insurance by the NFIP and has incurred flood-related damage for which four or more separate claim payments have been paid under flood insurance coverage, with the amount of each claim payment exceeding $5,000 and with cumulative amount of such claims payments exceeding $20,000; or for which at least two separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property.

Table 4.4.3: Repetitive Loss Properties in Greene County, Ohio

Jurisdiction Occupancy	Total RL/SRL Structures	RL Structures	SRL Structures	Total Losses	Total Paid
Greene County (Unincorporated) Other Residential	1	1	0	3	$21,355
Greene County (Unincorporated) Single Family Residential	2	2	0	5	$20,460
City of Bellbrook Single Family Residential	3	3	0	6	$25,166
City of Beavercreek Single Family Residential	3	3	0	6	$41,843
City of Beavercreek Business Non-Residential	1	1	0	3	$641,207
City of Fairborn Single Family Residential	1	1	0	6	$69,332
City of Xenia Other Non-Residential	1	1	0	3	$39,017
City of Xenia Business Non-Residential	1	1	0	3	$127,075
Total	**13**	**13**	**0**	**35**	**$985,455**

Source: Ohio EMA

History

There have been 79 floods or flash floods in Greene County between January 1995 and December 2023. These events have caused $279,500 in property damage. No deaths or injuries were reported. There have been two major disaster declarations related to flooding covering Greene County since May 1953. There have been three flood events that caused property damage since the 2020 Greene County Hazard Mitigation Plan. The major disaster declarations for flooding and floods that have caused the greatest amount of damage are described below:

Flash Floods in Greene County, June 18, 2021:

A low-pressure system with warm and humid air moved across the Ohio Valley in June 2021 bringing thunderstorms and heavy rainfall. The rain washed out several roadways in Sugarceek Township. On the same day heavy rainfall washed out a bridge three miles southwest of Jamestown. The rainfall caused numerous road closures across the county. Greene County reported $100,000 in property damage. No deaths or injuries were reported.

Major Disaster Declaration for Severe Storms and Flooding, May 23 – June 26, 1989:

On June 10, 1989, a major disaster declaration (DR-831-OH) was issued for 13 counties. Individual and public assistance was offered to each of the 13 counties, including Greene County.

Major Disaster Declaration for Heavy Rains and Flooding, June 5, 1986:

On June 5, 1968, a major disaster declaration (DR-243-OH) was issued for 28 counties. Individual assistance was offered to each of the 13 counties, including Greene County.

Probability

Figure 4.4.4 Between 1995 and 2023, Greene County experienced 79 flooding events, including both floods and flash floods. Annually, this amounts to approximately two floods or flash floods per year. The yellow trendline of flood occurrences per year is increasing, which may suggest that Greene County can expect an increased frequency of flood events each year. According to the State of Ohio Hazard Mitigation Plan (SOHMP), increased precipitation and variability from climate change will increase the likelihood and intensity of flood events. The Climate Change section in Future Trends discusses climate change further.

Figure 4.4.4: Probability of Flooding
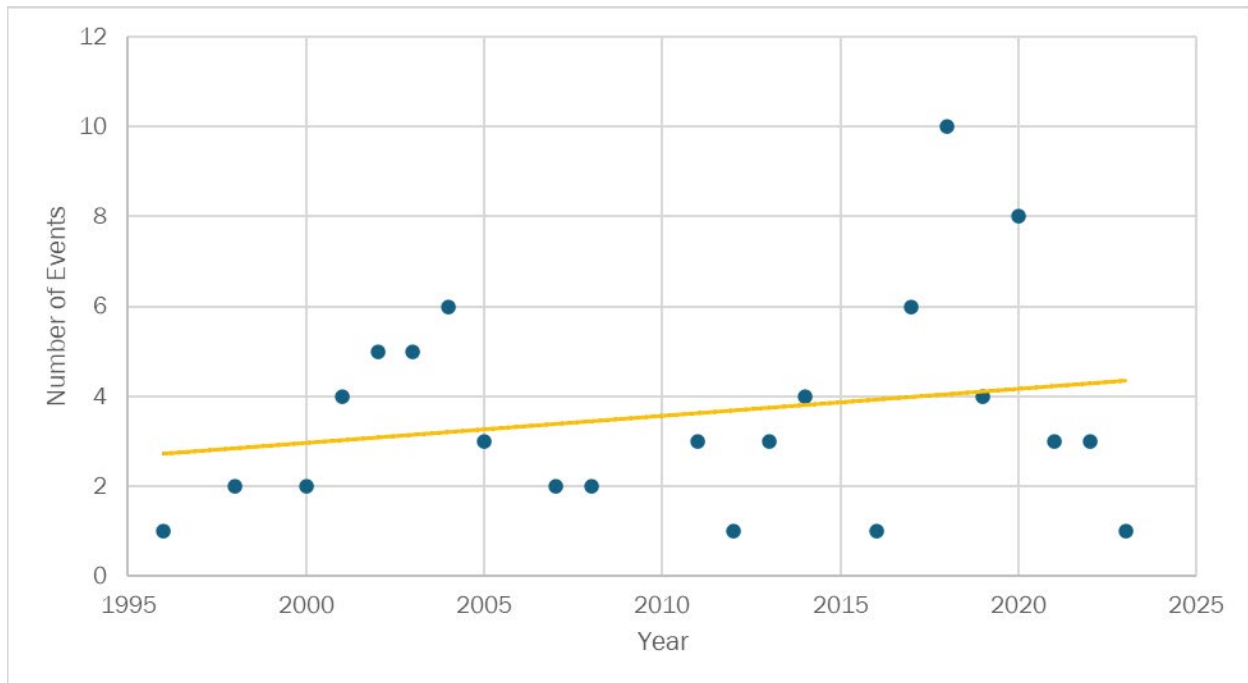
Data Source: NOAA

Figure 4.4.5 shows both the trend of flood events and affiliated cost over time since January 1995. Between 1995 and 2023, floods or flash flood events have resulted in $279,500 in property damages (Source: NCEI). Annually, this amounts to approximately $9,638 in property damages. The trendline (shown in red) indicates that the expected property loss stays relatively stable, with a slight upward increase and isn't expected to decrease.

Figure 4.4.5: Probability and Cost of Flooding
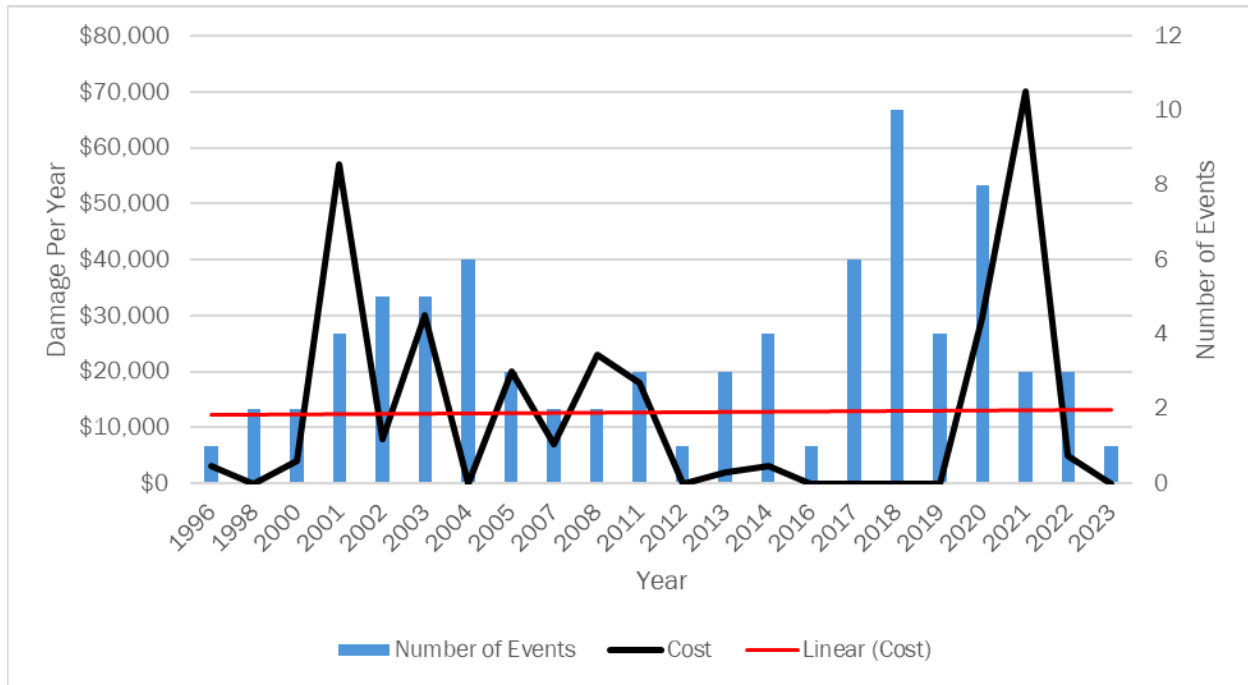
Data Source: NOAA

Vulnerability Assessment

Infrastructure Impact

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

Population Impact

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

For social vulnerability, in the National Risk Index, "riverine flooding" had a score of 53.3 ("Relatively Low"). People that are most vulnerable to flooding are those who live within the 100-year floodplain in structures that are not elevated above the base flood elevation. The index indicates an expected annual loss of $629,000 due to flood events with 2.1 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 Greene County for riverine flooding according to FEMA's National Risk Index are recorded in **Table 4.4.6** below. 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 Greene County. This table shows the 20 census tracts with the highest total EAL (expected annual loss). The table includes expected losses for buildings, population ($11.6 million for each fatality or 10 injuries), and agriculture per census tract for riverine flooding.

Table 4.4.6: Structure and Population Vulnerability from Riverine Flooding

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39057220102	$923	$81,306	$6,099	$88,327
39057260100	$378	$25,439	$59,285	$85,102
39057200300	$671	$46,431	$87	$47,189
39057270100	$608	$31,298	$8,627	$40,533
39057230100	$339	$21,133	$18,469	$39,942
39057200902	$283	$32,155	$3,972	$36,409
39057210602	$525	$30,510	$0	$31,034
39057280102	$103	$4,100	$19,133	$23,336
39057240302	$267	$19,017	$1,356	$20,641
39057220202	$235	$18,492	$239	$18,965
39057210603	$187	$12,654	$6,056	$18,898
39057240600	$170	$11,873	$5,306	$17,349
39057220101	$196	$14,368	$208	$14,771
39057210500	$271	$9,690	$3,962	$13,923
39057240700	$152	$11,098	$2,553	$13,803
39057240303	$62	$13,314	$0	$13,376
39057280101	$113	$7,047	$6,115	$13,275
39057200400	$163	$13,058	$0	$13,221
39057240500	$359	$10,862	$1,782	$13,003
39057240100	$316	$7,558	$3,478	$11,353
Grand Total	**$6,321**	**$421,403**	**$146,727**	**$574,450**

Source: FEMA National Risk Index

Loss of Life

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

Economic Losses

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

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.

Climate Change

According to the International Panel on Climate Change, climate change has impacted human and natural systems. For example, infrastructure and stormwater systems in the Midwest are threatened by increased precipitation frequency and intensity induced by climate change (NCA 2018). According to the SOHMP, increased precipitation and variability by climate change 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 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 climate change.

4.5   Invasive Species

Description

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

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

Location

Invasive species have the potential to impact any location within the County. The most invasive of terrestrial species degrade the State's woodlands, wetlands, and prairies. Aquatic Invasive Species use rivers to spread. Ohio has over 66,000 miles of streams, 312 miles of Great Lakes shoreline, nearly 2,000 inland lakes and reservoirs, and shares major watersheds with other states and Canada. Greene County lies in the Mississippi River basin, which is an ecologically diverse river system, and is susceptible to invasions through the Ohio River and its tributaries.

Extent

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

The Ohio Department of Agriculture (ODA) has issued a quarantine for six counties in Ohio (Butler, Clermont, Hamilton, Greene, Montgomery, and Warren counties) beginning April 11, 2024, to prevent the spread of the box tree moth (**Figure 4.5.1**). Plants should not be transported outside of the quarantine zone.

Figure 4.5.1: Box Tree Moth

The **Emerald Ash Borer (EAB) (Figure 4.5.2)** is a common invasive species in Greene County. It is an exotic beetle that feeds on ash trees inhibiting its ability to transport water and nutrients. This insect was first found in Ohio in 2002 and has since been found in every county in the State. The EAB was first discovered in Greene County in 2009. 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 4.5.2: Emerald Ash Borer and Feeding Tunnels

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

Approximately 2,300 plant species occur in the wild in Ohio. Of these, about 78 percent are native, that is, they were found in the region before the times of European settlement. Of the remaining 22 percent, fewer than 100 have been identified to be problems in natural areas. According to the Ohio Invasive Plants Council, there are 38 invasive plant species in Ohio that have been banned and more under consideration (**Table 4.5.3**). These plants cannot be sold, distributed, or imported.

Studies conducted by Ohio Department of Natural Resources, Ohio Sea Grant, and the Ohio State University have identified over 70 invasive aquatic species in Ohio (**Table 4.5.4**). With the exception of White Perch, it is unlawful to possess, import, or sell these species live.

Table 4.5.3: 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

Scientific Name	Common Name
Frangula alnus	Glossy buckthorn
Heracleum mantegazzianum	Giant hogweed
Hesperis matronlis	Dame's rocket
Hydrilla verticillata	Hydrilla
Hydrocharis morsus-ranae	European frog-bit
Lonicera japonica	Japanese honeysuckle
Lonicera maackii	Amur honeysuckle
Lonicera morrowii	Morrow's honeysuckle
Lonicera tatarica	Tatarian honeysuckle
Lythrum salicaria	Purple loosestrife
Lythrum virgatum (effective January 7, 2019)	European wand loosestrife
Microstegium vimineum	Japanese stiltgrass
Myriophyllum aquaticum	Parrotfeather
Myriophyllum spicatum	Eurasian water-milfoil
Nymphoides peltata	Yellow floating heart
Phragmites australis	Common reed
Potamogeton crispus	Curley-leaved pondweed
Pueraria montana var. lobate	Kudzu
Pyrus calleryana (effective January 7, 2023)	Callery pear
Ranunculus ficaria	Fig buttercup, lesser celandine
Rhamnus cathartica	Common Buckthorn
Rosa multiflora	Multiflora rose
Trapa natans	Water chestnut
Typha angustifolia	Narrow-leaved cattail
Typha x glauca	Hybrid cattail
Vincetoxicum nigrum	Black Swallow-Wort

Table 4.5.4: 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

Type	Scientific Name	Common Name
Fish	*Channa app. and Parachanna app.*	Snakeheads
Fish	*Claris batrachus*	Walking Catfish
Fish	*Ctenopharyngodon idella*	Diploid Grass Carp - White Amur
Fish	*Ctenopharyngodon Idella*	Grass Carp
Fish	*Cyprinus carpio*	Common Carp
Fish	*Fundulus catenatus*	Northern Studfish
Fish	*Fundulus diaphanus*	Eastern Banded Killifish
Fish	*Gambusia holbrooki and Gambusia affinis*	Eastern & Western Mosquitofish
Fish	*Gasterosteus aculeatus*	Three Spine 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
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

Type	Scientific Name	Common Name
Mollusks	*Bithynia tentaculata*	Faucet Snail
Mollusks	*Corbicula fluminea*	Asian Clam
Mollusks	*Dreissena bugensis*	Quagga Mussel
Mollusks	*Dreissena polymorpha*	Zebra Mussel
Mollusks	*Limnoperna fortune*	Golden Mussel
Mollusks	*Potamopyrgus antipodarum*	New Zealand Mudsnail
Crustaceans	*Bythotrephes longimanus*	Spiny Waterflea
Crustaceans	*Cercopagis pengoi*	Fishhook Waterflea
Crustaceans	*Cherax destructor*	Yabby
Crustaceans	*Cherax tenuimanus*	Marron
Crustaceans	*Dikerogammarus villosus*	Killer Shrimp
Crustaceans	*Eriocheir sinensis*	Chinese Mitten Crab
Crustaceans	*Eriocheir sinensis*	Chinese Mitten Crab
Crustaceans	*Faxonius virilis*	Virile Crayfish
Crustaceans	*Hemimysis anomala*	Bloody-red Shrimp
Crustaceans	*Procambarus clarki*	Red Swamp Crayfish
Plant	*Butomus umbellatus*	Flowering-rush
Plant	*Egeria densa*	Brazilian Waterweed
Plant	*Hydrilla verticillata*	Hydrilla
Plant	*Hydrocharis morsus-ranae*	European Frog-bit
Plant	*Iris pseudacorus*	Yellow Iris
Plant	*Ludwigia peploides*	Creeping Water-primrose
Plant	*Lysimachia nummularia*	Moneywort
Plant	*Lythrum salicaria*	Purple Loosestrife
Plant	*Marsilea quadrifolia*	European Water Clover
Plant	*Myriophyllum aquaticum*	Parrotfeather
Plant	*Myriophyllum spicatum*	Eurasian Watermilfoil
Plant	*Najas minor*	Brittle Naiad
Plant	*Nelumbo nucifera*	Pink Lotus
Plant	*Nitellopsis obtusa*	Starry Stonewort
Plant	*Nymphoides peltata*	Yellow Floating Heart
Plant	*Phalaris arundinacea*	Reed Canary Grass
Plant	*Phragmites australis*	Common Reed (Phragmites)

Type	Scientific Name	Common Name
Plant	*Pistia stratiotes*	Water Lettuce
Plant	*Potamogeton crispus*	Curly-Leaf Pondweed
Plant	*Trapa natans*	Water Chestnut
Plant	*Typha angustifolia, Typha x glauc*	Narrowleaf and Hybrid Cattails

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

Asian Long-Horned Beetles are wood-boring beetles native to Asia that were unintentionally introduced to North America, likely in wood packing material. Clermont County experienced an infestation in 2011. They pose a significant threat to forested land. There are no known Asian Long-Horned Beetle infestations in Greene County.

Mute Swans are non-native invasive species found on public lakes across Ohio, originally known as winter visitors with the first published record in the United States in 1936 and Ohio in 1987. During the breeding season, March through May, adult mute swans become highly territorial and will fight to push native birds out of their nesting area. Mute swans have attacked humans and pets during this time as well. Mute swans can consume submerged aquatic vegetation and usually uproot the whole plant leaving nothing behind. This takes away natural habitat from fish and leaves little food source for native waterfowl. The removal of aquatic vegetation can also cause water quality issues and erosion problems.

History

Greene County has been impacted by the Emerald Ash Borer, with infestations starting as early 2009. The extent of this damage is unknown. Box Tree Moths have been found in Greene County, and most of the county is part of a quarantine zone. Additionally, it is possible that any of the other species listed above have at one point affected the County and its residents.

Probability

Since there are many invasive species throughout Ohio, it is probable that Greene County will experience some of the invasive species listed above (**Tables 4.5.1 and 4.5.2**).

Vulnerability Assessment

Infrastructure Impact

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

Population Impact

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

Property Damage

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

Loss of Life

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

Economic Losses

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

Future Trends

Land Use and Development Trends

There could be slight impacts on development and land use due to invasive species. Some invasive species can be particularly damaging to crops, agricultural land, and wetlands. Future development may involve site investigation to identify any potential invasive species on the property.

Climate Change

According to the Fifth National Climate Assessment, warming temperatures caused by climate change is aiding in the spread of invasive species. Climate change can favor nonnative invading species over native ones due to the tolerance of invasive species to warmer climate zones and native communities' decreased resistance to the new extreme weather in their environment.

4.6 Landslide and Mine Subsidence

Description

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

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

According to the Ohio Administrative Code 3901-1-48, mine subsidence is loss caused by the collapse or lateral or vertical movement of structures resulting from the caving in of underground mines including coal mines, clay mines, limestone mines, and salt mines. Mine subsidence does not include loss caused by earthquakes, landslides, volcanic eruptions, or collapse of strip mines, storm and sewer drains, or rapid transit tunnels. Several factors determine the potential for mines to collapse including depth, mining technique used, types of rock and/or soils, and 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

Several sink holes have been located in Cedarville and Miami Townships. **Figure 4.6.1** shows the location of areas impacted by bedrock and glacial drift overlay.

Figure 4.6.2 shows the location of abandoned underground mines (UAMs) in Ohio and which counties have the option or are required to obtain mine subsidence insurance. The majority of abandoned underground mines can be found in region three or in nearby counties. Greene County is located in region two where nine counties have the option to obtain insurance. Greene County does not have any unabandoned underground mines.

Figure 4.6.3 shows the location of areas at risk for landslides. Greene County is in region two and has low incidence of landslides. The map displays both the incidence of landslides and susceptibility of the land surface to landslides. Briefly, the map was constructed by evaluating geologic units shown on the geologic map of the United States (King and Beikman, 1974) and classifying them as having high, medium, or low landslide incidence based on number of known landslides, and as having the high, medium, or low susceptibility to landslide. High incidence was assigned to map units (indicated in red on the map) having more than 15 percent of their area involved in landslide; moderate incidence (in tan) to those having between 15 and 1.5 percent; and low incidence (in yellow) to those having less than 1.5 percent.

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Figure 4.6.1: Karst Geology Impacted Area by Bedrock and Glacial Drift Overlay

Source: State of Ohio Enhanced Hazard Mitigation Plan

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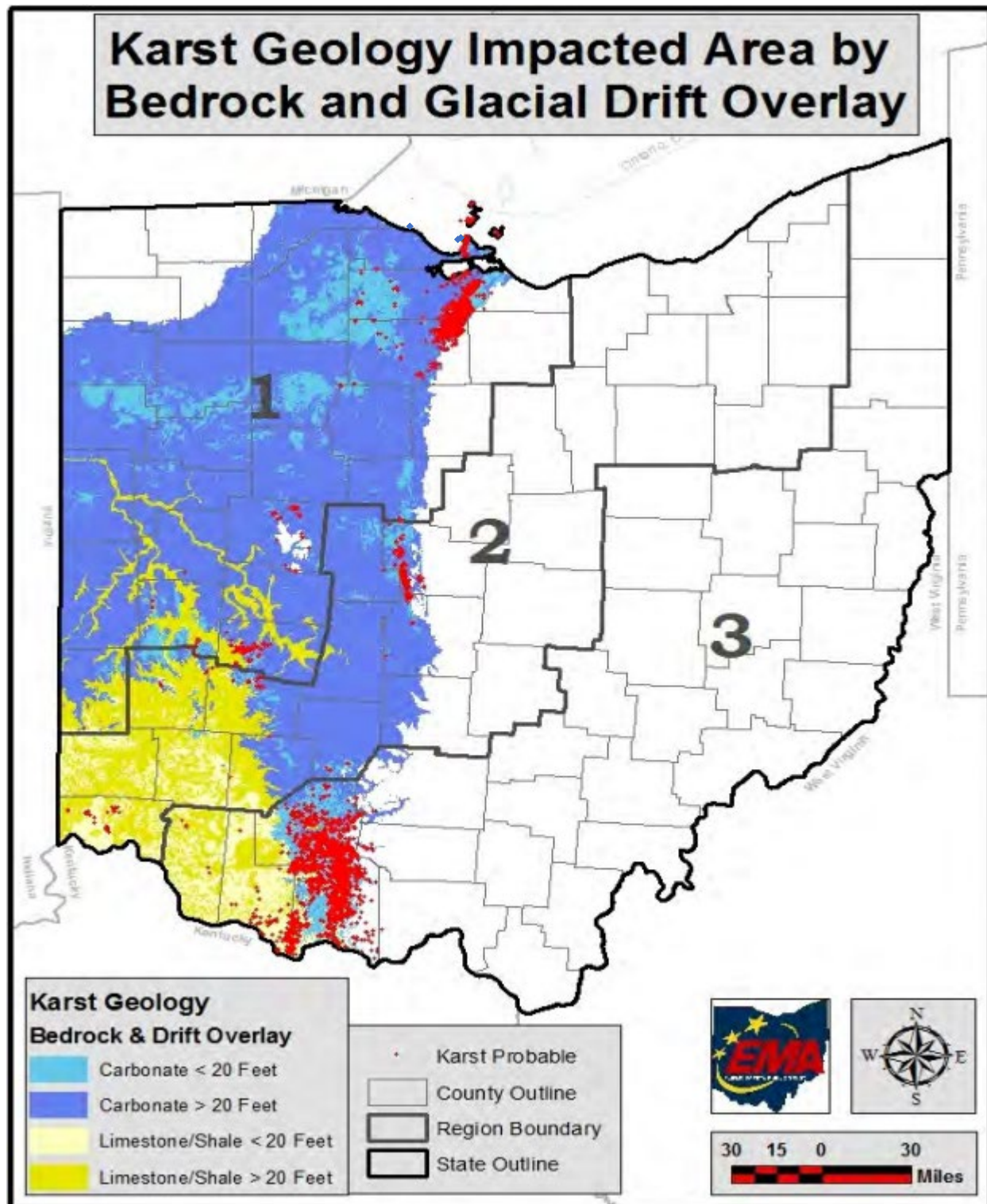
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Figure. 4.6.2: Abandon Mine Locations and Insurance Availability
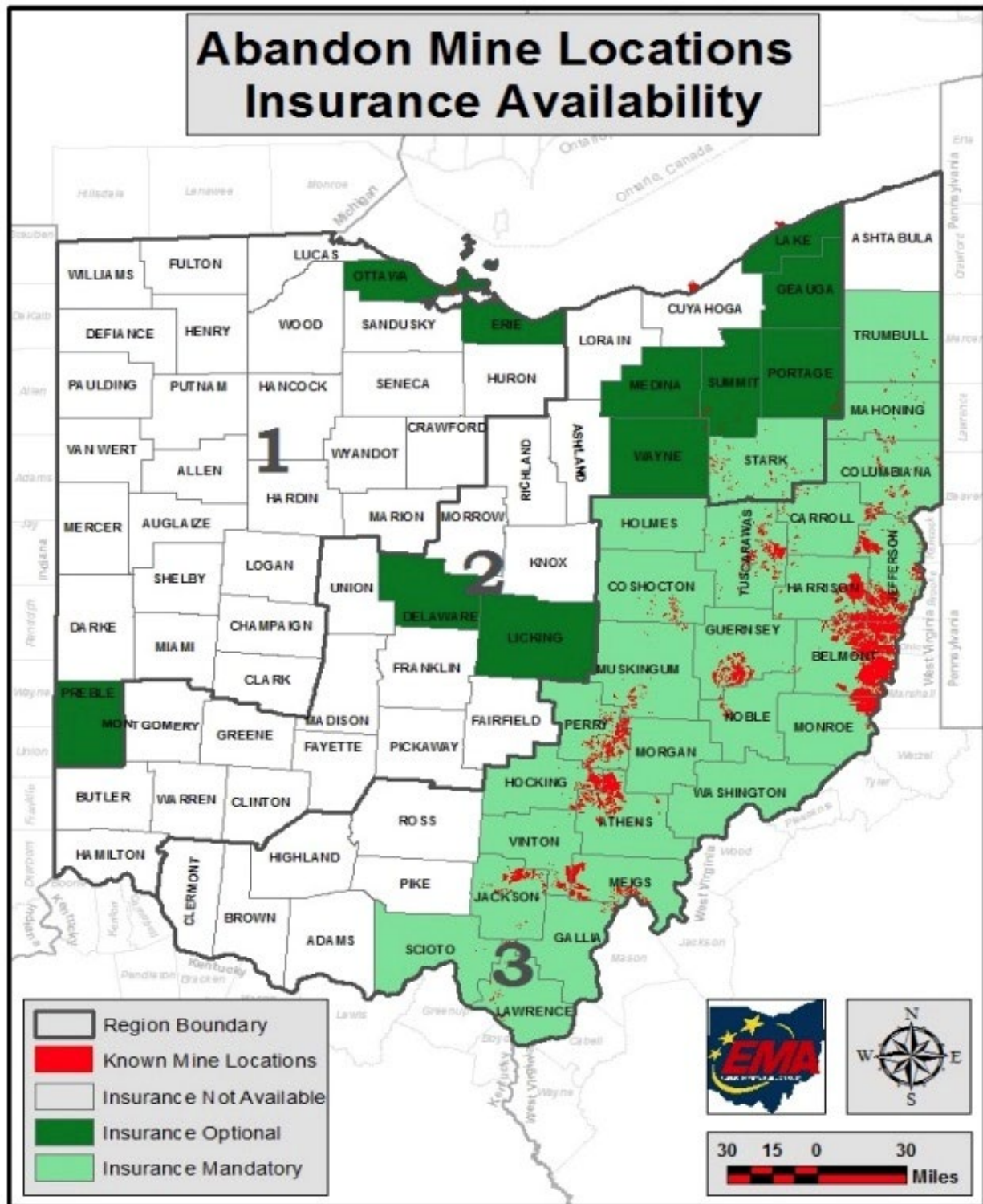
Source: State of Ohio Enhanced Hazard Mitigation Plan

Figure 4.6.3: Landslide Incidence and Susceptibility Map
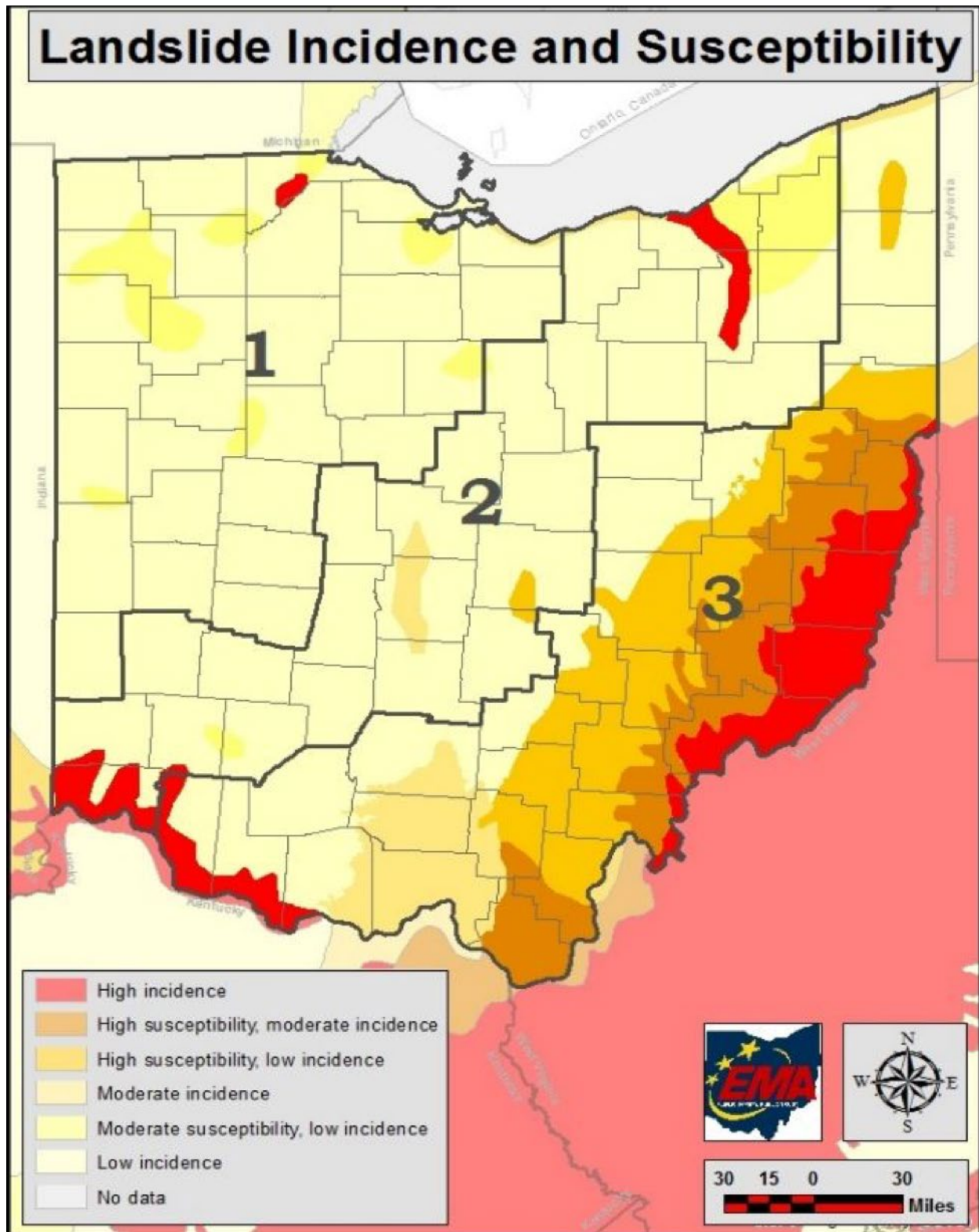
Source: State of Ohio Enhanced Hazard Mitigation Plan

Extent

According to ODNR Division of Geologic Survey, Greene County is home to five bedrock formations: the Allegheny and Pottsville Groups Undivided, the Conemaugh Group, the Monongahela Group, the Dunkard Group (Permian-Pennsylvanian), and the Dunkard Group (Permian). These formations include a mix of shale, mudstone, limestone, siltstone, sandstone, conglomerate, and subordinate amounts of limestone, clay, flint, and coal.

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 types of landslides in Ohio.

3. Rock fall, or a rapid downslope movement of large blocks of bedrock. Most rockfalls in Ohio involve sandstone or limestone that have been weakened by surface water.

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

History

According to the Ohio Department of Transportation (ODOT) there have been three landslides in Greene County. Most of the landslides occur along major roadways, such as S.R. 4 and S.R. 725 (**Figure 4.6.4**). All three landslides are rated Tier 1 and two have been remediated. 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. There have been no rock slopes in Greene County.

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. The most common tier in the County is Tier 1, with three Tier 1 sites for landslides.

Figure 4.6.4: Landslide Dashboard for Greene County
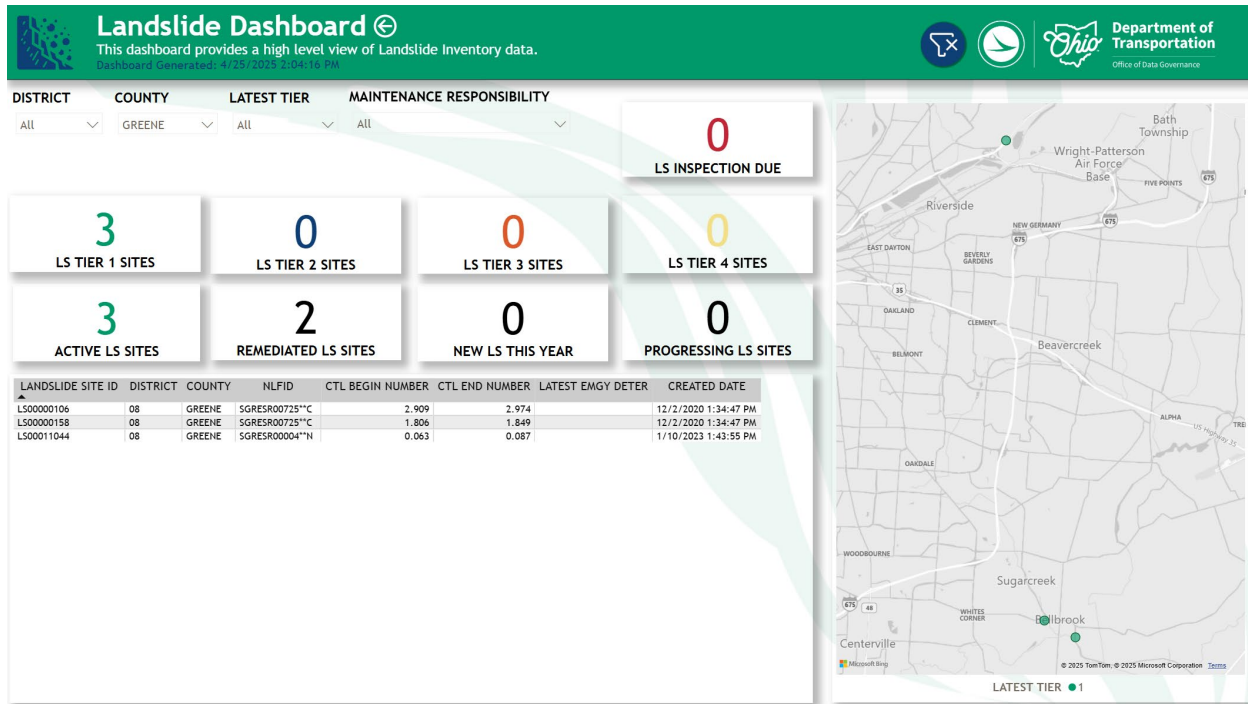
Source: Ohio Department of Transportation Geohazards Dashboard

Probability

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

Vulnerability Risk Assessment

Infrastructure Impact

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

Population Impact

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

For social vulnerability, mine subsidence is not listed in the National Risk Index, but landslide is listed with a score of 16.4 (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.

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Table 4.6.5 below shows the 20 census tracts with the highest total EAL (expected annual loss) from landslides, ranked in order from highest to lowest total EAL. These 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 Greene County. The subcategories in the chart below show expected losses for buildings, population ($11.6 million for each fatality or 10 injuries), and agriculture per census tract for landslides.

Table 4.6.5: Structure and Population Vulnerability from Landslides

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39057210500	$568	$1,700	$0	$2,267
39057220102	$481	$1,669	$0	$2,150
39057220101	$483	$1,485	$0	$1,968
39057210603	$340	$1,378	$0	$1,718
39057200902	$278	$1,367	$0	$1,645
39057200103	$159	$1,229	$0	$1,388
39057220202	$207	$1,097	$0	$1,304
39057200901	$149	$1,085	$0	$1,234
39057260100	$352	$767	$0	$1,120
39057230100	$257	$853	$0	$1,110
39057210604	$154	$718	$0	$872
39057240100	$142	$710	$0	$852
39057200300	$155	$650	$0	$805
39057220201	$106	$567	$0	$673
39057210402	$117	$547	$0	$664
39057240600	$157	$493	$0	$650
39057255000	$87	$253	$0	$340
39057280200	$85	$217	$0	$302
39057210602	$25	$124	$0	$149
39057210605	$34	$90	$0	$125
Grand Total	**$4,336**	**$16,999**	**$0**	**$21,336**

Source: FEMA National Risk Index

Loss of Life

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

Economic Losses

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

Future Trends

Land Use and Development Trends

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

Using the United States Geological Survey Landslide Inventory and Susceptibility map as a resource for mapping, future land use changes can reduce the potential of property damage. The map depicts areas that have increasing susceptibility to landslides. For Greene County there are several long stretches of state highways, roads, and rivers that have increasing susceptibility to landslides, rock slopes, and mine subsidence.

Climate Change

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

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4.7 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, Greene County does not have any record of such events affecting the County; therefore, the County has not deemed tropical storms and hurricanes to be a threat, and these specific types of weather will not be addressed further.

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

A Severe Thunderstorm Warning is issued if either the WSR-88D radar indicates a severe thunderstorm or if a spotter reports a storm producing hail or winds meeting the criteria outlined in the description above. The WSR-88D radar is an advanced Weather Surveillance Doppler Radar utilized by the NWS to generate a radar image. The NWS recommends that people in the affected area seek safe shelter immediately, as severe thunderstorms have the potential to produce tornadoes with little-to-no advance warning. Lightning frequency is not a criterion for issuing a severe thunderstorm warning. The warnings are usually issued for one hour and can be issued without a Severe Thunderstorm Watch already in effect. The National Weather Service Forecast Office in Cleveland, Ohio is responsible for issuing Severe Thunderstorm Watches and Warnings for Greene 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. Straight-line 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 inch (the size of a pea) to 4.5 inches (the size of a softball) (Source: National Weather Service).

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

Location

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

Extent

Severe summer weather events have the potential to create large-scale damage in Greene 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 251 high-, strong-, or thunderstorm-wind events, seven heavy rain events, three heat events, and 125 hail events recorded in Greene County from January 1995 to December 2023. These events resulted in $19,232,857 in property damage and $0 in crop damage. There was one death and no additional injuries caused by severe summer weather events in Greene County during this timeframe. The single death was caused by strong wind on August 4, 2004, when an estimated 45 mph gust caused the roof and wall of an autobody shop at a car dealership in Fairborn to collapse, killing a 38-year-old man. All severe storm events from 1995 to 2023 are summarized in Table 4.7.1, below:

Table 4.7.1: Thunderstorm-Related Events in Greene County since 1995

Severe Storm Event Type	Number of Events	Injuries	Deaths	Property Damage	Crop Damages
Hail	125	0	0	$101,000	$0
Heat	3	0	0	$0	$0
Heavy Rain	7	0	0	$0	$0
High Wind	17	0	0	$17,934,000	$0
Strong Wind	1	0	1	$60,000	$0
Thunderstorm Wind	233	0	0	$1,128,857	$0
Total:	386	0	1	$19,223,857	$0

Source: NOAA Storm Events Database

There were no disaster declarations for severe storms in Greene County since the previous hazard mitigation plan in 2020. However, the County has been subject to five Major Disaster Declarations (DR) and three emergency declarations (EM) for severe storms, flooding, hurricane (Hurricane Katrina Evacuation), and a Tropical Depression (remnants of Hurricane Ike) since January 1995. Several of the most damaging events and/or events that resulted in deaths and/or injuries are described in more detail below.

A Major Disaster Declaration for Severe Storms, Straight-line Winds, Tornadoes, Flooding, Landslides, and Mudslides, May 27, 2019:

Severe thunderstorms that produced hail up to 1.75 inches in diameter impacted areas including Byron, Cedarville, New Germany, Yellow Springs, and Zimmerman in May of 2019. These storms were part of a larger tornadic outbreak that began as far west as West Texas on May 17. As a warm front moved east into Ohio, thunderstorms developed as the evening progressed, with hail reportedly falling after 10 p.m. There were no reports of property, crop damage, injuries or deaths in Greene County.

Thunderstorm Wind Event, May 26, 2015:

Moist air and an unstable upper-level disturbance moved east through the Ohio Valley on May 26, 2015. By afternoon, scattered thunderstorms had developed with the potential for tornadoes and damaging winds. Thunderstorm winds caused minor roof damage to a few homes and downed several trees along Grange Hall Road in Zimmerman, and straight-line winds were blamed for damages near Shakertown Road. Property damages of $50,000 were reported; however, there were no reported crop damages, injuries or deaths in Greene County.

Emergency Declaration for Severe Storms, June 29, 2012:

A northwesterly flow in the upper atmosphere combined with an overly hot and unstable air mass and triggered powerful derecho storm system that quickly moved east-southeast through the Ohio Valley in June 2012, causing extensive damage. Nearly all counties in southwestern Ohio experienced straight-line winds that caused widespread power outages that in some areas lasted several days. The communities of Fairborn, Xenia and Zimmerman suffered downed trees and branches causing $3,000 in property damage, with no reports of crop damage. Additionally, no injuries or deaths were reported in Greene County.

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

The remnants of Hurricane Ike swept across the Midwest on September 14, 2008, causing widespread damage across Ohio. Sustained strong winds of 40 to 50 MPH were experienced across Greene County, with the highest observed wind gust of 63 MPH in Beavercreek. Most residents lost power, which was not fully restored for days to weeks depending on location. The storm downed hundreds, if not thousands, of trees and many utility poles, leading to the closure of numerous of roads and streets. Damage to homes and buildings was significant, with hundreds losing roofing or siding and many others damaged by fallen trees. Reported property damage from this storm totaled $17,900,000. Although crop losses occurred in other areas of Ohio, there were no reports of crop damage in Greene County. In addition, no injuries or deaths were reported in Greene County because of this event.

Strong Wind Event, August 4, 2004:

Tropical air moving northward collided with a high-pressure system resulting in severe thunderstorms across the Midwest in early August, 2004. The front of strong thunderstorms reached western Ohio on August 4, resulting in the death of a 38-year-old man in Fairborn when an estimated 45 mph gust caused the roof and wall of an autobody shop at a car dealership to collapse. No additional deaths or injuries were reported in Greene County. The storm resulted in $60,000 of property damage, with no reports of crop damage.

Thunderstorm Wind Event, July 24, 2000:

On July 24, 2000, thunderstorms across the region resulted in strong thunderstorm winds that toppled numerous trees. Some downed trees damaged homes and one home in Fairborn suffered major damage from a tree fall. Total property damage resulting in $50,000 was reported. No deaths or injuries were reported in Greene County related to this event.

Thunderstorm Wind Event, June 14, 1996:

Severe thunderstorms swept through the area in mid-June, 1996, bringing high winds that damaged the roof of the Beavercreek High School. Hail of .75-inch diameter was recorded at the Wright-Patterson Air Force Base. The total reported property damage from this event was $160,000. There were no reports of injuries, deaths or crop damage in relation to this event in Greene County.

Probability

According to the NCEI, there have been 220 severe summer storms that resulted in 386 storm events reported in Greene County from January 1995 to December 2023. This amounts to approximately eight severe storms causing an average of 13 severe summer storm events annually. Total property losses for these storm events reached $19,232,857 over the 29-year period, with an average of $663,202 annually in property damage and an average of $51,000 in property damage per event. Figure 4.7.2 below shows the trend in number of severe summer storm events per year since 1995. The year 2011 had 29 severe summer weather events, the highest of the last 29 years. Preliminary research suggests that the frequency and intensity of severe thunderstorms could increase, also increasing the number of storm events per storm as the climate changes, according to the National Climate Assessment. The Climate Change section in Future Trends discusses climate change further.

Figure 4.7.2: Severe Summer Storm Event Probability
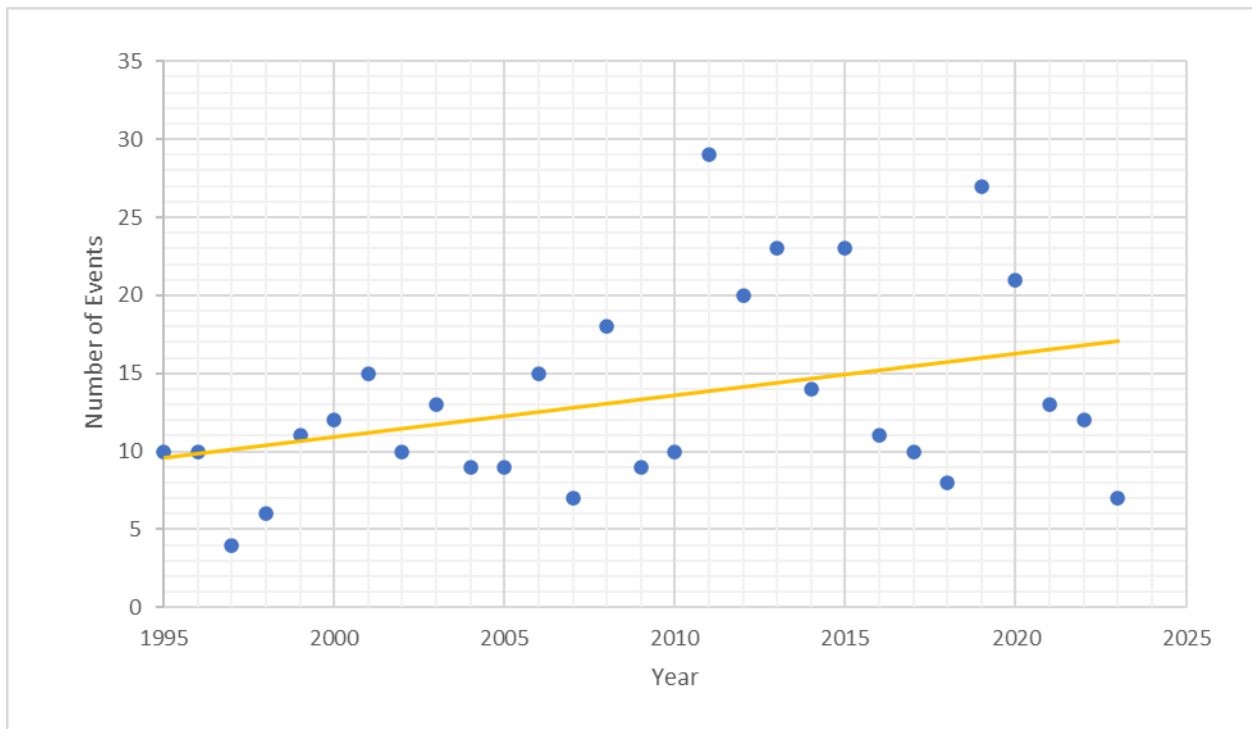
Source: NOAA

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 property damage, as well as injury 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 in the County should be prepared during a storm event. Populations residing in mobile home parks are particularly vulnerable and should seek shelter when advised.

According to the National Risk Index, social vulnerability for Greene County was considered "very low" and community resilience was "very high"; however, risk changes based on the storm event. For summer storms, community risk for hail, lightning, and strong wind events in Greene County was scored at 25.6 ("very low") for hail, 86.0 ("relatively moderate") for lightning, and 83.6 ("relatively moderate") for strong winds, when compared to the rest of the United States. This information indicates that severe summer storms are exposing the population of Greene County to a low to moderate level of risk from storm events. The index indicates an expected annual loss of $37,620 due to hail events, $525,216 due to lightning events, and $1,302,627 due to strong wind events, with 3.7, 73.3, and 2.4 events occurring per year, respectively, based on all events recorded in the NRI. Greene County's full list of census tracts can be found in Appendix E.

Property Damage

As described above, severe summer weather events, including hail, heavy rain, and high winds have caused an average of $663,202 in property damage annually since 1995. While these events have likely caused damage to crops, those damages are likely to be reported under tornados or flooding. Due to the non-site-specific nature of this hazard, **Tables 4.7.3 - 4.7.5** list all structures within Greene County as having potential impacts from severe storms.

Loss of Life

There has been one death in Greene County since 1995. There is always 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. Potential economic losses and damage associated with Greene County for hail, strong wind events, and lightning are recorded in **Tables 4.7.3 to 4.7.5** below. This table summarizes the population from 2020, building value, expected annual loss (EAL) for buildings, and expected annual loss (EALP) for population equivalence in Greene County. The top 20 most vulnerable census tracts according to FEMA's National Risk Index are used for the calculations. EAL for buildings and population combine the totals from hail, strong wind events, and lightning. Compared with other hazards, severe summer weather has a very low index rating, meaning that economic loss due to severe summer weather is very low for Greene County.

Table 4.7.3: 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)
39057260100	$671	$309	$3,405	$4,384
39057280102	$353	$106	$2,423	$2,881
39057270100	$385	$172	$1,142	$1,699
39057210603	$876	$376	$333	$1,585
39057230100	$352	$114	$1,029	$1,495
39057240600	$523	$246	$624	$1,394

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Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39057210500	$794	$299	$122	$1,215
39057220102	$573	$221	$401	$1,195
39057280101	$281	$121	$782	$1,184
39057280200	$223	$64	$886	$1,173
39057240700	$349	$123	$489	$962
39057200104	$605	$240	$62	$907
39057210602	$627	$246	$0	$873
39057210604	$564	$264	$19	$847
39057240500	$477	$213	$140	$829
39057200902	$342	$168	$316	$826
39057220101	$524	$194	$94	$812
39057210101	$616	$179	$0	$795
39057240302	$397	$187	$196	$781
39057210401	$510	$248	$0	$758
Grand Total	**$10,042**	**$4,090**	**$12,463**	**$26,595**

Source: FEMA National Risk Index

Table 4.7.4: 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)
39057210603	$1,342	$22,657	$0	$23,999
39057260100	$1,120	$20,349	$0	$21,468
39057210500	$1,260	$18,695	$0	$19,955
39057210604	$937	$17,139	$0	$18,076
39057200104	$1,036	$16,411	$0	$17,447
39057200500	$481	$15,831	$0	$16,312
39057210602	$980	$15,084	$0	$16,064
39057240600	$820	$15,214	$0	$16,034
39057210402	$728	$15,276	$0	$16,004
39057210401	$794	$15,085	$0	$15,880
39057200700	$324	$14,073	$0	$14,397
39057210201	$602	$13,585	$0	$14,187

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39057220102	$876	$13,192	$0	$14,068
39057200901	$643	$12,914	$0	$13,557
39057240500	$723	$12,642	$0	$13,365
39057240200	$485	$12,740	$0	$13,225
39057220201	$740	$12,290	$0	$13,030
39057210101	$1,043	$11,981	$0	$13,023
39057200600	$489	$11,950	$0	$12,440
39057200300	$489	$11,932	$0	$12,420
Grand Total	**$15,912**	**$299,040**	**$0**	**$314,951**

Source: FEMA National Risk Index

Table 4.7.5: 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)
39057210603	$53,705	$13,700	$107	$67,512
39057210500	$48,694	$10,880	$39	$59,613
39057260100	$38,086	$10,391	$1,009	$49,486
39057210602	$38,439	$8,967	$0	$47,406
39057200104	$37,122	$8,729	$20	$45,870
39057210101	$37,788	$6,517	$0	$44,305
39057210604	$34,599	$9,600	$6	$44,205
39057240600	$32,059	$8,954	$199	$41,211
39057220102	$33,206	$7,623	$118	$40,947
39057210401	$31,264	$9,036	$0	$40,301
39057220101	$31,613	$6,951	$30	$38,594
39057210402	$28,564	$9,095	$0	$37,659
39057240500	$29,253	$7,743	$45	$37,041
39057220201	$27,764	$6,986	$0	$34,750
39057210300	$25,794	$6,406	$5	$32,206
39057240302	$24,324	$6,819	$63	$31,206
39057200901	$23,737	$7,179	$22	$30,938
39057210201	$22,919	$7,836	$0	$30,755
39057280300	$27,519	$2,742	$5	$30,267

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Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39057255000	$22,179	$6,166	$9	$28,355
Grand Total	**$648,628**	**$162,320**	**$1,677**	**$812,627**

Source: FEMA National Risk Index

Future Trends

Land Use and Development Trends

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

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

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

Climate Change

Preliminary research suggests that the frequency and intensity of severe thunderstorms could increase as the climate changes, according to the National Climate Assessment. A warming climate may also increase the number of days with conditions conducive to a severe thunderstorm. Future modeling techniques could reveal additional information about the correlation between atmospheric changes and severe thunderstorm formation and intensity.

4.8   Severe Winter Weather

Description

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

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

1. Below freezing temperatures in the clouds and near the ground, which are necessary to make snow and ice.

2. Lift, which raises the moist air from the clouds and causes precipitation. Warm air colliding with cold air and being forced to rise over the cold is an example of lift.

3. Moisture is needed to form clouds and precipitation. Air blowing across a body of water is a common source of moisture.

Winter storms are categorized by their type: blizzards, ice storms, lake effect storms, and snow squalls. Extreme cold events often accompany winter storms, bringing low temperatures and higher risks of frostbite and hypothermia.

- **Blizzards** are winter storms that are a combination of blowing snow and wind which lead to very low visibility. Heavy snowfalls and severe cold often accompany blizzards, but this is not required. Ground blizzards occur when strong winds pick up snow that has already fallen.

- **Ice Storms** occur when at least a quarter inch of ice accumulates on exposed surfaces. Roads and sidewalks can become dangerously slick, and trees and powerlines can easily break under the weight of accumulated ice.

- **Lake Effect Storms** are cold, dry air masses that move over the Great Lakes regions and drop the moisture as snow in the northeastern portion of Ohio near the Great Lakes area.

- **Snow Squalls** are brief, intense snow showers accompanied by strong winds. Impacts may be significant.

- **Extreme Cold Events** occur when temperatures drop below normal for the given area, and they generally coincide with winter storms or are the lasting effect of a winter storm.

Location

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

Extent

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

History

There have been at least 125 winter storm events, including cold/wind chill, extreme cold/wind chill, heavy snow, ice storm, winter storm, and winter weather in Greene County since January 1995. These events caused $546,000 in property damage and $540,000 in crop damage according to the National Centers for Environmental Information (NCEI). An extreme cold/wind chill event on December 21,

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2008, caused the death of one person in Greene County due to prolonged exposure. All severe winter weather and extreme cold events from 1995 to 2023 are summarized in **Table 4.8.1,** below:

Table 4.8.1: Severe Winter Related Events in Greene County since 1995

Severe Storm Event Type	Number of Events	Deaths	Injuries	Property Damage	Crop Damage
Cold/Wind Chill	1	0	0	$20,000	$0
Extreme Cold/Wind Chill	3	1	0	$0	$540,000
Frost/Freeze	1	0	0	$0	$0
Heavy Snow	11	0	0	$1,000	$0
Ice Storm	5	0	0	$0	$0
Winter Storm	25	0	0	$525,000	$0
Winter Weather	79	0	0	$0	$0
Grand Total	**124**	**1**	**0**	**$546,000**	**$540,000**

Source: NOAA Storm Events Database

Greene County has not had a federal disaster declaration for winter storms since the previous hazard mitigation plan in 2020. However, the County has been subject to four Emergency Declarations for snowstorms, and one Disaster Declaration for a severe winter storm/record/near record snow since 1968. Several of the most damaging events and/or events that resulted in deaths and/or injuries are described in more detail below. These events are not necessarily the most recent, and all events are listed individually in **Appendix A.**

Extreme Cold/Windchill Event, December 21, 2008:

Severe cold weather was responsible for the death of a Greene County woman found outside of her home on Sunday, December 21st. No property damage or crop damage amounts were reported.

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

A low-pressure system along the Gulf Coast blanketed northeast and north-central Ohio with 5 to 20 inches of snow, with Greene County receiving 15.4 inches over two days. Wind gusts of 20-30 MPH led to intermittent blizzard conditions and snow drifts of 3 feet or more causing numerous accidents. No property damage or crop damage amounts were reported. No injuries or deaths were reported in Greene County. An emergency declaration (EM-3286-OH) was issued on April 24, 2008, offering public assistance to 20 counties in Ohio, including Greene County.

Frost/Freeze Event, April 6, 2007:

Temperatures rose in the Ohio Valley in mid-March, allowing for the agricultural season to start early. In April, temperatures dropped into the 20s, threatening crops throughout Ohio. Overall, crop damage was estimated at 16.74 million for 31 counties in Ohio. There was $540,000 in crop damage was reported. No deaths or injuries were reported.

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

A unique and unusual combination of an Arctic cold front, warm and humid air mass, and a low-pressure center from the southern Great Plains collided in the Ohio River Valley resulting in a historic snow and ice storm that hit Illinois, Indiana, Kentucky, and Ohio. Snowfall rates in some areas were up to two inches per hour accumulating over 30 hours to over 2 feet of snow, setting new records across Illinois, Indiana, and western Ohio. The heavy snow caused damage and collapsed the roofs of homes and businesses across the region. Additionally, a secondary ice storm along the snowstorm's

southern edge in Kentucky and Ohio. Together the snow, ice, and blizzard conditions from wind gusts of up to 30 MPH paralyzed highway, airline, and train traffic, stranding thousands of people. Record low temperatures made recovery and clean-up efforts more difficult. The resulting property damage and clean-up costs were historic and over $100 million for the state of Ohio, second only to the Blizzard of 1978. Although there were many injuries and 17 deaths reported, there were no reports of injury to death in Greene County. An emergency declaration (EM-3198-OH) was issued on January 11, 2005, offering public assistance to 26 counties in Ohio, including Greene County.

Major Disaster Declaration for Severe Winter Storm and Record/Near Record Snow, February 14, 2003 – March 3, 2003:

Abundant moisture from a warm front and low-pressure mixed with surface cold air resulting in 6-8 inches of snowfall across Ohio, with the highest accumulation along I-70. Greene and several other counties received record or near record snowfall. Counties in southern Ohio also saw some ice accumulation. On March 14, 2003, a major disaster declaration (DR-1453-OH) was issued for blank counties, including Greene County. Greene County was eligible for public assistance. No deaths or injuries were reported.

Winter Storm Event, January 6-8, 1996:

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

Emergency Declaration for Bliazzards & Snowstorms, January 26, 1978:

On January 26, 1978, an emergency declaration (EM-3055-OH) was issued for every county in Ohio due to Blizzards and snowstorms. Every county in Ohio was able to receive public assistance.

Emergency Declaration for Snowstorms, February 2, 1977:

On February 2, 1977, an emergency declaration (EM-3029-OH) was issued for 47 counties in Ohio, including Greene County due to snowstorms. Each of the 47 counties was able to receive public assistance.

Probability

According to the NCEI, there have been a total of 124 severe winter storm events reported in Greene County from January of 1995 to December 2023, with total losses amounting to $546,000 in property damage. Averaged over those 29 years, there were approximately 4.3 winter storm events annually with average annual damages of $18,828. **Figure 4.8.2** shows the trend of severe winter weather events over time between January 1995 and December 2023. The trend line increases over the 29 years and begins to slowly level off from 2020. According to the Fifth National Climate Assessment, due to the warming climate, extreme winter weather will be less severe and less frequent in Ohio, and heavy snowfall will manifest as heavy rainfall in future years. The Climate Change section in Future Trends discusses climate change further.

Figure 4.8.2: Severe Winter Weather Probability
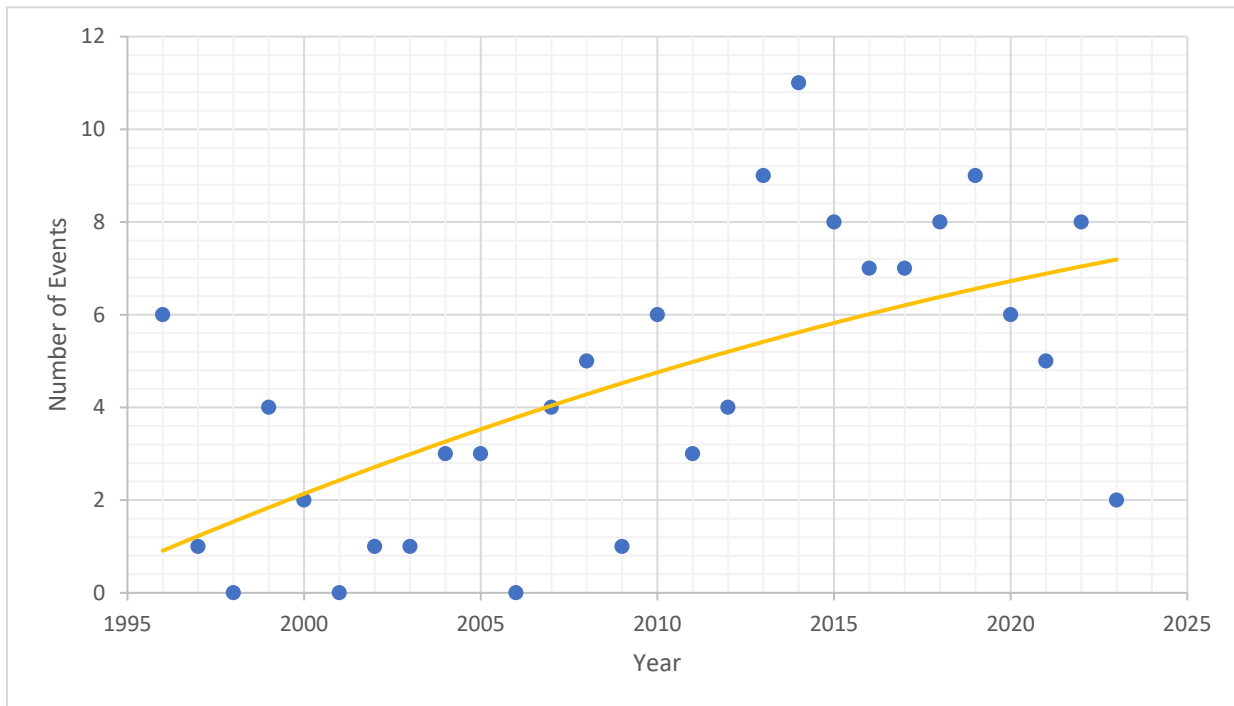
Vulnerability Assessment

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 being iced over. Bridges and overpasses are particularly dangerous because they freeze before other surfaces. Heavy snow fall and accumulation can cause business and private homes to have partial or full roof collapses. The State of Ohio Hazard Mitigation Plan 2024 estimates the annual probability of 5.1 severe winter storms annually.

Population Impact

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

For social vulnerability, according to FEMA's National Risk Index, Greene County was scored a 16.23 ("very low") to the adverse impacts of all natural hazards, compared to the rest of the U.S. In addition, the index calculates a 55.7/100 ("relatively low") risk score of a cold wave event with an expected annual loss of $75,000, a score of 97.6/100 ("very high") risk of ice storms with an expected annual loss of $2,000,000, and a 81.3/100 ("relatively moderate") risk of winter weather events with an annual loss of $186,000 expected for Greene County.

Property Damage

Property can be damaged by accumulated snow and ice, debris, and falling trees and utility poles. Extreme low temperatures can also freeze the water in pipes which could cause them to explode. All buildings in the County are exposed and vulnerable to winter storms. The State of Ohio Hazard Mitigation Plan 2024 estimates annual potential losses due to damage caused by winter storms in Greene County to be $569,857.

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 was one reported death during the extreme cold/wind chill event December 21, 2008, due to prolonged exposure in Greene County. Most common causes of death from winter events are vehicular accidents from iced-over and dangerous roads, frostbite or hypothermia from prolonged exposure to cold, heart attacks from heavy snow shoveling, and carbon monoxide poisoning due to toxic fumes from heating sources.

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

Economic Losses

Economic losses can occur from businesses shutting down for potentially long periods of time, structural damage, and death and injury. Economic activity can be completely halted during winter storms including transportation of goods and people. Electricity outages may lead to spoiled goods. Since winter storms occur during the winter season, damage to crops is unlikely but possible. Damaged buildings and pipes, fallen trees and power lines, and costs to repair damages and remove snow further impact the economy of cities and towns. Additionally, deaths and injuries can lead to economic losses for a community. **Table 4.8.3-4.8.5** shows the total value of economic impacts expected in Greene County from winter hazard events.

The table below shows the 20 census tracts with the highest total EAL (expected annual loss) from severe winter events. 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 Greene County. Expected losses for buildings, population ($11.6 million for each fatality or 10 injuries), and agriculture per census tract for cold wave, ice storm, and winter weather events.

Table 4.8.3: 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)
39057260100	$105	$1,553	$9,011	$10,669
39057280102	$55	$532	$6,435	$7,022
39057270100	$60	$863	$3,028	$3,951
39057230100	$55	$572	$2,716	$3,343

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39057240600	$80	$1,199	$1,606	$2,884
39057210603	$133	$1,832	$854	$2,818
39057280101	$44	$610	$2,070	$2,724
39057280200	$34	$316	$2,295	$2,645
39057220102	$88	$1,090	$1,055	$2,234
39057240700	$53	$602	$1,260	$1,915
39057210500	$121	$1,455	$314	$1,889
39057200902	$52	$817	$812	$1,681
39057240302	$60	$913	$504	$1,477
39057240500	$72	$1,035	$358	$1,466
39057200104	$92	$1,167	$159	$1,418
39057210604	$86	$1,283	$49	$1,418
39057210602	$95	$1,199	$0	$1,294
39057210402	$71	$1,216	$1	$1,287
39057210401	$77	$1,208	$0	$1,286
39057220101	$80	$949	$242	$1,270
Grand Total	**$1,514**	**$20,409**	**$32,769**	**$54,692**

Source: FEMA National Risk Index

Table 4.8.4: 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)
39145003600	$99,468	$4,780	$0	$104,248
39145003800	$90,186	$3,796	$0	$93,983
39145002400	$71,193	$3,129	$0	$74,322
39145002800	$68,970	$3,543	$0	$72,513
39145003100	$69,987	$2,274	$0	$72,261
39145002100	$68,754	$3,046	$0	$71,799
39145002200	$67,093	$2,881	$0	$69,974
39145002300	$64,081	$3,350	$0	$67,431
39145003700	$60,013	$2,486	$0	$62,499
39145002902	$59,355	$3,123	$0	$62,479

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39145002600	$57,905	$3,153	$0	$61,058
39145004000	$57,891	$2,750	$0	$60,641
39145002700	$54,180	$2,702	$0	$56,882
39145003400	$52,904	$3,173	$0	$56,077
39145003000	$50,969	$957	$0	$51,926
39145003300	$47,774	$2,235	$0	$50,009
39145003500	$45,104	$2,382	$0	$47,487
39145002500	$43,963	$2,505	$0	$46,468
39145003900	$42,448	$2,734	$0	$45,182
39145002901	$42,420	$1,420	$0	$43,840
Grand Total	**$1,214,658**	**$56,419**	**$0**	**$1,271,077**

Source: FEMA National Risk Index

Table 4.8.5: 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)
39057210603	$2,760	$6,222	$9	$8,990
39057210500	$2,181	$5,275	$94	$7,550
39057210602	$2,502	$4,941	$3	$7,446
39057260100	$1,778	$4,360	$1	$6,138
39057210101	$1,975	$4,072	$0	$6,048
39057200104	$1,908	$3,964	$2	$5,873
39057220102	$1,650	$4,072	$17	$5,740
39057210604	$1,607	$4,104	$0	$5,710
39057220101	$1,468	$4,131	$0	$5,598
39057240600	$1,837	$3,703	$11	$5,551
39057210401	$1,577	$3,513	$0	$5,091
39057220201	$1,503	$3,516	$4	$5,023
39057240500	$1,942	$2,960	$0	$4,902
39057210402	$1,659	$3,223	$3	$4,884
39057280300	$1,178	$3,559	$0	$4,737
39057210300	$864	$3,809	$0	$4,673
39057240302	$1,029	$3,623	$0	$4,653

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39057200901	$1,220	$3,260	$2	$4,482
39057210201	$1,251	$3,100	$5	$4,357
39057280102	$1,325	$2,909	$0	$4,235
Grand Total	**$33,214**	**$78,317**	**$150**	**$111,681**

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

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

Climate Change

According to the Midwest chapter of the Fourth National Climate Assessment, the average Midwest air temperature increased by more than 1.5 degrees Fahrenheit between 1900 and 2010. In recent years, however, warming has increased three times as quickly between 1980 and 2010. By the end of 2030, Ohio's climate may trend towards the climate of Southern Illinois. By 2100, Ohio might feel like Arkansas or Texas. As a result, the warming climate 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.

4.9   Tornadoes and Severe Wind

Description

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

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

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

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

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

Location

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

Extent

Tornadoes are measured by the amount of damage caused by a certain wind speed, assuming greater wind speeds will result in greater damage. The original Fujita Tornado Damage Scale (F-scale) was developed in 1971 without much consideration to a building or structure's integrity or condition as it relates to the wind speed required to damage it. The Enhanced Fujita-scale (EF-Scale) took effect on February 1, 2007. This scale retains the original F-scale's F0 through F5 wind ratings and classifies tornado damage across 28 different types of damage indicators. These indicators mostly involve building/structure type and are assessed at eight damage levels from 1 through 8. Therefore, construction types and their relative strengths and weaknesses are incorporated into the EF classification given to a particular tornado. The most intense damage along with the type of

construction affected within the tornado path will generally determine the EF scale rating given to the tornado. **Table 4.9.1** 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 the National Oceanic and Atmospheric Administration (NOAA) or NWS have re-evaluated the historical tornado data using the enhanced scale; therefore, this assessment and subsequent plans will reference both scales until a complete switchover has occurred.

Table 4.9.1: 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 4.9.2 simulates an extremely destructive, worst-case scenario EF5 tornado and its impacts on Greene County assets and infrastructure.

Figure 4.9.2: Worst Case Tornado Scenario
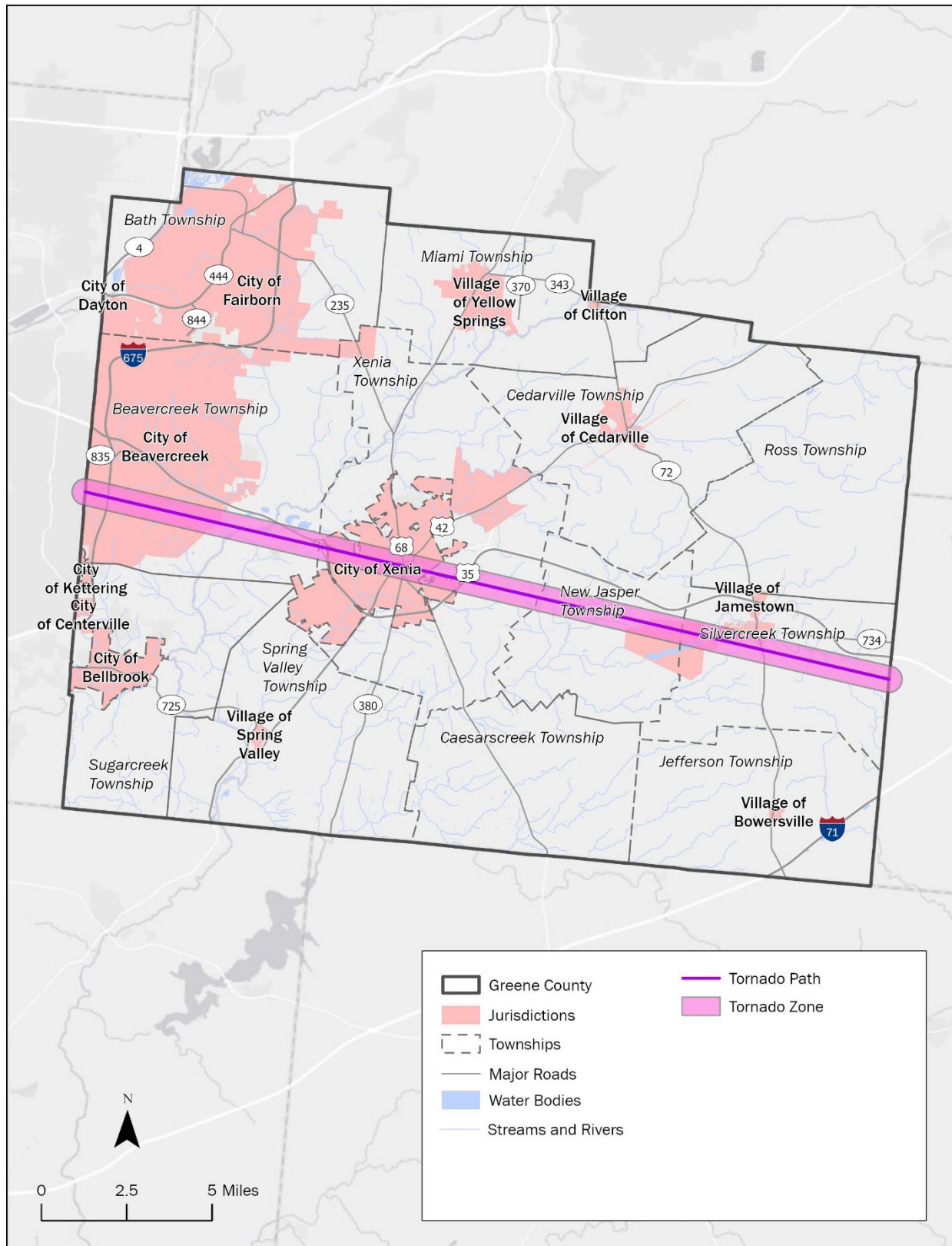
History

There have been 11 tornado events, two of which caused three tornadoes each, in Greene County between January 1995 and December 2023. Greene County has had four Major Disaster Declarations for Severe Storms, Tornadoes, Windstorms, and Straight-Line Winds. The tornadoes caused an estimated $67.1 million in property damage, one death, and 102 injuries. The high and strong wind events caused an estimated $18 million in property damage and one death. Several of the most damaging events, events that resulted in deaths and/or injuries, and events with emergency or major disaster declarations are described in more detail below.

A Major Disaster Declaration for Severe Storms, Straight-line Winds, Tornadoes, Flooding, Landslides, and Mudslides, May 27, 2019 – May 29, 2019:

In May 2019, a tornado outbreak lasted about two weeks, producing 400 tornadoes across multiple states. Between May 27 and May 29, 19 tornadoes occurred in Ohio. A thunderstorm developed in the evening hours of May 27, 2019, producing many destructive tornadoes. Three tornadoes developed and traveled through Greene County. An EF3 tornado touched down in Montgomery County and traveled through western and central Greene County, completely lifting several roofs and destroying outside walls of several buildings. Several homes on Rushton Drive had entire roofs lift off and several buildings had exterior walls destroyed with only interior walls standing. There were homes along Gardenview and Wendover Drives that had garage doors destroyed, roofs collapsed and/or removed. An EF1 tornado touched down on Lackey Road, damaging trees and causing minor structural damage to a building's roof and siding. Multiple large tree limbs were downed and a power pole was knocked down. A carport was destroyed and there was mud splatter on several homes, with some roof and siding damage. A EF0 tornado touched down along South Charleston Road, damaging roofs, interior walls, and trees along Rogers Road and Watkins Road. In the Beavercreek an apartment complex had large sections of roofs removed and upper level's exterior walls collapsed. Several businesses had partially collapsed walls and roof lift off near North Fairfield Road. According to the Regional Planning Commission there were 1,182 Green Count properties damaged by the tornadoes. A Major Disaster Declaration (DR-4447-OH) was declared on June 18, 2019, offering individual assistance to eight counties, public assistance to one county, and both individual and public assistance to three counties. Greene County was offered both individual and public assistance. Greene County reported approximately $50.3 million in property damage. No deaths were reported in Greene County.

An EF1 Tornado in Greene County, May 26, 2015:

An EF1 tornado touched down at the Greene Crossing Shopping Center on Indian Ripple Road, lifting at least five cars in late May 2015. Two individuals sustained injuries when tornados rolled their cars. As many as 22 vehicles were damaged, along with Fitworks (a local gym). An HVAC unit was also pushed off of a rooftop. The tornado traveled northeast, damaging several home roofs and downing numerous trees. Greene County reported approximately $750,000 in property damage. No deaths or additional injuries were reported in Greene County.

An EF3 Tornado in Greene County, May 14, 2014:

In May 2014, an EF3 tornado touched down west of Stringtown Road and traveled across Highway 35 and Federal Road, significantly damaging a barn. The tornado then traveled across Highway 72 where it damaged a property, destroying outbuildings and several fences. Roof damage was seen on one residential home and several barns. A trailer was also tipped over. The tornado intensified as it traveled past a stone quarry, hitting an 1880 home head on and destroying the house. The tornado then crossed Barber Road where it caused significant damage to another residence. Greene County reported approximately $500,000 in property damage. No deaths or injuries were reported in Greene County.

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

The remnants of Hurricane Ike moved northeast with a frontal boundary across the lower Ohio Valley in September 2008. Wind gusts of up to 70 mph were observed, causing significant damage and widespread power outages. Sustained winds were observed up to 50 mph and lasted for several hours. A Major Disaster Declaration (DR-1805-OH) was declared on October 24, 2008, offering public assistance to 33 counties, including Greene County. The County reported approximately $17.9 million in property damage. No deaths or injuries were reported in Greene County.

Strong Wind Event in Greene County, August 4, 2004:

In early August 2004, strong winds with gusts up to 45 mph caused significant roof and wall damage to a body shop in the Village of Fairborn. The wall collapsed on a 38-year-old man, leading to his death. Greene County reported approximately $60,000 in property damage. No additional deaths or injuries were reported in the County.

A Major Disaster Declaration for Severe Storms and Tornado, September 20, 2000:

On September 20, 2000, a dangerous and violent tornado touched down in Sugarcreek Township, and traveled through Beavercreek Township, the City of Xenia, and Xenia Township. The EF4 tornado traveled at 65 miles per hour (mph) for eight to nine miles. The tornado destroyed and/or damaged over 250 homes, 40 businesses, and six churches. The tornado picked up and tossed cars along US-35, and four semi-trailers were thrown up to 400 yards. In Sugarcreek Township, the tornado damaged 14 homes and three barns. Along the path, many electric poles were downed, causing over 10,000 people to be without power for at least a day. A Major Disaster Declaration (DR-1343-OH) was declared on September 26, 2020, offering public and individual assistance to Greene County. The County reported one death and 100 injuries, along with approximately $15 million in property damage. No additional information is available.

A Major Disaster Declaration for Tornadoes, April 4, 1974:

In early April 1974, a super outbreak of tornadoes occurred across central and eastern U.S. and parts of Canada. A total of 148 tornadoes were confirmed, 30 of which were EF4 and EF5. There were 335 direct deaths and over 6,000 injuries across 13 U.S. states and Ontario, Canada. An EF5 tornado struck the City of Xenia, causing devastating damage to homes and businesses. The tornado caused 33 deaths and hundreds of injuries in the City of Xenia. A Major Disaster Declaration (DR-421-OH) was declared on April 4, 1974, offering public and individual assistance to 14 counties, including Greene County.

Probability

There were 11 tornado events in Greene County between January 1995 and December 2023 resulting in a total of $67 million in property damage. There were 18 strong wind or high wind events between January 1995 and December 2023, resulting in a total of $18 million in property damage. On average that equates to .48 tornadoes and .62 wind events a year, with an average of $2.3 million in property damage for tornadoes and $620,793 in property damage for wind events.

Although it is difficult to predict future tornado activity, a study completed in 2018 on spatial trends of tornadoes saw an eastward shift in tornado frequency. Two other studies (2015 and 2016) showed an increase in tornado frequency in the eastern United States and a decrease in tornado activity in central United States. The study published in 2016 on spatial redistribution of tornado activity stated that there is a documented increase in hazardous conductive weather (HCW) in the lower Ohio valley regions. The studies do note that the number of tornadoes produced from a single storm is increasing. For instance, in 2020 there were 20 documented tornadoes in Ohio, seven tornadoes from one storm and five tornadoes from another. In Greene County, there were two events that caused three tornadoes each.

Vulnerability Assessment

Infrastructure Impact

Above-ground infrastructure can be damaged by tornadoes. Debris lofted airborne by tornadoes as well as fallen trees can cause damage to buildings and infrastructure and lead to road closures. Above ground utility infrastructure can be damaged or destroyed, which can cause service outages.

Population Impact

Tornadoes are random in nature and have the potential to occur anywhere in the County. Everyone within the County should be prepared for a tornado. Residents in mobile home parks are particularly vulnerable and should have a plan in place.

For social vulnerability, according to the National Risk Index, tornadoes and strong winds have a score of 81.2 ("relatively moderate") and 83.6 ("relatively moderate") in Greene County. The index indicates an expected annual loss of $4.4 million due to tornadoes and $1.3 million due to strong winds, with 0.3 and 2.4 events occurring per year, respectively.

Property Damage

Tornadoes that have occurred in Greene County are generally weaker, rated EF-2 or lower; however, even weaker tornadoes can cause significant damage to property. In the last 29 years the property damage in Greene County has included homes, businesses, mobile homes, roofs, windows, siding, powerlines, and tree damage. About 25 percent of the tornadoes that have hit Greene County have been rated EF3 or higher. Two tornado events have caused the bulk of approximately $65 million in property damage. One event in 2019, which produced three tornadoes, caused $50.3 million and another event in 2000, which produced one tornado, caused $15 million.

Wind damage in Greene County has included homes, businesses, roofs, siding, trees, and powerlines. Most of the wind events cause little to no damage, however, one event caused $17.9 million in property damage.

Loss of Life

There has been one reported death and 102 injuries a result of tornadoes in Greene County since 1995. In addition, there were 33 reported deaths and hundreds of injuries directly related to the tornado of 1974. There has been one death as a result of high/strong wind since 1995. Loss of life and injuries are always possible during tornadoes and strong wind events. Falling debris is the main the cause of death in a tornado, along with becoming airborne.

Economic Losses

Tornadoes and strong winds have the potential to damage infrastructure, resulting in the economic burden of clean up and repairs, as well as the economic loss from deaths and injuries. Expected annual loss (EAL) rates, calculated by FEMA, identify the total value of loss expected each year for a particular community, in this case Greene County census tracts. Potential economic losses and damage associated with Greene County for tornadoes and strong wind are recorded in **Tables 4.9.3 and Table 4.9.4** below. The tables show the top 20 census tracts with expected losses for buildings, population ($11.6 million for each fatality or ten injuries), and agriculture per census tract from tornadoes and strong winds, listing them from highest total EAL to lowest. Additional census tracts can be found in **Appendix E**.

Table 4.9.3: 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)
39057210603	$165,544	$61,681	$30	$227,255

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Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39057210500	$150,083	$48,984	$13	$199,080
39057210602	$118,456	$40,373	$0	$158,829
39057200104	$114,398	$39,299	$6	$153,703
39057260100	$110,329	$42,698	$238	$153,264
39057210604	$106,622	$43,223	$2	$149,846
39057220102	$110,338	$37,041	$37	$147,416
39057210101	$116,448	$29,342	$0	$145,790
39057240600	$98,704	$40,272	$52	$139,028
39057210401	$96,345	$40,685	$0	$137,029
39057220101	$99,515	$32,039	$8	$131,562
39057220201	$94,816	$35,291	$0	$130,107
39057210402	$88,025	$40,949	$0	$128,974
39057240500	$90,148	$34,861	$12	$125,021
39057210300	$79,489	$28,844	$1	$108,334
39057210201	$70,627	$35,282	$0	$105,908
39057240302	$75,035	$30,740	$16	$105,791
39057200901	$73,148	$32,323	$6	$105,478
39057240200	$61,698	$35,920	$1	$97,620
39057280300	$84,996	$12,350	$2	$97,347
Grand Total	**$2,004,762**	**$742,197**	**$424**	**$2,747,382**

Source: FEMA National Risk Index

Table 4.9.4 Structure and Population Vulnerability from Strong Winds

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39057210603	$53,705	$13,700	$107	$67,512
39057210500	$48,694	$10,880	$39	$59,613
39057260100	$38,086	$10,391	$1,009	$49,486
39057210602	$38,439	$8,967	$0	$47,406
39057200104	$37,122	$8,729	$20	$45,870
39057210101	$37,788	$6,517	$0	$44,305
39057210604	$34,599	$9,600	$6	$44,205

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Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39057240600	$32,059	$8,954	$199	$41,211
39057220102	$33,206	$7,623	$118	$40,947
39057210401	$31,264	$9,036	$0	$40,301
39057220101	$31,613	$6,951	$30	$38,594
39057210402	$28,564	$9,095	$0	$37,659
39057240500	$29,253	$7,743	$45	$37,041
39057220201	$27,764	$6,986	$0	$34,750
39057210300	$25,794	$6,406	$5	$32,206
39057240302	$24,324	$6,819	$63	$31,206
39057200901	$23,737	$7,179	$22	$30,938
39057210201	$22,919	$7,836	$0	$30,755
39057280300	$27,519	$2,742	$5	$30,267
39057255000	$22,179	$6,166	$9	$28,355
Grand Total	**$648,628**	**$162,320**	**$1,677**	**$812,627**

Source: FEMA National Risk Index

Future Trends

Land Use and Development Trends

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

The vulnerability of structures and populations to tornado damage is related to the number and age of buildings and population density, such that older buildings with more people increases vulnerability, and fewer buildings and people reduces vulnerability. Much of Greene County is nonresidential including rangeland, forest, cropland and pasture, with only 22.23 percent either residential or industrial/commercial, reducing the risk of much of the County to tornado damage.

Climate Change

While rainfall, heat, and drought have clear links to climate change, the link between climate change and tornadoes is not yet fully understood. Tornado records in the United States typically only go back as far as the 1950's, 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, although not yet linked directly to climate change. 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 eastwards, 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 the effects of climate change on severe storms 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 will increase in a warming climate.

4.10 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), Greene County is in Region 2 and falls outside the Ohio Department of Natural Resources (ODNR) Division of Forestry's Forest Fire Protection Area (**Figure 4.10.1**). All but eight counties in Region 2 fall outside the ODNR Division of Forestry wildfire protection area. Region 2 is home to the most developed metropolitan areas and has the highest population density. Due to the urban areas, grasslands and woodlands are not as abundant, reducing the potential for large-scale wildfires.

Extent

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

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

History

The SOHMP identifies 75 total fire events from 2018 to 2022, with an average of 2.78 acres burned per incident. These events burned a total of 80 acres.

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

Probability

According to the State of Ohio Hazard Mitigation Plan, there is a 100 percent probability that a wildfire will occur within any county in any given year. Based on the reported 75 fire events in Greene County from 2018 to 2022, an average of approximately five fire events is estimated to occur annually in the County. In addition, according to the U.S. Environmental Protection Agency, the average total area burned by wildfires has increased since the 1980s, and the record-breaking fires tend to occur during record-breaking warm years. The Climate Change section in Future Trends discusses climate change further.

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Figure 4.10.1: Ohio Wildfire Protection Areas
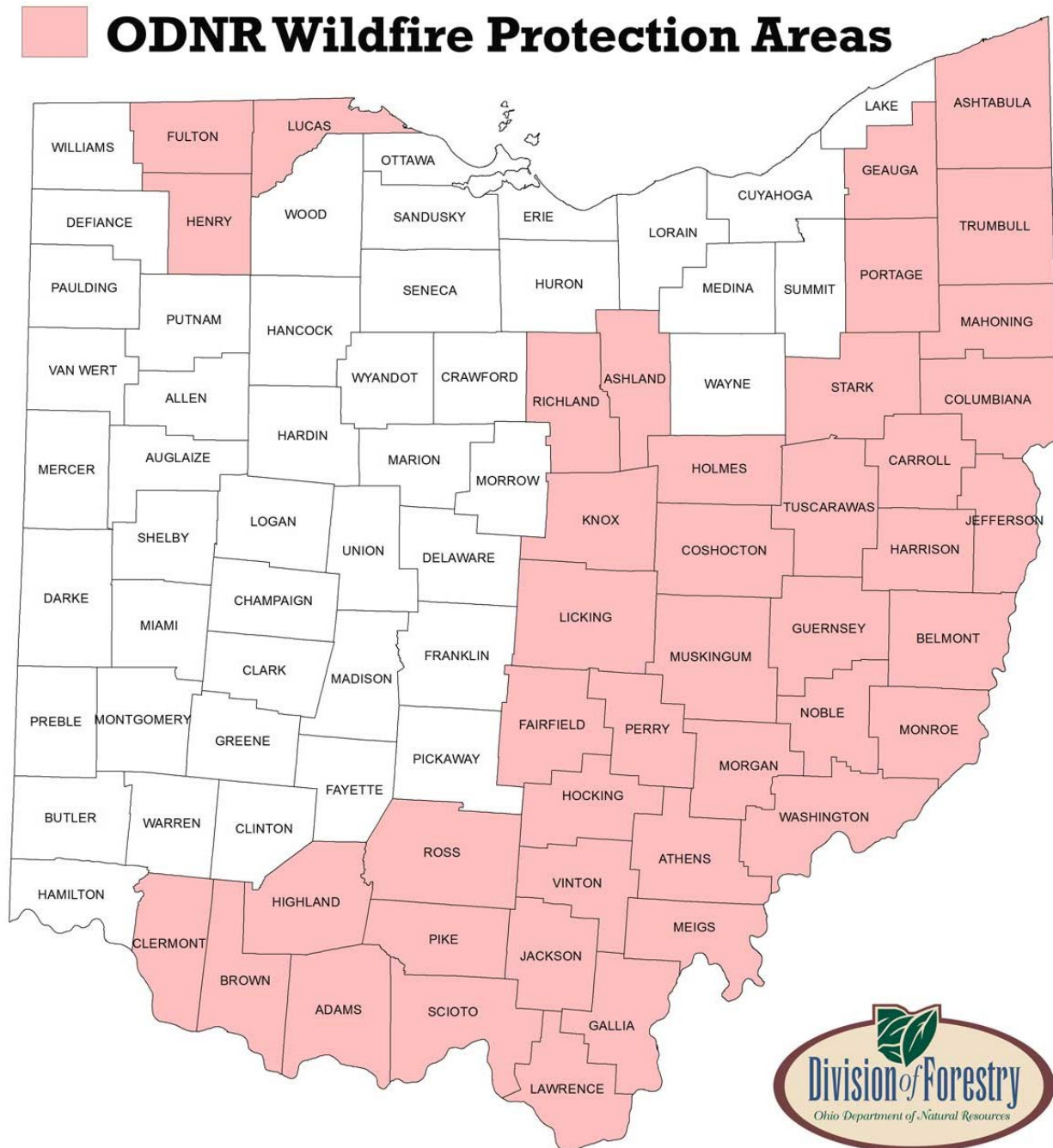
Source: ODNR Ohio Division of Forestry

Vulnerability Assessment

Infrastructure Impact

According to the USDA Forest Service Wildfire Risk to Communities, a free website with interactive maps and charts, Greene County has a low risk of wildfire damage to homes.

Population Impact

If a wildfire occurs within the County, the entire population could be impacted by the loss of homes, infrastructure, and crops. Large portions of Greene County are used for agriculture, increasing the risk of economic loss to farms in spring, fall, and during drought. A growth in the number of houses in forested areas is expanding the Wildland Urban Interface (WUI), putting more structures within areas of continuous vegetation and increasing the potential for loss. Furthermore, some residents may be more vulnerable because they tend to experience more difficulty preparing for, responding to, and recovering from wildfire. The **USDA Forest Service Wildfire Risk to Communities** identifies areas that have a greater risk (medium) to wildfire. The vulnerable populations are children under the age of five and people who are Black, Native American, and/or Hispanic. Race and ethnicity are correlated with disparities in access to aid, resources and health.

According to the National Risk Index, calculated by FEMA, Greene County's risk score for wildfires is 51.1 ("very low") compared to all other U.S. counties, based on its relatively moderate social vulnerability and community resilience, and very low expected annual loss. The index indicates an expected annual loss of $52,000 due to wildfires.

Property Damage

There were 75 recorded wildfire events between 2018 and 2022 in Greene County, burning approximately 80 acres. There were no structures threatened or destroyed. It is assumed that the County has experienced some crop damage because of wildfires, however that data was not available. Occasionally, in the event of a wildfire, fire engines belonging to local fire departments can be damaged while suppressing wildfires, although there are no reports of this in Greene County. Potential economic losses and damage associated with Greene County for wildfires are recorded in **Table 4.10.2** below.

The table shows the 20 census tracts with the highest total EAL (expected annual loss) from wildfires, listed from highest total EAL to lowest. 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 Greene County.

Table 4.10.2: Structure and Population Vulnerability from Wildfires

Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39057210603	$3,697	$301	$0.2	$3,998
39057210500	$3,465	$242	$0.1	$3,707
39057220102	$3,322	$236	$0.2	$3,558
39057210604	$2,322	$212	$0.0	$2,534
39057210602	$2,123	$186	$0.0	$2,309
39057220101	$2,123	$141	$0.1	$2,264
39057230100	$1,954	$125	$0.4	$2,079
39057255000	$1,542	$146	$0.0	$1,688

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Census Tract	Expected Annual Loss (Building)	Expected Annual Loss (Population Equivalence)	Expected Annual Loss (Agriculture)	Expected Annual Loss (Total)
39057210300	$1,332	$95	$0.0	$1,427
39057210402	$1,235	$127	$0.0	$1,362
39057210605	$1,256	$97	$0.0	$1,353
39057210202	$1,160	$119	$0.0	$1,279
39057210201	$1,138	$115	$0.0	$1,253
39057200901	$1,141	$111	$0.1	$1,252
39057200902	$1,156	$95	$0.2	$1,251
39057240600	$1,131	$96	$0.2	$1,227
39057240700	$1,136	$74	$0.2	$1,210
39057260100	$1,073	$118	$0.4	$1,191
39057220201	$1,062	$100	$0.0	$1,162
39057210101	$1,049	$102	$0.0	$1,150
Total	**$34,414**	**$2,837**	**$2**	**$37,253**

Source: FEMA National Risk Index

Loss of Life

Greene County has no recorded wildfire-related loss of life or injuries. Injuries caused by wildfires are not widely publicized, so information is limited. With any wildfire event, there is potential for loss of life. Advanced evacuation warnings can reduce the likelihood of death from wildfires.

Economic Losses

According to the SOHMP, there are 21 state-owned or state-leased community lifelines (critical facilities) with a relatively low hazard risk. These facilities have a total replacement cost of $17,560,312. No state-owned or state-leased critical facilities were considered to have a relatively moderate, relatively high, or very high-risk rating to wildfires.

Future Trends

Land Use and Development Trends

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

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

Climate Change

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

5| Hazard Mitigation Strategy

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 Greene 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 one for the County itself. The resulting hazard rank and associated priority score for each hazard are shown in **Table 5.1.1 – Table 5.1.11**.

Table 5.1.1: Greene County Hazard Priorities

Hazard	Priority Score	Hazard Rank
Multiple Hazards	5.00	1
Tornadoes	4.75	2
Flooding	3.83	3
Severe Winter Weather and Extreme Cold	3.83	4
Severe Summer Weather	3.75	5
Drought and Extreme Heat	3.17	6
Invasive Species	2.75	7
Dam/Levee Failure	2.67	8
Landslides, Land Subsidence, and Erosion	2.58	9
Earthquakes	2.00	10
Wildfire	1.92	11

Table 5.1.2: City of Beavercreek Hazard Priorities

Hazard	Priority Score	Hazard Rank
Multiple Hazards	5.00	1
Tornadoes	4.00	2
Severe Winter Weather and Extreme Cold	3.67	3
Severe Summer Weather	3.33	4
Flooding	2.33	5
Invasive Species	2.00	6
Wildfire	1.67	7
Dam/Levee Failure	1.00	8
Drought and Extreme Heat	1.00	9
Earthquakes	1.00	10
Landslides, Land Subsidence, and Erosion	0.67	11

Table 5.1.3: City of Bellbrook Hazard Priorities

Hazard	Priority Score	Hazard Rank
Multiple Hazards	5.00	1
Dam/Levee Failure	4.00	2
Tornadoes	4.00	3
Drought and Extreme Heat	1.00	4
Severe Summer Weather	1.00	5
Severe Winter Weather and Extreme Cold	1.00	6
Flooding	1.00	7
Invasive Species	Do Not Include	
Earthquakes	Do Not Include	
Landslides and Land Subsidence	Do Not Include	
Wildfire	Do Not Include	

Table 5.1.4: City of Fairborn Hazard Priorities

Hazard	Priority Score	Hazard Rank
Multiple Hazards	5.00	1
Tornadoes	4.50	2
Dam/Levee Failure	3.00	3
Flooding	3.00	4
Severe Winter Weather and Extreme Cold	3.00	5
Wildfire	3.00	6
Drought and Extreme Heat	2.50	7
Earthquakes	2.00	8
Invasive Species	2.00	9
Severe Summer Weather	2.00	10
Landslides, Land Subsidence, and Erosion	1.50	11

Table 5.1.5: City of Xenia Hazard Priorities

Hazard	Priority Score	Hazard Rank
Multiple Hazards	5.00	1
Severe Winter Weather and Extreme Cold	5.00	2
Tornadoes	5.00	3
Earthquakes	3.00	4
Flooding	3.00	5

Hazard	Priority Score	Hazard Rank
Severe Summer Weather	3.00	6
Invasive Species	2.00	7
Wildfire	2.00	8
Dam/Levee Failure	1.00	9
Drought and Extreme Heat	1.00	10
Landslides, Land Subsidence, and Erosion	1.00	11

Table 5.1.6: Village of Bowersville Hazard Priorities

Hazard	Priority Score	Hazard Rank
Multiple Hazards	5.00	1
Drought and Extreme Heat	2.00	2
Earthquakes	2.00	3
Severe Winter Weather and Extreme Cold	2.00	4
Tornadoes	2.00	5
Flooding	1.00	6
Invasive Species	1.00	7
Landslides, Land Subsidence, and Erosion	1.00	8
Severe Summer Weather	1.00	9
Wildfire	1.00	10
Dam/Levee Failure	Do Not Include	

Table 5.1.7: Village of Cedarville Hazard Priorities

Hazard	Priority Score	Hazard Rank
Multiple Hazards	5.00	1
Severe Winter Weather and Extreme Cold	5.00	2
Tornadoes	5.00	3
Drought and Extreme Heat	4.00	4
Flooding	4.00	5
Severe Summer Weather	3.00	6
Dam/Levee Failure	2.00	7
Invasive Species	1.00	8
Landslides, Land Subsidence, and Erosion	1.00	9
Wildfire	1.00	10
Earthquakes	Do Not Include	

Table 5.1.8: Village of Clifton Hazard Priorities

Hazard	Priority Score	Hazard Rank
Multiple Hazards	5.00	1
Tornadoes	4.50	2
Severe Summer Weather	4.00	3
Severe Winter Weather and Extreme Cold	4.00	4
Drought and Extreme Heat	3.00	5
Earthquakes	3.00	6
Flooding	3.00	7
Invasive Species	2.50	8
Dam/Levee Failure	1.00	9
Landslides, Land Subsidence, and Erosion	1.00	10
Wildfire	1.00	11

Table 5.1.9: Village of Jamestown Hazard Priorities

Hazard	Priority Score	Hazard Rank
Multiple Hazards	5.00	1
Tornadoes	4.50	2
Severe Summer Weather	4.00	3
Severe Winter Weather and Extreme Cold	4.00	4
Drought and Extreme Heat	3.00	5
Earthquakes	3.00	6
Flooding	3.00	7
Invasive Species	2.50	8
Dam/Levee Failure	1.00	9
Landslides, Land Subsidence, and Erosion	1.00	10
Wildfire	1.00	11

Table 5.1.10: Village of Spring Valley Hazard Priorities

Hazard	Priority Score	Hazard Rank
Multiple Hazards	5.00	1
Flooding	5.00	2
Tornadoes	5.00	3
Drought and Extreme Heat	4.00	4
Severe Summer Weather	4.00	5

Hazard	Priority Score	Hazard Rank
Severe Winter Weather and Extreme Cold	4.00	6
Dam/Levee Failure	3.00	7
Landslides, Land Subsidence, and Erosion	2.00	8
Wildfire	2.00	9
Earthquakes	1.00	10
Invasive Species	1.00	11

Table 5.1.11: Village of Yellow Springs Hazard Priorities

Hazard	Priority Score	Hazard Rank
Multiple Hazards	5.00	1
Flooding	5.00	2
Severe Summer Weather	5.00	3
Severe Winter Weather and Extreme Cold	5.00	4
Tornadoes	5.00	5
Drought and Extreme Heat	4.00	6
Wildfire	4.00	7
Invasive Species	2.00	8
Dam/Levee Failure	1.00	9
Earthquakes	Do Not Include	
Landslides and Land Subsidence	Do Not Include	

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 Greene County's previous 2020 HMP.

Coastal Erosion

Coastal erosion is a hazard that is not applicable to Greene County due to the County's inland location, so it was not assessed.

Dam/Levee Failure

The Village of Bowersville is not affected by dam/levee failures and has opted to not include any mitigation actions for the hazard.

Earthquakes

The City of Bellbrook, the Village of Cedarville, and the Village of Yellow Springs are not affected by earthquakes and have opted to not include any mitigation actions for the hazard.

Invasive Species

The City of Bellbrook is not affected by invasive species and has opted to not include any mitigation actions for the hazard.

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Hurricanes/Tropical Storms

Hurricanes/tropical storms are hazards that are not directly applicable to Greene 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, Land Subsidence, and Erosion

The City of Bellbrook and the Village of Yellow Springs are not affected by landslides, land subsidence, and erosion and have opted to not include any mitigation actions for the hazard.

Seiche/Coastal Flooding

Seiche/coastal flooding is a hazard that is not applicable to Greene County due to the County's inland location, so it was not assessed.

Wildfire

The City of Bellbrook is not affected by wildfire and has opted to not include any mitigation actions for the hazard.

5.2 Hazard Mitigation Goals

Developing achievable goals forms the foundation for all mitigation actions and activities that will aid Greene 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 2020 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 Greene County Hazard Mitigation Plan are as follows:

- Goal 1: Increase public awareness.
- Goal 2: Protect life and property.
- Goal 3: Create and/or strengthen partnerships.
- Goal 4: Create a safer environment through construction or installation projects of natural hazard safety systems.
- Goal 5: Reduce losses that result from the failure of High Hazard Potential Dams.

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 2020 Hazard Mitigation Plan. This survey asked representatives to indicate whether the mitigation actions from the previous plan were completed, deleted, deferred, unchanged, 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 2020 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, environmentally 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 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 – 5.1.11**), to develop a score for each mitigation action. The action scores were then ranked to indicate the priority of each specific action. The action with the highest action score was given an action priority of one, indicating that action was the highest priority. Hazard Mitigation Action priorities are organized by hazard in **Table 5.2.1 – Table 5.2.11**. Each table is specific to the jurisdiction or county. 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 cost of the proposed project. The Core Planning Committee, in coordination with the Greene 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 in order to determine the economic feasibility of each action. Projects will also be evaluated for social and environmental impact-related feasibility, as well as technical feasibility and any other criteria that evaluate project effectiveness. This evaluation of each project will be performed during the pre-application phase of a grant request. Project implementation will be subject to the availability of FEMA grants and other funding sources, as well as local resources.

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

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

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
			Dam/Levee Failure					
1	Concrete, structural repairs, and other improvements at Huffman Dam.	Greene County, Cedarville Township, Spring Valley Township	8	59	Miami Conservancy District	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025 - 08/2030	Previous
2	Construct or repair storm drainage systems and/or levees.	Greene County, Cedarville Township, Spring Valley Township	8	55	City of Bellbrook, Greene County EMA	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025 - 08/2030	Previous
3	Develop a dam failure evacuation plan for Huffman Dam.	Greene County, Cedarville Township, Spring Valley Township	8	56	Miami Conservancy District and Greene County EMA	Staff Time	08/2025 - 08/2030	Previous
4	Ensure all high-hazard potential dams have updated Emergency Action Plans (EAPs) in place.	Greene County, Cedarville Township, Spring Valley Township	8	53	Greene County EMA, Jurisdictional Leaders	General Operating Budget	08/2025 - 08/2030	New

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
5	Obtain or create inundation maps for all dams.	Greene County, Cedarville Township, Spring Valley Township	8	54	Greene County EMA, Jurisdictional Leaders	General Operating Budget	08/2025 - 08/2030	New
6	Structural stability analysis of Huffman Dam to assess any risks and develop a rehabilitation strategy, if necessary.	Greene County, Cedarville Township, Spring Valley Township	8	57	Miami Conservancy District	General Operating Budget	08/2025 - 08/2030	Previous
7	Update dam maintenance programs and services.	Greene County, Cedarville Township, Spring Valley Township	8	58	Greene County EMA	General Operating Budget	08/2025 - 08/2030	Previous
Drought & Extreme Heat							
8	Develop and distribute information about risks associated with drought.	Greene County, Cedarville Township, Spring Valley Township	6	51	Greene County EMA	General Operating Budget	08/2025 - 08/2030	Previous
9	Establish program(s) providing air conditioning to at-risk populations.	Greene County, Cedarville Township, Spring Valley Township	6	50	Greene County EMA	General Operating Budget	08/2025 - 08/2030	Previous
10	Provide water and shade at all public outdoor events during extreme heat.	Greene County, Cedarville Township, Spring Valley Township	6	49	Greene County EMA	General Operating Budget	08/2025 - 08/2030	Previous
Earthquakes							
11	Require compliance and enforcement of existing building codes.	Greene County, Cedarville Township, Spring Valley Township	10	60	Greene County EMA	General Operating Budget	08/2025 - 08/2030	Previous
Flooding							
12	Adopt floodplain buffer areas to restrict development beyond the floodplain especially with the Little Miami Scenic River.	Greene County	3	26	Greene County EMA, Jurisdictional Leaders	General Operating Budget	08/2025 - 08/2030	New

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
13	Adpot compensatory storage for development in the floodplain	Greene County	3	27	Greene County EMA, Jurisdictional Leaders	General Operating Budget	08/2025 - 08/2030	New
14	Develop a set of planned alternative routes and gate frequently flooded areas and inform the citizens.	Greene County, Cedarville Township, Spring Valley Township	3	29	Greene County EMA	General Operating Budget	08/2025 - 08/2030	Previous
15	Develop and distribute an informational brochure on the types of homeowner's hazard insurance, i.e. flood, fire, earthquake, etc.	Greene County, Cedarville Township, Spring Valley Township	3	34	Greene County EMA	General Operating Budget	08/2025 - 08/2030	Previous
16	Encourage regular and periodic pier inspections for bridges.	Greene County, Cedarville Township, Spring Valley Township	3	30	Greene County EMA	Staff Time	08/2025 - 08/2030	Previous
17	Encourage watershed and wetland planning, as well as natural resource management in conjunction with land-use planning for natural hazard mitigation.	Greene County, Cedarville Township, Spring Valley Township	3	32	Greene County EMA	Staff Time	08/2025 - 08/2030	Previous
18	Ensure all eligible jurisdictions are participating in the NFIP.	Greene County, Cedarville Township, Spring Valley Township	3	28	Greene County EMA, Jurisdictional Leaders	General Operating Budget	08/2025 - 08/2030	New
19	Establish a Flood Diversion program for roads in Greene County using the Hyper Reach mass notification system.	Greene County, Cedarville Township, Spring Valley Township	3	33	Greene County EMA, Spring Valley, Fairborn, Xenia, Yellow Springs, Bellbrook, Beavercreek, Jamestown, Bowersville	Staff Time	08/2025 - 08/2030	Previous
20	Identify at-risk structures in Special Flood Hazard Area.	Greene County, Cedarville Township, Spring Valley Township	3	31	Cedarville Township, Bellbrook, Xenia, Yellow Springs, Fairborn, Beavercreek, Jamestown, Bowersville	Staff Time	08/2025 - 08/2030	Previous

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
21	Massie Creek US 68 N property acquisition; Kaufman/Washington Mill/Patterson.	Greene County, Cedarville Township, Spring Valley Township	3	35	Greene County EMA	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025 - 08/2030	Previous
				Invasive Species				
22	Partner with organizations whose mission is to restore or preserve beneficial natural systems (wetlands, watersheds, etc.).	Greene County, Cedarville Township, Spring Valley Township	7	52	Greene County EMA	General Operating Budget	08/2025 - 08/2030	Previous
				Landslides and Mine Subsidence (Included with Multiple Hazards)				
				Multiple Hazards				
23	Develop and complete a baseline survey to gather citizens' perceptions of the risks associated with natural disasters and the tools and services available to the public to reduce risk.	Greene County, Cedarville Township, Spring Valley Township	1	11	Greene County EMA	Emergency Management Performance Grant (EMPG) Special Project Grants	08/2025 - 08/2030	Previous
24	Develop and complete a periodic post-educational campaign surveys to gather citizens' perceptions of the risks associated with natural disasters and the tools and services available to the public to reduce risk (Method to measure the effectiveness of educational campaigns).	Greene County, Cedarville Township, Spring Valley Township	1	14	Greene County EMA	Staff Time	08/2025 - 08/2030	Previous
25	Develop and distribute information about risks associated with the identified natural disasters affecting the County.	Greene County, Cedarville Township, Spring Valley Township	1	9	Greene County EMA	Staff Time	08/2025 - 08/2030	Previous
26	Educate the public, businesses and residents, of the importance of creating hazard contingency plans (May be included in materials about natural hazard risk).	Greene County, Cedarville Township, Spring Valley Township	1	6	Greene County EMA	Staff Time	08/2025 - 08/2030	Previous
27	Encourage code enforcement and engineering practitioners to enroll in seminars/classes offered by accredited building training centers that showcase the latest materials and techniques in natural hazard resistant construction.	Greene County, Cedarville Township, Spring Valley Township	1	7	Greene County EMA	Staff Time	08/2025 - 08/2030	Previous

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
28	Encourage jurisdictions to prevent or prohibit new development in areas vulnerable to natural hazards.	Greene County, Cedarville Township, Spring Valley Township	1	10	Greene County EMA	Staff Time	08/2025 - 08/2030	Previous
29	Encourage mitigation measures for existing development in areas vulnerable to natural hazards.	Greene County, Cedarville Township, Spring Valley Township	1	4	Greene County EMA	Hazard Mitigation Grant Program (HMGP)	08/2025 - 08/2030	Previous
30	Encourage the cooperation of neighbors to include, but not limited to: Contingency plans for the evacuation and care of neighboring families and pets and communication among the neighbors in the event of a natural hazard.; Contingency plans for checking- in on the shut-in and frail elderly neighbors.	Greene County, Cedarville Township, Spring Valley Township	1	5	Greene County EMA	General Operating Budget	08/2025 - 08/2030	Previous
31	Establish clearly identified places of refuge within public facilities and spaces, neighborhoods, and businesses.	Greene County, Cedarville Township, Spring Valley Township	1	3	Greene County EMA	General Operating Budget	08/2025 - 08/2030	Previous
32	Launch educational campaigns through public/government cable channels and newsletters, websites, street festivals, libraries, school functions, etc.	Greene County, Cedarville Township, Spring Valley Township	1	8	Greene County EMA	Staff Time	08/2025 - 08/2030	Previous
33	Restrict the storage of materials both hazardous and non-hazardous in the floodplain.	Greene County	1	1	Greene County EMA, Jurisdictional Leaders	General Operating Budget	08/2025 - 08/2030	New
34	Two maps should be generated as established in the Miami Valley Emergency Operations Plan, 1993, Annex L, Damage Assessment, PG L-5. One map should graphically display Public damage where the worst damage is located and where minimal damage is located. The second should address the same for Private damages.	Greene County, Cedarville Township, Spring Valley Township	1	12	Greene County EMA	General Operating Budget	08/2025 - 08/2030	Previous

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
35	Upgrade windows to high impact windows on schools.	Greene County, Cedarville Township, Spring Valley Township	1	13	Greene County EMA, Fairborn, Xenia, Beavercreek, Bellbrook, Jamestown, Bowersville	Community Development Block Grant (CDBG)	08/2025 - 08/2030	Previous
36	Work with all jurisdictions on filling in gaps and strengthening capabilities in enacting mitigation strategies.	Greene County, Cedarville Township, Spring Valley Township	1	2	Greene County EMA, Jurisdictional Leaders	General Operating Budget	08/2025 - 08/2030	New
			Severe Summer Weather					
37	Develop and distribute information/education on weather-related-preparedness tools and resources, i.e. sources to purchase such material, etc.	Greene County, Cedarville Township, Spring Valley Township	5	41	Greene County EMA	General Operating Budget	08/2025 - 08/2030	Previous
38	Develop and launch awareness/educational campaigns to increase knowledge of weather alert methods (alert radios, e-mail, cell phones, etc.).	Greene County, Cedarville Township, Spring Valley Township	5	38	Greene County EMA	General Operating Budget	08/2025 - 08/2030	Previous
39	Educate the public on the importance of properly trimming and maintaining the trees on their property (may be included in materials about natural hazard risk).	Greene County, Cedarville Township, Spring Valley Township	5	45	Greene County EMA	Staff Time	08/2025 - 08/2030	Previous
40	Encourage the use of vinyl siding to reduce dent damage due to hail incidents.	Greene County, Cedarville Township, Spring Valley Township	5	47	Greene County EMA	General Operating Budget	08/2025 - 08/2030	Previous
41	Encourage utility companies to hire tree trimming contractors who are capable of a more citizen friendly trimming service	Greene County, Cedarville Township, Spring Valley Township	5	37	Greene County EMA	General Operating Budget	08/2025 - 08/2030	Previous
42	Furnish and install a 25KW Emergency Standby Generator with Automatic Transfer Switch at Gerspacher Water Tower. This generator is needed to maintain communications.	Greene County, Cedarville Township, Spring Valley Township	5	40	Greene County Sanitary Engineer	Emergency Management Performance Grant (EMPG) Special Project Grants	08/2025 - 08/2030	Previous

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#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
43	Furnish and install a 25KW Emergency Standby Generator with Automatic Transfer Switch at Indian Ripple Water Tower. This generator is needed to maintain communications.	Greene County, Cedarville Township, Spring Valley Township	5	43	Greene County Sanitary Engineer	Emergency Management Performance Grant (EMPG) Special Project Grants	08/2025 - 08/2030	Previous
44	Furnish and install a 40KW Emergency Standby Generator with Automatic Transfer Switch at the Valley Well Field for wells 11 and 12. This generator is needed to maintain continuous service to the potable water system.	Greene County, Cedarville Township, Spring Valley Township	5	42	Greene County Sanitary Engineer	Emergency Management Performance Grant (EMPG) Special Project Grants	08/2025 - 08/2030	Previous
45	Furnish and install an emergency generator with automatic transfer switch at the Environmental Services facility. The facility is the receiving facility for storm debris and 24/7 operation could be needed.	Greene County, Cedarville Township, Spring Valley Township	5	44	Greene County Sanitary Engineer	Emergency Management Performance Grant (EMPG) Special Project Grants	08/2025 - 08/2030	Previous
46	Furnish, wire, and install a 60Hz, 175kW Emergency Standby Generator with Automatic Transfer Switch at the Greene County Engineer's Building. This generator is needed to maintain emergency operations for the Engineer's Office for 24/7 operations during and after a major storm event.	Greene County	5	39	Greene County Engineer	Hazard Mitigation Grant Program (HMGP)	08/2025 - 08/2030	New
47	Supply equipment to manage storm debris.	Greene County, Cedarville Township, Spring Valley Township	5	48	Greene County Sanitary Engineer	Staff Time	08/2025 - 08/2030	Previous
48	Supply two portable generators with emergency connections to be used at sanitary lift stations and potable water pump stations during power outages.	Greene County, Cedarville Township, Spring Valley Township	5	46	Greene County Sanitary Engineer	Community Development Block Grant (CDBG)	08/2025 - 08/2030	Previous
	Severe Winter Weather and Extreme Cold							
49	Establish and encourage the use of weather warning radios in all public spaces, businesses, and residences.	Greene County, Cedarville Township, Spring Valley Township	4	36	Greene County EMA	Staff Time	08/2025 - 08/2030	Previous

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
			Tornadoes					
50	Appeal to the State to enhance or create wind/impact resistant Ohio Basic Building Code(s).	Greene County, Cedarville Township, Spring Valley Township	2	24	Greene County EMA	Staff Time	08/2025 - 08/2030	Previous
51	Construct tornado safe rooms in public areas and neighborhoods without basements.	Greene County, Cedarville Township, Spring Valley Township	2	19	Greene County EMA	Community Development Block Grant (CDBG)	08/2025 - 08/2030	Previous
52	Encourage the use of wind and impact resistant building components designed to withstand tornado strength winds.	Greene County, Cedarville Township, Spring Valley Township	2	22	Greene County EMA	Staff Time	08/2025 - 08/2030	Previous
53	Install a tornado warning system on the north end of town near the university campus.	Greene County, Cedarville Township, Spring Valley Township	2	18	Township Trustees	Community Development Block Grant (CDBG)	08/2025 - 08/2030	Previous
54	Provide drove footage of tornado damaged areas as soon as possible after the event.	Greene County	2	15	Greene County EMA, Jurisdictional Leaders	General Operating Budget	08/2025 - 08/2030	New
55	Request legislation requiring tornado safe rooms in new mobile home communities and new residential communities without basements.	Greene County, Cedarville Township, Spring Valley Township	2	23	Greene County EMA	Staff Time	08/2025 - 08/2030	Previous
56	Seek $2.1 million in funding to install a county-wide tornado warning system complete with battery backup in communities with inadequate coverage, or no tornado siren systems.	Greene County, Cedarville Township, Spring Valley Township	2	17	Greene County EMA, Jurisdictional Leaders	Community Development Block Grant (CDBG)	08/2025 - 08/2030	Previous
57	Supply of a portable 6-inch bypass pump that will be used to bypass pump the sanitary sewer in the event of a catastrophic failure of the system. The proximity of local streams, creeks, and rivers make this equipment a higher priority to prevent pollution of the environment.	Greene County, Cedarville Township, Spring Valley Township	2	25	Greene County EMA	Staff Time	08/2025 - 08/2030	Previous

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
58	Supply of an emergency response trailer including chainsaws, traffic safety signage, and proper PPE.	Greene County, Cedarville Township, Spring Valley Township	2	21	Greene County Sanitary Engineer	Staff Time	08/2025 - 08/2030	Previous
59	Test the effectiveness of tornado sirens.	Greene County, Cedarville Township, Spring Valley Township	2	16	Greene County EMA	Staff Time	08/2025 - 08/2030	Previous
60	Tornado safe rooms for Kitridge Road, Spangler Road and Spring Valley and State Route 725 Trailer Parks.	Greene County, Cedarville Township, Spring Valley Township	2	20	Greene County EMA	Community Development Block Grant (CDBG)	08/2025 - 08/2030	Previous
				Wildfire				
61	Develop and distribute information about risks associated with wildfires.	Greene County, Cedarville Township, Spring Valley Township	11	61	Greene County EMA	Staff Time	08/2025 - 08/2030	Previous

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

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
			Dam/Levee Failure					
1	Ensure all high-hazard potential dams have updated Emergency Action Plans (EAPs) in place.	City of Beavercreek	8	8	Greene County EMA, City of Beavercreek Mayor or Administrator, Miami Conservancy District	General Operating Budget	08/2025-08/2030	New
2	Obtain or create inundation maps for all dams.	City of Beavercreek	8	9	Greene County EMA, City of Beavercreek Mayor or Administrator, Miami Conservancy District	General Operating Budget	08/2025-08/2030	New
3	Seek funding for, prioritize and remove and/or relocate at-risk structures or construction of improved or new storm drainage systems or levees to protect at-risk structures.	City of Beavercreek	8	10	Greene County EMA, Greene County Engineer	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous
			Drought & Extreme Heat (Included with Multiple Hazards)					
			Earthquakes (Included with Multiple Hazards)					
			Flooding					
4	Ensure all eligible jurisdictions are participating in the NFIP.	City of Beavercreek	5	6	Greene County EMA, City of Beavercreek Mayor or Administrator	General Operating Budget	08/2025-08/2030	New
5	Establish a Flood Diversion program for roads in Greene County using the Hyper Reach mass notification system.	City of Beavercreek	5	7	Greene County, City of Beavercreek Mayor or Administrator	Staff Time	08/2025-08/2030	Previous
6	Identify at-risk structures in Special Flood Hazard Area.	City of Beavercreek	5	5	Greene County, City of Beavercreek Mayor or Administrator	Staff Time	08/2025-08/2030	Previous
			Invasive Species (Included with Multiple Hazards)					
			Landslides and Mine Subsidence (Included with Multiple Hazards)					

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
	Multiple Hazards							
7	The City of Beavercreek will work to equip city staff with the training and knowledge necessary to better prepare for, mitigate against, respond to, and recover from disasters.	City of Beavercreek	1	1	City of Beavercreek Mayor or Administrator	General Operating Budget	08/2025-08/2030	New
8	Upgrade windows to high impact windows on schools.	City of Beavercreek	1	3	Greene County, City of Beavercreek Mayor or Administrator	Community Development Block Grant (CDBG)	08/2025-08/2030	Previous
9	Work with all jurisdictions on filling in gaps and strengthening capabilities in enacting mitigation strategies.	City of Beavercreek	1	2	Greene County EMA, City of Beavercreek Mayor or Administrator	General Operating Budget	08/2025-08/2030	New
	Severe Summer Weather (Included with Multiple Hazards)							
	Severe Winter Weather and Extreme Cold (Included with Multiple Hazards)							
	Tornadoes							
10	Seek $2.1 million in funding to install a county-wide tornado warning system complete with battery backup in communities with inadequate coverage, or no tornado siren systems.	City of Beavercreek	2	4	Greene County EMA, City of Beavercreek Mayor or Administrator	Community Development Block Grant (CDBG)	08/2025-08/2030	Previous
	Wildfire (Included with Multiple Hazards)							

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

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
	Dam/Levee Failure							
1	Seek funding for, prioritize and remove and/or relocate at-risk structures or construction of improved or new storm drainage systems or levees to protect at- risk structures.	City of Bellbrook	3	5	Greene County EMA, Greene County Engineer	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous
	Drought & Extreme Heat (Included with Multiple Hazards)							
	Earthquakes (Not Included)							
	Flooding							
2	Establish a Flood Diversion program for roads in Greene County using the Hyper Reach mass notification system. (Flooding)	City of Bellbrook	5	7	Greene County, City of Bellbrook Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	Previous
3	Identify at-risk structures in Special Flood Hazard Area.	City of Bellbrook	5	6	Greene County, City of Bellbrook Mayor or Administrator	Staff Time	08/2025-08/2030	Previous
	Invasive Species (Included with Multiple Hazards)							
	Landslides and Mine Subsidence (Not Included)							
	Multiple Hazards							
4	Develop and complete a periodic post- educational campaign surveys to gather citizens' perceptions of the risks associated with natural disasters and the tools and services available to the public to reduce risk (Method to measure the effectiveness of educational campaigns).	City of Bellbrook	1	3	Greene County, City of Bellbrook Mayor or Administrator	Staff Time	08/2025-08/2030	Previous
5	Upgrade windows to high impact windows on schools.	City of Bellbrook	1	1	Greene County EMA, City of Bellbrook Mayor or Administrator	Community DEV. Block Grant (CDBG)	08/2025-08/2030	Previous
6	Work with all jurisdictions on filling in gaps and strengthening capabilities in enacting mitigation strategies.	City of Bellbrook	1	2	Greene County EMA, City of Bellbrook Mayor or Administrator	Staff Time	08/2025-08/2030	New
	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					
7	Seek $2.1 million in funding to install a county-wide tornado warning system complete with battery backup in communities with inadequate coverage, or no tornado siren systems.	City of Bellbrook	2	4	Greene County EMA, City of Bellbrook Mayor or Administrator	Community Development Block Grant (CDBG)	08/2025-08/2030	Previous
			Wildfire (Not Included)					

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

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
	Dam/Levee Failure							
1	Ensure all high-hazard potential dams have updated Emergency Action Plans (EAPs) in place.	City of Fairborn	3	9	City of Fairborn Mayor or Administrator	Staff Time	08/2025-08/2030	New
2	Obtain or create inundation maps for all dams.	City of Fairborn	3	10	City of Fairborn Mayor or Administrator	Staff Time	08/2025-08/2030	New
	Drought & Extreme Heat							
3	Develop a drought communication plan and early warning system to facilitate timely communication of relevant information to officials, decision makers, emergency managers, and the general public. Create a database to track those individuals at high risk of death, such as the elderly, homeless, etc.	City of Fairborn	7	51	City of Fairborn Mayor or Administrator	Staff Time	08/2025-08/2030	New
	Earthquakes							
4	Adopt the International Building Code (IBC) and International Residential Code (IRC).	City of Fairborn	8	52	City of Fairborn Mayor or Administrator	Staff Time	08/2025-08/2030	New
	Flooding							
5	Adams St/Mitman Park Drainage Construction.	City of Fairborn	4	43	City of Fairborn Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	Previous
6	Adams St/Mitman Park Drainage Design.	City of Fairborn	4	44	City of Fairborn Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	Previous
7	Colonel Glenn drainage improvements.	City of Fairborn	4	26	City of Fairborn Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	Previous
8	Dayton-Yellow Springs drainage improvement – Commerce Center area.	City of Fairborn	4	27	City of Fairborn Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
9	Drainage area easement procurements.	City of Fairborn	4	48	City of Fairborn Mayor or Administrator	United States Army Corps of Engineers (USACE) Planning Assistance to States	08/2025-08/2030	Previous
10	Enclose Redbank Ditch between Kauffman and Maple Avenue.	City of Fairborn	4	49	City of Fairborn Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous
11	Ensure all eligible jurisdictions are participating in the NFIP.	City of Fairborn	4	25	City of Fairborn Mayor or Administrator	Staff Time	08/2025-08/2030	New
12	Establish a "green infrastructure" program to link, manage, and expand existing parks, preserves, greenways, etc. Require developers to construct on-site retention basins for excessive stormwater and as a firefighting water source.	City of Fairborn	4	17	City of Fairborn Mayor or Administrator	Capital Improvement Budgets	08/2025-08/2030	New
13	Establish a Flood Diversion program for roads in Greene County using the Hyper Reach mass notification system.	City of Fairborn	4	32	City of Fairborn Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous
14	Fairfield Park drainage improvements.	City of Fairborn	4	45	City of Fairborn Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous
15	Fairfield Park pervious pavement of parking lots.	City of Fairborn	4	46	City of Fairborn Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous
16	Hebble Creek creek reprofiling.	City of Fairborn	4	37	City of Fairborn Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous
17	Hebble Creek Culvert Replacement, Central Ave.	City of Fairborn	4	38	City of Fairborn Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous
18	Hebble Creek Culvert Replacement, Elm and Dayton Drive.	City of Fairborn	4	28	City of Fairborn Mayor or Administrator	General Operating Budget	08/2025-08/2030	Previous

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
19	Hebble Creek engineering study.	City of Fairborn	4	39	City of Fairborn Mayor or Administrator	General Operating Budget	08/2025-08/2030	Previous
20	Hidden Hills detection basin modifications.	City of Fairborn	4	47	City of Fairborn Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	Previous
21	Highview Drive storm sewer design and construction.	City of Fairborn	4	18	City of Fairborn Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	Previous
22	Identify at-risk structures in Special Flood Hazard Area.	City of Fairborn	4	31	City of Fairborn Mayor or Administrator	General Operating Budget	08/2025-08/2030	Previous
23	Ironwood Drive storm sewer design & construction.	City of Fairborn	4	40	City of Fairborn Mayor or Administrator	General Operating Budget	08/2025-08/2030	Previous
24	Kauffman Avenue drainage improvements.	City of Fairborn	4	33	City of Fairborn Mayor or Administrator	General Operating Budget	08/2025-08/2030	Previous
25	Langview/Royal Oaks storm sewer design & construction.	City of Fairborn	4	19	City of Fairborn Mayor or Administrator	Capital Improvement Budgets	08/2025-08/2030	Previous
26	Lincoln Drive storm sewer improvements construction.	City of Fairborn	4	41	City of Fairborn Mayor or Administrator	General Operating Budget	08/2025-08/2030	Previous
27	Mark Lane ditch renovation.	City of Fairborn	4	34	City of Fairborn Mayor or Administrator	Capital Improvement Budgets	08/2025-08/2030	Previous
28	Pleasant View Drainage, Phase I Construction – Redbank Parallel Trunk Sewer.	City of Fairborn	4	20	City of Fairborn Mayor or Administrator	General Operating Budget	08/2025-08/2030	Previous
29	Pleasant View Drainage, Phase II Construction – Dellwood Drive Sewer	City of Fairborn	4	21	City of Fairborn Mayor or Administrator	Capital Improvement Budgets	08/2025-08/2030	Previous
30	Pleasant View Drainage, Phase II Design – Dellwood Drive Sewer.	City of Fairborn	4	11	City of Fairborn Mayor or Administrator	General Operating Budget	08/2025-08/2030	Previous
31	Pleasant View Drainage, Phase III Construction – Florence Avenue Sewer.	City of Fairborn	4	22	City of Fairborn Mayor or Administrator	General Operating Budget	08/2025-08/2030	Previous
32	Pleasant View Drainage, Phase III Design – Florence Avenue Sewer.	City of Fairborn	4	12	City of Fairborn Mayor or Administrator	General Operating Budget	08/2025-08/2030	Previous

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
33	Pleasant View Drainage, Phase IV Design & Construction – Pat Lane & NE Sewer.	City of Fairborn	4	13	City of Fairborn Mayor or Administrator	General Operating Budget	08/2025-08/2030	Previous
34	Redbank Ditch retaining wall replacement.	City of Fairborn	4	14	City of Fairborn Mayor or Administrator	General Operating Budget	08/2025-08/2030	Previous
35	Redstone Drive storm sewer design & construction.	City of Fairborn	4	42	City of Fairborn Mayor or Administrator	General Operating Budget	08/2025-08/2030	Previous
36	Seek funding for the acquisition, elevation, or retrofit of structures with repetitive loss flood insurance claims through voluntary (owner) mitigation actions.	City of Fairborn	4	29	City of Fairborn Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous
37	Seek funding for, prioritize and remove and/or relocate at-risk structures or construction of improved or new storm drainage systems or levees to protect at- risk structures.	City of Fairborn	4	36	Greene County EMA, City of Fairborn Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous
38	Stormwater master plan.	City of Fairborn	4	16	City of Fairborn Mayor or Administrator	Community Dev. Block Grant (CDBG)	08/2025-08/2030	Previous
39	Upper Orville Street Storm Improvements Design & Construction.	City of Fairborn	4	35	City of Fairborn Mayor or Administrator	Community Dev. Block Grant (CDBG)	08/2025-08/2030	Previous
40	Wrightview Park plat storm sewer.	City of Fairborn	4	30	City of Fairborn Mayor or Administrator	United States Army Corps of Engineers (USACE) Planning Assistance to States	08/2025-08/2030	Previous
Invasive Species								
41	Coordinate with local experts, such as colleges, and/or State officials to create an invasive species mitigation plan. Identify all invasive species that are currently impacting the county and neighboring counties.	City of Fairborn	9	53	City of Fairborn Mayor or Administrator	Staff Time	08/2025-08/2030	New

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
Landslides, Mine Subsidence, and Erosion								
42	Define steep slope/high risk areas in land use and comprehensive plans and create guidelines or restrict new development in those areas. Prohibit development in areas that have been identified as at-risk to subsidence.	City of Fairborn	11	55	City of Fairborn Mayor or Administrator	Staff Time	08/2025-08/2030	New
Multiple Hazards								
43	Beaver control measures.	City of Fairborn	1	4	City of Fairborn Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	Previous
44	Chapel Drive at Sycamore Drainage Materials.	City of Fairborn	1	5	City of Fairborn Mayor or Administrator	Staff Time	08/2025-08/2030	Previous
45	Develop and complete a periodic post- educational campaign surveys to gather citizens' perceptions of the risks associated with natural disasters and the tools and services available to the public to reduce risk (Method to measure the effectiveness of educational campaigns). (Multiple Hazards)	City of Fairborn	1	2	City of Fairborn Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	Previous
46	Upgrade windows to high impact windows on schools. (Terrorism)	City of Fairborn	1	1	City of Fairborn Mayor or Administrator	United States Army Corps of Engineers (USACE) Planning Assistance to States	08/2025-08/2030	Previous
47	Work with all jurisdictions on filling in gaps and strengthening capabilities in enacting mitigation strategies.	City of Fairborn	1	3	City of Fairborn Mayor or Administrator	Staff Time	08/2025-08/2030	New
Severe Summer Weather								
48	Continue social media updates and information sharing.	City of Fairborn	10	54	City of Fairborn Mayor or Administrator	Staff Time	08/2025-08/2030	New
Severe Winter Weather and Extreme Cold								
49	Adopt the International Building Code (IBC) and International Residential Code (IRC). Ensure city salt supply and equipment is adequately maintained.	City of Fairborn	5	50	City of Fairborn Mayor or Administrator	Staff Time	08/2025-08/2030	New

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
				Tornadoes				
50	Circle Drive storm drainage improvements.	City of Fairborn	2	8	City of Fairborn Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	Previous
51	Conduct tornado drills in schools and conduct monthly tornado siren testing.	City of Fairborn	2	6	City of Fairborn Mayor or Administrator	Staff Time	08/2025-08/2030	New
52	Seek $2.1 million in funding to install a county-wide tornado warning system complete with battery backup in communities with inadequate coverage, or no tornado siren systems. (Tornado)	City of Fairborn	2	7	City of Fairborn Mayor or Administrator	United States Army Corps of Engineers (USACE) Planning Assistance to States	08/2025-08/2030	Previous
53	Supply of an emergency response trailer including chainsaws, traffic safety signage, and proper PPE.	Greene County, Cedarville Township, Spring Valley Township	2	24	Greene County Sanitary Engineer	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2028	Previous
54	Test the effectiveness of tornado sirens.	Greene County, Cedarville Township, Spring Valley Township	2	15	Greene County EMA	Staff Time	08/2025-08/2029	Previous
55	Tornado safe rooms for Kitridge Road, Spangler Road and Spring Valley and State Route 725 Trailer Parks.	Greene County, Cedarville Township, Spring Valley Township	2	23	Greene County EMA	Community Development Block Grant (CDBG)	08/2025-08/2030	Previous
				Wildfire				
56	Develop and distribute information about risks associated with wildfires.	Greene County, Cedarville Township, Spring Valley Township	11	56	Greene County EMA	Staff Time	08/2025-08/2032	Previous

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

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
				Dam/Levee Failure				
1	Ensure all high-hazard potential dams have updated Emergency Action Plans (EAPs) in place.	City of Xenia	3	9	City of Xenia Mayor or Administrator	Staff Time	08/2025-08/2030	New
2	Obtain or create inundation maps for all dams.	City of Xenia	3	8	City of Xenia Mayor or Administrator	Staff Time	08/2025-08/2030	New
3	Seek funding for, prioritize and remove and/or relocate at-risk structures or construction of improved or new storm drainage systems or levees to protect at-risk structures.	City of Xenia	3	7	Greene County EMA, City of Xenia Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous
				Drought & Extreme Heat (Included with Multiple Hazards)				
				Earthquakes (Included with Multiple Hazards)				
				Flooding				
4	Ensure all eligible jurisdictions are participating in the NFIP.	City of Xenia	4	13	City of Xenia Mayor or Administrator	Staff Time	08/2025-08/2030	New
5	Establish a Flood Diversion program for roads in Greene County using the Hyper Reach mass notification system.	City of Xenia	4	10	City of Xenia Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	Previous
6	Identify at-risk structures in Special Flood Hazard Area.	City of Xenia	4	11	City of Xenia Mayor or Administrator	General Operating Budget	08/2025-08/2030	Previous
7	Sycamore Street property acquisitions (3 structures and 5 parcels of land that are prone to flooding).	City of Xenia	4	12	City of Xenia Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	Previous
				Invasive Species (Included with Multiple Hazards)				
				Landslides, Mine Subsidence, and Erosion (Included with Multiple Hazards)				

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
	Multiple Hazards							
8	Develop and complete a periodic post- educational campaign surveys to gather citizens' perceptions of the risks associated with natural disasters and the tools and services available to the public to reduce risk (Method to measure the effectiveness of educational campaigns).	City of Xenia	1	4	City of Xenia Mayor or Administrator	Staff Time	08/2025-08/2030	Previous
9	Seek funding for the acquisition, elevation, or retrofit of structures with repetitive loss flood insurance claims through voluntary (owner) mitigation actions.	City of Xenia	1	3	City of Xenia Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	Previous
10	Support tree-trimming to prevent limb breakage and safeguard nearby utility lines during severe storm events.	City of Xenia	1	1	City of Xenia Mayor or Administrator	General Operating Budget	08/2025-08/2030	Previous
11	Upgrade windows to high impact windows on schools.	City of Xenia	1	2	City of Xenia Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous
12	Work with all jurisdictions on filling in gaps and strengthening capabilities in enacting mitigation strategies.	City of Xenia	1	5	City of Xenia Mayor or Administrator	Staff Time	08/2025-08/2030	New
	Severe Summer Weather (Included with Multiple Hazards)							
	Severe Winter Weather and Extreme Cold (Included with Multiple Hazards)							
	Tornadoes							
13	Seek $2.1 million in funding to install a county-wide tornado warning system complete with battery backup in communities with inadequate coverage, or no tornado siren systems.	City of Xenia	2	6	City of Fairborn Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous
	Wildfire (Included with Multiple Hazards)							

Table 5.2.6: Mitigation Actions Priority Table by Hazard for Village of Bowersville

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
	Dam/Levee Failure (Do Not Include)							
	Drought & Extreme Heat (Included with Multiple Hazards)							
	Earthquakes (Included with Multiple Hazards)							
	Flooding							
1	Ensure all eligible jurisdictions are participating in the NFIP.	Village of Bowersville	6	4	Village of Bowersville Mayor or Administrator	Staff Time	08/2025-08/2030	New
	Invasive Species (Included with Multiple Hazards)							
	Landslides, Mine Subsidence, and Erosion (Included with Multiple Hazards)							
	Multiple Hazards							
2	Work with all jurisdictions on filling in gaps and strengthening capabilities in enacting mitigation strategies.	Village of Bowersville	1	1	Village of Bowersville Mayor or Administrator	Staff Time	08/2025-08/2030	New
	Severe Summer Weather (Included with Multiple Hazards)							
	Severe Winter Weather and Extreme Cold (Included with Multiple Hazards)							
	Tornadoes							
3	Install a tornado siren in the center of town on the corner of Maysville St. and Hussey Rd. (Tornado)	Village of Bowersville	5	2	Greene County EMA, Village of Bowersville Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous
4	Seek $2.1 million in funding to install a county-wide tornado warning system complete with battery backup in communities with inadequate coverage, or no tornado siren systems. (Tornado)	Village of Bowersville	5	3	Village of Bowersville Mayor or Administrator	Emergency Mgmt. Performance Grant (EMPG) Special Project Grants	08/2025-08/2030	Previous
	Wildfire (Included with Multiple Hazards)							

Table 5.2.7: Mitigation Actions Priority Table by Hazard for Village of Cedarville

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
	Dam/Levee Failure							
1	Ensure all high-hazard potential dams have updated Emergency Action Plans (EAPs) in place.	Village of Cedarville	7	5	Village of Cedarville Mayor or Administrator	Staff Time	08/2025-08/2030	New
2	Obtain or create inundation maps for all dams.	Village of Cedarville	7	6	Village of Cedarville Mayor or Administrator	Staff Time	08/2025-08/2030	New
3	Push in the old water retention reservoir that is no longer in use. It is a breeding area for rodents and mosquitoes and a drowning risk for area youth.	Village of Cedarville	7	4	Greene County EMA, Village of Cedarville Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	Previous
	Drought & Extreme Heat (Included with Multiple Hazards)							
	Earthquakes (Do Not Include)							
	Flooding							
4	Ensure all eligible jurisdictions are participating in the NFIP.	Village of Cedarville	5	3	Village of Cedarville Mayor or Administrator	Staff Time	08/2025-08/2030	New
	Invasive Species (Included with Multiple Hazards)							
	Landslides, Mine Subsidence, and Erosion (Included with Multiple Hazards)							
	Multiple Hazards							
5	Work with all jurisdictions on filling in gaps and strengthening capabilities in enacting mitigation strategies.	Village of Cedarville	1	1	Village of Cedarville Mayor or Administrator	Staff Time	08/2025-08/2030	New
	Severe Summer Weather (Included with Multiple Hazards)							
	Severe Winter Weather and Extreme Cold (Included with Multiple Hazards)							
	Tornadoes							
6	Village administrative building that can double as shelter from tornadoes for community members and a command center for disasters and other emergencies that occur in the Village or the eastern half of Greene County.	Village of Cedarville	3	2	Village of Cedarville Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous
	Wildfire (Included with Multiple Hazards)							

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

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
	Dam/Levee Failure							
1	Ensure all high-hazard potential dams have updated Emergency Action Plans (EAPs) in place.	Village of Clifton	8	19	Greene County Engineer, Village of Clifton Mayor or Administrator	Staff Time	08/2025-08/2030	New
2	Obtain or create inundation maps for all dams.	Village of Clifton	8	20	Village of Clifton Mayor or Administrator	Staff Time	08/2025-08/2030	New
	Drought & Extreme Heat							
3	Develop and distribute information about risks associated with drought.	Village of Clifton	6	17	Greene County EMA, Village of Clifton Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous
4	Provide water and shade at all public outdoor events during extreme heat.	Village of Clifton	6	16	Village of Clifton Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	Previous
	Earthquakes							
5	Require compliance and enforcement of existing building codes.	Village of Clifton	10	21	Village of Clifton Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	Previous
	Flooding							
6	Ensure all eligible jurisdictions are participating in the NFIP.	Village of Clifton	2	7	Greene County EMA, Village of Clifton Mayor or Administrator	Staff Time	08/2025-08/2030	New
7	Improve the storm water drainage system throughout the village to alleviate flooding or properties and the public right of way.	Village of Clifton	2	8	Greene County Engineer, Village of Clifton Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	New
8	Test the effectiveness of tornado sirens.	Village of Clifton	2	6	Village of Clifton Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous
	Invasive Species (Included with Multiple Hazards)							

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
	Landslides, Mine Subsidence, and Erosion (Included with Multiple Hazards)							
	Multiple Hazards							
9	Develop and distribute information about risks associated with the identified natural disasters affecting the County	Village of Clifton	1	3	Village of Clifton Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	Previous
10	Educate the public, businesses and residents, of the importance of creating hazard contingency plans (May be included in materials about natural hazard risk)	Village of Clifton	1	1	Village of Clifton Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	Previous
11	Encourage the cooperation of neighbors to include but not limited to: Contingency plans for the evacuation and care of neighboring families and pets and communication among the neighbors in the event of a natural hazard.; Contingency plans for checking- in on the shut-in and frail elderly neighbors.	Village of Clifton	1	5	Village of Clifton Mayor or Administrator	Staff Time	08/2025-08/2030	Previous
12	Launch educational campaigns through public/government cable channels and newsletters, websites, street festivals, libraries, school functions, etc.	Village of Clifton	1	2	Village of Clifton Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous
13	Work with all jurisdictions on filling in gaps and strengthening capabilities in enacting mitigation strategies.	Village of Clifton	1	4	Village of Clifton Mayor or Administrator	Staff Time	08/2025-08/2030	New
	Severe Summer Weather							
14	Develop and distribute information/education on weather-related-preparedness tools and resources, i.e. sources to purchase such material, etc.	Village of Clifton	3	12	Village of Clifton Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	Previous
15	Develop and launch awareness/educational campaigns to increase knowledge of weather alert methods (alert radios, e-mail, cell phones, etc.).	Village of Clifton	3	10	Village of Clifton Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
16	Educate the public on the importance of properly trimming and maintaining the trees on their property (may be included in materials about natural hazard risk).	Village of Clifton	3	14	Village of Clifton Mayor or Administrator	United States Army Corps of Engineers (USACE) Planning Assistance to States	08/2025-08/2030	Previous
17	Encourage utility companies to hire tree trimming contractors who are capable of a more citizen friendly trimming service	Village of Clifton	3	9	Village of Clifton Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous
18	Replace utility poles that have been identified as needed replaced.	Village of Clifton	3	13	Greene County Engineer, Village of Clifton Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	New
19	Supply equipment to manage storm debris.	Village of Clifton	3	11	Village of Clifton Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous
Severe Winter Weather and Extreme Cold (Included with Multiple Hazards)								
Tornadoes								
20	Install a tornado warning system.	Village of Clifton	5	15	Village of Clifton Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous
Wildfire								
21	Develop and distribute information about risks associated with wildfires.	Village of Clifton	7	18	Village of Clifton Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous

Table 5.2.9: Mitigation Actions Priority Table by Hazard for Village of Jamestown

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
				Dam/Levee Failure				
1	Ensure all high-hazard potential dams have updated Emergency Action Plans (EAPs) in place.	Village of Jamestown	9	10	Village of Jamestown Mayor or Administrator	Staff Time	08/2025-08/2030	New
2	Obtain or create inundation maps for all dams.	Village of Jamestown	9	11	Village of Jamestown Mayor or Administrator	Staff Time	08/2025-08/2030	New
3	Seek funding for, prioritize and remove and/or relocate at-risk structures or construction of improved or new storm drainage systems or levees to protect at- risk structures.	Village of Jamestown	9	12	Village of Jamestown Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	Previous
				Drought & Extreme Heat				
4	Seek funding for new storm drainage systems or levees to protect at-risk structures.	Village of Jamestown	5	6	Greene County EMA, Village of Jamestown Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous
				Earthquakes (Included with Multiple Hazards)				
				Flooding (Included with Multiple Hazards)				
5	Ensure all eligible jurisdictions are participating in the NFIP.	Village of Jamestown	7	7	Village of Clifton Mayor or Administrator	Staff Time	08/2025-08/2030	New
6	Establish a Flood Diversion program for roads in Greene County using the Hyper Reach mass notification system.	Village of Jamestown	7	8	Village of Jamestown Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	Previous
7	Identify at-risk structures in Special Flood Hazard Area.	Village of Jamestown	7	9	Village of Jamestown Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	Previous
				Invasive Species (Included with Multiple Hazards)				
				Landslides, Mine Subsidence, and Erosion (Included with Multiple Hazards)				

GREENE
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Greene County Hazard Mitigation Plan

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
	Multiple Hazards							
8	Develop and complete a periodic post- educational campaign surveys to gather citizens' perceptions of the risks associated with natural disasters and the tools and services available to the public to reduce risk (Method to measure the effectiveness of educational campaigns).	Village of Jamestown	1	3	Greene County EMA, Village of Jamestown Mayor or Administrator	Staff Time	08/2025-08/2030	Previous
9	Upgrade windows to high impact windows on schools.	Village of Jamestown	1	2	Village of Jamestown Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	Previous
10	Work with all jurisdictions on filling in gaps and strengthening capabilities in enacting mitigation strategies.	Village of Jamestown	1	1	Village of Jamestown Mayor or Administrator	Staff Time	08/2025-08/2030	New
	Severe Summer Weather (Included with Multiple Hazards)							
	Severe Winter Weather and Extreme Cold (Included with Multiple Hazards)							
	Tornadoes							
11	In the event a county-wide warning siren system cannot be achieved, the following jurisdictions have requested funding to replace existing equipment or install new equipment: Jamestown.	Village of Jamestown	2	5	Village of Jamestown Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	Previous
12	Seek $2.1 million in funding to install a county-wide tornado warning system complete with battery backup in communities with inadequate coverage, or no tornado siren systems.	Village of Jamestown	2	4	Village of Jamestown Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous
	Wildfire (Included with Multiple Hazards)							

Table 5.2.10: Mitigation Actions Priority Table by Hazard for Village of Spring Valley

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
	Dam/Levee Failure							
1	Ensure all high-hazard potential dams have updated Emergency Action Plans (EAPs) in place.	Village of Spring Valley	7	8	City of Spring Valley Mayor or Administrator	Staff Time	08/2025-08/2030	New
2	Obtain or create inundation maps for all dams.	Village of Spring Valley	7	9	Village of Spring Valley Mayor or Administrator	Staff Time	08/2025-08/2030	New
3	Seek funding for, prioritize and remove and/or relocate at-risk structures or construction of improved or new storm drainage systems or levees to protect at-risk structures.	Village of Spring Valley	7	10	Greene County EMA, Village of Spring Valley Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous
	Drought & Extreme Heat (Included with Multiple Hazards)							
	Earthquakes (Included with Multiple Hazards)							
	Flooding (Included with Multiple Hazards)							
4	Ensure all eligible jurisdictions are participating in the NFIP.	Village of Spring Valley	2	4	Village of Spring Valley Mayor or Administrator	Staff Time	08/2025-08/2030	New
5	Establish a Flood Diversion program for roads in Greene County using the Hyper Reach mass notification system.	Village of Spring Valley	2	5	Village of Spring Valley Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	Previous
6	Purchase a second pump for the stormwater system.	Village of Spring Valley	2	3	Village of Spring Valley Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	Previous
	Invasive Species (Included with Multiple Hazards)							
	Landslides, Mine Subsidence, and Erosion (Included with Multiple Hazards)							
	Multiple Hazards							
7	Develop and complete a periodic post-educational campaign surveys to gather citizens' perceptions of the risks associated with natural disasters and the tools and services available to the public to reduce risk (Method to measure the effectiveness of educational campaigns).	Village of Spring Valley	1	2	Village of Spring Valley Mayor or Administrator	Staff Time	08/2025-08/2030	Previous

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
8	Work with all jurisdictions on filling in gaps and strengthening capabilities in enacting mitigation strategies.	Village of Spring Valley	1	1	Village of Spring Valley Mayor or Administrator	Staff Time	08/2025-08/2030	New
Severe Summer Weather								
9	Purchase a generator.	Village of Spring Valley	5	7	Village of Spring Valley Mayor or Administrator	General Operating Budget	08/2025-08/2030	Previous
Severe Winter Weather and Extreme Cold (Included with Multiple Hazards)								
Tornadoes								
10	Seek $2.1 million in funding to install a county-wide tornado warning system complete with battery backup in communities with inadequate coverage, or no tornado siren systems.	Village of Spring Valley	3	6	Village of Spring Valley Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous
Wildfire (Included with Multiple Hazards)								

Table 5.2.11: Mitigation Actions Priority Table by Hazard for Village of Yellow Springs

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
	Dam/Levee Failure							
1	Ensure all high-hazard potential dams have updated Emergency Action Plans (EAPs) in place.	Village of Yellow Springs	9	10	Village of Yellow Springs Mayor or Administrator	Staff Time	08/2025-08/2030	New
2	Obtain or create inundation maps for all dams.	Village of Yellow Springs	9	11	Village of Yellow Springs Mayor or Administrator	Staff Time	08/2025-08/2030	New
3	Seek funding for, prioritize and remove and/or relocate at-risk structures or construction of improved or new storm drainage systems or levees to protect at-risk structures.	Village of Yellow Springs	9	12	Greene County EMA, Village of Yellow Springs Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous
	Drought & Extreme Heat (Included with Multiple Hazards)							
	Earthquakes (Not Included)							
	Flooding							
4	Ensure all eligible jurisdictions are participating in the NFIP.	Village of Yellow Springs	2	5	Village of Yellow Springs Mayor or Administrator	Staff Time	08/2025-08/2030	New
5	Establish a Flood Diversion program for roads in Greene County using the Hyper Reach mass notification system.	Village of Yellow Springs	2	6	Village of Yellow Springs Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	Previous
6	Identify at-risk structures in Special Flood Hazard Area.	Village of Yellow Springs	2	8	Village of Yellow Springs Mayor or Administrator	General Operating Budget	08/2025-08/2030	Previous
7	Update stormwater systems and reline sewer system.	Village of Yellow Springs	2	7	Village of Yellow Springs Mayor or Administrator	United States Army Corps of Engineers (USACE) Flood Control Program	08/2025-08/2030	Previous
	Invasive Species (Included with Multiple Hazards)							
	Landslides, Mine Subsidence, and Erosion (Not Included)							
	Multiple Hazards							
8	Develop a program providing assistance for the disparate population.	Village of Yellow Springs	1	2	Village of Yellow Springs Mayor or Administrator	General Operating Budget	08/2025-08/2030	Previous
9	Monitoring wells for the source water contamination.	Village of Yellow Springs	1	3	Village of Yellow Springs Mayor or Administrator	General Operating Budget	08/2025-08/2030	Previous

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/End	Status
10	Purchase and install a security camera system.	Village of Yellow Springs	1	1	Village of Yellow Springs Mayor or Administrator	General Operating Budget	08/2025-08/2030	Previous
11	Work with all jurisdictions on filling in gaps and strengthening capabilities in enacting mitigation strategies.	Village of Yellow Springs	1	4	Village of Yellow Springs Mayor or Administrator	Staff Time	08/2025-08/2030	New
	Severe Summer Weather							
12	Install underground power lines.	Village of Yellow Springs	3	9	Village of Yellow Springs Mayor or Administrator	Hazard Mitigation Grant Program (HMGP)	08/2025-08/2030	Previous
	Severe Winter Weather and Extreme Cold (Included with Multiple Hazards)							
	Tornadoes (Included with Multiple Hazards)							
	Wildfire (Included with Multiple Hazards)							

6| Schedule & Maintenance

6.1   Participation Overview

The Greene County Hazard Mitigation Plan will be adopted by all participating jurisdictions in Greene County. After the participating jurisdictions have adopted the plan, their signed resolutions or ordinances will be added to the plan in **Appendix G**.

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 meet to provide a status update for each mitigation action that is under their purview, record and report on any major climate events, and report on any other related issues. This meeting will allow the jurisdictions and responsible parties to 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 should also be available to the public. Additionally, each jurisdiction and the County will review and consider 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 Greene County Emergency Management Agency and Ohio Emergency Management Agency websites. Greene 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 Greene 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. Greene 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 and universities, play a major role in enforcing and implementing mitigation strategies because their daily operations guide the development of the communities in Greene County.

6.4   Future Integration Efforts

Greene County and its participating jurisdictions will make a concerted effort to integrate the Hazard Mitigation Plan and its mitigation actions into 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 jurisdiction in Greene 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. Some 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.

The Greene County Emergency Operations Plan (EOP) should facilitate integration of mitigation actions into response and recovery activities where appropriate. Key staff responsible for administering and

updating the EOP should coordinate with the Core Planning Committee to identify integration areas. The jurisdictions with floodplain regulations (Greene 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 and support to ensure this goal is being met. 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, areas in the base flood zone or in dam inundation areas should be designated for limited to no development; and for 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.

Greene County also has a Floodplain Manager who works with the Greene 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 ensure that new structures are not placed within flood risk zones without taking compensatory measures, like elevation, as early as the site development stage of construction. The Greene County Engineer and Floodplain Manager works with the Greene County Auditor to manage the floodplain mapping and parcel identification and documentation by developing and maintaining GIS mapping. The Greene County Engineer also ensures that mitigation actions, like elevation, are properly included in the submitted building and occupancy permits during the approval process. The Greene County Engineer is also responsible for County ditch maintenance, which ties the County Engineer's office to the Greene 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, Greene 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. Greene County will defer meeting HHPD requirements for their 2025 Hazard Mitigation Plan and will amend them when/where necessary. Greene 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 Greene 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.