



# 2019 Gallia County Hazard Mitigation Plan

Gallia County, Ohio

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## SECTION 1:

# Introduction

### Authority

This plan is an update of the **Gallia County Natural Hazards Mitigation Plan** that was developed in 2004, updated in 2013 and adopted for implementation by the Gallia County Commissioners and all incorporated jurisdictions within the County. This updated plan complies with all requirements set forth by the Ohio Emergency Management Agency and the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Section 104 of the Disaster Mitigation of 2000. In addition, it complies with all of FEMA's Final Rule 44 CFR Part 201, which outlines criteria for approval of hazard mitigation plans.

### Purpose

The Federal Emergency Management Agency (FEMA) and the Ohio Emergency Management Agency (OEMA) define Hazard Mitigation as any sustained action taken to reduce or eliminate long-term risk to people and property from natural hazards such as flooding, storms, high winds, earthquakes, etc. Mitigation efforts undertaken by communities will help to minimize damages to buildings and infrastructure, such as water supplies, sewers, and utility transmission lines, as well as natural, cultural and historic resources.

Gallia County is at risk of damage from a variety of natural hazards: flooding, winter storms, severe storms, landslides, tornadoes, mine subsidence, earthquakes and droughts. The objective of the Gallia County Hazard Mitigation Plan is to protect citizens, critical facilities, infrastructure, private property and the surrounding environment from natural hazards. This objective can be achieved by identifying potential hazards in the county and establishing procedures that will mitigate the effects of hazards. This plan provides a framework for planning against hazards in the county and participating jurisdictions.

The primary objective of this Plan is to protect Gallia's citizens, critical facilities, infrastructure, private property, and the surrounding environment from natural hazards.

The Gallia County Hazard Mitigation Plan includes all unincorporated areas and incorporated areas within the county. This Plan includes Gallia County unincorporated, Villages of Centerville, Cheshire, Crown City, Rio Grande, and Vinton, and the City of Gallipolis.

### Scope

The focus of the 2019 Gallia County Mitigation Plan Update is on those hazards determined to be "high" or "moderate" risks to Gallia County, as determined through a detailed hazard risk assessment. All potential hazards warranted some analysis and assessment. Other hazards that pose a "low" or "negligible" risk will continue to be evaluated during future updates to the Plan, but they may not be fully addressed until they are determined to be of high or moderate risk. This enables Gallia County and the participating jurisdictions to prioritize mitigation actions based on those hazards which are understood to present the greatest risk to lives and property.

The geographic scope (i.e., the planning area) for the Plan includes Gallia County and incorporated jurisdictions. Table 1.1 indicates the participating jurisdictions.

**Table 1.1: Participating Communities in Gallia County Hazard Mitigation Plan**

Communities	
Village of Centerville	Village of Vinton
Village of Crown City	City of Gallipolis
Village of Cheshire	Gallia County
Village of Rio Grande	

## Summary of Plan Contents

This plan is designed to be as reader-friendly and functional as possible. While significant background information is included on the processes and studies used (i.e., risk assessment, capability assessment), this information is separated from the more meaningful planning outcomes or actions (i.e., mitigation strategy, mitigation action plan). In the beginning of each section is a list of the 44 CFR 201.6 requirements that are met.

Section 2, **Planning Process**, describes the process used to prepare the Plan. It identifies members of the planning team and how the public and other stakeholders were involved. It also includes a summary for each of the key meetings along with any associated outcomes.

The **County Profile**, located in Section 3, provides a general overview of Gallia County, including geographic, demographic, and economic characteristics. In addition, this section discusses building characteristics and land use patterns. This baseline information provides a snapshot of the planning area and helps local officials recognize those social, environmental, and economic factors that ultimately play a role in determining the city’s vulnerability to hazards.

Historical information is provided to assess hazards impactful to the County and for the development of mitigation actions to reduce risk and improve long-term resilience.

The **Risk Assessment** is presented in Section 4. This section serves to identify, analyze, and assess hazards that threaten Gallia County. The risk assessment also attempts to define hazard risks that may uniquely or exclusively affect specific areas of the county.

The Risk Assessment begins by identifying hazards that threaten Gallia County. Next, it establishes detailed profiles for each hazard, building on available historical data from the previous plan, past hazard occurrences, spatial extent, and probability of future occurrence. This section culminates in a hazard risk ranking based on conclusions regarding the frequency of occurrence, spatial extent, and potential impact highlighted in each of the hazard profiles (known as the Priority Risk Index).

The vulnerability assessment uses available hazard data to evaluate vulnerability. FEMA’s HAZUS®MH loss estimation methodology evaluates flood and earthquake risk. In essence, the information generated through the risk assessment serves a critical function as the county seeks to determine the most appropriate mitigation actions to pursue and implement. The risk assessment enables the county

to prioritize and focus its efforts on those hazards of greatest concern and those structures or planning areas facing the greatest risk.

The **Mitigation Strategy**, found in Section 5, consists of broad goal statements (refined for the 2019 plan update) as well as an analysis of hazard mitigation techniques for Gallia County to consider in reducing hazard vulnerabilities. The strategy provides the foundation for a detailed **Mitigation Action Plan**, which links specific mitigation actions for each jurisdiction, department, or community partner. This process locally-assigns implementation mechanisms and target completion dates. Together, these sections are designed to make the plan both strategic, through the identification of long-term goals, and functional, through the identification of immediate and short-term actions that will guide day-to-day decision-making and project implementation.

The plan emphasizes using program and policy alternatives to make Gallia County less vulnerable to natural hazards while improving the economic, social, and environmental health of the community.

With this plan, Gallia County is embarking on an innovative planning process to consider future hazard risks and projection in the risk assessment and mitigation strategies. The concept of multi-objective planning was emphasized throughout the planning process, particularly in identifying ways to link, where possible, hazard mitigation policies and programs with complimentary community goals related to disaster recovery, housing, economic development, recreational opportunities, transportation improvements, environmental quality, land development, and public health and safety.

The **Capability Assessment**, found in Section 5, provides an inventory and analysis of existing plans, ordinances, and relevant documents. The purpose of this assessment is to identify any existing gaps, opportunities, or conflicts in programs or activities that may hinder hazard mitigation efforts and to identify those activities that should be built upon in establishing a successful and sustainable local hazard mitigation program. Specific capabilities addressed in this section include planning and regulatory capability, staff and organizational (administrative) capability, technical capability, fiscal capability, and political capability. Information was obtained through the use of a Capability Assessment Survey.

The Community Profile, Risk Assessment, and Capability Assessment collectively serve as a basis for determining the goals for the Gallia County Hazard Mitigation Plan, each contributing to the development, adoption, and implementation of a meaningful and manageable Mitigation Strategy that is based on accurate background information.

**Plan Maintenance**, found in Section 6, includes the measures that the Gallia County will take to ensure the Plan's continuous long-term implementation. The procedures also include the manner in which the Plan will be regularly evaluated and updated to remain a current and meaningful planning document.

Lastly, the **Appendices** provide documentation including: Appendix A: Adoption Resolution; Appendix B: Meeting Notes/Sign-in; Appendix C: Correspondence; Appendix D: Community Hazard Maps; Appendix E: Review Tool (Federal Review Tool).

## SECTION 5:

# Mitigation Strategy

### 44 CFR Requirement

**Requirement §201.6(c)(3)(i):** [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

**Requirement §201.6(c)(3)(ii):** [The mitigation strategy **shall** include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

**Requirement: §201.6(c)(3)(iii):** [The mitigation strategy section **shall** include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization **shall** include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

**Requirement §201.6(c)(3)(iv):** For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

## Introduction

The mitigation strategy provides a blueprint for Gallia County to follow to become less vulnerable to its identified hazards. It is based on general consensus of the Core Committee, the findings and conclusions of the Risk Assessment, and input from the public and stakeholders. The mitigation strategy includes hazard mitigation plan goals and hazard mitigation actions. The plan goals serve as the guiding principles for future mitigation policy and project administration and hazard mitigation actions serve as implemental items that support goals. The mitigation strategy includes a process for evaluating mitigation actions to ensure actions are feasible based on community capabilities, tied to plan goals, and effective in reducing hazard losses for current and future structures and populations. This section outlines the goals, capabilities, mitigation action evaluation, prioritization process and the Mitigation Action Plan (MAP) for Gallia County.

## 2019 Gallia County Hazard Mitigation Plan Goals

The plan goals reflect current needs and priorities of the county and are intended to reduce long-term vulnerability to all hazards identified in this plan. The 2019 Gallia County Hazard Mitigation Plan goals were reviewed at the Core Committee kickoff and Risk Assessment meeting in December 2018. The Core Committee reviewed the goals and opted to consolidate the goals to more accurately reflect the desires of the county. The plan goals are as follows:

## SECTION 2:

# Planning Process

### 44 CFR Requirement

**Requirement §201.6(b):** In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

- (1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
- (2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and
- (3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

**Requirement §201.6(c)(1):** [The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

**Requirement: §201.6(c)(3)(ii):** [The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.

## Overview of Hazard Mitigation Planning

Local hazard mitigation planning is the process of organizing community resources, identifying and assessing hazard risks, and determining how to best minimize or manage those risks. This process culminates in a hazard mitigation plan that identifies specific mitigation actions, each designed to achieve both short-term planning objectives and a long-term community vision.

To ensure the functionality of a hazard mitigation plan, responsibility is assigned for each proposed mitigation action to a specific individual, department, or agency along with a schedule or target completion date for its implementation. Plan maintenance procedures are established for the routine monitoring of implementation progress, as well as the evaluation and enhancement of the mitigation plan itself. These plan maintenance procedures ensure that the Plan remains a current, dynamic, and effective planning document over time that becomes integrated into the routine local decision-making process.

Communities that participate in hazard mitigation planning have the potential to accomplish many benefits, including:

- Saving lives and property,
- Saving money,
- Speeding recovery following disasters,
- Reducing future vulnerability through wise development and post-disaster recovery and reconstruction,

- Expediting the receipt of pre-disaster and post-disaster grant funding, and
- Demonstrating a firm commitment to improving community health and safety.

Typically, communities that participate in mitigation planning are described as having the potential to produce long-term and recurring benefits by breaking the repetitive cycle of disaster loss. A core assumption of hazard mitigation is that the investments made before a hazard event will significantly reduce the demand for post-disaster assistance by lessening the need for emergency response, repair, recovery, and reconstruction. Furthermore, mitigation practices will enable local residents, businesses, and industries to re-establish themselves in the wake of a disaster, getting the community economy back on track sooner and with less interruption.

The benefits of mitigation planning go beyond solely reducing hazard vulnerability. Mitigation measures such as the acquisition or regulation of land in known hazard areas can help achieve multiple community goals, such as preserving open space, maintaining environmental health, and enhancing recreational opportunities. Thus, it is vitally important that any local mitigation planning process be integrated with other concurrent local planning efforts, and any proposed mitigation strategies must take into account other existing community goals or initiatives that will help complement or hinder their future implementation.

## Summary of Previous Planning Efforts

Gallia County has been engaged in planning since the passage of the Disaster Mitigation Act of 2000 with their initial plan created in 2004 and the latest update completed in 2013. In the 2013 Plan, hazards were identified and prioritized based on likelihood, occurrence, and estimated structure impact. The hazards of greatest concern as part of the 2013 plan update were Floods, Winter Storms, and Severe Storms.

## Preparing the 2019 Hazard Mitigation Plan Update

To prepare the 2019 *Gallia County Hazard Mitigation Plan Update*, Stantec was hired as the consultant to provide professional mitigation planning services. Matthew Leshner from Stantec served as the project manager while Ben Schattschneider served as the lead planner for this project.

Per the contractual scope of work, the consultant team followed the mitigation planning process recommended by FEMA (Publication Series 386 and Local Mitigation Plan Review Guide). The Local Mitigation Plan Review Tool, found in Appendix E, provides a detailed summary of FEMA's current minimum standards of acceptability for compliance with DMA 2000 and notes the location where each requirement is met within this Plan. These standards are based upon FEMA's Final Rule as published in the Federal Register in Part 201 of the Code of Federal Regulations (CFR). The planning team used FEMA's Local Mitigation Plan Review Guide (October 2011) for reference as they completed the Plan.

Hazard mitigation plans are required to be updated every five (5) years, so your County remains eligible for federal mitigation funding.

It was the focus of the Gallia County EMA to identify Core Committee members that would include all jurisdictions within Gallia County and additional Gallia County Agencies. Gallia County EMA worked with all the jurisdictions to identify appropriate individuals to serve on the Core Committee for the 2019 update. The selected individuals were invited to all mitigation planning meetings to support the

development of the hazard mitigation plan. Table 2.1 lists representatives from the county and local jurisdictions who participated in the update. The Core Committee includes at least one representative from each local jurisdiction and Gallia County.

**Table 2.1: Core Committee Representatives**

Community	Name	Title
Village of Centerville	Gene Layton	Mayor
Village of Cheshire	Susan Baker	Mayor's Assistant
Village of Crown City	Daryl Hager	Mayor
Village of Rio Grande	Jeff Seagraves	Water and Wastewater Superintendent
Village of Vinton	Joshua Whealdon	Mayor
City of Gallipolis	Gene Green	City Manager
Gallia County EMA	Tim Miller	EMA Deputy Director
Gallia County EMA	Sherry Daines	EMA Director
Gallia County	Nick Mills	SWCD and FPA
Gallia County	Larry Betz	County Auditor
Gallia County	Kevin Nicholas	County Auditor's Office
Gallia County	Brent Saunders	County Commission
Gallia County	Melissa Clark	Planning and Economic Development
ODOT	Mark Kirkhuart	ODOT Representative
State of Ohio EMA	Lorie Haukedahl	Regional Supervisor

## Plan Development Meetings

The preparation of this Plan required a series of meetings and open houses for facilitating discussion, gaining consensus and initiating data collection efforts with local government staff, community officials, and other identified stakeholders. More importantly, the meetings and workshops prompted continuous input and feedback from relevant participants throughout the drafting stages of the Plan. The following is a summary of the key meetings and community workshops held during the development of the plan update.<sup>1</sup>

Four key meetings were conducted and a public survey:

- Core Committee Kick-off/Risk Assessment Meeting,
- Core Committee Mitigation Strategy Meeting,
- Public Survey,
- Core Committee Plan Review Meeting and
- Public Plan Review Open House.

In many cases, routine discussions and additional meetings were held by local staff to accomplish

<sup>1</sup> Copies of agendas, sign-in sheets, minutes, handout materials, and public advertisement for all meetings and workshops can be found in Appendix B.

planning tasks specific to their department or agency, such as the approval of specific mitigation actions for their department or agency to undertake and include in the Mitigation Action Plan.

### Core Committee Kick-off/Risk Assessment –December 12, 2018

The kick-off meeting was held at the Gallia County 911 Center on December 12, 2018 at 1 pm. The purpose of the meeting was to provide an overview of hazard mitigation including possible techniques; gather local information; and review roles, responsibilities, and project schedule. The meeting was facilitated by Matthew Leshner and Ben Schattschneider with Stantec.

Mr. Leshner started the meeting with a review of the Disaster Mitigation Act of 2000. Mr. Leshner asked the participants to review the goals from the 2013 plan to determine if they are still relevant or if they should be updated to reflect the current needs of Gallia County. The 2013 plan identified the following three hazards as priority:

- Floods
- Winter Weather
- Severe Storms

Mr. Leshner asked the participants to review the goals from the 2012 plan to determine if they are still relevant or if they should be updated to reflect the current needs of Gallia County. He recommends not having a goal for each hazard as currently included in the 2012 plan. He recommended consolidating the goals from the current plan and add a few goals regarding emergency services/response and natural resource protection. Mr. Leshner discussed the 2019 plan update process will include a plan that meets the current needs of Gallia County, leverage local knowledge on historical events and impacts, and obtain new hazard information.

Participants were asked to think about mitigation in two ways. First, what mitigation actions can be implemented to reduce risk to the existing built environment. Second, what can be done to ensure future development is not at an increased risk to specific hazards.

An icebreaker exercise was conducted so that participants could allocate money to mitigation techniques that were of highest priority. Each community was provided \$100 million to allocate for mitigation projects. A summary of the results is provided below in table 2.2:

Table 2.2: Ice Breaker Exercise Results

Mitigation Technique	Dollars Allocated
Structural Projects	\$170 million
Emergency Services	\$170 million
Prevention	\$165 million
Property Protection	\$115 million
Natural Resource Protection	\$115 million
Public Education/Awareness	\$65 million

Mr. Leshner asked the Core Committee to share how they decided to “spend” the money. Examples include:

- Drainage issues leading to flooding in many areas of the county lead many communities to allocate a majority of funds to structural projects.
- Many participants also allocated substantial funds to emergency protection because it is important
- Prevention, and Private Property and Natural Resource Protection were substantially funded due primarily to flash flooding, erosion, and a lack of riparian corridor.

Mr. Leshar outlined the planning process moving forward. There will be requests to communities to provide information on available GIS data, land use plans, and regulations. This information will be used to help develop the capability assessment in the hazard mitigation plan. Mr. Leshar wrapped up with a review of the major plan milestones, project schedule, and asked if there were any questions.

## Core Committee Mitigation Strategy Meeting –March 21, 2019

The mitigation strategy meeting was held at the Gallia County 911 Center on March 21, 2019 at 1 pm. The purpose of the meeting was to provide an overview of hazard mitigation, plan progress to date (including risk assessment), and develop potential mitigation actions. Matt Leshar, Ben Schattschneider and Danielle Johnson, Stantec, facilitated the meeting. Matt Leshar began the meeting with an overview of the meeting agenda and a review of the Disaster Mitigation Act (DMA) of 2000.

Ben Schattschneider from Stantec presented the risk assessment results. It was emphasized that what was being presented was a high-level approach compared to what could be found in the plan. Each hazard provided hazard highlights such as previous occurrences, probability, location, potential impacts, and previous losses.

The results of the risk assessment process were used to generate a Priority Risk Index (PRI), which categorizes and prioritizes potential hazards. The ranking of hazards was presented, and attendees were asked to review and comment on the list if anything seemed out of line with perceived risks. The

The Priority Risk Index (PRI) categorizes and prioritizes potential hazards in your County as high, moderate, or low based on:

- Probability;
- Impact;
- Spatial extent;
- Warning time; and
- Duration.

results of the various hazards are as follows:

- High Risk Hazards
  - Flood
  - Severe Storms (Thunderstorms, Windstorms, Hail)
  - Winter Storm
- Moderate Risk Hazards
  - Wildfire
  - Landslide
  - Tornado
  - Drought
- Low Risk Hazards
  - Land Subsidence
  - Earthquake

**The Communities agreed that landslides should be a higher-ranking priority** and wildfire should have a lower priority. It was explained that landslides in the county typically moderate in size and impact a significant area. **Additionally, although wildfires occur often, they are minor and have a negligible spatial extent.** These changes were reflected in the risk assessment to better guide the mitigation strategy for Gallia County.

Mr. Leshar then gave an overview of the mitigation strategy, explaining that it includes goals, actions,

and the action plan. The goals were reviewed and confirmed at the kick-off meeting, meaning the remaining focus was on mitigation actions. He explained the 3-step process needed to complete the mitigation strategy:

1. Review and update existing actions
2. Evaluate potential hazard mitigation actions
3. Develop new hazard mitigation action

Mr. Leshar reviewed with the attendees the mitigation actions from the 2007 plan that were identified for all jurisdictions. These actions were reviewed and the statuses were updated for the 2019 plan.

Mr. Leshar introduced the community capability assessment. The purpose of the assessment is to identify strengths within a community and areas where a community may need additional resources to pursue mitigation actions. The capability assessment worksheet was used to review planning/regulatory capabilities, administrative/technical capabilities, fiscal capabilities, and political capabilities. Meeting notes and sign in sheets are provided in Appendix B.

### **Public Survey – Start: February 18, 2019 End: March 19, 2019**

The Public Survey was created to gather community feedback on how disasters have impacted community members across the county and on how prepared they are for future disasters. The survey provided the public an opportunity to be engaged in the hazard mitigation plan update and recommend mitigation actions. Gallia County EMA posted the Survey on social media for a month. Ninety-eight community members viewed the survey and thirty completed it.

The following insights were gleaned from the 30 participants that completed the community survey:

- 64% were somewhat concerned about their community being impacted by a disaster
- 13% live in the floodplain and 10% of total participants have flood insurance
- 86% are interested in making their home and community more resistant to hazards
- 82% do NOT know who to contact regarding reducing hazards risks
- The most effective way to receive information is ranked as follows:
  - Internet (46%)
  - Mail (20%)
  - Public Meetings (10%)
  - TV and Phone (8%)
  - School Meetings (4%)
  - Radio and Newspaper (2%)
- Prevention was the most significant mitigation activity identified and Property Protection, Structural Projects, Public Education and Awareness, Natural Resources, and Emergency Services followed in respective order.

The full summarized results of this survey can be viewed in appendix C.

### **LEPC Meeting – May 20, 2019**

The LEPC meeting was held at the Gallia County 911 Center on May 20, 2019 at 12:00pm. The meeting was opened by chairperson Sherry Daines. Sherry advised the committee the County EMA is currently working on the Hazard Mitigation Plan and the process is going well and Matt Leshar from Stantec will provide an update on the plan. The committee's business was reviewed and training

opportunities were discussed. Once the old and new business was completed Sherry ask Mr. Lesher to provide an update on the hazard mitigation plan.

Mr. Lesher discussed the history of hazard mitigation in context of the Disaster Mitigation Act of 2000. He presented the results of the hazard risk assessment and provided details on the highest ranking hazards: Flood, Severe Thunderstorm/Windstorm, Winter Storm and Landslide. Mr. Lesher then discussed the community capability assessment and presented some of the mitigation actions identified by the communities that are included in the plan. Mr. Lesher closed the presentation by requesting committee members to review the draft plan once it is available and to provide comments.

### **Plan Review Meeting – May 29, 2019**

The purpose of the meeting was to provide an overview of the draft hazard mitigation plan and request any comments from the meeting participants. Matt Lesher and Danielle Johnson, Stantec, facilitated the meeting and began the meeting with an overview of the agenda. Mr. Lesher provided an overview of the hazard mitigation planning process for the Gallia County, Ohio plan update. He then presented the plan and discussed highlights from the sections of the plan. As he discussed the plan, he requested any questions or comments from the meeting participants.

Mr. Lesher also provided an overview of the remaining schedule for the Hazard Mitigation Plan update. A public open house will be held on May 29 from 4 to 5 pm at the Gallia County 911 Center to provide the public an opportunity to provide comments and ask questions regarding the draft plan. Notification of the public meeting was posted previously on EMA's website and social media. Community officials and the public will be provided a 2-week comment period for the plan. Comments should be sent to Tim Miller at the Gallia County 911 Center. Mr. Miller provided the draft plan to all the communities via email on May 24th. Following the review period the plan will updated and then submitted to Ohio EMA for review. Following the Ohio EMA review, the plan will be submitted to FEMA for final review and approval. After the plan has been approved by FEMA, the communities will work to adopt the final plan.

### **Public Plan Review Open House –May 29, 2019**

A public open house will be held on May 29 from 4 to 5 pm at the Gallia County 911 Center to provide the public an opportunity to provide comments and ask questions regarding the draft plan. No community residents attended the open house.

#### **INVOLVING THE STAKEHOLDERS**

Gallia County EMA worked to provide an opportunity for a wide range of stakeholders, including opportunity for agencies within the County, communities within Gallia County and the public through an online survey and a public open house.

In addition, neighboring counties were notified by email of the plan update process and invited to review and comment on the draft plan. The email was sent to county emergency management coordinators. A complete list of these emails and a copy of the outreach email can be found in Appendix C.

#### **REVIEW AND INCORPORATION OF EXISTING PLANS AND STUDIES**

Gallia County plans and regulations have been leveraged during the development of this plan. Each section references these sources which are primarily found in Section 3 through Section 6. Types of sources leveraged included:

## Local Planning Documents (e.g., floodplain management ordinances and Subdivision Regulations)

- Floodplain Regulations
  - Gallia County and many of the jurisdictions have adopted floodplain regulations that meet all National Flood Insurance Program (NFIP) requirements. Table 2.3 identifies Gallia County communities participating in the NFIP. The Village of Centerville does not participate in the NFIP as there is no identified floodplains within the village corporate boundaries. Floodplain regulations call for the proper elevation of structures and also control the effects on the floodplain itself (cuts, fills). These regulations do not ensure the safety of those who develop in the floodplain but go a long way in reducing the effects of flooding by removing structures from the projected path of water.

Table 2.3: Communities Participation in the NFIP

Community	NFIP Participation
Village of Cheshire	Yes
Village of Crown City	Yes
Village of Rio Grande	Yes
Village of Vinton	Yes
City of Gallipolis	Yes
Gallia County	Yes

- Subdivision Regulations
  - These regulations govern the development of how land will be divided into separate lots or sites within the County. The required compliance allows access for emergency vehicles during various hazard events and identifies concerns such as avoiding development in floodplains and erosion.

### DOCUMENTATION OF PLAN PROGRESS

Progress in hazard mitigation planning for the participating jurisdictions in Gallia County is documented in this plan update. Since hazard mitigation planning update in 2011, some mitigation actions have been completed and implemented in the participating jurisdictions. These actions will help reduce the overall risk to natural hazards for the people and property in Gallia County. The actions that have been completed are documented in the Mitigation Action Plan found in Section 5.

In addition, community capability continues to improve with the implementation of new plans, policies and programs that help to promote hazard mitigation at the local level. The current state of local capabilities for the participating jurisdictions are captured in *Capability Assessment*. The participating jurisdictions continue to demonstrate their commitment to hazard mitigation and hazard mitigation planning and have proven this by developing the Core Committee to update the Plan and by continuing to involve the public in the hazard mitigation planning process.

1. Reduce the loss of life and property damage due to the effects of natural hazards.
2. Increase the public's awareness and provide education opportunities about natural hazards.

## Community Capability Assessment

In order to select feasible mitigation actions, an assessment of the current capabilities must be considered. These capabilities include plans, policies, authorities, programs and resources in place to accomplish mitigation within the County.

Each of these items was assessed via a thorough review. Representatives from each community were contacted to complete the matrix. Capabilities were categorized into planning tool, administrative and technical, fiscal and education and training.

The results of the capability assessment are presented in the following matrix. The status of each capability item is indicated with a symbol:

- A checkmark (✓) indicates that the given item is currently in place and being implemented;
- A "C" indicates the item is covered by the county;

**PLANNING TOOL CAPABILITIES:** What plans are in place that may help implement hazard mitigation projects? (see chart on the following page)

## SECTION 3:

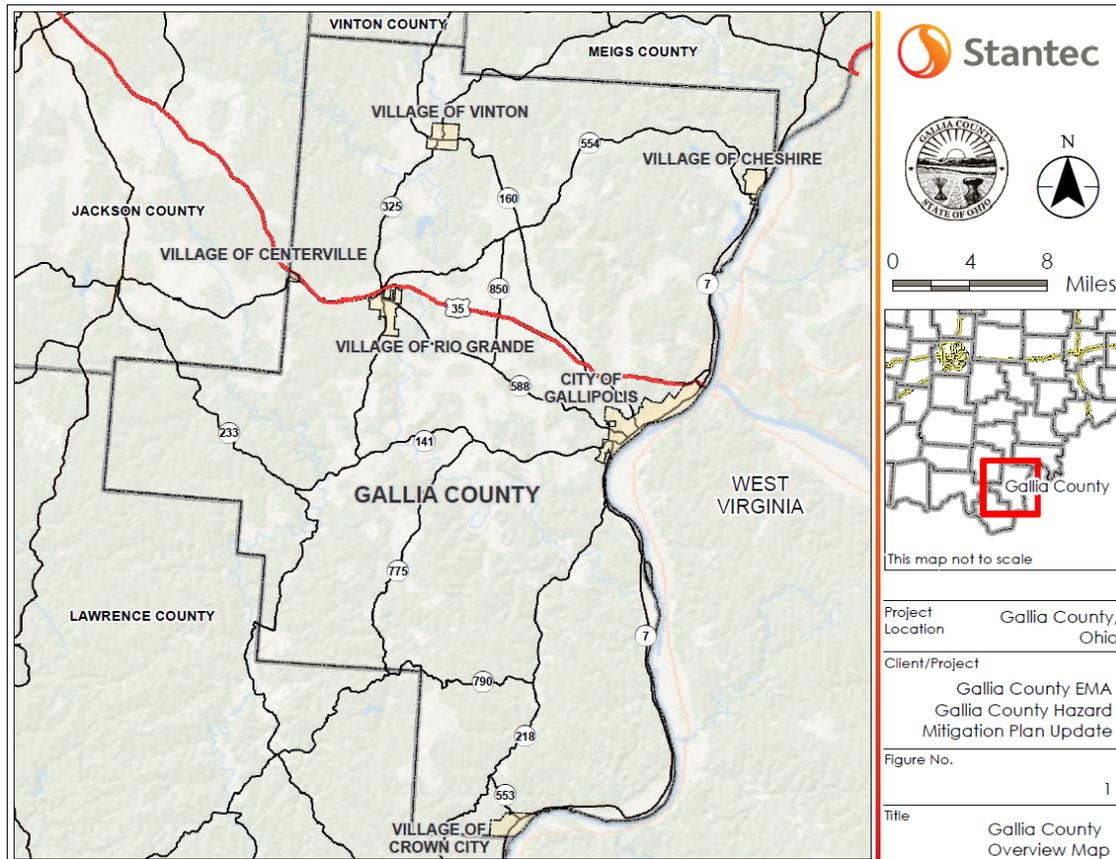
# County Profile

### 44 CFR Requirement

**Requirement §201.6(d)(3):** A local jurisdiction must 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 5 years in order to continue to be eligible for mitigation project grant funding.

### Geography and the Environment

Gallia County is located in southeast Ohio and is bordered by Meigs and Vinton counties to the north, Jackson and Lawrence counties to the west, Lawrence County to the south, and the state of West Virginia to the east joined by the Ohio River. The county lies on the north and west shores of the Ohio River. Its river boundary stretches for more than 60 miles on the eastside of Gallia County. The county is comprised of 469 square miles of land. There are 15 townships in Gallia County and six incorporated jurisdictions. Gallia County was formed on April 30, 1803 and was named for Gaul, the ancient name for France. The county seat of Gallia County is the City of Gallipolis.



Gallia County enjoys a four-season climate with an average annual temperature of 57.4 degrees Fahrenheit, average annual rainfall of 41 inches and average annual snowfall of 7 inches. The county enjoys a climate that is characterized by moderate winters with few hot, humid summer days. Summer temperatures average in the high 80s and winter temperatures range from the low 20s to low 40s. Gallia County offers a variety of recreation activities which include hiking, biking, canoeing or kayaking, tennis, golf, swimming, and boating. Gallia County is home to attractions such as the John Gee Black Historical Center and the Ariel-Carson Dater Performing Arts Centre.

## Population and Demographics

From 2000 to 2010, population in Gallia County decreased by 134 people, a 0.4 percent decrease. The population counts from the US Census Bureau for 2000, 2010 and 2017 for each of the participating communities are provided in the table below.

Table 3.1: Population Counts

Community	2000 Census Population	2010 Census Population	2017 Estimated Population	% Change 2000 to 2017
Village of Centerville	134	103	100*	-25%
Village of Cheshire	221	132	128*	-42%
Village of Crown City	411	413	400*	-2.6%
Village of Rio Grande	915	830	804*	-12.1%
Village of Vinton	324	222	215*	-33.6
City of Gallipolis	4,180	3,641	3,432	-17.8
Gallia County (Unincorporated Areas)	24,854	25,593	24,894*	0.2%
Total Gallia County	31,069	30,934	29,973	-3%

Source: U.S. Census Bureau \*Estimated applying a consistent 3% decline associated with the overall County

Based on the 2010 Census, the median age for Gallia County is 40.5 years. The racial characteristics of the county is presented in Table 3.2.

Table 3.2: Demographics

Community	White Persons, Percent (2010)	African American, Percent (2010)	Hispanic, Percent (2010)	Other Race, Percent (2010)
Gallia County	94.8	2.7	1.2	1.3

Source: Ohio Gallia County Profile

## Housing, Infrastructure, and Land Use

According to the 2017 Census, there were 13,727 housing units in Gallia County. The median home value was \$101,200 (2017). Housing information is provided in Table 3.3.

Table 3.3: Housing Characteristics

Community	Housing Units (2000)	Housing Units (2010)	Housing Units (2017)	Owner Occupied Units (2017)	Median Home Value (2017)
Gallia County	13,498	13,925	13,727	74.8%	\$101,200

Source: U.S. Census Bureau

Gallia County is mostly rural (94.2%) and forest is the largest land cover percentage (59.23%). A majority of the land use in Gallia County is either cropland or forest. Gallia is part of Ohio's Appalachian Region. U.S. Route 35 runs east-west through the county and State Route 7 is the main north-south thoroughfare that runs along the Ohio River in the county.

There are several communities located in the county and these areas are where the county's population is generally concentrated. The commercial areas are also where many businesses, commercial uses, and institutional uses are located. Local land use is further discussed in the capability assessment section of this hazard mitigation plan.

## Employment and Industry

Gallia County has a labor force of 11,400 as of 2017 with an unemployment rate of 6.7% (Ohio County Profile). The private sector is the largest employer with 9,125 persons (80%). Local governments also employ significant numbers in the Gallia County workforce.

## SECTION 4

# Hazard Risk Assessment

### 4.1 Introduction

Gallia County is vulnerable to a range of natural hazards which threaten life and property. Current FEMA regulations and guidance under the Disaster Mitigation Act of 2000 (DMA 2000) require an evaluation of a full range of natural hazards as described in Table 4.1.

**Table 4.1: FEMA-Approved Multi-Hazard Mitigation Planning Requirements**

#### 44 CFR Requirement

**Requirement §201.6(c)(2)(i):** [The risk assessment shall include a] description of the type ... of all-natural hazards that can affect the jurisdiction.

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

**Requirement §201.6(c)(2)(ii):** [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

**Requirement §201.6(c)(2)(ii):** [The risk assessment] must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged floods.

**Requirement §201.6(c)(2)(ii)(A):** The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area.

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

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

**Requirement §201.6(c)(2)(iii):** For multi-jurisdictional plans, the risk assessment must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

During this 2019 Mitigation Plan Update, the county identified and analyzed hazards thought to be of potential risk. This was evaluated by reviewing historical data and known vulnerabilities, building upon the *2012 Gallia County Mitigation Plan*, and integrating community input. Previous events were updated and validated using the National Center for Environmental Information (NCEI), the Ohio Department of Natural Resources (ODNR), and other hazard specific sources. Hazard Profiles were edited to clearly follow the DMA 2000 reflecting the probability that an event will occur, potential impact, spatial extent, warning time, and the event duration.

Accompanying these hazard profiles, where possible, are an inventory of assets and an estimate of associated losses. Lastly, these profiles are prioritized in a Priority Risk Index (PRI) to guide the Mitigation Strategy in the following section.

## 4.2 FEMA Declared Disasters

Disaster declarations will help determine the likelihood that certain events will occur and will help provide initial insight into the hazards that may impact Gallia County. Since 1968, thirteen presidential disaster declarations have been reported in Gallia County. Eight declarations relate to severe storms, two winter storms and blizzards events, one hurricane, one heavy rain. There were eight flooding related events and one event which contained landslides.

Table 4.2a: Gallia County Presidential Disaster Declarations

Date	Name	Disaster Number
June 1968	Heavy Rains, Flooding	DR-243
January 1978	Blizzards and Snowstorms	EM-3055
January 1996	Storms/Floods	DR-1097
June 1996	Flooding	DR-1122
March 1997	Severe Storms/Flooding	DR-1164
March 2000	Severe Storms and Flooding	DR-1321
March 2003	Severe Winter Storm	DR-1453
September 2004	Severe Storms and Flooding	DR-1556
September 2005	Ohio Hurricane Katrina Evacuation	EM-3250
July 2011	Severe Storms/Flooding	DR-4002
June 2012	Severe Storms/Flooding	EM-3346
August 2012	Severe Storms and Straight-line Winds	DR-4077
April 2018	Severe Storms, Landslides, and Mudslides	DR-4360

## 4.3 Hazard Identifications

To reduce the potential for damage due to hazards, it is necessary to identify hazards that may affect the County. This process is completed using published information and Web sites that address hazards globally, nationally, within Ohio, or specifically within Gallia County as well as anecdotal information provided by members of the Mitigation Core Group and the public.

Only natural hazards are identified and examined in this plan update as required by the Disaster Mitigation Act of 2000. As part of the update process, hazards from the existing plan were reviewed and new hazards were considered by cross checking with the 2011 State of Ohio Hazard Mitigation Plan.

Table 4.3a includes the hazards from the 2012 Gallia County Hazard Mitigation plan and the state plan that were reviewed during the Mitigation Plan Update meeting on December 12, 2018. It also includes a list of the hazards identified for the 2019 Gallia County Hazard Mitigation Plan update.

Gallia County requested Wildfire and Dam Failure be assessed for inclusion into the 2019 plan.

Table 4.3a Hazards Identified for 2019 Plan

Hazards	State Plan	2012 Plan	New 2019 Plan
Coastal Erosion	x		
Dam Failure	x		x
Droughts	x	x	x
Earthquakes	x	x	x
Flood	x	x	x
Seiche/Coastal Flooding	x		
Landslide	x	x	x
Land Subsidence	x	x	x
Invasive Species	x		
Severe Thunderstorms	x	x	x
Windstorms	x	x	x
Hail	x	x	x
Winter/Ice Storms	x	x	x
Tornado	x	x	x
Wildfires	x		x

## 4.4 Hazard Profiles

Hazard profiles are an in-depth assessment of both past and potential impact. Hazard profiles will be developed for the hazards identified in Table 4.3a. Each is profiled separately to more easily assign a priority risk index (PRI) value and contain the following categories:

### Description:

A scientific explanation of the hazard, including severity and impacts, and how this is determined.

### Location:

Geographical extent of the hazard (both possible future and past locations).

### Previous Occurrences:

The number of previous events and impacts of each hazard.

### Extent (or Magnitude):

The severity of the hazard in the past which indicates potential severity in the future. Measures may include wind speed, wave height, or property damage; Subcategories include Speed of Onset, Duration, and Availability of Warning Time.

### Probability of Future Events:

The likelihood of future events impacting the county. Given that an exact probability is often difficult to quantify, this characteristic is categorized into the following ranges to be used in hazard profiles (per the PRI criteria):

- Unlikely: Less than a 1% annual probability
- Possible: Between 1% and 10% annual probability
- Likely: Between 10% and 90% annual probability
- Highly Likely: Greater than 90% annual probability

### Vulnerability Assessment:

The vulnerability assessment will address conditions that may increase or decrease vulnerability such as topography, soil type, land use, and development trends. In addition, estimated potential losses will be calculated using historic data and data provided by Gallia County. GIS analysis and hazard modeling will be used to assess this data where available. Information such as the number of structures and critical facilities at risk will be analyzed as well.

### Priority Risk Index:

As discussed in subsection 4.5, the PRI is calculated by applying the above categories for each hazard profile

## 4.5 Priority Risk Index (PRI)

Prioritization and categorization of identified hazards for Gallia County is based on the Priority Risk Index (PRI) -- a tool used to measure the degree of risk for identified hazards in a particular planning area. This methodology will be applied to the hazard profiles so a consensus on the highest-threat hazards in Gallia County can be determined.

The PRI results allow hazards to be ranked against one another (the higher the PRI value, the greater the hazard risk). PRI values are obtained by assigning varying degrees of risk to five categories for each hazard (probability, impact, spatial extent, warning time and duration). Each degree of risk is assigned a value (1 to 4) and a weighting factor.

To calculate the PRI value for a given hazard, the assigned risk value for each category is multiplied by the weighting factor. The sum of all five categories equals the final PRI value, as demonstrated in the following equation:

$$\text{PRI VALUE} = [(\text{PROBABILITY} \times .30) + (\text{IMPACT} \times .30) + (\text{SPATIAL EXTENT} \times .20) + (\text{WARNING TIME} \times .10) + (\text{DURATION} \times .10)]$$

See next page for Table 4.5a: Priority Risk Index Criteria.

Table 4.5a: Priority Risk Index Criteria

PRI Category	Degree of Risk			Assigned Weighting Factor
	Level	Criteria	Index Value	
Probability	Unlikely	Less than 1% annual probability	1	30%
	Possible	Between 1 and 10% annual probability	2	
	Likely	Between 10 and 90% annual probability	3	
	Highly Likely	90%+ annual probability	4	
Vulnerability	Minor	Only minor property damage and minimal disruption to government functions and services. No shutdown of critical facilities.	1	30%
	Limited	Minor injuries are possible. More than 10% of buildings damaged or destroyed. Temporary shutdown of critical facilities (less than one week).	2	
	Critical	Multiple deaths/injuries possible. More than 25% of buildings damaged or destroyed. Complete shutdown of critical facilities for more than one week.	3	
	Catastrophic	High number of deaths/injuries possible. More than 50% of buildings damaged or destroyed. Complete shutdown of critical facilities for 30 days or more.	4	
Spatial Extent	Negligible	Limited to a specific area.	1	20%
	Small	Small areas affected	2	
	Moderate	Large areas / multiple areas affected	3	
	Large	All areas / all areas affected	4	
Warning Time	More than 24 hrs	Self-explanatory	1	10%
	12 to 24 hrs	Self-explanatory	2	
	6 to 12 hrs	Self-explanatory	3	
	Less than 6 hrs	Self-explanatory	4	
Duration	Less than 6 hrs	Self-explanatory	1	10%
	Less than 24 hrs	Self-explanatory	2	
	Less than one week	Self-explanatory	3	
	More than one week	Self-explanatory	4	

According to the weighting scheme applied for Gallia County, the highest possible PRI value is 4.0. Table 4.5a shows the weighting factors and criteria for each category. By determining a value for each hazard, they can be compared and ranked to other hazards threatening the planning area. Once PRI calculations are made, the hazard rankings are reviewed by the planning team and adjusted to reflect local knowledge of risks in the planning area. The hazard rank created then guides mitigation strategy efforts and allocation of mitigation resources.

Individual PRI results are calculated by applying the categories explained within each of the hazard profiles. Final PRI results, including calculated values for each hazard in Gallia County, are found at the end of this section in the “Summary of Hazard Risk”.

## 4.6 Dam Failure

### Description:

Dams are classified within four categories (I-IV) based on height, volume and potential impact due to failure.

Table 4.6a: Dam Classes

Class	Height	Volume	Impact
I	> 60 feet	> 5,000 acre-feet	Probable loss of life. Structural damage to high value property anticipated.
II	> 40 feet	> 500 acre-feet	No loss of life anticipated. Damage to homes and businesses is likely.
III	> 25 feet	> 50 acre-feet	Damage restricted to low-value non-residential structures.
IV	< or = 25 feet	< or = 50 acre-feet	Losses restricted mainly to dam.

Source: ODNR Division of Soil and Water Resources Fact Sheet 94-29.

The impact caused by a dam failure would depend on the Class of the dam, its location relative to populations and development, and the dam’s type of failure, which include structural, mechanical or hydraulic failures. A dam failure could become a huge disaster resulting in substantial damage and deaths.

Most dam failures are a combination of structural problems and overloading due to water retention. Spring is the most likely season for dam failure when melting snow and high ground saturation combine with seasonal precipitation. These conditions can cause flash flooding, when sudden amounts of heavy precipitation result in quick rises in water level. Such events can quickly overwhelm a dam and cause it to fail, especially if an underlying condition is present, such as poor maintenance.

There are approximately 80,000 dams in the United States today. Dam owners include state and local authorities, public utilities, private owners and federal agencies. The benefits of dams are numerous: they provide water for drinking, navigation, and agricultural irrigation. Dams also provide

hydroelectric power, create lakes for fishing and recreation, and save lives by preventing or reducing floods.

Though dams have many benefits, they also can pose a risk to communities if not designed, operated, and maintained properly. In the event of a dam failure, the energy of the water stored behind even a small dam can cause loss of life and great property damage if development exists downstream. If a levee breaks, scores of properties may become submerged in floodwaters and residents may become trapped by rapidly rising water. The failure of dams and levees has the potential to place large numbers of people and great amounts of property in harm's way.

### Location:

Per the ODNR Dam Locator website, there are 4 Classification I dams in Gallia County, 6 in Classification II and 4 in Classification III. The spatial extent would depend on the height of the dam, the volume of the dam, its location within Gallia County, and other factors such as precipitation and the extent of failure. The probable spatial extent of any particular dam failure would have to be evaluated on a case by case basis.

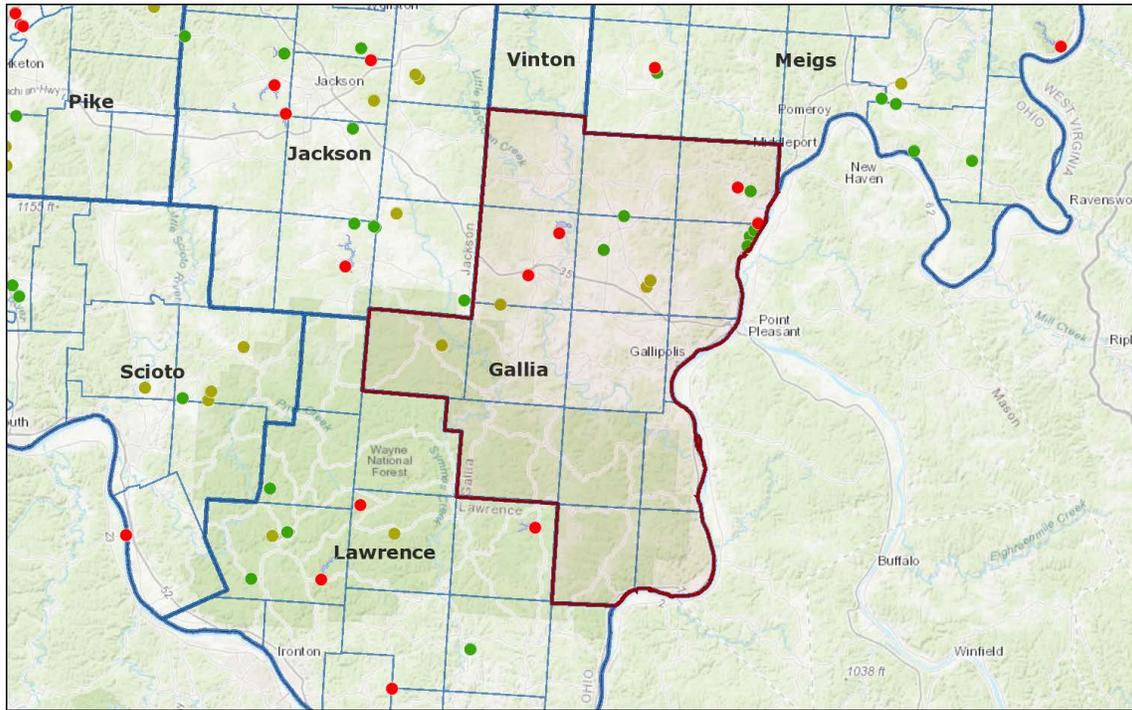
The map included below provides the locations of dams in Gallia County per the ODNR Dam Locator website.

Table 4.6b: Gallia County Dam Class

Dam Name	Class Type	EAP Status	Date Approved
Stingy Run Fly Ash Dam	I	Approved	April 2017
Gavin Bottom Ash Pond	I	Approved	April 2017
Tycoon Lake Dam	I	Approved	2018
Rio Grande Reservoir	I	Not Approved	N/A
Kyger Creek Levee	II	Approved	February 2017
Kyger Creek Tailings Pond	II	Approved	February 2017
Kyger Creek South Fly Ash Pond	II	Approved	February 2017
Kyger Creek Bottom Ash Pond	II	Approved	February 2017
Pine Acres Lake Dam	II	Not Approved	Draft January 2018
Bidwell/Porter WWT Lagoon	II	Approved	2013
Charolais Lake Dam	III	Approved	2014
Davidson Lake Dam	III	Not Approved	N/A
Camp Francis Asbury Lake Dam	III	Not Approved	Draft 2016
Kenton Lake Dam	III	Not Approved	N/A

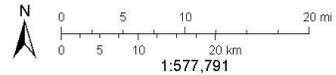
Figure 4.6a: Dams in Gallia County

Ohio Dam Locator



August 22, 2019

- Class I Dams
- Class II Dams
- Class III Dams
- Lakes (ODNR)
- Counties
- Current Township



ODNR - Division of Water Resources

Source: ODNR Dam Locator Map Viewer <https://gis.ohiodnr.gov/MapView/?config=ohiodams>

### Previous Occurrences:

There are no records of dam failures within Gallia County. The County EMA office provided the following information on the dams within the county which they have had or currently have issues.

#### Pine Acres Lake Dam

Original complaint date: 3-23-2012

ODNR Division of Soil & Water Resources, Dam Safety Engineering Program reported that the lake level is currently 7.2 feet below the top of dam elevation (about 5 feet below the normal pool elevation; a current lake depth of about 14 feet). At this elevation, most of the water has drained from the lake. The spillway system for the dam has failed – water is leaking through joints/voids in the pipe, causing the embankment to erode and the lake level to drop. ODNR found that there has been additional development in the valley downstream of the dam that will likely cause the

classification of the dam to change from Class III (damage to local roads) to Class II or Class I (damage to roads and homes and impact to people).

Release of the water impounded by the dam would not likely cause significant inundation downstream. However, a severe storm would cause the impoundment to fill and would potentially cause the dam to erode along the spillway and fail rapidly. This could cause downstream damage. The Gallia County EMA said that they would monitor rainfall in the area and notify the Dam Safety Engineering Program in the event of a severe storm.

The last periodic inspection was May 2017. The report lists the following Required Remedial Measures:

- This dam must have a dam failure inundation study and map included in an Emergency Action Plan
- The dams discharge/storage capacity must safely pass the design storm (50% of the PMF).
- The dam must have an emergency spillway.
- The spillway system must be repaired or replaced.
- Investigate the stability of the embankment.
- The lake drain pipe must be repaired or replaced.

The inspection found that nothing had been done to remedy the dam since the dam incident in 2012. It also found the dam had new owners.

Since the inspection, the owner removed the old principal spillway pipe and riser and installed a slant pipe. This was done without ODNR's approval. The slant pipe was an N12 corrugated plastic pipe which is specifically not allowed in a dam. The owner has hired an engineer to submit plans and specifications to make the dam exempt from the jurisdiction of ODNR by lowering the top of dam so that it can store no more than 15 acre-feet of water at the top of dam elevation. Those plans are 90% complete.

### **Tycoon Lake Dam**

The last periodic inspection of the dam was in November 2016. The report lists the following Required Remedial Measures:

- The dams discharge/storage capacity must safely pass the design storm (100% of the PMF).
- The dam must have an emergency spillway.
- The spillway system must be repaired or replaced.
- Seepage from the dam must be controlled.
- The lake drain pipe must be repaired or replaced.

### **Dam Incident**

- Earthen slide found on the downstream slope. The slide was measured, staked, and tarped. (mid-February 2019)
- Reservoir was drained by 5 feet (and remains at this level) and soil borings of the embankment were taken in order to do a stability analysis (mid-March 2019)
- Currently designing plans and specifications for repairs. Plans are 50 % complete. (These plans encompass all needed remedial measures at the dam.)

## **Rio Grande Reservoir**

### Dam Incident

There was a flood in mid-July 2015 that caused serious damage to the principal spillway. In early August 2015 the owner notified Gallia County EMA. The water level was lowered and the area around the principal spillway was sandbagged. The owner stated that they were going to hire an engineer and grout the hole until the engineer could design repair plans.

The last periodic inspection was in October 2016. It found that no repairs to the dam had occurred, including grouting the hole in the spillway. The report lists the following Required Remedial Measures:

- The dam must have a dam failure inundation study included in its Emergency Action Plan.
- The dams discharge/storage capacity must safely pass the design storm (100% of the PMF).
- The spillway system must be repaired or replaced.
- The lake drain pipe must be repaired or replaced.

It was noted at the inspection that the lake drain was partially open and the water level was around 2 feet below the normal pool level.

### **Magnitude:**

Gallia County has four Class I dams. These are the only dams in the county that would be expected to result in a loss of life due to their failure. All others are only expected to result in property and ecological damage.

### **Speed of Onset:**

The speed of onset will vary by the design of each dam and other factors such as precipitation and maintenance. Dam failures are usually not sudden and will most likely be preceded by signs of structural weakening or other problems. But, if these signs go unchecked, the results will appear to have a very sudden onset.

### **Duration:**

The immediate danger posed by a dam failure would likely pass very quickly, but the resulting flooding due to a lack of water control could persist for weeks, months, or even longer. The duration of the actual dam failure could be minutes or days, depending on the extent and speed of the failure.

### **Availability of Warning Time:**

Dam failures provide a possibility for warning and evacuation, but only if a leak or other structural problem that would lead to failure is detected. If such things go unnoticed, little or no warning will be available.

### **Probability of Future Events:**

There are no records of dam failures in Gallia County. As such, it is difficult to predict an annual chance of dam failure.

## Vulnerability Assessment:

At this time, no estimation data exists. There is no historical precedent for dam failure in Gallia County and the full extent of the areas threatened by the failure of a Class I dam is unknown. This makes loss estimation for this hazard particularly difficult.

## Priority Risk Index:

Table 4.6c: PRI Calculation for Dam Failure

PRI Category	Level	Index Value
Probability	Unlikely	1
Vulnerability	Limited	2
Spatial Extent	Moderate	3
Warning Time	More than 24 hours	1
Duration	Less than 24 hours	2

## 4.7 Drought

### Description:

The National Drought Mitigation Center (NDMC) defines drought as "...a deficiency in water precipitation over an extended period of time, resulting in water shortages." Climatic factors such as high temperatures, high wind, and low relative humidity are often associated with drought, however the definition in general is a fluid specification as no single definition of deficiency or time applies to all circumstances. 'Water shortage' is the guiding phrase which defines the drought type and category.

Drought types are defined in Table 4.7a as categorized by Wilhite and Glantz. The first three measure the physical phenomenon while the fourth tracks the effects of the water deficit. The fifth category was recently added through research by the Science for Nature and People in an effort to connect "...human and natural systems in order to highlight opportunities to mitigate drought risks" (SNAPP).

Coupled with broad definitions of drought comes a difficulty to predict when and exactly where such disasters will occur. Summer is the season most susceptible to drought impact as it is the warmest and driest part of the year however Gallia County typically experiences fall drought.

Drought occurs in virtually all-climatic zones, varying significantly from one region to another detailed in Table 4.7a on the following page.

Table 4.7a: Drought Types

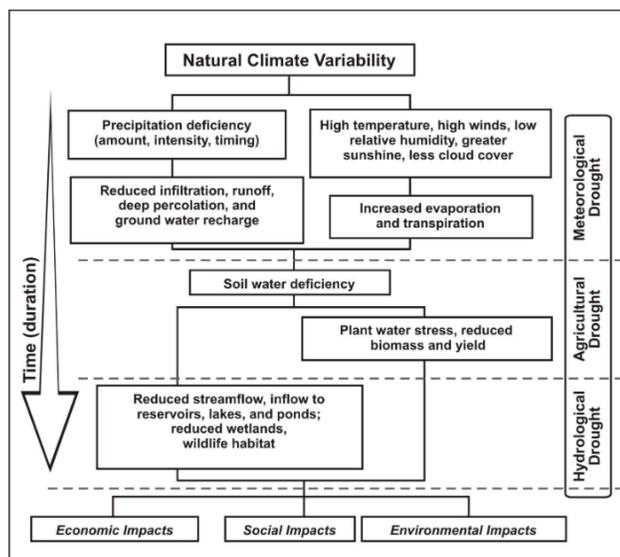
Drought Type	Description
Meteorological Drought <sup>1</sup>	Meteorological drought is usually based on long-term precipitation departures from normal, but there is no consensus regarding the threshold of the deficit or the minimum duration of the lack of precipitation that makes a dry spell an official drought.
Hydrological Drought <sup>1</sup>	Hydrological drought refers to deficiencies in surface and subsurface water supplies. It is measured as stream flow, and as lake, reservoir, and ground water levels.
Agricultural Drought <sup>1</sup>	Agricultural drought occurs when there is insufficient soil moisture to meet the needs of a specific crop at a particular time. A deficit of rainfall over cropped areas during critical periods of the growth cycle can result in destroyed or underdeveloped crops with greatly depleted yields. Agricultural drought is typically evident after meteorological drought but before a hydrological drought.
Socioeconomic Drought <sup>1</sup>	Socioeconomic drought is a period when water shortages begin to affect people when there is not enough water to meet human and environmental needs.
Ecological Drought <sup>2</sup>	A prolonged and widespread deficit in naturally available water supplies – including changes in natural and managed hydrology – that create multiple stresses across ecosystems.

**Source 1:** Wilhite, D.A.; and M.H. Glantz. 1985. Understanding the Drought Phenomenon: The Role of Definitions. *Water International* 10(3):111–120. NDMC. <https://drought.unl.edu/Education/DroughtIn-depth/TypesofDrought.aspx>

**Source 2:** SNAPP. <https://snappartnership.net/teams/ecological-drought/>

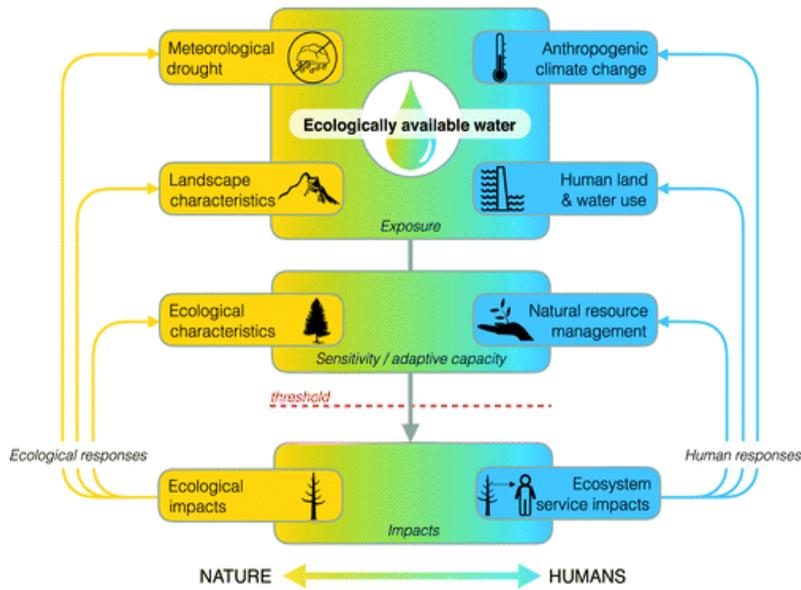
Figures 4.7a and figure 4.7b describe the sequence of the commonly accepted drought types described in Table 4.7a.

Figure 4.7a: NDMC Drought Progression



**Source:** NDMC. <https://drought.unl.edu/Education/DroughtIn-depth/TypesofDrought.aspx>

Figure 4.7b: Ecological Drought Progression



Source: SNAPP. <https://snappartnership.net/teams/ecological-drought/>

The US Drought Monitor records drought severity in five categories as listed in Table 4.6b below.

Table 4.7b: Drought Categories

Category	Name	Description
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered
D1	Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested
D2	Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed
D3	Extreme Drought	Major crop/pasture losses; widespread water shortages or restrictions
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies

The impacts of droughts can be far-reaching. Droughts vary in geographical area from a region of the United States to one or more areas of several square miles within a state or county. Drought

conditions impact both rural and urban areas resulting in significant economic and social consequences. An increased population demand upon water supplies, both individual and municipal, demands from agriculture crops, needs of livestock and human consumption, and industrial and leisure demands all affect drought conditions.

The more common summer droughts, usually accompanied by extremely hot weather, can also lead to outages of electric power. Reduced electric transmission efficiency and significantly increased demand due to increased use of air conditioning cause these outages. These can also be a delayed impact upon agricultural product costs in ensuing months.

During a drought, the likelihood of a wildfire increases. On average, Ohio estimates 15,000 wildfires and natural fuel fires occur annually. Although droughts can persist for several years, even a short drought with intense heat can cause significant damage and harm to the local economy.

With Gallia County's close proximity to the Ohio River, most droughts will have smaller effect on water supplies.

### **Location:**

Due to the nature of droughts, all of Gallia County will be affected by a drought.

### **Extent:**

Even during extended periods of drought, such events rarely result in direct property damage. Most damages associated with drought occur in the agricultural sector as the result of crop and livestock losses. As indicated in the Drought Monitor data, there have only been abnormally dry to moderately dry droughts since 2008. Although worse drought has not occurred in the county over the past 10 years, if damaging drought would have the capacity to significantly impact Gallia.

According to the 2012 Census of Agriculture, an extreme drought incurring agricultural losses of 50% or more would cost Gallia County farmers over \$7,573,000. The most severe drought experienced in Gallia County since 2008 was 10 weeks categorized as moderately dry, however longer and more severe periods of drought may be possible.

### **Duration:**

For a drought to cause severe damage, it must last long enough to show an abnormal shift from previous precipitation patterns. The length of a drought will depend upon the length of time that there is moisture deficiency in the area.

### **Speed of Onset:**

Droughts are difficult to predict and are usually determined based on an identified threshold of historical precipitation. Information such as temperature, precipitation, and rate of soil moisture deletion should be considered. It is not the speed of onset, but the length of a drought that does the damage, so it is possible to take measures to prepare for drought like conditions.

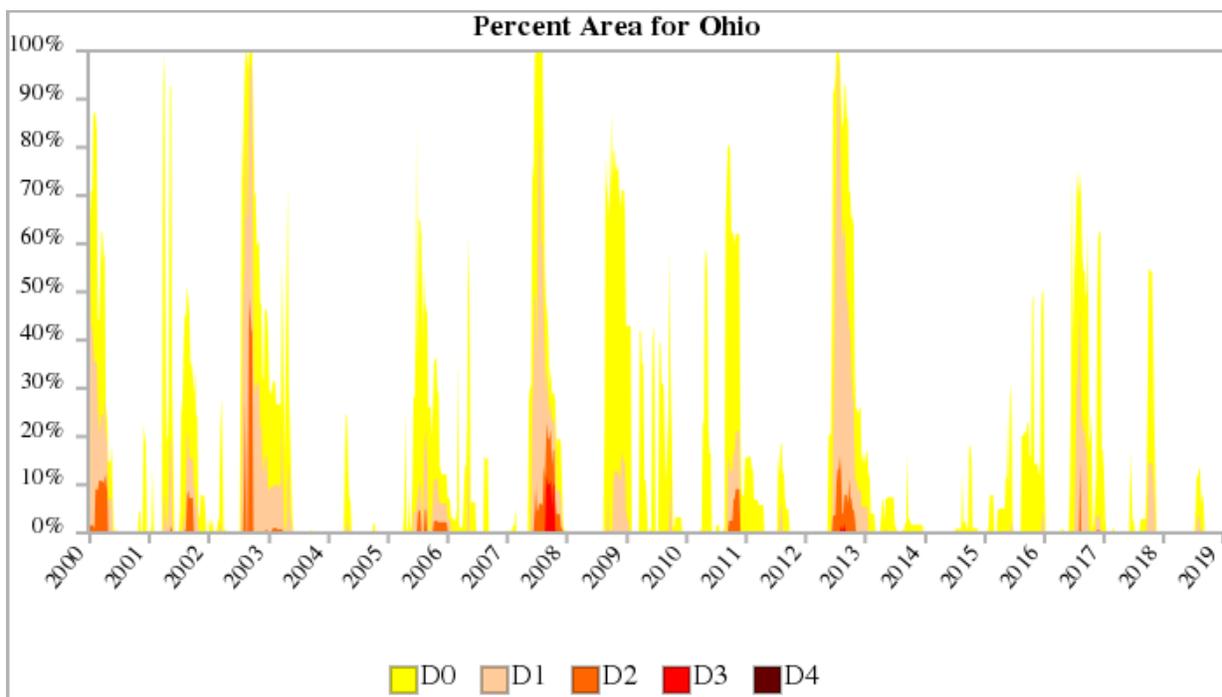
## Availability of Warning Time:

Scientists do not know how to predict drought a month or more in advance for most locations. Because drought depends on temperature and precipitation and climate are inherently variable, drought advisories are based more on monitoring thresholds to averages. Meteorologists working in conjunction with local officials can notify the public of the potential for a drought however this is likely to occur as or after a drought has begun. This information will also allow officials to make informed decisions about the issuance of water conservation warnings and other water preservation measures.

## Previous Occurrences:

The National Integrated Drought Information System (NIDIS) collects and displays drought information by state. Figure 4.7c below, illustrates the percent area of Ohio affected by each drought category over the past 20 years. The longest drought in Ohio lasted 44 weeks beginning on July 23, 2002 and ending May 20, 2003. The most intense period of drought occurred in September 2007 where D3 affected 11.45% of Ohio land.

Figure 4.7c: Drought Category vs. Percent Area for Ohio (2000-2018)



Data collected from the U.S. Drought Monitor was compiled for Gallia County. Table 4.7d on next page reports the percent of each of the past ten years spent in various categories of drought. The average time spent in drought over the past 10 years paints a relative probability of experiencing that drought category in any given year.

It should be reported that data collected does not represent total area impact for Gallia County. Exact locations and effects have not been reported however soybean and cattle would see the largest impact as they are the main crop and livestock respectively.

**Table 4.7d: Percent Year in Drought (2008-2018)**

Drought Categories					
Year	D0-D4	D1-D4	D2-D4	D3-D4	D4
2008	4	10	0	0	0
2009	6	0	0	0	0
2010	1	0	0	0	0
2011	0	0	0	0	0
2012	14	7	0	0	0
2013	0	0	0	0	0
2014	3	0	0	0	0
2015	16	0	0	0	0
2016	11	0	0	0	0
2017	1	0	0	0	0
2018	0	0	0	0	0

Source: <https://droughtmonitor.unl.edu/Maps/MapArchive.aspx>

The following information from the 2012 Plan, details two continental droughts encompassing Gallia County. This indicates the potentially far reaching and devastating effects of droughts.

### 1988-1989 NORTH AMERICAN DROUGHT

The drought of the late 1980s followed a milder drought in the Southeastern United States and California the year before. This drought spread from the Mid-Atlantic, Southeast, Midwest, Northern Great Plains and Western United States. It was widespread, unusually intense and accompanied by heat waves which killed around 4,800-17,000 people across the United States and also killed livestock across the county.

One particular reason that the Drought of 1989 became very damaging was farmers might have farmed on land which was marginally arable. Another reason was pumping groundwater near the depletion mark. The Drought of 1989 destroyed crops almost nationwide, residents' lawns went brown and water restrictions were declared in many cities. This drought was very catastrophic for multiple reasons; it continued across the Midwest States and North Plains during 1989, not officially ending until 1990.

### 2012 NORTH AMERICAN DROUGHT

The 2012-2013 North American Drought is an expansion of the 2010-2012 United States drought which began in the spring 2012, when the lack of snow in the United States caused very little melt water to absorb into the soil. The drought includes most of the US and included Ohio. Among many counties, Gallia County was designated with moderate drought conditions by mid-June. It has been equaled to similar effects as droughts in 1930s and 1950s. However, the drought has inflicted, and is expected to continue to inflict, catastrophic economic ramifications. In most measures, the drought has exceeded the 1988-1989 North American Drought, which is the most recent comparable drought.

On July 30, 2012, the Governor of Ohio sent a memorandum to the USDA Ohio State Executive Director requesting primary county natural disaster designations for eligible counties due to

agricultural losses caused by drought and additional disasters during the 2012 crop year. The USDA reviewed the Loss Assessment Reports and determined that there were sufficient production losses in 85 counties to warrant a Secretarial disaster designation. On September 5, 2012, Gallia County was one of those designated counties.

### Probability of Future Events:

The county will continue to face drought challenges. According to the trend over the past 10 years, each year there is a 10% chance of it being abnormally dry and a 3% chance of a moderate drought.

### Vulnerability Assessment:

Approximately 25% of the acreage in Gallia County is used as crop land and pasture per the Ohio Department of Development Gallia County Profile (2017). According to the USDA’s 2012 Census of Agriculture, the total market value of the agricultural products produced and sold by said farmland equaled \$15,146,000 in just one year alone. The loss of even a fraction of that revenue due to drought would be damaging to the County’s economy and potentially devastating to individual farmers. No structural damage due to drought is anticipated in Gallia County.

### Priority Risk Index:

Table 4.7d: PRI Calculation for Drought

PRI Category	Level	Index Value
Probability	Possible	2
Vulnerability	Minor	1
Spatial Extent	Moderate	3
Warning Time	More than 24 hours	1
Duration	Less than one week	4

Source: SNAPP. <https://snappartnership.net/teams/ecological-drought/>

## 4.8 Earthquake

### Description

The earth is divided into layers, the outmost of which is called the crust. The crust is rigid and brittle and is comprised of many individual pieces called plates. Plates meet at “fault lines” where they rub together, rise over, or sink under each other. It is along these fault lines where earthquakes are typically experienced. An earthquake is the resulting ground shaking and radiated seismic energy caused by sudden stress changes in the earth. Fault lines do run through Ohio as shown in figure 4.8a, however the intensity is less substantial because majority are buried and very few are visible at the surface.

Figure 4.8a: Map of Deep Structures

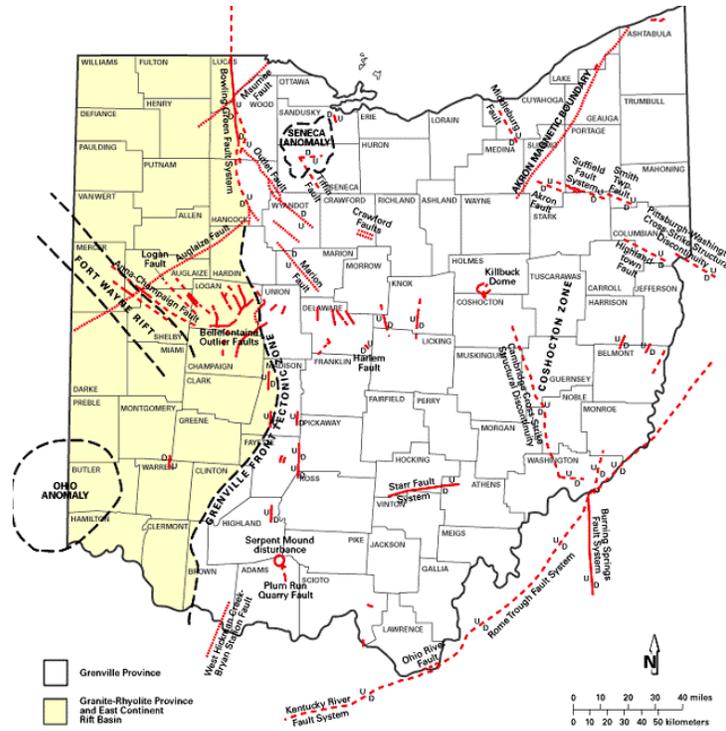
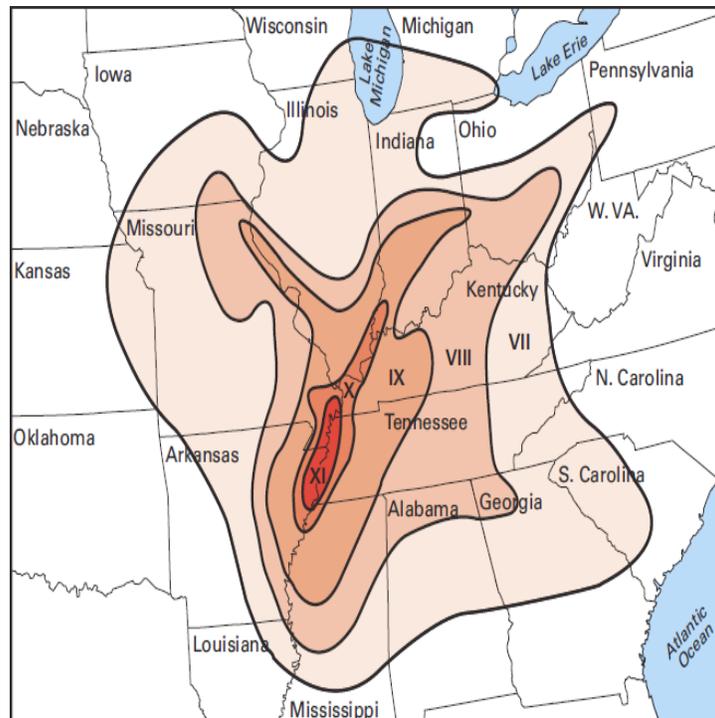


Figure 4.8b: New Madrid Seismic Zone in Ohio



Source: <http://geosurvey.ohiodnr.gov/earthquakes-ohio/seismic-risk-in-ohio>

Figure 4.8c: Scale Comparison

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

The New Madrid Seismic Zone was the site of the largest earthquake sequence in the continental United States. Shown in Figure 4.8b, Ohio resides on the periphery of an 8.0 magnitude earthquake emanating from the New Madrid Faultline. According to Ohio Department of Natural Resources (ODNR) Geological Survey website, events in 1811 and 1812 were “sufficient enough to topple chimneys in Cincinnati.” The New Madrid Seismic Zone does stretch across Gallia County.

There are several ways to measure the force and power of an earthquake. Two of the most common are the Modified Mercalli Scale and the Magnitude Scale. The Magnitude Scale, also known as the Richter Scale, is a logarithmic (base 10) scale used to measure the magnitude of the largest seismic wave of an earthquake. The Modified Mercalli Scale, on the other hand, is used to evaluate the physical effects of an earthquake on an area. The Magnitude Scale is an objective measurement of an earthquake’s overall power, whereas the Modified Mercalli Scale provides a subjective analysis of the damage it causes. The chart shown at right shown on the following page compares the two scales.

By the New Madrid prediction map in figure 4.8b, Gallia County would likely experience no more than a Modified Mercalli intensity of VII. However, this has a high probability of causing structural damage.

While a Magnitude 8.0 earthquake is a very rare occurrence, it is not impossible. According to the Central United States Earthquake Consortium (CUSEC), the New Madrid fault line has a 25%-40% chance of generating a 6.0 or higher magnitude earthquake within the next 50 years.

### Location:

As seen in the hazard profile and as determined by the Core Group, Gallia County has a very low risk of incurring damage from earthquakes. The county has had 4 epicenters within its boundaries, but an earthquake can occur anywhere in the county. The epicenter of the first earthquake that occurred in 1975 was approximately seven miles west- northwest of Gallipolis. In 2009, the second earthquake occurred approximately six miles west-northwest and had a magnitude of 3.3. The most recent in 2016, occurred furthest from Gallipolis close to the county border with Jackson and carried a 2.6 magnitude.

### Extent:

Collateral damage from earthquakes could be extensive and might include floods, hazardous material spills, landslides, subsidence, dam failures, fire, groundwater contamination, pipeline breaks, infrastructure disruptions, epidemics, and looting. Historically, earthquakes in Gallia County

were of magnitude 2.5 and 3.3 correlating to a II or III on the Mercalli Scale. These earthquakes were very light vibrations that caused no damages nor injury.

## Duration

The initial effects of an earthquake would be over quickly, but aftershocks could be felt up to hours or days afterward. Additionally, if a particular earthquake were powerful enough, the resulting damage to infrastructure could require significant clean-up efforts.

## Speed of Onset

Earthquakes occur as pressure is released in the earth's crust. This causes earthquakes to appear as though they occur instantaneously, with little to no prior buildup of activity.

## Availability of Warning Time

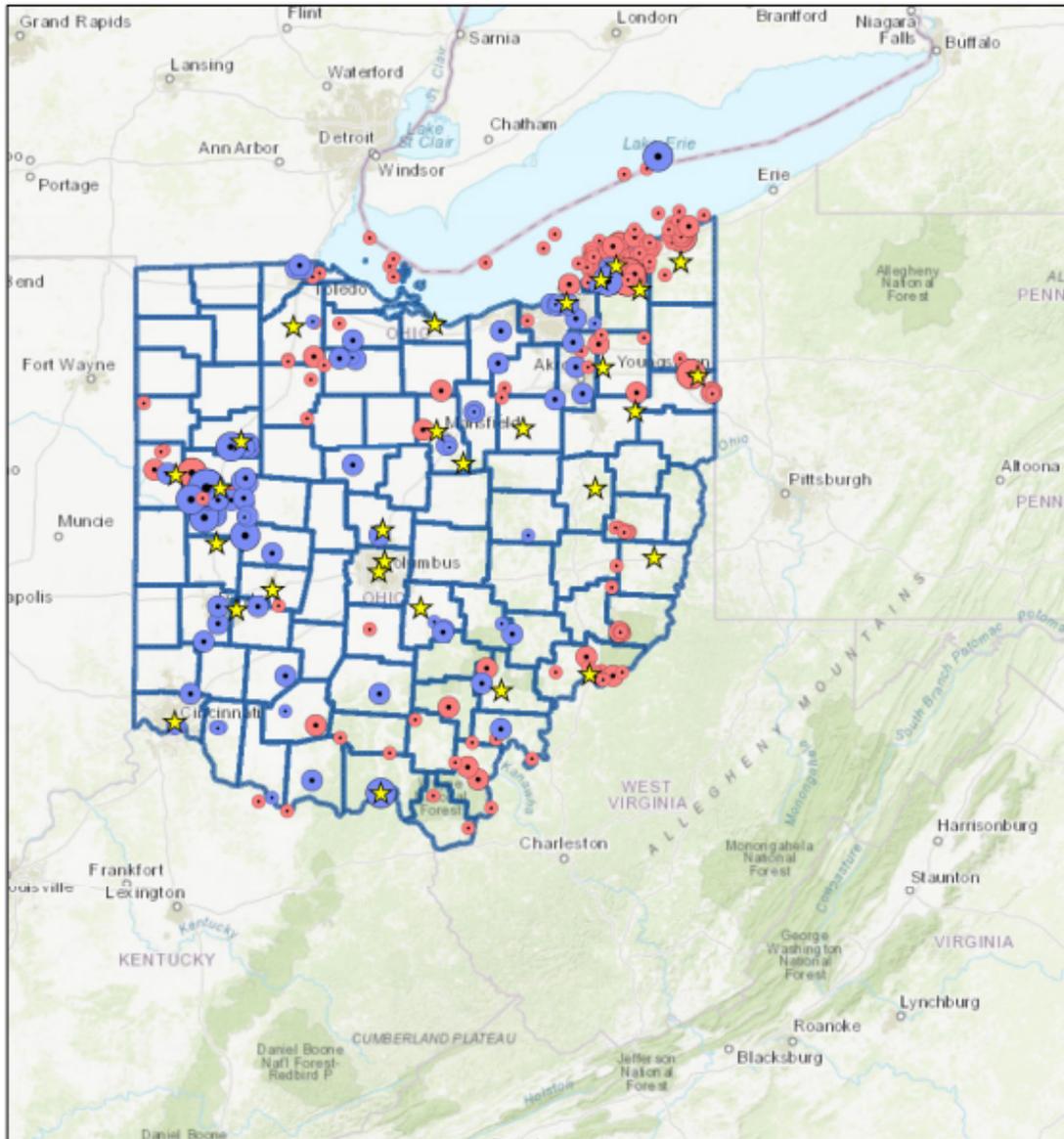
Although research is being done on how to best predict earthquakes, accurate prediction of any one single earthquake is almost impossible. Because earthquakes happen very quickly and with very few pre-event effects, the available warning for an earthquake is almost nonexistent.

## Previous Occurrences:

ODNR reports that an earthquake happened on February 16, 1975 near Rodney, OH with a magnitude of 3.0. A quake also occurred near Rodney, OH on April 24, 2009 with a magnitude of 3.3, and was felt over a several county area. One in 2013 and 2016 were felt in Gallia with magnitudes of 2.5 and 2.6 respectively. The earthquakes in the County's history are considered non-damaging. Nonetheless, figures 4.8f through 4.8h detail the epicenters in Gallia County for Green Township and Racoon Township.

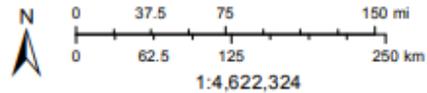
Figure 4.8d: Ohio Epicenters (1776 – 2018)

### Ohio Earthquake Epicenters



January 22, 2019

- |                             |                         |
|-----------------------------|-------------------------|
| ★ OhioSeis Seismic Stations | ● Historical 2.0 - 3.0  |
| ⊕ Instrumental 2.0 - 3.0    | ⊕ Historical 3.0 - 4.0  |
| ⊕ Instrumental 3.0 - 4.0    | ⊕ Historical 4.0 - 5.0  |
| ⊕ Instrumental 4.0 - 5.0    | ⊕ Historical 5.0 and up |
| ⊕ Instrumental 5.0 and up   |                         |

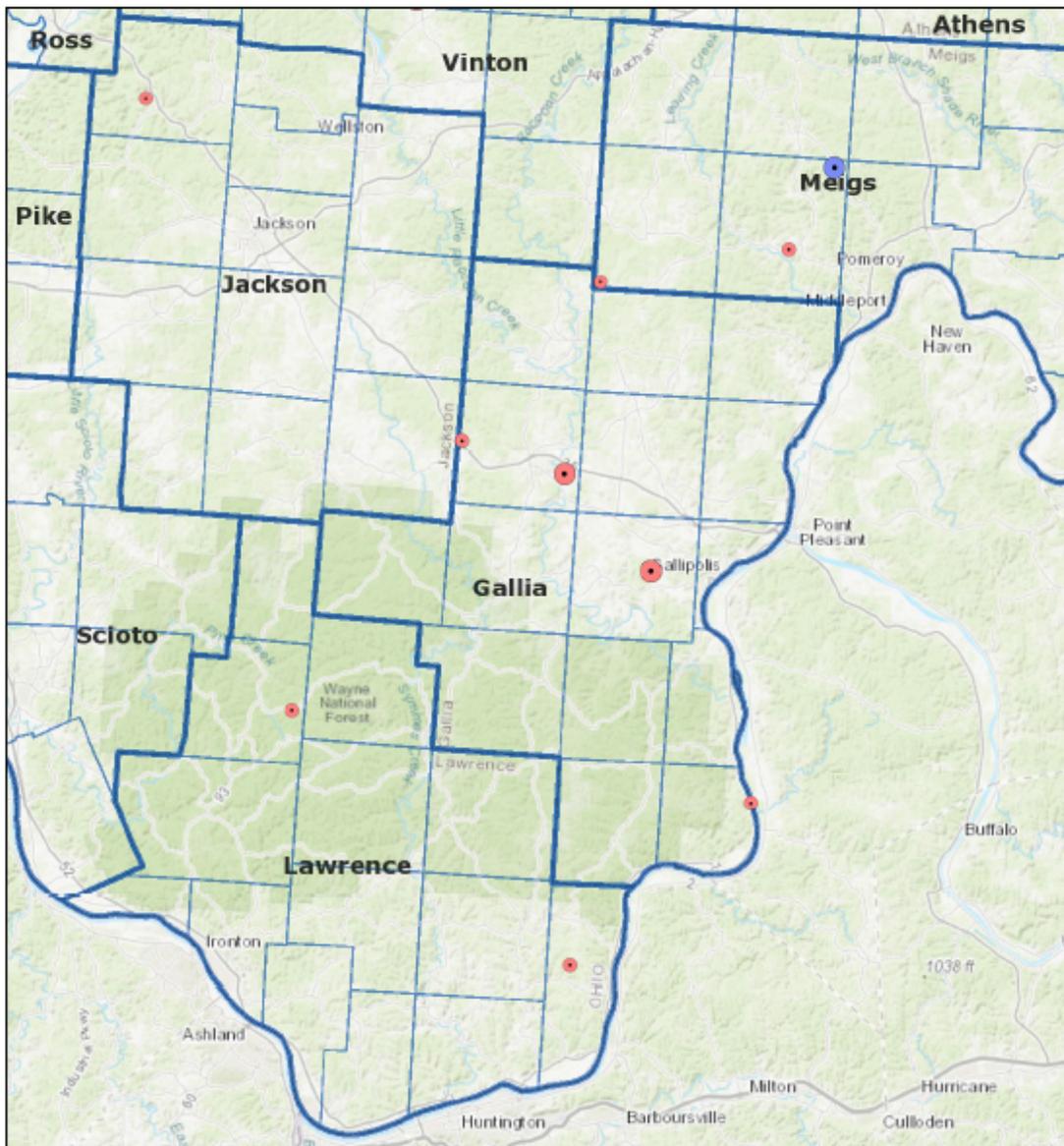


ODNR - Div. of Geosurvey

Source: ODNR Earthquake Epicenter Map Viewer <https://gis.ohiodnr.gov/MapViewer/?config=earthquakes>

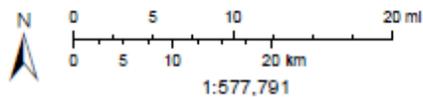
Figure 4.8e: Gallia County Earthquake Epicenters

### Ohio Earthquake Epicenters



March 4, 2019

- |                           |                       |
|---------------------------|-----------------------|
| OhioSeis Seismic Stations | Historical 2.0 - 3.0  |
| <b>Epicenters</b>         | Historical 3.0 - 4.0  |
| Instrumental 2.0 - 3.0    | Historical 4.0 - 5.0  |
| Instrumental 3.0 - 4.0    | Historical 5.0 and up |
| Instrumental 4.0 - 5.0    |                       |
| Instrumental 5.0 and up   |                       |



ODNR - Div. of Geosurvey

Source: ODNR Earthquake Epicenter Map Viewer <https://gis.ohiodnr.gov/MapViewer/?config=earthquakes>

Figure 4.8f: Greene Township

**Earthquake Epicenter**

Earthquake Epicenters
<b>Magnitude:</b> 3.3
<b>County:</b> GALL
<b>Year:</b> 2009
<b>Month:</b> Apr
<b>Day:</b> 24
<b>Hour:</b> 13
<b>Minute:</b> 42
<b>Second:</b> 46.03
<b>Source:</b> NCE
<b>Latitude:</b> 38.81
<b>longitude:</b> -82.27
<b>Calculated Depth:</b> 5
<b>Magnitude Type:</b> 1

Figure 4.8g: Racoon Township

**Earthquake Epicenter**

Earthquake Epicenters
<b>Magnitude:</b> 3
<b>County:</b> GALL
<b>Year:</b> 1975
<b>Month:</b> Feb
<b>Day:</b> 16
<b>Hour:</b> 23
<b>Minute:</b> 21
<b>Second:</b> 34.4
<b>Source:</b> NCE
<b>Latitude:</b> 38.88
<b>longitude:</b> -82.35
<b>Calculated Depth:</b> 0
<b>Magnitude Type:</b> 1

Figure 4.8h: Racoon Township

**Earthquake Epicenter**

Earthquake Epicenters
<b>Magnitude:</b> 2.6
<b>County:</b> GALL
<b>Year:</b> 2016
<b>Month:</b> Mar
<b>Day:</b> 8
<b>Hour:</b> 14
<b>Minute:</b> 25
<b>Second:</b> 29
<b>Source:</b> OSN
<b>Latitude:</b> 38.904
<b>longitude:</b> -82.445
<b>Calculated Depth:</b> 20
<b>Magnitude Type:</b> 1

Figure 4.8i: Ohio Township

**Earthquake Epicenter**

Earthquake Epicenters
<b>Magnitude:</b> 2.5
<b>County:</b> GALL
<b>Year:</b> 2013
<b>Month:</b> Mar
<b>Day:</b> 27
<b>Hour:</b> 9
<b>Minute:</b> 10
<b>Second:</b> 50.08
<b>Source:</b> OSN/USGS
<b>Latitude:</b> 38.643
<b>longitude:</b> -82.178
<b>Calculated Depth:</b> 5
<b>Magnitude Type:</b> 1

Source: ODNR Earthquake Epicenter Map Viewer <https://gis.ohiodnr.gov/MapView/?config=earthquakes>

## Probability of Future Events:

Probability of future earthquake events impacting Gallia County is determined by using historical occurrence information. There were four events since 1975, none of which carried associated damages. Thus, annual probability of earthquake occurrence in Gallia is considered “unlikely”, or less than 1% annual probability.

## Vulnerability Assessment:

For the earthquake hazard vulnerability assessment, a probabilistic scenario was created using Hazus 4.2 to estimate the annualized loss for the county. The probabilistic analysis does not require a magnitude or epicenter for the annualized loss estimate. The results are provided for the expected average annual losses in the county. Since there have been four reported earthquake events with a low magnitude, the probabilistic analysis was selected for the earthquake vulnerability analysis to show the expected losses in the county in any year. The losses reported in the table include building damage, inventory loss and business interruption. The historic events reported in the figures above show there were few losses reported from the earthquake hazard in Gallia County and the Hazus results reflect this since the results per year are low as well.

Table 4.8a: Hazus-MH Annualized Loss results by Jurisdiction

Location	Annualized Loss
Village of Centerville	\$0
Village of Cheshire	\$0
Village of Rio Grande	\$0
Village of Crown City	\$0
City of Gallipolis	\$4,000
Village of Vinton	\$0
Gallia County	\$51,000
<b>TOTAL</b>	<b>\$55,000</b>

\*Losses of less than \$500 were rounded to \$0 in the table.

All structures and infrastructure in Gallia County are equally at risk of experiencing an earthquake. However, in a mild earthquake of the magnitude typically experienced in Ohio, no structural damage is anticipated. The level of damage expected from an earthquake in Gallia County is very low. It would be expected to be on the order of a 2.5-3.9 magnitude quake, or lower, as registered on the Richter scale.

A quake of this magnitude would be felt by most people and include some breakage of dishes, windows and plasters. For this plan, the estimated probability of a damaging earthquake affecting Gallia County in any given year is estimated to cause negligible damage.

## Priority Risk Index:

**Table 4.8b: PRI Calculation for Earthquake**

PRI Category	Level	Index Value
Probability	Unlikely	1
Vulnerability	Minor	1
Spatial Extent	Small	2
Warning Time	Less than 6 hours	4
Duration	Less than 6 hours	1

## 4.9 Flooding

### Description:

Floods are natural and beneficial functions of soil deposition and water infiltration of overflowing streams and rivers into floodplains. However, where this floodplain intersects with homes, businesses, and other building structures, loss of life and property can result. Floods can occur for a variety of reasons including heavy rain, snow melt, soil saturation, vegetation removal, ground freeze, severe winds, and an overabundance of impervious surfaces such as roads and parking lots. Floods are the most frequently occurring natural disaster in Ohio and cause damage to private and public property every year.

Several types of flooding events are described below:

#### FLASH FLOODING:

Flash floods occur within a few minutes or hours of heavy rainfall and are capable of destroying buildings, uprooting trees, and scouring new drainage channels. Heavy rains that produce flash floods can also trigger mudslides and landslides. Most flash flooding is caused by slow-moving thunderstorms, repeated thunderstorms in a local area, or by heavy rains from hurricanes and tropical storms. Although flash flooding often occurs in mountainous areas, it is also common in urban centers where much of the ground is covered by impervious surfaces, channels are straighter allowing for higher water velocity, and water is directed through sewer drains straight to the river or stream channel.

#### SHEET FLOODING:

Sheet flooding is a uniform layer of water runoff flowing overland as a sheet rather than in a defined channel. This type of flooding more commonly occurs in flat areas such as farmland and is most noted for eroding particles, such as topsoil, from an entire surface area.

#### URBAN FLOODING:

Urban flooding is usually caused by heavy rain over a developed area lacking necessary drainage. As land is converted from fields or woodlands to roads and parking lots, it loses its ability to absorb water. Since sidewalks and roads are impervious, water flows down the surface of the streets and drains directly into storm sewers. Fixed drainage channels in urban areas may be unable to contain the runoff that is generated by relatively small but intense rainfall events. Urbanization increases

runoff two to six times over what would occur on natural terrain. As a consequence, high volumes of water can turn parking lots into lakes, flood basements and businesses, and cause ponding in the middle of roads and intersections. Urbanization intensifies the magnitude and frequency of floods by increasing impermeable surfaces, amplifying the speed of drainage collection, reducing the carrying capacity of the land, and occasionally, overwhelming sewer systems.

### **RIVERINE FLOODING:**

Riverine flooding is a function of precipitation levels and water runoff volumes within the watershed of a stream or river. It is a natural rising of the water levels culminating in flooding but typically allowing for more warning time.

Floodplains are designated by the frequency of the flood that is large enough to cover them. For example, the 10-year floodplain will be covered by the 10-year flood and the 100-year floodplain by the 100-year flood. Flood frequencies, such as the 100-year flood, are determined by plotting a graph of the size of all known floods for an area and determining how often floods of a particular size occur.

A better way to characterize the naming convention is the percentage of the probability of flooding each year. For example, the 100-year flood has a one-percent chance of occurring in any given year and the 500-year flood has a 0.2-percent chance of occurring in any given year. This can also be referred to as a recurrence interval, defined as the average time interval measured in years, expected to take place between the occurrence of a flood of a particular magnitude and an equal or larger flood. Flood magnitude increases with increasing recurrence interval.

Most dams, levees, and other flood-related structures have been designed to meet 100-year flood conditions. FEMA develops digital Flood Insurance Rate Maps (DFIRMs) to indicate areas in the U.S. where mandatory flood insurance requirements apply (the 100-year flood). They are also used for planning purposes to identify hazard areas. In 2011, updated DFIRMs were published by FEMA for Gallia County in support of the National Flood Insurance Program (NFIP) designating areas according to potential risk and impact due to flooding.

Flood Insurance Rate Maps (FIRM) show areas delineated to be special flood hazards. The Base Flood Elevation (BFE) refers to the elevation associated with a special flood zone, or a flood with a 1% chance of occurring in any given year. If the area is a special area, also known as 100-year floodplain, they will have an "A" or "AE" classification. "A" zones are special flood hazard areas inundated by the 100-year flood; base flood elevations are not determined. "AE" zones are special flood hazard area inundated by the 100-year flood; base flood elevations are determined.

### **Location:**

All of Gallia County lies within the drainage basin of the Ohio River, which is the largest tributary, by volume, to the Mississippi River. The Villages of Crown City, Cheshire and Gallipolis have the Ohio River bordering the east side of each village.

The various tributary streams and creeks generally flow north to south, from the foothills of the Appalachian Plateau towards the Ohio River. Raccoon Creek and Symmes Creek have the largest tributaries for creeks that run through the County.

Table 4.9a on the following page shows which tributaries have the potential to lead to flooding in particular jurisdictions; there is a potential for flooding due to rivers and streams in each jurisdiction in the County.

**Table 4.9a: Rivers and Streams in Gallia County**

Municipality	Rivers and Streams						
	Campaign Creek	Chickamauga Creek	Kyger Creek	Indian Guyan Creek	Ohio River	Raccoon Creek	Symmes Creek
Centerville							
Cheshire			X		X		
Crown City					X		
Gallia County	X	X	X	X	X	X	X
Gallipolis		X			X		
Rio Grande						X	
Vinton						X	

Multi-Hazard Maps are in Appendix D include maps of the entire county and each jurisdiction. Each map shows the floodplain locations, along with other previous disasters that have affected the county.

**Extent:**

Flooding is a site-specific hazard. Therefore, floodplains are an important planning consideration. In Gallia County, flooding can happen almost anytime however this hazard can be exacerbated when heavy rains occur in late winter and accelerate the melting of snow.

Flooding can also be exacerbated locally by the presence of impermeable surfaces due to buildings and pavement or lack of appropriately sized flood water detention basins. Flooding in Gallia County can also be exacerbated if the flow of water is obstructed in some way such as by an undersized culvert or downed trees.

Any development within floodplains can impact the direction, flow and level of the watercourse during periods of high water or flooding. In other words, if fill material is placed or a house constructed in a floodplain, it will alter the boundaries of the floodplain downstream of that area. This alteration happens because structures or fill occupies space that would otherwise act as a natural retaining area for floodwaters to spread and slow. Not only does development in the floodplain increase dangers downstream, developments within the floodplain are at higher risk of damage due to flooding. This damage includes fill material and debris from destroyed structures upstream colliding with structures in the floodplain downstream of an affected area. Many bridges are washed out in floods because river borne debris clog their free-flow area.

## Duration:

The duration of a flood is dependent on many different factors, such as rainfall, soil conditions, and ground saturation levels. Depending on the conditions, flood waters could recede rapidly, or they could remain for days or more.

## Speed of Onset:

The speed at which a flood occurs depends on the conditions at the time. They can happen very quickly, as in a flash flood, or they can happen gradually over time, such as a swelling river. All of this is determined by factors such as soil conditions and precipitation.

## Availability of Warning Time:

Modern meteorology can predict when conditions conducive to flooding will occur and the National Weather Service (NWS) routinely provides warnings when there is a potential for flood. These warnings are issued via weather radio, television broadcast, and other electronic media. While the NWS does provide warning for flood, not all floods can be predicted. Because of this, not all floods can be warned against, such as some cases of flash flooding.

## Previous Occurrences:

Gallia County has a long history of flooding problems. The County has suffered damage from numerous major floods and localized flash flooding. Appendix VI lists all flooding events in Gallia County since 1996; the source of these data is the NCDC website. This data indicates that there have been 62 flooding events in the past 22 years with damages reported in the NCDC data.

Further research through the NCDC shows that there have been three major floods in Gallia County since 2004 which caused significant damage and are described in Table 4.9b. Further, since 2010, there has been at least one flood per year resulting in property damage.

Table 4.9b: Recent History of Flooding

Date	Description
9/17/2004	Remnants of Hurricane Ivan dropped 4 to 6 inches of rain over an extended period of four days. In Gallia County, 6 homes had major damage with 1 home destroyed.
5/29/2014	Slow moving storms lead to 4 inches of rain in less than 2.5 hours. 25 to 30 homes were impacted, roads were flooded, and elementary students were held after hours. Damages reported total \$250,000.
7/14/2015	Recurring Severe Thunderstorms over an 8-day period resulted in over 6 inches of rain. This resulted in washed out culverts, damaged roads, and stranded vehicles totaling more than \$1 million in damages.

### Severe Summer Storm and Flooding, September 2004 (DR-1556)

Beginning in late August 2004, a succession of three storms in a three-week period impacted the state of Ohio. This started with scattered thundershowers and progressed into heavy rain across northeast part of the state. On September 8, 2004, remnants of Hurricane Frances produced a

diagonal line of severe storms and heavy rain from southwest to the northeast Ohio. Rain fell on saturated soils, causing riverine and flash flooding. Floodwaters rose quickly, and homes suffered foundation damage due to the high-water velocity. These adverse effects were exacerbated as a result of Hurricane Ivan storms on September 2004 when flooding conditions rose along the Ohio River and its tributaries, increasing the number of affected homes and businesses. Evacuations were necessary, and significant damage occurred to roads, county facilities and schools.

### Severe Summer Storm and Flooding, July 2011 (DR-4002)

From April through mid-May 2011, severe storms caused flooding and flash flooding in twenty-one counties across Ohio, including Gallia County. The impact was widespread and costly due to a prolonged and record setting spring rainfall. Many county organizations and assets had been exhausted and debris removal was still remaining task from material that fell from uphill slips into the roadways. After a joint State and FEMA survey, county and municipal infrastructure damages were determined to be the third most-costly per capita in the state.

### Probability of Future Events:

In this plan, the term special flood hazard area is used rather than floodplain to clarify that the area under consideration is identified on the Flood Insurance Rate Maps as having at least a 1-percent chance of flooding in any given year. Historically, the area with a 1-percent chance of flooding in any given year has been called the “100-year floodplain” and the area with a 0.2-percent chance of flooding in any given year has been called the “500-year floodplain.” As these terms can be misleading by suggesting that there will be a flood only every 100 or 500 years respectively, they are not used in this plan.

The NCDC data indicates that there have been 62 events in the past 22 years with reported damages. The occurrence of future flood events is “highly likely” as it relates to the PRI because there is greater than 100 percent probability annually.

### Vulnerability Assessment:

Losses will most likely occur to properties located within floodplains. However, all current and future buildings and populations should be considered at risk to flooding. Impacts of flooding can be severe and include business disruption, mold issues, and damaged building contents and equipment. Just a few inches of water in a building could cause thousands of dollars in damage to the flooring and foundation of the structure. In cases where water rises above a few inches, electrical systems and appliances may need to be replaced. Additionally, the County generally tries to acquire those properties that are routinely subjected to flood damages, which further reduces flood loss.

Hazus-MH 4.2 SP1 was used to estimate potential riverine flood losses in Gallia County. A Digital Elevation model (DEM) was obtained from the USGS for the study area. Hazus-MH was used to estimate floodplain boundaries, potential exposure for each event frequency based on probabilistic scenarios for the 10-, 25-, 50-, 100- and 500-year flood events using a level 1 analysis. A drainage area of 10 square miles was used to generate the stream network. Of note, this boundary is not equivalent to the regulatory flood insurance rate map or FEMA data. However, it does provide comparable flood hazard boundaries that are useful for estimating flood losses.

Table 4.9c lists the total exposure in the county (total replacement value of buildings in the Hazus-

MH inventory). Total losses are presented due to flood in Table 4.9d. Total loss includes building loss, content loss, inventory loss, relocation costs, income loss, rental income loss and wage loss. Tables 4.8e and 4.8f include total loss for residential and non-residential buildings.

**Table 4.9c: Total Building Exposure by Building Type in Gallia County based on Hazus-MH Default Inventory**

Location	Residential	Commercial	Other	Total Building
Village of Centerville	\$3,013,000	\$0	\$607,000	\$3,620,000
Village of Cheshire	\$9,243,000	\$9,259,000	\$9,433,000	\$27,935,000
Village of Rio Grande	\$58,849,000	\$8,807,000	\$44,681,000	\$112,337,000
Village of Crown City	\$30,082,000	\$1,066,000	\$993,000	\$32,141,000
City of Gallipolis	\$329,363,000	\$198,634,000	\$68,492,000	\$596,489,000
Village of Vinton	\$16,886,000	\$1,760,000	\$1,033,000	\$19,679,000
Gallia County	\$1,765,604,000	\$291,682,000	\$189,154,000	\$2,246,440,000
<b>TOTAL</b>	<b>\$2,213,040,000</b>	<b>\$511,208,000</b>	<b>\$314,393,000</b>	<b>\$3,038,641,000</b>

**Table 4.9d: Potential Total Losses from Flood by Return Period**

Location	10-year	25-year	50-year	100-year	500-year
Village of Centerville	\$0	\$0	\$0	\$0	\$0
Village of Cheshire	\$2,000	\$3,000	\$3,000	\$4,000	\$5,000
Village of Rio Grande	\$3,000	\$4,000	\$4,000	\$8,000	\$31,000
Village of Crown City	\$127,000	\$138,000	\$152,000	\$176,000	\$228,000
City of Gallipolis	\$3,780,000	\$4,915,000	\$6,020,000	\$7,003,000	\$11,087,000
Village of Vinton	\$4,336,000	\$5,084,000	\$5,520,000	\$5,970,000	\$6,852,000
Gallia County	\$72,271,000	\$87,226,000	\$97,932,000	\$107,553,000	\$129,315,000
<b>TOTAL</b>	<b>\$80,519,000</b>	<b>\$97,370,000</b>	<b>\$109,631,000</b>	<b>\$120,714,000</b>	<b>\$147,518,000</b>

**Table 4.9e: Potential Total Residential Losses from Flood by Return Period**

<b>Location</b>	<b>10-year</b>	<b>25-year</b>	<b>50-year</b>	<b>100-year</b>	<b>500-year</b>
Village of Centerville	\$0	\$0	\$0	\$0	\$0
Village of Cheshire	\$1,000	\$2,000	\$2,000	\$2,000	\$3,000
Village of Rio Grande	\$2,000	\$2,000	\$2,000	\$5,000	\$28,000
Village of Crown City	\$114,000	\$125,000	\$138,000	\$161,000	\$211,000
City of Gallipolis	\$1,395,000	\$1,765,000	\$2,137,000	\$2,472,000	\$4,083,000
Village of Vinton	\$2,534,000	\$3,044,000	\$3,371,000	\$3,683,000	\$4,334,000
Gallia County	\$36,700,000	\$43,192,000	\$48,456,000	\$53,090,000	\$63,480,000
<b>TOTAL</b>	<b>\$40,746,000</b>	<b>\$48,130,000</b>	<b>\$54,106,000</b>	<b>\$59,413,000</b>	<b>\$72,139,000</b>

**Table 4.9f: Potential Total Non-Residential Losses from Flood by Return Period**

<b>Location</b>	<b>10-year</b>	<b>25-year</b>	<b>50-year</b>	<b>100-year</b>	<b>500-year</b>
Village of Centerville	\$0	\$0	\$0	\$0	\$0
Village of Cheshire	\$1,000	\$1,000	\$1,000	\$2,000	\$2,000
Village of Rio Grande	\$1,000	\$2,000	\$2,000	\$3,000	\$3,000
Village of Crown City	\$13,000	\$13,000	\$14,000	\$15,000	\$17,000
City of Gallipolis	\$2,385,000	\$3,150,000	\$3,883,000	\$4,531,000	\$7,004,000
Village of Vinton	\$1,802,000	\$2,040,000	\$2,149,000	\$2,287,000	\$2,518,000
Gallia County	\$35,571,000	\$44,034,000	\$49,476,000	\$54,463,000	\$65,835,000
<b>TOTAL</b>	<b>\$39,773,000</b>	<b>\$49,240,000</b>	<b>\$55,525,000</b>	<b>\$61,301,000</b>	<b>\$75,379,000</b>

## Repetitive Loss Properties:

FEMA defines a repetitive loss property as any insurable building for which two or more claims of more than \$1,000 were paid by the NFIP within any rolling 10-year period since 1978. A repetitive loss property may or may not be currently insured by the NFIP. Currently, there are over 140,000 repetitive loss properties nationwide.

As of May 2019, there are 10 non-mitigated repetitive loss properties located in Gallia County, which account for 48 losses and about \$350,112 in claims payments under the NFIP. The average claim amount for these properties is \$12,504. It is expected that without mitigation these structures will likely continue to experience flood losses.

Table 4.9g below presents detailed information on the repetitive loss properties and NFIP claims for Gallia County. There are five severe repetitive loss properties in Gallia County. As defined by FEMA a severe loss structure that has 4 or more flood insurance claims payments that each exceed \$5,000, and with the total claims paid exceeding \$20,000. The severe repetitive loss properties account for 23 losses and a total of \$332,809 in claim payments. The average claim amount is \$14,469. Table 4.9h summarizes the severe repetitive loss properties.

**Table 4.9g: Summary of Repetitive Loss Properties**

Location	# of Properties	Types of Properties	# of Losses	Building Payments	Content Payments	Total Payments	Average Payment
Village of Cheshire	1	Single Family	2	\$18,658.78	\$0.00	\$18,658.78	\$9,329.39
Village of Crown City	1	Single Family	4	\$33,150.94	\$2,200.75	\$35,351.69	\$8,837.92
City of Gallipolis	7	Single Family	20	\$216,208.31	\$48,314.25	\$264,522.56	\$13,226.13
Gallia County	1	Single Family	2	\$24,832.62	\$6,746.43	\$31,579.05	\$15,789.53

**Table 4.9h: Summary of Severe Repetitive Loss Properties**

Location	# of Properties	Types of Properties	# of Losses	Building Payments	Content Payments	Total Payments	Average Payment
Gallia County	3	2 Single Family, 1 Non-residential	13	\$88,180.04	\$109,746.64	\$197,926.68	\$15,225.13
Village of Cheshire	1	1 Single Family	6	\$41,889.23	\$569.08	\$42,458.31	\$7,076.39
Village of Vinton	1	1 Non-residential	4	\$57,859.26	\$34,565.23	\$92,424.49	\$23,106.12

## Priority Risk Index:

Table 4.9i: PRI Calculation for Flood

PRI Category	Level	Index Value
Probability	Highly Likely	4
Vulnerability	Limited	2
Spatial Extent	Moderate	3
Warning Time	6-12 hours	3
Duration	Less than 24 hours	2

## 4.10 Landslide Risk Assessment

### Description:

A landslide is the downward and outward movement of earth, rock, and debris. Both natural and human-induced changes in the environment can trigger landslides. Heavy rains, steep slopes, vertically jointed rocks, and fine grained or shale slopes can serve as an alert to potential landslides problems in Ohio.

There are several types of landslides:

#### ROCKFALLS

Are rapid movements of bedrock, which result in bouncing or rolling.

#### TOPPLE

A section or block of rock that rotates or tilts before falling to the slope below.

#### SLIDES

Are movements of soil or rock along a distinct surface of rupture, which separates the slide material from the more stable underlying material.

#### MUDFLOWS

Sometimes referred to as mudslides, mudflows, lahars, or debris avalanches, are fast-moving rivers of rock, earth, and other debris saturated with water. They develop when water rapidly accumulates in the ground, such as heavy rainfall or rapid snowmelt, changing the soil into a flowing river of mud or “slurry.”

#### SLURRY

Can flow rapidly down slopes or through channels and can strike with little or no warning at avalanche speeds. Slurry can travel several miles from its source, growing larger as it picks up trees, cars, and other materials along the way. As the flows reach flatter ground, the mudflow spreads over a broad area where it can accumulate in thick deposits.

Landslides are typically associated with periods of heavy rainfall or rapid snow melt and tend to worsen the effects of flooding that often accompany these events. In areas burned by forest and brush fires, a lower threshold of precipitation may initiate landslides. Ohio landslides are commonly triggered by vibrations, over steepened slopes, increased weight on slopes, and removal of vegetation. Some landslides move slowly and cause damage gradually, whereas others move so rapidly that they can destroy property and take lives suddenly and unexpectedly.

### **Location:**

Landslides can occur in any location in the county and range in size.

### **Extent:**

The extent of the damage is dependent on structures and infrastructure around or involved in the event. It is also a factor of time, inclement weather, vegetation, and steepness of slope. The Ohio Department of Transportation collected data on landslides in the County. The “high” and “very high” designations for landslides denote an assessed high probability of additional slope movement and significant impact to roadway, structures, or adjacent property (Manual for Landslide Inventory, p.3).

### **Duration:**

The duration of a landslide can vary from a rapid change over a few moments to a gradual progression over many years

### **Speed of Onset:**

The rapid landslide onset is unpredictable and only the potential for the hazard occurring can sometimes be predicted. The very gradual landslides can be extrapolated to predict eventual impact and extensive damage can typically be anticipated and prevented.

### **Availability of Warning Time:**

Unless it is a gradual landslide there is no availability of warning time. The only ability is to warn of the potential so proper precautions can be taken while in the vicinity.

### **Previous Occurrences:**

The Ohio Department of Transportation has identified 254 landslides as potential geohazards in Gallia County as shown in Figures 4.9a-b. Forty-six landslides have had a high or very high impact on roadways. The number under the county name indicates sites of moderate, high or very high, and total number of instances respectively. This assessment is based on the impact to roadways, structures, and adjacent property verses the probability of additional movement.

Figure 4.10a: ODOT Landslide Inventory

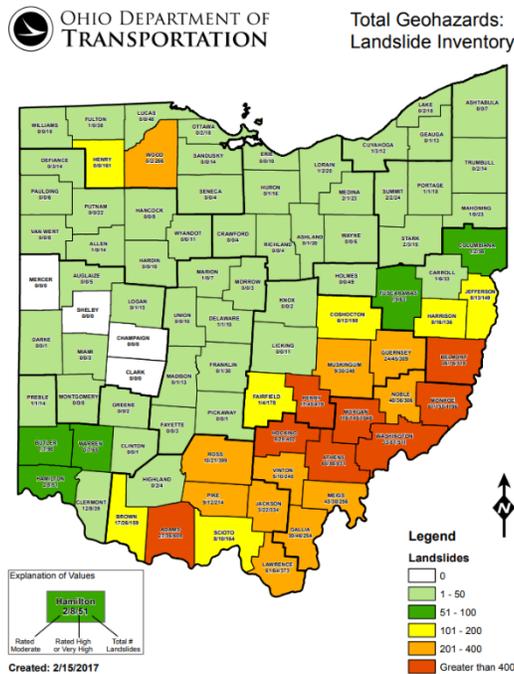
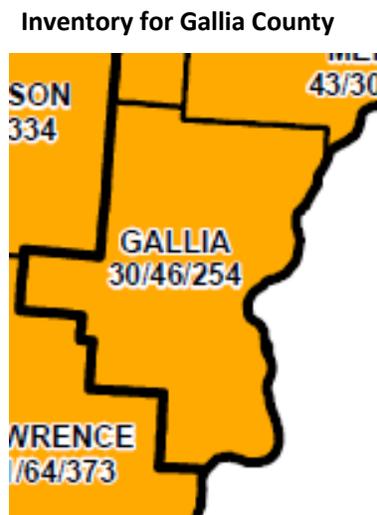


Figure 4.10b: ODOT Landslide Inventory for Gallia County



Source: Office of Geotechnical Engineering <http://www.dot.state.oh.us/Divisions/Engineering/Geotechnical/Pages/GeoHazards.aspx>

### Probability of Future Landslides:

The annual probability of a landslide occurring in Gallia county is very likely. ODOT recorded 46 landslides over a 13- year collection period that have high damage impact. An annual estimate of 3.5 high or very high impact landslides are expected per year in Gallia county.

## Vulnerability Assessment:

Losses attributed to this type of hazard would depend on the size of the collapse and the specific location it affects. A reliable dollar loss damage estimate is difficult to determine due to limited data and information. Although 3.5 landslides are estimated to cause damages each year, the degree of potential damage is not known. Annualized losses are assumed to be negligible.

## Priority Risk Index:

Table 4.10a: PRI Calculation for Landslide

PRI Category	Level	Index Value
Probability	Highly Likely	4
Vulnerability	Minor	1
Spatial Extent	Small	2
Warning Time	Less than 6 hours	4
Duration	Less than 6 hours	1

## 4.11 Severe Thunderstorms/Windstorms

### Description:

According to the National Weather Service, severe thunderstorms are defined as storms that produce hail that is one inch or larger or produce wind gusts over 58 mph. Both hazard potentials can cause substantial damage to property and resources and pose threat for personal injury as well. Thunderstorms are typically connected with other hazards such as tornadoes, windstorms, or hail/winter storms and are sometimes associated with flooding.

Three conditions must occur for a thunderstorm to form. First, it needs moisture to form clouds and rain. Second, it needs unstable air, such as warm air that can rise rapidly (this often referred to as the “engine” of the storm). Third, thunderstorms need lift, which comes in the form of cold or warm fronts, sea breezes, mountains, or the sun’s heat. When these conditions occur simultaneously, air masses of varying temperatures meet, and a thunderstorm is formed. These storm events can occur singularly, in lines, or in clusters. Furthermore, they can move through an area very quickly or linger for several hours.

Downbursts are also possible with thunderstorm events. Such events are an excessive burst of wind more than 125 miles per hour. They are often confused with tornadoes. Downbursts are caused by down-drafts from the base of a convective thunderstorm cloud. It occurs when rain-cooled air within the cloud becomes heavier than its surroundings. Thus, air rushes towards the ground in a destructive yet isolated manner. There are two types of downbursts. Downbursts less than 2.5 miles wide, duration less than 5 minutes, and winds up to 168 miles per hour are called “microbursts.” Larger events greater than 2.5 miles at the surface and longer than 5 minutes with winds up to 130 miles per hour are referred to as “macrobursts.”

## Location:

Severe thunderstorms can occur anywhere within Gallia County. Particularly vulnerable locations include floodplain areas as these storms are typically accompanied by heavy rain. Additionally, the flatter and less forested an area is, the more potential impact to structures from heavy winds. Every citizen in the county is potentially at risk during a severe storm, due to the possibility of lightning, flooding, or possibly tornadoes.

## Extent:

Severe storms occur throughout the State of Ohio. All of Gallia County is exposed to the hazards associated with severe storms all year round. These storms can contain hail, thunder and lightning, high wind, and heavy rain.

One common way of measuring wind speed is with the Beaufort Wind Force Scale (See Table 4.11a on the following page). Originally developed to describe wind conditions on the open ocean, the Beaufort Scale has been modified over time to describe land-based conditions as well, as is shown below. One should note that most Severe Thunderstorm and High Wind conditions would rank on the scale as at least a Force 10 wind.

## Duration:

Weather events that produce dangerous wind conditions could last minutes, hours, or more. This factor will depend on the size and strength of each individual storm event.

## Speed of Onset:

The evolution of storms conducive to the generation of high winds can be monitored with weather radar and other observation. This can allow for the provision of as much warning as possible. The speed with which a storm arises is entirely dependent on environmental factors, so the speed of onset and warning time will vary from event to event.

## Availability of Warning Time:

Warnings for dangerous wind events are provided by the NWS and are disseminated through various media outlets (television, radio, etc.) and NOAA weather radios. Additionally, the majority of warnings are issued at least a few hours in advance of a given storm.

Table 4.11a: Beaufort Wind Force Scale

Force	Wind (MPH)	WMO Classification	Appearance of Wind Effects
			On Land
0	Less than 1	Calm	Calm, smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vanes
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves and small twigs constantly moving, light flags extended
4	13-17	Moderate Breeze	Dust, leaves, and loose paper lifted, small tree branches move
5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind
8	39-46	Gale	Whole trees in motion, resistance felt walking against wind
9	47-54	Strong Gale	Slight structural damage occurs, slate blows off roofs
10	55-63	Storm	Seldom experienced on land, trees broken or uprooted, "considerable structural damage"
11	64-72	Violent Storm	
12	73+	Hurricane	

### Previous Occurrences:

According to the NCEI, there have been 195 severe storm events in Gallia County reported since 1950, with total property losses of more than \$4 million. There have also been the following FEMA Declared Disasters involving severe storms in Gallia County:

- Major Disaster (DR-1164) on March 3, 1997
- Major Disaster (DR-1321) on March 6, 2000
- Major Disaster (DR-1556) on September 18, 2004
- Major Disaster (DR-4002) on July 12, 2011
- Emergency Declaration (EM-3346) on June 29, 2012
- Major Disaster (DR-4077) on August 19, 2012
- Major Disaster (DR-4360) on April 16, 2018

## Probability of Future Events:

There were 92 thunderstorm events (63 causing damage) in Gallia County over 43 years between 1975 and 2018. Therefore, probability of a thunderstorm event in the County in any given year is estimated to be  $92/43 = 2.13$  or 213 percent. There is a  $63/43 = 1.46$  or greater than 100 percent annual probability of some damage. It should be noted that of the 63 events reported with associated damage, 48 are considered minor damages between \$500 and \$5000.

The NCEI data lists 16 strong/high wind events since 1998, 5 of which resulted in damages. Wind data for the 20-year period are used in this section to estimate probability of a damaging wind event. The calculated probability of wind events in the County in any given year is  $16/20 = 0.8$  (80%). There is a  $5/20 = 0.25$  or 25 percent annual probability of some damage.

A total of 73 hail events occurred in the County over 68 years between 1950 and 2018. Thus, the probability of a hail event in the County in any given year is estimated to be  $73/68 = 1.07$  or 107 percent.

A total of 14 heavy rain events occurred in the County over 20 years between 1998 and 2018. The probability of a heavy rain event in the County in any given year is estimated to be  $14/20 = 0.7$  or 70 percent. Two of the 14 events caused a total of \$15,000 in damages.

## Vulnerability Assessment:

In Gallia County, high winds occur annually. The most common detrimental effects are interruptions in power supply and communications services due to downed wires and blocked roadways due to downed trees. The vulnerability in this section is assessed in terms of the annual damage possible given past events.

There were 63 thunderstorm events causing damage in Gallia County over 43 years between 1975 and 2018. Total damages associated with these 63 events is \$2,921,000. Thunderstorm damage anticipated in any given year is estimated to be  $\$2,921,000/43\text{years} = \$67,930$  per year. It should be noted that of the 63 events reported with associated damage, 48 are considered minor damages between \$500 and \$5000.

The NCEI data lists 16 strong/high wind events since 1998, 5 of which resulted in total damages of \$95,000. Wind data for the 20-year period are used in this section to estimate annual damages. Wind damage anticipated in any given year is estimated to be  $\$95,000/20\text{years} = \$4,750$  per year.

A total of 73 hail events occurred in the County over 68 years between 1950 and 2018. Reported damages totaled \$1,064,500. Hail damage anticipated in any given year is estimated to be  $\$1,064,500/68\text{years} = \$15,654$  per year.

A total of 14 heavy rain events occurred in the County over 20 years between 1998 and 2018. Heavy rain has resulted in total reported damages of \$15,000. This results in an annual probability of less than \$1000 per year.

## Priority Risk Index:

Table 4.11b: PRI Calculation for Severe Storms

PRI Category	Level	Index Value
Probability	Highly Likely	4
Vulnerability	Limited	2
Spatial Extent	Large	4
Warning Time	More than 24 hours	1
Duration	Less than 24 hours	2

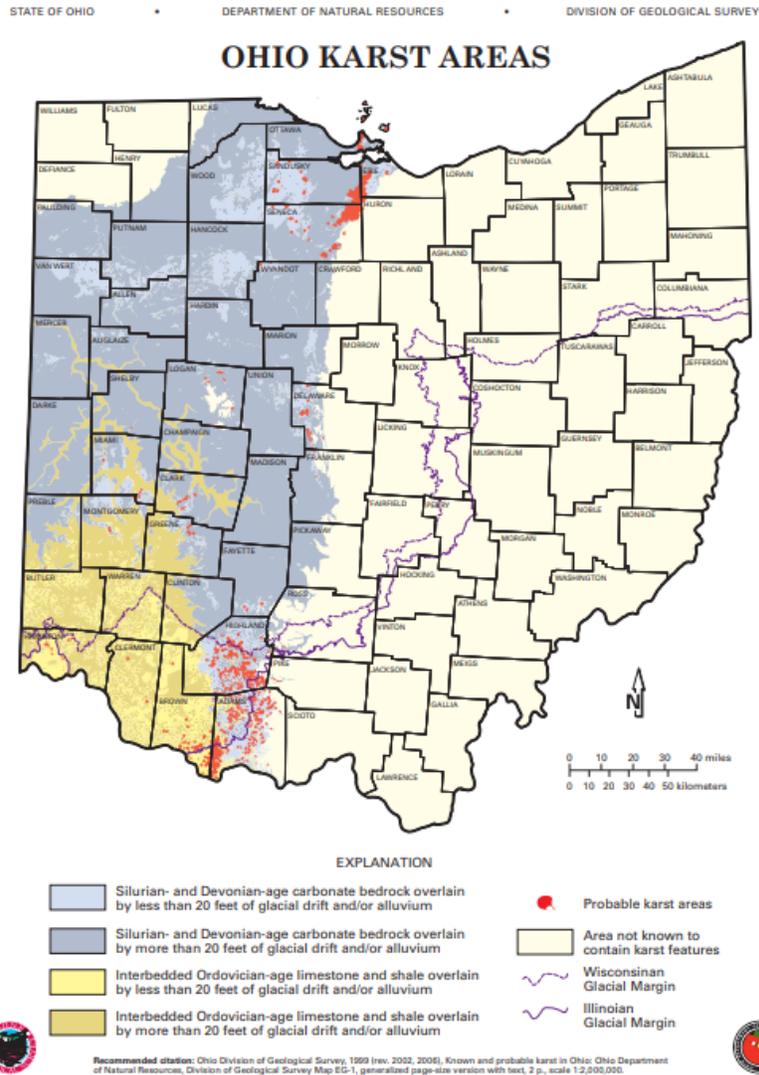
## 4.12 Subsidence

### Description:

Subsidence, more commonly referred to as sinkholes, is defined as a drop in the earth's surface due to a collapse in bedrock and other underlying material (sand, gravel, limestone) into underground mines or caves. Caves are created naturally by eroding or dissolving rock. Karst is the term used for landforms and landscapes formed by dissolving rock. Karst develops in water soluble rock such as limestone, dolomite, and gypsum and is a significant indicator of sinkholes, caves, and underground drainage.

As illustrated in Figure 4.12a on the following page, karst locations in Ohio have been identified to help determine the potential for subsidence, however this is not a significant cause for subsidence within Gallia County.

Figure 4.12a: Identified Karst Locations in Ohio



Source: Ohio Karst Areas. Ohio Department of Natural Resources.  
<http://geosurvey.ohiodnr.gov/portals/geosurvey/PDFs/Karst/karstmap.pdf>

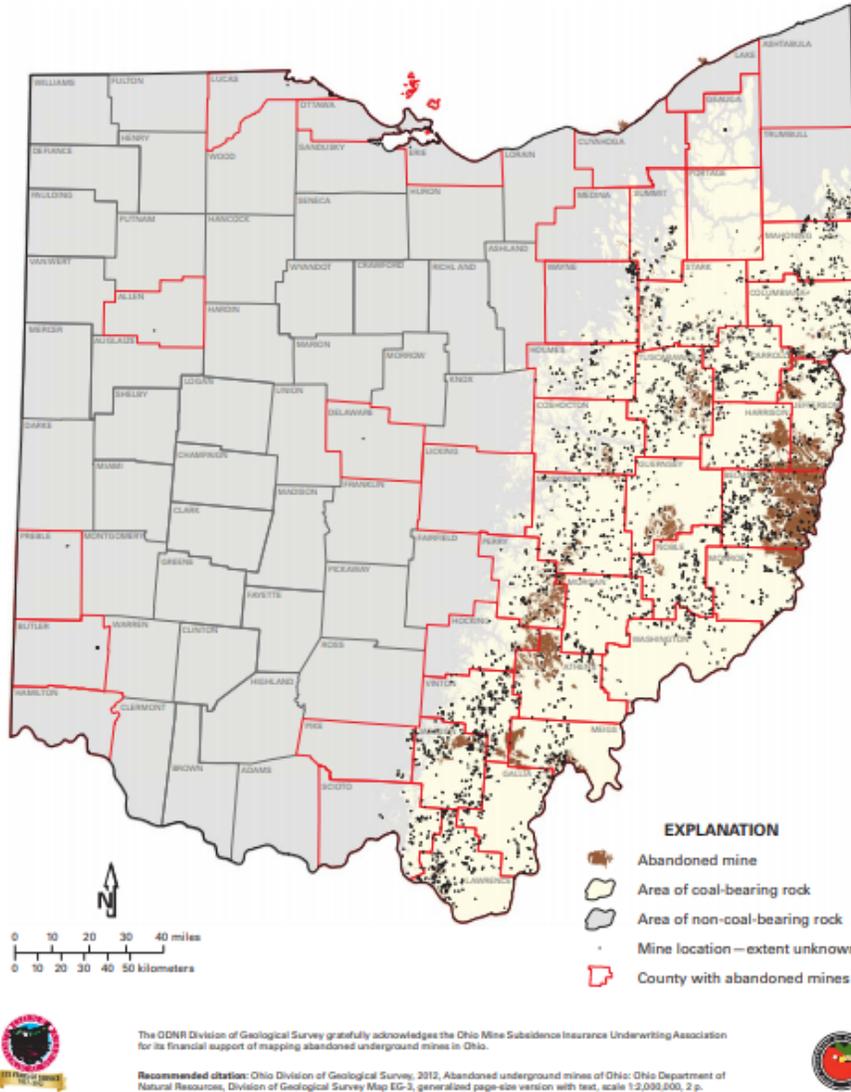
Underground mines can also be a source of sinkholes and is the most significant source of subsidence within the County. Coal mines, most often associated with Appalachian Ohio, vary in depth from less than 100 feet below the surface to 1,000 feet or more. Oftentimes, as miners withdrew, they removed the pillars which supported the mine roof. This is where the mine depth is important. As the amount of solid rock between the mine roof and the surface increases, the more sturdy and less likely subsidence will occur.

Figure 4.12b (on the following page), maps the abandoned the ODNr has identified in Ohio. Gallia County is identified as containing 171 abandoned mines, as of 2017, which are located predominantly throughout rural regions of the county.

Figure 4.12b: Abandoned Underground Mines in Ohio

STATE OF OHIO • DEPARTMENT OF NATURAL RESOURCES • DIVISION OF GEOLOGICAL SURVEY

**ABANDONED UNDERGROUND MINES OF OHIO**

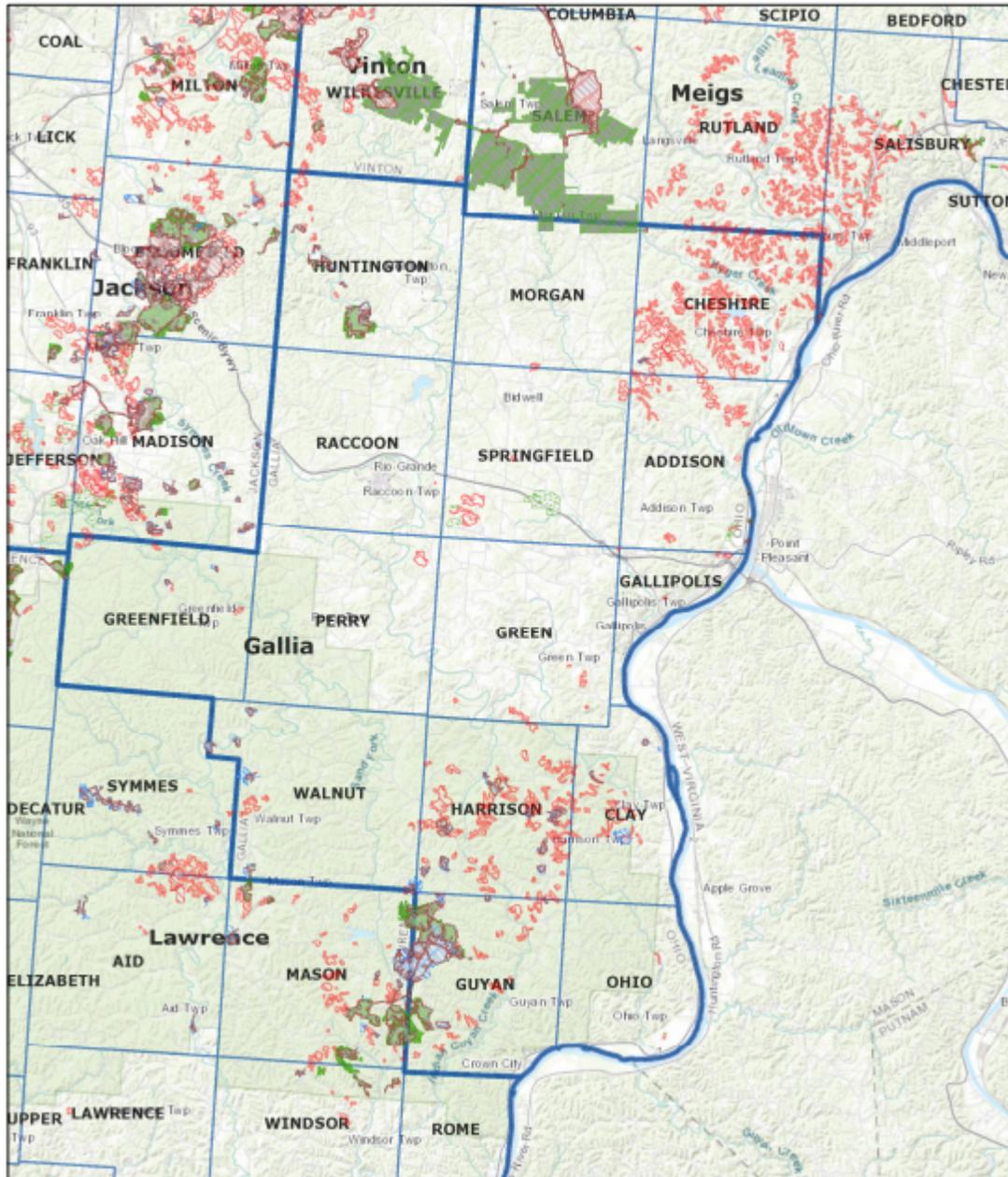


Source: ODNR Division of Geological Survey [http://geosurvey.ohiodnr.gov/portals/geosurvey/PDFs/AUM/AUM-map\\_page-size.pdf](http://geosurvey.ohiodnr.gov/portals/geosurvey/PDFs/AUM/AUM-map_page-size.pdf)

**Location:**

Mine subsidence has the potential to affect utilities, transportation, and all other forms of infrastructure, whether public or private constructed in and around underground mine locations. Since mine subsidence is a site-specific hazard, only infrastructure in areas susceptible to slides or subsidence is at risk. Figure 4.12c (on the following page), shows in red surface area that has been affected by underground mines.

Figure 4.12c: Abandoned Underground Mines in Ohio



Source: ODNR Mines of Ohio Map Viewer. <https://gis.ohiodnr.gov/MapView/?config=OhioMines>

**Extent:**

Some residents within Gallia County live above the coal seams associated with old mines and do not suffer hardship from these mines. History suggests minor damage, but magnitude varies greatly with the size and location of the collapsing mine.

## Duration:

The duration of a subsidence event could be a gradual sinking but the most often occurrences associated with hazards are rapid and occur within seconds or minutes.

## Speed of Onset:

The rapid subsidence onset is unpredictable and only the potential for the hazard occurring can sometimes be predicted.

## Availability of Warning Time:

Unless it is a gradual subsidence there is no availability of warning time. This makes early detection that much more important, so precautionary stabilization efforts can be implemented.

## Previous Occurrences:

Since mine subsidence is a site-specific hazard, only those populations located in areas of underground and strip mines will be impacted. Since villages are not located in areas where underground mines exist, only rural populations near abandoned mines will be susceptible to damage from mine subsidence and collapse in the County. The Ohio Mine Subsidence Underwriting Association reports that there are 171 abandoned mines with no active mines. Between 2005 and 2017, the Ohio Mine Subsidence Underwriting Association reported nine claims due to mine subsidence.

Table 4.112a: Gallia County Mine Subsidence Claims

Year	Abandoned Mines	Reported Claims	Closed Claims	Paid Losses & Adjustment Expenses	Policies	Premium
2017	171	0	0	\$ 75.00	9,140	\$ 9,139.81
2016	171	1	1	\$ 4,265.86	9,277	\$ 9,277.02
2015	171	3	3	\$ 2,132.46	9,368	\$ 9,368.33
2014	166	0	0	\$ -	9,027	\$ 9,027.38
2013	202	0	0	\$ -	9,061	\$ 9,061.50
2012	202	2	2	\$ 4,977.50	10,306	\$ 10,305.88
2011	177	0	0	\$ -	8,641	\$ 8,640.85
2010	175	0	0	\$ -	9,540	\$ 9,539.78
2009	175	0	0	\$ 2,041.55	8,699	\$ 8,699.13
2008	175	1	2	\$ 2,676.26	9,509	\$ 9,508.62
2007	165	1	0	\$ -	9,587	\$ 9,586.94
2006	169	0	0	\$ -	9,746	\$ 9,744.27
2005	169	1	2	\$ 3,454.87	10,615	\$10,614.43

## Probability of Future Events:

Because there are nine documented occurrences of mine subsidence in the County effecting structures over 12 years, the probability of mine subsidence occurring in Gallia County is estimated to be around 75 percent per year. Due to the relatively small timeframe in which data was collected, the probability may differ greatly.

## Vulnerability Assessment:

This discussion has been updated to reflect the PRI assessment, but conclusions are not different from those presented in the 2012 Plan. Damages due to reported subsidence are annualized below. New data about degree to which specific locations within Gallia County have the potential for mine subsidence was the same as the previous plan.

## Priority Risk Index:

**Table 4.12b: PRI Calculation for Subsidence**

PRI Category	Level	Index Value
Probability	Likely	3
Vulnerability	Minor	1
Spatial Extent	Negligible	1
Warning Time	Less than 6 hours	4
Duration	Less than 6 hours	1

## 4.13 Tornadoes Risk Assessment

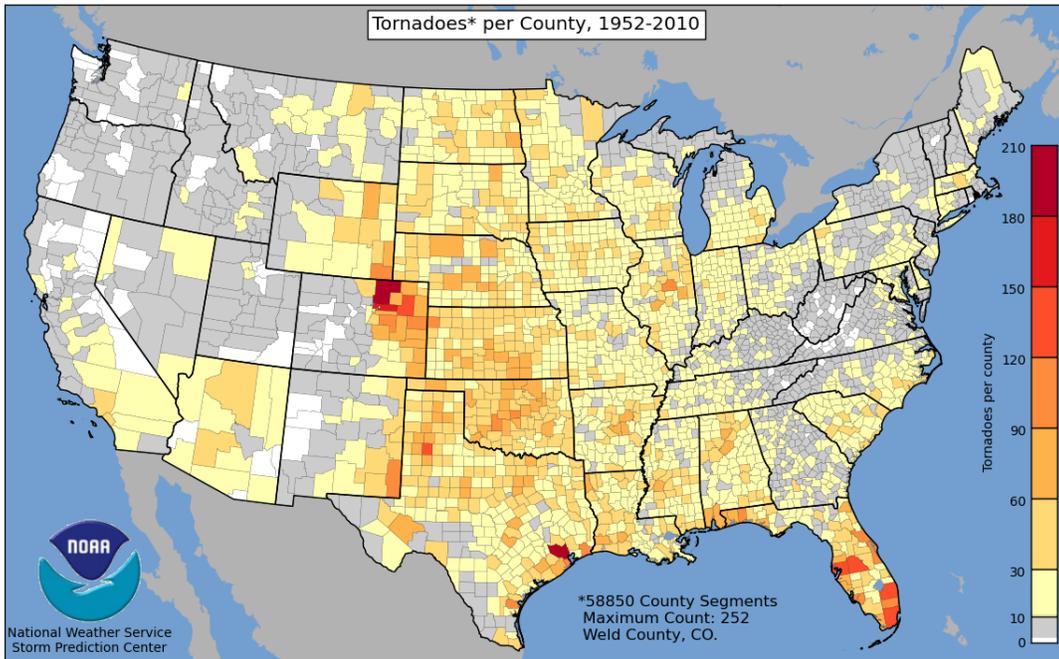
### Description:

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud extending to the ground. Tornadoes are most often generated by thunderstorm activity (but sometimes result from hurricanes and other tropical storms) when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. The damage caused by a tornado is a result of the high wind velocity and wind-blown debris, also accompanied by lightning or large hail.

The National Weather Service states tornado wind speeds normally range from 40 miles per hour to more than 300 miles per hour. The most violent tornadoes have rotating winds of 250 miles per hour or more and can cause extreme destruction by turning normally harmless objects into deadly missiles.

Each year over 800 tornadoes are reported nationwide, resulting in an average of 80 deaths and 1,500 injuries. Figure 4.13a shows tornado activity per county in the United States based on the number of recorded tornadoes between 1952 and 2010.

Figure 4.13a: Tornado Activity per County in the United States



Source: National Weather Service Storm Prediction Center

Tornadoes are more likely to occur during the months of March through May and are most likely to form in the late afternoon and early evening. Most tornadoes are a few dozen yards wide and touch down briefly, but even small short-lived tornadoes can inflict tremendous damage. Highly destructive tornadoes may carve out a path over a mile wide and several miles long.

The destruction caused by tornadoes ranges from light to inconceivable depending on the intensity, size, and duration of the storm. Typically, tornadoes cause the greatest damage to structures of light construction, including residential dwellings (particularly mobile homes).

Tornadic magnitude is reported according to the Fujita and Enhanced Fujita Scales. Tornado magnitudes prior to 2005 were determined using the traditional version of the Fujita Scale (Table 4.13a). Tornado magnitudes that were assessed in 2005 and later were determined using the Enhanced Fujita Scale (Table 4.13b).

Table 4.13a: The Fujita Scale (Effective Prior to 2005)

F-Scale Number	Intensity	Wind Speed	Type of Damage Done
F0	GALE TORNADO	40–72 MPH	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign boards.
F1	MODERATE TORNADO	73–112 MPH	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
F2	SIGNIFICANT TORNADO	113–157 MPH	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
F3	SEVERE TORNADO	158–206 MPH	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.
F4	DEVASTATING TORNADO	207–260 MPH	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
F5	INCREDIBLE TORNADO	261–318 MPH	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel reinforced concrete structures badly damaged.
F6	INCONCEIVABLE TORNADO	319–379 MPH	These winds are very unlikely. The small area of damage they might produce would probably not be recognizable along with the mess produced by F4 and F5 wind that would surround the F6 winds. Missiles, such as cars and refrigerators would do serious secondary damage that could not be directly identified as F6 damage. If this level is ever achieved, evidence for it might only be found in some manner of ground swirl pattern, for it may never be identifiable through engineering studies.

Source: NOAA Storm Prediction Center

Table 4.13b: The Enhanced Fujita Scale (Effective 2005 and Later)

Ef-Scale Number	Intensity Phrase	3 Second Gust	Type of Damage Done
EF0	GALE	65–85 MPH	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign boards.
EF1	MODERATE	86–110 MPH	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
EF2	SIGNIFICANT	111–135 MPH	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
EF3	SEVERE	136–165 MPH	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.
EF4	DEVASTATING	166–200 MPH	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
EF5	INCREDIBLE	Over 200 MPH	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel reinforced concrete structures badly damaged.

Source: NOAA Storm Prediction Center

### Location:

Tornadoes can occur anywhere in Gallia County and have a varying area of impact. Downed trees also block roadways throughout the county and have to be cleared quickly to ensure emergency response vehicles continued to have access. Event locations are completely random and it is not possible to predict areas that are more susceptible although it can be stated that flatter terrain will reflect greater damages associated with a tornado. It is assumed that Gallia is uniformly exposed to tornados.

### Extent:

Tornado extent can be determined by tornado magnitude according to the Fujita and Enhanced Fujita Scale. Gallia County has experienced gale, moderate, and significant tornadoes historically. Events of greater magnitudes are possible.

The extent of the tornadoes may also be measured in terms of property damage and human impact

(including loss of life and injuries). The greatest amount of damage reported from a single tornado event in Gallia County was \$3.5 million in 2002. However, much costlier events are possible. Further, injuries have occurred with this hazard and are possible in the future.

### **Duration:**

The duration of a tornado varies from a brief touch down to carving a path many miles in length.

### **Speed of Onset:**

Formation of tornadoes can be predicted and monitored, tornadoes often occur suddenly and with very little warning.

### **Availability of Warning Time:**

The National Weather Service (NWS) averages about 10-15 minutes of lead time for a tornado. Larger tornadoes that appear on radar provide more warning, but smaller tornadoes not seen on radar could provide less than 10 minutes warning. Whenever the NWS detects a tornado, or foresees the potential for one to occur, an announcement is made over the NOAA Weather Radio system.

### **Previous Occurrences:**

Gallia County is moderately susceptible to tornadoes. According to the NCEI, there have been 7 tornado events in Gallia County reported since 1950, with total property losses of \$9.15 million. The most powerful of which was an F5 that occurred back in 1968 and was the most injurious of all the tornadoes in the county with 17 injuries. The most damaging was the most recent, back in 2002, with a price tag of \$3.5 million and had only a F2 magnitude.

### **Probability of Future Tornadoes:**

The NCEI data lists seven damaging tornadoes for Gallia County for the entire 1950– 2018 period. Thus, the calculated probability of a damaging tornado in the County in any given year is  $7/68 = .102$ , or 10.2percent.

### **Vulnerability Assessment:**

The total costs due to tornadoes over 68 years is \$9,150,000, therefore the average annual losses due to tornadoes is  $\$9,150,000 / 68 = \$134,558$ .

## Priority Risk Index:

Table 4.13c: PRI Calculation for Tornadoes

PRI Category	Level	Index Value
Probability	Possible	2
Vulnerability	Critical	3
Spatial Extent	Small	2
Warning Time	More than 24 hours	1
Duration	Less than 6 hours	1

### 4.14 Wildfire

#### Description:

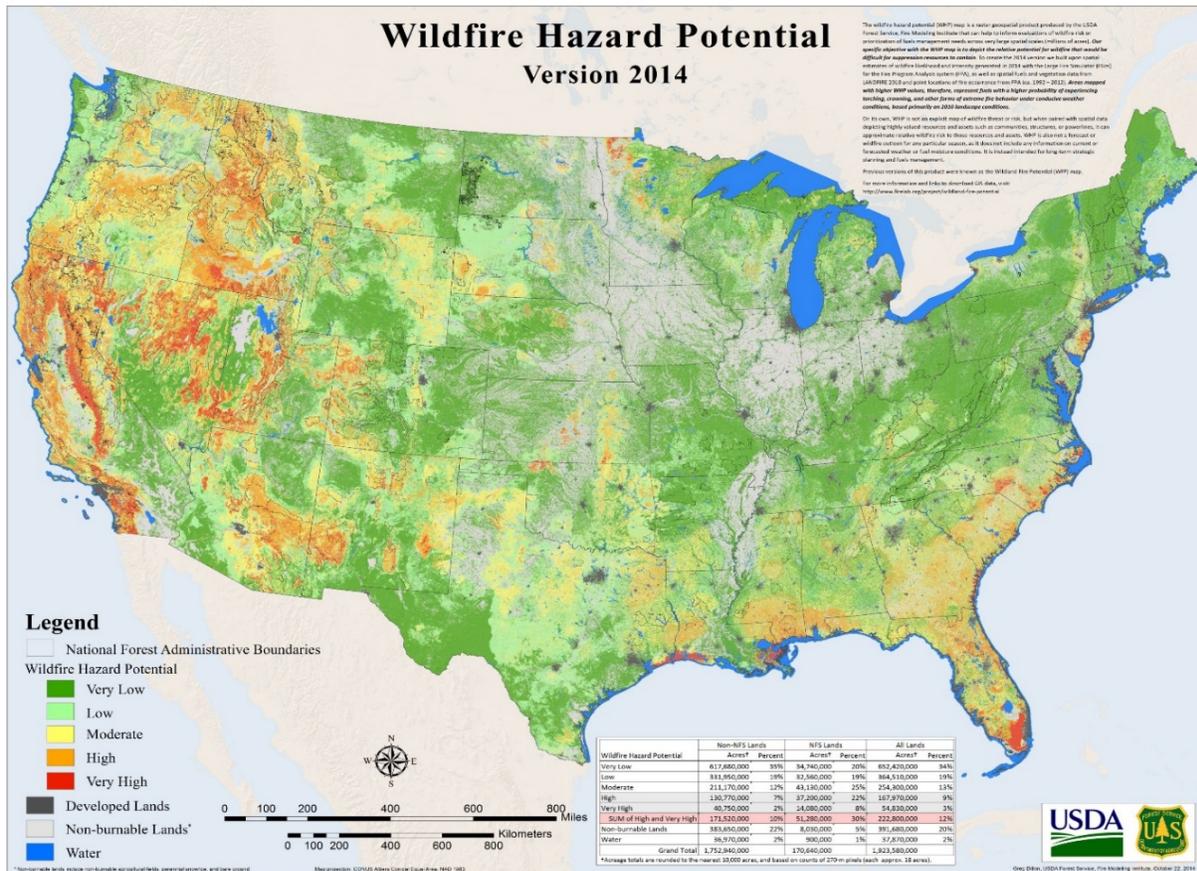
The Ohio Department of Natural Resources Division of Forestry reports that each year 1,000 wildfires burn up to 6,000 acres of Ohio's protected forest and grassland. Ohio's wildfire season is typically in fall after leaves drop and early spring before leaves sprout again. Majority of these damaging fires result from careless burning of debris including campfires. In Ohio, fires are prohibited outside municipal limits from 6am to 6pm during the months of March, April, May, October, and November.

#### Location:

According to Gallia's Ohio County Profile, roughly 60% of the county is covered in forest. By technical definition, the majority of vegetated land in Gallia County not used for urban purposes is potentially susceptible to wildfires. The probable extent of any wildfires in Gallia County should be very small, limited to small groupings of trees or, at most, several acres of field.

The biggest concern wildfires pose to the County is their potential to impact the built environment and initiate structure fires. Per the US Department of Agriculture Forest Service, Fire Modeling Institute, the map below indicates that the wildfire hazard potential for Gallia County is in the Low or Very Low category.

Figure 4.14a: Wildfire Hazard Potential



Source: US Department of Agriculture Forest Service, Fire Modeling Institute  
<https://www.firelab.org/project/wildfire-hazard-potential>

### Extent:

Past events have been small but the potential for a larger event is high. According to Gallia’s County Profile, roughly 60% of the county is covered in forest. Providing the right conditions, the potential exists for substantial losses, particularly near wildland-urban interface areas.

### Duration:

The duration of a wildfire will depend entirely on things such as weather conditions, ignition sources, available fuel, location, and fire crew response time and could vary from a few minutes to days. Containment of a wildfire could prove to be more important than the duration it burns, as a wildfire has the potential to start structure fires and damage actual property.

### Speed of Onset

Onset is dependent many variables including the season, temperature and windspeeds, and dryness. It also depends on the fuel that starts the fire, and keeps it going, and the area available for it to spread.

## Availability of Warning Time:

The actual start of a wildfire is likely to occur without any warning, but it is possible to warn citizens when environmental conditions, such as extreme drought, are conducive to producing wildfires. If necessary, the National Weather Service can issue what is known as a “Red Flag Warning”. This warning indicates that weather conditions are ideal for the generation and propagation of wildfires. Should a large wildfire occur in Gallia County, it could also be possible to warn those individuals who are down wind (i.e. in the path) of the fire, providing them with time to evacuate.

## Previous Occurrences:

The 2019 Revised Ohio State Hazard Identification Plan estimates wildfires for Gallia County as moderate-very high hazard level. It reports 190 wildfire occurrences between 2007 and 2017 damaging roughly 1911 acres. A summary of previous occurrences is provided below in Table 4.14a.

**Table 4.14a: Previous Occurrences**

County	Total Fire Events	Total Acres Burned	Average Acres/Event	Est. Events per Year	1 to 9.99 Acres		10 to 99.99 Acres		100+ Acres	
					# of Events	% of Total	# of Events	% of Total	# of Events	% of Total
Gallia	190	1911	10.06	17	146	76.84%	40	21.05%	4	2.11%

## Probability of Future Events:

There have been multiple events reported in Gallia County according to the Ohio State Hazard Identification Plan. Due to the substantial amount of forest cover in Gallia County, it is likely that the probability of future occurrences will be likely (between 10 and 90% annual probability).

## Vulnerability Assessment:

Loss estimation for a wildfire event would need to be done on a case-by-case basis.

## Priority Risk Assessment:

**Table 4.14b: PRI Calculation for Wildfires**

PRI Category	Level	Index Value
Probability	Likely	3
Vulnerability	Limited	2
Spatial Extent	Small	2
Warning Time	Less than 6 hours	4
Duration	Less than 24 hours	2

## 4.15 Winter Storms Risk Assessment

### Description:

Severe winter weather refers to blizzards, ice storms, heavy snow falls, and any other harsh cold weather event. Severe winter storms are a yearly occurrence within Gallia County, and all of Southern Ohio. Severe winter weather can often impact the local economy by shutting down a community, causing business closures, and creating hazardous travel conditions. There is no way to eliminate winter storms. But weather prediction technology, like Doppler radar, and informed weather preparedness allows the community to brace itself before these harsh winter events occur.

A winter storm is an event in which varieties of precipitation are formed that only occur at low temperatures such as snow, sleet, freezing rain, or ice. Snow storms generally occur with the clash of different types of air masses with differences in temperature, moisture and pressure; specifically, when warm moist air interacts with cold dry air. Snow storms that produce a lot of snow require an outside source of moisture, such as the Gulf of Mexico or the Atlantic Ocean in the United States.

#### HEAVY SNOW

A heavy snow storm is any winter storm that produces six inches or more of snow within a 48-hour period or less.

#### BLIZZARD

A blizzard is a severe snow storm with winds more than 35 mph and visibility of less than a 1/4 mile for more than three (3) hours.

#### ICE STORM

An ice storm is defined as a storm with significant amounts of freezing rain and is a result of warm air in between two layers of cold air. With warmer air above, falling precipitation in the form of snow melts, then becomes either super-cooled (liquid below the melting point of water) or re-freezes.

#### HARSH COLD EVENT

These are miscellaneous other events caused by severe cold including Extreme Cold/Wind Chill and Frost Freeze Event.

A winter storm can range from a moderate snow over a period of a few hours to blizzard conditions with blinding wind-driven snow that lasts for several days. Events may include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. Some winter storms might be large enough to affect several states, while others might affect only localized areas. Occasionally, heavy snow might also cause significant property damage, such as roof collapses on older buildings.

All of the winter storm elements – snow, low temperatures, sleet, ice, etc. – have the potential to cause significant hazard to a community. Even small accumulations can down power lines and trees limbs and create hazardous driving conditions. Furthermore, communication and power may be disrupted for days.

## Location:

Every location within the County is susceptible to severe winter weather. These events often affect entire regions of the state and are not confined to political boundaries. The spatial extent of a severe winter weather event depends on the characteristics of each individual event. Because of their nature, it is more than likely that most of these events will cover all of Gallia County and the surrounding region.

## Extent:

Because the area receives a moderate amount of snowfall and can be stricken by ice storms, all of the structures erected in the county are susceptible to damage if not designed to proper snow loading standards.

Anecdotal evidence indicates that ice storms in Gallia County can cause as much damage as traditional winter storms due to the ice built up on trees and utility wires. Storms have blocked roads for several days. In addition, the County has experienced winter weather events that have resulted in injuries, due to car accidents and falls on the ice. Further, single events have resulted in losses totaling in the millions of dollars.

## Duration:

A given severe winter weather event could last for only a few hours or for many days, depending on the prevailing weather conditions. Also, it is entirely possible that several different events could happen one after another, in quick succession.

## Speed of Onset:

Modern weather forecasting can predict severe weather events well enough to allow at least some preparation before the events strike. Still, the speed of onset of an event will vary due to meteorological conditions.

## Availability of Warning Time:

The National Weather Service can usually provide warning of an impending severe weather event twelve to twenty-four hours before it actually arrives. These warnings are disseminated via NOAA Weather Radio, cable and broadcast television, and other media channels.

## Previous Occurrences:

According to the NCEI there have been 30 winter storm events in Gallia County reported since 1996, with total property losses of \$2.25 million. Only five of these events resulted in damages. The 2012 plan describes the most recent presidential disaster declaration below.

### Winter Storm, March 2003 (DR-1453)

In mid-February 2003, a winter storm system producing dangerous weather conditions stalled over the entire state of Ohio. The storm combined high winds with precipitation creating heavy snowfall, blowing and drifting snow, rain, freezing rain and sleet. It created dangerous conditions and damages in nine counties across Ohio including Gallia County. This storm resulted in the declaration of snow emergencies in many counties and caused significant damage. Transportation and utilities

were disrupted, threatening the health and safety of many citizens.

### Probability of Future Winter Storms:

Anecdotal evidence indicates that winter storms typically occur every year in Gallia County. The NCEI data supports this showing that there was a total of 30 significant winter hazard events over the 22 years between 1996 and 2018. This suggests a “highly likely” recurrence with an annual probability of greater than 100 percent.

### Vulnerability Assessment:

The losses incurred by this type of hazard will vary each time. This makes it difficult to predict future losses. NCEI data provides a general understanding of what to expect from a severe weather event. Examples of types of damages to expect from a severe winter storm event include frostbite, driving hazards and property damage including roof collapse.

Previous reported losses totaled approximately \$2.25 million for heavy snow, ice storm, winter storm, and extreme cold per the NCEI data. Annualized, this amounts to \$102,272 for the county. Future losses should be expected due to snow and could be significant.

### Priority Risk Assessment:

Table 4.15a: PRI Calculation for Winter Storms

PRI Category	Level	Index Value
Probability	Highly Likely	4
Vulnerability	Limited	2
Spatial Extent	Large	4
Warning Time	More than 24 hours	1
Duration	Less than 24 hours	2

## 4.16 Summary of Hazard Risk

The PRI results are presented in the Summary of Hazard Risk table on the following page.

Table 4.16a: Summary of PRI Results for Gallia County

Hazard	Category/Degree of Risk					PRI Score
	Probability	Vulnerability	Spatial Extent	Warning Time	Duration	
Dam Failure	Unlikely	Limited	Moderate	More than 24 hours	Less than 24 hours	1.8
Drought	Possible	Minor	Moderate	More than 24 hours	More than 1 week	2
Earthquake	Unlikely	Minor	Small	Less than 6 hours	Less than 6 hours	1.5
Flood	Highly Likely	Limited	Moderate	6 to 12 hours	Less than 24 hours	2.9
Landslide	Highly Likely	Limited	Moderate	Less than 6 hours	Less than 6 hours	2.9
Land Subsidence	Likely	Minor	Negligible	Less than 6 hours	Less than 6 hours	1.9
Severe Storms	Highly Likely	Limited	Large	More than 24 hours	Less than 24 hours	2.9
Tornado	Possible	Critical	Small	More than 24 hours	Less than 6 hours	2.1
Wildfire	Likely	Minor	Negligible	Less than 6 hours	Less than 24 hours	2
Winter Storms	Highly Likely	Limited	Large	More than 24 hours	Less than 24 hours	2.9

### Hazard Ranking

The hazards were ranked based on PRI results and divided into high, moderate and low.

Ranking	Hazard
High	Flood Severe Thunderstorm / Windstorm Winter Storm Landslide
Moderate	Tornado Drought Wildfire
Low	Land Subsidence Dam Failure Earthquake

## Conclusions on Hazard Risk:

**The hazards that pose the greatest threat to Gallia County include Flood, Severe Thunderstorm / High Wind, Winter Weather and Landslide.** However, the other natural hazards listed in the table above also pose a risk to the population and property in the county. Gallia County has experienced severe hazard events over the past few years including several disaster declarations for severe storms and multiple flooding events. This could be a trend for future more severe and more frequent hazard events in the county. The county is prepared to address these hazards and continues to take steps to reduce their vulnerability. Specific mitigation measures completed, developed and ongoing are defined in Section 5.

## SECTION 5:

# Mitigation Strategy

### 44 CFR Requirement

**Requirement §201.6(c)(3)(i):** [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

**Requirement §201.6(c)(3)(ii):** [The mitigation strategy **shall** include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

**Requirement: §201.6(c)(3)(iii):** [The mitigation strategy section **shall** include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization **shall** include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

**Requirement §201.6(c)(3)(iv):** For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

## Introduction

The mitigation strategy provides a blueprint for Gallia County to follow to become less vulnerable to its identified hazards. It is based on general consensus of the Core Committee, the findings and conclusions of the Risk Assessment, and input from the public and stakeholders. The mitigation strategy includes hazard mitigation plan goals and hazard mitigation actions. The plan goals serve as the guiding principles for future mitigation policy and project administration and hazard mitigation actions serve as implemental items that support goals. The mitigation strategy includes a process for evaluating mitigation actions to ensure actions are feasible based on community capabilities, tied to plan goals, and effective in reducing hazard losses for current and future structures and populations. This section outlines the goals, capabilities, mitigation action evaluation, prioritization process and the Mitigation Action Plan (MAP) for Gallia County.

## 2019 Gallia County Hazard Mitigation Plan Goals

The plan goals reflect current needs and priorities of the county and are intended to reduce long-term vulnerability to all hazards identified in this plan. The 2019 Gallia County Hazard Mitigation Plan goals were reviewed at the Core Committee kickoff and Risk Assessment meeting in December 2018. The Core Committee reviewed the goals and opted to consolidate the goals to more accurately reflect the desires of the county. The plan goals are as follows:

1. Reduce the loss of life and property damage due to the effects of natural hazards.
2. Increase the public's awareness and provide education opportunities about natural hazards.

## Community Capability Assessment

In order to select feasible mitigation actions, an assessment of the current capabilities must be considered. These capabilities include plans, policies, authorities, programs and resources in place to accomplish mitigation within the County.

Each of these items was assessed via a thorough review. Representatives from each community were contacted to complete the matrix. Capabilities were categorized into planning tool, administrative and technical, fiscal and education and training.

The results of the capability assessment are presented in the following matrix. The status of each capability item is indicated with a symbol:

- A checkmark (✓) indicates that the given item is currently in place and being implemented;
- A "C" indicates the item is covered by the county;

**PLANNING TOOL CAPABILITIES:** What plans are in place that may help implement hazard mitigation projects? (see chart on the following page)

**Table 5.1 Planning and Regulatory Capability (Relevant Plans, Ordinances, and Programs)**

Planning / Regulatory Tool	Centerville	Cheshire	Crown City	Gallia County	Gallipolis	Rio Grande	Vinton
Hazard Mitigation Plan	C	C	C	C	C	C	C
Comprehensive Land Use Plan							
Floodplain Management Plan/Regulations	✓	✓	✓	✓	✓	✓	✓
Open Space Management Plan (Parks & Rec/Greenway Plan)			✓				
Stormwater Management Plan/Ordinance			✓				
Natural Resource Protection Plan							
Flood Response Plan			✓				
Emergency Operations Plan	C	C	C	C	C	C	C
Continuity of Operations Plan							
Evacuation Plan					✓	✓	
Disaster Recovery Plan							
Capital Improvements Plan							
Economic Development Plan							
Historic Preservation Plan							
Flood Damage Prevention Ordinance							
Zoning Ordinance							
Subdivision Ordinance							
Unified Development Ordinance							
Post-Disaster Redevelopment Ordinance							
Building Code			✓		✓		
Fire Code					✓		
National Flood Insurance Program (NFIP)			✓				
NFIP Community Rating System							

**ADMINISTRATIVE AND TECHNICAL CAPABILITIES:** What staff and personal resources are available that may help implement hazard mitigation projects?

**Table 5.2: Administrative and Technical Capability (Relevant Staff / Personnel Resources)**

Staff/Personnel Resource	Centerville	Cheshire	Crown City	Gallia County	Gallipolis	Rio Grande	Vinton
Planners with knowledge of land development / land management practices			✓				
Engineers or professionals trained in construction practices related to buildings and/or infrastructure			✓				
Planners or engineers with an understanding of natural and/or human-caused hazards			✓				
Emergency Manager							
Floodplain Manager							
Land Surveyors							
Scientists familiar with the hazards of the community							
Staff with education or expertise to assess the community's vulnerability to hazards							
Personnel skilled in GIS and/or Hazus							
Resource development staff or grant writers							

**FISCAL CAPABILITIES:** What fiscal avenues and means are available to help implement hazard mitigation projects? (see chart on the following page)

**Table 5.3: Fiscal Capability (Relevant Fiscal Resources)**

<b>Fiscal Tool / Resource</b>	<b>Centerville</b>	<b>Cheshire</b>	<b>Crown City</b>	<b>Gallia County</b>	<b>Gallipolis</b>	<b>Rio Grande</b>	<b>Vinton</b>
Capital Improvement Programming							
Community Development Block Grants (CDBG)							
Special Purpose Taxes (or taxing districts)							
Gas / Electric Utility Fees							
Water / Sewer Fees			✓				
Stormwater Utility Fees							
Development Impact Fees							
General Obligation, Revenue, and/or Special Tax Bonds							
Partnering Arrangements or Intergovernmental Agreements			✓				

## Mitigation Techniques

After evaluating the hazards facing Gallia County and identifying the number of people and the extent of property at risk, the Core Committee began to analyze mitigation actions that might be taken to reduce that risk. During the kick-off meeting the Core Committee began to discuss and analyze the mitigation techniques. In general, all activities considered can be classified under one of the following six (6) broad categories of mitigation techniques.

### 1. PREVENTION

Preventative activities are intended to keep hazards from getting worse and are typically administered through regulatory programs or enforcement actions. Adopting and administering ordinances, regulations, and programs that manage the development of land and buildings to minimize risks of loss due to natural hazards are examples of prevention activities.

- Building codes
- Land use plans
- Subdivision regulations
- Floodplain regulations
- Capital improvement programs

## **2. PROPERTY PROTECTION**

Property protection measures involve the modification of existing buildings and structures to help them better withstand the forces of a hazard. Examples of property protection measures include retrofitting existing structures to increase their resistance to damage and exposure of occupants to harm, relocating vulnerable structures and occupants from hazard locations, and conversion of developed land to permanent open space through acquisition and demolition of existing structures.

- Acquisition of flooded homes
- Elevation above flood height
- Safe rooms
- Tie downs
- Critical facilities protection
- Insurance

## **3. PUBLIC EDUCATION AND OUTREACH**

Public education and outreach activities are used to advise the public about the risks of hazards and mitigation techniques available to reduce threats to life and property.

- Severe weather awareness events
- Public service announcements on radio or television
- Internet access to hazard information
- Social media campaigns

## **4. NATURAL RESOURCES PROTECTION**

Natural resources protection is preserving and restoring the beneficial functions of the natural environment (such as floodplains, wetlands, etc.) to promote sustainable community development that balances the constraints of nature with the social and economic demands of the community. Such areas include floodplains, wetlands, etc. Parks, recreation, or conservation agencies and organizations often assist with the implementation of these protective measures.

- Open space easements
- Wetland restoration/preservation
- Acquisition of environmentally beneficial lands
- Floodplain protection
- Watershed management
- Riparian buffers

## **5. EMERGENCY SERVICES**

Although not typically considered a “mitigation” technique, emergency service measures do minimize the impact of a hazard event on people and property. Responding to and recovering from a natural hazard disaster.

- Disaster warning and forecasting systems
- Weather alert radios

- Storm shelters
- Emergency power generation

## 6. STRUCTURAL PROJECTS

Structural projects include engineering structural modifications to natural systems and to public infrastructure in order to reduce the potentially damaging impacts of a hazard on a community. The structural projects are usually designed by engineers and are managed or maintained by public works departments at local, state and federal agency levels.

- Reservoirs
- Dams / levees
- Stream channel modifications
- Storm sewers

## Evaluation of Potential Mitigation Actions

FEMA guidance for meeting the planning requirements of the Disaster Mitigation Act of 2000 specifies that plan participants should consider a variety of potential mitigation actions. Considering mitigation is a long-term, ongoing process. Actions are continuously considered based on community needs. Further, there may be a variety of solutions for an existing problem. By evaluating potential actions against a range of factors, the best solution can be selected.

The Core Committee considered the county's overall hazard risk and capability to mitigate the effects of hazards. To assist in evaluating potential actions, the planning team applied the FEMA-recommended "STAPLEE" evaluation criteria to each proposed mitigation action. This includes social, technical, administrative, political, legal, economic and environmental considerations, collectively known as "STAPLEE" evaluation criteria and listed in Table 5.4.

Any proposed actions that were deemed to not adequately meet the "STAPLEE" evaluation criteria were eliminated from further consideration in the development of the Mitigation Action Plan. In addition to STAPLEE the Core Committee considered life safety that factored into final prioritization of actions.

**Table 5.4: Additional Considerations (STAPLEE evaluation)**

Hazard	Justification for Inclusion
Socially Acceptable	Is the proposed action socially acceptable? Is the action compatible with present and future values? Are there equity issues involved that would mean that one segment of the community is adversely affected?
Technically Feasible	Will the proposed action serve as a long-term solution? Will it create any negative secondary impacts? Are there any foreseeable problems or technical constraints that could limit its effectiveness?
Administratively Possible	Does the community have the capability to implement the proposed action? Is there someone available to coordinate and sustain the effort?
Politically Acceptable	Is there political support to implement the proposed action? Is there enough public support to ensure the success of the action?
Legal	Is the community authorized to implement the proposed action? Is there a clear legal basis or precedent for the action? Are there any potential legal consequences of the action?
Economically Sound	What are the costs and benefits of the proposed action? Does the cost seem reasonable for the size of the problem and the estimated benefits? Are there funding sources available to help offset costs of the action? Is the action compatible with other goals of the community?
Environmentally Sound	How will the action impact the environment (natural resources, ecosystems, endangered species, etc.)? Will the action require any environmental regulatory approvals? Is the action consistent with other environmental goals of the community?

## Selection of Mitigation Actions

The Mitigation Action Plan (MAP) is a functional plan for action and is considered to be the most essential outcome of the mitigation planning process. The MAP includes a prioritized listing of proposed hazard mitigation actions (policies and projects) for the county and participating jurisdictions to implement. Each action includes accompanying information such as the department responsible for completing the action, timeline, and funding source.

The MAP provides departments or individuals responsible for implementing mitigation actions with a clear path to reduce vulnerability over time. Further, the MAP provides a mechanism to monitor progress over time. Each action also considers benefits and costs of an action, to ensure it is cost effective, which is included in the prioritization of actions.

## Prioritization of Mitigation Actions

All actions considered cost-effectiveness including a cost-benefit review for prioritization. In addition, local knowledge or need may necessitate a priority shift from the guidelines presented below.

- **Low Priority Projects:** Projects that are associated with low or infrequent hazard probability and least likely to prevent loss of life.
- **Medium Priority Projects:** Projects associated with a less probable hazard with potential to save lives or damage to property.
- **High Priority Projects:** Projects identified in response to one or more of the highest probability hazards combined with the ability to save lives.

## Implementation of Mitigation Actions

The MAP includes several measures to ensure actions are implemented. Gallia County Emergency Management Agency will serve as the coordinating agency. However, each action is tied to an agency or individual responsible for leading the mitigation action. By assigning responsibility, it increases accountability and the likelihood of action.

In addition to assignment of a local lead department or agency, an implementation time period or a specific implementation date has been assigned in order to assess whether actions are being implemented in a timely fashion. Further, the county will seek outside funding sources to implement mitigation projects in both pre-disaster and post-disaster environments. When known, potential funding sources have been identified for proposed actions listed in the MAP.

The MAP, provides a functional plan of action for each jurisdiction. It is designed to achieve the established mitigation goals and will be maintained on a regular basis according to the plan maintenance procedures.

Each proposed mitigation action has been identified as an effective measure (policy or project) to reduce hazard risk for Gallia County. Each action is listed in the MAP in conjunction with background information such as the plan goal addressed by the action, a brief description of the action, hazard(s) addressed, relative priority, and estimated cost.

Other information provided in the MAP includes potential funding sources to implement the action should funding be required (not all proposed actions are contingent upon funding). Most importantly, implementation mechanisms are provided for each action, including the designation of a lead agency or department responsible for carrying the action out as well as a timeframe for its completion. These implementation mechanisms ensure that the Gallia County Hazard Mitigation Plan remains a functional document that can be monitored for progress over time. The proposed actions are not listed in priority order, though each has been assigned a priority level of “high,” “moderate,” or “low” as described below. The plan goals are provided below for reference and are listed by number in the Mitigation Action Plan in Table 5.5.

### Plan Goals

1. Reduce the loss of life and property damage due to the effects of natural hazards.
2. Increase the public’s awareness and provide education opportunities about natural hazards.

Table 5.5: 2019 Mitigation Action Plan

Goal	Project Description	Hazard	Jurisdiction	Type	Cost	Benefit	CBR	Funding Source	Time Frame	Responsible Parties	Priority	2018 Status
1	Assess Impacts on the community in regards to the fly ash caused by heavy wind	Severe Wind	Village of Cheshire	Prevention	Medium	Public Health	Yes	Federal Grants/ Local	2023	Village of Cheshire	High	New
2	Education and Outreach about procedures and best practices for fly ash impacts	Severe Wind	Village of Cheshire	Public Education	Low	Public Health/ Loss Avoidance	Yes	Federal Grants/ Local	2023	Village of Cheshire	High	New
1	Establish procedures and locations for excess debris to better manage clean up and disposal during and after an emergency.	Flooding	All	Prevention	Low	Public Health/ Environment	Yes	Local	2019-2021	County EMA	High	In-progress: developing plan
1	Evaluate the existing sewage plants' capacities and provide necessary improvements to increase plant capacities as needed.	Flooding	All	Structural Projects	High	Loss Avoidance	Yes	Local / Federal Grant	2019-2024	County and Community Public Work	High	In-progress: being made by communities as necessary
1	Gallia County is continuously threatened by potential landslides but lacks the equipment to aid in mitigating that threat. Therefore, the County wants to obtain a drilling machine and pile driver to mitigate continued threat of landslides.	Landslides	All	Structural Projects	High	Loss Avoidance	Yes	Local / Federal Grant	2020-2023	County Department of Transportation	High	Deferred: hasn't been initiated, but will be in future
1	Public infrastructure (culverts and bridges) are undersized and are contributing to stormwater flooding and increased erosion issues	Flooding	Village of Centerville	Structural Projects	Medium	Loss Avoidance	Yes	Local / Federal Grant	2020-2023	Village of Centerville Public Works	High	New
1	Remove existing structures in floodplains that have been impacted by flooding	Flooding	Village of Centerville	Property Protection	High	Existing Structures/ Prevention	Yes	Local / Federal Grant	2021-2023	Village of Centerville Mayors Office, County EMA	Medium	New

Goal	Project Description	Hazard	Jurisdiction	Type	Cost	Benefit	CBR	Funding Source	Time Frame	Responsible Parties	Priority	2018 Status
1	Sewer plant flooded about seven years ago. There was a storm event that overwhelmed the pumps and resulted in flooding. The Village will need to conduct an assessment of the flooding in the area at the sewer plant and determine potential actions to reduce flood risk.	Flooding	Village of Rio Grande	Structural Project	Medium	Loss Avoidance	Yes	Federal Grants	2023	Village of Rio Grande and Gallia County EMA	Medium	New
1	Protect critical facilities by providing an alternate power source, such as a back-up generator, for fire station which may also be used as an emergency shelter	Flooding, Severe Storms	City of Gallipolis	Emergency Services	Medium	Life safety	Yes	Federal Grants	2023	City of Gallipolis and Gallia County EMA	Medium	New
2	Expand use of public notification service (NotifyNow).	Flooding, Severe Storms	City of Gallipolis	Prevention	Medium	Life safety	Yes	Federal Grants	2023	City of Gallipolis and Gallia County EMA	Medium	New
1	Establish procedures and maintenance protocols for excess debris and undersized culverts to alleviate flooding and promote better drainage.	Flood	Village of Cheshire	Prevention	Low	Loss Avoidance	Yes	Federal Grants/ Local	2023	Village of Cheshire and Gallia County EMA	Medium	New
1	Protect critical infrastructure (lift station) from being impacted by flooding	Flood	Village of Vinton	Structural Projects	High	Loss Avoidance	Yes	Federal Grants/ Local	2021-2023	Village of Vinton Public Works	Medium	New
1	Public infrastructure (culverts and bridges) are undersized and are contributing to stormwater flooding and increased erosion issues	Flood	Village of Crown City	Structural Projects	Medium	Loss Avoidance	Yes	Federal Grants/ Local	2020-2024	Village or Crown City Public works	Medium	New
2	Develop an educational outreach program to educate County residents on the dangers associated with natural hazards.	All	All	Public Education	Low	Public Information/ Education	Yes	Local	2019-2023	Gallia Co. EMA	Medium	In-progress: outreach via social media and County Fair
1	Construct designated safe shelters throughout the County that would provide protection from natural hazards.	Flood, Winter Storms, Severe Storms	All	Structural Projects	High	Life Safety/Future Structures	Yes	Federal Grant	2019-2021	Gallia Co. EMA	Medium	In-progress: as funds become available

Goal	Project Description	Hazard	Jurisdiction	Type	Cost	Benefit	CBR	Funding Source	Time Frame	Responsible Parties	Priority	2018 Status
1	Gallia County lacks proper fuel supply to sustain necessary activities in an emergency. The County wants to coordinate with the OEMA to evaluate the community's need for additional fuel supplies during emergencies.	Winter Storms	All	Emergency Services	High	Public Health / Loss Avoidance	Yes	State/ Local	2019-2022	Gallia Co. EMA	Medium	in-progress: continue coordination with OEMA
1	Gallia County's mapping system lacks updated information concerning areas of potential landslides. Therefore, the County wants to develop an electronic map illustrating existing soil layers and known slip areas.	Landslides	All	Prevention	Medium	Loss Avoidance	Yes	State/ Local	2019-2022	Gallia Co. Engineer and EMA	Medium	In-progress: limited due available resources
1	Provide an alternate power source, such as back-up generators, for sensitive populations and critical facilities that must have continuous power to preserve and protect human health.	All	All	Emergency Services	Medium	Life Safety	Yes	Local / Federal Grant	2019-2024	County EMA/ private	Medium	In-progress: completed as funds become available
1	Gallia County's township infrastructure and bridgeways are inadequate to handle flooding. The County wants to enlarge bridge decking on those structures identified to be inadequate.	Flooding	All	Structural Projects	High	Future/ Existing Structures	Yes	Local / Federal Grant	2019-2024	County Engineer	Medium	In-progress: completed as funds become available
1	Remove existing structures in floodplains that have been identified as repetitive loss structures according to FEMA.	Flooding	All	Property Protection	High	Existing Structures/ Prevention	Yes	Local / Federal Grant	2019-2023	County EMA	Medium	In-progress: as structures are identified
1	Due to the increased amount of sedimentation caused by subsidence, the information on the County's FIRM map is no longer accurate. Floodplains are not depicted accurately since streams, such as Kyger Creek, are not as deep due to increased sediment loading.	Land Subsidence	All	Prevention	High	Loss Avoidance	Yes	Local / Federal Grant	2022-2024	County Floodplain Administrator	Medium	Deferred: hasn't been initiated, but will be in future

Goal	Project Description	Hazard	Jurisdiction	Type	Cost	Benefit	CBR	Funding Source	Time Frame	Responsible Parties	Priority	2018 Status
1	As part of their maintenance program, utility companies use a chop and drop method for trees around power lines and above ground utilities. The County wants to coordinate with utility companies for timely removal of debris after chop and drop.	Severe Storms	All	Prevention	Low	Public Health/ Environment	Yes	Private	2018	Gallia County Commissioners	Medium	Complete: Utilities have hired contractors to remove debris
1	Gallia County lacks an adequate outdoor warning system throughout the County. Therefore, the County wants to install an interoperable, multi-purpose siren system that would alert residents of approaching severe weather.	Tornadoes	All	Emergency Services	Medium	Life Safety/Future Structures	Yes	Local	2018	Gallia Co. EMA	Medium	Complete: currently Gallia County have reverse 911
1	Identify opportunities to incorporate language in new or current regulations to address need for dry hydrant systems for new development	Drought	All	Structural Projects	Low	Future/ Existing Structures	Yes	Local	2021-2023	Gallia Co. EMA	Low	Deferred: hasn't been initiated, but will be in future
1	Because Gallia County is prone to landslides, the County wants to obtain a piling drilling machine to mitigate landslides resulting from flooding.	Landslide	All	Structural Projects	High	Loss Avoidance	Yes	Local / Federal Grant	2022-2024	County Engineer	Low	Deferred: hasn't been initiated, but will in future
1	Underground mines, some of which have been abandoned for years, can be found in different parts of Gallia County. The County wants to establish an enforceable permitting process for construction in areas affected by mines to limit the subsidence which causes landslides.	Land Subsidence	All	Prevention	Low	Loss Avoidance	Yes	Local	N/A	N/A	Low	Deferred: not priority to permitting
1	Gallia County wants to better coordinate efforts with logging companies and the logging industry to protect and maintain local roads and assess potential enforcement actions.	Landslides	All	Prevention	Low	Loss Avoidance	Yes	Local	N/A	Gallia Co. Engineer	Low	Deferred: hasn't be initiated

Goal	Project Description	Hazard	Jurisdiction	Type	Cost	Benefit	CBR	Funding Source	Time Frame	Responsible Parties	Priority	2018 Status
2	Gallia County lacks the coverage of the Doppler radar through NOAA. The County wants to coordinate with NOAA to expand the coverage area of the Doppler radar to include Gallia County.	Severe Storms	All	Emergency Services	High	Public Safety	Yes	Federal	N/A	N/A	Low	Complete: Has Doppler coverage
1	Gallia County's water supply becomes depleted during mild and severe droughts. The County wants to establish designated back-up water sources for use during droughts.	Drought	All	Prevention	High	Life Safety	Yes	Local	N/A	N/A	Low	Removed: priorities have changed
1	Provide emergency water supply tanks with each tank being designated to serve a particular area of the County.	Drought	All	Prevention	High	Loss Avoidance	Yes	Local	N/A	N/A	Low	Removed: priorities have changed
1	The County wants to define and map floodplain areas where repetitive loss structures are located to avoid future building in these areas.	Flooding	All	Prevention	Low	Further Study/Loss Avoidance	Yes	Local	N/A	N/A	Low	Removed: no longer priority
1	Many residents in Gallia County are served by propane tanks. The County wants to establish regulations for propane tank tie down to avoid tanks floating down stream in flooding situations.	Flooding	All	Prevention	Low	Life Safety	Yes	Local	N/A	N/A	Low	Removed: no longer issue
1	Gallia County lacks emergency response vehicles that can navigate in snow.	Winter Storms	All	Emergency Services	Low	Life Safety	Yes	Local	N/A	N/A	Low	Removed: no longer issue
1	Gallia County needs more man power for disaster cleanup activities. The County wants to coordinate with correction institutions for recruitment of workers for cleanup.	Winter Storms	All	Emergency Services	Medium	Public Health/ Environment	Yes	Local	N/A	N/A	Low	Removed: no longer issue
1	Work with public and private entities to develop Emergency Action Plan and inundation data	Dam Failure	All	Prevention	Medium	Loss Avoidance	Yes	Local	2020-2025	ODNR Dam Safety Program, Gallia County EMA and private or public owner	Medium	New

Goal	Project Description	Hazard	Jurisdiction	Type	Cost	Benefit	CBR	Funding Source	Time Frame	Responsible Parties	Priority	2018 Status
1	Rehabilitate dam or levee structures deemed potential hazard for failure	Dam Failure	All	Prevention	High	Loss Avoidance	Yes	Local	2020-2025	ODNR Dam Safety Program, and private or public owner	Medium	New

## SECTION 6

# Plan Maintenance

An annual review of mitigation actions will be conducted. The process for evaluating the plan has been modified slightly from that presented in the previous version of the plan. The protocols for updating the plan and continued public involvement have been elaborated upon in this version of the plan.

## Monitoring Mitigation Actions

The Gallia County EMA Director will monitor the progress made on the implementation of the identified action items annually at about the anniversary date of plan adoption. Monitoring will be accomplished by calling or e-mailing each County or municipal agency that, through adoption of the plan, has assumed the responsibility of implementing one or more mitigation actions.

By monitoring mitigation actions, when the plan is next updated, information about the status of proposed mitigation actions will be readily available. The updated plan will include a section explaining if previously proposed mitigation actions have been implemented, completed, or deferred. The updated plan will identify actions that are no longer appropriate for the community and should be deleted. The updated plan will identify obstacles to implementation that caused proposed actions to be deferred and will recommend strategies for overcoming those obstacles.

## Evaluating the Plan

The annual monitoring of mitigation actions will allow the Gallia County EMA Director to evaluate the mitigation planning process, implementation of the plan, and conditions in Gallia County that suggest the need to modify either planning data or planning actions. Participating jurisdictions' and townships will be invited to attend the evaluation meetings. The evaluation will update any disaster events and/or loss data, as available, as well as evaluates the progress of mitigation actions. During the meeting, the following questions could be asked:

- Do mitigation goals and objectives reflect current community concerns as well as the finding of the risk assessment?
- Have conditions in the County changed so that findings of the risk assessment should be updated?
- What hazards have caused damage in the County since the plan was written? Were these anticipated and evaluated in the plan or should these hazards be added to the plan?
- Have conditions in the County changed so that the magnitude of risk as expressed in this plan has changed?
- Are new sources of data available that will improve the risk assessment?
- Are current resources sufficient for implementing mitigation actions?

- Do any new or old county plans or regulations have common interest with any action items? Could any of these plans or regulations help in completing an action item?
- For each mitigation action that has not been completed, what are the obstacles to implementation? What are potential solutions for overcoming these obstacles?
- Is each completed mitigation action effective in reducing risk? What action is required to further reduce the risk addressed by the completed action?
- What mitigation actions should be added to the plan and proposed for implementation?
- Should any proposed mitigation actions be deleted from the plan? What is the rationale for deleting previously proposed actions from the plan?
- Based upon the evaluation, should the plan be updated as soon as possible or should the plan be updated as scheduled 5 years after it was adopted?

The Gallia County EMA Director will document the results of the annual evaluation meeting and submit the findings to each incorporated jurisdiction and townships in the County. If the Mitigation Core Group determined that the plan should be updated as soon as possible, the Gallia County EMA Director will take action to initiate the plan update.

## Updating the Plan

This plan must be updated within five (5) years and again adopted by the County and participating jurisdictions in order to maintain compliance with the regulations stated in 44 CFR Part 201.6 and ensure eligibility for applying for and receiving certain Federal mitigation grant funds.

The plan has to be updated in the next 5 years to remain in compliance and remain eligible for applicable Federal mitigation grant funds.

Monitoring and evaluation will identify necessary modifications to the plan including changes in mitigation strategies and actions that should be incorporated in the next update.

The plan review provides officials with an opportunity to evaluate those actions that have been successful and to document losses avoided due to implementation of specific mitigation measures. The plan review also provides an opportunity to address mitigation actions that may not have been successful. The Gallia County EMA will be responsible

for reconvening the Core Committee and conducting the five-year review.

During the five-year plan review process, the following questions will be considered as criteria for assessing the effectiveness and appropriateness of the Plan:

- Do the goals address current and expected conditions?
- Has the nature or magnitude of risks changed?
- Are the current resources appropriate for implementing the Plan?
- Are there implementation problems, such as technical, political, legal or coordination issues with other agencies?
- Have the outcomes occurred as expected?
- Did County/tribal departments participate in the plan implementation process as assigned?

Following the five-year review, any revisions deemed necessary will be summarized and implemented according to the reporting procedures and plan amendment process outlined herein. Upon completion of the review and update/amendment process, the Gallia County Hazard Mitigation Plan will be submitted to the State Hazard Mitigation Officer at the Ohio Emergency Management Agency (Ohio EMA) for final review and approval in coordination with the Federal Emergency Management Agency (FEMA).

## Disaster Declaration

Following a disaster declaration, the Gallia County Hazard Mitigation Plan will be revised as necessary to reflect lessons learned, or to address specific issues and circumstances arising from the event. Gallia County EMA will be responsible for reconvening the Core Committee and ensuring appropriate stakeholders are invited to participate in the plan revision and update process following declared disaster events.

## Plan Amendment Process

Upon the initiation of the amendment process, representatives from Gallia County EMA will forward information on the proposed change(s) to all interested parties including, but not limited to, all directly affected community departments, residents, and businesses. Information will also be forwarded to the Ohio EMA. This information will be disseminated in order to seek input on the proposed amendment(s) for no less than a 45-day review and comment period.

At the end of the 45-day review and comment period, the proposed amendment(s) and all comments will be forwarded to the Core Committee for final consideration. The Core Committee will review the proposed amendment along with the comments received from other parties, and if acceptable, the committee will submit a recommendation for the approval and adoption of changes to the Plan. In determining whether to recommend approval or denial of a Plan amendment request, the following factors will be considered by the Core Committee:

- There are errors, inaccuracies, or omissions made in the identification of issues or needs in the Plan.
- New issues or needs have been identified which are not adequately addressed in the Plan.
- There has been a change in information, data, or assumptions from those on which the Plan is based.

Upon receiving the recommendation from the Core Committee, and prior to adoption of the Plan, the participating jurisdictions will hold a public hearing, if deemed necessary. The governing bodies of each participating jurisdiction will review the recommendation from the Core Committee (including the factors listed above) and any oral or written comments received at the public hearing. Following that review, the governing bodies will take one of the following actions:

- Adopt the proposed amendments as presented;
- Adopt the proposed amendments with modifications;
- Refer the amendments request back to the Regional Hazard Mitigation Planning Committee for further revision; or
- Defer the amendment request back to the Regional Hazard Mitigation Planning Committee for further consideration and/or additional hearings.

## Continued Public Involvement

The Gallia County EMA Director will provide printed copies of the plan to key Gallia County offices. A copy of the adopted plan will be posted on the County Web site for five years so that the public has electronic access to the plan. The website will include contact information for anyone to provide comment so that residents, business owners, and others who read the plan will be able to provide a comment about the plan or about the mitigation strategies. The Gallia County EMA will maintain these comments and will provide them to the Mitigation Core Group for consideration at the annual plan evaluation meetings.

The Gallia County EMA Director will post notices of annual mitigation plan evaluation meetings using the usual methods for posting meeting announcements in the County to invite the public to participate. In addition to posting announcements on the County Web site, postings may be made on social media at the onset of the process of updating the plan inviting public participation.

The Gallia County EMA Director may provide a written report and/or make a presentation to the Gallia County Commissioners to advise them of the status of the plan and of proposed mitigation actions. In this way, the public will have another opportunity to become aware of local mitigation efforts.