Lawrence County, Ohio

Natural Hazards Mitigation Plan

October 2021

Prepared for: Lawrence County Emergency Management Agency
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Executive Summary

The Lawrence County Mitigation Plan lays the road map to a safer community by identifying the natural hazards that may affect the county, assessing the impacts of these hazards on community assets – those things that are important to the residents of the county – and developing mitigation actions to lessen or eliminate the impacts on community assets.

Having a current mitigation plan allows the county to apply for mitigation funding – as it may become available. It also provides a mitigation action list for other sources of funding. Further, it provides information that may be used in other planning efforts and future development.

Through a quantitative and qualitative process of analyzing hazards and impacts on our community, the Mitigation Planning Team identified 6 mitigation goals and developed 21 mitigation actions to achieve the goals. Of these actions, 18 actions were carried over from the previous plan, 2 actions were deleted, 19 actions were merged with those carried over, and 3 actions were added.

The following summarizes these efforts:

- Hazards Identified and Analyzed in Rank Order
  - Flooding
  - Severe Winter Storm
  - Severe Summer Storm
  - Infectious Disease
  - Tornado
  - Earthquake
  - Drought
  - Mud/Landslide
  - Dam/Levee Failure
  - Wildfire
  - Land Subsidence
- Goals Identified and Mitigation Actions Developed, Analyzed and Prioritized
  - Reduce or eliminate impact of hazards on public safety, lives, property and infrastructure Evaluate and repair levees and their flood control systems.
    - Identify and advise responsible parties of required maintenance of trees in utility right-of-way areas.
    - Identify areas where additional utility cutoffs are needed to isolate utility systems.
    - Identify areas where fire break lines are needed and create them.
    - Design back-flow prevention in areas of combined storm/sanitary sewers.
    - Inspect, repair and upgrade stormwater systems.
    - Rehabilitate and maintain High Hazard Potential Dams.
  - Provide timely warning
    - Design and implement a comprehensive public emergency notification system.
  - Enhance emergency response capability
    - Develop back-up plans in case of public safety communication failure.
    - Develop inventory assets available for responding to and recovering from major hazard occurrences.
  - Create self sufficiency
    - Identify emergency shelters.

    - Construct Safe Rooms – Community and Residential
- Plan for Safe Development
    - Mitigate structures at risk.
    - Develop and adopt anchoring criteria for objects that can become hazardous during natural hazard events and assist residents with anchoring these items.
    - Update dam Emergency Action Plans, update inundation data for dams without EAPs or no current inundation data.
    - Develop building codes in jurisdictions without building codes.
    - Require new/improved critical facilities to be elevated/flood protected to the 500-year flood level.
    - Develop improved logging practices.
    - Identify and map areas and sites vulnerable to specific natural hazards.
- Increase public awareness
    - Develop an All-Hazards public education program.
    - Educate the public on regulated Fire Burning Seasons and drought conditions as well as fire hazards created by disposal of debris.

This plan will be reviewed and updated annually and undergo a complete review and rewrite within five years of adoption. Please address any questions, comments, mitigation action status or additional mitigation actions to the Lawrence County Emergency Management Agency.

Section I – Introduction

A. Background & Purpose

There are two basic truths about hazards and community assets:

- Hazards will occur – there is little, if anything, we can do to prevent natural hazards from occurring.
- Community assets will be impacted by the occurrence of hazards to the extent of the assets' vulnerabilities to the hazards' effects.

Mitigation seeks to lessen or eliminate:

- The impact of hazards
- The vulnerability of assets to hazard impacts

As there are many impacts on community assets, impacts are ranked and mitigation actions cost-estimated using a quantitative analysis approach. Mitigation Actions may then be implemented in a cost-effective manner that resolves the greatest impact.

The purpose of this plan is to document the mitigation planning process conducted in Lawrence County, Ohio, and provide that road map to a safer community.

B. Scope

This plan covers Lawrence County, Ohio, and all its political subdivisions and municipalities.

C. Project Management

The Lawrence County EMA is the lead agency for this plan.

D. Relationship to the 2015 Mitigation Plan

As this is an updated plan, the previously approved plan was the point of departure. All information in it was reviewed and updated as needed.

E. The Mitigation Planning Process

The Lawrence County Mitigation Planning Team worked together to update the 2015 Plan. The team used the Federal Emergency Management Agency's (FEMA) *Local Mitigation Planning Handbook – March 2013*, as a guide.

Mitigation planning starts with profiling the community and identifying its assets – those things that are important to it. Next, hazards that potentially may affect these community assets are profiled and ranked – past and projected future occurrences and impacts. Then, mitigation actions are reviewed and updated and new ones developed that can either lessen or eliminate the impact of a hazard or the vulnerability of a community asset to the impact of a hazard are developed. These mitigation actions form the basis for making the community a safer place to live, work and recreate.

Throughout the process, those who have a stake – elected and appointed government officials, agencies providing services to people, the public – as well as those with pertinent information are advised, consulted and their input incorporated into the plan. *Section II – The Planning Process* describes and summarizes the results of this process.

F. Integration of Results into Other Mechanisms

The county's process to integrate the data, information, and hazard mitigation goals and actions in other planning mechanisms is accomplished through specifically including select positions in the planning process and are members of the Mitigation Planning Team. These include, but are not limited to:

- Lawrence County Commissioners – consider incorporating mitigation actions when approving and funding county development projects.
- Lawrence County Floodplain Administrator – use the results of flooding hazard analysis and vulnerability assessments in refining floodplain regulations.
- Lawrence County Planning Commission – use hazard analysis in approving land use proposals.
- Lawrence County Emergency Management Agency – use hazard analysis in focusing preparedness, response and recovery efforts on areas of higher risk.
- Lawrence County Sheriff's Office – use hazard analysis targeting response efforts in areas of higher risk for impending or ongoing incidents.
- Lawrence County Engineer's Office – use mitigation actions in performing maintenance or making repairs to lessen or eliminate damages caused by future hazard occurrences.
- Municipal Mayors and Councils; Township Trustees – consider incorporating mitigation actions when approving and funding development and maintenance projects.

These individuals take information to their respective organizations that are charged with the development, maintenance, and on occasion, enforcement of rules, regulations, codes, ordinances, policies, plans, procedures and other administrative instruments. Information from the mitigation planning effort is presented to the leadership of these organizations, who then authorize the information to be added, to revise or update current administrative instruments. This allows for oversight, commitment of time, energy, and resources to change actions into projects.

Although the jurisdictions do not have as many representatives to serve on the Planning Team, their representatives follow the same processes as those at County level.

G. Other Uses for This Plan

While this plan focuses on mitigation actions, the results of the information gathered and analysis performed can be used for other purposes including:

- Already-identified mitigation actions for funding through other sources
- Assessing risk for other purposes

H. Sources Consulted

Many sources were consulted in the planning process. The major sources are shown in the following table.

Source	Used to Provide Information on
Federal Emergency Management Agency (FEMA)	National Flood Insurance Program Previous Disasters
National Oceanic and Atmospheric Administration (NOAA)	Hazards U.S. Multi-Hazard Climate, Weather & Drought History and Trends

Source	Used to Provide Information on
Ohio Department of Natural Resources (ODNR)	Dams, Waterways & Drought History and Conditions Landslide Characteristics
United States Geological Survey (USGS) & Lawrence County Soil & Water Conservation District	Slopes & Soils Affecting Public Safety and County Assets
Ohio Emergency Management Agency (Ohio EMA)	Mitigation Plan State-Wide Hazards History and Trends
Lawrence County Emergency Management Agency (EMA)	Emergency Operations Plan Previous Disasters, Emergencies & Other Incidents
Lawrence County Engineer's Office	Impacted Roadways and Cost Estimates
Lawrence County Sheriff's Office	Public Safety Impacts: Location, Severity, Frequency
Lawrence County Planning Commission	Planning Regulations and Development Trends

I. Mitigation Action Changes as a Result of This Update

The following table indicates those actions that changed and what was changed. Note that the prioritization methodology in the 2015 plan is not directly relatable to methodology in this plan so changes in priorities could not be presented.

Mitigation Action	Priority	Status
Mitigate structures at risk.	1	Unchanged
Require new/improved critical facilities to be elevated/flood protected to the 500-year flood level.	2	Unchanged
Develop an All-Hazards public education program.	3	Unchanged
Develop back-up plans in case of public safety communication failure.	4	Unchanged
Design and implement a comprehensive public emergency notification system.	5	Unchanged
Develop inventory assets available for responding to and recovering from major hazard occurrences.	6	Unchanged
Identify emergency shelters.	7	Unchanged
Inspect, repair and upgrade stormwater systems.	8	New
Evaluate and repair levees and their flood control systems.	9	Unchanged
Update dam Emergency Action Plans, update inundation data for dams without EAPs or no current inundation data.	10	Unchanged
Design back-flow prevention in areas of combined storm/sanitary sewers.	11	Unchanged
Identify and map areas and sites vulnerable to specific natural hazards.	12	Unchanged
Identify and advise responsible parties of required maintenance of trees in utility right-of-way areas.	13	Unchanged
Educate the public on regulated Fire Burning Seasons and drought conditions as well as fire hazards created by disposal of debris.	14	Unchanged
Identify areas where additional utility cutoffs are needed to isolate utility systems.	15	Unchanged
Develop and adopt anchoring criteria for objects that can become hazardous during natural hazard events and assist residents with	16	Unchanged

anchoring these items.		
Develop improved logging practices.	17	Unchanged
Identify areas where fire break lines are needed and create them.	18	Unchanged
Develop building codes in jurisdictions without building codes.	19	Unchanged
Rehabilitate and maintain High Hazard Potential Dams.	20	New
Construct Safe Rooms – Community and Residential.	21	New

J. Progress Made

As this plan is an update to the 2015 plan, progress can be measured. While none of the existing actions have been completed, tangible progress has been made to decrease hazard impacts. As for the bulk of the costly mitigation actions, lack of funding has resulted in little progress.

K. Plan Organization

This plan is organized into the following sections:

Section I – Introduction.

Section II – Planning Process. This section details the planning process; it provides the summary information and conclusions as a result of hazard analysis and details mitigation goals developed.

Section III – Community Profile and Assets. This section provides detailed information about Lawrence County and its Assets.

Section IV – Hazard Identification and Analysis. This section lists the hazards likely to affect Lawrence County and details the analysis conducted on each. It also summarizes the rankings of hazards and impacts.

Section V – Hazard Profiles, Analyses and Vulnerable Assets. This section documents profiles and analyses conducted. It then details the impacts to vulnerable community assets.

Section VI – Mitigation Goals and Actions. This section lists and details the mitigation goals and actions updated or developed.

Section VII – Mitigation Action Analysis. This section details each action and its analysis.

Section VIII – Supplemental Information. This section includes information meaningful to the overall plan development but not included in the preceding sections.

Section II – The Planning Process

This section describes and summarizes the steps and actions taken to update the 2015 Lawrence County Mitigation Plan. The ongoing COVID-19 pandemic placed many restrictions on public gatherings to where meeting face-to-face was all but prohibited. Video conferencing was not a viable option as Internet service is sketchy in most of Lawrence County. Additionally, several key participants were personally affected by the pandemic, limiting their participation. Therefore, all communication was conducted using email, phone calls, and several physically distanced mask-to-mask limited attendance meetings.

Note that the documentation for mentioned events/actions are included in *Section VIII – Supplemental Information*.

A. Inform and Involve Chief Elected Officials, Stakeholders and the Public

The Lawrence County EMA Director met with the Board of County Commissioners on June 4, 2019, advising them of the mitigation plan update project and received their full support. The commissioners executed the Designation of Applicant's Agent Resolution.

On September 21, 2021, the Lawrence County EMA issued a press release, sent to the Ironton Tribune, informing the public of the mitigation plan update effort and soliciting their participation and input to the planning process. This plan was made available at the Briggs Lawrence County Public Library, the Lawrence County EMA office, and the Lawrence County Soil & Water Conservation District Office and web site. However, there was no participation by, nor comments received from the public.

Throughout the plan development phase, stakeholders – businesses, industry, commercial ventures, private organizations – were invited to attend and participate in the Planning Team activities via email.

Additionally, adjacent counties were advised of the project and invited to participate.

B. Form the Planning Team

The Lawrence County EMA Director invited those individuals that were on the Planning Team to reconvene the team from the previous planning process along with additional individuals or organizations. This list included representatives from agencies involved in hazard mitigation activities, agencies with the authority to regulate development, and offices responsible for enforcing local ordinances were important members of the Planning Team. The table below indicates those currently on the Planning Team.

C. Identify Participating Agencies

The following agencies and individuals who were invited to participate in the development of this plan. Numerous emails and personal contacts were made to maximize participation. In the last three columns, "Sent" indicates at least one email was sent and "Resp" indicates a response was received.

Community	Agency/Position	Name	Plan Team	Kick Off	Hazards	Actions
County	EMA Director	Michael Boster	X	Resp	Resp	Resp
County	911 Director	Lonnie Best		Resp	Sent	Resp

Community	Agency/Position	Name	Plan Team	Kick Off	Hazards	Actions
County	Auditor Chief Deputy Auditor	Chris Kline		Sent	Resp	Sent
County	Commissioners Assistant Administrator	Katrina Keith		Resp	Sent	Sent
County	Commissioners Commissioner	Colton Copley		Sent	Sent	
County	Commissioners Commissioner	DeAnna Holliday		Sent	Sent	Sent
County	Commissioners Commissioner	Freddie Hayes Jr		Sent	Sent	
County	Engineer Engineer	Patrick Leighty		Sent	Sent	Sent
County	Engineer Deputy Engineer GIS Mapping	Paul Rubadue		Sent	Sent	Sent
County	Floodplain Mgt Floodplain Manager	Kim Carrico	X	Resp	Sent	Sent
County	LC EMS Exec Dir of Finance	Lori Morris		Resp	Resp	Sent
County	LC EMS Admin Assistant	Kathy Bamer		Resp	Resp	Resp
County	SWCD Program Manager	Peggy Reynolds		Sent	Sent	Sent
Municipality	Athalia Mayor	Willie Ward		Sent	Sent	Sent
Municipality	Chesapeake Mayor	Kim Oldaker		Sent	Sent	Sent
Municipality	Coal Grove Mayor	Gary Sherman		Sent	Sent	Resp
Municipality	Hanging Rock	Carol Goldcamp		Sent	Sent	Resp
Municipality	Hanging Rock Mayor	Chris Davidson		Sent	Sent	Resp
Municipality	Ironton Mayor	Samuel Cramblit		Sent	Sent	Resp
Municipality	Ironton Asst to Mayor	Terri Smith		Sent	Sent	Sent
Municipality	Ironton Fire Chief	Michael Mahlmeister		Sent	Sent	Resp
Municipality	Proctorville Clerk	Darrell L. Legg		Sent	Sent	Sent
Municipality	Proctorville Mayor	Rick Dunfee		Sent	Sent	Resp
Municipality	South Point Mayor	Jeff Gaskin		Sent	Sent	Resp
Municipality	South Point	Mark Davidson			Sent	Resp

Community	Agency/Position	Name	Plan Team	Kick Off	Hazards	Actions
Township	Decatur Twp Trustee	Ronnie Cox		Sent	Sent	Sent
Township	Elizabeth Twp Fiscal Officer	Kathy Bamer		Resp	Resp	Resp
Township	Elizabeth Twp Trustee	Rick Cox		Sent	Sent	Sent
Township	Fayette Twp Trustee	Mike Finley		Sent	Sent	Sent
Township	Hamilton Twp Trustee	Benny Kerns			Sent	Sent
Township	Lawrence Twp Trustee	Adam Gilmore		Sent	Sent	Sent
Township	Lawrence Twp Fiscal Officer	Lori Morris		Resp	Resp	Sent
Township	Mason Twp Trustee	Jeff Estep		Sent	Sent	
Township	Perry Twp Fiscal Officer	Jeff Joseph		Resp	Sent	Resp
Township	Perry Twp Trustee	Matt Malone		Sent	Sent	Sent
Township	Rome Twp Trustee	Bob Mayo		Sent	Sent	Sent
Township	Symmes Twp Trustee	Cecil Mays		Sent	Sent	Sent
Township	Union Twp Trustee	Cole Webb		Sent	Sent	Sent
Township	Upper Twp Trustee	Craig Thomas		Sent	Sent	Sent
Township	Washington Twp Trustee	Charles Michael Freeman		Sent	Sent	Sent
Township	Windsor Twp Trustee	Norrman Humphrey		Sent	Sent	Sent
Township	Trustee	Rodney Littlejohn		Sent	Sent	Sent
Federal	NOAA	Tony Edwards			Resp	Sent
Federal	US Army Corps Eng	Gaskin, Adam	X	Resp	Sent	Resp
Education	OUSC Director, Facilities Management	Adam J. Riehl, PE		Sent	Resp	Resp
NGO	Community Action Community Development Director	Cindy Anderson		Sent	Sent	Sent
NGO	Community Action	Ralph Kline			Sent	Sent
Contractor	RDI Solutions Consultant/Analyst	David Pollinger	X	Resp	Resp	Resp

D. Hold the Kick-Off Meeting

The Planning Team conducted their Kick-Off meeting via email. The contractor prepared a talking paper describing the Mitigation Planning Process. The EMA Director sent the email to participants and stakeholders.

E. Gather Information

The Planning Team invited each jurisdiction's governing body to submit information unique to each jurisdiction. The team also contacted agencies that have a mitigation-related role. This included the Lawrence County Health Department, Lawrence County Soil & Water Conservation District, Lawrence County Engineer's Office, Lawrence County Auditor's Office, Lawrence County Sheriff's Office and Lawrence County EMA.

The Planning Team reviewed existing plans and reports including Lawrence County's Emergency Operations Plan, Soil Report, plat maps, and Planning Commission regulations.

The Planning Team performed extensive research from online resources such as Federal Emergency Management Agency (FEMA), National Oceanic and Atmospheric Administration (NOAA), US and Ohio Departments of Transportation (USDOT/ODOT) and Ohio Department of Natural Resources (ODNR). The source is identified where this information is presented in this plan.

The contractor prepared instructions and worksheets to facilitate data collection and information exchange. The EMA Director sent emails to all participants as follows:

- Hazard Identification and Ranking
- Mitigation Actions Review
- Mitigation Actions Prioritization

The EMA Director sent out multiple emails and made personal contacts to ensure those who were required to participate as well as a broad spectrum of experience and responsibility gave their input.

F. Draft the Updated Plan

1. Update Community Profile and Assets

The Planning Team updated the community profile and its assets based on data collected and is presented in *Section III – Community Profile and Assets.*

2. Perform Hazard Analysis, Formulate Goals and Mitigation Actions

a. Hazard Identification

The Planning Team identified the following hazards, in rank order, considered to be credible threats to Lawrence County's community assets.

- Flooding
- Severe Winter Storm
- Severe Summer Storm
- Infectious Disease
- Tornado
- Earthquake
- Drought
- Mud/Landslide

- Dam/Levee Failure
- Wildfire
- Land Subsidence

Refer to *Section IV – Hazard Identification and Analysis* and for details.

b. Hazard Profile, Vulnerability Assessment & Impacts

The Planning Team collected and reviewed hazard information, assessed the impacts and the community's vulnerabilities. Refer to *Section V – Hazard Profiles, Analyses and Vulnerable Assets* for details.

c. Mitigation Goals

The Planning Team reviewed the vulnerabilities of impacted assets and decided on the following mitigation goals in priority order based on impact resolution.

The Planning Team selected the following goals:

- Reduce or eliminate impact of hazards on public safety, lives, property and infrastructure
- Provide timely warning
- Enhance emergency response capability
- Create self sufficiency
- Plan for Safe Development
- Increase public awareness

d. Mitigation Actions

The Planning Team first reviewed the 39 mitigation actions from the 2015 plan and found several issues that needed to be resolved as follows before continuing:

Issue	Count	Resolution
Not a mitigation action	2	Deleted
So close to another action as to be the same	19	Deleted
None (Restated as necessary)	18	Carried Forward

Refer to *Section VII – Supplemental Information* for a chart detailing these adjustments.

The Planning Team then reviewed current mitigation actions and added three new ones. Using Cost Benefit Review procedures, the planning team prioritized the actions. The following table depicts the mitigation actions developed and selected and the priority assigned. Note that priorities from the previous Plan were modified based on the results of this approach.

Priority	Action
1	Mitigate structures at risk.
2	Require new/improved critical facilities to be elevated/flood protected to the 500-year flood level.
3	Develop an All-Hazards public education program.
4	Develop back-up plans in case of public safety communication failure.

Priority	Action
5	Design and implement a comprehensive public emergency notification system.
6	Develop inventory assets available for responding to and recovering from major hazard occurrences.
7	Identify emergency shelters.
8	Inspect, repair and upgrade stormwater systems.
9	Evaluate and repair levees and their flood control systems.
10	Update dam Emergency Action Plans, update inundation data for dams without EAPs or no current inundation data.
11	Design back-flow prevention in areas of combined storm/sanitary sewers.
12	Identify and map areas and sites vulnerable to specific natural hazards.
13	Identify and advise responsible parties of required maintenance of trees in utility right-of-way areas.
14	Educate the public on regulated Fire Burning Seasons and drought conditions as well as fire hazards created by disposal of debris.
15	Identify areas where additional utility cutoffs are needed to isolate utility systems.
16	Develop and adopt anchoring criteria for objects that can become hazardous during natural hazard events and assist residents with anchoring these items.
17	Develop improved logging practices.
18	Identify areas where fire break lines are needed and create them.
19	Develop building codes in jurisdictions without building codes.
20	Rehabilitate and maintain High Hazard Potential Dams.
21	Construct Safe Rooms – Community and Residential.

Refer to *Section VI – Mitigation Goals and Actions* and *Section VII – Mitigation Action Analysis* for details.

e. Draft Plan

The draft plan was completed and reviewed for comments and changes.

G. Submit Plan to Ohio EMA and FEMA

The plan in its final form was submitted to Ohio EMA in October 2021.

On ***$$$ ##, 20##,*** FEMA determined this plan meets its requirements.

H. Adopt Plan

This plan was adopted by the Lawrence County jurisdictions:

Jurisdiction	Adoption Date
Lawrence County	
Village of Athalia	Non-Participating
Village of Chesapeake	Non-Participating
Village of Coal Grove	
Village of Hanging Rock	
City of Ironton	

Jurisdiction	Adoption Date
Village of Proctorville	
Village of South Point	

I. Receive Federal Approval

On ***$$$ ##, 20##,*** FEMA granted federal approval.

J. Present Plan to the Public

The plan was placed in the Ironton Public Library and on the Lawrence County EMA's website and a public notice was placed on the Lawrence County EMA web site as well as through a social media (Facebook) post inviting residents to review and comment on the plan.

Additionally, a copy of the updated plan was sent to the EMAs of adjacent counties.

K. Monitor Plan Implementation

The Lawrence County EMA Director monitors the implementation of this plan by periodic contact with lead agencies and presents status to the Planning Team and commissioners at each annual review.

The Lawrence County EMA Director also provides a copy of this plan to all stakeholders and agencies with authorities related to mitigation actions and coordinates with them to assist in integrating mitigation goals and actions into their plans and actions.

L. Keep Plan Up to Date

The Lawrence County EMA Director monitors the implementation of this plan by having lead agencies provide updates as the status of their mitigation actions change.

The Lawrence County EMA Director convenes the Planning Team annually to review the progress of this plan and propose any needed updates. This meeting is publicly announced and is open to the public; notices are posted on the Lawrence County EMA's web site and Facebook page as well as announced in the various newspapers serving Lawrence County. At this meeting, the team:

- Reviews the status of all mitigation actions.
- Assesses the progress toward achieving mitigation goals.
- Considers new related information as it becomes available. This includes recent hazard occurrences as well as changes in related planning documents. If this information would have an impact on goals or actions, the team proposes changes such as adding, changing or eliminating goals or mitigation actions.
- Presents proposed changes to the Board of County Commissioners and chief elected officials of affected jurisdictions for concurrence.
- Formally documents the proceedings, provides it to all stakeholders and makes it available with the current plan.

Once every five years, the Lawrence County EMA initiates a formal plan update based on then current FEMA requirements and FEMA and Ohio EMA guidance.

The Lawrence County EMA may process out-of-cycle updates by submitting changes to the Board of County Commissioners and the Ohio EMA.

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Section III – Community Profile and Assets

A. Location

Lawrence County is located at the southern tip of the State of Ohio. It covers approximately 457square miles. It is bounded by Scioto County to the west, Jackson County to the north, Gallia County to the northeast. Across the Ohio River to the south are Greenup and Boyd Counties, Kentucky and Wayne and Cabell Counties, West Virginia.

B. Waterways

Symmes Creek is the primary waterway in Lawrence County. It originates in Jackson County and flows through Gallia County into Lawrence County and into the Ohio River.

C. Land Use

1. Land Use/Land Cover

The following chart depicts Lawrence County's land use and cover[1]:

Land Use/Land Cover	Percentage
Developed, Lower Intensity	7.38%
Developed, Higher Intensity	1.36%

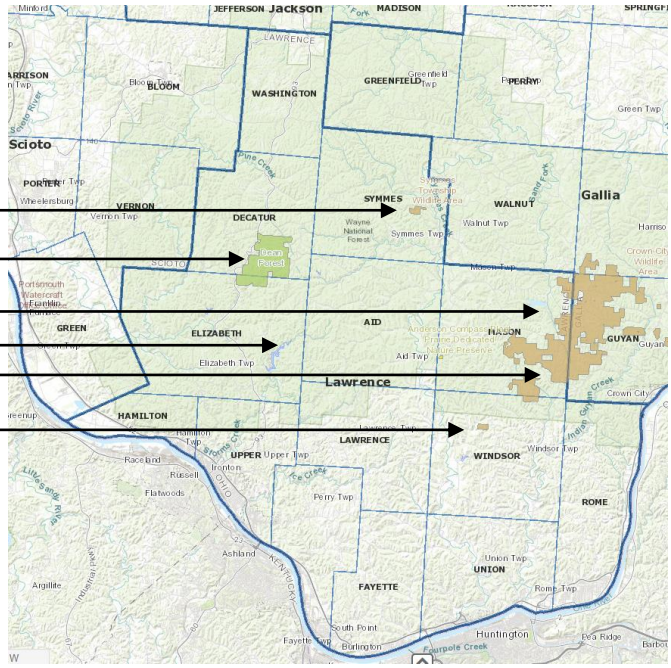
[1] https://www.development.ohio.gov/files/research/C1045.pdf

Land Use/Land Cover	Percentage
Barren (strip mines, gravel pits, etc.)	.08%
Forest	79.37%
Shrub/Scrub and Grasslands	1.28%
Pasture/Hay	9.12%
Cultivated Crops	.65%
Wetlands	.17%
Open Water	.59%

2. State Lands[2]

There are six state lands in Lawrence County. These are:

- *Timbre Ridge Lake Fishing Area*
- *Dean State Forest*
- *Crown City Wildlife Area*
- *Symmes Township Wildlife Area*
- *Anderson Compass Plant Prairie State Nature Preserve*



Source: Ohio Department of Natural Resources

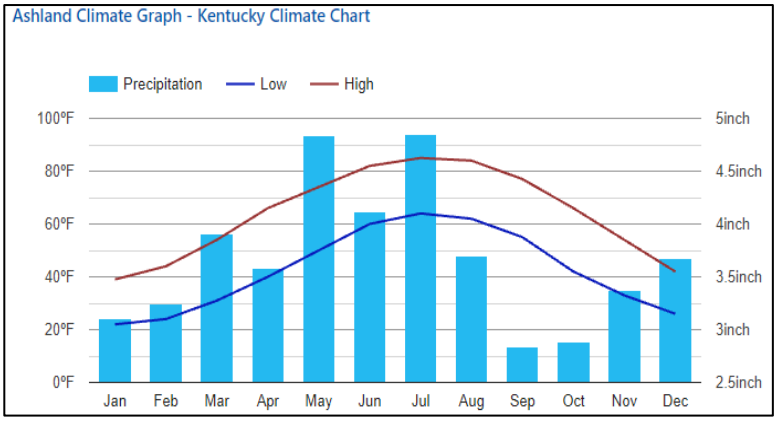
3. Federal Lands

Wayne National Forest[3] encompasses the northern half of Lawrence County. It includes *Lake Vesuvius Fishing Area*

[2] http://ohiodnr.gov/
[3] https://www.fs.usda.gov/wayne

D. Climate

The following chart depicts climate information for Lawrence County[4]. The average high temperature in Lawrence County is 64 degrees; the average low is 43 degrees. The county has temperature extremes from low 20s in the winter to the mid 80s in the summer. The average annual rainfall in Lawrence County is 44 inches.



E. Government

The government of Lawrence County[5] is organized as specified in Ohio Revised Code Title 3, Chapters 301, 303 and following. The City of Ironton is the county seat.

F. Jurisdictions and Populations

Lawrence County is subdivided into fourteen townships, one city and six villages. Populations are 2019 estimates calculated by the Ohio Development Services Agency[6]

Population by Municipality	2019	2018	2010	2010 to 2019 Delta
Athalia Village	354	356	371	-5%
Chesapeake Village	702	707	745	-6%
Coal Grove Village	2,074	2,084	2,165	-4%
Hanging Rock Village	209	210	219	-5%
Ironton City	10,532	10,598	11,120	-5%
Proctorville Village	542	545	574	-6%
South Point Village	3,839	3,854	3,958	-3%
Unincorporated	41,211	41,413	43,296	-5%
Lawrence County Total	59,463	59,767	62,448	-5%

Population by Township	2019	2018	2010	2010 to 2019 Delta
Aid Township	825	830	875	-6%
Decatur Township	699	700	726	-4%
Elizabeth Township	2,846	2,857	2,969	-4%
Fayette Township	8,802	8,843	9,194	-4%
South Point Village (part)	2,490	2,498	2,566	-3%
Unincorporated	6,312	6,345	6,628	-5%
Hamilton Township	1,695	1,703	1,772	-4%
Hanging Rock Village	209	210	219	-5%
Ironton City (part)	804	808	845	-5%
Unincorporated	682	685	708	-4%
Lawrence Township	2,473	2,483	2,579	-4%
Mason Township	1,066	1,070	1,116	-4%
Perry Township	6,640	6,675	6,973	-5%

[4] https://www.usclimatedata.com/climate/ashland/kentucky/united-states/usky0658
[5] https://lawrencecounty.org
[6] https://development.ohio.gov/files/research/P5027.pdf

Population by Township	2019	2018	2010	2010 to 2019 Delta
Coal Grove Village (part)	4	4	4	0%
South Point Village (part)	1,349	1,356	1,392	-3%
Unincorporated	5,287	5,315	5,577	-5%
Rome Township	8,435	8,482	8,889	-5%
Athalia Village	354	356	371	-5%
Unincorporated	8,081	8,126	8,518	-5%
Symmes Township	441	441	462	-5%
Union Township	8,641	8,686	9,086	-5%
Chesapeake Village	702	707	745	-6%
Proctorville Village	542	545	574	-6%
Unincorporated	7,397	7,434	7,767	-5%
Upper Township	14,628	14,714	15,418	-5%
Coal Grove Village (part)	2,070	2,080	2,161	-4%
Ironton City (part)	9,728	9,790	10,275	-5%
Unincorporated	2,830	2,844	2,982	-5%
Washington Township	228	229	239	-5%
Windsor Township	2,044	2,054	2,150	-5%
Lawrence County Total	59,463	59,767	62,448	-5%

The Ohio Development Services Agency also projects the following populations for Lawrence County[7]:

	2010	2015	2020	2025	2030	2035	2040
	62,450	60,400	59,100	57,820	57,070	56,770	57,050
Change from 2010	-	-3.28%	-5.36%	-7.41%	-8.61%	-9.10%	-8.65%

G. Demographics

The following information is a summary of information from the US Census Bureau[8]:

Population Trend. While the nation is growing at a 6.3% rate and Ohio at a 1.3% rate, Lawrence County is losing population at an estimated rate of 4.8 % per year.

Diversity. With the exception of ethnicity and primary language (Lawrence County is approximately 20% more European American, 11% less African American and 17% less Hispanic than Ohio overall), Lawrence County's diversity closely matches that of Ohio and the United States. This includes gender, age, and family size.

Home Ownership. Lawrence County's home ownership rate is about 8% higher than the national average.

Home Values. The average value of homes in Lawrence County is $106,500, 27% less than the state average and 51% less than the national average.

Education. Lawrence County students graduate high school at a rate slightly less than the state and national averages. The number of residents with post-high school degrees is about one half of the state and national averages.

[7] https://www.development.ohio.gov/files/research/P6045.pdf
[8] https://www.census.gov/quickfacts/fact/table/Lawrencecountyohio,oh,US/PST045219

Unemployment. As of August 2021, Lawrence County's unemployment rate is approximately 5.7%, similar to Ohio as a whole and the national average.

Income. The per capita income is $22,366, 29% lower than the state average and 34% lower than the national average. Nineteen percent of Lawrence County's population live below the poverty line, 46% higher than the state and 68% higher than national levels.

H. Major Employers

Major employers in Lawrence County[9] are:

- Ironton City Schools
- JennMar McSweeney Inc
- Jo-Lin Health Center
- Lawrence County Government
- Liebert Corp/Vertiv
- McGinnis Inc
- Ohio University
- Rock Hill Local Schools
- South Point Local Schools
- Wal-Mart Stores Inc

I. Major Transportation Routes

1. Highways

The major highways in Lawrence County are:

US 52 follows the Ohio River from Scioto County in the east through Hanging Rock, Ironton, Coal Grove to between South Point and Chesapeake where it crosses the Ohio River into West Virginia.

SR 7 continues to follow the Ohio River from where US 52 crosses the Ohio River through Chesapeake, Proctorville and Athalia and into Gallia County.

SR 93 enters Lawrence County at its northern tip from Jackson County and proceeds to Ironton.

2. Airways

Lawrence County is served by:

Huntington Tri-State Airport just across the Ohio River from South Point.

Lawrence County Airpark at the intersection of US 52 and SR 7.

Ashland (Kentucky) Regional Airport just across the Ohio River from Ironton.

3. Railways

Norfolk Southern operates a rail line that parallels US 52 and the Ohio River from the Scioto County line in the east to South Point where it crosses the river into West Virginia.

J. Utilities

1. Electric[10]

- Buckeye Rural Electric
- AEP Ohio

[9] https://development.ohio.gov/files/research/C1045.pdf

[10] https://puco.ohio.gov/wps/portal/gov/puco/utilities/electricity/service-area-map/electric-certified-territories-web-mapping-application

2. Natural Gas[11]

- Columbia Gas of Ohio

3. Bottled Gas

- Arrick's Propane
- AmeriGas Propane Exchange

4. Potable Water

- City of Ironton
- Village of Coal Grove
- Village of South Point
- Village of Proctorville
- Aqua Ohio – Lawrence County
- HECLA Water Association
- Private Wells - 4% of population/homes

5. Wastewater

The following operate wastewater treatment plants:

- Ironton
- Union-Rome
- South Point
- Coal Grove
- Farmview Wastewater

All other wastewater is treated with private septic systems.

K. Structure Types and Values

The following structure and related information are used in the plan:

Structure Type	Inventory	Average Value	Total Value
Residential	25701	$167,000	$4,292,067,000
Nonresidential	1642	$670,000	$1,100,140,000
Critical	51	$670,000	$34,170,000
Total	27,394		$5,426,377,000

Refer to *Section IV – Hazard Identification and Analysis* for details on the source.

L. Public Warning and Notifications Systems

1. NOAA Weather Radio All Hazards[12]

All county government facilities, local schools, and nursing homes have weather/all hazard alert radios.

2. Emergency Alert System[13]

The Emergency Alert System (EAS) is a national public warning system that requires radio and TV broadcasters, cable TV, wireless cable systems, satellite and wireline

[11] https://puco.ohio.gov/wps/wcm/connect/gov/0bd5594e-d98d-43dd-bdfc-4dccc1a88178/Natural_Gas_Distribution_Companies.pdf?MOD=AJPERES&CONVERT_TO=url&CACHEID=ROOTWORKSPACE.Z18_M1HGGIK0N0JO00QO9DDDDM3000-0bd5594e-d98d-43dd-bdfc-4dccc1a88178-naVi3mK

[12] http://www.nws.noaa.gov/nwr/

[13] https://www.fema.gov/emergency-managers/practitioners/integrated-public-alert-warning-system/public/emergency-alert-system

operators to provide the President with capability to address the American people within 10 minutes during a national emergency.

Broadcast, cable, and satellite operators are the stewards of this important public service in close partnership with state, local, tribal, and territorial authorities.

3. Integrated Public Alert and Warning System[14]

The Integrated Public Alert & Warning System (IPAWS) is FEMA's national system for local alerting that provides authenticated emergency and life-saving information to the public through mobile phones using Wireless Emergency Alerts, to radio and television via the Emergency Alert System, and on the National Oceanic and Atmospheric Administration's Weather Radio.

M. Major Community Events

Community events draw a number of people into a small area. These events also cause congestion on highways and roads in the county. The most attended ones are:

- Lawrence County Fair, Rome Township, 2nd week of July
- Memorial Day Parade, Memorial Day, Ironton

N. Development Trends

1. Land Usage

Land usage hasn't changed significantly in recent years.

2. Economic Conditions

Lawrence County is enjoying a steady decrease in unemployment – 20.1% in 2010 to currently 8.4%. There was a spike in unemployment between March and August 2020 – the highest of 17.5% in April – attributed to the ongoing COVID-19 pandemic.

O. Authorities Affecting Mitigation Activities

1. Zoning and Building Regulations

Lawrence County has a Planning Commission and countywide Comprehensive Plan which is and includes all townships and jurisdictions. Lawrence County (covering unincorporated areas) as well as all villages have floodplain regulations formally adopted by resolution or ordinance. All entities in Ohio now follow Ohio's State Building Code. All health and safety regulations follow State of Ohio laws. Below is a summary of their capabilities:

[14] https://www.fema.gov/emergency-managers/practitioners/integrated-public-alert-warning-system#:~:text=The%20Integrated%20Public%20Alert%20%26%20Warning%20System%20%28IPAWS%29,the%20National%20Oceanic%20and%20Atmospheric%20Administration%27s%20Weather%20Radio.

Jurisdiction	Planning Commission	Comprehensive Plans	Floodplain Regulations	Building Codes	Zoning Ordinances	Capital Budget for Mitigation	Public Works Budget for Mitigation
Lawrence County (Covers Unincorporated Areas)	Yes	No	Yes	Ohio Building Codes	No	Yes	Operating Funds In-Kind Wages
Ironton	Yes	Yes	Yes		Yes	Yes	
Athalia	No	No	No		Yes	No	
Chesapeake	No	No	Yes		Yes	No	
Coal Grove	Yes	No	Yes		Yes	Yes	
Hanging Rock	Yes	No	Yes		Yes	Yes	
Proctorville	Yes	No	Yes		Yes	No	
South Point	Yes	No	No		Yes	No	

2. Floodplain Management

Lawrence County floodplain regulations are maintained by the county commissioners and mayors of those villages with such regulations. These regulations are the Special Purpose Flood Damage Reduction Regulations. Section 3.1 designates the position of Floodplain Administrator. Section 3.2 outlines the duties and responsibilities of this position. Duties include, but are not limited to enforcement of the regulations, routine monitoring of the flood zones and providing community assistance such as encouragement of owners to maintain flood insurance.

3. National Flood Insurance Program (NFIP)

The following table reflects participation and compliance with the NFIP[15].

CID	Jurisdiction	Initial FHBM Identified	Initial FIRM Identified	Current Effective Map Date	Reg-Emer Date	Sanction Date
390325	Lawrence County	2/14/1975	9/29/1989	4/2/2015	9/29/1989	
390327	Ironton	2/15/1974	7/5/1983	4/2/2015	7/5/1983	
390698	Athalia	8/1/1975	9/1/1983	3/16/2006	9/1/1983	
390608	Chesapeake	1/10/1975	10/18/1983	4/2/2015	10/18/1983	
390326	Coal Grove	6/14/1974	7/5/1983	4/2/2015	7/5/1983	
390699	Hanging Rock	3/28/1975	9/1/1983	4/2/2015	9/1/1983	
390700	Proctorville	4/18/1975	8/1/1984	4/2/2015	8/1/1984	
390630	South Point	1/3/1975	5/2/1983	4/2/2015	5/2/1983	

4. Lawrence County Health Department

The Health Department monitors and enforces regulations for septic systems and potable wells as well as deals with public health issues.

[15] https://www.fema.gov/cis/OH.html

P. Mitigation Funding Sources

1. Operating Budgets

Funding for routine maintenance and improvements come from normal operating budgets. Mitigation Actions are considered when performing routine maintenance and improvements. Property values (and therefore taxes collected) suffer due to the lack of industry and commercial businesses and sales tax collected per capita is about one-fourth of the state average – both factors limiting what would be considered to be normal revenues. In-kind labor is generally the only resources that can be committed to mitigation activities.

2. Grants

a. Community Development Block Grant Program[16]

The US Department of Housing and Urban Development's (HUD) Community Development Block Grant (CDBG) program is a flexible program that provides communities with resources to address a wide range of unique community development needs.

b. Appalachian Regional Commission[17]

As an Appalachian county, Lawrence County is eligible for grants and contracts from funds appropriated to the Appalachian Regional Commission annually by Congress.

c. Hazard Mitigation Grant Program

The Hazard Mitigation Grant Program (HMGP) is authorized by Section 404 of the Robert T. Stafford Disaster Relief and Emergency Act, as amended. The key purpose of HMGP is to ensure that the opportunity to take critical mitigation measures to reduce the risk of loss of life and property from future disasters is not lost during the reconstruction process following a disaster. HMGP is available, when authorized under the Presidential major disaster declaration, in areas of the State requested by the Governor.

d. Pre-Disaster Mitigation Program

The Pre-Disaster Mitigation (PDM) program is authorized by Section 203 of the Stafford Act, 42 USC 5133. The PDM program is designed to assist States and local communities to implement a sustained pre-disaster natural hazard mitigation program to reduce overall risk to the population and structures from future hazard events, while also reducing reliance on Federal funding from future major disaster declarations.

e. Flood Mitigation Assistance Program

The Flood Mitigation Assistance (FMA) program is authorized by Section 1366 of the National Flood Insurance Act (NFIA) of 1968, as amended with the goal of reducing or eliminating claims under the National Flood Insurance Program (NFIP).

f. Other Mitigation Grants

Information on other grant programs is available on the Ohio EMA's Mitigation Information Portal (MIP)[18].

[16] http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs
[17] http://www.arc.gov/
[18] https://www.ema.ohio.gov/mip/grants.aspx

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Section IV – Hazard Identification and Analysis

A. Overview

The Lawrence County Mitigation Planning Team identified hazards of credible threat and analyzed their impact using qualitative and quantitative methods. The team used the *FEMA Local Mitigation Planning Handbook, March 2013,* as a guide for conducting analysis.

B. Hazard Identification

The Planning Team chose the natural hazards the Ohio EMA identified as those likely to impact the state of Ohio (as documented in the *2019 State of Ohio Hazard Mitigation Plan (SOHMP)*[19]*,* page 2-3) as the starting point for hazard identification. It then, based on a review of the community profile and historical records of hazards affecting south central Ohio, selected the natural hazards it considered to be credible threats to Lawrence County's assets. Eight of these hazards were identified for Hazard and Vulnerability Analysis.

Hazard from SOHMP	Significant Impact on Assets
Flooding	Yes
Winter Storms	Yes
Severe Summer Storms	Yes
Tornado	Yes
Drought	Yes
Earthquake	Yes
Dam/Levee Failure	Yes
Invasive Species	No – Day-to-day operations deal with these
Landslide	Yes
Land subsidence	Yes
Wildfire	Yes
Coastal Erosion	No – No coastline

The Planning Team identified the following additional hazards that have had or would have significant impact on Lawrence County:

- *Infectious Disease*. The biological hazard would potentially have immeasurable impact. Illness and even deaths would cause a ripple effect all aspects of personal lives – physical, social, economic – as well as the community as a whole – medical assets, economic, policies and procedures, security to name a few. This hazard was included in the ranking of hazards as well as in hazard analysis, hazard profile and action development.

C. Hazard and Vulnerability Analysis Methodology

The Planning Team profiled each of the eleven hazards identified. It collected and reviewed hazard information, assessed the impacts and the vulnerabilities of the community's assets.

The Planning Team chose a 30-year lookback period for occurrences as this this period provided the most consistent records for most hazards. Events recorded in National

[19] https://www.ema.ohio.gov/mip/planning_sohmp.aspx

Centers for Environmental Information (NCEI)[20] data base as well as locally added events were considered occurrences. Criteria for NCEI event inclusion and categorization are contained in the *National Weather Service Instruction 10-1605*[21]

The team assigned risk factor values based on the following criteria and adjusting factors established by the Ohio EMA.

Risk Factor	Criteria	Adjusting Factor
Frequency	If a hazard/event does not apply it is given a value of NA. If a hazard/event resulted in no local disaster declarations, it scored a one. If the hazard/event resulted in one – two local disaster declarations, it has a Low Probability of occurrence and scored a two. If it resulted in three – five declarations, it has a Medium Probability and numerical score of three. If the hazard/event resulted in six – eight local disaster declarations, it has a High Probability and scored a four. If the hazard/event resulted in nine or more declarations, it should receive an Excessive Probability rating and a score of five. It is important to note that frequency was considered a key factor in determining the hazard profile. To that end, an Adjusted Frequency score was added for this factor and multiplied by 1.5 to weight the score more importantly than other factors.	1.5
Response	Average Response Duration may be defined as "time on the ground" or the time-period of response to a hazard, or event. Transportation accidents may last a few hours whereas a tire fire may last a week or a flood several weeks. Duration, therefore, may not always be indicative of the degree of damage but it remains an important planning factor.	1
Onset	Average Speed of Onset may affect all other factors due to lack of warning or time to prepare for impact. The lead-time required protecting lives and property varies greatly with each event. For instance, a winter storm may develop so slowly that there is time to alert crews and emplace plows, but flash floods can occur with no warning.	1
Magnitude	Average Magnitude is the geographic dispersion of the hazard. For instance, how much of your community would be impacted by a flood or hazardous material incident? Similar to the Frequency, this factor is deemed more important and therefore received a weighted value of 1.25 above the raw score. The score is based on the percent of land area impacted by an event.	1.25
Business	The Impact on Business refers to enduring economic impact of the hazard on the community by an event. A score of one compares to a shutdown of critical facilities for less than 24 hours. Two equals a complete shutdown of critical facilities for one week. A score of three means a complete shutdown of critical facilities for at least two weeks. A score of four equals a	1

[20] http://www.NCEI.noaa.gov/stormevents/
[21] https://www.ncdc.noaa.gov/stormevents/pd01016005curr.pdf

Risk Factor	Criteria	Adjusting Factor
	complete shutdown of critical facilities for 30 days or more. This factor was developed and in keeping with the hazard analysis in the Ohio Standard Mitigation Plan developed by the Ohio EMA Mitigation Branch.	
Human	This factor relates to the number of lives potentially lost to a particular hazard agent. This factor can vary between jurisdictions based on economic, geographic, and demographics of the particular populations. Therefore, some generalization need be inflected on this factor. This factor was developed and in keeping with the hazard analysis in the Ohio Standard Mitigation Plan developed by the Ohio EMA Mitigation Branch.	1
Property	This factor relates to the amount of property potentially lost to a particular hazard agent. This factor can vary between jurisdictions based on economics, geographic amount owned, and demographics of the particular populations. Therefore, some generalization need be inflected on this factor. This factor was developed and in keeping with the hazard analysis in the Ohio Standard Mitigation Plan developed by the Ohio EMA Mitigation Branch.	1

For consistency in analysis, the Planning Team used the property inventory and average values from the FEMA HAZUS-MH – Multi-hazard Risk Assessment Program for Analyzing Potential Losses simulations (addressed later in this plan) used in flooding and earthquake hazard analysis.

Structure Type	Inventory	Average Value
Residential	25701	$167,000
Nonresidential	1642	$670,000
Critical	51	$670,000
Total	**27394**	

To assist in estimating damage to structure in the absence of actual historical data, the team used the following formulas:

Number (of Structures) At Risk = Inventory x Percent At Risk

Number (of Structures) Damaged = Number At Risk x Percent Damaged

Total (Monetary) Damages = Number Damaged x Percent Damaged x Average Value

The team estimated the percent of total or actual numbers of structures at risk, the percent of these or actual number of damaged in a typical event and the percent of structure or actual structural damage. Knowing the inventory and average value, total damages incurred for a typical event were then calculated. Percentages were used when hard estimates were not available.

D. Hazard and Vulnerability Analysis Results

The following summarizes the analysis results. Details are contained in *Section V – Hazard Profiles, Analyses and Vulnerable Assets*.

1. Hazard Analysis

The following table consolidates and ranks the analysis of each hazard:

Hazard	Frequency	Response	Onset	Magnitude	Business Impact	Human Impact	Property Impact	Adjusted Total
Flooding	6	3	3	3.75	2	3	3	23.75
Severe Winter Storm	4.5	4	4	2.5	1	1	2	19
Severe Summer Storm	4.5	3	2	3.75	1	2	2	18.25
Infectious Disease	3	5	1	0	4	4	0	17
Tornado	3	3	4	2.5	1	2	1	16.5
Earthquake	1.5	4	2	3.75	1	1	2	15.25
Drought	3	5	1	5	1	0	0	15
Mud/Landslide	1.5	3	4	1.25	2	1	2	14.75
Dam/Levee Failure	1.5	3	1	1.25	2	1	2	11.75
Wildfire	1.5	1	4	1.25	0	0	1	8.75
Land Subsidence	1.5	2	1	1.25	1	0	1	7.75

2. Vulnerability Analysis

The following table consolidates the property impact analysis of each vulnerability:

	Structures at Risk				Structural Damage			
Hazard	Residential (Res)	Non-Res	Critical	Total	Res	Non-Res	Critical	Total
Flooding	25701	1642	51	27394	$150,640,000	$9,570,000	$19,150,000	$179,360,000
Severe Winter Storm	25701	1642	51	27394	$83,500	$134,000		$217,500
Severe Summer Storm	2570	164	5	2739	$83,500	$67,000		$150,500
Infectious Disease								
Tornado	12850	821	26	13697	$83,500	$67,000		$150,500
Earthquake	25701	1642	51	27394	$202,549,000	$138,324,000	$219,000	$341,092,000
Drought								
Mud/Landslide	3				$501,000			$501,000
Dam/Levee Failure	5055			5055	$8,441,850	$1,340,000		$9,781,850
Wildfire								
Land Subsidence								

Section V – Hazard Profiles, Analyses and Vulnerable Assets

A. Flooding

1. Description

Flooding is an overflowing of water onto land that is normally dry. Floods can happen during heavy rains, when snow melts too fast, or when dams or levees break. Flooding may happen with only a few inches of water, or it may cover a house to the rooftop. They can occur quickly or over a long period and may last days, weeks, or longer. Floods are the most common and widespread of all weather-related natural disasters.

Flash floods are the most dangerous kind of floods because they combine the destructive power of a flood with incredible speed and unpredictability. Flash floods occur when excessive water fills normally dry creeks or riverbeds along with currently flowing creeks and rivers, causing rapid rises of water in a short amount of time. They can happen with little or no warning.

Areas near rivers are at risk from flash floods. Embankments, known as levees, are often built along rivers and are used to prevent high water from flooding bordering land. In 1993, many levees failed along the Mississippi River, resulting in devastating flash floods. The city of New Orleans experienced massive devastating flooding days after Hurricane Katrina came onshore in 2005 due to the failure of levees designed to protect the city.

Mountains and steep hills produce rapid runoff, which causes streams to rise quickly. Rocks and clay soils do not allow much water to infiltrate the ground. Saturated soil also can lead rapidly to flash flooding. Vacationing or recreating along streams or rivers can be a risk if there are thunderstorms in the area. A creek only 6 inches deep in hilly areas can swell to a 10-foot-deep raging river in less than an hour if a thunderstorm lingers over an area for an extended period of time.

Additional high-risk locations include low water cross, recent burn [or logging] areas in mountains, and urban areas from pavement and roofs which concentrate rainfall runoff.

Ice jams and snowmelt can help cause flash floods. A deep snowpack increases runoff produced by melting snow. Heavy spring rains falling on melting snowpack can produce disastrous flash flooding. Melting snowpack may also contribute to flash floods produced by ice jams on creeks and rivers. Thick layers of ice often form on streams and rivers during the winter. Melting snow and/or warm rain running into the streams may lift and break this ice, allowing large chunks of ice to jam against bridges or other structures. This causes the water to rapidly rise behind the ice jam. If the water is suddenly released, serious flash flooding could occur downstream. Huge chunks of ice can be pushed onto the shore and through houses and buildings.

2. Extent of Hazard

The severity of flooding is measured in terms of inches of rain per hour, total inches per occurrence and the effect on community assets.

Significant events as recorded by NCEI and local sources are considered occurrences.

Major occurrences are those that caused injuries or deaths or total damage $5,000 or greater.

3. Historical Occurrence

The following major occurrences were recorded by the National Centers for Environmental Information (NCEI)[22] and local records.

Event	Date	Injured	Deaths	Property Damage	Crop Damage
Flood	1/20/1996	0	0	$250,000	$0
Flash Flood	4/1/1996	0	0	$10,000	$0
Flash Flood	5/15/1996	0	0	$10,000	$0
Flash Flood	5/24/1996	0	0	$10,000	$0
Flash Flood	6/8/1996	0	0	$10,000	$0
Flash Flood	6/23/1996	0	0	$400,000	$0
Flash Flood	7/31/1996	0	0	$400,000	$100,000
Flash Flood	3/1/1997	0	0	$2,000,000	$0
Flash Flood	3/2/1997	0	0	$1,000,000	$0
Flood	3/2/1997	0	0	$2,000,000	$0
Flash Flood	3/3/1997	0	0	$10,000	$0
Flash Flood	6/2/1997	0	0	$20,000	$0
Flash Flood	1/7/1998	0	0	$10,000	$0
Flash Flood	6/14/1998	0	0	$10,000	$0
Flash Flood	2/18/2000	0	0	$400,000	$0
Flood	7/11/2000	0	1	$0	$0
Flash Flood	5/17/2001	0	0	$250,000	$0
Flash Flood	5/17/2001	0	0	$25,000	$0
Flash Flood	5/18/2001	0	0	$400,000	$0
Flood	3/20/2002	0	0	$700,000	$0
Flood	4/21/2002	0	1	$10,000	$0
Flood	5/10/2003	0	0	$50,000	$0
Flash Flood	6/16/2003	0	0	$15,000	$0
Flash Flood	8/11/2003	0	0	$10,000	$0
Flash Flood	7/3/2004	0	0	$10,000	$0
Flood	9/8/2004	0	0	$10,000	$0
Flood	9/17/2004	0	0	$750,000	$0
Flood	11/4/2004	0	0	$400,000	$0
Flood	1/8/2005	0	0	$50,000	$0
Flood	6/4/2008	0	0	$750,000	$0
Flash Flood	6/17/2009	0	0	$250,000	$0
Flood	5/2/2010	0	0	$2,000,000	$0
Flash Flood	7/20/2010	0	0	$4,000,000	$0
Flood	3/11/2011	0	0	$50,000	$0
Flood	4/22/2011	0	0	$100,000	$0
Flash Flood	5/10/2011	0	0	$8,000,000	$0
Flood	11/22/2011	0	0	$10,000	$0
Flash Flood	4/29/2014	0	0	$25,000	$0
Flood	4/30/2014	0	0	$10,000	$0
Flash Flood	6/4/2014	0	0	$20,000	$0
Flood	3/4/2015	0	0	$150,000	$0
Flood	3/13/2015	0	0	$20,000	$0
Flash Flood	6/29/2015	0	0	$20,000	$0
Flash Flood	7/14/2015	0	0	$250,000	$0

[22] http://www.NCEI.noaa.gov/stormevents/

Event	Date	Injured	Deaths	Property Damage	Crop Damage
Flood	7/15/2015	0	0	$325,000	$200,000
Flood	2/21/2016	0	0	$75,000	$0
Flash Flood	6/23/2017	0	0	$10,000	$0
Flood	12/16/2019	0	0	$10,000	$0

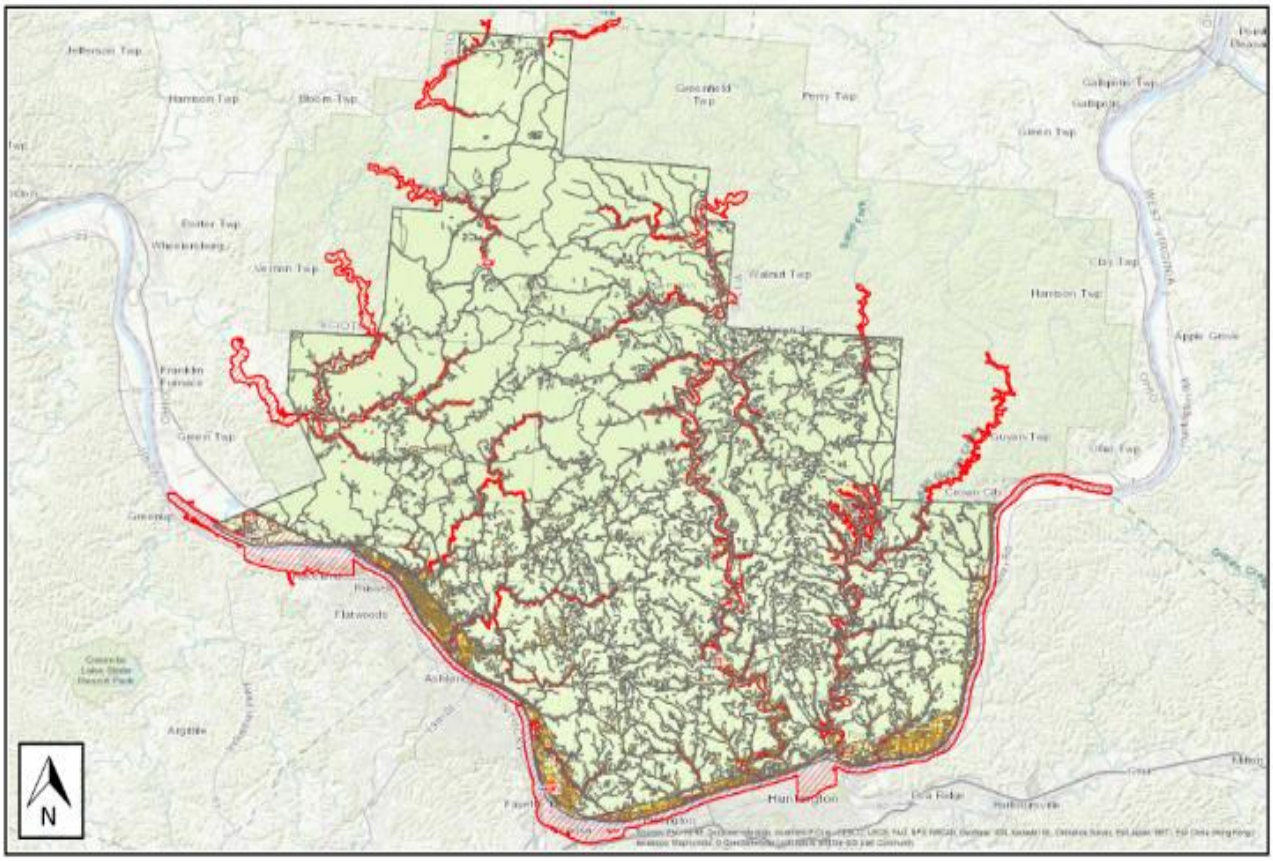
Available narratives of major events may be found in *Section VIII – Event Narratives*.

4. Probability of Future Occurrences

	Years	Events	Average Injuries	Average Deaths	Average Property Damage	Average Crop Damage	Annual Probability	Mean Time Between Occurrences (Months)
All Events	30	69	0	.03	$367,203	$4,348	230%	5
Major Events	30	48	0	.04	$526,979	$6,250	160%	8

5. Affected Locations

Expected Impacted Areas – 100 Year Flood



Source: HAZUS-MH Simulation

While flooding affects the entire county, those areas in identified floodplains are the most susceptible. However, areas not identified as being in a flood plain can experience flooding as well. The National Flood Insurance Administration estimates

that one-third of the claims that they receive are for structures located outside of a mapped flood plain.

The FEMA HAZUS-MH – Multi-hazard Risk Assessment Program for Analyzing Potential Losses simulation[23] results for a 100-year flood affecting Lawrence County was used to estimate damages and impact on community assets.

A ***Repetitive Loss Property*** is any insurable building for which two or more claims of more than $1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978. A repetitive loss property may or may not be currently insured by the NFIP.

A ***Severe Repetitive Loss (SRL) Property*** any NFIP-insured residential property that has met at least 1 of the following paid flood loss criteria since 1978, regardless of ownership:

- 4 or more separate claim payments of more than $5,000 each (including building and contents payments); or
- 2 or more separate claim payments (building payments only) where the total of the payments exceeds the current value of the property.[24]

Structures that flood frequently strain the National Flood Insurance Fund. In fact, the repetitive loss properties are the biggest draw on the Fund. Community leaders and residents are also concerned with the repetitive loss problem because residents' lives are disrupted and may be threatened by the continual flooding. The primary objective of the repetitive loss properties strategy is to eliminate or reduce the damage to property and the disruption to life caused by repeated flooding of the same properties.[25]

There are 50 repetitive loss structures, nine of which are classified as severe, in Lawrence County. Loss information through December 2020 is listed below:[26]

Community Name	Comm Nbr	Occu-pancy	Rated Flood Zone	Cumulative Building Payment	Cumulative Contents Payment	Total Losses	Total Paid	SRL Flag
Lawrence County	390325	Single Family	X	$31,033.18	$12,081.51	6	$43,114.69	Y
Lawrence County	390325	Single Family	AE	$30,267.59	$29,024.16	6	$59,291.75	Y
Lawrence County	390325	Single Family	A	$12,599.57	$0.00	2	$12,599.57	Y
Lawrence County	390325	Single Family	X	$69,575.23	$19,287.65	4	$88,862.88	Y
Lawrence County	390325	Single Family	A	$34,900.00	$19,276.25	2	$54,176.25	Y
Lawrence County	390325	Single Family	A	$54,669.59	$12,049.19	4	$66,718.78	Y
Lawrence County	390325	Single Family	A	$57,394.72	$1,588.54	5	$58,983.26	Y
Lawrence County	390325	Single Family	X	$27,426.35	$16,990.70	4	$44,417.05	Y

[23] Provided by Ohio EMA, available in Lawrence County EMA Office
[24] https://www.fema.gov/pdf/nfip/manual201205/content/20_srl.pdf
[25] https://www.fema.gov/txt/rebuild/repetitive_loss_faqs.txt
[26] Ohio EMA – 10/13/2021

Community Name	Comm Nbr	Occu-pancy	Rated Flood Zone	Cumulative Building Payment	Cumulative Contents Payment	Total Losses	Total Paid	SRL Flag
Lawrence County	390325	Single Family	A	$118,732.36	$3,961.76	5	$122,694.12	Y
Chesapeake	390608	Single Family	B	$8,194.20	$0.00	2	$8,194.20	N
Hanging Rock	390699	Single Family	AE	$28,569.89	$9,055.00	3	$37,624.89	N
Lawrence County	390325	Other-Nonres		$4,223.34	$0.00	2	$4,223.34	N
Lawrence County	390325	Single Family	AE	$9,541.65	$4,445.58	4	$13,987.23	N
Lawrence County	390325	Single Family		$5,196.54	$1,702.79	2	$6,899.33	N
Lawrence County	390325	Single Family		$631.00	$2,306.56	2	$2,937.56	N
Lawrence County	390325	Single Family	A	$24,047.55	$0.00	3	$24,047.55	N
Lawrence County	390325	Single Family	AE	$49,882.10	$0.00	3	$49,882.10	N
Lawrence County	390325	Single Family	AE	$30,988.73	$14,100.00	2	$45,088.73	N
Lawrence County	390325	Single Family	X	$18,887.94	$0.00	2	$18,887.94	N
Lawrence County	390325	Single Family	A	$87,505.72	$0.00	3	$87,505.72	N
Lawrence County	390325	Single Family	A	$4,127.49	$0.00	2	$4,127.49	N
Lawrence County	390325	Single Family	AE	$6,367.96	$1,972.48	2	$8,340.44	N
Lawrence County	390325	Othr-Nonres	A	$20,239.36	$0.00	3	$20,239.36	N
Lawrence County	390325	Single Family	X	$14,937.42	$25,776.57	3	$40,713.99	N
Lawrence County	390325	Single Family	AE	$19,592.63	$0.00	4	$19,592.63	N
Lawrence County	390325	Single Family	AE	$12,512.73	$0.00	2	$12,512.73	N
Lawrence County	390325	Single Family	X	$38,918.42	$5,655.64	2	$44,574.06	N
Lawrence County	390325	Single Family	A	$31,015.04	$0.00	2	$31,015.04	N
Lawrence County	390325	Single Family	AE	$42,394.41	$3,505.45	5	$45,899.86	N
Lawrence County	390325	Single Family	AE	$40,743.69	$16,586.62	3	$57,330.31	N
Lawrence County	390325	Single Family	X	$21,945.03	$0.00	6	$21,945.03	N
Lawrence County	390325	Single Family	X	$16,684.76	$5,190.89	4	$21,875.65	N
Lawrence County	390325	Single Family	X	$26,844.74	$15,475.79	3	$42,320.53	N

Community Name	Comm Nbr	Occu-pancy	Rated Flood Zone	Cumulative Building Payment	Cumulative Contents Payment	Total Losses	Total Paid	SRL Flag
Lawrence County	390325	Single Family	X	$21,653.08	$0.00	3	$21,653.08	N
Lawrence County	390325	Single Family	AE	$9,255.22	$0.00	2	$9,255.22	N
Lawrence County	390325	Single Family	X	$8,865.90	$9,717.39	2	$18,583.29	N
Lawrence County	390325	Single Family	AE	$20,653.76	$0.00	3	$20,653.76	N
Lawrence County	390325	Single Family	X	$14,919.78	$0.00	2	$14,919.78	N
Lawrence County	390325	Single Family	X	$6,733.30	$5,398.91	2	$12,132.21	N
Lawrence County	390325	Single Family	A	$129,946.06	$0.00	2	$129,946.06	N
Lawrence County	390325	Single Family	X	$69,112.89	$15,802.12	2	$84,915.01	N
Lawrence County	390325	Single Family	A	$34,615.99	$3,200.00	2	$37,815.99	N
Lawrence County	390325	Single Family	X	$7,365.21	$0.00	2	$7,365.21	N
Lawrence County	390325	Single Family	X	$63,290.69	$471.95	2	$63,762.64	N
South Point	390630	Single Family	C	$67,610.43	$18,447.14	2	$86,057.57	N
South Point	390630	Single Family	C	$67,070.86	$19,340.00	4	$86,410.86	N
South Point	390630	Single Family	X	$65,140.24	$29,291.18	4	$94,431.42	N
South Point	390630	Single Family	B	$9,345.87	$0.00	2	$9,345.87	N
South Point	390630	Single Family	X	$80,853.45	$3,361.81	3	$84,215.26	N
South Point	390630	Single Family	X	$7,332.33	$70.84	2	$7,403.17	N

6. Analysis

Factor	Ranking
Frequency	High: 6-8 Declarations
Response	< 1 Week
Onset	6-12 Hours
Magnitude	25-50% Land Area
Business	1 Week
Human	Multiple Severe Injuries
Property	25-50% Damaged

7. Vulnerable Community Assets

Asset	Impact
People	Major flooding potentially affects a large portion of the population, either directly or indirectly. This includes structural damages, isolation from essential services, need for relocation or sheltering, injuries and possibly death. Casualties. HAZUS-MH estimates no casualties. Displaced and Sheltered. HAZUS-HM estimates 4,846 people would be displaced and 163 of the these would seek shelter in public shelters.
Economy	Flooded businesses would be out of business until clean up and repairs are completed and damaged inventory replaced. HAZUS-MH estimates $435.95 million in economic losses.
Infrastructure	The primary vulnerable infrastructure assets are roads, culverts and bridges, damaged by erosion. HAZUS-MH doesn't simulate these damages. There is potential for contaminating water supplies and inundating wastewater treatment facilities.
Structures	The Planning Team used the results of FEMA's HAZUS-MH simulation of a 100-year flood. HAZUS-MH estimates the following structural damages.

8. Estimated Structural Damages

Structure	Inven-	Average	At Risk		Damaged			Damages
Type	tory	Value	%	Number	%	Number	%	Total
Residential	25,701	$167,000	100	25,701		491		$150,640,000
Nonresidential	1,642	$670,000	100	1,642		1		$9,570,000
Critical	51	$670,000	100	51		2		$19,150,000
Totals	**27,394**					**494**		**$179,360,000**

The following tables from the HAZUS-MH simulation report were used in making the above estimates:

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	0	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	1	33	2	67
Religion	0	0	0	0	0	0	0	0	0	0	0	0
Residential	3	1	68	14	62	13	42	9	31	6	285	58
Total	**3**		**68**		**62**		**42**		**32**		**287**	

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	1	0	0	0
Fire Stations	17	2	0	2
Hospitals	0	0	0	0
Police Stations	4	0	1	1
Schools	29	2	0	2

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	150.64	13.70	7.44	7.58	179.36
	Content	68.97	25.03	13.75	19.02	126.76
	Inventory	0.00	0.61	1.63	0.20	2.44
	Subtotal	**219.60**	**39.34**	**22.82**	**26.80**	**308.56**
Business Interruption						
	Income	1.02	11.97	0.14	7.26	20.39
	Relocation	27.48	2.37	0.20	3.12	33.15
	Rental Income	10.45	1.60	0.03	0.24	12.32
	Wage	2.40	14.29	0.27	44.57	61.54
	Subtotal	**41.35**	**30.23**	**0.63**	**55.18**	**127.39**
ALL	**Total**	**260.95**	**69.57**	**23.46**	**81.98**	**435.95**

B. Severe Winter Storm

1. Description

A winter storm is an event in which the main types of precipitation are snow, sleet or freezing rain. Winter Storm hazards include wind chill, ice storms, heavy snow, and blizzard conditions.

Most deaths from winter storms are not directly related to the storm itself.

- People die in traffic accidents on icy roads.
- People die of heart attacks while shoveling snow.
- People die of hypothermia from prolonged exposure to cold.

Everyone is potentially at risk during winter storms. The actual threat to you depends on your specific situation. Recent observations show that:

Of injuries related to ice and snow:

- About 70% occur in automobiles.
- About 25% are people caught out in the storm.
- Majority are males over 40 years old.

Of injuries related to exposure to cold:

- 50% are people over 60 years old.
- Over 75% are males.
- About 20% occur in the home.

Three basic ingredients are necessary to make a winter storm:

- Cold air. Below freezing temperatures in the clouds and near the ground are necessary to make snow and/or ice.
- Lift. Something to raise the moist air to form the clouds and cause precipitation. An example of lift is warm air colliding with cold air and being forced to rise over the cold dome. The boundary between the warm and cold air masses is called a front. Another example of lift is air flowing up a mountainside.
- Moisture. To form clouds and precipitation. Air blowing across a body of water, such as a large lake or the ocean, is an excellent source of moisture.

The severity may be measured in inches of snow or ice, but it's more the combination of freezing precipitation with the ambient and precipitation conditions just before the storm as well as the duration of freezing temperatures with temperatures hovering around freezing being an enhancer to the severity.

Wet Snow and Freezing Rain can weigh down power lines, tree limbs and roofs of structures. Wet snow compacts and can be difficult to dispose of.

Ice results for rain freezing or snow compacting. In addition to the effects of wet snow and freezing rain, ice can build up over time. As the temperature drops, it becomes harder and difficult to remove with snowplows; heavy equipment is usually needed. As the temperature rises above freezing, ice left on gravel roads, as are most township roads, will melt and seep into the roadbed causing the "bottom to drop out."

Dry Snow is usually not a significant problem as it can be plowed away.

There may also be flooding if the snow/ice accumulation is significant and the temperatures warm quickly.

Severe winter storms are those winter storms that have a significant impact. Source: NOAA[27].

2. Extent of Hazard

The severity of winter storms is measured in terms of snowfall, wind and temperature. Generally, a severe winter storm adds at least 6 new inches of snow, has winds of 40 mph or greater, causes ice accumulation of ½ inch or more or has a wind chill factor or less than 0 degrees.

Any of these are considered occurrences.

Major occurrences are those that caused injuries, deaths or total damage $5,000 or greater.

3. Historical Occurrence

The following major occurrences were recorded by the National Centers for Environmental Information (NCEI)[28] and local records.

Event	Date	Injured	Deaths	Property Damage	Crop Damage
Cold/Wind Chill	2/4/1996	0	0	$15,000	$0
Winter Storm	2/3/1998	0	0	$200,000	$0
Ice Storm	2/16/2003	0	0	$1,000,000	$0
Winter Storm	1/27/2009	0	0	$25,000	$0
Extreme Cold/Wind Chill	1/6/2014	0	0	$100,000	$0
Extreme Cold/Wind Chill	1/27/2014	0	0	$50,000	$0
Extreme Cold/Wind Chill	2/18/2015	0	0	$100,000	$0

Available narratives of major events may be found in *Section VIII – Event Narratives*.

4. Probability of Future Occurrences

	Years	Events	Average Injuries	Average Deaths	Average Property Damage	Average Crop Damage	Annual Probability	Mean Time Between Occurrences (Months)
All Events	30	63	0	0	$23,683	$0	210%	6
Major Events	30	7	0	0	$212,857	$0	23%	51

5. Affected Locations

Severe winter storms affect the entire county.

6. Analysis

Factor	Ranking
Frequency	Medium: 3-5 Declarations
Response	< 1 Month
Onset	< 6 Hours
Magnitude	10-25% Land Area
Business	< 24 Hours
Human	Minor Injuries
Property	10-25% Damaged

[27] http://www.nssl.noaa.gov/education/svrwx101/winter/
[28] http://www.NCEI.noaa.gov/stormevents/

7. Vulnerable Community Assets

Asset	Impact
People	The primary impact on people would be isolation and not being able to travel at least on primary routes for about 12 hours after the storm subsided. Power outages would also be widespread.
Economy	Loss of power affect businesses both in loss of sales and refrigeration.
Infrastructure	Electricity is likely to be out for a period of time. As this time increases, other utilities dependent on power will also likely fail.
Structures	Older structures and those with flat roofs would be most at risk by the weight of snow and ice on their roofs. The NWS's estimate of $212,857 in damages per major event was used in this analysis.

8. Estimated Structural Damages

Structure	Inven-	Average	At Risk		Damaged		Damages	
Type	tory	Value	%	Number	%	Number	%	Total
Residential	25,701	$167,000	100	25,701		10	5	$83,500
Nonresidential	1,642	$670,000	100	1,642		4	5	$134,000
Critical	51	$670,000	100	51		0	0	$0
Totals	**27,394**					**14**		**$217,500**

C. Severe Summer Storm/Thunderstorm/Windstorm/Hail

1. Description

A thunderstorm is a rain shower during which you hear thunder. Since thunder comes from lightning, all thunderstorms have lightning. A thunderstorm is the result of convection. Usually created by surface heating, convection is upward atmospheric motion that transports whatever is in the air along with it—especially any moisture available.

Damaging winds are often called “straight-line” winds to differentiate the damage they cause from tornado damage. Strong thunderstorm winds can come from a number of different processes. Most thunderstorm winds that cause damage at the ground are a result of outflow generated by a thunderstorm downdraft. Damaging winds are classified as those exceeding 50-60 mph.

Damage from severe thunderstorm winds account for half of all severe reports in the lower 48 states and is more common than damage from tornadoes. Wind speeds can reach up to 100 mph and can produce a damage path extending for hundreds of miles.

Since most thunderstorms produce some straight-line winds as a result of outflow generated by the thunderstorm downdraft, anyone living in thunderstorm-prone areas of the world is at risk for experiencing this hazard. People living in mobile homes are especially at risk for injury and death. Even anchored mobile homes can be seriously damaged when winds gust over 80 mph.

Severe windstorms can have a devastating effect on a community. Winds can cause trees to fall and structures to fail. These can cascade into other impacts such as downed power lines, interrupting travel and power, and trees blocking roads and causing damage to close-by structures.

Hail is often produced by severe thunderstorms. Hail is a form of precipitation that occurs when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere where they freeze into balls of ice. Hail can damage aircraft, homes and cars, and can be deadly to livestock and people.

Hailstorms are a potentially damaging outgrowth of severe thunderstorms. Hailstorms frequently accompany thunderstorms, so their locations and spatial extents overlap. Hail can cause substantial damage to vehicles, roofs, landscaping, and other areas of the built environment. U.S. agriculture is typically the area most affected by hailstorms, which cause severe crop damage even during minor events.

Hail is usually pea-sized to marble-sized, but big thunderstorms can produce big hail.

2. Extent of Hazard

A thunderstorm is classified as “severe” when it contains one or more of the following: hail one inch or greater or winds gusting in excess of 50 knots (57.5 mph). Additionally, rainfall rates greater than 2 inches per hour or one that produces hail indicates a severe thunderstorm.

The severity of hailstorms is measured in hail size. Hail of .75-inch diameter is considered to be damaging.

Significant events as recorded by NCEI and local sources are considered occurrences.

Major occurrences are those that caused injuries, deaths or total damage $5,000 or greater.

3. Historical Occurrence

The following major occurrences were recorded by the National Centers for Environmental Information (NCEI)[29] and local records.

Event	Date	Injured	Deaths	Property Damage	Crop Damage
Thunderstorm Wind	2/21/1993	0	0	$50,000	$0
Thunderstorm Wind	8/24/1993	0	0	$50,000	$0
Thunderstorm Wind	4/15/1994	0	0	$50,000	$50,000
Thunderstorm Wind	5/10/1995	0	0	$10,000	$0
Thunderstorm Wind	6/8/1995	0	0	$20,000	$0
Thunderstorm Wind	6/10/1995	0	0	$45,000	$0
Thunderstorm Wind	6/6/1996	0	0	$200,000	$0
Lightning	8/16/1996	0	0	$10,000	$0
Thunderstorm Wind	8/17/1997	0	0	$20,000	$0
Hail	5/24/1998	0	0	$50,000	$0
Hail	5/24/1998	0	0	$40,000	$0
Hail	6/16/1998	0	0	$25,000	$0
Hail	6/16/1998	0	0	$250,000	$0
Hail	7/2/1998	0	0	$10,000	$0
Thunderstorm Wind	8/9/2000	0	0	$75,000	$0
Thunderstorm Wind	5/10/2003	0	0	$10,000	$0
Thunderstorm Wind	7/10/2003	0	0	$75,000	$0
Thunderstorm Wind	7/17/2007	0	0	$250,000	$0
Thunderstorm Wind	7/20/2008	1	0	$15,000	$0
Heavy Rain	7/11/2009	0	0	$10,000	$0
Lightning	7/11/2009	3	0	$0	$0
Heavy Rain	7/31/2009	0	0	$35,000	$0
Thunderstorm Wind	6/27/2010	0	0	$20,000	$0
Thunderstorm Wind	3/23/2011	0	0	$10,000	$0
Thunderstorm Wind	4/23/2011	0	0	$10,000	$0
Thunderstorm Wind	4/23/2011	0	0	$50,000	$0
Thunderstorm Wind	4/23/2011	0	0	$75,000	$0
Hail	5/10/2011	0	0	$10,000	$0
Hail	5/10/2011	0	0	$10,000	$0
Hail	5/10/2011	0	0	$10,000	$0
Lightning	6/21/2011	0	0	$25,000	$0
Thunderstorm Wind	6/21/2011	0	0	$7,000	$0
Thunderstorm Wind	6/29/2012	0	0	$1,500,000	$0
Thunderstorm Wind	6/29/2012	0	0	$40,000	$0
Thunderstorm Wind	6/29/2012	0	0	$20,000	$0
Thunderstorm Wind	6/29/2012	0	0	$75,000	$0
Thunderstorm Wind	6/29/2012	0	0	$100,000	$0
Thunderstorm Wind	6/29/2012	0	0	$100,000	$0
Thunderstorm Wind	8/28/2013	0	0	$25,000	$0
Thunderstorm Wind	11/1/2013	0	0	$10,000	$0
Thunderstorm Wind	12/22/2013	0	0	$10,000	$0
Thunderstorm Wind	6/10/2014	0	0	$40,000	$0
Thunderstorm Wind	10/7/2014	0	0	$6,000	$0
Strong Wind	11/24/2014	0	0	$10,000	$0

[29] http://www.NCEI.noaa.gov/stormevents/

Event	Date	Injured	Deaths	Property Damage	Crop Damage
Hail	6/26/2015	0	0	$10,000	$0
Hail	6/26/2015	0	0	$25,000	$0
Strong Wind	3/1/2016	0	0	$10,000	$0
Strong Wind	4/2/2016	0	0	$25,000	$0
Thunderstorm Wind	3/1/2017	0	0	$7,000	$0
Strong Wind	10/20/2018	0	0	$10,000	$0
Strong Wind	2/24/2019	0	0	$25,000	$0
Thunderstorm Wind	6/2/2019	0	0	$20,000	$0
Strong Wind	11/27/2019	0	0	$10,000	$0

Available narratives of major events may be found in *Section VIII – Event Narratives*.

4. Probability of Future Occurrences

	Years	Events	Average Injuries	Average Deaths	Average Property Damage	Average Crop Damage	Annual Probability	Mean Time Between Occurrences (Months)
All Events	30	234	.03	0	$16,491	$214	780%	2
Major Events	30	47	0.11	0.02	$131,170	$0	157%	8

5. Affected Locations

Severe summer storms affect the entire county.

6. Analysis

Factor	Ranking
Frequency	Medium: 3-5 Declarations
Response	< 1 Week
Onset	12-24 Hours
Magnitude	25-50% Land Area
Business	< 24 Hours
Human	Some Injuries
Property	10-25% Damaged

7. Vulnerable Community Assets

Asset	Impact
People	The primary impact on people would be isolation and not being able to travel at least on primary routes for several hours – perhaps more on township roads that may be washed out. In some cases county roads, state routes and US highways may also be rendered impassible due to erosion damage. Injuries are possible from hail and other falling objects.
Economy	Loss of power affect businesses both in loss of sales and refrigeration. Heavy rain and hail may adversely affect crops.
Infrastructure	The primary vulnerable infrastructure assets are roads, culverts and bridges, damaged by erosion. Lightning may adversely affect electrical and communications systems.
Structures	All structures are at risk for rain water and hail damage. The Planning Team used the NWS's estimate of $131,170 in damages per major event in this analysis.

8. Estimated Structural Damages

Structure Type	Inven-tory	Average Value	At Risk		Damaged		Damages
			%	Number	%	Number	%	Total
Residential	25,701	$167,000	10	2,570		10	5	$83,500
Nonresidential	1,642	$670,000	10	164		2	5	$67,000
Critical	51	$670,000	10	5		0		$0
Totals	**27,394**					**12**		**$150,500**

D. Infectious Disease

1. Description

Disease outbreaks are usually caused by an infection, transmitted through person-to-person contact, animal-to-person contact, or from the environment or other media. Occasionally the cause of an outbreak is unknown, even after thorough investigation.

A number of environmental factors influence the spread of communicable diseases that are prone to cause epidemics. The most important of these are:

- water supply
- sanitation facilities
- food
- climate

A lack of safe water, inadequate excreta disposal facilities, poor hygiene, poor living conditions and unsafe food can all cause diarrheal diseases. These diseases are a major cause of suffering and death in an emergency situation.

Climate can affect disease transmission in a variety of ways. The distribution and population size of disease vectors can be heavily affected by local climate. Flooding after heavy rains can result in sewage overflow and widespread water contamination. In addition, there is some evidence to suggest that pathogens can be spread from one region to another along air streams or by wind.

Occasionally, an outbreak is seen in a population for which the cause is unclear. Such an outbreak may be due to a new or modified pathogen, a natural toxin, or it may be due to an initially undetected release of a chemical agent or over-exposure to ionizing radiation.

Source: World Health Organization[30]

For transmission to occur, there must be a source (typically an infected person), susceptible person and a mode of transmission. Typical modes of transmission are:

- Contact moves germs by touching germs present on surfaces and then carry the germs on their hands and spread to a susceptible person when proper hand hygiene is not performed before touching the susceptible person.
- Sprays and splashes occur when an infected person coughs or sneezes, creating droplets which carry germs short distances (within approximately 6 feet). These germs can land on a susceptible person's eyes, nose, or mouth and can cause infection. Close range inhalation occurs when a droplet containing germs is small enough to breathe in but not durable over distance.
- Inhalation occurs when germs are aerosolized in tiny particles that survive on air currents over great distances and time and reach a susceptible person. Airborne transmission can occur when infected patients cough, talk, or sneeze germs into the air.
- Sharps injuries can lead to infections when bloodborne pathogens enter a person through a skin puncture by a used needle or sharp instrument.

Source: Centers for Disease Control and Prevention[31]

[30] https://www.who.int/environmental_health_emergencies/disease_outbreaks/communicable_diseases/en/

A pandemic is a disease outbreak that spreads across countries or continents. The most common and anticipated is an influenza pandemic. This is a global outbreak of a new influenza A virus that is very different from current and recently circulating human seasonal influenza A viruses. Influenza A viruses are constantly changing, making it possible on very rare occasions for non-human influenza viruses to change in such a way that they can infect people easily and spread efficiently from person to person.

2. Extent of Hazard

A major pandemic is measured by a count of occurrences that result in emergency or disaster declaration.

3. Historical Occurrences

1918-1920 – Spanish Flu. The 1918 Influenza (Spanish Flu) pandemic which lasted globally for two years. There are wildly conflicting estimates about how many people caught the flu and how many people died from it. The lack of records from the time (either due to wartime censorship or shortages) makes it hard to tell. The smallest estimate is that 17 million people died. The highest estimate is that 100 million people died, or 5% of the global population. The flu pandemic is believed to have infected 500 million people, or over a quarter of the world.

1949-1952 - Polio. Over 6,000 people die from polio in the United States, out of a reported 100,000 cases. This, followed by the development of the polio vaccine, prompts one of the first major drives to inoculate children in the U.S.

1957 – Asian Flu. The "Asian Flu," H2N2, comes to the united states from China. It originates from a mutant flu strain carried by ducks. It arrives in the U.S. in June. This influenza pandemic kills 116,000 people in the United States.

1968 – Hong Kong Flu. The "Hong Kong Flu" is the third of the three influenza pandemics of the 1900s. This flu had a much lower mortality rate than the other two, but still resulted in 33,000 deaths in the U.S.

1981-2007 – HIV/AIDS. Human immunodeficiency viruses (HIV) and the symptomatic Acquired Immunodeficiency Syndrome (AIDS) spreads across the country, especially infecting high rates of homosexual people, lower income people, and drug addicts. Treatment for the disease receives little funding and attention due to the groups it affects. The FDA approves new tests that can quickly detect HIV, and new treatments. In 2007, Timothy Ray Brown becomes the first man cured of HIV. By this time, at least 600,000 people have died of HIV/AIDS in the U.S. alone.

2009 – Swine Flu. In April, H1N1, also known as Swine Flu, broke out and quickly spread to more than 150 countries. The CDC reported that between April and October 22 million Americans had contracted the virus, 98,000 required hospitalization, and about 3,900 people died from H1N1-related causes. The WHO estimated that the final death toll worldwide ending up reaching nearly 300,000.

2020-Current – COVID-19. A new coronavirus, identified just as the novel coronavirus and then the 2019 Corona Virus Disease (COVID-19), claimed its first official victim in China. At least one American traveler returning from Wuhan contracted the disease

[31] https://www.cdc.gov/infectioncontrol/spread/index.html

before the city is isolated. The coronavirus outbreak reached the United States; the first U.S. victim died from the disease, prompting widespread panic. The coronavirus outbreak in the U.S. is officially declared a national emergency. The Director-General of the WHO declared the disease to have grown from epidemic proportions to a pandemic. At the urging of health officials, different states began enforcing restrictions on businesses and public gatherings to contain the disease. The economy came to a virtual standstill and unemployment soared. Local, regional, state and federal health systems and government agencies are being stressed with rapidly changing conditions particularly with the emergence of the Delta variant. The full effects and implications on how this virus will affect community assets will not be known for so time to come.

Of these occurrences, only the Spanish Flu and COVID-19 are considered major events.

4. Probability of Future Occurrences

The estimated risk of the future occurrence of a major infectious disease outbreak is once every 100 years or 1% in a given year.

5. Affected Locations

The entire county would be affected.

6. Analysis

Factor	Ranking
Frequency	Low: 1-2 Declarations
Response	> 1 Month
Onset	> 24 Hours
Magnitude	No Impact
Business	> 30 Days
Human	Multiple Deaths
Property	No Impact

7. Vulnerable Community Assets

Asset	Impact
People	Many people will develop life-threatening conditions; many will also die. Measures to contain the spread the disease may cause emotional hardships for many.
Economy	In a major pandemic, portions or even most all of the economy may be shutdown - even for a short period of time would cause ripple and long-term impacts.
Infrastructure	No direct impact.
Structures	No direct impact.

8. Estimated Structural Damages

Structure Type	Inven-tory	Average Value	At Risk		Damaged		Damages
			%	Number	%	Number	%	Total
Residential	25,701	$167,000		0		0		$0
Nonresidential	1,642	$670,000		0		0		$0
Critical	51	$670,000		0		0		$0
Totals	**27,394**					**0**		**$0**

E. Tornado

1. Description

A tornado is a narrow, violently rotating column of air that extends from the base of a thunderstorm to the ground. Because wind is invisible, it is hard to see a tornado unless it forms a condensation funnel made up of water droplets, dust and debris. Tornadoes are the most violent of all atmospheric storms.

Source: NOAA[32]

2. Extent of Hazard

The severity of winds storms is measured in wind speed. Severe windstorms are those whose sustained winds are at least 40 mph and gusts exceed 57 mph.

EF 0	65-85 mph
EF 1	86-110 mph
EF 2	111-135 mph
EF 3	136-165 mph
EF 4	166-200 mph
EF 5	Over 200 mph

The severity of tornadoes is measured by the damaged it caused and relates it back to estimated three-second wind speed. The Enhanced Fujita Scale is used to rate tornadoes.

Significant events as recorded by NCEI and local sources are considered occurrences.

Major occurrences are those that caused injuries, deaths or total damage $5,000 or greater.

3. Historical Occurrence

The following major occurrences were recorded by the National Centers for Environmental Information (NCEI)[33] and local records.

Event	Date	Injured	Deaths	Property Damage	Crop Damage
Tornado	8/9/2000	0	0	$200,000	$0
Tornado	5/24/2017	0	0	$100,000	$0

Available narratives of major events may be found in *Section VIII – Event Narratives*.

4. Probability of Future Occurrences

	Years	Events	Average Injuries	Average Deaths	Average Property Damage	Average Crop Damage	Annual Probability	Mean Time Between Occurrences (Months)
All Events	30	6	0	0	$50,000	$0	20%	60
Major Events	30	2	0	0	$150,000	$0	7%	180

5. Affected Locations

Tornadoes can affect the entire county, primarily the flat areas along the Ohio River.

[32] http://www.nssl.noaa.gov/education/svrwx101/wind/
[33] http://www.NCEI.noaa.gov/stormevents/

6. Analysis

Factor	Ranking
Frequency	Low: 1-2 Declarations
Response	< 1 Week
Onset	< 6 Hours
Magnitude	10-25% Land Area
Business	< 24 Hours
Human	Some Injuries
Property	< 10% Damaged

7. Vulnerable Community Assets

Asset	Impact
People	The primary impact on people would be isolation and not being able to travel at least on primary routes for about 12 hours after the storm subsided. Power outages would also be widespread.
Economy	Loss of power affect businesses both in loss of sales and refrigeration.
Infrastructure	Electricity is likely to be out for a period of time. As this time increases, other utilities dependent on power will also likely fail.
Structures	Buildings under construction and mobile homes are highly susceptible to high winds could be damaged or destroyed. Buildings adjacent to large trees may be damaged by falling trees. Roofs and siding could also be damaged. Much of insured damages are not reported. The Planning Team used the NWS's estimate of $150,000 in damages per major event in this analysis.

8. Estimated Structural Damages

Structure	Inven-	Average	At Risk		Damaged		Damages	
Type	tory	Value	%	Number	%	Number	%	Total
Residential	25,701	$167,000	50	12,851		5	10	$83,500
Nonresidential	1,642	$670,000	50	821		1	10	$67,000
Critical	51	$670,000	50	26		0	0	$0
Totals	**27,394**					**6**		**$150,500**

F. Earthquake

1. Description

An earthquake is caused by a sudden slip on a fault. The tectonic plates are always slowly moving, but they get stuck at their edges due to friction. When the stress on the edge overcomes the friction, there is an earthquake that releases energy in waves that travel through the earth's crust and cause the shaking that we feel. Source: USGS[34]

Ohio is located near the New Madrid fault. Lawrence County is in the part of Ohio that is designated with a Modified Mercalli Intensity (MMI) of VIII, which anticipates moderate damage. In spite of this, there has been little seismic activity near Lawrence County.

2. Extent of Hazard

Earthquakes are typically measured on the Richter scale. The analyzed profile is a magnitude 5.0 earthquake with the epicenter in the City of Lawrence scenario as modeled by the *Hazards U.S. Multi-Hazard* (HAZUS-MH) simulation preformed and provided by Ohio EMA. The HAZUS-MH report used in this analysis is available from the Lawrence County EMA.

The impact of earthquakes is measured on the Modified Mercalli Scale. The table at the right depicts the sale and its relationship to the Richter Scale.

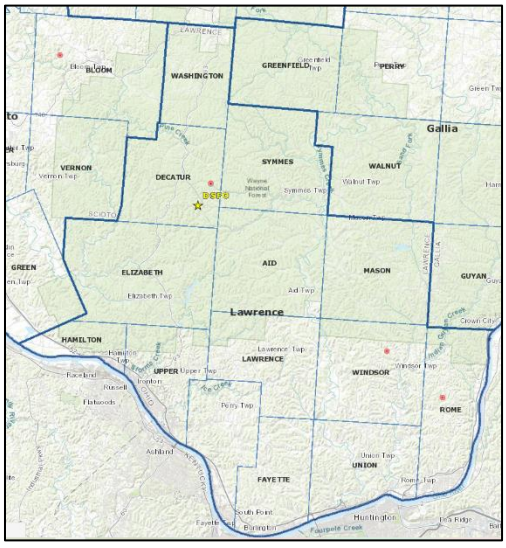
Any recorded earthquake of magnitude 3 or more is considered an occurrence.

Modified Mercalli Scale		Richter 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, vibration like passing truck	2.5
IV	Felt indoors by many, outdoors by few, at night some may awaken; dishes, windows, doors disturbed; 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; fall of walls, monuments, chimneys; 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 in air	7
		7.5
		8

3. Historical Occurrence

This map from the Ohio Department of Natural Resources[35] extends back into the 1800s, showing seismic activity in Lawrence County:

- 1995 – 2.5 – Decatur Twp
- 2017 – 2.2 – Rome Twp
- 2021 – 2.44 – Windsor Twp



[34] http://www.usgs.gov/faq/categories/9827/3343
[35] https://gis.ohiodnr.gov/MapViewer/?config=Earthquakes

4. Probability of Future Occurrences

The USGS reports a 2% probability that Lawrence County will be faced with a peak ground acceleration (PGA) of .06 within 50 years. While the USGS hasn't drawn a direct correlation between PGA and magnitude, the Laboratorio de Ingeniería Sísmica, Instituto de Investigaciones en Ingeniería, Universidad de Costa Rica[36], published research[37] estimating this relationship. A PGA of 2 to 3 relates to a Modified Mercalli Intensity of II and magnitude of 2, characterized as "Felt only by a few persons at rest, especially on upper floors of buildings." Source: USGS[38].

There is less than a 1% probability of a significant damaging occurrence in any given year.

5. Affected Locations

Earthquakes would affect the entire county.

6. Analysis

Factor	Ranking
Frequency	None: No Declarations
Response	< 1 Month
Onset	12-24 Hours
Magnitude	25-50% Land Area
Business	< 24 Hours
Human	Minor Injuries
Property	10-25% Damaged

7. Vulnerable Community Assets

Asset	Impact
People	Casualities. HAZUS-MH estimates that 129 people would receive minor injuries, 29 people would receive greater non-life-threatening injuries, 4 people would receive life-threating injuries and 7 people would die. Displaced and Sheltered. HAZUS-HM estimates 81 households would be displaced and 57 people seek shelter in public shelters. Electric Service. HAZUS-MH estimates that of 5,260 households, 4,069 would lose electricity at onset. After one week, 861 would still be without electricity. Less than 136 would still be without electricty after one month.
Economy	HAZUS-MH estimates a total economic loss of $530.17 million.
Infrastructure	HAZUS-HM estimates all infrastructure would unaffected or operational within one day. It also estimates that 5 wastewater treatment system would have moderate damage and be operations within 1 week.
Structures	HAZUS-MH estimates the following structural damages.

[36] http://www.lis.ucr.ac.cr/ index.php?id=Inicio

[37] https://www.researchgate.net/publication/228755080_Relationship_Between_Peak_Ground_Acceleration_and_Modified_Mercalli_Intensity_in_Costa_Rica#:~:text=The%20first%20relationship%20between%20Modified%20Mercalli%20Intensity%20%28MMI%29,%3C%207.7%29%20that%20occurred%20between%201983%20and%202004.

[38] http://earthquake.usgs.gov/learn/topics/mercalli.php

8. Estimated Structural Damages

Structure Type	Inven-tory	Average Value	At Risk		Damaged		Damages
			%	Number	%	Number	%	Total
Residential	25,701	$167,000	100	25,701		8,652		$202,549,000
Nonresidential	1,642	$670,000	100	1,642		9,455		$138,324,000
Critical	51	$670,000	100	51		15		$219,000

The following tables from the HAZUS-MH simulation report were used in making the above estimates:

Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	54.37	0.30	13.57	0.27	13.24	0.42	6.23	0.58	1.59	0.57
Commercial	525.01	2.93	190.71	3.81	206.44	6.61	100.90	9.47	30.94	11.01
Education	25.07	0.14	9.02	0.18	10.02	0.32	4.48	0.42	1.41	0.50
Government	26.32	0.15	9.44	0.19	11.01	0.35	4.71	0.44	1.52	0.54
Industrial	143.48	0.80	43.14	0.86	47.00	1.51	24.35	2.28	7.03	2.50
Other Residential	2698.26	15.05	982.87	19.65	1049.69	33.62	438.29	41.12	98.89	35.19
Religion	99.13	0.55	33.25	0.66	29.38	0.94	14.66	1.38	4.57	1.63
Single Family	14352.25	80.07	3719.22	74.37	1755.27	56.22	472.22	44.31	135.05	48.06
Total	**17,924**		**5,001**		**3,122**		**1,066**		**281**	

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	0	0	0	0
Schools	29	10	0	15
EOCs	1	0	0	1
PoliceStations	4	2	0	2
FireStations	17	3	0	8

Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	49	0	0	49	49
	Bridges	167	0	0	167	167
	Tunnels	0	0	0	0	0
Railways	Segments	51	0	0	51	51
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	17	7	0	17	17
Airport	Facilities	1	0	0	1	1
	Runways	1	0	0	1	1

Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	0.4657	13.1304	0.4653	1.3876	15.4490
	Capital-Related	0.0000	0.1985	10.6641	0.3102	0.3132	11.4860
	Rental	5.0125	2.3968	5.5588	0.2017	0.6468	13.8166
	Relocation	17.4639	4.3816	8.8254	1.0347	5.3401	37.0457
	Subtotal	**22.4764**	**7.4426**	**38.1787**	**2.0119**	**7.6877**	**77.7973**
Capital Stock Losses							
	Structural	24.6351	7.2518	15.3524	4.0730	5.2974	56.6097
	Non_Structural	95.0186	29.4131	40.3987	13.2288	16.1733	194.2325
	Content	38.2423	7.9880	22.5879	9.6613	9.3872	87.8667
	Inventory	0.0000	0.0000	0.7376	1.5933	0.0523	2.3832
	Subtotal	**157.8960**	**44.6529**	**79.0766**	**28.5564**	**30.9102**	**341.0921**
	Total	**180.37**	**52.10**	**117.26**	**30.57**	**38.60**	**418.89**

G. Drought

1. Description

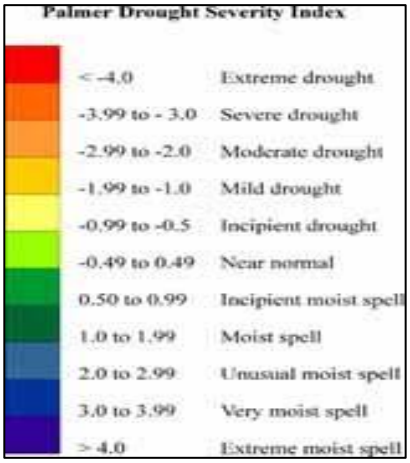
Drought is characterized by a period of extreme dry weather usually complicated by warm temperatures. It is a deficiency in precipitation over an extended period, usually a season or more, resulting in a water shortage causing adverse impacts on vegetation, animals, and/or people. It is a normal, recurrent feature of climate that occurs in virtually all climate zones, from very wet to very dry. Drought is a temporary aberration from normal climatic conditions, thus it can vary significantly from one region to another. Drought is different than aridity, which is a permanent feature of climate in regions where low precipitation is the norm, as in a desert. Human factors, such as water demand and water management, can exacerbate the impact that drought has on a region. Because of the interplay between a natural drought event and various human factors, drought means different things to different people. In practice, drought is defined in a number of ways that reflect various perspectives and interests. Below are three commonly used definitions:

Meteorological Drought is usually defined based on the degree of dryness (in comparison to some "normal" or average) and the duration of the dry period. Drought onset generally occurs with a meteorological drought.

Agricultural Drought links various characteristics of meteorological (or hydrological) drought to agricultural impacts, focusing on precipitation shortages, soil water deficits, reduced ground water or reservoir levels needed for irrigation, and so forth.

Hydrological Drought usually occurs following periods of extended precipitation shortfalls that impact water supply (i.e., streamflow, reservoir and lake levels, ground water), potentially resulting in significant societal impacts. Because regions are interconnected by hydrologic systems, the impact of meteorological drought may extend well beyond the borders of the precipitation-deficient area. Source: NOAA[39]

2. Extent of Hazard



Drought severity is measured using the Palmer Drought Severity Index (PDSI). The PDSI uses readily available temperature and precipitation data to estimate relative dryness. It is a standardized index that spans -10 (dry) to +10 (wet). It has been reasonably successful at quantifying long-term drought. This table translates PDSI indices to plain language.

Droughts declared by the federal or state officials are considered occurrences.

3. Historical Occurrence

The following occurrences within the past 30 years caused damage to community assets. Primary Source: National Centers for Environmental Information (NCEI)[40].

- **Summer 1999 Drought**
  Drought conditions existed in Lawrence County for a five-month period during the summer of 1999.

[39] http://www.nws.noaa.gov/os/brochures/climate/DroughtPublic2.pdf
[40] http://www.NCEI.noaa.gov/stormevents/

May 1999. After a dry April, drought conditions resurfaced again during May, after being alleviated during the winter months. Total rains during May were only 1.25 to 2.5 inches. The community of Lawrence had only 1.3 inches for the entire month, McArthur had 1.5 inches, while South Point measured 1.9 inches.

June 1999. The drought continued to spread and strengthen in southeast Ohio. A deterioration in stream flow and soil moisture was noted. Some showers at the end of the month temporarily helped the top soil and the crops. Only 1 to 2 inches of rain fell in most areas during the entire month of June. Nelsonville observed the minimum, with just a half inch of rain. Temperatures peaked in the mid and upper 90s during the second week of the month. Beverly registered 98 degrees, while South Point had 97 degrees on the 10th.

July 1999. The drought strengthened during the first half of the month, then eased slightly during the last 2 weeks. The worst drought conditions remained in Athens, Lawrence, Gallia, Meigs, and Lawrence Counties. In Lawrence County, an emergency drought declaration was issued. Delivery of water to residents with dry or contaminated wells continued in Lawrence County. The town of Rio Grande in Gallia County had to connect to another water system when their source was depleted. In Lawrence County, filling stations were set-up for families that had problems with their wells.

The extreme heat depleted much of the moisture from the scattered showers. Preliminary data indicated Beverly of Washington County and South Point of Lawrence County both reached 102 degrees on the 30th.

August 1999. The drought eased during the month of August across southeast Ohio. Monthly rains were 3 to 6 inches. Temperatures were not as hot, as those felt during July. However, the drought still lingered at month's end.

September 1999. Drought severity either increased or remain about constant during the month. The rainfall during September was mostly between 1 to 2 inches. Yet, South Point of Lawrence County had even less rain, with just three quarters of an inch.

October 1999. The drought severity eased as monthly rainfall was near normal. Amounts of 2.5 to 3.0 inches were common. Ground water shortages were still a concern at the end of the month.

- **Summer 2002 Drought**

  Two months moderate; two months severe. The emerging drought from August peaked during the first 2 weeks of September, as hot and dry conditions lingered. Rains of 1.5 to 2 inches, plus cooler temperatures, dampened the drought by the fourth week of the month.

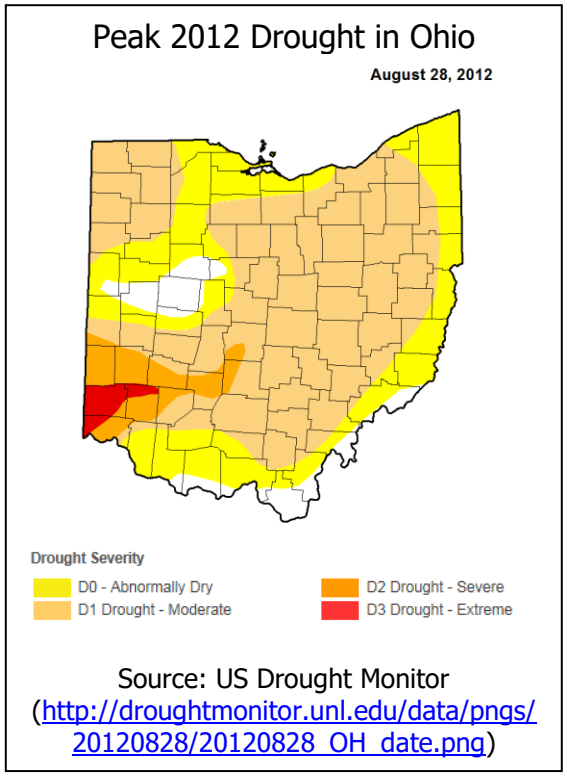
- **Fall 2007 Drought**

  Three months moderate; one month severe. In September, drought conditions crept north, as the month averaged warmer and drier than normal. The monthly rainfall was mostly between 1 and 2 inches.

  A rare October heat wave, during the 1st and 2nd weeks of the month, helped peak the severity of the drought. On the 11th, Gallia County declared an emergency due to a water shortage. With the lowering of the water table, wells were becoming less productive. Morgan County officials reported that their wildlife was being stressed from the lack of available water. Deer were dying from the effects of the drought and a dry weather disease.

Much needed and widespread rain finally arrived on the 23rd and the 24th. Rain amounts of 2 to 3 inches were common. As the growing season ended and the autumn foliage peaked, drought conditions began to abate or ease.

After peaking in early October, drought conditions continued to ease during the month of November. Monthly rainfall of 3 to 4 inches was common. By the end of November, the drought of 2007 was also coming to an end across southeast Ohio.



Source: US Drought Monitor (http://droughtmonitor.unl.edu/data/pngs/20120828/20120828_OH_date.png)

- **2012 North American Drought**

The 2012-2013 North American Drought was an expansion of the 2010-2012 United States drought which began in the spring of 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 United States and included Ohio. Among many counties, Lawrence County was designated with moderate drought conditions by mid-June. It has been equaled to similar effects as droughts in the 1930s and 1950s but it has not been in place as long. However, the drought has inflected, 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 United States Department of Agriculture's (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 and Loss Assessment Reports and determined that there were sufficient production losses in 85 counties to warrant a Secretarial disaster designation. On September 5, 2012, Lawrence County was one of those designated counties. Source: Ohio EMA.

The 2012 North American Drought is the largest drought since the 1950's as reported by NOAA's National Climatic Data Center National Drought Report of 15 August 2012[41]. At its peak in Ohio, Lawrence County experienced "Moderate Drought Severity" for four months. The University of Illinois at Urbana-Champaign reported a slightly elevated crop insurance loss ratio of 1.02 for 2012, indicating little insurance-reported crop loss during this period[42]. Lawrence County had no reported crop losses. Source: NCEI[43]

[41] http://www.NCEI.noaa.gov/sotc/drought/201207#det-reg
[42] http://farmdocdaily.illinois.edu/2013/03/drought-crop-insurance-loss-2012. html
[43] http://www.NCEI.noaa.gov/stormevents/

4. Probability of Future Occurrences

According to NOAA drought information, Lawrence County is in a low risk of drought area. With 4 events in 30 years, there is a 13% chance of an occurrence in any given year.

5. Affected Locations

Drought affects the entire county. The Lawrence County Health Department estimates that 4% of the county's population uses private wells and that the county can provide for the needs of this population during a drought. Public water supplies are generally considered to be adequate to withstand periods of drought. The greatest impact would be on water supplies for livestock and crops.

6. Analysis

Factor	Ranking
Frequency	Low: 1-2 Declarations
Response	> 1 Month
Onset	> 24 Hours
Magnitude	> 50% Land Area
Business	< 24 Hours
Human	No Impact
Property	No Impact

7. Vulnerable Community Assets

Asset	Impact
People	People relying on private wells may need to find alternate sources of potable water. NEED INFORMATION/DATA: Less than 5% are on private well water.
Economy	Agricultural impact - crops and livestock. Water-dependent businesses such as car washes.
Infrastructure	No impact.
Structures	No impact.

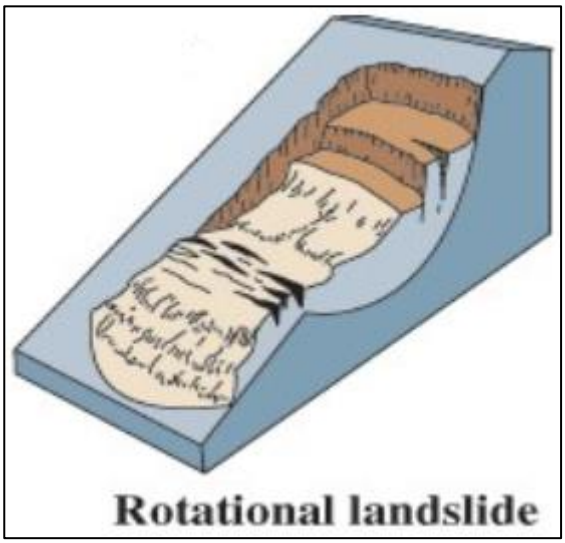
8. Estimated Structural Damages

Structure Type	Inventory	Average Value	At Risk		Damaged		Damages	
			%	Number	%	Number	%	Total
Residential	25,701	$167,000		0		0		$0
Nonresidential	1,642	$670,000		0		0		$0
Critical	51	$670,000		0		0		$0
Totals	**27,394**					**0**		**$0**

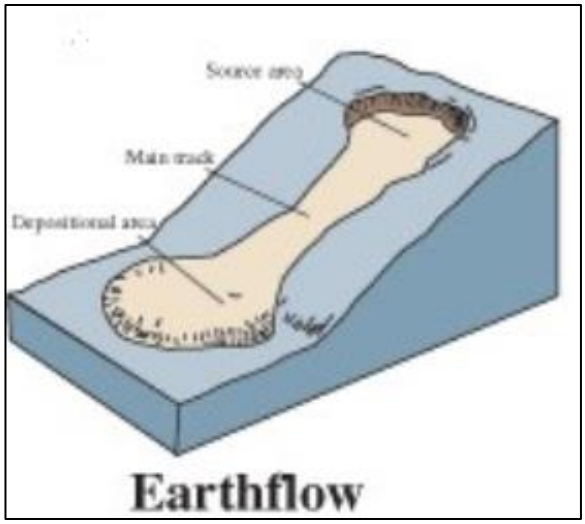
H. Mud/Landslides

1. Description

Per the Ohio Department of Natural Resources – Division of Geological Survey GeoFacts publication, a landslide is the downward and outward movement of soil and rock material on slopes. There are three main types of landslides that occur in Ohio[44]:



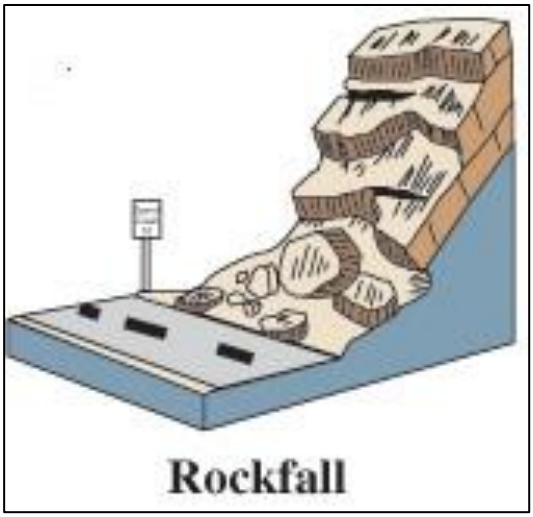
Rotational Slump: the movement of a mass of weak rock or sediment as a block unit along a curved slip plane. In Ohio, these types of slides commonly involve hundreds of thousands of cubic yards of material and extend for hundreds of feet. The crown or head, located in the upper section of the ground surface, consists of one or more rupture zones (scarps) that form a stair-step pattern of displaced blocks. The surfaces of these blocks are commonly rotated backward (reverse slope) and form depressions where water may accumulate, creating small ponds or swampy areas. Trees on these blocks may be inclined upslope, toward the top of the hill. The lower, downslope end (toe) of a rotational slump is a fan shaped, bulging mass of material characterized by radial ridges and cracks. Trees on this portion of the landslide may be inclined at strange angles, giving rise to the descriptive terms "drunken" or "staggering" forest. Rotational slumps may develop comparatively slowly and commonly require several months or even years to reach stability; however, on occasion, they may move rapidly, achieving stability in only a few hours.



Earthflow: involves rock, sediment, or weathered surface materials moving downslope in a mass. The most common form of earth movement in Ohio, earthflow involves a smaller area than a rotational slump and forms a hummocky topography of ridges and swales. Trees may be inclined at odd angles throughout the length of an earthflow. Earthflows are most common in weathered surface materials, do not necessarily indicate weak rock, and are also common in unconsolidated glacial sediments. The rate of movement of an earthflow is generally quite slow.

[44] http://geosurvey.ohiodnr.gov/portals/geosurvey/PDFs/GeoFacts/geof08.pdf

Rockfall: an extremely rapid, potentially dangerous downslope movement of earth materials. Large blocks of massive bedrock suddenly become detached from a cliff or steep hillside and free fall in a rolling, bounding, or sliding manner downslope. Most rockfalls in Ohio involve massive beds of sandstone or limestone. Surface water seeps into joints or cracks in the rock, increasing its weight and causing expansion of joints in freezing temperatures, thus prying blocks of rock away from the main cliff. Weak and easily eroded clay or shale beneath the massive bed is an important contributing factor to rockfall. All illustrations were provided by the USGS.



One or more of the following conditions contribute to the occurrence of landslide events:

- Steep slope: All landslides move downslope under the influence of gravity. Therefore, steep slopes, cliffs, or bluffs are a required element leading to a landslide, especially in conjunction with one or more of the conditions listed below.
- Jointed rocks: Fractures in rocks allow surface moisture to penetrate and weaken it. When the moisture freezes, it pries the rock masses apart at the joint.
- Fine-grained, permeable rock or sediment: Fine rock particles are particularly conducive to landslide development because large amounts of moisture can enter them easily, increasing the material's weight, reducing the bonding strength of individual grains, and dissolving grain cementing materials.
- Clay or shale units subject to lubrication: Groundwater penetration of clay or shale can lead to a loss of binding strength between individual mineral grains and subsequent failure.
- Large amounts of water: Periods of heavy rainfall, excess snowmelt, or other events where water is accumulated saturate the zone above the normal water table and cause a landslide.

In addition to the conditions noted above, a landslide requires a triggering mechanism to initiate downslope movement. Several events or circumstances, many of them human-caused, can trigger landslides, including:

- Vibrations such as those from human-causes like blasting, the passing of a heavy truck, or from natural events like earthquakes, although no such occurrence has been documented in Ohio.
- Over steepened slopes caused by undercutting by stream or wave erosion, by human construction activities, or by the addition of fill material to the upper portion of a slope, disturb the equilibrium of a stable slope and cause the angle of stability to be exceeded.
- Increased weight on a slope caused by the addition of large amounts of fill, the construction of a building or other structure, or an unusual increase in precipitation, either from heavy rains or from artificial alteration of drainage patterns.

- Removal of vegetation and trees because of the loss of roots, which tend to hold the rock or sediment in place and soak up excess moisture.

According to the Ohio Department of Natural Resources[45], the causes of landslides are steep slopes; jointed rocks; fine-grained, permeable rock or sediment; and clay or shale units subject to lubrication (ground water).

2. Extent of Hazard

Landslides are measured by a count of occurrences that cause damage to structures or infrastructure or restrict travel. Any landslide that impacts people, structures or infrastructure (such as roads) is considered an occurrence.

3. Historical Occurrence

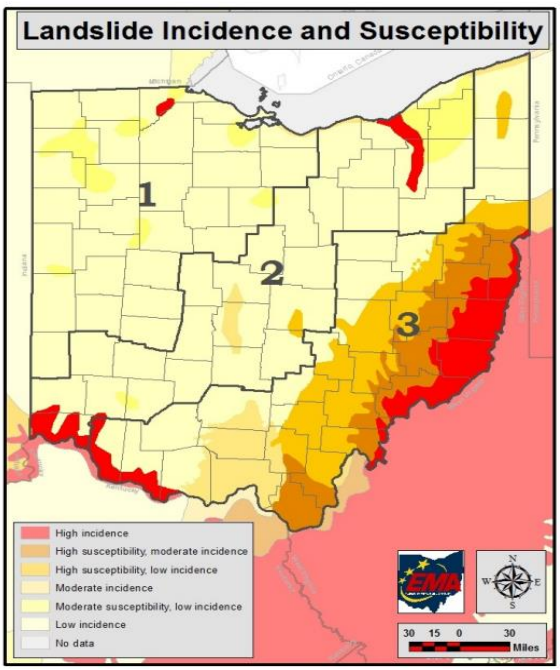
Ohio's only landslide fatality occurred in 1986 along U. S. Route 52 near Ironton when a rockfall crushed a passing car on the highway below[46]. Lawrence County averages 3 landslides per year that destroy residences. It typically experiences up to 12 landslides per year that affect roadways – mostly minor. More are averted by identification and neutralizing the hazard by various techniques.

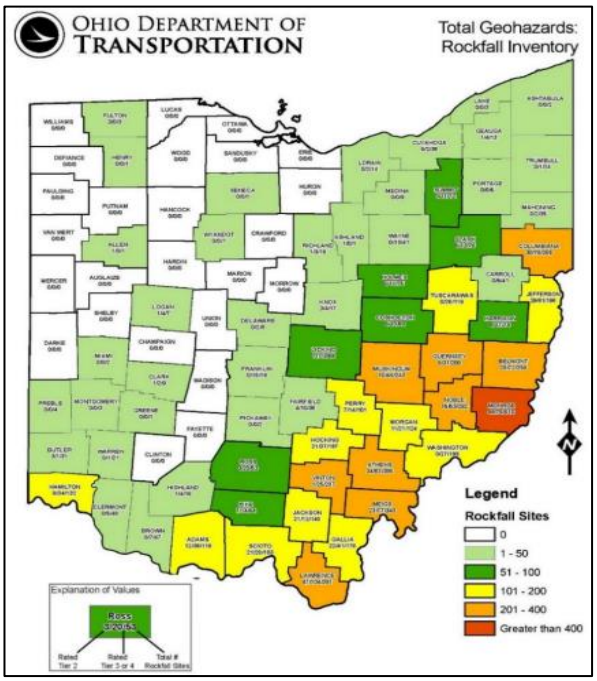
4. Probability of Future Occurrences

As logging continues throughout the county, the probability of more occurrences increases. With this increased potential, the Planning Team estimates a 25% chance of an occurrence in any given year.

5. Affected Locations

Due to the topography of Lawrence County, the entire county is susceptible to landslides. As shown below, It is in ODNR's *Landslide High Susceptibility, Moderate Incidence* category and *Rockfall High Incidence* category.





[45] https://ohiodnr.gov/static/documents/geology/GF8_Hansen_1995.pdf
[46] https://ohiohistorycentral.org/w/Landslides

6. Analysis

Factor	Ranking
Frequency	None: No Declarations
Response	< 1 Week
Onset	< 6 Hours
Magnitude	10% Land Area
Business	1 Week
Human	Minor Injuries
Property	10-25% Damaged

7. Vulnerable Community Assets

Asset	Impact
People	No impact.
Economy	Little or no measurable impact.
Infrastructure	Roads and bridges below and above slides would be impacted.
Structures	Minor damage to complete.y destroyed.

8. Estimated Structural Damages

Structure Type	Inven-tory	Average Value	At Risk		Damaged		Damages	
			%	Number	%	Number	%	Total
Residential	25,701	$167,000				3	100%	$501,000
Nonresidential	1,642	$670,000		0		0		$0
Critical	51	$670,000		0		0		$0
Totals	**27,394**					**0**		**$501,000**

I. Dam/Levee Failure

1. Description

A dam is defined as an artificial barrier that is usually constructed across a stream channel to impound water. A dam failure is defined as an uncontrolled release of that impounded water. The causes of dam failures can be divided into three groups: dam overtopping, excessive seepage, and structural failure of a component. Despite efforts to provide sufficient structural integrity and to perform inspection and maintenance, problems can develop that can lead to failure. While most dams have storage volumes small enough that failures would have little or no consequences, dams with large storage amounts could cause significant flooding downstream.

Dam failures can result from any one or a combination of the following causes:

- Prolonged periods of rainfall and flooding.
- Inadequate spillway capacity, resulting in excess overtopping flows.
- Internal erosion caused by embankment or foundation leakage or piping.
- Improper maintenance, including failure to remove trees, repair internal seepage problems, replace lost material from the cross section of the dam and abutments, or maintain gates, valves, and other operational components.
- Improper design, including the use of improper construction materials and construction practices.
- Improper operation, including the failure to remove or open gates or valves during high flow periods.
- Failure of upstream dams on the same waterway that release water to a downstream dam.
- Earthquakes, which typically cause longitudinal cracks at the tops of the embankments that can weaken entire structures.

In Ohio, dams are classified by size and potential impact of failure: Class I, II, III and IV. Refer to OAC 1501:21-13-01(A)[47]

Levees are also included with this hazard. A levee is a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water so as to reduce risk from temporary flooding." The NFIP regulations define a levee system as "a flood protection system which consists of a levee, or levees, and associated structures, such as closure and drainage devices, which are constructed and operated in accordance with sound engineering practices."[48]

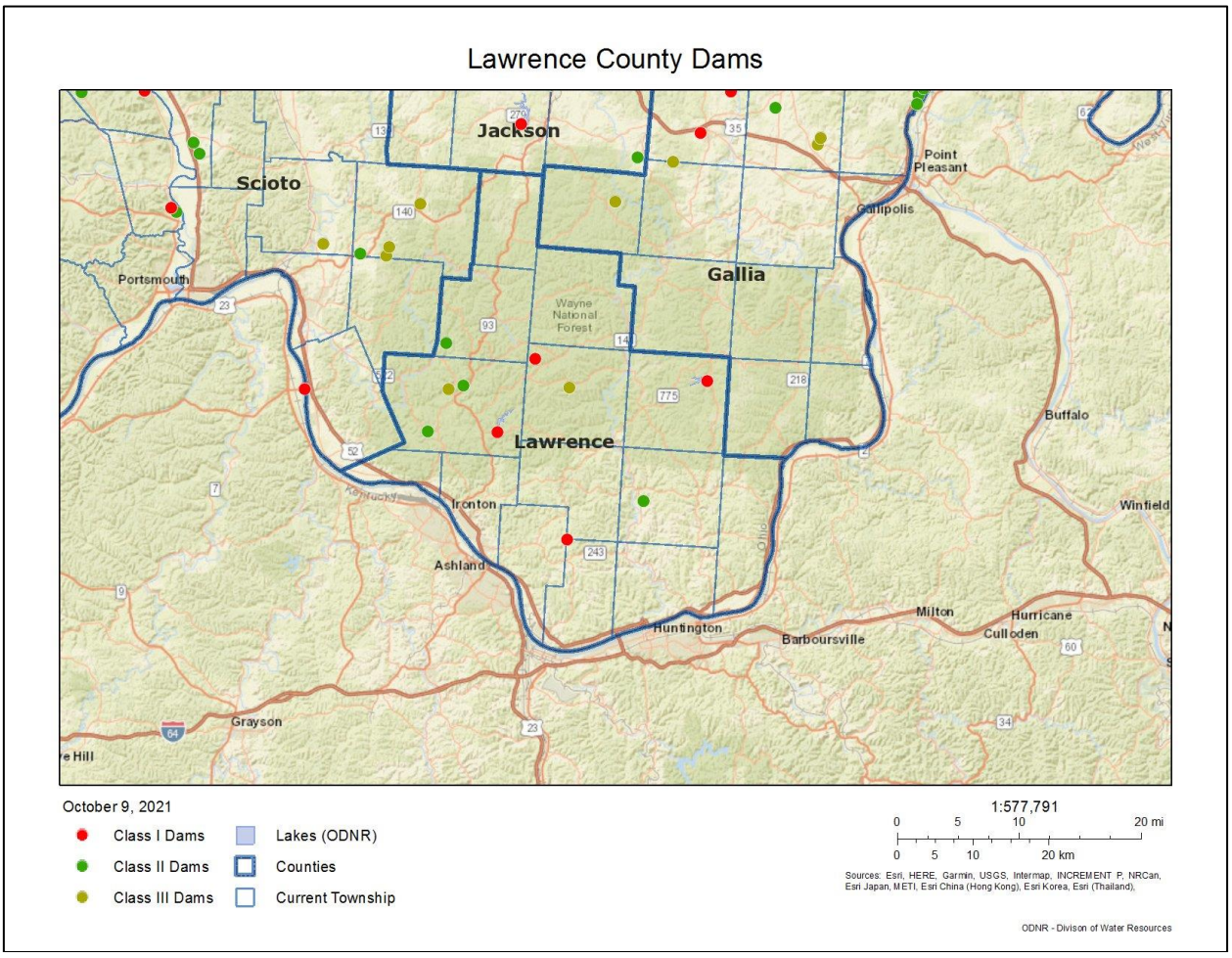
Levee system components – such as the levee itself, gates and pumps – may fail due to improper maintenance. For example, levees may erode, gates may not operate properly, and pumps may not function when needed. Less likely, levees may fail by overtopping.

[47] http://codes.ohio.gov/oac/1501:21-13-01
[48] https://www.fema.gov/media-library-data/1463585105805-48106ac358b81c67287ea9021db17804/What_is_a_Levee_0512_508.pdf

a. Inventory of Dams

The following lists Class I, II and III dams in Lawrence County and their hazard ratings as listed in the US Army Corps of Engineers' National Inventory of Dams[49]:

Class	Dam Name	NIDID	Hazard Poten-tial	River	City/ Distance (mi)		Emergency Action Plan Approval Date
I	Izaak Walton Lake Dam	OH00953	H	Johns Creek	Sherrits		Not Approved
I	Lake Vesuvius Dam	OH82424	H	Storms Creek			Unknown
I	Randolph Lake Dam	OH00143	H	Willow Creek	Ashland	4.2	
I	Timbre Ridge Dam	OH01012	H	Sand Fork	Lecta	2	Unknown
I	Waller Lake Dam	OH00145	H	Little Ice Creek	Forestdale	6.1	Not Approved
II	Lake Forest Dam	OH00144	S	Symmes Creek	Getaway	4.9	11/4/2004
II	Pine Creek Structure No. 8 Dam	OH00703	S	Sperry Fork	Pine Grove		Not Approved
III	Kenton Dam	OH00282	L	Lick Branch	Cadmus	11	
III	Lawco Lake Dam	OH00148	L	Darby Creek	Lawco	0.9	Not Approved
III	McClure Lake Dam	OH00961	L	Aaron Creek	Aid		Not Approved
III	Payne Lake Dam	OH00147	L	Symmes Creek	Arabia	4	



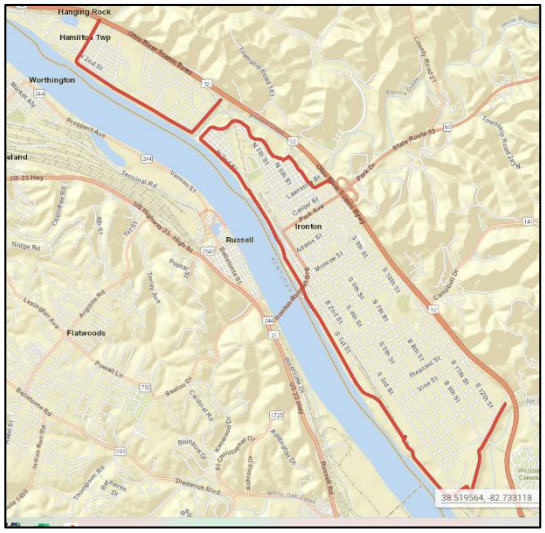
[49] https://nid.sec.usace.army.mil/ords/f?p=105:18:15360365863343::NO:::

b. Inventory of Levees

The following lists levees in Lawrence County as listed in the US Army Corps of Engineers' National Levee Database[50]:

LST ID	Name
2549	Ironton, OH LPP (South Unit)
2734	Ironton, OH, LPP, (North Unit)

The top of each levee is approximately 3 feet above the elevation of the January 1937 flood. Total leveed area is 2.35 square miles.



2. Extent of Hazard

An occurrence would be indicated by a failure of a Class I or II dam or levee.

3. Historical Occurrence

There have been no Class I or II dam failures in Lawrence County. According to the Stanford University's National Performance of Dam Program (NPDP) Dam Incident database[51], the following incidents have occurred:

ID	Dam Name	Date	Incident Type	Dam Failure
OH00144	Lake Forest Dam	11/29/2000	Inadequate Spillway Capacity	No
OH00143	Randolph Lake Dam	11/29/2000	Erosion/Undermining	No

No other information is available on these incidents.

There have been no levee failures in Lawrence County.

4. Probability of Future Occurrences

In the American Society of Civil Engineers *2009 Ohio Infrastructure Report Card – Dams Fact Sheet*[52], Ohio dams received a grade of C. One third of Ohio's dams were rated Poor or worse and 60% were rated Fair or worse. Based on these high-level ratings, no direct conclusions could be drawn about the failure of Lawrence County's Class I and II dams. Because of this report, the planning team couldn't assign a value of zero; the probability of a failure in a given year is less than 1%.

The LSOG considers the risk associated with the Ironton, OH, LPP, (N. Unit) levee segment (LST ID 2734) to be Low (LSAC 4) for Prior to Overtopping based on a low likelihood of poor performance with moderate associated consequences and to be Low (LSAC 4) for Overtopping due to moderate likelihood of overtopping with low to moderate associated consequences. The levee has been loaded up to 57% of the levee height with no performance issues. However, there are performance concerns related to seepage, however a breach would not be expected prior to overtopping. The levee has seen limited loading since it was loaded to greater than 50% in 1948. The sandy silty foundation materials could be conducive to seepage given the medium loading duration.

[50] https://levees.sec.usace.army.mil/#/
[51] http://npdp.stanford.edu/dam_incidents
[52] http://ohioasce.org/sites/default/files/2009 Dams Fact Sheet.pdf

The consequences associated with a levee breach may be overstated though, because most of the population in the area is associated with a school, which would most likely be vacant during an extreme flood. Additionally, evacuation effectiveness for the area is very good and the egress routes are short (less than half a mile), so any threatened population would be able to evacuate quickly.[53]

The LSOG considers the risk associated with the Ironton, OH LPP (LST ID 2549) to be Moderate (LSAC 3) for Prior to Overtopping due to anticipated poor performance and high life risk consequences and to be Low (LSAC 4) for Overtopping due to anticipated Low likelihood of overtopping but associated high consequences during flood events. The risk is driven by seepage concerns and culverts and drainage pipes. The lack of loading history increases the uncertainty in the risk associated with this segment. These concerns are somewhat offset by the level of predictability of the Ohio River due to upstream flow

Source: US Army Corps of Engineers (USACE)[54]

5. Affected Locations

The following locations may be affected by the failure of a Class I or II dam or levee:

a. Class I Dams

Izaak Walton Lake Dam
Homes: 16; Population: 31; Churches: 1

Lake Vesuvius Dam
Homes:8; Population: 12; Commercial Structures: 12

Randolph Lake Dam
Homes: 22; Population: 60

Timbre Ridge Dam
Homes: 18; Population: 32

Waller Lake Dam
Homes: 1; Population: 4

b. Class II Dams

Lake Forest Dam
Homes: 4; Population: 7

Pine Creek Structure No. 8 Dam
Homes: 3; Population: 6

c. Levees

Ironton, OH LPP (South &North Units)
City of Ironton: Homes: 4,991; Population: 10,313

6. Analysis

Factor	Ranking
Frequency	None: No Declarations
Response	< 1 Week
Onset	> 24 Hours
Magnitude	10% Land Area
Business	1 Week
Human	Minor Injuries

[53] https://levees.sec.usace.army.mil/#/levees/system/3305000008/summary
[54] https://levees.sec.usace.army.mil/#/levees/system/3305000009/summary

Factor	Ranking
Property	10-25% Damaged

7. Vulnerable Community Assets

Asset	Impact
People	Little or no impact; warning is expected to be sufficient for complete evacuation.
Economy	Businesses in the inundated areas would likely be closed for up to a week.
Infrastructure	Roads and bridges closer to the breach would receive moderate damage – gravel roads would likely be washed out. Less damage is expected as the water fans out.
Structures	The Planning Team estimated that all structures in a dam's inundation path would be damaged and receive on average 5% damages. It also estimated that 50% of structures in levee-protected areas would be damaged and receive on average 5% damages. The Planning Team used the averages to estimate structural damages.

8. Estimated Structural Damages

Structure Type	Inven-tory	Average Value	At Risk		Damaged		Damages	
			%	Number	%	Number	%	Total
Residential	25,701	$167,000		520.7		263.0		$2,196,050
Nonresidential	1,642	$670,000		32.4		16.2		$543,444
Critical	51	$670,000		1.4		0.7		$24,194
Totals	**27,394**			**554.6**		**279.9**		**$2,763,689**

The following table details damage estimates for each dam and levee.

Dam/Levee Name	Structure Type	At Risk Number	Damaged		Damages	
			%	Number	%	Total
Izaak Walton Lake Dam	Residential	16	100%	16.0	5%	$133,600
	Non-Residential	1	100%	1.0	5%	$33,500
	Critical	0	100%	0.0	5%	$0
	Totals	17		17.0		$167,100
Lake Vesuvius Dam	Residential	8	100%	8.0	5%	$66,800
	Non-Residential	12	100%	12.0	5%	$402,000
	Critical	0	100%	0.0	5%	$0
	Totals	20		20.0		$468,800
Randolph Lake Dam	Residential	22	100%	22.0	5%	$183,700
	Non-Residential	0	100%	0.0	5%	$0
	Critical	0	100%	0.0	5%	$0
	Totals	22		22.0		$183,700
Timbre Ridge Dam	Residential	18	100%	18.0	5%	$150,300
	Non-Residential	0	100%	0.0	5%	$0
	Critical	0	100%	0.0	5%	$0
	Totals	18		18.0		$150,300

Dam/Levee Name	Structure Type	At Risk Number	Damaged %	Damaged Number	Damages %	Damages Total
Waller Lake Dam	Residential	1	100%	1.0	5%	$8,350
	Non-Residential	0	100%	0.0	5%	$0
	Critical	0	100%	0.0	5%	$0
	Totals	1		1.0		$8,350
Lake Forest Dam	Residential	4	100%	4.0	5%	$33,400
	Non-Residential	0	100%	0.0	5%	$0
	Critical	0	100%	0.0	5%	$0
	Totals	4		4.0		$33,400
Pine Creek No. 8 Dam	Residential	3	100%	3.0	5%	$25,050
	Non-Residential	0	100%	0.0	5%	$0
	Critical	0	100%	0.0	5%	$0
	Totals	3		3.0		$25,050
Ironton North Levee	Residential	716	50%	358.0	5%	$2,989,300
	Non-Residential	47	50%	23.5	5%	$787,250
	Critical	2	50%	1.0	5%	$33,500
	Totals	765		382.5		$3,810,050
Ironton South Levee	Residential	3922	50%	1961.0	5%	$16,374,351
	Non-Residential	245	50%	122.5	5%	$4,103,750
	Critical	11	50%	5.5	5%	$184,250
	Totals	4178		2089.0		$20,662,351
Totals	Residential	4686		2367.0		$19,764,450
	Non-Residential	292		146.0		$4,891,000
	Critical	13		6.5		$217,750
	Totals	4991		2519.5		$24,873,201
Averages	Residential	520.7		263.0		$2,196,050
	Non-Residential	32.4		16.2		$543,444
	Critical	1.4		0.7		$24,194
	Totals	554.6		279.9		$2,763,689

J. Wildfire

1. Description

A wildfire is any uncontrolled fire with extensive size and speed in a combustible vegetative area. The danger of wildfires is that they are unpredictable, especially when weather conditions are warm, dry, and windy and the topography of the area is uneven.

2. Extent of Hazard

A reportable wildfire is considered an occurrence.

Major occurrences are those that caused injuries, deaths or total damage $5,000 or greater.

3. Historical Occurrence

Lawrence County experiences several wildfires each year. They are generally burn less than 5 acres and may threaten individual homes and outbuildings. While the Planning Team found no records, a number of outbuildings – but no other structures – are known to have been damaged or destroyed. The *2019 State of Ohio Hazard Mitigation Plan (SOHMP)*[55], page 2-125 records reported wildfires for the 11-year period of 2007 – 2017 in Lawrence County as follows:

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
456	4430	9.71	41	339	74.34%	112	24.56%	5	1.10%

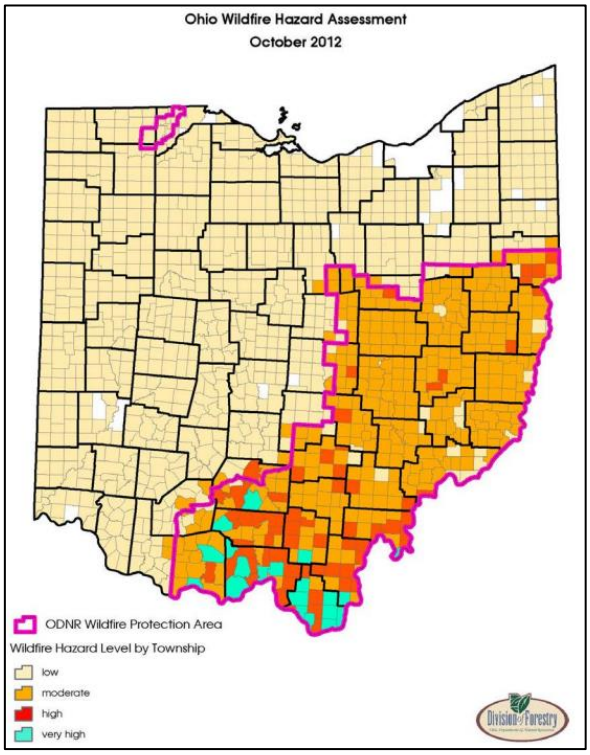
4. Probability of Future Occurrences

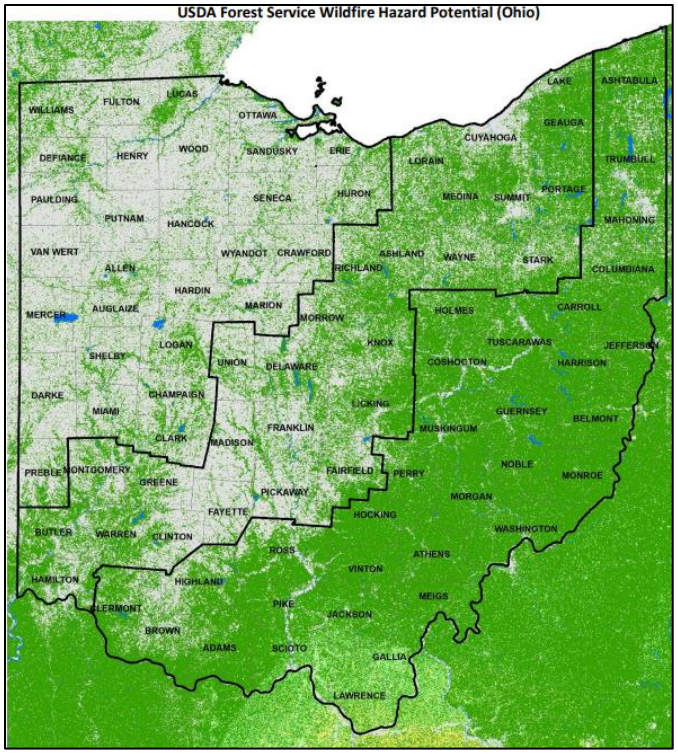
	Years	Events	Average Injuries	Average Deaths	Average Property Damage	Average Crop Damage	Annual Probability	Mean Time Between Occurrences (Months)
All Events	11	456	0	0	$0	$0	4145%	.3
Major Events	11	0	0	0	N/A	N/A	N/A	N/A

5. Affected Locations

Lawrence County is located in the highest wildfire risk region in Ohio. While wildfires may occur across the county, they do not pose a significant threat to populated or built-up areas. The following maps depict risk areas[56]

[55] https://www.ema.ohio.gov/mip/planning_sohmp.aspx
[56] https://www.ema.ohio.gov/mip/planning_sohmp.aspx





6. Analysis

Factor	Ranking
Frequency	None: No Declarations
Response	< 1/2 Day
Onset	< 6 Hours
Magnitude	10% Land Area
Business	No Impact
Human	No Impact
Property	< 10% Damaged

7. Vulnerable Community Assets

Asset	Impact
People	Little or no measurable impact.
Economy	Little or no measurable impact.
Infrastructure	Little or no measurable impact.
Structures	Little or no measurable impact to residential or commercial structures. Outbuildings in high risk areas may be damaged or lost before a fire is contained.

8. Estimated Structural Damages

Structure Type	Inventory	Average Value	At Risk		Damaged		Damages	
			%	Number	%	Number	%	Total
Residential	25,701	$167,000		0		0		$0
Nonresidential	1,642	$670,000		0		0		$0
Critical	51	$670,000		0		0		$0
Totals	**27,394**					**0**		**$0**

K. Land Subsidence

1. Description

Subsidence is the motion of the Earth's surface as it shifts downward relative to a benchmark (often sea-level) of the surrounding terrain. There are a number of causes for this effect. In Ohio, the two primary causes are abandoned underground mines (AUMs) and karst.

Underground mining of coal began in the early 1800's and continues to current day. In the 1900s, underground salt, limestone, and gypsum mining began. All mining activities create voids under the Earth's surface. Several key factors determining the potential for these voids to collapse include depth, mining technique used, types of rock and/or soils, and development on the ground surface. Abandoned underground coal mines in Ohio have the added environmental impact of discharging acidic water. If acidic mine water is discharged into creeks or streams, it can alter the chemical composition of the water habitat and cause considerable harm to sensitive aquatic life.

Per the ODNR, Division of Geological Survey, karst is a little-known, but unique and important landform that can be found throughout the state of Ohio. Regions that contain sinkholes and other solutional features, such as caves, springs, disappearing streams, and enlarged fractures, are known as karst terrains. Sinkholes form as bedrock dissolves and surface materials erode or collapse into the resulting voids. Sinkholes are the main hazard associated with karst landforms in Ohio, and there are thousands of them in the state. There is no known karst topography in Lawrence County.[57]

2. Extent of Hazard

An event that causes injury, death, or damage to structures is considered an occurrence.

Major occurrences are those that caused injuries, deaths or total damage $5,000 or greater.

3. Historical Occurrence

While no records could be found on the details of these occurrences, subsidences are known to have occurred.

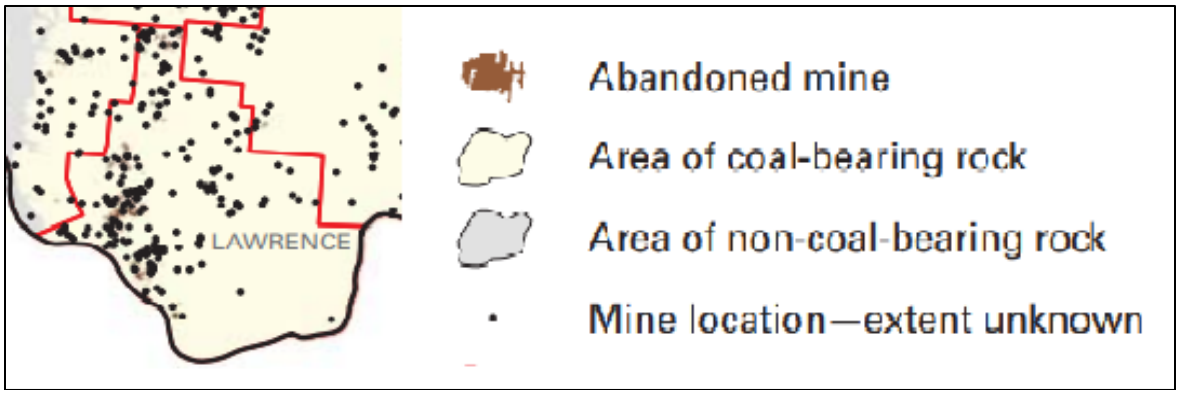
4. Probability of Future Occurrences

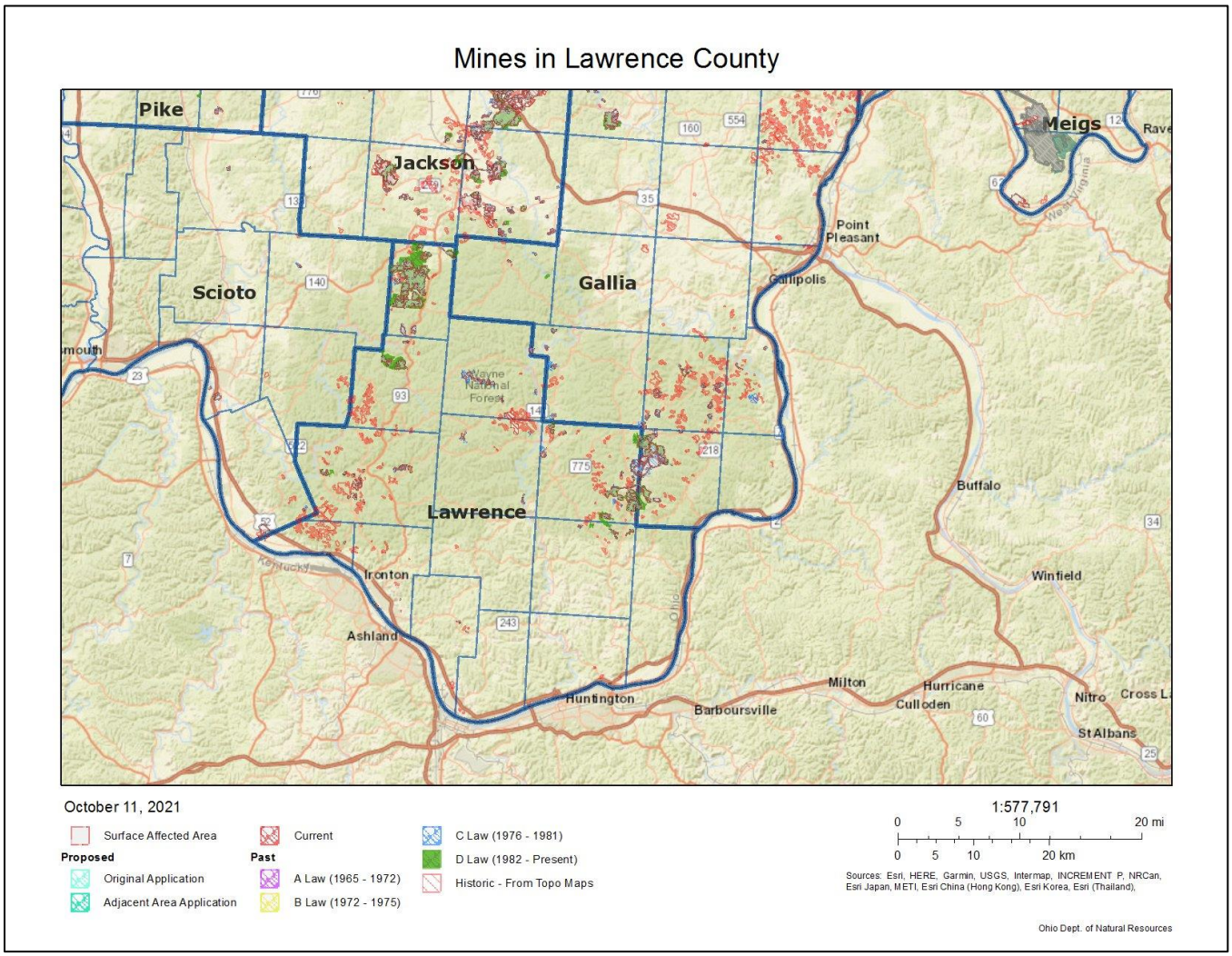
Time and development increase the probability of occurrences. The Planning Team estimates a 10% probability in a given year of an occurrence.,

5. Affected Locations

The following maps show the underground mines in Lawrence County[58]

[57] https://ohiomitigationplan.ohio.gov/wps/portal/gov/ema-mp/section-2
[58] https://gis.ohiodnr.gov/MapViewer/?config=OhioMines





These show that most abandoned underground mines haven't been assessed as to their propensity to subside. These mines are primarily in Elizabeth, Decatur, Symmes, Aid and Mason Townships.

As subsidence insurance is required on insured structures in Lawrence, insured losses would minimize the need for financial assistance.

6. Analysis

Factor	Ranking
Frequency	None: No Declarations
Response	< 1 Day
Onset	> 24 Hours
Magnitude	10% Land Area
Business	< 24 Hours
Human	No Impact
Property	< 10% Damaged

7. Vulnerable Community Assets

Asset	Impact
People	Little or no impact.
Economy	Subsiding/subsided business locations would be adversely affected.
Infrastructure	Subsiding/subsided roads and other infrastructures would be adversely affected. Underground mines contain potentially contaminated water that may be released into the aquifer.
Structures	No structures are located in known risk areas.

8. Estimated Structural Damages

Structure Type	Inven-tory	Average Value	At Risk		Damaged		Damages	
			%	Number	%	Number	%	Total
Residential	25,701	$167,000		0		0		$0
Nonresidential	1,642	$670,000		0		0		$0
Critical	51	$670,000		0		0		$0
Totals	**27,394**					**0**		**$0**

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Section VI – Mitigation Goals and Actions

A. Overview

The Lawrence County Mitigation Planning Team identified hazards of credible threat and analyzed their impact using qualitative and quantitative methods. The team used the *FEMA Local Mitigation Planning Handbook, March 2013,* as a guide for conducting analysis.

B. Identification and Analysis Methodology

The Planning Team profiled each hazard. It collected and reviewed hazard information, assessed the impacts and the vulnerabilities of the community's assets. The team assigned risk factor values based on the criteria and adjusting factors established by the Ohio EMA.

The team then estimated structures at risk and associated damages.

C. Goals

The Planning Team selected the following mitigation goals:

- Reduce or eliminate impact of hazards on public safety, lives, property and infrastructure
- Provide timely warning
- Enhance emergency response capability
- Create self sufficiency
- Plan for Safe Development
- Increase public awareness

D. Actions

The Planning Team then reviewed eighteen actions from the previous mitigation plan and added three actions.

- Reduce or eliminate impact of hazards on public safety, lives, property and infrastructure
  - Evaluate and repair levees and their flood control systems.
  - Identify and advise responsible parties of required maintenance of trees in utility right-of-way areas.
  - Identify areas where additional utility cutoffs are needed to isolate utility systems.
  - Identify areas where fire break lines are needed and create them.
  - Design back-flow prevention in areas of combined storm/sanitary sewers.
  - Inspect, repair and upgrade stormwater systems.
  - Rehabilitate and maintain High Hazard Potential Dams.
- Provide timely warning
  - Design and implement a comprehensive public emergency notification system.
- Enhance emergency response capability
  - Develop back-up plans in case of public safety communication failure.
  - Develop inventory assets available for responding to and recovering from major hazard occurrences.
- Create self sufficiency
  - Identify emergency shelters.
  - Construct Safe Rooms – Community and Residential
- Plan for Safe Development

- Mitigate structures at risk.
- Develop and adopt anchoring criteria for objects that can become hazardous during natural hazard events and assist residents with anchoring these items.
- Update dam Emergency Action Plans, update inundation data for dams without EAPs or no current inundation data.
- Develop building codes in jurisdictions without building codes.
- Require new/improved critical facilities to be elevated/flood protected to the 500-year flood level.
- Develop improved logging practices.
- Identify and map areas and sites vulnerable to specific natural hazards.

- Increase public awareness
  - Develop an All-Hazards public education program.
  - Educate the public on regulated Fire Burning Seasons and drought conditions as well as fire hazards created by disposal of debris.

E. Cost-Benefit Review

Cost-Benefit Review is used to determine the relative feasibility of mitigation actions, thus establishing a prioritized list. The Planning Team used *Using Benefit-Cost Review in Mitigation Planning – State and Local Mitigation Planning How-To Guide Number Five – FEMA 386-5, May 2007*[59], to conduct this review. Using qualitative methods (Method A), this Cost-Benefit Review methodology was emphasized in the prioritization process.

1. Review Benefits and Costs

This step is documented with each selected mitigation action. Refer to *Section VII – Mitigation Action Analysis*.

2. Prioritize Actions

The following summarizes the benefits and costs of each mitigation action and reflects the priority assigned by the Planning Team. Guiding criteria was:

- Impact on public safety (isolation and injuries)
- Impact on property damage
- Impact on other mitigation actions
- Acceptability of implementation by elected officials and voters
- Monetary costs

Priority	Mitigation Action	Benefits	Costs
1	Mitigate structures at risk.	Decreased isolation Increased public safety Decreased response and recovery costs Community-owned green space Decreased response and recovery costs	Buy-in and funding by elected officials and property owners
2	Require new/improved critical facilities to be elevated/flood protected to the 500-year flood level.	Increased public safety	Unknown

[59] http://www.fema.gov/media-library-data/20130726-1606-20490-3557/how_to__5___final_may_2007.pdf

Priority	Mitigation Action	Benefits	Costs
3	Develop an All-Hazards public education program.	Increased public safety Increased self-sufficiency Decreased response and recovery costs	EMA Staff Costs
4	Develop back-up plans in case of public safety communication failure.	Increased public safety	Unknown
5	Design and implement a comprehensive public emergency notification system.	Increased public awareness	$50k/yr
6	Develop inventory assets available for responding to and recovering from major hazard occurrences.	Quicker and more cost-effective response and recovery actions	Study costs
7	Identify emergency shelters.	Locally-accessible shelters Increased public safety Increased self-sufficiency	$5k
8	Inspect, repair and upgrade stormwater systems.	Increased public safety Decreased response and recovery costs Decreased damaged to infrastructure	Unknown
9	Evaluate and repair levees and their flood control systems.	Flooding prevention Increased public safety Decreased response and recovery costs	Unknown
10	Update dam Emergency Action Plans, update inundation data for dams without EAPs or no current inundation data.	Reduced people, businesses, other assets at risk	Dam owner buy-in Study costs
11	Design back-flow prevention in areas of combined storm/sanitary sewers.	Increased public safety Decreased response and recovery costs	Unknown
12	Identify and map areas and sites vulnerable to specific natural hazards.	Increased awareness	Study costs
13	Identify and advise responsible parties of required maintenance of trees in utility right-of-way areas.	Increased public safety Decreased response and recovery costs	Responsible party buy-in
14	Educate the public on regulated Fire Burning Seasons and drought conditions as well as fire hazards created by disposal of debris.	Increased public safety Decreased response and recovery costs Decreased potential damage	Unknown
15	Identify areas where additional utility cutoffs are needed to isolate utility systems.	Increased public safety Decreased response and recovery costs	Study costs Utility company buy-in

Priority	Mitigation Action	Benefits	Costs
16	Develop and adopt anchoring criteria for objects that can become hazardous during natural hazard events and assist residents with anchoring these items.	Increased public safety Decreased response and recovery costs	Study costs Elected official buy-in
17	Develop improved logging practices.	Increased public safety Decreased damage to infrastructure Decreased response and recovery costs	Study costs SWCD buy-in Logger buy-in
18	Identify areas where fire break lines are needed and create them.	Increased public safety Decreased response and recovery costs	Study costs Property owner buy-in
19	Develop building codes in jurisdictions without building codes.	Increased public safety Decreased response and recovery costs	Study costs Elected official buy-in
20	Rehabilitate and maintain High Hazard Potential Dams.	Reduced people, businesses, other assets at risk	Dam owner buy in Rehabilitation costs
21	Construct Safe Rooms – Community and Residential.	Increased public safety Decreased response and recovery costs	Community education Home-owner buy-in and funding

Section VII – Mitigation Action Analysis

A. Goal: Reduce or eliminate impact of hazards on public safety, lives, property and infrastructure

1. Action: Evaluate and repair levees and their flood control systems.

Reevaluate floodwall work with US Army Corps of Engenieers. The floodwall pump stations control systems are failing and replacement parts are not available. Replace floodwall pump station control system.

Priority	Start Date	End Date	Estimated Cost	Current Status
9	10/15/2021	10/15/2026	Unknown	Unchanged

Hazards Addressed: Flooding

Jurisdiction(s) Affected: Ironton City

Project Lead(s): Ironton Mayor

Funding Resource(s): Community Development Block Grant, Flood Mitigation Assistance Grant, Hazard Mitigation Grant Program, In-Kind (Work or Labor), Local Funds, Pre-Disaster Mitigation Grant, State Funds

Mitigation Action Type(s): Minor Localized Flood Reduction, Planning, Reconstruction

Vulnerability	Before Implementation	After Implementation	Difference
People in inundation zones - Casualities	10,500	Fewer at Risk	Not Quantifiable
Structures in inundation zones - Flood damage	20,000	Fewer at Risk	Not Quantifiable

Benefits	Costs
Flooding prevention Increased public safety Decreased response and recovery costs	Unknown

2. Action: Identify and advise responsible parties of required maintenance of trees in utility right-of-way areas.

Trees are often destroyed in high winds and ice storms, taking down power and communication lines.

Priority	Start Date	End Date	Estimated Cost	Current Status
13	10/15/2021	10/15/2026	Unknown	Unchanged

Hazards Addressed: Severe Winter Storm, Tornado, Earthquake, Severe Summer Storm/Thunderstorm/Windstorm/Hail

Jurisdiction(s) Affected: South Point Village, Lawrence County, Proctorville Village, Ironton City, Coal Grove Village, Hanging Rock Village

Project Lead(s): City and Village Public Works Dept; Township Trustees

Funding Resource(s): Hazard Mitigation Grant Program, In-Kind (Work or Labor), Local Funds, Pre-Disaster Mitigation Grant

Mitigation Action Type(s): Planning

Vulnerability	Before Implementation	After Implementation	Difference
People and businesses without power	Unknown	Fewer at Risk	Not quantifiable

Benefits	Costs
Increased public safety Decreased response and recovery costs	Responsible party buy-in

3. Action: Identify areas where additional utility cutoffs are needed to isolate utility systems.

Utility lines are often damaged during earthquakes, increasing risks to people and structures.

Priority	Start Date	End Date	Estimated Cost	Current Status
15	10/15/2021	10/15/2026	Unknown	Unchanged

Hazards Addressed: Flooding, Severe Winter Storm, Tornado, Earthquake, Severe Summer Storm/Thunderstorm/Windstorm/Hail

Jurisdiction(s) Affected: Coal Grove Village, Lawrence County, Proctorville Village, South Point Village, Hanging Rock Village, Ironton City

Project Lead(s): City and Village Public Works Dept; Township Trustees

Funding Resource(s): Hazard Mitigation Grant Program, In-Kind (Work or Labor), Local Funds, Pre-Disaster Mitigation Grant

Mitigation Action Type(s): Planning

Vulnerability	Before Implementation	After Implementation	Difference
People and businesses without power	Unknown	Fewer at Risk	Not quantifiable

Benefits	Costs
Increased public safety Decreased response and recovery costs	Study costs Utility company buy-in

4. Action: Identify areas where fire break lines are needed and create them.

Priority	Start Date	End Date	Estimated Cost	Current Status
18	10/15/2021	10/15/2026	Unknown	Unchanged

Hazards Addressed: Wildfire

Jurisdiction(s) Affected: Lawrence County

Project Lead(s): Jurisdictional Fire Chiefs

Funding Resource(s): Hazard Mitigation Grant Program, In-Kind (Work or Labor), Local Funds, Pre-Disaster Mitigation Grant

Mitigation Action Type(s): Planning

Vulnerability	Before Implementation	After Implementation	Difference
Structures at risk of catching fire	Unknown	Fewer at Risk	Not quantifiable

Benefits	Costs
Increased public safety Decreased response and recovery costs	Study costs Property owner buy-in

5. Action: Design back-flow prevention in areas of combined storm/sanitary sewers.
Combined sanitary sewers often fill with flood waters, which then back up into structures.

Priority	Start Date	End Date	Estimated Cost	Current Status
11	10/15/2021	10/15/2026	Unknown	Unchanged

Hazards Addressed: Flooding, Severe Summer Storm/Thunderstorm/Windstorm/Hail

Jurisdiction(s) Affected: Coal Grove Village, Hanging Rock Village, Ironton City, Proctorville Village, South Point Village

Project Lead(s): City and Village Public Works Dept

Funding Resource(s): Community Development Block Grant, Flood Mitigation Assistance Grant, Hazard Mitigation Grant Program, In-Kind (Work or Labor), Local Funds, Pre-Disaster Mitigation Grant

Mitigation Action Type(s): Minor Localized Flood Reduction, Planning, Reconstruction, Retrofit, Stormwater

Vulnerability	Before Implementation	After Implementation	Difference
Contamination affecting people	Unknown	Fewer at Risk	Not Quantifiable

Benefits	Costs
Increased public safety Decreased response and recovery costs	Unknown

6. Action: Inspect, repair and upgrade stormwater systems.
Aging pipe systems should be inspected using video equipment and evaluated to determine condition and maintenance planning. A majority of localized flooding occurs when local jurisdictions don't adequately clean/maintain their stormwater runoff structures routinely resulting in the backup of flood waters in residential and commercial areas.

Priority	Start Date	End Date	Estimated Cost	Current Status
8	10/15/2021	10/15/2026	Unknown	New

Hazards Addressed: Flooding, Severe Summer Storm/Thunderstorm/Windstorm/Hail

Jurisdiction(s) Affected: Lawrence County, Proctorville Village, Ironton City, Coal Grove Village, South Point Village, Hanging Rock Village

Project Lead(s): Jurisdictional Public Works Dept

Funding Resource(s): Community Development Block Grant, Hazard Mitigation Grant Program, In-Kind (Work or Labor), Local Funds, Pre-Disaster Mitigation Grant

Mitigation Action Type(s): Minor Localized Flood Reduction, Planning, Retrofit, Stormwater

Vulnerability	Before Implementation	After Implementation	Difference
Damaged streets	Unknown	Fewer at Risk	Not quantifiable
People in inundation zones - Isolation	Unknown	Fewer at Risk	Not quantifiable

Benefits	Costs
Increased public safety Decreased response and recovery costs Decreased damaged to infrastructure	Unknown

7. Action: Rehabilitate and maintain High Hazard Potential dams.

Rehabilitate and maintain dams to ensure integrity.

Priority	Start Date	End Date	Estimated Cost	Current Status
20	12/1/2020	11/30/2025	Unknown	New

Hazards Addressed: Dam/Levee Failure

Jurisdiction(s) Affected: Lawrence County

Project Lead(s): Dam Owners; Jurisdictional Chief Elected Officials of affected jurisdictions

Funding Resource(s): Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant, Owner Funding

Mitigation Action Type(s): Planning, Reconstruction, Dam Maintenance

Vulnerability	Before Implementation	After Implementation	Difference
People in inundation zones - Casualities	Unknown	Fewer at Risk	Not Quantifiable
People in inundation zones - Lack of warning	Unknown	Fewer at Risk	Not Quantifiable

Benefits	Costs
Reduced people, businesses, other assets at risk	Dam owner buy in Rehabilitation costs

B. Goal: Provide timely warning

1. Action: Design and implement a comprehensive public emergency notification system.

There are no severe storm warning sirens throughout the county.

Priority	Start Date	End Date	Estimated Cost	Current Status
5	10/15/2021	10/15/2026	$40k	Unchanged

Hazards Addressed: Flooding, Severe Winter Storm, Tornado, Earthquake, Drought, Wildfire, Land Subsidence, Mud/Landslide, Severe Summer Storm/Thunderstorm/Windstorm/Hail, Infectious Disease, Dam/Levee Failure

Jurisdiction(s) Affected: Lawrence County

Project Lead(s): Lawrence County EMA

Funding Resource(s): Community Development Block Grant, Hazard Mitigation Grant Program, In-Kind (Work or Labor), Local Funds, Pre-Disaster Mitigation Grant

Mitigation Action Type(s): Public Warning

Vulnerability	Before Implementation	After Implementation	Difference
People - Lack of warning; casualities, fatalities	Unknown	Fewer at Risk	Not quantifiable

Benefits	Costs
Increased public awareness	$50k/yr

C. Goal: Enhance emergency response capability

1. Action: Develop back-up plans in case of public safety communication failure.

Communication systems often fail during disaster events.

Priority	Start Date	End Date	Estimated Cost	Current Status
4	10/15/2021	10/15/2026	$10k	Unchanged

Hazards Addressed: Flooding, Severe Winter Storm, Tornado, Earthquake, Severe Summer Storm/Thunderstorm/Windstorm/Hail

Jurisdiction(s) Affected: Lawrence County

Project Lead(s): Lawrence County EMA

Funding Resource(s): Community Development Block Grant, Hazard Mitigation Grant Program, In-Kind (Work or Labor), Local Funds, Pre-Disaster Mitigation Grant

Mitigation Action Type(s): Public Safety

Vulnerability	Before Implementation	After Implementation	Difference
Responders - lack of coordinated response	Unknown	None	100%

Benefits	Costs
Increased public safety	Unknown

2. Action: Develop inventory assets available for responding to and recovering from major hazard occurrences.

Adopt a resolution requiring all government agencies in the county to provide a list of typed equipment and assets along with qualifications and certifications of employees and personnel that can be used by our county Emergency Management office during major events. Develop a list of equipment resources and contractors available. This information should be uploaded and managed by the NIMS Incident Resource Inventory System (IRIS).

Priority	Start Date	End Date	Estimated Cost	Current Status
6	10/15/2021	10/15/2026	$5k	Unchanged

Hazards Addressed: Dam/Levee Failure

Jurisdiction(s) Affected:

Project Lead(s): Lawrence County EMA

Funding Resource(s): Hazard Mitigation Grant Program, In-Kind (Work or Labor), Local Funds, Pre-Disaster Mitigation Grant

Mitigation Action Type(s): Public Safety

Vulnerability	Before Implementation	After Implementation	Difference
People - not receiving timely assistance	Unknown	Fewer at Risk	Not Quantifiable

Benefits	Costs
Quicker and more cost-effective response and recovery actions	Study costs

D. Goal: Create self sufficiency

1. Action: Identify emergency shelters.

Priority	Start Date	End Date	Estimated Cost	Current Status
7	10/15/2021	10/15/2026	$5k	Unchanged

Hazards Addressed: Flooding, Tornado, Earthquake, Dam/Levee Failure

Jurisdiction(s) Affected: Lawrence County

Project Lead(s): Lawrence County EMA

Funding Resource(s): Hazard Mitigation Grant Program, In-Kind (Work or Labor), Local Funds, Pre-Disaster Mitigation Grant

Mitigation Action Type(s): Public Protection

Vulnerability	Before Implementation	After Implementation	Difference
People - In Vulnerable Structures/Situations	Unknown	Fewer at Risk	Not Quantifiable

Benefits	Costs
Locally-accessible shelters Increased public safety Increased self-sufficiency	$5k

2. Action: Construct Safe Rooms - Community and Residential

A safe room is an extreme-wind shelter or space that provides protection to people during a tornado or other severe weather.

Priority	Start Date	End Date	Estimated Cost	Current Status
21	10/15/2021	10/15/2026	Unknown	New

Hazards Addressed: Tornado, Severe Summer Storm/Thunderstorm/Windstorm/Hail

Jurisdiction(s) Affected: Aid Township, Washington Township, Upper Township, Union Township, Symmes Township, Rome Township, Perry Township, Mason Township, Lawrence Township, Hamilton Township, Fayette Township, Decatur Township, South Point Village, Proctorville Village, Ironton City, Hanging Rock Village, Coal Grove Village, Windsor Township, Lawrence County, Elizabeth Township

Project Lead(s): Lawrence County EMA; Jurisdictional Chief Elected Officials

Funding Resource(s): Community Development Block Grant, Hazard Mitigation Grant Program, In-Kind (Work or Labor), Local Funds, Pre-Disaster Mitigation Grant, State Funds

Mitigation Action Type(s): Planning, Reconstruction, Retrofit, Storm Shelter

Vulnerability	Before Implementation	After Implementation	Difference
People - In Vulnerable Structures	Unknown	Fewer at Risk	Not Quantifiable

Benefits	Costs
Increased public safety Decreased response and recovery costs	Community education Home-owner buy-in and funding

E. Goal: Plan for Safe Development

1. Action: Mitigate structures at risk.

Priority	Start Date	End Date	Estimated Cost	Current Status
1	10/15/2021	10/15/2026	$51m	Unchanged

Hazards Addressed: Flooding

Jurisdiction(s) Affected: Coal Grove Village, Lawrence County, Lawrence Township, Hanging Rock Village, Ironton City, Aid Township, Elizabeth Township, Proctorville Village, South Point Village, Hamilton Township, Upper Township, Decatur Township, Fayette Township, Washington Township, Mason Township, Union Township, Symmes Township, Rome Township, Perry Township, Windsor Township

Project Lead(s): Jurisdictional Chief Elected Officials; Jurisidctional Floodplain Managers

Funding Resource(s): Flood Mitigation Assistance Grant, Hazard Mitigation Grant Program, In-Kind (Work or Labor), Local Funds, Pre-Disaster Mitigation Grant

Mitigation Action Type(s): Acquisition, Elevation, Planning, Relocation, Retrofit

Vulnerability	Before Implementation	After Implementation	Difference
People - Casualties, displaced	Unknown	Fewer at Risk	Not quantifiable

Benefits	Costs
Decreased isolation Increased public safety Decreased response and recovery costs Community-owned green space Decreased response and recovery costs	Buy-in and funding by elected officials and property owners

2. Action: Develop and adopt anchoring criteria for objects that can become hazardous during natural hazard events and assist residents with anchoring these items.

Mobile homes are more prone to high wind damage. Propane tanks can become airborne during a tornado or float away during flooding events, causing an additional explosion hazard. Seek funding for anchoring of existing mobile homes.

Priority	Start Date	End Date	Estimated Cost	Current Status
16	10/15/2021	10/15/2026	Unknown	Unchanged

Hazards Addressed: Flooding, Severe Summer Storm/Thunderstorm/Windstorm/Hail

Jurisdiction(s) Affected: Lawrence County

Project Lead(s): Jurisdictional Chief Elected Officials

Funding Resource(s): Hazard Mitigation Grant Program, In-Kind (Work or Labor), Local Funds, Pre-Disaster Mitigation Grant

Mitigation Action Type(s): Planning, Retrofit

Vulnerability	Before Implementation	After Implementation	Difference
People - injured by floating/exploding tanks	Unknown	Fewer at Risk	Not quantifiable
People - Swept away in mobile homes	Unknown	Fewer at Risk	Not quantifiable

Benefits	Costs
Increased public safety Decreased response and recovery costs	Study costs Elected official buy-in

3. Action: Update dam Emergency Action Plans, update inundation data for dams without EAPs or no current inundation data.

Create an EAP for each small dam on private property using Standards of the International Committee of Dam Safety (ICODS), developed in compliance with OAC requirements and including an update of the design floods and the downstream hazards. There is a lack of maintenance of the dams. Coordinate with ODNR Division of Water regarding lack of maintenance and inspection of dams. There are dams that have been constructed without review or state oversight. Identify dams throughout county to determine if they fall under state regulation. Findings to be provided to ODNR and to dam owners.

Priority	Start Date	End Date	Estimated Cost	Current Status
10	10/15/2021	10/15/2026	Unknown	Unchanged

Hazards Addressed: Flooding, Severe Summer Storm/Thunderstorm/Windstorm/Hail, Dam/Levee Failure

Jurisdiction(s) Affected: Lawrence County

Project Lead(s): Dam Owners; Jurisdictional Chief Elected Officials of affected jurisdictions

Funding Resource(s): Hazard Mitigation Grant Program, In-Kind (Work or Labor), Local Funds, Pre-Disaster Mitigation Grant

Mitigation Action Type(s): Planning

Vulnerability	Before Implementation	After Implementation	Difference
People - In Inundation Zones	Unknown	Fewer at Risk	Not Quantifiable
Businesses in inundation zones	Unknown	Fewer at Risk	Not Quantifiable
Other community assets in inundation zones	Unknown	Fewer at Risk	Not Quantifiable

Benefits	Costs
Reduced people, businesses, other assets at risk	Dam owner buy-in Study costs

4. Action: Develop building codes in jurisdictions without building codes.

Buildings are not properly constructed to resist the forces and elements that can be encountered during a natural disaster event. This is due to a lack of a local building code and inspection system.

Priority	Start Date	End Date	Estimated Cost	Current Status
19	10/15/2021	10/15/2026	Unknown	Unchanged

Hazards Addressed: Flooding, Severe Winter Storm, Tornado, Earthquake, Wildfire, Land Subsidence, Mud/Landslide, Severe Summer Storm/Thunderstorm/Windstorm/Hail, Dam/Levee Failure

Jurisdiction(s) Affected: Lawrence County

Project Lead(s): Jurisdictional Chief Elected Officials/Planning Commissions

Funding Resource(s): Hazard Mitigation Grant Program, In-Kind (Work or Labor), Local Funds, Pre-Disaster Mitigation Grant

Mitigation Action Type(s): Planning

Vulnerability	Before Implementation	After Implementation	Difference
People	Unknown	Fewer at Risk	Fewer casualties/isolated
Infrastructure - new	All	None	100%
Structures - new	All	None	100%

Benefits	Costs
Increased public safety Decreased response and recovery costs	Study costs Elected official buy-in

5. Action: Require new/improved critical facilities to be elevated/flood protected to the 500-year flood level.

Critical facilities should have an extra level of protection.

Priority	Start Date	End Date	Estimated Cost	Current Status
2	10/15/2021	10/15/2026	Unknown	Unchanged

Hazards Addressed: Flooding

Jurisdiction(s) Affected: Lawrence County

Project Lead(s): Jurisdictional Chief Elected Officials/Planning Commissions

Funding Resource(s): Community Development Block Grant, Flood Mitigation Assistance Grant, Hazard Mitigation Grant Program, In-Kind (Work or Labor), Local Funds, Pre-Disaster Mitigation Grant

Mitigation Action Type(s): Elevation, Planning, Dry Floodproofing, Minor Localized Flood Reduction, Relocation, Retrofit, Reconstruction

Vulnerability	Before Implementation	After Implementation	Difference
People - receiving services	Unknown	Fewer at Risk	Fewer people without assistance

Benefits	Costs
Increased public safety	Unknown

6. Action: Develop improved logging practices.

Logging often increases the risk of landslides and flooding. Improved logging practices including Best Management Practices in construction of haul roads, drainage facilities and silt/sediment controls.

Priority	Start Date	End Date	Estimated Cost	Current Status
17	10/15/2021	10/15/2026	Unknown	Unchanged

Hazards Addressed: Flooding, Mud/Landslide, Severe Summer Storm/Thunderstorm/Windstorm/Hail

Jurisdiction(s) Affected: Lawrence County

Project Lead(s): Lawrence County Soil and Water Conservation District

Funding Resource(s): Hazard Mitigation Grant Program, In-Kind (Work or Labor), Local Funds, Pre-Disaster Mitigation Grant

Mitigation Action Type(s): Planning

Vulnerability	Before Implementation	After Implementation	Difference
Assets damaged by landslides	Unknown	Fewer at Risk	Fewer Damaged Assets

Benefits	Costs
Increased public safety Decreased damage to infrastructure Decreased response and recovery costs	Study costs SWCD buy-in Logger buy-in

7. Action: Identify and map areas and sites vulnerable to specific natural hazards.

Develop a county GIS map showing areas and specific sites vulnerable to natural hazards and make available to the public. Additional investigation and mapping is needed to determine where old mines are. Seek funding for mapping and subsurface investigations. There is a lack of or conflicting information of where the high hazard areas are. Identify landslide, mined areas and problem soil areas.

Priority	Start Date	End Date	Estimated Cost	Current Status
12	10/15/2021	10/15/2026	Unknown	Unchanged

Hazards Addressed: Flooding, Severe Winter Storm, Tornado, Earthquake, Drought, Wildfire, Land Subsidence, Mud/Landslide, Severe Summer Storm/Thunderstorm/Windstorm/Hail, Dam/Levee Failure

Jurisdiction(s) Affected: Lawrence County

Project Lead(s): Lawrence County EMA

Funding Resource(s): Hazard Mitigation Grant Program, In-Kind (Work or Labor), Local Funds, Pre-Disaster Mitigation Grant

Mitigation Action Type(s): Planning

Vulnerability	Before Implementation	After Implementation	Difference
All assets	Unknown	More accurate information	Not quantifiable

Benefits	Costs
Increased awareness	Study costs

F. Goal: Increase public awareness

1. Action: Develop an All-Hazards public education program.

Priority	Start Date	End Date	Estimated Cost	Current Status
3	10/15/2021	10/15/2026	Unknown	Unchanged

Hazards Addressed: Flooding, Severe Winter Storm, Tornado, Earthquake, Drought, Wildfire, Land Subsidence, Mud/Landslide, Severe Summer Storm/Thunderstorm/Windstorm/Hail, Infectious Disease, Dam/Levee Failure

Jurisdiction(s) Affected: Lawrence County

Project Lead(s): Lawrence County EMA

Funding Resource(s): Hazard Mitigation Grant Program, In-Kind (Work or Labor), Local Funds, Pre-Disaster Mitigation Grant

Mitigation Action Type(s): Planning, Public Education

Vulnerability	Before Implementation	After Implementation	Difference
People - Unaware of Hazards and Actions to Take	80%	50%	-30%

Benefits	Costs
Increased public safety Increased self-sufficiency Decreased response and recovery costs	EMA Staff Costs

2. Action: Educate the public on regulated Fire Burning Seasons and drought conditions as well as fire hazards created by disposal of debris.

Provide public notification of regulated Fire Burning Seasons and drought conditions to prevent ignition of wildfires either from unsupervised brush burning or failed camp fire extinguishment. Also to help regulate fire hazards created by disposal of debris.

Priority	Start Date	End Date	Estimated Cost	Current Status
14	10/15/2021	10/15/2026	Unknown	Unchanged

Hazards Addressed: Wildfire

Jurisdiction(s) Affected: Lawrence County

Project Lead(s): Jurisdictional Fire Chiefs; Lawrence County EMA

Funding Resource(s): Hazard Mitigation Grant Program, In-Kind (Work or Labor), Local Funds, Pre-Disaster Mitigation Grant

Mitigation Action Type(s): Planning, Public Education

Vulnerability	Before Implementation	After Implementation	Difference
Structures close to wildfire fuel	Unknown	Less	Fewer Damaged Structures

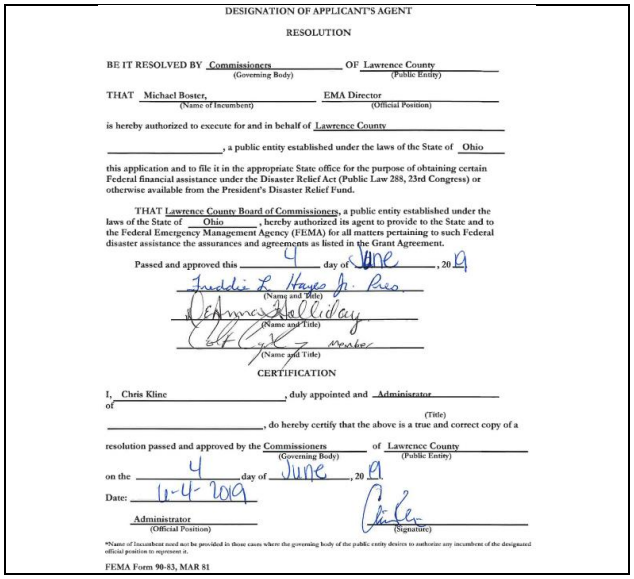
Benefits	Costs
Increased public safety Decreased response and recovery costs Decreased potential damage	Unknown

Section VIII – Supplemental Information

A. Meetings, Announcements and Correspondence

The following announcements and emails were sent out or posted to officially brief chief elected officials, gather data for inclusion in the updated plan, and make decisions on elements of the plan. Responses are noted in the Participating Agencies table in *Section II – The Planning Process*.

1. Commissioners' Resolution



DESIGNATION OF APPLICANT'S AGENT

RESOLUTION

BE IT RESOLVED BY Commissioners (Governing Body) OF Lawrence County (Public Entity)

THAT Michael Boster, (Name of Incumbent) EMA Director (Official Position)

is hereby authorized to execute for and in behalf of Lawrence County

, a public entity established under the laws of the State of Ohio

this application and to file it in the appropriate State office for the purpose of obtaining certain Federal financial assistance under the Disaster Relief Act (Public Law 288, 23rd Congress) or otherwise available from the President's Disaster Relief Fund.

THAT Lawrence County Board of Commissioners, a public entity established under the laws of the State of Ohio, hereby authorized its agent to provide to the State and to the Federal Emergency Management Agency (FEMA) for all matters pertaining to such Federal disaster assistance the assurances and agreements as listed in the Grant Agreement.

Passed and approved this 4 day of June, 20 19

Judd L. Hayes Jr. Pres. (Name and Title)

(Name and Title)

(Name and Title)

CERTIFICATION

I, Chris Kline, duly appointed and Administrator (Title) of

, do hereby certify that the above is a true and correct copy of a resolution passed and approved by the Commissioners (Governing Body) of Lawrence County (Public Entity)

on the 4 day of June, 20 19

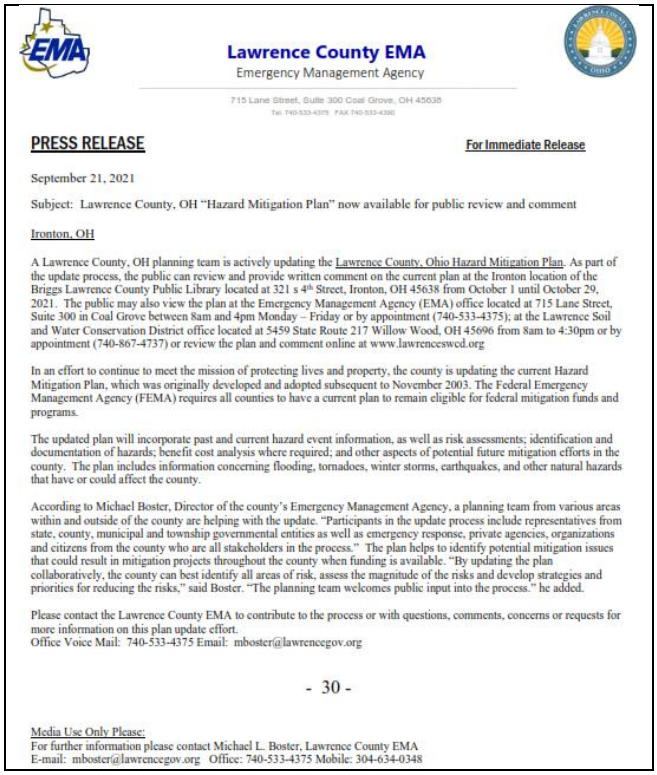
Date: 6-4-2019

Administrator (Official Position) (Signature)

*Name of Incumbent need not be provided in those cases where the governing body of the public entity desires to authorize any incumbent of the designated official position to represent it.

FEMA Form 90-83, MAR 81

2. Public Announcement



Lawrence County EMA
Emergency Management Agency

715 Lane Street, Suite 300 Coal Grove, OH 45638
Tel. 740-533-4375 FAX 740-533-4390

PRESS RELEASE **For Immediate Release**

September 21, 2021

Subject: Lawrence County, OH "Hazard Mitigation Plan" now available for public review and comment

Ironton, OH

A Lawrence County, OH planning team is actively updating the Lawrence County, Ohio Hazard Mitigation Plan. As part of the update process, the public can review and provide written comment on the current plan at the Ironton location of the Briggs Lawrence County Public Library located at 321 s 4th Street, Ironton, OH 45638 from October 1 until October 29, 2021. The public may also view the plan at the Emergency Management Agency (EMA) office located at 715 Lane Street, Suite 300 in Coal Grove between 8am and 4pm Monday – Friday or by appointment (740-533-4375); at the Lawrence Soil and Water Conservation District office located at 5459 State Route 217 Willow Wood, OH 45696 from 8am to 4:30pm or by appointment (740-867-4737) or review the plan and comment online at www.lawrenceswcd.org

In an effort to continue to meet the mission of protecting lives and property, the county is updating the current Hazard Mitigation Plan, which was originally developed and adopted subsequent to November 2003. The Federal Emergency Management Agency (FEMA) requires all counties to have a current plan to remain eligible for federal mitigation funds and programs.

The updated plan will incorporate past and current hazard event information, as well as risk assessments; identification and documentation of hazards; benefit cost analysis where required; and other aspects of potential future mitigation efforts in the county. The plan includes information concerning flooding, tornadoes, winter storms, earthquakes, and other natural hazards that have or could affect the county.

According to Michael Boster, Director of the county's Emergency Management Agency, a planning team from various areas within and outside of the county are helping with the update. "Participants in the update process include representatives from state, county, municipal and township governmental entities as well as emergency response, private agencies, organizations and citizens from the county who are all stakeholders in the process." The plan helps to identify potential mitigation issues that could result in mitigation projects throughout the county when funding is available. "By updating the plan collaboratively, the county can best identify all areas of risk, assess the magnitude of the risks and develop strategies and priorities for reducing the risks," said Boster. "The planning team welcomes public input into the process." he added.

Please contact the Lawrence County EMA to contribute to the process or with questions, comments, concerns or requests for more information on this plan update effort.
Office Voice Mail: 740-533-4375 Email: mboster@lawrencegov.org

- 30 -

Media Use Only Please:
For further information please contact Michael L. Boster, Lawrence County EMA
E-mail: mboster@lawrencegov.org Office: 740-533-4375 Mobile: 304-634-0348

3. Kick-Of Meeting

a. Kick-Off Meeting Talking Paper

RDI SOLUTIONS, LLC
"From Concept to Implementation"
Homeland Security/Emergency, Business, Project & Information Systems Planning & Management
A Service-Connected Disabled Veteran-Owned Small Business
65238 Infirmary Rd
McArthur, Ohio 45651
Office/Cell/Text: (740) 418-1598
Fax: (740) 994-8463
Email: main@rdisolutions.org

Mitigation Planning Kick-Off Meeting
Talking Paper

What is Mitigation?

Mitigation is the effort to reduce loss of life and property by lessening the impact of disasters. For mitigation to be effective we need to take action now – before the next disaster – reduce human and financial consequences later (analyzing risk, reducing risk, and insuring against risk).

What are the Benefits of Mitigation?

- Identifying actions for risk reduction that are agreed upon by stakeholders and the public.
- Focusing resources on the greatest risks and vulnerabilities.
- Building partnerships by involving citizens, organizations, and businesses.
- Increasing education and awareness of threats and hazards, as well as their risks.
- Communicating priorities to State and Federal officials.
- Aligning risk reduction with other community objectives.

What's the Real Value of Mitigation?

- It creates safer communities by reducing loss of life and property damage. For example, the rigorous building standards adopted by 20,000 communities across the country are saving the nation more than $1.1 billion a year in prevented flood damages.
- It allows individuals to minimize post-flood disaster disruptions and recover more rapidly. For example, homes built to NFIP standards incur less damage from floods. When floods cause damage, flood insurance protects the homeowner's investment, as it did for the more than 200,000 Gulf Coast residents who received more than $23 billion in payments following the 2005 hurricanes.
- It lessens the financial impact on individuals, communities, and society as a whole. For example, a recently updated study by the National Institute of Building Sciences shows that federally funded mitigation grants, on average, can save the nation $6 in future disaster costs for every $1 spent on hazard mitigation. The report also demonstrates for the first time that, on average, investments made by local communities and homeowners in hazard mitigation measures that exceed standard building codes can save the nation $4 for every $1 spent.

What's the Benefit Having a FEMA-Approved Mitigation Plan?

The purpose of the Stafford Act, as amended by the Disaster Mitigation Act of 2000, is "to reduce the loss of life and property, human suffering, economic disruption, and disaster assistance costs resulting from natural disasters." Section 322 requires state and local governments to prepare multi-hazard mitigation plans as a precondition for receiving FEMA mitigation project grants.

Who's Involved in County Mitigation Planning?

"Stakeholders":

- Emergency management (including adjacent jurisdictions)
- Chief and other elected officials

- Agencies with responsibilities related to hazards
- Agencies with regulatory authority in/affecting your county
- Agencies (all levels of government) involved in mitigation for your county
- Groups that may be affected by your mitigation actions or policies
- Any others that add value to the process
- The public

What's the Mitigation Planning Process?

- Organize Resources
  - Access Community Support
    - Is the community ready?
    - Gain support
  - Build the Hazard Mitigation Planning Team
    - Representatives from those involved (above)
  - Engage the public
    - Marketing, media, social media, outreach, feedback
- Assess Risks
  - Identify hazards
  - Identify affected community assets
  - Analyze risk
  - Summarize vulnerability
- Develop Goals, Actions and Priorities
  - Establish mitigation goals
  - Identify and prioritize mitigation actions
  - Prepare implementation strategy
- Assemble the plan
- Implement the plan and monitor progress
  - Adopt the plan – commissioners and mayors/councils
  - Implement the plan
  - Monitor progress
  - Revise the plan

What's Your Involvement in the Mitigation Planning Process?

- Mitigation Planning Team
  - Understand mitigation and the planning process (Kick-Off Meeting)
  - Participate in hazard and risk analysis (Hazards Meeting)
  - Participate in mitigation goals and actions development (Actions Meeting)
- Commissioners and Mayors/Councils
  - Understand mitigation and the planning process (Kick-Off Meeting)
  - Participate in the process
  - Adopt and implement the plan
- Other Stakeholders
  - Understand mitigation and the planning process (Kick-Off Meeting)
  - Provide input as requested and as seen fit
- Consultant
  - Keep process on track
  - Prepare documents and worksheets for Planning Team to review, provide information and make decisions (All meetings)
  - Document the process and assemble the plan

What Meetings are Held?

- Kick-Off Meeting
  - Present the information in this talking paper
  - Answer questions
- Hazards Meeting
  - Identify hazards
  - Identify affected assets
  - Prioritize hazards by risk (usually done by email after above information is assimilated)
- Actions Meeting
  - Identify Goals
  - Evaluate actions from previous plan
  - Add new actions
  - Prioritize actions (usually done by email after above information is assimilated)

What are Acceptable Alternate Forms of Participation?

For those who cannot attend meetings or when in-person meetings cannot be held, the following are acceptable alternatives:

- Webinars
- Conference calls
- Direct phone calls
- Email exchanges
- Postal mail
- Surveys

What Does a Mitigation Plan Look Like?

- Cover & Table of Contents
- Executive Summary
  - 1-2-page quick read
- Introduction
  - A lot of overhead material
- The Planning Process
  - Describes each step
  - Identifies participants, public involvement, meetings, analysis and results
- Community Profile
  - Describes geography, climate, demographics and other things that make the county unique
- Hazards
  - Identifies hazards affecting community assets
  - Profiles identified natural hazards
  - Ranks hazards based on impact on assets
- Mitigation Goals & Actions
  - Identifies goals
  - Identifies actions to achieve these goals
  - Always starts with actions from previous plan
  - Prioritizes actions
- Supplemental Information
  - Anything that adds value to the plan

Author:
David Pollinger, Owner/Consultant
RDI Solutions LLC
Current as of February 2021

b. Kick-Off Meeting Email

RDI Solutions

From: Lawrence Ema <lawcoohema@gmail.com>
Sent: Wednesday, June 9, 2021 2:54 PM
To: Lonnie Best; Patrick Leighty; Peggy Reynolds; Kim Carrico; napawillie385@yahoo.com; Kim Oldaker; Gary Sherman; Carol Goldcamp; HangingRock Mayor; Samuel Cramblit; Darrell L. Legg; mayorgaskin@zoominternet.net; Terri Smith; jeff joseph; pville532000 @yahoo.com; Cindy Anderson; Gaskin, Adam G CIV (USA); riehl@ohio.edu; rubaduep@lawrencecountyengineer.org; Tim Dickens; Michael Mahlmeister; Lori Morris; Kathy Bamer; Chris Kline; rodneylittlejohn@hotmail.com; coxr3960@gmail.com; rcox5151@gmail.com; superior.construction@hotmail.com; Adam Gilmore; jestep248 @icloud.com; malone.matt@att.net; bmayokitchens@hotmail.com; trustmays2004 @gmail.com; pacgoalie12@yahoo.com; Craig Thomas; ohiotinyhomes@gmail.com; hazelhumphrey@yahoo.com
Cc: RDI Solutions
Subject: Invitation to assist Lawrence County in updating it's Hazard Mitigation Plan
Attachments: Stakeholder Letter.doc; Kick-Off Meeting Talking Paper.pdf

June 8, 2021

To: Mitigation Plan Stakeholders
From: Michael L. Boster, Director

The Lawrence County EMA is required to update the Lawrence County All Hazards Mitigation Plan. You have been identified as a stakeholder in this process – someone in a position of authority to implement mitigation actions, has expertise in assessing the impact of hazards on our community, or ways of lessening or eliminating the impacts.

How does it all work?

A "Kick-Off Meeting" will be set up to gather together the stakeholders in this process and present what mitigation is, its value, and to discuss the plan update process. We have engaged the services of a planning contractor, RDI Solutions, to facilitate this process.

Due to the pandemic, travel issues / restrictions, meeting guidance, and participation efficiency, we will be holding our "Kick-Off Meeting" via email. Subsequent meetings could be held via email, virtual platforms, conference calls, postal mail, webinars, or in person. Attached is a talking paper discussing what would be presented at a face-to-face meeting.

Please review the attached Kick-Off Meeting Talking Paper and, by return email (reply all), confirm that you read it.

Lawrence County EMA Email Address - LawCoOHema@gmail.com

Also, you submit back any questions you may have by email or simply call the EMA Office.

Respectfully,

Michael L. Boster, Director
Lawrence Co Emergency Management Agency
Office Phone – 740-533-4375
Office Fax – 740-533-4390
Cell Phone – 304-634-0348

Copy: FILE
RDI Solutions, David Pollinger

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Lawrence County Emergency Management Agency
715 Lane Street, Suite 300, Coal Grove, OH 45638
740-533-4375 voice
740-533-4390 fax

Michael L. Boster, Director

2

Lawrence County EMA
Emergency Management Agency
715 Lane Street, Suite 300 Coal Grove, OH 45638
Tel. 740-533-4375 FAX 740-533-4390

June 8, 2021

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Please review the Kick-Off Meeting Talking Paper and, by return email (reply all), confirm that you read it.

Lawrence County EMA Email Address - LawCoOHema@gmail.com

Also, you submit back any questions you may have by email or simply call the EMA Office.

Respectfully,

Michael L. Boster, Director
Lawrence County Emergency Management Agency

Office Phone – 740-533-4375
Office Fax – 740-533-4390
Cell Phone – 304-634-0348
Address in Letterhead

Copy FILE
RDI Solutions, David Pollinger

Lawrence County EMA
Emergency Management Agency
715 Lane Street, Suite 300 Coal Grove, OH 45638
EMA: Tel. 740-533-4375 Fax 740-533-4390

June 14, 2021

To: Larry Mullins, Director Scioto County EMA
Robert Czechlewski, Director Jackson County EMA and Homeland Security
Sherry Daines, Director Gallia County EMA
Garth Wireman, Director Greenup County OEM
Tim England, Director Boyd County OEM
BJ Willis, Director Wayne County EM
Gordon Merry, Director Cabell County OES

From: Michael L. Boster, Director Lawrence County EMA
Subject: Lawrence County (All-Natural Hazards) Hazard Mitigation Plan update process

The purpose of this letter is to notify you that the Lawrence County is actively updating the **Lawrence County, Ohio Hazard Mitigation Plan**. This is a required notification to adjacent communities about these actions.

In an effort to continue to meet the mission of protecting lives, property, economic interests and quality of life for the people of Lawrence County, the county is updating the current Hazard Mitigation Plan originally developed and adopted subsequent to November 2003. This is a required FEMA update to remain eligible for federal mitigation funds and programs.

The updated plan will incorporate past and current hazard event information, as well as risk assessments, identification and documentation of hazards, cost / benefit analysis where required, and other aspects of potential future mitigation efforts in the county. Included will be information concerning flooding, tornadoes, winter storms, earthquakes, and other natural hazards that have or could affect the county.

Participants in the update process will include state, county, municipal and township governmental entities as well as emergency response, private agencies, organizations and individuals who are stakeholders in the process. By updating the plan collaboratively, the county can best identify all areas of risk, assess the magnitude of the risks and develop strategies and priorities for reducing the risks. The county, as well as all municipal jurisdictions will be participating in the update process.

Please contact the Lawrence County EMA as necessary to contribute to the process, or, with any questions, comments, concerns or requests for more information on this plan update effort.

Sincerely,

Michael L. Boster, Director
Lawrence Emergency Management Agency

CC: FILE

4. Hazards Identification and Ranking

a. Instructions and Worksheets

"From Concept to Implementation"
Homeland Security/Emergency, Business, Project & Information Systems Planning & Management
RDI SOLUTIONS, LLC
A Service-Connected Disabled Veteran-Owned Small Business

65238 Infirmary Rd
McArthur, Ohio 45651
Office/Cell: (740) 418-1598
Fax: (740) 994-8463
Email: main@rdisolutions.org

July 12, 2021

Memorandum for: Lawrence County Mitigation Planning Team

Re: Mitigation Plan Update – Hazard Identification and Ranking

All,

We need to rank the identified hazards in order of impact on county assets – people, structures, infrastructure, economy. Relying your experience and knowledge of each hazard, rank the identified hazards based on impact on assets tempered by the frequency of their occurrence. For example:

- Major flooding may have a significant impact on people (isolation and potential injuries or deaths), infrastructure (washed out roads, culverts or bridges), and structures (water in structures particularly those in flood-prone areas); with a high frequency, this would rank high.
- A 5.0 earthquake would have devasting effects on assets; with a low probability of occurrence, this would probably rank in the mid-range.

I've added two hazards that weren't addressed in the 2015 plan: Dam/Levee Failure and Infectious Disease (aka pandemic, COVID-19). If you see these as hazards affecting Lawrence County, include them in your ranking. Also, if there are other hazards you believe to affect Lawrence County, add them at the end of the table and include them in your ranking.

As we receive your completed worksheets, I'll tally the results and average the rankings and perform some statistical analysis. If the collective rankings are relatively close to the whole, we will go with them. Otherwise, Mike Boster and I will take action to resolve the differences.

Please return these worksheets as soon as you can. Contact us if you have any questions.

Respectfully,

David J Pollinger
Senior Analyst/Consultant

Hazard Ranking Worksheet

Using your experience and knowledge of each hazard, rank the identified hazards based on impact on assets tempered by the frequency of their occurrence.

Hazard	2015 Plan Ranking	My Ranking	Notes
Flooding	1		
Severe Winter Storm	2		
Tornado	3		
Earthquake	4		
Drought	5		
Wildfire	6		
Land Subsidence	7		
Mud/Landslide	8		
Severe Summer Storm/ Thunderstorm/Windstorm/Hail	9		
Dam/Levee Failure	N/A		
Infectious Disease	N/A		

b. Email

RDI Solutions

From: Lawrence Ema <lawcoohema@gmail.com>
Sent: Friday, July 30, 2021 7:12 PM
To: Lonnie Best; Patrick Leighty; Peggy Reynolds; Kim Carrico; Willie Ward; Kim Oldaker; Gary Sherman; Carol Goldcamp; HangingRock Mayor; Samuel Cramblit; Darrell L. Legg; Jeff Gaskin; Terri Smith; Rick Dunfee; Cindy Anderson; Gaskin, Adam G CIV (USA); Riehl, Adam; rubaduep@lawrencecountyengineer.org; Tim Dickens; Michael Mahlmeister; Lori Morris; Kathy Bamer; Chris Kline; rodneylittlejohn@hotmail.com; Ronnie Cox; Rick Cox; Mike Finley; Adam Gilmore; Odie Estep (jestep248@icloud.com); matt malone; Bob Mayo; Cecil Mays; Cole Webb; Craig Thomas; Charles Michael Freeman; Hazel Humphrey (hazelhumphrey@yahoo.com); RDI Solutions; jeff joseph; Tony Edwards - NOAA Federal
Subject: Mitigation Plan Update process - HAZARD RANKING WORKSHOP ONLINE
Attachments: Hazard Ranking Workshop.pdf

Re: Mitigation Plan Update – Hazard Identification and Ranking

All,
We need to rank the identified hazards in order of impact on county assets. Relying your experience and knowledge of each hazard, rank the identified hazards based on impact on assets tempered by the frequency of their occurrence. For example: • Major flooding may have a significant impact on people (isolation and potential injuries or deaths), infrastructure (washed out roads, culverts or bridges), and structures (water in structures particularly those in flood-prone areas); with a high frequency, this would rank high. • A 5.0 earthquake would have devastating effects on assets; with a low probability of occurrence, this would probably rank in the mid-range. As we receive your completed worksheets, I'll tally the results and average the rankings and perform some statistical analysis. If the collective rankings are relatively close to the whole, we will go with them. Otherwise, Karen, Tom and I will take action to resolve the differences. Please return these worksheets as soon as you can. Contact us if you have any questions.

TO PARTICIPATE:

- PRINT THE ATTACHED LETTER AND WORKSHEET
- ON PAGE 2, ENTER YOUR RANKING SCORES ON THE WORKSHEET
- PHOTOGRAPH, SCAN, IMAGE YOUR WORKSHEET
- EMAIL THE WORKSHEET BACK TO: Mike Boster at: LawCoOHema@gmail.com and to Dave Pollinger at: main@rdisolutions.org
- or FAX YOUR WORKSHEET BACK TO EMA AT 740-533-4390

We appreciate all your help!

Respectfully,

David J Pollinger Senior Analyst/Consultant - RDI Solutions, LLC

Michael Boster, EMA Director

Lawrence County Emergency Management Agency
715 Lane Street, Suite 300 Coal Grove, OH 45638

5. Mitigation Actions Review

a. Instructions and Worksheets

RDI SOLUTIONS, LLC
"From Concept to Implementation"
Homeland Security/Emergency, Business, Project & Information Systems Planning & Management
A Service-Connected Disabled Veteran-Owned Small Business
65238 Infirmary Rd
McArthur, Ohio 45651
Office/Cell: (740) 418-1598
Fax: (740) 994-8463
Email: main@rdisolutions.org

September 21, 2021

Memorandum for: Mitigation Planning Team

Re: Mitigation Goals and Actions Review

Greetings!

Based on averaging your individual hazard rankings, here are the averaged hazards' rankings:

- Flooding
- Severe Winter Storm
- Severe Summer Storm
- Tornado
- Infectious Disease
- Mud/Landslide
- Drought
- Wildfire
- Land Subsidence
- Earthquake
- Dam/Levee Failure

The next step is to develop actions to mitigate the impacts of these hazards.

We'll start with the actions from the 2015 plan. These are listed on the next three pages. For each existing action that pertains to your area of expertise or experience:

- If the action has been completed, note "COMPLETED" in the total cost column.
- If the action is no longer viable. note "DELETE" in the total cost column.
- As you have knowledge of the impacted locations, estimate the Number of Sites, Average Cost to Fix a Site, and Total Cost (as they apply to the action) in your jurisdiction.
- The actions marked "County-wide" are shown for information only.

Next, identify any new actions you'd like to add to the plan. Use the New Action form. There is a Mitigation Action fact sheet that should help you in identifying new actions.

Thanks for your interest, time and effort to make Lawrence County a safer place to live and work.

Respectfully,

David J Pollinger
Senior Analyst/Consultant

Lawrence County Mitigation Plan Update Mitigation Action Data Collection Worksheet

Name	Jurisdiction/Agency

Action	Nbr Sites	Ave Cost Each	Total Cost
Develop back-up plans in case of public safety communication failure. Communication systems often fail during disaster events.	County-wide		
Develop an All-Hazards public education program.	County-wide		
Design and implement a comprehensive public emergency notification system. There are no severe storm warning sirens throughout the county.	County-wide		
Idenitfy emergency shelters.	County-wide		
Educate the public on regulated Fire Burning Seasons and drought conditions as well as fire hazards created by disposal of debris. Provide public notification of regulated Fire Burning Seasons and drought conditions to prevent ignition of wildfires either from unsupervised brush burning or failed camp fire extinguishment. Also to help regulate fire hazards created by disposal of debris.	County-wide		
Mitigate structures at risk.			
Develop and adopt anchoring criteria for objects that can become hazardous during natural hazard events and assist residents with anchoring these items. Mobile homes are more prone to high wind damage. Propane tanks can become airborne during a tornado or float away during flooding events, causing an additional explosion hazard. Seek funding for anchoring of existing mobile homes.	County-wide		
Evaluate and repair levees and their flood control systems. Reevaluate floodwall work with USACE. The floodwall pump stations control systems are failing and replacement parts are not available. Replace floodwall pump station control system.			
Update dam Emergency Action Plans, update inundation data for dams without EAPs or no current inundation data. Create an EAP for each small dam on private property using Standards of the International Committee of Dam Safety (ICODS), developed in compliance with OAC requirements and including an update of the design floods and the downstream hazards. There is a lack of maintenance of the dams. Coordinate with ODNR Division of Water regarding lack of maintenance and inspection of dams. There are dams that have been constructed without review or state oversight. Identify dams throughout county to determine if they fall under state regulation. Findings to be provided to ODNR and to dam owners.			

Action	Nbr Sites	Ave Cost Each	Total Cost
Identify and advise responsible parties of required maintenance of trees in utility right-of-way areas. Trees are often destroyed in high winds and ice storms, taking down power and communication lines.			
Identify areas where additional utility cutoffs are needed to isolate utility systems. Utility lines are often damaged during earthquakes, increasing risks to people and structures.			
Developing building codes in jurisdictions without building codes. Buildings are not properly constructed to resist the forces and elements that can be encountered during a natural disaster event. This is due to a lack of a local building code and inspection system.			
Require new/improved critical facilities to be elevated/flood protected to the 500-year flood level. Critical facilities should have an extra level of protection.	County-wide		
Identify areas where fire break lines are needed and create them.			
Design back-flow prevention in areas of combined storm/sanitary sewers. Combined sanitary sewers often fill with flood waters, which then back up into structures.			
Coordinate with NRCS to develop improved logging practices. Logging often increases the risk of landslides and flooding. Coordinate with NRCS to improve logging practices including Best Management Practices in construction of haul roads, drainage facilities and			
Identify and map areas and sites vulnerable to specific natural hazards. Develop a county GIS map showing areas and specific sites vulnerable to natural hazards and make available to the public. Additional investigation and mapping is needed to determine where old mines are. Seek funding for mapping and subsurface investigations. There is a lack of or conflicting information of where the high hazard areas are. Identify landslide, mined areas and problem soil areas.	County-wide		
Develop inventory assets available for responding to and recovering from major hazard occurences. Adopt a resolution requiring all government agencies in the county to provide a list of typed equipment and assets along with qualifications and certifications of employees and personnel that can be used by our county Emergency Management office during major events. Develop a list of equipment resources and contractors available. This information should be uploaded and managed by the NIMS Incident Resource Inventory System (IRIS).	County-wide		

Lawrence County Mitigation Plan Update Mitigation Action Data Collection Worksheet

Name	Jurisdiction/Agency

NEW ACTIONS

New Action	Nbr Sites	Ave Cost Each	Total Cost

Mitigation Actions

A mitigation action is a specific action, project, activity, or process taken to reduce or eliminate long-term risk to people and property from hazards and their impacts. Implementing mitigation actions helps achieve the plan's mission and goals. The actions to reduce vulnerability to threats and hazards form the core of the plan and are a key outcome of the planning process.

Types of Mitigation Actions

The primary types of mitigation actions to reduce long-term vulnerability are:

- Local plans and regulations
- Structural projects
- Natural systems protection
- Education programs
- Preparedness and response actions

Local Plans and Regulations

Local land use or comprehensive plans embody the goals, values and aspirations of the community, as expressed through a process of community engagement. The plan should identify current development patterns and trends as well as areas where future development should and should not occur. The plan should include policies and ordinances that steer development away from hazard-prone areas, such as floodplains, to avoid putting people and property at risk. In some cases, local plans can work at cross-purposes. For example, a capital improvement plan may call for extending water and sewer lines to an area that is vulnerable to natural hazards. Emergency managers, planners and others in a community should coordinate in preparing plans to ensure consistency across plans; that is, consistent goals, policies, and strategies.

Local ordinances and review processes influence the way land and buildings are developed and built. Examples include:

- Comprehensive plans
- Land use ordinances
- Subdivision regulations
- Development review
- Building codes and enforcement
- NFIP Community Rating System
- Capital improvement programs
- Open space preservation
- Stormwater management regulations and master plans
- Plans, ordinances, policies and regulations should be mutually reinforcing. All should leave to the development of a more sustainable, resilient community.

Structure and Infrastructure Projects

These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards. Many of these types of actions are projects eligible for funding through the FEMA Hazard Mitigation Assistance program. Task 9 – Create a Safe and Resilient Community provides more information on these programs. Examples include:

- Acquisitions and elevations of structures in flood prone areas
- Utility undergrounding
- Structural retrofits.
- Floodwalls and retaining walls
- Detention and retention structures
- Culverts
- Safe rooms

Natural Systems Protection

These are actions that minimize damage and losses and also preserve or restore the functions of natural systems. Examples include:

- Sediment and erosion control
- Stream corridor restoration
- Forest management
- Conservation easements
- Wetland restoration and preservation

Education and Awareness Programs

These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady1 or Firewise2 Communities. Although this type of mitigation reduces risk less directly than structural projects or regulation, it is an important foundation. A greater understanding and awareness of hazards and risk among local officials, stakeholders, and the public is more likely to lead to direct actions. Examples include:

- Radio or television spots
- Websites with maps and information
- Real estate disclosure
- Presentations to school groups or neighborhood organizations
- Mailings to residents in hazard-prone areas.
- StormReady
- Firewise Communities

Preparedness and Response Actions

Mitigation actions reduce or eliminate long-term risk and are different from actions taken to prepare for or respond to hazard events. Mitigation activities lessen or eliminate the need for preparedness or response resources in the future. When analyzing risks and identifying mitigation actions, the planning team may also identify emergency response or operational preparedness actions. Examples include:

- Creating mutual aid agreements with neighboring communities to meet emergency response needs.
- Purchasing radio communications equipment for the Fire Department.
- Developing procedures for notifying citizens of available shelter locations during and following an event.
- For some hazards, such as tornadoes, including preparedness actions in the mitigation plan may be necessary and practical. The mitigation plan may be the best place for your community to capture and justify the need for these actions. However, these will not take the place of or meet the federal mitigation planning requirements for identifying mitigation actions. It is important that the planning team understands the difference and can distinguish between mitigation and other emergency management activities.

b. Email

RDI Solutions

From: Lawrence Ema <lawcoohema@gmail.com>
Sent: Friday, September 24, 2021 7:23 PM
To: Lonnie Best; Patrick Leighty; Peggy Reynolds; Kim Carrico; Carol Goldcamp; jeff joseph; Cindy Anderson; ralph kline; Riehl, Adam; Gaskin, Adam G CIV (USA); Tony Edwards - NOAA Federal; rubaduep@lawrencecountyengineer.org; Tim Dickens; Michael Mahlmeister; Lori Morris; Kathy Bamer; rodneylittlejohn@hotmail.com; Ronnie Cox; Rick Cox; Mike Finley; Bentley Kerns Sr. (kernsplumbing@yahoo.com); Adam Gilmore; jeff estep; Douglas Matt Malone; Bob Mayo; Cecil Mays; Cole Webb; Craig Thomas; Charles Michael Freeman; Norman Hazel Humphrey
Cc: RDI Solutions; Chris Kline; Katrina Keith; DeAnna Holliday
Subject: Mike Boster - URGENT TIME SENSITIVE Action Items needed
Attachments: 1_Mitigation Grant Oct 2018 Letter to participate.docx; 2_Kick-Off Meeting Talking Paper(5).pdf; 3_Hazard Ranking Workshop.pdf; 4_Mitigation Actions Review.docx; 5 _Mitigation Actions Review.pdf

HAZARD MITIGATION PLANNING TEAM:

DEADLINE - PLEASE- FRIDAY, OCTOBER 1, 2021
Who? Planning Team Members - Municipal jurisdictions
What? Review and Respond by email to the attached document No. 4
Where? Document attached - Email return
When? By Friday, October 1, 2021 deadline
How? Please read below for more information

First, THANK YOU!

Over the past several months we have been working to update the county Hazard Mitigation Plan. We as a county are mandated by FEMA / Federal statutes to maintain-current the plan to be eligible for any Federal Mitigation Funds.

The good news is we have made good progress and are nearing the end of the process; however, there are still **important and necessary** documents for our planning team and our chief elected officials to review and provide feedback.

IT IS IMPORTANT that each planning team member and municipality participates - (chief elected official (Mayor) or designee) - because capturing your work, your email replies and responses shows that you participated along with the county in the planning process. FEMA requires that we document your participation

Later on, after FEMA approves the plan, the county, city / villages will need to adopt the plan by resolution. I will provide sample template documents to help with that process later.

REVIEW AND RESPOND TO **DOCUMENT NO. 4** (5 is the PDF version of 4) "MITIGATION ACTIONS REVIEW"

Page 1 lays out what we are asking you to do with Document No. 4

Once you have completed the Mitigation Actions Review, may I ask that you email your completed work back to me and the planning contractor by Friday, October 1, 2021

LawCoOHema@gmail.com

and CC our planning contractor Davd Pollinger, RDI Solutions

main@rdisolutions.org

The other documents are added showing what we have done already (No. 1,2,3)
YOU MAY SIMPLY ACKNOWLEDGE IN YOUR RETURN EMAIL / REPLY THAT YOU HAVE RECEIVED AND REVIEWED IF YOU HAVE NOT DONE SO ALREADY:

* Letter to Participate
* Kick Off Meeting Talking Paper
* Hazard Ranking Workshop (if you returned this THANK YOU!)

Note: If you would like a copy of the Lawrence County 2015 Hazard Mitigation Plan (expiring plan) emailed to you separately to look over let me know. Its a large digital document

Once again, I sincerely appreciate each of you and your attention to this project.

Respectfully.

Michael L. Boster

--
Lawrence County Emergency Management Agency
715 Lane Street, Suite 300 Coal Grove, OH 45638
740-533-4375 voice
740-533-4390 fax

Michael L. Boster, Director

RDI Solutions

From: Lawrence Ema <lawcoohema@gmail.com>
Sent: Friday, September 24, 2021 7:06 PM
To: Willie Ward; Kim Oldaker; Gary Sherman; Carol Goldcamp; HangingRock Mayor; Samuel Cramblit; Rick Dunfee; Terri Smith; Jeff Gaskin; Darrell L. Legg
Cc: Chris Kline; Katrina Keith; DeAnna Holliday; RDI Solutions
Subject: Mike Boster - URGENT TIME SENSITIVE Action Items needed
Attachments: 1_Mitigation Grant Oct 2018 Letter to participate.docx; 2_Kick-Off Meeting Talking Paper(5).pdf; 3_Hazard Ranking Workshop.pdf; 4_Mitigation Actions Review.docx; 5 _Mitigation Actions Review.pdf

MAYORS and Chief Elected Officials:

DEADLINE - PLEASE FRIDAY, OCTOBER 1, 2021
Who? Mayors or designees
What? Review and Respond by email to the attached document No. 4
Where? Document attached - Email return
When? By Friday, October 1, 2021 deadline
How? Please read below for more information

First, THANK YOU!

Over the past several months we have been working to update the county Hazard Mitigation Plan. We as a county are mandated by FEMA / Federal statutes to maintain-current the plan to be eligible for any Federal Mitigation Funds.

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IT IS IMPORTANT that each municipality participates - chief elected official (Mayor) or designee - because capturing your work, your email replies and responses shows that your jurisdiction participated along with the county in the planning process. FEMA requires that we document your participation

Later on, after FEMA approves the plan, your city / village will need to adopt the plan by resolution. I will provide sample template documents to help with that process later.

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LawCoOHema@gmail.com

and CC our planning contractor Davd Pollinger, RDI Solutions

main@rdisolutions.org

1

The other documents are added showing what we have done already (No. 1,2,3)
YOU MAY SIMPLY ACKNOWLEDGE IN YOUR RETURN EMAIL / REPLY THAT YOU HAVE RECEIVED AND REVIEWED:

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* Hazard Ranking Workshop (if you returned this THANK YOU!)

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Once again, I sincerely appreciate each of you and your attention to this project.

Respectfully.

Michael L. Boster

Lawrence County Emergency Management Agency
715 Lane Street, Suite 300 Coal Grove, OH 45638
740-533-4375 voice
740-533-4390 fax

Michael L. Boster, Director

6. Mitigation Actions Prioritization

a. Instructions and Worksheets

RDI SOLUTIONS, LLC
"From Concept to Implementation"
Homeland Security/Emergency, Business, Project & Information Systems Planning & Management
A Service-Connected Disabled Veteran-Owned Small Business

65238 Infirmary Rd
McArthur, Ohio 45651
Office/Cell: (740) 418-1598
Fax: (740) 994-8463
Email: main@rdisolutions.org

October 4, 2021

Memorandum for: Mitigation Planning Team

Re: Mitigation Action Prioritization

Greetings!

You've validated the list of mitigation actions. The next step is to prioritize the actions based on the importance of action to the county from your perspective and cost versus benefits. It's important to understand that this prioritization is not binding; it's a tool for you to use in deciding which actions to submit as projects when funding becomes available.

Attached are two pages of actions, each with expected benefits and estimated costs. Please review each one and, prioritizing as stated above, assign a numeric priority to each. Then return it to Mike Boster and me.

Once prioritization is complete, I'll assemble the complete plan for your review.

Thanks for your interest, time and effort to make Lawrence a safer place to live and work. Standing by for your input.

Respectfully,

David J. Pollinger
Senior Analyst/Consultant

Lawrence County 2021 Mitigation Plan Update **Jurisdiction/Agency/Name**

Mitigation Action Prioritization Worksheet

Action	Benefits	Costs	Priority
Develop back-up plans in case of public safety communication failure.	Increased public safety	Unknown	
Develop an All-Hazards public education program.	Increased public safety Increased self-sufficiency Decreased response and recovery costs	EMA Staff Costs	
Design and implement a comprehensive public emergency notification system.	Increased public awareness	$50k/yr	
Identify emergency shelters.	Locally-accessible shelters Increased public safety Increased self-sufficiency	$5k	
Educate the public on regulated Fire Burning Seasons and drought conditions as well as fire hazards created by disposal of debris.	Increased public safety Decreased response and recovery costs Decreased potential damage	Unknown	
Mitigate structures at risk.	Decreased isolation Increased public safety Decreased response and recovery costs Community-owned green space Decreased response and recovery costs	Buy-in and funding by elected officials and property owners	
Develop and adopt anchoring criteria for objects that can become hazardous during natural hazard events and assist residents with anchoring these items..	Increased public safety Decreased response and recovery costs	Study costs Elected official buy-in	
Evaluate and repair levees and their flood control systems.	Flooding prevention Increased public safety Decreased response and recovery costs	Unknown	
Update dam Emergency Action Plans, update inundation data for dams without EAPs or no current inundation data.	Reduced people, businesses, other assets at risk	Dam owner buy-in Study costs	
Identify and advise responsible parties of required maintenance of trees in utility right-of-way areas.	Increased public safety Decreased response and recovery costs	Responsible party buy-in	

Action	Benefits	Costs	Priority
Identify areas where additional utility cutoffs are needed to isolate utility systems.	Increased public safety Decreased response and recovery costs	Study costs Utility company buy-in	
Developing building codes in jurisdictions without building codes.	Increased public safety Decreased response and recovery costs	Study costs Elected official buy-in	
Require new/improved critical facilities to be elevated/flood protected to the 500-year flood level.	Increased public safety	Unknown	
Identify areas where fire break lines are needed and create them.	Increased public safety Decreased response and recovery costs	Study costs Property owner buy-in	
Design back-flow prevention in areas of combined storm/sanitary sewers.	Increased public safety Decreased response and recovery costs	Unknown	
Coordinate with NRCS to develop improved logging practices.	Increased public safety Decreased damage to infrastructure Decreased response and recovery costs	Study costs NRCS buy-in Logger buy-in	
Identify and map areas and sites vulnerable to specific natural hazards.	Increased awareness	Study costs	
Develop inventory assets available for responding to and recovering from major hazard occurences.	Quicker and more cost-effective response and recovery actions	Study costs	
Develop and stock a warehousing system for storing a 30-day supply of PPE	Increased responder and essential personnel safety. Increased public safety Increased self-reliance	$50k	
Develop a non-congregate quarantine care plan	Increased public safety Ability to quickly implement a quarantine	EMA Staff Costs	

7. Jurisdictional Participation

a. Village of Athalia

Non-Participating

b. Village of Chesapeake

Non-Participating

c. Village of Coal Grove

RDI Solutions

From: Michael Boster <michael_bosterema@yahoo.com>
Sent: Wednesday, September 29, 2021 1:56 PM
To: RDI Solutions
Subject: Fw: Lawrence County - Mitigation Planning deadline approaching

Village of Coal Grove response

Michael Boster, Director
Lawrence County Emergency Management Agency

715 Lane Street, Suite 300
Coal Grove, OH 45638

740-533-4375

----- Forwarded Message -----
From: Gary S <fchief401421@gmail.com>
To: Lawrence Ema <lawcoohema@gmail.com>
Cc: Michael Boster <michael_bosterema@yahoo.com>; RDI Solutions <main@rdisolutions.org>
Sent: Tuesday, September 28, 2021, 09:22:16 PM EDT
Subject: Re: Lawrence County - Mitigation Planning deadline approaching

Mike,

I have reviewed the information and can find no changes needed concerning The Village Coal Grove.

Respectfully,

Mayor Gary Sherman
The Village of Coal Grove

d. Village of Hanging Rock

RDI Solutions

From: Lawrence Ema <lawcoohema@gmail.com>
Sent: Monday, October 4, 2021 10:06 AM
To: RDI Solutions
Subject: Fwd: VILLAGE OF HANGING ROCK MIGATION PLAN - NO CHANGES

---------- Forwarded message ---------
From: **Carole Goldcamp** <hrclerk@hotmail.com>
Date: Mon, Oct 4, 2021 at 10:01 AM
Subject: VILLAGE OF HANGING ROCK MIGATION PLAN - NO CHANGES
To: Mike Boster <lawcoohema@gmail.com>

OCTOBER 1, 2021

LAWRENCE COUNTY EMA
ATTN: MIKE BOSTER

THE VILLAGE OF HANGING ROCK, WE CONCUR WITH THE CURRENT MIGATION PLAN AND HAVE NO CHANGES TO THE MIGATION ACTION LIST.

SINCERELY,
CHRIS DAVIDSON
MAYOR OF THE VILLAGE OF HANGING ROCK

--
Lawrence County Emergency Management Agency
715 Lane Street, Suite 300 Coal Grove, OH 45638
740-533-4375 voice
740-533-4390 fax

Michael L. Boster, Director

e. City of Ironton

RDI Solutions

From: Lawrence Ema <lawcoohema@gmail.com>
Sent: Thursday, September 30, 2021 3:11 PM
To: RDI Solutions
Subject: Fwd: Mike Boster - URGENT TIME SENSITIVE Action Items needed

Mr. Pollinger

Participation from Mayor Samuel Cramblit, the City of Ironton. see email herewith.

Best Regards,

Michael Boster

---------- Forwarded message ---------
From: **Samuel Cramblit** <irontonmayor@ironton-ohio.com>
Date: Thu, Sep 30, 2021 at 3:04 PM
Subject: Re: Mike Boster - URGENT TIME SENSITIVE Action Items needed
To: Lawrence Ema <lawcoohema@gmail.com>

We have reviewed the Mitigation Actions provided by Lawrence County EMA and we are in agreement with the plan.

Thank you,

Samuel Cramblit
Mayor, City of Ironton
(O)740-532-3833 (C) 740-442-0084
Email: Irontonmayor@ironton-ohio.com

On Sep 24, 2021, at 7:06 PM, Lawrence Ema <lawcoohema@gmail.com> wrote:

<4_Mitigation Actions Review.docx>

--
Lawrence County Emergency Management Agency
715 Lane Street, Suite 300 Coal Grove, OH 45638
740-533-4375 voice
740-533-4390 fax

Michael L. Boster, Director

f. Village of Proctorville

RDI Solutions

From: Lawrence Ema <lawcoohema@gmail.com>
Sent: Wednesday, September 29, 2021 10:14 AM
To: RDI Solutions
Subject: Fwd: Mike Boster - URGENT TIME SENSITIVE Action Items needed

Mayor Rick Dunfee and the Village of Proctorville participation
--------- Forwarded message ---------
From: **pville532000** <pville532000@yahoo.com>
Date: Wed, Sep 29, 2021 at 9:40 AM
Subject: Re: Mike Boster - URGENT TIME SENSITIVE Action Items needed
To: Lawrence Ema <lawcoohema@gmail.com>
Cc: RDI Solutions <main@rdisolutions.org>

Michael,
We here in the village of Proctorville agree that the county must stay on course with it's mitigation plan.
Thank you for all you do for our county.

Sent from my Galaxy

------- Original message -------
From: Lawrence Ema <lawcoohema@gmail.com>
Date: 9/28/21 4:03 PM (GMT-05:00)
To: pville532000 <pville532000@yahoo.com>
Cc: RDI Solutions <main@rdisolutions.org>
Subject: Re: Mike Boster - URGENT TIME SENSITIVE Action Items needed

Yes, let's discuss. The Mitigation Plan is just an existing document we have had since 2003 that we are mandated to update every 5 years...and its time. Mark Root and Dale Burcham were previously part of the Planning Team in past update efforts.

What I sent to you is just part of the update process to help get a FEMA-approved updated plan. If you have reviewed and are OK with the stated actions with no additional, you may just email me back and say you concur with the stated mitigation actions. If you would like us (the planning team) to consider additional or new mitigation actions, you may write out the New Actions on page 4 and return with any other comments you have. Just make sure you copy the contractor we hired to assist with the update process

David Pollinger
main@rdisolutions.org

Thank you, Mayor Rick!

Respectfully,
Mike Boster

On Sat, Sep 25, 2021 at 8:28 PM pville532000 <pville532000@yahoo.com> wrote:
Michael, I have read sect.4 and I am not sure how this will apply or help the village. Does the mitagation fall uder the ODNR flood plain. Maybe in the next few days we can talk and you can help me understand the plan.
Thanks
Rick Dunfee,
Mayor Proctorville

Sent from my Galaxy

------- Original message -------
From: Lawrence Ema <lawcoohema@gmail.com>
Date: 9/24/21 7:06 PM (GMT-05:00)
To: Willie Ward <napawillie385@yahoo.com>, Kim Oldaker <mayoroldaker@gmail.com>, Gary Sherman <fchief401421@gmail.com>, Carol Goldcamp <hrclerk@hotmail.com>, HangingRock Mayor <yhrmayor@yahoo.com>, Samuel Cramblit <irontonmayor@ironton-ohio.com>, Rick Dunfee <pville532000@yahoo.com>, Terri Smith <mayorassist@ironton-ohio.com>, Jeff Gaskin <mayorgaskin@zoominternet.net>, "Darrell L. Legg" <proctorvilleclerk@zoominternet.net>
Cc: Chris Kline <ckline@lawrencegov.org>, Katrina Keith <kkeith@lawrencegov.org>, DeAnna Holliday <dholliday@lawrencegov.org>, RDI Solutions <main@rdisolutions.org>
Subject: Mike Boster - URGENT TIME SENSITIVE Action Items needed

MAYORS and Chief Elected Officials:

DEADLINE - PLEASE FRIDAY, OCTOBER 1, 2021
Who? Mayors or designees
What? Review and Respond by email to the attached document No. 4
Where? Document attached - Email return
When? By Friday, October 1, 2021 deadline
How? Please read below for more information

First, THANK YOU!

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The good news is we have made good progress and are nearing the end of the process; however, there are still **Important and necessary** documents for our chief elected officials to review and provide feedback.

IT IS IMPORTANT that each municipality participates - chief elected official (Mayor) or designee - because capturing your work, your email replies and responses shows that your jurisdiction participated along with the county in the planning process. FEMA requires that we document your participation

Later on, after FEMA approves the plan, your city / village will need to adopt the plan by resolution. I will provide sample template documents to help with that process later.

REVIEW AND RESPOND TO **DOCUMENT NO. 4** (5 is the PDF version of 4) "MITIGATION ACTIONS REVIEW"

Page 1 lays out what we are asking you to do with Document No. 4

Once you have completed the Mitigation Actions Review, may I ask that you email your completed work back to me and the planning contractor by Friday October 1, 2021

LawCoOHema@gmail.com

and CC our planning contractor Davd Pollinger, RDI Solutions

main@rdisolutions.org

The other documents are added showing what we have done already (No. 1,2,3)
YOU MAY SIMPLY ACKNOWLEDGE IN YOUR RETURN EMAIL / REPLY THAT YOU HAVE RECEIVED AND REVIEWED:
* Letter to Participate
* Kick Off Meeting Talking Paper
* Hazard Ranking Workshop (if you returned this THANK YOU!)

Note: If you would like a copy of the Lawrence County 2015 Hazard Mitigation Plan (expiring plan) emailed to you separately to look over let me know. Its a large digital document

Once again, I sincerely appreciate each of you and your attention to this project.

Respectfully.

Michael L. Boster

Lawrence County Emergency Management Agency
715 Lane Street, Suite 300 Coal Grove, OH 45638
740-533-4375 voice
740-533-4390 fax

Michael L. Boster, Director

--
Lawrence County Emergency Management Agency
715 Lane Street, Suite 300 Coal Grove, OH 45638
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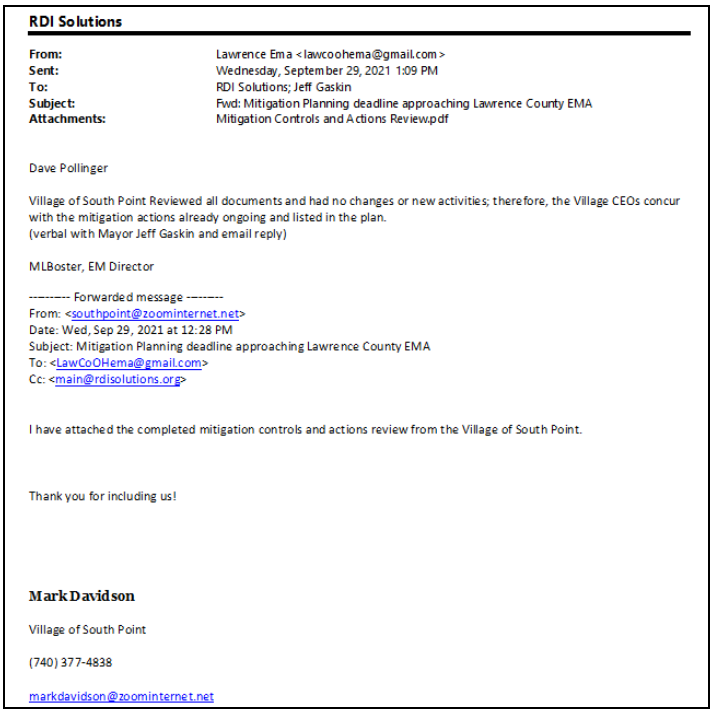
Michael L. Boster, Director

Lawrence County Emergency Management Agency
715 Lane Street, Suite 300 Coal Grove, OH 45638
740-533-4375 voice
740-533-4390 fax

Michael L. Boster, Director

g. Village of South Point



RDI Solutions

From: Lawrence Ema <lawcoohema@gmail.com>
Sent: Wednesday, September 29, 2021 1:09 PM
To: RDI Solutions; Jeff Gaskin
Subject: Fwd: Mitigation Planning deadline approaching Lawrence County EMA
Attachments: Mitigation Controls and Actions Review.pdf

Dave Pollinger

Village of South Point Reviewed all documents and had no changes or new activities; therefore, the Village CEOs concur with the mitigation actions already ongoing and listed in the plan.
(verbal with Mayor Jeff Gaskin and email reply)

MLBoster, EM Director

--------- Forwarded message ---------
From: <southpoint@zoominternet.net>
Date: Wed, Sep 29, 2021 at 12:28 PM
Subject: Mitigation Planning deadline approaching Lawrence County EMA
To: <LawCoOHema@gmail.com>
Cc: <main@rdisolutions.org>

I have attached the completed mitigation controls and actions review from the Village of South Point.

Thank you for including us!

Mark Davidson

Village of South Point

(740) 377-4838

markdavidson@zoominternet.net

B. Mitigation Actions by Jurisdiction

Jurisdiction	Priority	Action
Lawrence County	1	Mitigate structures at risk.
	2	Require new/improved critical facilities to be elevated/flood protected to the 500-year flood level.
	3	Develop an All-Hazards public education program.
	4	Develop back-up plans in case of public safety communication failure.
	5	Design and implement a comprehensive public emergency notification system.
	7	Identify emergency shelters.
	10	Update dam Emergency Action Plans, update inundation data for dams without EAPs or no current inundation data.
	12	Identify and map areas and sites vulnerable to specific natural hazards.
	13	Identify and advise responsible parties of required maintenance of trees in utility right-of-way areas.
	14	Educate the public on regulated Fire Burning Seasons and drought conditions as well as fire hazards created by disposal of debris.
	15	Identify areas where additional utility cutoffs are needed to isolate utility systems.
	16	Develop and adopt anchoring criteria for objects that can become hazardous during natural hazard events and assist residents with anchoring these items.

Jurisdiction	Priority	Action
	17	Develop improved logging practices.
	18	Identify areas where fire break lines are needed and create them.
	19	Develop building codes in jurisdictions without building codes.
	20	Rehabilitate and maintain High Hazard Potential Dams.
	21	Construct Safe Rooms - Residential.
Athalia Village	1	Mitigate structures at risk.
	8	Inspect, repair and upgrade stormwater systems.
	11	Design back-flow prevention in areas of combined storm/sanitary sewers.
	13	Identify and advise responsible parties of required maintenance of trees in utility right-of-way areas.
	15	Identify areas where additional utility cutoffs are needed to isolate utility systems.
Chesapeake Village	1	Mitigate structures at risk.
	8	Inspect, repair and upgrade stormwater systems.
	11	Design back-flow prevention in areas of combined storm/sanitary sewers.
	13	Identify and advise responsible parties of required maintenance of trees in utility right-of-way areas.
	15	Identify areas where additional utility cutoffs are needed to isolate utility systems.
Coal Grove Village	1	Mitigate structures at risk.
	8	Inspect, repair and upgrade stormwater systems.
	11	Design back-flow prevention in areas of combined storm/sanitary sewers.
	13	Identify and advise responsible parties of required maintenance of trees in utility right-of-way areas.
	15	Identify areas where additional utility cutoffs are needed to isolate utility systems.
Hanging Rock Village	1	Mitigate structures at risk.
	8	Inspect, repair and upgrade stormwater systems.
	11	Design back-flow prevention in areas of combined storm/sanitary sewers.
	13	Identify and advise responsible parties of required maintenance of trees in utility right-of-way areas.
	15	Identify areas where additional utility cutoffs are needed to isolate utility systems.
Ironton City	1	Mitigate structures at risk.
	8	Inspect, repair and upgrade stormwater systems.
	9	Evaluate and repair levees and their flood control systems.
	11	Design back-flow prevention in areas of combined storm/sanitary sewers.
	13	Identify and advise responsible parties of required maintenance of trees in utility right-of-way areas.
	15	Identify areas where additional utility cutoffs are needed to isolate utility systems.

Jurisdiction	Priority	Action
Proctorville Village	1	Mitigate structures at risk.
	8	Inspect, repair and upgrade stormwater systems.
	11	Design back-flow prevention in areas of combined storm/sanitary sewers.
	13	Identify and advise responsible parties of required maintenance of trees in utility right-of-way areas.
	15	Identify areas where additional utility cutoffs are needed to isolate utility systems.
South Point Village	1	Mitigate structures at risk.
	8	Inspect, repair and upgrade stormwater systems.
	11	Design back-flow prevention in areas of combined storm/sanitary sewers.
	13	Identify and advise responsible parties of required maintenance of trees in utility right-of-way areas.
	15	Identify areas where additional utility cutoffs are needed to isolate utility systems.
Aid Township	1	Mitigate structures at risk.
Decatur Township	1	Mitigate structures at risk.
Elizabeth Township	1	Mitigate structures at risk.
Fayette Township	1	Mitigate structures at risk.
Hamilton Township	1	Mitigate structures at risk.
Lawrence Township	1	Mitigate structures at risk.
Mason Township	1	Mitigate structures at risk.
Perry Township	1	Mitigate structures at risk.
Rome Township	1	Mitigate structures at risk.
Symmes Township	1	Mitigate structures at risk.
Union Township	1	Mitigate structures at risk.
Upper Township	1	Mitigate structures at risk.
Washington Township	1	Mitigate structures at risk.
Windsor Township	1	Mitigate structures at risk.

C. Mitigation Actions by Hazard

Hazard	Priority	Action
Flooding	1	Mitigate structures at risk.
	2	Require new/improved critical facilities to be elevated/flood protected to the 500-year flood level.
	3	Develop an All-Hazards public education program.
	4	Develop back-up plans in case of public safety communication failure.
	5	Design and implement a comprehensive public emergency notification system.
	7	Identify emergency shelters.
	8	Inspect, repair and upgrade stormwater systems.
	9	Evaluate and repair levees and their flood control systems.
	10	Update dam Emergency Action Plans, update inundation data for dams without EAPs or no current inundation data.
	11	Design back-flow prevention in areas of combined storm/sanitary sewers.
	12	Identify and map areas and sites vulnerable to specific natural hazards.
	15	Identify areas where additional utility cutoffs are needed to isolate utility systems.
	16	Develop and adopt anchoring criteria for objects that can become hazardous during natural hazard events and assist residents with anchoring these items.
	17	Develop improved logging practices.
	19	Develop building codes in jurisdictions without building codes.
Severe Winter Storm	3	Develop an All-Hazards public education program.
	4	Develop back-up plans in case of public safety communication failure.
	5	Design and implement a comprehensive public emergency notification system.
	12	Identify and map areas and sites vulnerable to specific natural hazards.
	13	Identify and advise responsible parties of required maintenance of trees in utility right-of-way areas.
	15	Identify areas where additional utility cutoffs are needed to isolate utility systems.
	19	Develop building codes in jurisdictions without building codes.
Severe Summer Storm	3	Develop an All-Hazards public education program.
	4	Develop back-up plans in case of public safety communication failure.
	5	Design and implement a comprehensive public emergency notification system.
	8	Inspect, repair and upgrade stormwater systems.
	10	Update dam Emergency Action Plans, update inundation data for dams without EAPs or no current inundation data.

Hazard	Priority	Action
	11	Design back-flow prevention in areas of combined storm/sanitary sewers.
	12	Identify and map areas and sites vulnerable to specific natural hazards.
	13	Identify and advise responsible parties of required maintenance of trees in utility right-of-way areas.
	15	Identify areas where additional utility cutoffs are needed to isolate utility systems.
	16	Develop and adopt anchoring criteria for objects that can become hazardous during natural hazard events and assist residents with anchoring these items.
	17	Develop improved logging practices.
	19	Develop building codes in jurisdictions without building codes.
	21	Construct Safe Rooms - Residential.
Infectious Disease	3	Develop an All-Hazards public education program.
	5	Design and implement a comprehensive public emergency notification system.
Tornado	3	Develop an All-Hazards public education program.
	4	Develop back-up plans in case of public safety communication failure.
	5	Design and implement a comprehensive public emergency notification system.
	7	Identify emergency shelters.
	12	Identify and map areas and sites vulnerable to specific natural hazards.
	13	Identify and advise responsible parties of required maintenance of trees in utility right-of-way areas.
	15	Identify areas where additional utility cutoffs are needed to isolate utility systems.
	19	Develop building codes in jurisdictions without building codes.
	21	Construct Safe Rooms - Residential.
Earthquake	3	Develop an All-Hazards public education program.
	4	Develop back-up plans in case of public safety communication failure.
	5	Design and implement a comprehensive public emergency notification system.
	7	Identify emergency shelters.
	12	Identify and map areas and sites vulnerable to specific natural hazards.
	13	Identify and advise responsible parties of required maintenance of trees in utility right-of-way areas.
	15	Identify areas where additional utility cutoffs are needed to isolate utility systems.
	19	Develop building codes in jurisdictions without building codes.
Drought	3	Develop an All-Hazards public education program.
	5	Design and implement a comprehensive public emergency

Hazard	Priority	Action
		notification system.
	12	Identify and map areas and sites vulnerable to specific natural hazards.
Mud/ Landslide	3	Develop an All-Hazards public education program.
	5	Design and implement a comprehensive public emergency notification system.
	12	Identify and map areas and sites vulnerable to specific natural hazards.
	17	Develop improved logging practices.
	19	Develop building codes in jurisdictions without building codes.
Dam/Levee Failure	3	Develop an All-Hazards public education program.
	5	Design and implement a comprehensive public emergency notification system.
	6	Develop inventory assets available for responding to and recovering from major hazard occurrences.
	7	Identify emergency shelters.
	10	Update dam Emergency Action Plans, update inundation data for dams without EAPs or no current inundation data.
	12	Identify and map areas and sites vulnerable to specific natural hazards.
	19	Develop building codes in jurisdictions without building codes.
	20	Rehabilitate and maintain High Hazard Potential Dams.
Wildfire	3	Develop an All-Hazards public education program.
	5	Design and implement a comprehensive public emergency notification system.
	12	Identify and map areas and sites vulnerable to specific natural hazards.
	14	Educate the public on regulated Fire Burning Seasons and drought conditions as well as fire hazards created by disposal of debris.
	18	Identify areas where fire break lines are needed and create them.
	19	Develop building codes in jurisdictions without building codes.
Land Subsidence	3	Develop an All-Hazards public education program.
	5	Design and implement a comprehensive public emergency notification system.
	12	Identify and map areas and sites vulnerable to specific natural hazards.
	19	Develop building codes in jurisdictions without building codes.

D. Event Narratives

1. Flooding

Event Narrative
Flood - 1/20/1996 As a result of rain and melted snow in Pennsylvania, West Virginia, and western Maryland, the Ohio River crested 3 to 6 feet above flood stage from Marietta to Ironton. The crest at the Corps of Engineers gauge at Marietta was 39.3 feet, Pomeroy reached 50.5 feet, Gallipolis saw 51.6 feet. This crest was slightly greater than the crest in January 1994. A flood of equal magnitude occurred in February 1979. In Washington County, 28 structures were reported destroyed, Meigs County had 20 dwelling destroyed, while Lawrence County had 19 destroyed.
Flash Flood - 4/1/1996 An overnight and morning rain of 0.75 to 1.25 inches caused several creeks to flood and close secondary roads during the late morning and afternoon. Cannons Creek, Symmes Creek, and Storms Creek were the main streams causing the minor flooding. No evacuations were reported.
Flash Flood - 5/15/1996 Rains of 2 to 3 inches fell in about 6 hours along a warm frontal boundary. Small streams overflowed and closed secondary roads.
Flash Flood - 5/24/1996 One family was evacuated by boat after 5 feet of water surrounded their home along Route 93. Sections of Route 217were also flooded by small streams.
Flash Flood - 6/8/1996 Streams flooded and closed Route 93. Damage was minimal.
Flash Flood - 6/23/1996 Two inches of rain in 1 to 2 hours caused flooding that was mainly concentrated along Symmes and Little Guyan Creeks in the eastern part of the county. Seven mobile homes and 8 low income houses were destroyed. About 30 families were affected. The Scottown Post Office was also flooded.
Flash Flood - 7/31/1996 Late night and predawn thunderstorms moved out of northeast Kentucky and dumped 2 to 4 inches of rain in less than 6 hours across Lawrence and southern Gallia Counties. Gallipolis measured 4.7 inches in the 24 hour period. Waterloo had4 inches of rain. No evacuations were reported, but water got into 25 to 40 homes. The hardest hit region was around Pedro, Waterloo, and Scottown of Lawrence County. Corn and tobacco crops were also lost. In southern Gallia County some vehicles were damaged in the Sand Fork to Mercerville vicinity.
Flash Flood - 1/7/1998 Rains of 1.5 to over 3 inches fell along a frontal boundary in 12 to 18 hours. The heaviest rains in southeast Ohio were over Perry, Vinton, and Jackson Counties. McArthur reported 3.25 inches of rain. The Middle Fork of Salt Creek flooded around Ratcliffsburg in Vinton County. Some evacuations were required in western Vinton County. Many roads were closed across the 8 counties.
Flash Flood - 6/14/1998 Rains of 1.5 to 2 inches in less than 3 hours, caused small streams to flood and damage roads. No dwellings were evacuated.

Event Narrative
Flash Flood - 2/18/2000 Rains of 2 to 4 inches fell in about an 18-hour period. A strong frontal zone was in the vicinity, as low pressure moved up the Ohio Valley. Southerly winds pulled low level moisture north from Tennessee and Kentucky. Surface dew points were in the 55-to-60-degree range south of the frontal boundary. Carpenter of western Meigs County had 4.1 inches, Gallipolis measured 3.7 inches, Jackson 3.45 inches, Patriot, Salem Center, and Willow wood all had around 3.3 inches, while McArthur had 3.2 inches. A spotter network in Meigs County revealed 3.9 inches at Racine and 3.6 inches at Syracuse. Preliminary damage assessment figures from emergency management officials had 3 homes in Meigs County and 2 homes in Lawrence County sustaining major damage. Minor damage to homes was reported in Athens, Gallia, Meigs, and Washington Counties. In Gallia County, about a dozen homes sustained minor damage. Racoon Creek flooded and closed roads. Minor river flooding occurred after the flash flooding on the small streams. The Hocking River in Athens County crested just over its 20-foot flood stage at 20.49 feet around 0600E on the 20th. The Ohio River caused the usual backwater flooding from below Belleville Lock and Dam to the Ironton vicinity. The crest at Pomeroy was a half of a foot over the 46-foot flood stage around 0500E on the 21st. This was not high enough to affect the businesses in town. In Meigs County, a 51-year-old man drowned in the flooded backwaters of the Ohio River near the mouth of Leading Creek. The area is known as Shady Cove near Hudson. A father and his son were in a small boat, ferrying across a flooded area. The boat hit a submerged object around 1430E on the 20th. The father fell out of the boat. He was not wearing a life jacket. His body was recovered that evening by the fire department.
Flood - 3/20/2002 Rains of 4 to 5 inches fell on southern Lawrence County in a 30-hour period on the 19th until after dawn on the 20th. The heaviest rains fell in about a 6-hour period, before dawn on the 20th. The most rain appeared to have fallen along the Ohio River. The storm total at South Point was 4.8 inches. Automated gauges indicated 4.2 inches at Rankin Creek, with 4.0 inches at Kitts Hill and Procterville. Some of the flooded streams included Solida Creek, Charley Creek, Buffalo Creek, Symmes Creek, and Indian Guyan Creek. Urban and poor drainage flooding also occurred. Four people and 2 pets were rescued from the top of their vehicles on Charlie Creek Road in Lawrence County shortly after 0600E. Rain amounts diminished to the north. In northern Lawrence County, Waterloo had 2.9 inches of rain. Governor Taft declared a state of emergency in Lawrence County. According to the Ohio Emergency Management Agency, four homes were destroyed. On the order of 26 homes sustained major damage in Lawrence County, while another 60 homes had minor damage. Four businesses along Solida Road near South Point sustained water damage. Rains of 1.5 to 2.5 inches affected Gallia and Meigs Counties. Damage was restricted to roads in Gallia and Meigs Counties.
Flood - 4/21/2002 Warm frontal rains of 1.5 to 2.5 inches were common in about an 18-hour period on the 21st. McArthur measured 2.27 inches, Gallipolis had 2 inches. Isolated amounts over 3 inches were likely. Roads were closed in the usual low spots by overflowing small streams. Jackson County Sheriff's department reported a mobile home flooded along Route 279. A 44-year-old Lawrence County man drowned in Johns Creek along County

Event Narrative
Road 4 in Aid Township around 2200E on the 21st. He was driving to a job in Gallipolis. County officials believed he drove into some water on the road, stopped, put his vehicle in reverse to turn around, and then drove into the swollen stream. His body was discovered on Monday morning the 22nd, by a local resident, who was checking the level of the stream. A few reports of large hail also occurred with this episode.
Flood - 5/10/2003 On the 10th, several rounds of showers and thunderstorms crossed southeast Ohio. Flooding, gusty winds, hail, and even some funnel clouds occurred. The heaviest rains were across southern Jackson County on east, into Gallia County. Gallipolis had a 24-hour rain amount of 2.67 inches, ending at dawn on the 11th. Jackson County emergency officials reported a tributary to Hunting Camp Creek overflowed into 3 homes and 4 businesses around Oak Hill. Over recent years, the stream has seen more culverts installed. In Hamilton Township of Jackson County, several homes had flooded basements. The fire department rescued a person in a flooded car along Route 139.
Flood - 9/8/2004 The low pressure remains of Hurricane Frances caused about a 30 hour rain event, from the afternoon of the 7th, into the evening hours of the 8th. A stalled frontal boundary helped trigger heavier convection on the northern, or leading edge, of the rain shield during the late afternoon and evening of the 7th. This initial convection caused the heavier storm totals to be over Morgan and Perry Counties, compared to points further south. Storm totals of 4 to 7 inches were common, with isolated amounts both above and below those totals. Some specific preliminary totals include New Lexington with 7.5 inches, McConnelsville 6.6 inches, McArthur 6.3 inches, Salem Center 5.7 inches, Athens 5.5 inches, Gallipolis 5.1 inches, Carpenter 5.0 inches, South Point 4.7 inches, Newport and Nelsonville 4.6 inches, and finally Marietta 3.8 inches. The Scalia Lab on the Ohio University campus in Athens reported a storm total of 5.3 inches. Other rain totals from spotters included 5.9 inches at Pageville of Meigs County, 5.7 inches from Darwin of Meigs County and Guysville of Athens County. Tuppers Plains of Meigs County measured 5.4 inches. A few automated gauges totaled 5.1 inches at Coolville, 4.9 inches at Kitts Hill, and 4.8 inches at Amesville. Since the ground was dry prior to this event, most flooding was to roads and low-lying areas. In Athens County, Sunday Creek surrounded buildings in Trimble and blocked streets. Some residents evacuated their homes as a precaution. Flooding remained minor. The gauge at Glouster crested at 16.4 feet on the 9th, well below the 19-foot crest observed back in May 2004.However, flooding was more severe in Perry, Morgan, and Washington Counties, affecting some homes. In Perry County, around 50 homes had major damage, with 3 homes destroyed. Duck Creek flooded in Washington County, including around Elba and Lower Salem. In Washington County, one house was destroyed, while 7 homes had major damage. In Morgan County, 8 homes had major damage. The Muskingum River crested at 11.7 feet early on the 9th at McConnelsville in Morgan County. Flood stage is 11 feet. The Shade River near Chester of Meigs County rose from 4.7 feet around 0500E on the 8th, to 21.5 feet around 1830E on the 9th. Bankfull is around 17 feet. This event set the stage for a more widespread flood across southeast Ohio, to follow later in the month.
Flood - 9/17/2004

Event Narrative
Light rain spread north into southeast Ohio during the afternoon and evening hours of the 16th. The heavier rain from the remnants of Hurricane Ivan developed over Lawrence County before dawn on Friday the 17th, reaching the Athens and Marietta vicinity by 0900E on the 17th. By 1700E the heavy rain was pulling east and northeast, out of southeast Ohio. A rain event of 24 to 30 hours dumped 4 to 6.5 inches of rain. Some specific preliminary totals included Beverly 6.4 inches, McArthur 6 inches, McConnelsville 5.5 inches, Athens and Waterloo 5.1 inches, Marietta and Newport 4.8 inches, Gallipolis 4.3 inches, and Nelsonville 4 inches. Rains were not as heavy over central and northern portions of Perry County. New Lexington measured 2.4 inches. Spotters reported 6.2 inches from Guysville, 6.1 inches at Tuppers Plains, and 5.5 inches in Pageville. Since the ground was still recovering from the effects of Hurricane Frances 8 days earlier, streams crested higher in many instances. The small stream flooding developed during the late morning and early afternoon period of the 17th. Serious small stream flooding occurred on such streams as Sunday Creek, Duck Creek, Racoon Creek, Little Racoon Creek, and Symmes Creek. On the 2 year old gauge at Bolins Mills on Racoon Creek, the crest was 17 feet, its highest. At Millfield on Sunday Creek, a crest of 24.5 feet established a new record. However, the upper reaches of Sunday Creek in Perry and northern Athens County were higher in May of 2004, than this event. For example, the gauge at Glouster crested at 17.6 feet compared to 19 feet in May. Symmes Creek near Aid crested at 23.3 feet. The smaller rivers, such as the Little Muskingum and Shade, saw serious flooding. The Little Muskingum River at Bloomfield crested at 31.1 feet, surpassing the 30.7 feet crest in 1998. The Rinard covered bridge, originally built in 1874, was shoved into the river. During a restoration project in the early 1990s, gaps between the wooden boards were taken out. Local residents think, without those gaps, the water pressure was greater, knocking the bridge off its supports. In this vicinity, general stores in Bloomfield and Wingett Run were flooded with 5 feet of water. The Shade River crested at 30 feet near Chester. The 1997 crest was at 31.4 feet. The Hocking River at Athens crested slightly over its 20 foot flood stage at 20.8 feet. The crest occurred before dawn on the 18th at Athens. The axis of heaviest rain ran up the main stem of the Ohio River toward Wheeling and Pittsburgh. Storm totals of 6 to 8 inches were seen there. This rain was almost direct local runoff into the upper Ohio River. As a result, a strong rise of 1 to 2 feet per hour was observed on the Ohio River during the Friday evening, the 17th. For example, between 1600E and 2100E, the Ohio River rose 9 feet at Willow Island Lock and Dam, and around 10 feet on the Marietta 2SW gauge. The 24 hour rise at Marietta was 22 feet in 24 hours, the greatest 24 hour rise there on record. On the 18th and 19th, as most small streams were receding, moderate to major flooding occurred on the Ohio River from New Matamoras and Willow Island on down through Marietta, Belpre, Racine and Pomeroy. It was the highest stage since March 1964. The crest then dampened to minor flooding below the mouth of the Kanawha River. Some specific crests included Willow Island 44.8 feet, Marietta 2SW 42.4 feet, Belleville 45.8 feet, Racine 50.2 feet, Pomeroy 51.2 feet, and R C Bryd Lock and Dam 51 feet. The crest was 2 to 4 feet deep inside hundreds of Marietta businesses, plus on the order of 40 businesses in Meigs County including the town of Pomeroy. In Washington County, the Red Cross surveyed 159 homes with major damage, with 60 homes destroyed. Two trailer parks were hit hard by flooding around Marietta. On the order of 400 to 500 businesses in the county were affected. State damage assessments had 56 homes with

Event Narrative
major damage in Athens County. In Meigs County, 16 homes had major damage and 1 house was destroyed. In Gallia County, 6 homes had major damage with 1 home destroyed. In Lawrence County, 8 homes had major damage and 3 were destroyed. In Vinton County, 5 homes had major damage and 2 homes were destroyed. The FEMA disaster 1556 included this flood event.
Flood - 11/4/2004 Warm frontal rain began near 0000E, but intensified toward dawn. Embedded convection caused narrow bands of heavy rain to cross the county from southwest to northeast between 0500E and 0830E. The rain ended by midmorning, as the warm front lifted north of Lawrence County. A 2 to 3 inch rain maximum fell in 6 to 10 hours. The corridor of maximum rain went from near Sheridan on northeast toward Scottown. The worst flooding appeared to be concentrated along the small drainage of Lick Creek. A vertical rise of at least 15 feet was reported along portions of Lick Creek. Rankins Creek, Leatherwood Creek, Greasy Creek, and McKinney Creek were some of the other creeks affected. One resident along Lick Creek said, "we barely got out at all, in just a few minutes, your whole life is gone. “Lawrence County Emergency Services surveyed 5 mobile homes that were destroyed. Eleven homes had major damage across the county, with minor damage to 14 other homes. The value of these homes was generally below average. Some other property damage was due to clogged culverts or ditches, that could not handle the runoff.
Flood - 1/8/2005 Separate waves of rain moved along a strong west to east frontal zone in the Ohio Valley, from late on the 3rd into the early morning hours of the 8th. To the south of the boundary, dew points were in the 50 to 55 degree range. The heaviest rain amounts were from Perry County on north and east into eastern Ohio and western Pennsylvania. Preliminary 5 day totals were 5.2 inches for New Lexington, 4.6 inches at McConnelsville, 4.5 inches at Nelsonville, 4.2 inches at McArthur and Beverly, 3.4 inches at Athens, and 2.9 inches at Marietta. Small stream flooding started during the morning hours on the 5th, across Perry, Athens, Morgan, Vinton, and Washington Counties. Some of the flooded streams included Jonathan Creek in northern Perry County, plus Monday and Sunday Creeks in southern Perry County and northern Athens County. Sunday Creek crested at 15.8 feet on the 6th at Glouster, and near 23 feet at Millfield. On Monday Creek, the gauge at Doanville crested at 19.1 feet on the 6th. In Perry County, 9 families were evacuated. The small stream flooding across Vinton County was limited to flooded roads. Significant river flooding occurred on the Muskingum, the Hocking, and the Ohio River. The crest on the Hocking River at Athens was 23.7 feet around 1100E on the 7th. This was the highest level since the 24.65 feet observed on the 25th of May in 1968. It was the highest stage since the river was rechanneled in 1972. The crest level was also the 5th highest on record for Athens. Communities such as Nelsonville and Chauncey were flooded. The lowest and most vulnerable sections of Chauncey had water inside dwellings and other buildings. In Athens, the storm drainage system backup into the business area along East State Street. Some homes on Blick Avenue were flooded. West Union Street was also flooded and closed. Elsewhere in Athens County, the high water along the Ohio River affected Hockingport. All total, about 73 homes in Athens County had minor damage, 56 homes had major damage, and 11 homes were destroyed. About a dozen

Event Narrative
businesses applied for disaster loans. In McConnelsville of Morgan County, the Muskingum River crested at 13.45 feet around 1400E on the 6th. This was the highest level since the 13.8 feet seen back in March 1964. Water rescues were performed by the Ohio Department of Natural Resources and the county sheriff department. An 85 year old woman was rescued from her flooded mobile home along the Muskingum River on the 6th. She did not want to evacuate earlier and had her pets inside. When finally rescued, she was sitting on a chair, with water almost up to her knees. Her feet were swollen. She never recovered from the hypothermia, and died several days later. A second crest would occur less than a week later, from additional rain and dam releases. See the 12th for details. In Morgan County, around 142 homes had minor damage. One furniture store in McConnelsville had flood waters inside. In Washington County, small stream and river damage was less severe than in September 2004. The Ohio River crested at 41.0 feet at Marietta 2SW during the predawn hours of the 8th. The crest was 42.4 feet the previous September. Flood stage is 34 feet. Downtown Marietta streets and businesses were still flooded, but sandbags protected most 1st floors. Further down the Ohio River, Racine Lock and Dam crested at 48.9 feet. The crest at Pomeroy was 50.5 feet around 0000E on the 9th. Flood stage is 46 feet at Pomeroy. Back in September 2004 the crest was 51.2 feet. Water still got into businesses. All total, Meigs County had 17 homes with minor damage, 2 homes with major damage, and 3 homes destroyed. Five businesses had major damage and 1 business was destroyed. The crest near Gallipolis, at the RC Byrd Lock and Dam was 50.3 feet around 1400E on the 9th. This was just over the 50 foot flood stage. For the Chesapeake to South Point reach of the river, the Huntington gauge crested at 51.8 feet during the evening hours of the 9th. This was about 6 inches higher than in September 2004. Flood stage at Huntington is 50 feet. Around 0845E on the 6th, just north of the Belleville Lock and Dam, the tugboat Jon Strong was heading up the Ohio River. After passing through the lock chamber, 9 of the 12 barges came loose in the strong currents. Three of barges sank under the gates of the dam, while 3 others were forced up against the dam pier houses. Three other barges went through the structure and were recovered downstream. Salvage crews did not remove all the damaged barges until the last day of the month. Since the gates could not be closed, the pool above Belleville Lock and Dam dropped 10 to 15 feet below normal. River traffic was suspended on the 19th. River bank slippage occurred around Hockingport during the unusually low levels late in the month. This caused damage to roads and a few homes. Water levels returned toward normal in early February.
Flood - 6/4/2008 Increasing moisture quickly moved up the Ohio River Valley on the morning of the 3rd into a developing east to west frontal zone. The first of several thunderstorm complexes moved from west to east into extreme southern Ohio during the early afternoon on Tuesday, the 3rd. The west to east band of training thunderstorms shifted slightly north overnight, to include Jackson, Vinton, Athens, Meigs, Morgan, and Washington Counties. A tornado warning, during the evening of the 3rd, prompted Ohio University at Athens to enact emergency precautions for their dormitories. However, no tornado occurred. The ground was already wetter than normal in the Hocking Valley on north, from above normal rainfall in May. By dawn on the 4th, the highest rain totals were over 2 inches around Jackson on northeast toward Athens. These rain amounts over the wet terrain, caused some flash flooding on small streams late on the 3rd and early on

Event Narrative
the 4th. The west to east band of convection sank slightly back to the south during the daylight hours on Wednesday, the 4th. Portions of Jackson, Meigs, Gallia, and Lawrence Counties saw the heaviest rains then. Small stream flooding was widespread with numerous road closures. Lawrence County was hit the hardest with small stream flooding. Hail and some wind damage occurred with the convection. The last of the significant showers exited after 2100E on the 4th. Rain totals over a 30 to 36 hour time frame were 2.5 to 4.5 inches. A few specific preliminary totals from cooperative observers included Waterloo with 4.5 inches, Jackson 4.3 inches, Gallipolis 3.8 inches, Salem Center 3.4 inches, South Point 3.1 inches, and Athens, McArthur, plus McConnelsville 2.9 inches.
Flash Flood - 6/17/2009 A frontal boundary ran from central Indiana, on southeast, to near the Ironton vicinity of extreme southern Ohio. Clusters of showers and thunderstorms rode southeast along this boundary. The low level moisture inflow from the southwest was able to enhance the rain over portions of Lawrence County.
Flood - 5/2/2010 A strong southerly flow, ahead of a cold front, transported very moist air through Tennessee, Kentucky and into southeast Ohio. Surface dew points were in the mid and upper 60s. Wave after wave in the mid and upper levels helped trigger widespread showers, with embedded thunderstorms. These training rains first affected Jackson and Vinton Counties between 0500E and 0600E on Sunday May 2nd. The heaviest rains arched into Athens County and eventually sank slowly south, to affect Lawrence, Gallia, and Meigs Counties later in the day. The rains continued into the evening hours on the 2nd, then diminished during the late evening. However, some light rain lingered until after midnight on the 3rd. The rain amounts over about an 18 to 20 hour period were mostly 3.5 to 4.5 inches across Lawrence, Jackson, Viinton, Gallia, Meigs, and Athens Counties. Waterloo in northern Lawrence County reported 4.8 inches for the maximum. McArthur in Vinton County and Jackson in Jackson County both measured around 4.3 inches. The town of Athens had 4.1 inches, while Gallipolis had 3.9 inches, and South Point measured 3.8 inches. An automatic gauge in Gallia County, between Gallipolis and Rio Grande measured 3.7 inches. Small stream flooding was common. Roads were flooded. Some small bridges and culverts were washed out. Two men drowned near the Athens County line in Morgan County.
Flash Flood - 7/20/2010 Well south of a frontal boundary, a moist and unstable air mass resided over the Ohio Valley. The ground was already wetter than normal from previous rains. A southwest and west wind along with daytime heating formed showers and thunderstorms during the afternoon of the 20th. Overnight, more storms formed along a leftover east to west boundary. That allowed for repetitive showers from portions of northeast Kentucky into extreme southern Ohio and western West Virginia. The main period of rain was from around 1400E on the 20th to 0100E on the 21st. The heaviest rain amounts ran west to east across Lawrence County. This rain maximum started near Hanging Rock and Pine Grove. The higher rain totals ran east to near Lake Vesuvius, Kitts Hill, Linnville and Scottown. An automatic gauge at Kitts Hill measure a total of 4.47 inches of rain, with 3 inches falling in 3 hours. The rain total at Procterville was 4.01 inches, while South Point measured 3.35 inches. The stream gauge at Aid along Symmes Creek jumped

Event Narrative
from 6 feet to a crest around 18 feet overnight.
Flood - 3/11/2011 Another major rain event occurred from late on the 9th into the evening hours of the 10th. Rain amounts of 1 to 2 inches were common. Including this episode, the accumulative affects of 5 significant rain events since February 21st, caused the Ohio River to flood. The crest along the Ohio River was mostly 2 to 6 feet above the assigned flood stages. The crest occurred late on the 12th into the morning hours of the 13th. Along many reaches, it was the highest stage on the Ohio River since 2005. Some of the flood gates were installed in the Ironton floodwall, forcing a school to be canceled for a few days. The crest of 49 feet at Pomeroy did allow water to reach the businesses along Main Street. Water was about 6 inches to a foot inside the structures. However, damage was minimal. Inventory and personal property was moved to higher levels well in advance of the flood. The Pomeroy police chief said, the community knew what they needed to do, they knew what was expected, and they stuck together, and that's what separates us from other people. In Lawrence County, about 20 properties along the river had minor water problems. This was either water reaching around their homes, or into their garages and outbuildings. The other most significant impact was road closures along the entire reach of the river in southeast Ohio. This caused motorists to take alternate routes for a few days. In the wake of the high water, a few roads suffered slips from the saturated ground. Many of the flood prone parks and recreational areas along the river were also flooded, including some of their outbuildings. The unique feature about this flood, was the fact that there was very little headwater river or small small flooding in southeast Ohio. Leading into the Ohio River flood, only some minor stream flooding occurred along portions of some of the larger creeks, such as Raccoon Creek and the Little Muskingum River.
Flood - 4/22/2011 Several more rounds of showers and thunderstorms moved through southeast Ohio from Friday the 22nd into Sunday the 24th. This time the heaviest rains were a bit further south. The counties of Gallia and Lawrence were hit the hardest. For example, the cooperative observer at Waterloo measured 1.9 inches at dawn on the 23rd and another 1.67 inches at dawn on the 24th. Meanwhile, Gallipolis had 1.57 inches and 1.40 inches respectively. Small stream flooding was again common from the late on the 22nd into the 25th. The larger creeks, such as Symmes Creek, did not crest until early on the 25th. At Aid in Lawrence County, the crest on Symmes Creek was 21.5 feet. This was the highest stage in over 11 years, since February 2000. The bankfull stage there is 19 feet. According to county emergency officials, only roads were flooded and closed. No dwellings were flooded. The thunderstorms also caused wind damage early on 23rd and again later that afternoon across Lawrence County.
Flash Flood - 5/10/2011 Repetitive showers and thunderstorms, moved southeast through western Vinton County, Jackson County, and western and central portions of Lawrence County between 1500E and 1830E on Tuesday, the 10th. This convection was just northeast of the surface warm front. A sharp dew point gradient existed along the front. Surface dew points were around 70 degrees just southwest of the boundary. Luckily, later that same evening, repetitive convection occurred in the Scioto River Valley, missing this area just to the west. Initially, the main impact was large hail. As back building caused repetitive

Event Narrative
showers and thunderstorms, flooding became the primary issue. Maximum rain amounts of 3 to 4 inches were observed. Jackson measured 3.35 inches. Waterloo observed 3.76 inches. South Point had 3.25 inches of rain. Luckily, no injuries or fatalities occurred. State assistance money was committed to aid uninsured homeowners and renters.
Flood - 11/22/2011 The ground was wetter than normal from around an inch of rain that occurred on the 15th into the 16th. Periods of rain started to fall again on Sunday the 20th. A front then sank south on Monday the 21st and became nearly stationary just south of Lawrence County. The heaviest rain fell on the 22nd. The 3 day total rain amounts were generally 2 to 3 inches from Lawrence County on up the Ohio River into Meigs County. Racine Lock and Dam for example had 2.71 inches. To the east, even heavier rain fell in West Virginia. Minor stream flooding occurred, including Symmes Creek in Lawrence County and the Shade River in Meigs County.
Flash Flood - 4/29/2014 Rounds of convection began on Monday the 28th. A nearly stationary front was located across the Tri State area near extreme southeast Ohio on Tuesday the 29th with more unstable air upstream over Kentucky. Additional rounds of convection fell on Tuesday. More discrete thunderstorm cells formed during the late afternoon and early evening of the 29th. This produced some large hail and damage to vehicles. One of those downpours caused a flash flood in western Lawrence County. Additional showers fell on the 30th, but amounts were not as heavy. The storm totals for the rain reached into the 3 to 3.6 inch range. This was over a 3 day period. Spotters in Albany and Athens both measured around 3.6 inches of rain. A spotter in Guysville measured around 3.3 inches. An automatic gauge near Pomeroy had around 3.2 inches of rain. Dean State Forest in Lawrence County and Rio Grande in Gallia County both had around 3 inches. The cooperative observer in Jackson measured just over 3 inches. Many streams eventually overflowed, causing minor flooding on the 30th. A strong rise occurred on the Hocking River, but eventually the crest remained below flood stage.
Flood - 4/30/2014 Rounds of convection began on Monday the 28th. A nearly stationary front was located across the Tri State area near extreme southeast Ohio on Tuesday the 29th with more unstable air upstream over Kentucky. Additional rounds of convection fell on Tuesday. More discrete thunderstorm cells formed during the late afternoon and early evening of the 29th. This produced some large hail and damage to vehicles. One of those downpours caused a flash flood in western Lawrence County. Additional showers fell on the 30th, but amounts were not as heavy. The storm totals for the rain reached into the 3 to 3.6 inch range. This was over a 3 day period. Spotters in Albany and Athens both measured around 3.6 inches of rain. A spotter in Guysville measured around 3.3 inches. An automatic gauge near Pomeroy had around 3.2 inches of rain. Dean State Forest in Lawrence County and Rio Grande in Gallia County both had around 3 inches. The cooperative observer in Jackson measured just over 3 inches. Many streams eventually overflowed, causing minor flooding on the 30th. A strong rise occurred on the Hocking River, but eventually the crest remained below flood stage.
Flash Flood - 6/4/2014 After some early morning rain showers, scattered thunderstorms formed in eastern and

Event Narrative
southern Ohio during the mid afternoon hours of the 3rd, ahead of a cold front. The front sagged south to near the southern Ohio border with Kentucky by dawn on the 4th. A strong low pressure for early June moved east through the Midwest, and along the frontal boundary, during the day on the 4th. Near and south of the front, dew points were in the upper 60s and lower 70s. The disturbance passed to the east by early on the 5th. Several rounds of showers and thunderstorms passed through southeast Ohio during the afternoon and evening hours on the 4th.
Flood - 3/4/2015 A warm front lifted north through southeast Ohio on the 3rd with a quarter to a half inch of rain. Late afternoon and evening temperatures rose into the 40s and 50s. Winds and dew points also increased. This combination helped accelerate the melting of the leftover snow pack. Rains increased again overnight, with 1 to 1.7 inches of rain falling by dawn on the 4th in mainly north of the Hocking River Valley. An automatic gauge near Lower Salem in Washington County measured 1.69 inches. Beverly had 1.48 inches of rain through dawn. This caused small stream flooding to begin. Small stream flooding became more common along the Ohio River counties as a steady rain fell. Rain rates were mostly 1 to 2 tenths of an inch per hour. Total rainfall of 1.5 to 2 inches became common by that evening. As the small stream flooding continued, the rain changed to sleet and wet snow during the late afternoon and early evening of the 4th. Heavy wet snow quickly accumulated along the Ohio River counties during the late evening on the 4th and into the morning hours of Thursday the 5th. As the heavy snow was falling, several high water signs and barricades were stolen across Lawrence County. Further north, the snow was lighter over Morgan and Perry Counties. The snow diminished by early afternoon of the 5th. A total snow accumulation of 10 to 13 inches was common from Jackson and Lawrence Counties on up the Ohio River to Washington County. For example, Waterloo of northern Lawrence County measured a 13 inch accumulation. The snow depth at Gallipolis also went from zero to 13 inches during the storm. Marietta reported a snow accumulation of a foot. Further north snow accumulations were mostly 4 to 8 inches across Morgan, and 3 to 5 inches in Perry County. An unofficial report of 17 inches was received north of Waterloo near the border with Gallia County. A spotter in Thurman of Gallia County measured 14 inches of snow. After transitioning from rain to snow, the wet snow accumulated on trees, especially evergreen trees. Prolonged power outages were common in the counties adjacent to the Ohio River. After the storm, clearing resulted in a cold dawn on the 6th for so late in the season. The coldest minimum temperatures was 8 below zero at New Lexington of Perry County. Waterloo of Lawrence County had 6 below zero, while Jackson had minus 3. Near the Ohio River readings were closer to zero degrees. Newport in Washington County was 2 below zero. Eventually, the Ohio River had minor flooding from Gallia County on down the river through Ironton on the 6th into the 7th. Overall, both the stream and river flooding mainly blocked roads with little damage to structures.
Flood - 3/13/2015 Streams and rivers were still swollen from previous rains and snow melt. The Ohio River was still having some minor overflow as more rain began during the afternoon of the 13th. This rain was associated with a warm front lifting north from Tennessee and southern Kentucky. The rain diminished during the morning of the 14th. Total rain

Event Narrative
amounts were just over an inch. Minor stream flooding occurred in Lawrence and Meigs Counties. Minor flooding also occurred along the swollen Ohio River.
Flash Flood - 6/29/2015 In the late afternoon, a low level boundary existed along the Ohio River from near Cincinnati to Ironton, then east into central West Virginia. Rotating thunderstorms formed along this boundary, the strongest of which moved east across interior Lawrence County. Downpours also occurred. An automatic gauge near Kitts Hill measured 1.4 inches in an hour with 1.9 inches in less than 3 hours.
Flash Flood - 7/14/2015 Showers and thunderstorms formed during the evening hours on the 12th. A weak low pressure was over southern Ohio. Minor flash flooding occurred in Jackson County. After a lull in the rain during the morning into the early afternoon on the 13th, a mesoscale convective complex moved southeast through southern Ohio during the mid and late afternoon. After another lull during the evening, more thunderstorms formed by late evening on the 13th in southeast Ohio. These moved southeast and caused repetitive showers. The heaviest rains were from Jackson County through Gallia County. The 24 hour rain maximum was from an automatic gauge near Rio Grande with 3.98 inches. Another gauge in Gallia County at Northup measured 3.23 inches. Two gauges around Jackson measured 2.68 and 2.03 inches of rain. The cooperative observer in Gallipolis measured 2.25 inches. Significant flash flooding occurred. Finally, more thunderstorms formed in northern Ohio ahead of a cold front and mid level disturbance during the midday and early afternoon on the 14th. These storms formed into a squall line and moved southeast, through southern Ohio during the late afternoon. Rain amounts of a half inch to an inch in an hour were enough to cause minor flash flooding, since streams were running well above normal and soils were saturated. In less than 8 days, the rain total at both Waterloo and Gallipolis was around 6.1 inches. The last event from this multiple day episode was from the slow responding Symmes Creek in Lawrence County.
Flood - 7/15/2015 Showers and thunderstorms formed during the evening hours on the 12th. A weak low pressure was over southern Ohio. Minor flash flooding occurred in Jackson County. After a lull in the rain during the morning into the early afternoon on the 13th, a mesoscale convective complex moved southeast through southern Ohio during the mid and late afternoon. After another lull during the evening, more thunderstorms formed by late evening on the 13th in southeast Ohio. These moved southeast and caused repetitive showers. The heaviest rains were from Jackson County through Gallia County. The 24 hour rain maximum was from an automatic gauge near Rio Grande with 3.98 inches. Another gauge in Gallia County at Northup measured 3.23 inches. Two gauges around Jackson measured 2.68 and 2.03 inches of rain. The cooperative observer in Gallipolis measured 2.25 inches. Significant flash flooding occurred. Finally, more thunderstorms formed in northern Ohio ahead of a cold front and mid level disturbance during the midday and early afternoon on the 14th. These storms formed into a squall line and moved southeast, through southern Ohio during the late afternoon. Rain amounts of a half inch to an inch in an hour were enough to cause minor flash flooding, since streams were running well above normal and soils were saturated. In less than 8 days, the rain total at both Waterloo and Gallipolis was around

Event Narrative
6.1 inches. The last event from this multiple day episode was from the slow responding Symmes Creek in Lawrence County.
Flood - 2/21/2016 Strong support in the winds above the ground, caused showers and thunderstorms to form in the lower Ohio Valley during the evening of the 20th. Dew points were in the low and mid 50s. The cluster of showers, with a few embedded thunderstorms, streaked through southern Ohio from 0300E to 1200E on the 21st. A narrow west to east band of enhanced rain fell across central Lawrence County into southern Gallia County. An automatic rain gauge in Dean State Forest of Lawrence County measured 1.42 inches of rain in 8 hours. The cooperative observer in Waterloo measured 1.45 inches. Streams overflowed and closed roads.
Flash Flood - 6/23/2017 Tropical Storm Cindy made landfall in southwestern Louisiana on the 22nd. The storm weakened after making landfall and became post tropical as it moved through the Mississippi and lower Ohio River Valleys into the 23rd. At the same time, a strong cold front was moving eastward across the Midwest and western Great Lakes. The remnants of Cindy passed through the eastern portions of the Ohio River Basin during the evening of the 23rd. The tropical moisture and energy associated with the remnants combined with the lift of the approaching cold front to produce a large area of heavy rainfall. The area of the heaviest rain stretched along the Middle Ohio River Valley, from central and northeastern Kentucky into southeastern Ohio and western West Virginia. Common rainfall measurements ranged from 2 to 3 inches across Southeast Ohio. For example, in Athens County the Nelsonville cooperative observer measured 2.6 inches of rain, while a CoCoRaHS observer in nearby Chauncey reported 2.8 inches. In Meigs County, the cooperative observer near Salem Center received 2.08 inches of rain, and the Newport observer in Washington County had 2.18 inches in their rain gauge. Initially, flash flooding closed many roads across Southeast Ohio. Some areas of high water lingering through the 24th as water drained through the river system. Strong rises were seen on local stream gauges such as the Duck Creek at Whipple and the Little Muskingum River at Bloomfield in Washington County. In general, the Ohio River rose about 10 feet, however no river flooding occurred along the Ohio River.
Flood - 12/16/2019 A strong storm system brought a prolonged period of moderate to heavy rainfall to the middle Ohio River Valley on the 15th and 16th. Over a roughly 36 hour period, 1.5 to 3 inches of rain fell. This led to flooding along creeks, streams, and eventually smaller rivers as the water worked through the system.

2. Severe Winter Storm

Event Narrative
Cold/Wind Chill - 2/4/1996 A fresh snow cover combined with an arctic cold wave to droptemperatures well below zero on 2 consecutive mornings.The coldest readings were around minus 20 on both morningsfrom rural areas away from the rivers. Waterloo of LawrenceCounty, for example, had 22 degrees below zero. Readingsnear the Ohio, Hocking and Muskingum Rivers were not assevere, mostly minus 5 to minus 10. Athens had minus 10,Pomeroy and Marietta had minus 7, while McConnelsville hadminus 6. Power outages occurred

Event Narrative
in Gallia County, whilecity water lines broke in Marietta.
Winter Storm - 2/3/1998 A slow moving coastal storm and a prolong period of easterly wind aloft, resulted in several periods of snow, sleet, and freezing rain. The deepest snow cover over southeast Ohio was in Lawrence, Gallia, Jackson, and Vinton Counties. On the 6th, Ironton had 9 inches on the ground, South Point and Waterloo had 7 inches, Patriot of Gallia County had 8 inches, the city of Jackson had 5 inches, while McArthur had 4 to 5 inches. No old snow was on the ground prior to the storm. A roof to a South Point home caved in, due to the weight of the snow.More sleet than snow fell further to the northeast, resulting in 1 to 3 inches of snow and ice over Meigs and Athens Counties.
Ice Storm - 2/16/2003 A severe ice storm occurred, when 1 to 2 inches of ice from freezing rain accumulated on trees and power lines. The precipitation initially started as snow then changed to rain then freezing rain. The freezing rain was mixed with sleet at times. The storm finally ended as a period of snow on Monday, the 17th. Roads remained blocked by fallen branches and trees for several days. A Meigs County deputy sheriff said on the 17th, "We've got trees coming down about every 5 minutes". The city of Pomeroy was without electricity for 5 days, No electricity lead to water shortages. Refrigerated frozen foods spoiled. Governor Taft declared a state of emergency in Lawrence, Gallia, and Meigs Counties for the severe icing. Jackson and Vinton Counties in southeast Ohio were later added for a request of federal assistance. President Bush declared a major disaster that included Jackson, Lawrence, Vinton, Meigs, and Gallia Counties. See FEMA disaster number 1453.
Winter Storm - 1/27/2009 Snow moved up the Ohio River Valley and overspread southeast Ohio shortly after midnight on Tuesday the 27th. The snow quickly accumulated 4 to 6 inches across Jackson, Lawrence, Gallia, and Meigs by mid morning, with 2 to 4 inches common further north. The snow became lighter by early afternoon. The snow transitioned to freezing rain from south to north, reaching Perry County by 1900E on the 27th. The intensity of the freezing rain increased for the evening hours, with temperatures still in the upper 20s. Ice accumulations of a quarter to a half inch were widespread. The intensity of the freezing rain decreased during the predawn hours of the 28th. Once the low pressure center lifted northeast through West Virginia, the storm ended as a quick burst of snow, during the daylight hours. This added a coating of snow on top of the ice. Damage to structures was minimal. The main problem was the loss of electricity due to tree limbs falling across power lines. Over 25,000 customers had no power. Some rural areas were without electricity for 4 days. One electric company official said it was the worst ice storm in his area in over 15 years. A few shelters were open for people without heat, but only a handfull of residents stayed. Law enforcement and fire departments conducted wellness checks and assisted where needed.
Extreme Cold/Wind Chill - 1/6/2014 An arctic cold front sweep through southeast Ohio just after midnight on Monday the 6th. Rain showers and temperatures in the 40s quickly became snow showers with temperatures falling through the 20s by the predawn hours. During these predawn hours, an Athens County woman with mental health issues went outside in Knollwood Trailer Park. This mobile home park was located just southwest of the city of Athens.

Event Narrative
She apparently slipped and fell a few times on driveways. Detectives concluded she staggered and collapsed in a yard. She was not found until after daybreak and likely died of exposure. Snow accumulations across southeast Ohio were less than 2 inches. Temperatures continued to fall during the day on the 6th, with blustery winds. Readings reached down to either side of zero by sunset. Temperatures at dawn on the 7th were mostly 5 below zero to 10 below zero. Wind chill readings bottomed out around minus 25 degrees overnight and into the morning hours. Despite sunshine, temperatures were slow to rise during the day on the 7th. However, the wind did subside during the mid and late afternoon. A scattering of frozen pipes, power outages, home furnace difficulties, and vehicular engine problems occurred during the cold wave. Repair companies were kept busy. School systems were closed.
Extreme Cold/Wind Chill - 1/27/2014 Arctic air poured into southeast Ohio on the 27th. A clear night with diminishing winds resulted in temperatures mostly in the minus 5 to minus 20 degree range across southeast Ohio. At dawn on Tuesday the 28th, preliminary data indicated the coldest temperature from the official cooperative observers network was 21 degrees below zero from New Lexington. Some of the other minimum temperature readings around dawn on the 28th from cooperative observers included minus 9 at Jackson, minus 8 at Newport, minus 7 at Marietta, and minus 6 at Gallipolis. Some unofficial readings included a minus 20 from Corning in Perry County and a minus 16 from McConnelsville in Morgan County. A minus 14 was reported from both Zaleski in Vinton County and Watertown in Washington County. Readings of minus 13 to minus 17 were reported around the town of Athens. The night of Jan 28th into Jan 29th was another bitter cold night with readings in interior southeast Ohio very similar to the previous night. New Lexington reached minus 22 degrees, Beverly minus 16, Waterloo minus 13, Jackson minus 10. With the Ohio River filled with broken ice, communities along the river were colder at dawn on the 29th. Marietta observed 11 below zero. Newport reached down to 10 below zero, while Gallipolis fell to minus 8, and South Point reached minus 2. Some unofficial readings from the 29th included minus 21 at Corning, minus 19 along Interstate 77 in northern Washington County, minus 18 at Ohio University in Athens, plus Zaleski in Vinton County and McConnelsville in Morgan County. A minus 17 was reported in Wellston in Jackson County. The 3rd clear night was not quite as bitter, but still resulted in temperatures dipping below zero in many areas for dawn on Thursday the 30th. New Lexington had 10 below zero. Some unofficial readings also included minus 10 at Ohio University and Zaleski. The 3 day cold wave finally broke that afternoon, as temperatures rose to either side of freezing with sunshine.
Extreme Cold/Wind Chill - 2/18/2015 In less than a week, a second arctic front swept through southeast Ohio during the late morning hours of the 18th. Snow showers formed ahead of the front, with a few bands lingering during the afternoon in its wake. Snow accumulations of 2 to 3 inches were common in Jackson, Vinton, Athens, Perry, and Morgan Counties, with less toward the Ohio River. Temperatures dropped into the zero to 5 below range by dawn on the 19th. Despite sunshine through icy low clouds, daytime readings only recovered into the 5 to 10 degree range. Wind chill readings of minus 10 to minus 20 were felt on the 19th. The diminishing winds and a clear sky developed first over southern counties then moved north during the overnight hours of the 19th into the 20th. With a fresh snow

Event Narrative
pack, temperatures dropped well below zero for dawn on Friday, the 20th. The coldest official temperature in southeast Ohio was 26 degrees below zero at Waterloo of Lawrence County. Readings of minus 15 to minus 20 were more common. New Lexington had minus 17, South Point observed minus 15, Gallipolis had minus 13, and Jackson felt minus 12. Unofficially, the Athens airport near Albany had minus 20 and the Scalia Lab at Ohio University dropped to minus 18. The general public reported minus 20 in McArthur and around Kitts Hill. | |In several counties, the morning of Friday the 20th was the coldest since the cold waves of February 1996 and January 1994. A power outage on the 20th affected about 2,000 customers in Lawrence County. It caused a pump at a water utility to fail. About 800 customers in the Proctorville and Scottown vicinity lost their water service.

3. Severe Summer Storm/Thunderstorm/Windstorm/Hail

Event Narrative
Thunderstorm Wind - 6/6/1996 Trees and several large limbs fell across roads and houses. Mobile homes and houses sustained damage, mainly to awnings and porches. Damage was generally between Fifth and Twelfth Streets on the south side of town. Two cars were damaged andone destroyed. The sides of a storage barn for the state were torn away.
Lightning - 8/16/1996 Lightning struck a school chimney. Bricks were thrown through windows of the gyn and nearby classrooms. Some debris traveled more than 100 feet. Luckily, the school year had not started.
Thunderstorm Wind - 5/10/2003 On the 10th, several rounds of showers and thunderstorms crossed southeast Ohio. Flooding, gusty winds, hail, and even some funnel clouds occurred. The heaviest rains were across southern Jackson County on east, into Gallia County. Gallipolis had a 24 hour rain amount of 2.67 inches, ending at dawn on the 11th. Jackson County emergency officials reported a tributary to Hunting camp Creek overflowed into 3 homes and 4 businesses around Oak Hill. Over recent years, the stream has seen more culverts installed. In Hamilton Township of Jackson County, several homes had flooded basements. The fire department rescued a person in a flooded car along Route 139.
Thunderstorm Wind - 7/17/2007 Small clusters of thunderstorms intensified near the Ohio River.
Thunderstorm Wind - 7/20/2008 Multicellular thunderstorms formed in the late afternoon heat, ahead of a weak summer cold front in the Ohio Valley.
Heavy Rain - 7/11/2009 A thunderstorm complex developed ahead of a cold front in northern and central Ohio. The storms then dropped southeast. Wind gusts and downpours were the main threat.
Lightning - 7/11/2009 A thunderstorm complex developed ahead of a cold front in northern and central Ohio. The storms then dropped southeast. Wind gusts and downpours were the main threat.
Heavy Rain - 7/31/2009 Showers and thunderstorms dumped 1.5 to 2 inches of rain between 0000E and 0800E.

Event Narrative
Due to previous rains over the past week, runoff was efficient.
Thunderstorm Wind - 6/27/2010 A southwest wind flow of hot and humid air helped induce scattered afternoon and evening thunderstorms. One storm pulsed to a stronger level in Kentucky before moving into Lawrence County in Ohio and Cabell County in West Virginia.
Thunderstorm Wind - 3/23/2011 This was a synoptic scale event. A strong north to south temperature gradient existed along the Interstate 70 corridor in Ohio. Low pressure moved out of Illinois in the morning, reaching western Pennsylvania by evening. Individual thunderstorm cells developed in western Ohio and southern Indiana around midday. Hail was initially the main impact, but higher wind gusts developed as the thunderstorm complex matured. A separate batch of showers and thunderstorms developed closer to the cold front and reached into southeast Ohio during the late evening.
Thunderstorm Wind - 4/23/2011 Several more rounds of showers and thunderstorms moved through southeast Ohio from Friday the 22nd into Sunday the 24th. This time the heaviest rains were a bit further south. The counties of Gallia and Lawrence were hit the hardest. For example, the cooperative observer at Waterloo measured 1.9 inches at dawn on the 23rd and another 1.67 inches at dawn on the 24th. Meanwhile, Gallipolis had 1.57 inches and 1.40 inches respectively. Small stream flooding was again common from the late on the 22nd into the 25th. The larger creeks, such as Symmes Creek, did not crest until early on the 25th. At Aid in Lawrence County, the crest on Symmes Creek was 21.5 feet. This was the highest stage in over 11 years, since February 2000. The bankfull stage there is 19 feet. According to county emergency officials, only roads were flooded and closed. No dwellings were flooded. The thunderstorms also caused wind damage early on 23rd and again later that afternoon across Lawrence County.
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Event Narrative
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Hail - 5/10/2011 Repetitive showers and thunderstorms, moved southeast through western Vinton County, Jackson County, and western and central portions of Lawrence County between 1500E and 1830E on Tuesday, the 10th. This convection was just northeast of the surface warm front. A sharp dew point gradient existed along the front. Surface dew points were around 70 degrees just southwest of the boundary. Luckily, later that same evening, repetitive convection occurred in the Scioto River Valley, missing this area just to the west. Initially, the main impact was large hail. As back building caused repetitive showers and thunderstorms, flooding became the primary issue. Maximum rain amounts of 3 to 4 inches were observed. Jackson measured 3.35 inches. Waterloo observed 3.76 inches. South Point had 3.25 inches of rain. Luckily, no injuries or fatalities occurred. State assistance money was committed to aid uninsured homeowners and renters.
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Lightning - 6/21/2011

Event Narrative
Thunderstorms developed over southern West Virginia and eastern Kentucky during the heat and humidity of this June afternoon. The storms moved northeast into southeast Ohio by the early evening. Despite the high freezing level, some large hail still occurred. The rapid temperature drop from near 90 to 70 degrees also helped produced some damaging wind gusts.
Thunderstorm Wind - 6/21/2011 Thunderstorms developed over southern West Virginia and eastern Kentucky during the heat and humidity of this June afternoon. The storms moved northeast into southeast Ohio by the early evening. Despite the high freezing level, some large hail still occurred. The rapid temperature drop from near 90 to 70 degrees also helped produced some damaging wind gusts.
Thunderstorm Wind - 6/29/2012 On the second day of a developing heat wave, under a sunny sky, afternoon temperatures reached the upper 90s to above 100 degrees across most of southeast Ohio. For example, Waterloo in Lawrence County reached 104 degrees that Friday afternoon. Marietta had 100 degrees. Meanwhile, an area of multi-cellular convection had moved out of northern Illinois that morning. It continued to organize and strengthen, as it propagated east and southeast across northern Indiana into western Ohio during the afternoon. As it moved toward southeast Ohio, it had already formed into a large arch of storms, or bow, with a developing cool pool in its wake. The temperature contrast between the air ahead of the developing derecho, compared to that in its wake was reaching 30 to 35 degrees. The resultant wind shift in the cool pool resulted in strong moisture convergence on the leading edge of the complex. This in turn, helped drive the storms further southeast, away from the mid and upper level wind support. However, the complex was diving right into that hot air that had obtained large convective available potential energy (CAPE), on the order of 4000 to 5000 j/kg. The derecho reached southeast Ohio near the hottest time of the day, after 1600E. It was racing southeast around 65 mph. The outflow or gust front began to outrace the rain as it moved into southeast Ohio. As the system matured, the strong gusts were longer in duration, in some cases around 10 minutes. That gust front then crossed the Ohio River into northeast Kentucky and western West Virginia on either side of 1730E. The storms and showers only provided about a quarter to a half inch of rain. Widespread wind gusts of 60 to 85 mph were likely with the leading gust front across southeast Ohio. A department of highways garage in Perry County measured 62 mph at 1650E. Ohio University at Athens measured 64 mph at 1712E. The airport near Albany of Athens County had a gust to 59 mph at 1715E. The department of highways garage in Gallia County near Kerr had 62 mph at 1731E. The wind caused trees and large branches to fall in scattered locations throughout the 9 counties in southeast Ohio. There was some structural damage. Corrugated metal and siding were ripped off a few buildings. Trees fell onto houses and vehicles. Out of the 9 counties only 4 counties reported individual damage to the state. Those counties were Athens, Jackson, Lawrence and Meigs. The fallen trees and power lines also caused roads to be temporarily blocked. However, the largest impact was on the electric power grid. Prolonged power outages occurred. Some areas were without electricity for 4 to 7 days. Luckily there were no direct deaths or injuries. One indirect death can be attributed to the storm. The lack of electricity in the midst of the heat wave, disrupted the daily routines of most citizens for

Event Narrative
several days. Water and ice were in high demand. An emergency declaration by President Obama allowed federal supplies to be quickly delivered. Family and retail refrigerated food lost was substantial. Rural citizens with private wells may have been hit harder than those living in towns on public water systems. Citizens that relied on well water had no power to pump the water from their wells. Water had to be hauled just to flush the toilet. Some people slept outside on porches where it was cooler. With limited gas stations available to pump gas, long lines developed for a few days in the wake of the storm. Workers trying to restore the electricity had to take frequent breaks due to the heat and the safety equipment they had to wear. Due to the public damage, a federal major disaster was eventually declared for this episode. A few others episodes during the first few days of July were also included. See FEMA disaster number 4077 for more details.
Thunderstorm Wind - 8/28/2013 A northwest flow with upper disturbances aloft dominated the area for this episode. A west to east frontal system lay well to the north, across northern Ohio early Wednesday morning. The front dropped slowly south during the afternoon. The afternoon heating combined with the unstable environment to trigger thunderstorms. |Several convective complexes developed in the afternoon and early evening. One batch|of storms formed over southeast Ohio. One individual cell within the southern Ohio complex pulsed to a stronger level as it approached the Ohio River.
Thunderstorm Wind - 11/1/2013 A strong autumn cold front swept across southeast Ohio between 0000E and 0300E. Strong winds existed just above the surface. There were fast moving showers near the front, with just a few embedded thunderstorms. The convection was able to mix some of the strong wind gusts down to the surface. Wind gusts of 35 to 50 mph were common in southeast Ohio. A few locations had stronger wind gusts. No injuries occurred.
Thunderstorm Wind - 12/22/2013 The winter solstice arrived on the 21st with near record warmth in southeast Ohio. Temperatures reached into the upper 60s to lower 70s. In a fast wind flow above the ground, a squall line raced northeast into the area after midnight. The gusty showers had a few embedded thunderstorms and preceded a larger area of rain. Some minor wind damage occurred. The 1 to 2 inches of rain from the 21st into the 22nd caused the larger streams to swell.
Thunderstorm Wind - 6/10/2014 Ahead of a slow moving mid level trough in the Missouri, warm and humid air returned to extreme southeast Ohio on the 10th. Sunshine helped temperatures reach into the mid 80s during the afternoon. An arch of thunderstorms moved northeast out of Tennessee during the late afternoon, through eastern Kentucky and into southeast Ohio during the evening. A well defined shelf cloud was observed on the leading edge of the squall line. Wind gusts of 45 to 50 mph were widespread. A few spots received slightly stronger wind gusts.
Thunderstorm Wind - 10/7/2014 A strong wind flow existed in the lower atmosphere, well ahead of a surface cold front. Clusters of fast moving showers and thunderstorms raced across northeast Kentucky into southeast Ohio during the late afternoon and early evening hours.
Strong Wind - 11/24/2014

Event Narrative
As a strengthening low pressure system lifted north through the Great Lakes into Ontario, strong winds aloft mixed down to the ground during the late morning and early afternoon. Surface temperatures were still in the 60s with partial sunshine. The cold air advection aloft aided in the downward momentum transfer. Wind gusts of 40 to 50 mph were common. Electricity was temporarily out, mostly due to weak tree limbs falling on overhead lines. The most power outages were in Perry County where 5,900 customers were affected. In Athens County, over 4,000 customers were affected.
Hail - 6/26/2015 During the afternoon of the 26th, a low pressure system was organizing over the lower Ohio River. Meanwhile, ahead of that system, a frontal boundary stretched east through southern Ohio and central West Virginia. Thunderstorms formed along the frontal boundary in southern Ohio, with more widespread rain north of the front. One of the leading storms was severe as it moved east. Repetitive thunderstorms and showers affected Jackson, northern Gallia, and southern Meigs Counties for a few hours. Downpours occurred. An automatic gauge in Jackson measured 1.5 inches in less than an hour. Its total by 2200E was 2.96 inches. Flash flooding closed several roads, but damage to houses was minimal. Other storms formed further south during the evening, affecting Lawrence County.
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Strong Wind - 3/1/2016 A strengthening low pressure system tracked east into northern Ohio and the Lake Erie vicinity by the early evening. Temperatures had peaked in the mid and upper 60s during the early and mid afternoon. The powerful cold front, associated with the storm system, streaked through between 1800E and 2100E. Wind gusts of 40 to 50 mph occurred with the showers associated with the front. The airport near Athens measured a gust to 43 mph. As colder air moved in, winds continued overnight, but gusts were not as strong. A few trees fell causing power outages. Roughly 1,000 customers were without electricity.
Strong Wind - 4/2/2016 A cold front whipped through during the evening with just light showers and some graupel. The front was associated with a strong flow aloft and falling temperatures. Wind gusts of 45 to 55 mph were common during the late afternoon into the evening. There were no injuries. Minor damage and power outages occurred. Fallen trees, tree limbs, and blown debris partially blocked roads. A tall pine tree fell and smashed a car in Gallipolis. The most power outages were in Washington County where over 1800 customers were affected. Jackson County had nearly 900 customers affected, with

Event Narrative
around 600 without power in Athens and Meigs Counties.
Thunderstorm Wind - 3/1/2017 A strong cold front moved across the Ohio River Valley during the afternoon of March 1. Strong storms had developed near this cold front well to the west the day before, and raced through the middle Ohio River Valley early on the 1st as a severe squall line producing widespread damaging wind gusts. Heavy rainfall from training storms also produced flash flooding as 1-2 inches of rain fell over several hours. The flash flooding combined with the wet ground eventually lead to river and stream flooding during the afternoon of the 1st through the 2nd. The Muskingum river at Beverly, spilled over its banks on the evening of the 1st, and remained in flood stage for several hours. The river had a crest of 29.3 feet, just above the flood stage of 29 feet. This caused minor flooding of several homes, roads and lowlands next to the river. The Hocking River at Athens rose out of its banks just after noon on the 2nd, and remained above flood stage through mid morning on the 3rd. The river crested at just over 21 feet, about a foot over flood stage of 20 feet. This resulted in minor flooding of lowlands and campgrounds along the river. Other smaller creeks and streams, such as Duck Creek, the Little Muskingum, Raccoon Creek, Shade Creek and Symmes Creek all rose out of their banks. The Raccoon Creek was the last to return below bankfull, early on the 4th. According to the Ohio DOT, various roads were closed due to the flooding across Southeast Ohio.
Strong Wind - 10/20/2018 A strong cold front swept through the middle Ohio River Valley on the 20th. This brought a round of gusty winds which led to scattered tree damage and power outages. Several thousand power customers experienced outages that evening.
Strong Wind - 2/24/2019 A warm front lifted northward into Ohio on the evening of the 23rd, promoting widespread showers and a few isolated thunderstorms due to the close proximity of an approaching cold front. Local reports of 1 to 1.5 inches of rain had fallen between the evening of the 23rd and the morning of the 24th. Behind the cold front, very gusty winds developed with most areas seeing gusts of 40 to 50 knots. Combined with the soggy ground, these winds led to power outages due to downed trees and power lines. Thousands of power customers lost power, and it took a couple days for all service to be restored.
Thunderstorm Wind - 6/2/2019 A cold front swept across the middle Ohio River Valley on the 2nd. Strong to severe thunderstorms moved through along and ahead of the front.
Strong Wind - 11/27/2019 A strong low pressure system moved through the Great Lakes on the 26th and 27th. This pushed a cold front through the middle Ohio River Valley on the afternoon of the 27th. Very strong synoptic winds behind the front led to a couple thousand utility company customers losing power as multiple trees fell onto power lines across southeast Ohio. Hardest hit by the power outages were Gallia, Jackson and Meigs Counties. In Lawrence County, a tree fell through the roof of a home in Coal Grove. The automated weather system at Ohio University Airport near Albany measured a max wind gust of 45 mph just before 1 PM EST.

4. Tornado

Event Narrative
Tornado - 5/24/2017 Showers and thunderstorms developed in a weak instability but strong shear environment across Central Kentucky on the afternoon of the 24th. The showers and storms moved into Southeast Ohio just before sunset. There was very little lighting, but one low-topped supercell, which had persistent rotation, was able to spin up a brief tornado.

E. 2015 Mitigation Action Adjustments

2015 Goal/Action	Disposition	2021 Action
Public Safety		
Communication systems often fail during disaster events. Develop back-up plans in the EOP for cases of communication failure.	Unchanged	Develop back-up plans in case of public safety communication failure.
Develop a program for presentations in high schools, to Civic organizations (e.g. Rotary and Kiwanis clubs) & Chambers of Commerce, etc. to acquaint the public with county emergencies, responses, programs, shelters, etc. using personal appearances, and/or video presentations.	Unchanged	Develop an All-Hazards public education program.
Establish a NOAA Weather Radio program for all schools, libraries, government buildings, large industries, nursing homes, festivals, fairgrounds, etc.	Unchanged	Design and implement a comprehensive public emergency notification system.
People are not always around media to alert them to severe weather. Develop an audible alert system.	Deleted Merged	Design and implement a comprehensive public emergency notification system.
Prepare a list of available emergency shelters including city and county facilities, churches, schools, Salvation Army, others, etc.	Unchanged	Identify emergency shelters.
Promote periodic public workshops either by Lawrence County alone or with other counties, held in such venues as OUSC to call public attention to the EMA programs and concerns and to seek public input.	Deleted Merged	Develop an All-Hazards public education program.
Provide public notification of regulated Fire Burning Seasons and drought conditions to prevent ignition of wildfires either from unsupervised brush burning or failed camp fire extinguishment. Also to help regulate fire hazards created by disposal of debris.	Unchanged	Educate the public on regulated Fire Burning Seasons and drought conditions as well as fire hazards created by disposal of debris.
Publish a Disaster Preparation hand-out brochure or flier for distribution thru county court house offices, restaurants, banks etc.	Deleted Merged	Develop an All-Hazards public education program.
The public is not always aware of imminent dangerous weather situations. Educate the public on the benefits of weather radios and what to do in cases of imposing danger.	Deleted Merged	Develop an All-Hazards public education program.
The public is not aware of the risks from natural hazards. Educate public about severe weather risks and damage prevention.	Deleted Merged	Develop an All-Hazards public education program.

2015 Goal/Action	Disposition	2021 Action
Existing Development		
Mitigate all Repetitive Loss Structures with Lawrence County.	Unchanged	Mitigate structures at risk.
Mobile homes are more prone to high wind damage. Propane tanks can become airborne during a tornado or float away during flooding events, causing an additional explosion hazard. Adopt & enforce anchoring criteria for mobile homes, propane tanks and any other objects that can become hazardous during natural hazard events. Seek funding for anchoring of existing mobile homes.	Unchanged	Develop and adopt anchoring criteria for objects that can become hazardous during natural hazard events and assist residents with anchoring these items.
Reevaluate floodwall work with USACE. The floodwall pump stations control systems are failing and replacement parts are not available. Seek emergency funding to replace floodwall pump station control system.	Unchanged	Evaluate and repair levees and their flood control systems.
Update dam Emergency Action Plans, update inundation data for dams without EAPs or current data.	Unchanged	Update dam Emergency Action Plans, update inundation data for dams without EAPs or no current inundation data.
There are dams that have been constructed without review or state oversight. Identify dams throughout county to determine if they fall under state regulation.	Deleted Merged	Update dam Emergency Action Plans, update inundation data for dams without EAPs or no current inundation data.
Trees are often destroyed in high winds and ice storms, taking down power and communication lines. Encourage maintenance of trees in right-of-way areas.	Unchanged	Identify and advise responsible parties of required maintenance of trees in utility right-of-way areas.
Utility lines are often damaged during earthquakes, increasing risks to people and structures. Identify areas where additional utility cutoffs are needed to isolate utility systems.	Unchanged	Identify areas where additional utility cutoffs are needed to isolate utility systems.
Future Development		
Buildings are not properly constructed to resist the forces and elements that can be encountered during a natural disaster event. This is due to a lack of a local building code and inspection system. Investigate developing building codes and inspection system in jurisdictions without building codes and educate the public regarding regulations designed to protect themselves from hazards.	Unchanged	Develop building codes in jurisdictions without building codes.

2015 Goal/Action	Disposition	2021 Action
Critical facilities should have an extra level of protection. Require new/improved critical facilities to be elevated/flood protected to the 500year flood level.	Unchanged	Require new/improved critical facilities to be elevated/flood protected to the 500-year flood level.
Participation in the NFIP		
Establish a NOAA Weather Radio program for all schools, libraries, government buildings, large industries, nursing homes, festivals, fairgrounds, etc.	Deleted Merged	Design and implement a comprehensive public emergency notification system.
Mitigate all Repetitive Loss Structures within Lawrence County	Deleted Duplucate	Mitigate structures at risk.
Additional Mitigation Actions		
Additional fire break lines are needed. Identify areas where fire break lines are needed.	Unchanged	Identify areas where fire break lines are needed and create them.
Address the problem of arson within the county by increasing enforcement and prosecution and provide a no way to report suspected arsonists.	Deleted Not a mitigation action	
Combined sanitary sewers often fill with flood waters, which then back up into structures. Seek funding for back-flow preventers in areas of combined sanitary sewers.	Unchanged	Design back-flow prevention in areas of combined storm/sanitary sewers.
Logging often increases the risk of landslides and flooding. Coordinate with NRCS to improve logging practices including Best Management Practices in construction of haul roads, drainage facilities and silt/sediment controls.	Unchanged	Develop improved logging practices.
Reevaluate floodwall work with USACE. The floodwall pump stations control systems are failing and replacement parts are not available. Seek emergency funding to replace floodwall pump station control system.	Deleted Duplucate	Evaluate and repair levees and their flood control systems.
There are no severe storm warning sirens throughout the county. Seek funding to complete a tornado warning siren program for all populated areas within the county. Make warning system capable of addressing other hazards within other hazard prone areas.	Deleted Merged	Design and implement a comprehensive public emergency notification system.
There is a lack of maintenance of the dams. Coordinate with ODNR Division of Water regarding lack of maintenance and inspection of dams.	Deleted Merged	Update dam Emergency Action Plans, update inundation data for dams without EAPs or no current inundation data.
Other		

2015 Goal/Action	Disposition	2021 Action
Additional investigation and mapping is needed to determine where old mines are. Seek funding for mapping and subsurface investigations.	Unchanged	Identify and map areas and sites vulnerable to specific natural hazards.
Adopt a resolution requiring all government agencies in the county to provide a list of typed equipment and assets along with qualifications and certifications of employees and personnel that can be used by our county Emergency Management office during major events. Develop a list of equipment resources and contractors. This information should be uploaded and managed by the NIMS Incident Resource Inventory System (IRIS).	Unchanged	Develop inventory assets available for responding to and recovering from major hazard occurrences.
Buildings are not properly constructed to resist the forces and elements that can be encountered during a natural disaster event. This is due to a lack of a local building code and inspection system. Investigate developing building codes and inspection system in jurisdictions without building codes and educate the public regarding regulations designed to protect themselves from hazards.	Deleted Merged	Develop building codes in jurisdictions without building codes.
Communication systems often fail during disaster events. Develop backup plans in the EOP for cases of communication failure.	Deleted Duplicate	Develop back-up plans in case of public safety communication failure.
Develop a county GIS map showing areas and specific sites vulnerable to natural hazards and make available to the public.	Deleted Merged	Identify and map areas and sites vulnerable to specific natural hazards.
Evaluate where tornado shelters are needed throughout the county and seek funding to construct the shelters.	Deleted Merged	Identify emergency shelters.
Landslides and subsidence can destroy utilities. Identify areas where additional utility cut-offs are needed to isolate systems in high-risk zones.	Deleted Merged	Identify areas where fire break lines are needed and create them.
Seek funding for additional EMA personnel to assist current staff with needed disaster planning and prevention activities and programs.	Deleted Not a mitigation action	

2015 Goal/Action	Disposition	2021 Action
Seek funding to create an EAP for each small dam on private property using Standards of the International Committee of Dam Safety (ICODS), developed in compliance with OAC requirements and including an update of the design floods and the downstream hazards. Findings to be provided to ODNR and to dam owners.	Deleted Merged	Update dam Emergency Action Plans, update inundation data for dams without EAPs or no current inundation data.
There is a lack of available equipment and contractors to handle snow removal. Develop a list of equipment resources and contractors.	Deleted Merged	Develop inventory assets available for responding to and recovering from major hazard occurrences.
There is a lack of or conflicting information of where the high hazard areas are. Identify landslide, mined areas and problem soil areas.	Deleted Merged	Identify and map areas and sites vulnerable to specific natural hazards.

F. Acronyms, Terms and Definitions

Term	Acronym	Description
Community Development Block Grant Program	CDBC	The Community Development Block Grant program is a flexible program that provides communities with resources to address a wide range of unique community development needs.
Community Asset		The people, structures, facilities, and systems that have value to the community
Dam - Class I		Dams having a total storage volume greater than five thousand acre-feet or a height of greater than sixty feet shall be placed in class I. A dam shall be placed in class I when sudden failure of the dam would result in one of the following conditions: (a) Probable loss of human life. (b) Structural collapse of at least one residence or one commercial or industrial business. Reference: OAC 1501:21-13-01(A)(1)
Dam - Class II		Dams having a total storage volume greater than five hundred acre-feet or a height of greater than forty feet shall be placed in class II. A dam shall be placed in class II when sudden failure of the dam would result in at least one of the following conditions, but loss of human life is not probable. (a) Disruption of a public water supply or wastewater treatment facility, release of health hazardous industrial or commercial waste, or other health hazards. (b) Flooding of residential, commercial, industrial, or publicly owned structures. At the request of the dam owner, the chief may exempt dams from the criterion of this paragraph if the dam owner owns the potentially affected property. (c) Flooding of high-value property. At the request of the dam owner, the chief may exempt dams from the criterion of this paragraph if the dam owner owns the potentially affected property. (d) Damage or disruption to major roads including but not limited to interstate and state highways, and the only access to residential or other critical areas such as hospitals, nursing homes, or correctional facilities as determined by the chief. (e) Damage or disruption to railroads or public utilities. (f) Damage to downstream class I, II or III dams or levees, or other dams or levees of high value. Damage to dams or levees can include, but is not limited to, overtopping of the structure. At the request of the dam owner, the chief may exempt dams from the criterion of this paragraph if the dam owner owns the potentially affected property. Reference: OAC 1501:21-13-01(A)(2)
Dam - Class III		Dams having a total storage volume greater than fifty acre-feet or a height of greater than twenty-five feet shall be placed in

Term	Acronym	Description
		class III. A dam shall be placed in class III when sudden failure of the dam would result in at least one of the following conditions, but loss of human life is not probable. (a) Property losses including but not limited to rural buildings not otherwise described in paragraph (A) of this rule, and class IV dams and levees not otherwise listed as high-value property in paragraph (A) of this rule. At the request of the dam owner, the chief may exempt dams from the criterion of this paragraph if the dam owner owns the potentially affected property. (b) Damage or disruption to local roads including but not limited to roads not otherwise listed as major roads in paragraph (A) of this rule. Reference: OAC 1501:21-13-01(A)(3)
Dam - Class IV		Dams which are twenty-five feet or less in height and have a total storage volume of fifty acre-feet or less may be placed in class IV. When sudden failure of the dam would result in property losses restricted mainly to the dam and rural lands, and loss of human life is not probable, the dam may be placed in class IV. Class IV dams are exempt from the permit requirements of section 1521.06 of the Revised Code pursuant to paragraph (C) of rule 1501:21-19-01 of the Administrative Code. Reference: OAC 1501:21-13-01(A)(4)
Emergency Management Agency	EMA	
Federal Emergency Management Agency	FEMA	FEMA's mission is to support our citizens and first responders to ensure that as a nation we work together to build, sustain and improve our capability to prepare for, protect against, respond to, recover from and mitigate all hazards.
Hazards U.S. Multi-Hazard	HAZUS-MH	The Hazards U.S. Multi-Hazard is a nationally applicable standardized method that estimates potential losses from earthquakes, hurricane winds, and floods. HAZUS-MH uses state-of-the-art geographic information system (GIS) software to map and display hazard data and estimates of damage and economic loss to buildings and infrastructure.
Impact		The consequences or effects of a hazard on the community and its assets
Mitigation		Activities providing a critical foundation in the effort to reduce the loss of life and property from natural and/or manmade disasters by avoiding or lessening the impact of a disaster and providing value to the public by creating safer communities. Mitigation seeks to fix the cycle of disaster damage, reconstruction, and repeated damage. These activities or actions, in most cases, will have a long-term sustained effect. Mitigation measures may be implemented prior to, during, or after an incident. Mitigation measures are often informed by

Term	Acronym	Description
		lessons learned from prior incidents. Mitigation involves ongoing actions to reduce exposure to, probability of, or potential loss from hazards. Measures may include zoning and building codes, floodplain buyouts, and analysis of hazard related data to determine where it is safe to build or locate temporary facilities. Mitigation can include efforts to educate governments, businesses, and the public on measures they can take to reduce loss and injury.
Modified Mercalli Intensity Scale		The Modified Mercalli Intensity value assigned to a specific site after an earthquake has a more meaningful measure of severity to the nonscientist than the magnitude because intensity refers to the effects actually experienced at that place. The lower numbers of the intensity scale generally deal with the manner in which the earthquake is felt by people. The higher numbers of the scale are based on observed structural damage.
Natural Hazard		Source of harm or difficulty created by a meteorological, environmental, or geological event
National Flood Insurance Program	NFIP	The National Flood Insurance Program is aimed at reducing the impact of flooding on private and public structures. This is achieved by providing affordable insurance for property owners and by encouraging communities to adopt and enforce floodplain management regulations. These efforts help mitigate the effects of flooding on new and improved structures. Overall, the program reduces the socio-economic impact of disasters by promoting the purchase and retention of Risk Insurance in general, and National Flood Insurance in particular.
National Oceanic and Atmospheric Administration	NOAA	Science, Service, and Stewardship. Mission: To understand and predict changes in climate, weather, oceans, and coasts, To share that knowledge and information with others, and To conserve and manage coastal and marine ecosystems and resources.
National Weather Service	NWS	The National Weather Service provides weather, hydrologic, and climate forecasts and warnings for the United States, its territories, adjacent waters and ocean areas, for the protection of life and property and the enhancement of the national economy. NWS data and products form a national information database and infrastructure which can be used by other governmental agencies, the private sector, the public, and the global community.
Ohio Department of Natural Resources	ODNR	

Term	Acronym	Description
Per Capita		Per unit of population.
Repetitive Loss Property		Any insurable building for which two or more claims of more than $1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978. The property may or may not be currently insured by the NFIP.
Risk		The potential for damage, loss, or other impacts created by the interaction of natural hazards with community assets.
Risk Assessment		Product or process that collects information and assigns values to risks for the purpose of informing priorities, developing or comparing courses of action, and informing decision making.
Severe Repetitive Loss Property		A residential property that is covered under an NFIP flood insurance policy and: (a) That has at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000; or (b) For which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.
Threat or Human-Caused Incident		Intentional actions of an adversary, such as a threatened or actual chemical or biological attack or cyber event
United States Geological Survey	USGS	The USGS serves the Nation by providing reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.
United States Department of Housing and Urban Development	USHUD	HUD's mission is to create strong, sustainable, inclusive communities and quality affordable homes for all. HUD is working to strengthen the housing market to bolster the economy and protect consumers; meet the need for quality affordable rental homes; utilize housing as a platform for improving quality of life; build inclusive and sustainable communities free from discrimination and transform the way HUD does business.
Vulnerability		Characteristics of community assets that make them susceptible to damage from a given hazard