Morgan County Hazard Mitigation Plan
2021 Update

MORGAN COUNTY EMA

Prepared by Great Lakes Community Action Partnership
March 2021

Great Lakes COMMUNITY ACTION PARTNERSHIP

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TABLE OF CONTENTS

Appendices

List of Figures

List of Tables

The Morgan County Hazard Mitigation Plan is a multi jurisdictional plan that was created to protect the health, safety and economic interests of County residents and businesses by reducing the impacts of natural disasters through hazard mitigation planning, awareness and project implementation. The plan serves as the foundation for hazard mitigation activities and actions within Morgan County and its jurisdictions. Implementation of recommendations will reduce the loss of life, destruction of property and economic losses due to natural disasters. The plan provides a path toward continuous, proactive reduction of vulnerability to hazards which result in repetitive and oftentimes severe social, economic and physical damage. The ideal end state is full integration of hazard mitigation concepts into day-to-day governmental and business functions and management practices. This plan updates the 2013 Hazard Mitigation Plan.

The plan employs a broad perspective in examining multi-hazard mitigation activities and opportunities in the County. Emphasis is placed on hazards which have resulted in threats to the public health, safety and welfare as well as the social, economic and physical fabric of the community. The plan addresses the primary hazards determined to impact the county by the planning team which are: landslides, floods, severe storms (including thunderstorms, windstorms and hail), winter storms (ice and snow storms as well as extreme cold temperatures), and drought and extreme heat. Other identified hazards that impact the county are being mitigated through enhanced public education and awareness activities until additional studies and/or resources can be made available for mitigation actions. Each identified hazard was analyzed from an historical perspective, evaluated for potential future risk and considered for possible mitigative action. The plan also lays out the legal basis for planning and the tools to be used for its implementation.

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1.1 County Profile

Figure 1.1-Location Map of Morgan County

Named for revolutionary war officer, Brigadier General Daniel Morgan, Morgan County was platted in 1817 and officially founded March 1, 1819. Morgan County is located in the Appalachian region of Ohio and is the 4th least populated county in Ohio. Adjacent counties include Muskingum, Noble, Washington, Athens and Perry counties. The County boasts excellent recreational opportunities across its 30,000 acres of public recreation lands including camping, canoeing, kayaking, hunting, birding and hiking. It hosts a number of natural resources including Wayne National Forest, Burr Oak State Park, Buckeye and North Country (hiking) Trails, Jessie Owens State Park and Wildlife Area and Wolf Creek Wildlife Area. The County is also home to several historic and cultural features including the Muskingum River Navigation Historic District, Twin City Opera House, Adams Covered Bridge, Big Bottom Massacre Site and the McConnelsville Historic District, to name a few.

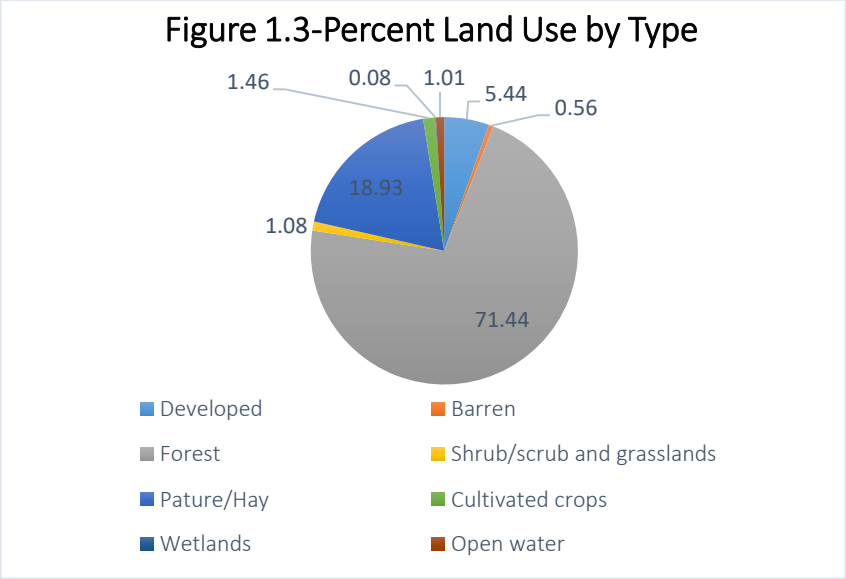
Major employers in Morgan County include EZG Manufacturing (Lang), Hann Manufacturing, Highland Oaks Health Center, Kroger, MAHLE International, Miba Bearings US, Morgan County Government and Morgan Local Schools. These employers are all located in the Village of McConnelsville, which also serves as the county seat.

Geography

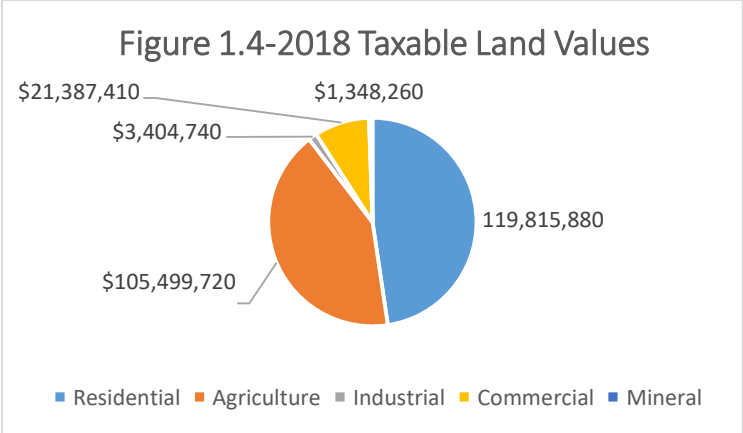
Figure 1.2-Map of Morgan County

Morgan County is located in southeastern Ohio, approximately 70 miles southeast of the City of Columbus and 30 miles south of the City of Zanesville, within the Appalachian Region of Ohio. It is primarily a rural county with 4 incorporated communities: Village of McConnelsville, Village of Malta, Village of Stockport and Village of Chesterhill.

The County has a total land area of 422 square miles. Land use in the county is approximately 5.44% Urban, 1.46% Cropland, 18.93% Pasture, 71.44% Forest, 0.58% Open Water and wetlands, 1.08% shrub/scrub and grasslands and 0.56% barren land as shown in Figure 1.3 below. Elevations in the County vary from 564 feet to 1,335 feet. The County lies in the Appalachian and Allegheny plateaus.



Taxable land values for the county as reported by the Ohio Development Services Agency's County Profiles reveals a total valuation of $251,456,010 with residential values being highest as shown in Figure 1.4.



Demographics

Morgan County is the 4th least populated county in Ohio. The 2018 ACS estimates the total population of Morgan County at 14,604. Of that, approximately 11,561 or 78.0% of the population live within the unincorporated areas of the County, while only 3,212 people or 22.0% live in the municipalities. The County's median age is 44.2, which is slightly older than the State's median age of 38.8. Table 1.1 shows the basic demographic profile for the County.

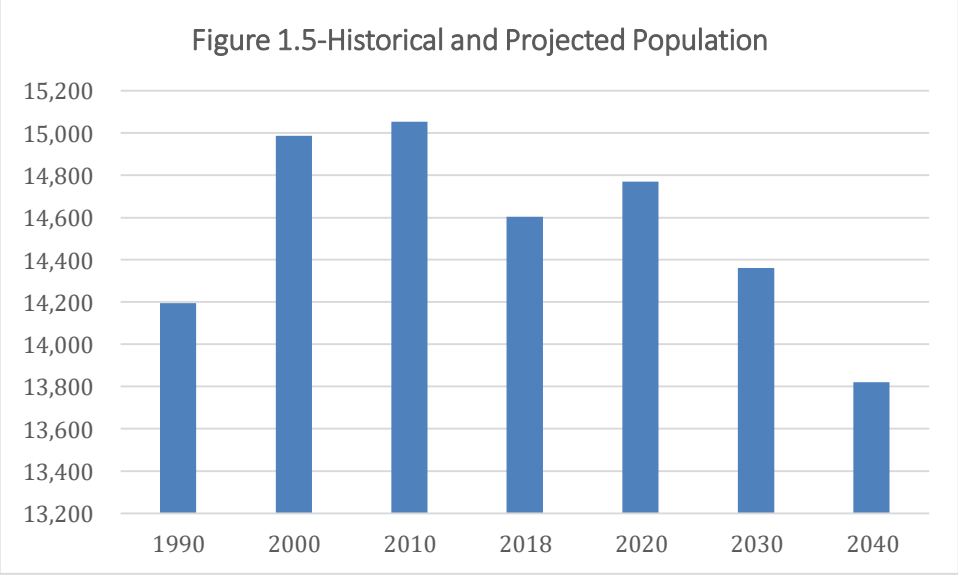
Table 1.1-Morgan County Demographic Profile (2018)

Land Area	422 square miles
Total Population	14,773
Male	7,395
Female	7,378
Population under 18	3,207
Population over 65	2,902
Percent high school graduate or better	86.7%
Percent Bachelor's degree or higher	13%
Median Household Income	$40,276

Individuals below poverty	3,110 (21.5%)
Families Below Poverty Level	746 (17.4%)
Unemployment Rate	6.0%
White	13,768
African American or Black	507
Hispanic or Latino	129
Number of Households	7,926
Average household size	2.39
Owner occupied households	6,116
Median home value	$90,500
Multi-unit structures	2,109
Mobile homes	1,664
Homes built before 1939	2,125 (26.8%)
Median Year built	1971 (48 years)
Median gross rent	$550
Median cost to own	$994

Source: American Community Survey and ODSA County Profile

Population in the county has been trending downwards in recent years with the highest recorded population numbers being in 2010 at 15,054. Over the next 20 years population is expected to continue to decline. Figure 1.5 shows the historical and projected population for Morgan County as reported by ODSA's Office of Research.



Special populations include individuals with disabilities, the elderly, children, non-English speaking individuals, individuals in a nursing home and institutionalized individuals. Special considerations to accommodate these populations in the event of a disaster need to be considered. Table 1.2 shows the percent of population for these special populations.

Table 1.2-Special Populations (2018 percent of total population)

Individuals with a disability	22.1%
Elderly (aged 75+)	8.7%
Children (under 18)	21.4%
Non-English speaking	2.2%
Nursing homes (2010)	<1%

Ethnicity

Table 1.3-Total Population by Race

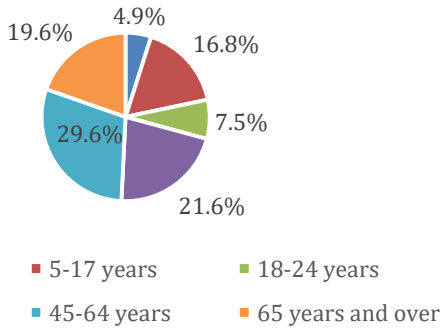
Race	Number	Percent
Caucasian	13,768	93.2
African-American	507	3.4
Native American	10	0.1
Asian	34	0.2
Other	12	0.1
Two or more races	442	3.0
Hispanic or Latino	129	0.9
Total	1,130	7.6

The 2018 ACS estimates reveal that 93% of the County's population is Caucasian. The second largest ethnic group is African-American at 3.4%. Hispanic or Latino individuals comprise less than 1% of the overall population as shown in Table 1.3. In addition, 442 (3.0%) individuals report being of 2 or more races.

Age

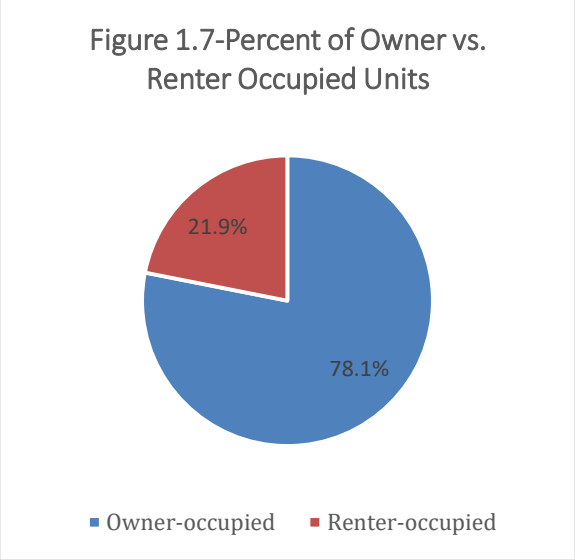
According to the (Ohio) State Hazard Mitigation Plan, the most vulnerable populations after a disaster are children under the age of 5 and individuals over 65 years of age. The percentage of children under the age of 5 in Morgan County is 4.9% and 19.6% for individuals over 65. Figure 1.6 shows the population distribution by age for Morgan County.

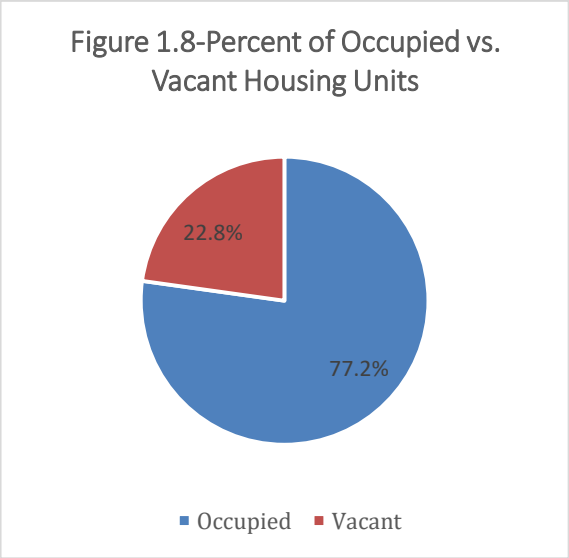
Figure 1.6-Age Distribution (2018)



Housing

The 2018 ACS estimates that there are 7,926 housing units in Morgan County with a median value of $90,500. Of these, 6,116 (77.2%) are occupied, resulting in a 22.8% vacancy rate. Of the occupied units, 4,778 (78.1%) are owner occupied and 1,338 (21.9%) are renter occupied. Of the total housing units, 5,818 are single-family, 437 are multi-family units and 1,671 are mobile homes.





Housing stock in Morgan County is relatively aged with 66% of its housing being 50 years or older. However, in recent years new home construction has been increasing from 5 units in 2014 to 30 units in 2018.

The only special housing facilities located in Morgan County include 2 nursing homes, the county drug and alcohol rehabilitation facility and the County jail. Assisted group housing programs for the County are coordinated by Washington-Morgan Community Action.

Income and Economy

Services and manufacturing comprise the 2 largest employment sectors in Morgan County. Several Census and other statistics help describe the County's population as a labor force. The majority of the County's employment opportunities are concentrated in the Village of McConnlesville. The County's income tax liability for 2018 was $3,973,550. Table 1.4 shows the employment and wages for Morgan County.

Table 1.4-Employment and Wages by Sector (2018)

Industrial Sector	Number of Establishments	Average Employment	Total Wages	Average Weekly Wages
Private Sector	158	2,009	$73,369,891	$702
Goods-Producing	35	548	$27,977,003	$982
Natural Resources and Mining	4	27	$1,624,149	$1,146
Construction	24	98	$4,021,475	$790
Manufacturing	7	423	$22,331,379	$1,016
Service-Providing	124	1,461	$45,392,888	$597
Trade, Transportation and Utilities	45	642	$23,126,093	$692
Information	3	25	$808,794	$620
Financial Services	11	87	$2,627,310	$579
Professional & Business	16	87	$4,171,803	$918

Services				
Education and Health Services	17	372	$11,625,607	$605
Leisure and Hospitality	20	215	$2,511,682	$224
Other Services	12	32	$521,599	$311
Federal Government		42	$2,011,225	$919
State Government		59	$2,990,115	$982
Local Government		555	$18,732,259	$650

Unemployment in Morgan County has been decreasing in recent years with the highest rate over the past 5 years being reported in 2016 at 8.3% as shown in Table 1.5 below. Despite this trend toward decreasing unemployment rates, Morgan County continues to have higher unemployment rates than the State of Ohio as a whole, which was 4.6% in 2018.

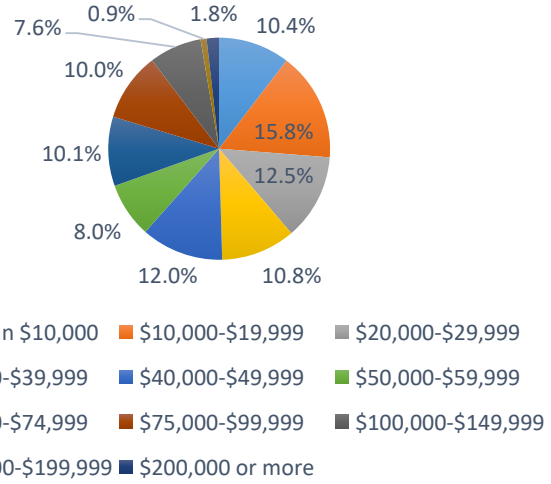
Table 1.5-Civilian Labor Force

	2014	2015	2016	2017	2018
Total labor force	6,700	6,700	6,800	6,700	6,700
Employed	6,100	6,200	6,200	6,200	6,300
Unemployed	500	500	600	400	400
Unemployment Rate	7.8	7.3	8.3	6.7	6.0

Source: ODSA Ohio County Profiles

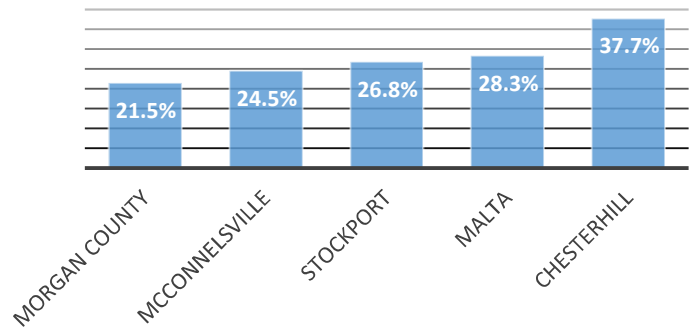
According to ODSA's County Profiles, the median household income in Morgan County is $40,276, which is 24% lower than the state median household income of $52,407. Median household incomes for the villages in Morgan County are generally lower than the County income with the exception of Chesterhill which has a reported median household income of $41,250. Figure 1.9 reveals the income distribution for the County.

Figure 1.9-Household Income Distribution (2018)



The poverty rate for Morgan County is 21.5% which is significantly higher than the state poverty rate of 14.9%. Poverty rates in the villages are generally higher than the county and vary from 24.5% in McConnelsville to 37.7% in Chesterhill as shown in Figure 1.10.

Figure 1.10-Poverty Rates for Morgan County and Jurisdictions



Transportation Networks

Roads

Morgan County is served by 7 designated state highways, making up 191 miles of roadway, which are listed below:

State Route 60 is a north-south route that generally follows the Muskingum River through Morgan County until it reaches the Village of McConnelsville. It then traverses in a south-easterly direction through Washington County.

State Route 669 is a north-south route that generally follows the Muskingum River on the west bank between Philo in Muskingum County and the Village of Malta in Morgan County.

State Route 376 generally runs north-south through Morgan County.

State Route 78 is a northeast-southwest route traversing through McConnelsville and Malta and following the eastern edge of the Wayne National Forest in the County.

State Route 37 traverses east to west in the northeastern part of the County into Perry County.

State Route 555 traverses generally north-south from State Route 60 in Muskingum County into Washington County and follows the eastern edge of the Wayne National Forest.

State Route 266 traverses generally east to west from Pennsville, through Stockport to State Route 60.

State Route 377 is generally a north-south route that traverses the County from just south of the Village of Malta into Athens County.

Morgan County also has an extensive county, township and municipal road system, accounting for an additional 730 miles of roadway.

Bridges and Culverts

The County Engineer's office maintains 202 County bridges. In addition, there are 2 State-owned bridges in Morgan County.

Airports

Morgan County has one general use airport that serves municipal and private uses. It is owned by the Morgan County Airport Authority and is located approximately 3 miles east of the Village of McConnelsville along County Road 5. The airport covers approximately 123 acres and has one 3,500 foot runway with an asphalt surface.

Public Transportation

The County Commissioners own and operate Morgan County Public Transit, a countywide on-demand public transportation system with regular stops in the Village of McConnelsville. The system also offers out-of-county service to several locations including Columbus, Zanesville, Marietta, Athens and New Lexington. In 2019, the Authority served an estimated 1,020 riders and completed over 28,000 trips.

Railroads

There are no railroads serving Morgan County.

Utilities

Electricity: Electrical providers in Morgan County include: Guernsey-Muskingum Electric, Washington Co-op and AEP.

Water: Municipal water services are provided by the Villages of Malta, Stockport and Chesterhill. Private water companies in Morgan County include: Burr Oak, West Malta Water, Tri County Regional Water and Morgan-Meigs Water Company. The Village of McConnelsville is served by the Village of Malta.

Sewer: Municipal sewer service is provided by the Villages of McConnelsville, Malta and Stockport. The Village of Chesterhill is currently planning for a municipal wastewater system.

Natural Gas: Natural gas is provided to the County by Columbia Gas and Tennessee Gas.

Telecommunications: Century Link, Spectrum and Horizon Communications (for the school and medical facilities).

Jurisdictions

Morgan County is comprised of 4 villages, 14 Townships, 19 unincorporated communities and 1 Census Designated Place. Below summarizes the demographic information for the individual municipalities. Township and unincorporated community data is reflected in the overall county data.

McConnelsville

The Village of McConnelsville is the largest municipality in the County and operates as the County Seat. Originally named Old Town, McConnelsville was platted in 1817, and named after Robert McConnell, one of the early settlers in the area. During the mid-1800's McConnelsville was a bustling river town, along with neighboring Malta, which housed dozens of flourishing businesses including, mills, factories, hotels, restaurants and other retailers. It is centrally located along State Routes 60/376/78 and remains the major employment center in Morgan County. McConnnelsville also remains as the main art and cultural hub of

the County housing the Dover House Gallery, Twin City Opera House and the Doll House. There is one public school system in Morgan County and all of its facilities are located in McConnelsville. Population in the Village has generally been in decline since 1970. Table 1.6 shows the basic demographic information for McConnelsville.

Table 1.6-McConnelsville Demographic Profile (2018)

Land Area	1.79 square miles
Population	1,784
White	1,665
Black or African American	42
Other	53
Hispanic or Latino	24
Number of Households	765
Persons per household	2.17
Median Household Income	$30,313
Persons below Poverty level	437 (24.5%)
Median Age	47.1

Malta

The Village of Malta is the second largest municipality in the County and is located on the west bank of the Muskingum River, adjacent to McConnelsville. The Village was platted in 1816 and is centrally located along State Routes 376/37/669. The Village, in conjunction with the Village of McConnelsville, hosts the annual Civil War Encampment Days and is home to the historic Rock Hollow School. Population in the Village has generally been in decline since 1970. Table 1.7 shows the basic demographic information for Malta.

Table 1.7-Malta Demographic Profile (2018)

Land Area	0.34 square miles
Population	671
White	611
Black or African American	27
Other	31
Hispanic or Latino	2
Number of Households	278
Persons per household	2.41
Median Household Income	$28,529
Persons below Poverty level	190 (28.3%)
Median Age	36.0

Stockport

The Village of Stockport was platted in 1839and was named after a town in England by the local Postmaster, Samuel Beswick. The Village is located approximately 10 miles south of the Village of McConnelsville at the intersection of State Routes 376 and 266 on the west bank of the Muskingum River. The Village has a rich history as a river town and boasts a four-story post office, the Hardware Inn of Stockport and the Stockport Mill. The Mill was built as a grist mill in 1906 and is now a beautifully restored 14-room inn and restaurant. It is located at the Muskingum Lock and Dam #6, where its 2 turbines generate electricity to provide power to the Inn, making it Morgan County's "greenest" hotel. Table 1.8 shows the basic demographic profile for Stockport.

Table 1.8-Stockport Demographic Profile (2016*)

Land Area	0.33 square miles
Population	549
White	477
Black or African American	23
Other	49
Hispanic or Latino	0
Number of Households	247
Persons per household	2.2
Median Household Income	$26,406
Persons below Poverty level	147 (26.8%)
Median Age	40.9

*The 2018 ACS estimates report a population of 796, however historically the Village's population has hovered around 500. Village officials confirm a population of 500-550, therefore the 2016 ACS estimates were used in this analysis.

Chesterhill

The Village of Chesterhill is located at the intersection of State Routes 377 and 555 in southeast Morgan County. Originally founded by Quakers, the Village was platted in 1834 and is named for Chester County, Pennsylvania where a large number of its first settlers came from. It is home to the Union Hall Theater, Multicultural Genealogical Center and the Chesterhill Produce Auction, which is held weekly from mid-May through October. Population in the Village has generally been declining since 1960. Table 1.9 shows the basic demographic information for Chesterhill.

Table 1.9-Chesterhill Demographic Profile (2018)

Land Area	0.54 square miles
Population	289
White	213
Black or African American	28
Other	47
Hispanic or Latino	1

Number of Households	121
Persons per household	2.4
Median Household Income	$41,250
Persons below Poverty level	109 (37.7%)
Median Age	41.5

1.2 Planning Process

Authority

The Morgan County Hazard Mitigation Plan is a multi-jurisdictional plan that details the natural hazards that threaten Morgan County and its municipalities. The plan fulfills the requirements set forth by the Mitigation Act of 2000 (DMA 2000). This Act requires counties to formulate a hazard mitigation plan in order to be eligible for mitigation funds made available by the Federal Emergency Management Agency (FEMA).

The first Hazard Mitigation Plan for Morgan County was developed in 2007 and subsequently updated in 2013. For this 2020 update, a kick-off meeting with potential stakeholders was held on August 13, 2019. The final stakeholder committee came together for the first meeting on November 6, 2019. The process for the plan development followed by the stakeholder committee is summarized below.

Scope

The Morgan County Hazard Mitigation Plan includes all incorporated and unincorporated areas in the County. The plan addresses all natural hazards identified by the Stakeholder Committee with input from the general public. All hazards that may affect the County and its residents have been analyzed. Hazard mitigation strategies are discussed in terms of general activities and mitigation action items. Responsibility for implementation of strategies is discussed and possible funding sources are identified. The plan is one of many steps Morgan County may take to protect the welfare of its residents and businesses in order to reduce the long-term risk to human life and property before, during and after a natural disaster occurs.

Plan Development

Great Lakes Community Action Partnership met with Morgan County representatives to discuss the planning process, schedule and development of the planning committee on July 22, 2019. The Morgan County EMA director prepared and sent out the invitations for the kick-off meeting. Meetings were announced via email.

A kick-off meeting was held on August 13, 2019 at the Malta/McConnelsville Fire Station where 26 individuals were in attendance representing County agencies, Township Trustees and local governments. The purpose of the meeting was to introduce the project to the stakeholders and discuss the planning process. Planning Committee Meetings were held on November 6, 2019, December 4, 2019, January 16, 2020 and February 5, 2020. Additional planning meetings were held in the Village of Chesterhill on

February 3, 2020 and in the Village of Stockport on February 19, 2020. The project was also discussed at meetings of the County Commissioners which are held regularly and open to the public.

The planning committee was responsible for reviewing and updating the HIRA and Vulnerability Assessment, analyzing and updating the Hazard Mitigation Strategy, including goals, objectives and action items and reviewing and updating the plan update process. The members of the Stakeholder Committee are found in Table 1.10 below.

Table 1.10: Hazard Mitigation Plan Update Committee

NAME	POSITION / TITLE	JURISDICTION
John Wilt	Director	Morgan County EMA
Shannon Wells	Director	Morgan County Development Office
Jennifer Ponchak	Village Administrator	Village of McConnelsville
Gordon Armstrong	Village Administrator	Village of Chesterhill
Greg Hill	Mayor	Village of Malta
Dan Dunn	Village Administrator	Village of Stockport
Richard Wetzel	Mayor	Village of Chesterhill
Jeff McInturf	Floodplain Administrator	Morgan County Engineer's Office
Marcia Wolf	GIS	Morgan County Engineer's Office

Each member of the planning committee participated in the revision process by reviewing and commenting on the hazard analysis, risk assessment and vulnerability assessment, the mitigation strategy and the update/revision process in the existing plan. Member comments are integrated into this Plan update, where appropriate.

Additionally, adjacent counties were invited to participate in the planning process. Invitations were sent to: Athens County EMA, Muskingum County EMA, Noble County EMA, Perry County EMA and Washington County EMA announcing the Plan update and representatives were invited to attend and participate in the process. The Director of the Muskingum County EMA attended a meeting on February 5, 2020. No other counties were represented.

Other interested parties invited to participate include: Washington-Morgan Community Action, Morgan County Public Transit, Morgan Local Schools, OSU Extension, Washington State Community College, Morgan County Board of Developmental Disabilities, Morgan County Health Department and Habitat for Humanity. No representatives from these groups participated.

Interested parties from the business and commerce sector that were invited to participate include: ABC Manufacturing, Hann Manufacturing, MAHLE International, Miba Bearings Inc., Miba Sinter, Highland Oaks and EZ Grout. No representatives from these groups participated.

Public Outreach and Other Stakeholder Involvement

A public interest survey was developed and kicked off at the County Fair in August 2019. Notice of the availability of this survey was widely publicized on the county and local jurisdiction's social media and

websites. Surveys were collected between August and December 2019. One hundred seventy responses were received with 70% of those reporting that they have been impacted by a natural disaster. Flooding and damages related to storm events were the most commonly reported impacts. A summary of the survey responses can be found in Appendix B.

The first official meeting of the Planning Committee was held on November 6, 2019 at the Morgan County EMA Office. At this meeting, the plan committee reviewed and discussed the Memorandum of Agreement for a Multi-jurisdictional Plan, discussed and approved a community outreach strategy and reviewed the most recent demographic data for the County and its jurisdictions.

In December, the planning committee reviewed and updated the risk assessment from the previous plan. National Oceanic and Atmospheric Administration (NOAA) data was reviewed and local representatives from each jurisdiction provided information on hazards, risks and vulnerabilities of their respective municipalities. The committee identified and ranked hazards based on the following criteria: location, extent, previous occurrences and probability of future occurrences. The results of this ranking can be found in Section 2 of this report. In addition, each municipality individually ranked hazards and identified vulnerabilities that impacts their respective jurisdictions.

The January meeting included a review of the public interest survey and a discussion of additional public outreach. Due to the lack of response and participation from special interest groups and other local agencies, it was decided that a survey would be sent out. In February, the committee reviewed and updated the status of prior plan mitigation actions and discussed mitigation strategies going forward. It was determined that due to the limited availability of local funds and resources to dedicate to mitigation planning, as well as the nature of hazards that impact the county, the primary focus of mitigation strategies will involve public education and outreach to help individuals become more disaster resilient.

Due to the limited involvement of non-governmental organizations, 100 surveys were mailed in February 2020 to interested parties and other local governments including Township Trustees, County agencies such as Jobs and Family Services and the Health Department, non-profit organizations such as United Way, Red Cross and Friends of the Muskingum River and major local employers. Of these surveys, 19 were completed and returned. The results of these surveys can be found in Appendix B.

Due to the limited participation from representatives of Stockport and Chesterhill, GLCAP conducted meetings with the respective councils of each of these villages. During these meetings, GLCAP facilitated a review and prioritization of the hazards that affect the communities. Potential mitigation strategies were also discussed. Representatives from the Planning Committee conducted this assessment for the Villages of Malta and McConnelsville. The results of these activities are summarized in Section 2 of this report.

Due to the COVID-19 pandemic that struck the country in March 2020, the planning committee was unable to meet in person to prioritize mitigation strategies. An online survey of potential mitigation activities was developed by GLCAP and sent to the planning committee members and Morgan County's jurisdictions. Individuals were asked to identify the strategies that they felt would provide the biggest benefit to Morgan County in terms of reducing impacts from natural disasters and then prioritize those activities in terms of importance to the county. The results of this activity can be found in Appendix B. Mitigation strategies were developed around the highest priority items as discussed in Section 3.0.

Table 1.11 summarizes the participation by each jurisdiction in the planning process:

Table 1.11-Plan Participation by Jurisdiction

Jurisdiction	8/13/19	11/6/19	12/4/19	1/6/20	2/3/20	2/5/20	2/19/20	Other*
Morgan Co	X	X	X	X		X		X
McConnelsville	X		X	X		X		X
Malta	X	X	X	X		X		X
Stockport	X						X	X
Chesterhill					X			X

*Includes participation by surveys, emails and phone calls

The existing Hazard Mitigation Plan could be viewed at the State of Ohio EMA website at https://sharpp.dps.ohio.gov/OhioSHARPP/Search/Results/LHMPs.aspx?type=county&name=Morgan. Two public notices announcing the availability of the Plan Update for public review and comment was advertised in the Morgan County Herald on 11/25/2020 and 12/9/2020. A link to the GLCAP website where the plan was hosted, was posted on the Morgan County EMA website and social media as well as all local jurisdictions' and county agencies' websites and social media where available. The comment period lasted for 30 days from 11/25/2020 to 12/18/2020. Printed copies of the Plan Update are available at the County EMA office, County Commissioners Office, Morgan County Sheriff's Office, all local jurisdiction offices and the 2 public libraries (McConnelsville and Chesterhill). No comments on the plan were received. A virtual presentation on the plan was made to the County Commissioners on November 16, 2020. All three County Commissioners, the County Clerk and EMA Director were in attendance. Two virtual open house meetings were held on December 2, 2020 and December 9, 2020, facilitated by GLCAP. The County EMA Director was the only other person in attendance. The Plan and supporting documentation was hosted on GLCAP's website for the entirety of the comment period. A comment form was provided on the website for individuals to submit questions or comments on the plan. None were received. On December 7, 2020, the County EMA Director sent an email to all county agencies and employees announcing the availability of the Plan for review and comment. No comments were received. All individuals that attended Hazard Mitigation Plan meetings or who asked to be notified and provided an email address were e-mailed a copy of the plan for review. Following final federal approval, a copy of the final plan will be made available to all interested parties including all municipalities in Morgan County and neighboring jurisdictions.

1.3 Integration with Existing Plans

Integration with other planning mechanisms is an important factor in the successful implementation of mitigation strategies. Neither the County nor its jurisdictions undertake organized planning activities or development initiatives and there are no planning commissions or boards. Morgan County and its jurisdictions are not zoned. Individual agencies within the county conduct planning as required by state law such as the EMA, County Health Department and local utilities. These initiatives may include standard operations plans, emergency response plans or others deemed necessary. The County EMA will lead the effort to ensure that hazard mitigation is considered across all other planning efforts when or if they are undertaken. The EMA Director will provide information to all local jurisdictions and agencies about hazards, risks and vulnerabilities and promote mitigation planning and its inclusion in plans, procedures, guidelines and priorities.

Below is a list of planning documents that are available in Morgan County:

- Morgan County Hazard Risk Assessment (November 2003)
    - The risk assessment was used to provide background information in developing the 2013 Plan Update.
- Morgan County Mitigation Plan (2013)
    - This plan provides an update to the 2003 Plan.
- Morgan County Emergency Operations Plan (April 2006, currently being updated)
    - The county will strive to include hazard mitigation actions in its emergency operations plan updates.
- Morgan County Economic Development Strategic Plan (2017)
    - While there is no formal economic development entity in Morgan County, the County Development Office maintains this plan on behalf of the County Commissioners. The County EMA will work with the Development Office to ensure that commercial and industrial expansion does not occur in areas that are vulnerable to disruption or damage from hazards, ensuring resiliency in attracting, expanding and retaining business and industry.
- Morgan County Health Department Emergency Operations Plan
    - The County EMA participates with the local Health Department during its emergency operations planning updates to ensure that hazard mitigation activities are considered when dealing with public health emergencies.
- Asset Management Plans of all public water systems in the county as required by Ohio EPA.
    - The current hazard mitigation plan considers actions to provide continued utility operations during a hazard event. The County can work with local jurisdictions to ensure these actions are part of their asset management programs. The county can also assist with the development of policies that can protect utilities and other critical infrastructure from the effects of hazards.
- Morgan County and Local Floodplain Regulations
    - Each required entity has formally adopted floodplain regulations by Resolution or Ordinance and update them as new maps are released. The County floodplain manager and GIS coordinator are part of the County Engineer's office, as such, lenders and developers work with the floodplain manager to ensure compliance with flood prevention regulations while the GIS specialist ensures maps are accurate and up to date. The County EMA can work with the floodplain manager to ensure continued NFIP compliance and provide public information and education.

In addition, the 2019 Ohio State Hazard Mitigation Plan was consulted to assist with background information and hazard identification.

Unlike larger counties in Ohio, Morgan County and its jurisdictions have very limited technical and financial hazard mitigation capabilities. The County ranks as one of the least populated counties in the state, has median household incomes lower than the state average and significantly higher rates of poverty and unemployment. The County and its jurisdictions barely have adequate resources to operate and maintain

public utilities and public facilities. Considering the low population numbers, a per capita income of $14,702 and 21.5% of the population living below poverty level, the County and its jurisdictions do not have much flexibility in financial assets to accomplish mitigation tasks on their own. Below is a summary of their capabilities:

Table 1.11: County and Jurisdiction Hazard Mitigation Capabilities

COMMUNITY	PLANNING COMMISSION	COMPREHENSIVE PLANS	FLOODPLAIN REGULATIONS	BUILDING CODES[1]	ZONING ORDINANCES	CAPITAL BUDGET[2]	PUBLIC WORKS BUDGET[2]
Morgan County	(none)	(none)	YES	YES	(none)	(none)	Limited in-kind wages only.
Village of Chesterhill	(none)	(none)	YES	YES	(none)	(none)	Limited in-kind wages only.
Village of Malta	(none)	(none)	YES	YES	(none)	(none)	Limited in-kind wages only.
Village of McConnelsville	(none)	(none)	YES	YES	(none)	(none)	Limited in-kind wages only.
Village of Stockport	(none)	(none)	YES	YES	(none)	(none)	Limited in-kind wages only.

[1] All jurisdictions within the state now follow the State Building Code. (Ohio Administrative Code 4101:1.)
[2] Budget that would allow the jurisdiction to devote financial resources toward hazard mitigation activities

1.4 Plan Maintenance and Project Monitoring

The planning period for the Morgan County Hazard Mitigation Plan is five years. This planning cycle is consistent with FEMA requirements. The Director of the Morgan County Emergency Management Agency (herein after referred to as "Director") is solely responsible for the maintenance of the Hazard Mitigation Plan. The Director will facilitate a planning evaluation meeting with members of the Hazard Mitigation Planning Committee as needed, especially during periods following a disaster event, but at least annually. The Director will be responsible for contacting committee members and organizing the evaluation meeting. The meeting will be announced by invitation and advertised in advance by newspaper, postings and other social media. The Committee, at a minimum will consist of the following individuals:

- Morgan County EMA Director
- Morgan County Development Director
- Morgan County Sheriff or representative
- Morgan Commissioners or representative
- Village of Malta Mayor or representative
- Village of McConnelsville or representative
- Village of Stockport or representative
- Village of Chesterhill or representative

- Morgan County Engineer or representative
- Malta/McConnelsville Fire Department

The Committee will utilize these meetings to evaluate the Hazard Mitigation Plan and how disasters affected their respective jurisdictions during the period. Prior to the annual meeting, the committee members shall review their mitigation sections for any needed changes. Local committee member representatives shall keep a log of natural disasters in their jurisdiction, including financial loss information, if available, to discuss at the annual meeting. After the meeting, the jurisdictions will adopt any changes made to the Plan.

The Director will regularly stay in contact with each jurisdiction in order to address preparation and education issues regarding hazard events within the County and its municipalities.

The Planning Committee led by the Director, will also be responsible for updating the Hazard Mitigation Plan before the five-year planning cycle expires. The Planning Committee will be responsible for developing a funding source, procurement of services and preparation of the scope of work for future plans, if necessary.

Continued Public Involvement

Any future Hazard Mitigation Planning Committee meetings will be advertised to the public by local media and public postings. The public is encouraged to attend and participate in any Plan updates. Additional surveys of residents will be utilized as needed as determined by the Director.

Copies of the updated Hazard Mitigation Plan will be available at each municipal office, the Morgan County Commissioners Office and the Morgan County Emergency Management Agency office.

2.1 OVERVIEW

Morgan County is susceptible to hazards, both natural and man-made that impact the County and its jurisdictions. The County has experienced hundreds of events that has resulted in millions of dollars in damages but only limited physical injuries or loss of life. This risk analysis will identify those natural hazards that have affected the county in the past and will likely continue to affect Morgan County and its jurisdictions in the future. According to the FEMA Local Hazard Mitigation Planning Handbook, the steps to conduct a risk analysis include:

1. Hazard Identification of type and extent
2. Identify community assets
3. Analyze risk by evaluating vulnerable assets, describing potential impacts and estimating losses for each hazard identified
4. A summary of each jurisdiction's vulnerability

2.2 Hazard Identification and Prioritization

Morgan County is vulnerable to many hazards that disrupt life and property. Hazards may affect Morgan County throughout the entire year. The County developed a Hazard Risk Assessment, which identified 17 natural hazards that either have affected or may affect Morgan County. These hazards were identified through a process that included planning committee input, public and stakeholder survey input, empirical data, historical occurrences and researching the susceptibility of locations within the County to individual hazards. Identified hazards were ranked and prioritized based on a pre-determined set of criteria. This criterion included location, extent and probability of future occurrence. Table 2.1 describes the scale used to score each hazard and Table 2.2 reveals the composite score of identified hazards and their respective rankings.

Table 2.1-Criteria for Risk Assessment

CRITERIA	LEVEL	SCALE	VALUE
FREQUENCY/PROBABILITY	Unlikely	Less than 1% chance annually or recurrence interval of greater than every 100 years	1
	Occasional	1-10% chance annually or recurrence interval of 11 to 100 years	2
	Likely	10-90% chance annually or recurrence interval of 1-10 years	3
	Highly Likely	90-100% chance annually or a recurrence interval of less than 1 year	4

EXTENT (MAGNITUDE/STRENGTH BASED ON HISTORIC EVENTS OR FUTURE PROBABILITY)	Weak	Limited classification on scientific scale. Very few injuries, if any. Only minor property damage and minimal disruption on quality of life. Temporary shutdown of critical facilities	1
	Moderate	Moderate classification on scientific scale, moderate speed of onset or duration of event. Minor injuries only. Property damages between 10-25% of property in affected area damaged or destroyed. Loss of services or complete shutdown of critical facilities for more than one day.	2
	Severe	Severe classification on scientific scale, fast speed of onset or long duration of event. Multiple deaths/injuries possible. Property damages between 25-50% of affected area damaged or destroyed. Complete shutdown of critical facilities for more than 1 week.	3
	Catastrophic	Extreme classification on scientific scale, immediate speed of onset or long duration of event, resulting in catastrophic damage and uninhabitable conditions. High number of deaths/injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shut-down of critical facilities for 30 days or more	4
LOCATION	Localized	Less than 10% of planning area or single point occurrence	1
	Limited	10-25% of area affected or limited single point occurrence	2
	Significant	25-75% of area affected or frequent single point occurrence	3
	Extensive	75-100 of area affected or consistent single point occurrence	4

Table 2.2: Morgan County Prioritized Hazards List

Rank	Hazard	Location	Extent	Probability of Future Occurrence	Overall Significance Rating
1	Landslide/road slips*	1	2	4	7

2	Thunderstorms	4	2	4	10
3	Severe Winter Weather	4	2	4	10
4	Drought and extreme Heat	4	2	3	9
5	Flooding	4	2	3	9
6	Windstorms	4	2	3	9
7	Hailstorm	4	1	3	8
8	Erosion	2	2	4	8
9	Epidemic/pandemic	4	3	1	8
10	Earthquake	4	1	1	6
11	Hazardous Materials Incident	1	1	4	6
12	Wildfire	3	1	1	5
13	Dam Failure	1	1	1	3
14	Mine Subsidence	1	1	1	3
15	Tornado	1	1	1	3
16	Sink Holes	1	1	1	3
17	Invasive Species	1	1	1	3

*This hazard was re-prioritized by the planning committee as the primary hazard impacting the county due to the cost and inconvenience created by multiple road slips. These events have been increasing in recent years.

Hazards were also ranked and identified for Morgan County's jurisdictions. This ranking utilized the same criteria set above and is shown in Table 2.3 below.

Table 2.3-Summary of Prioritized Rankings by Jurisdiction

	Landslides	Thunderstorms	Severe Winter Weather	Drought and Extreme	Flooding	Windstorms	Hailstorm	Erosion	Epidemic	Earthquake	Hazardous Materials	Wildfire	Dam Failure	Mine Subsidence	Tornado	Sink Holes	Invasive Species
McConnelsville	7	9	7	3	10	9	9	8	n/a	3	5	3	7	4	8	6	7
Malta	2.6	1.6	2.3	1.1	3.1	2.5	1.2	2.0	n/a	1.9	2.2	1.0	3.4	1.5	2.6	2.0	1.3
Chesterhill	5.8	7.6	9.4	9.5	n/a	7.8	5.9	7.6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Stockport	7.2	6.3	8.5	7.3	n/a	8.8	7.5	5.8	n/a	n/a	6.3	n/a	5.0	n/a	5.5	5.4	n/a

The hazard identification process identified 17 hazards that could or have impacted Morgan County and its jurisdictions. This update does not include an in-depth analysis of all identified hazards. Due the limited mitigation resources available in the county, the plan committee opted to focus its efforts on those hazards

that have the highest probability of occurrence and the greatest documented impact to people and property. Based on historical data and stakeholder input, including that of the general public, the following hazards will be analyzed in detail:

- Landslides, specifically road slips
- Severe summer storms including thunderstorms, hailstorms and heavy rain
- Severe Winter Weather (includes snow, ice and hail)
- Drought and extreme heat
- Flooding
- Windstorms
- Erosion
- Dam failure
- Tornados
- Earthquakes

Individually, these hazards may affect the County and its municipalities in varying degrees of severity, which will be addressed in subsequent sections of the Plan update.

The Risk Assessment further identified several hazards that have no applicability to Morgan County and will not be considered further:

- Avalanche
- Coastal erosion
- Coastal storms
- Hurricane
- Land subsidence
- Tsunami
- Volcano

Disaster Declarations and Public Assistance

Morgan County has received 4 federal disaster declarations and financial assistance since the previous plan update in 2012 due to natural hazard events. Table 2.4 below summarizes these declarations.

Table 2.4: Federal Disaster Declarations in Morgan County

DR Number	Declaration Date	Incident Type
DR-4507	March 31, 2020	Ohio COVID 19 Pandemic
DR-4424 Public Assistance:	April 8, 2019	Severe storms, flooding, landslides
DR-4360 Public Assistance:	April 17, 2018	Severe storms, landslides and mudslides
DR-4077	August 20, 2012	Severe storms and straight-line winds

In recent years, Morgan County has also been included in 8 USDA disaster declarations for crop losses due to natural disasters as shown in Table 2.5 below.

Table 2.5: USDA Disaster Declarations in Morgan County

Designation Number	Declaration Date	Incident Type
S-4486	June 25, 2019	Excessive rain and flooding
S-4498	July 25, 2019	Extreme cold, excessive rain, flooding and polar vortex
S-4532	September 6, 2019	Excessive rain and flooding
S-4539	October 4, 2019	Excessive rain and flooding
S-4541	October 3, 2019	Excessive rain and flooding
S-4131	January 1, 2017	Drought (2016)
S-3934	November 18, 2015	Excessive rain, flash flooding, flooding, excessive heat, landslides, mudslides, high winds, hail and lightning
S-3384	September 5, 2012	Drought and excessive heat

Climate Change

Climate change describes a change in the average global or regional climate patterns such as temperature and rainfall, over a long period of time. The Earth's average temperature has risen by 1.5 degrees F and is projected to rise another 0.5-8.5 degrees F over the next 100 years. Even small increases in average temperatures can translate to large and potentially dangerous shifts in climate and weather patterns (https://19january2017snapshot.epa.gov/climatechange/climate-change-basic-information). The County does not consider climate change in and of itself to be a natural hazard, however it is obvious that its impacts are felt due to increasing rain, snow, flooding and extreme temperature events over time.

Future Growth

Significant population growth is not expected to occur in Morgan County. In general, population in the County and its jurisdictions is relatively stable and has trended toward decline during the past 100 years. In addition, OSDA population projections predict a continued downward trend in total population over the next 20 years as discussed in Section 1. Any potential future growth is anticipated to follow current and historic patterns and is not expected to contribute significantly to the impacts of hazard events in the County.

Critical Facilities

When assessing the impacts of natural disasters, one important factor lies in the vulnerability of critical facilities and their potential for being severely impacted by a disaster. Critical facilities are considered those that provide essential services to the community, such as hospitals, schools, fire departments, law enforcement offices and nursing homes. Protection of these facilities is identified as a goal of the Plan and mitigation activities are specified in Section 3.0. A list of critical facilities by jurisdiction can be found in Appendix C.

2.3 HAZARD DESCRIPTIONS

2.3.1 Landslides and Erosion

Landslides

According to the US Geologic Service (USGS), a landslide is defined as the "*movement of a mass of rock, debris or earth down a slope…under the influence of gravity".* The term includes a wide range of ground movement, such as rock falls, deep failure of slope, slips and shallow debris flows. Landslides are influenced by human activity (mining, urbanization, railroads, deforestation and highways) as well as natural factors such as geology, precipitation and topography.

According to the Ohio Department of Natural Resources-Division of Geologic Survey, there are three types of landslides that occur in Ohio:

Rotational Slumps: this type of landslide is characterized by the movement of a mass of weak rock or sediment as a block unit along a curved plane. These slumps are the largest type of landslide in Ohio generally moving hundreds of thousands of cubic yards of material and extending for hundreds of feet. The crown or head consists of one or more scarps that form a stair-step pattern. The upper portion of these blocks are typically rotated backwards, forming depressions along which water can accumulate creating small ponds or swampy areas. The toe or downslope end of the slump is a fan-shaped, bulging mass of material characterized by radial ridges and cracks. Rotational slumps generally develop slowly and require several months or even years to reach stability; however, on occasion, they may move rapidly achieving stability in a few hours.

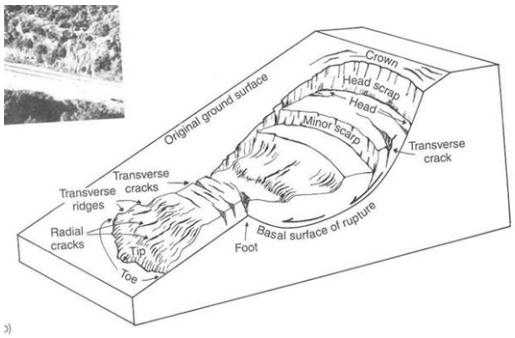


Figure 2.1-Rotational Slump
Source: www.people.uwec.edu

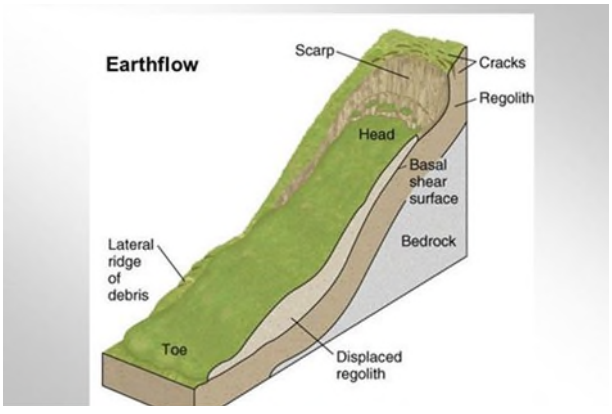


Figure 2.2-Earthflow
Source: https://earthfow-70.webself.net

Earthflows: an earthflow involves a weathered mass of rock or sediment that flows down slope as a jumbled mass, forming a hummocky topography of ridges and swales. They are the most common form of landslide in Ohio and most are generally small in size. They are most common in weathered surface materials and do not necessarily indicate weak rock. They are also common in unconsolidated glacial sediments. The movement of earthflows is generally quite slow.

Rock-falls: a natural process of cliff and hillside erosion that consists of the rapid movement of large rock fragments and earth materials. These materials suddenly become detached from a cliff or steep hillside, traveling downslope in a free fall and/or rolling, bounding or sliding manner. They can be a major hazard and threat to life, property and infrastructure. In Ohio, most rock-falls involve massive beds of sandstone or limestone where surface water seeps into joints and cracks in the rock increasing the weight of the rocks and causing expansion of the joints when the water freezes, thus prying rock from the main cliff. Weak and easily eroded clay or shale underneath the bed is also a contributing factor in a rock-fall.

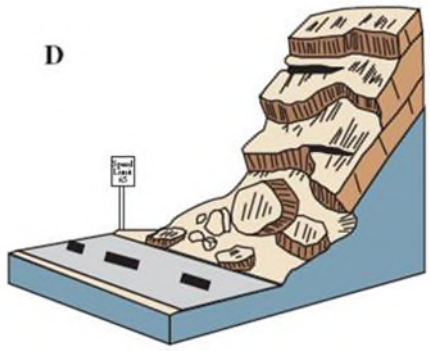


Figure 2.3-Rockfall
Source: http://pubs.usgs.gov/fs/2004/3072/

According to ODNR, several geologic conditions contribute to landslides in Ohio. The presence of one or more of these conditions may indicate the potential for landslide hazards.

Steep slopes: all landslides move downslope under the force of gravity. Therefore steep slopes, bluffs or cliffs are a requirement for the development of a landslide.

Jointed rocks: fractures in rocks allow surface moisture to penetrate the rock and weaken it. During periods of cold weather, this moisture freezes and causes the rock to be pried apart along the joint.

Fine-grained, permeable rock or sediment: these materials are particularly susceptible to landslides because large amounts of moisture can easily enter the rock or sediment, causing an increase in weight, reduction of bonding strength and dissolution of grain-cementing materials.

Clay or shale subject to lubrication: ground water penetrating these materials can lead to loss of binding strength between individual mineral grains leading to lubrication between the rock and underlying clay or shale promoting failure of the slope.

Large amounts of water: periods of heavy rain or excess snowmelt can saturate the zone above the normal water level and cause a landslide.

In addition to the above geologic conditions, a triggering mechanism is required to initiate downslope movement. Events or circumstances that commonly trigger landslides in Ohio include:

Vibrations: human-induced vibrations such as those from blasting or heavy truck traffic can trigger a landslide in some circumstances. Vibrations from earthquakes can also trigger landslides although none have been documented in Ohio.

Over-steepened slope: undercutting of a slope by a stream or other human construction activities can disturb the equilibrium of a stable slope and cause it to fail.

Increased weight on a slope: the addition of large amounts of fill, construction of a building or other structure or an unusual increase in precipitation can trigger a landslide.

Removal of vegetation: cutting of trees or other vegetation on landslide-prone slopes can trigger failure as the roots tend to hold rock and sediment in place and soak up excess moisture.

Erosion

Erosion is a geologic process by which soil and rock particles are worn away and transported somewhere else by gravity or a moving agent such as wind, water or ice. The physical movement of rock and soil by gravity is called mass-wasting and include processes such as soil creep, rocks-falls, landslips and mudflows as described in detail above. Wind erosion is a serious problem in dry parts of the country, removing soil from farmland and covering large areas and towns with sand and dust. A strong breeze can easily pick up dry dust and fine sand whereby the lightest particles are swirled up into the air and can be carried hundreds of miles. Small pebbles can be moved along the sand in a process called creep. Erosion by water is the major agent of erosion, particularly in Ohio. Rainfall, rivers, floods, lakes and the ocean carry away millions of tons of sediment every day worldwide. Rainfall produces 4 types of erosion including splash erosion-the impact of a falling raindrop which can scatter tiny soil particles; sheet erosion-erosion by run-off; rill erosion-erosion that takes place as run-off develops into discrete streams; and gully erosion-soil particles are transported through large channels, for a brief period of time during rainfall events or snowmelts. Fluvial or river erosion occurs in several ways: abrasion or corrosion is where boulders or stones wear away the river bed and its banks; attrition is when sediment particles knock against the bed or each other and break becoming more rounded and smaller as they move down river; hydraulic action is when the force of fast moving water hits the bed and banks and forces water and air into cracks in the bedrock, causing the river bed to weaken; and solution or corrosion is where acidic water dissolves rocks such as chalk or limestone. Coastal erosion occurs where ice erosion occurs in one of two forms, the movement of glaciers or thawing processes.

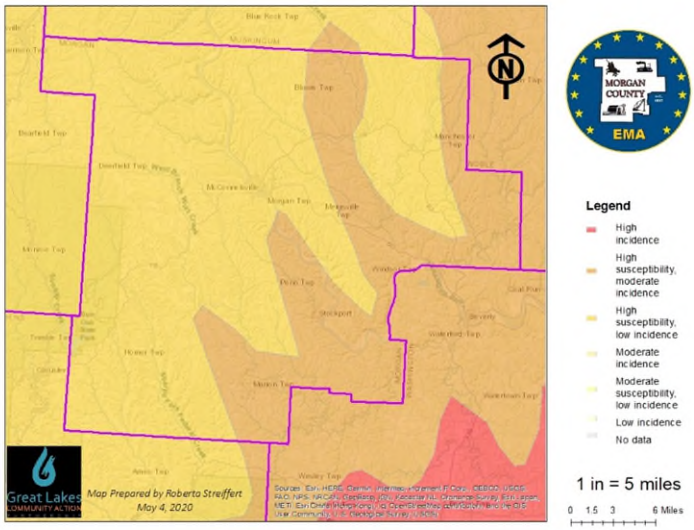


Figure 2.4: USGS Landslide Incidence and Susceptibility

Location

Morgan County is located in an area of high relief and is subject to landslides and erosion, particularly, road slips. The south and east portions of the County, generally paralleling the Muskingum River are more susceptible to landslides because of highway excavation, steep slopes and flooding incidents.

Susceptibility to landslides is defined as the probable degree of response of the areal rocks and soils to natural or artificial cutting or loading of slopes or anomalously high precipitation. According to the United States Geologic Survey (USGS), *Landslide Incidence and Susceptibility Overview Map of the Conterminous United States*, Morgan County has a rating of high susceptibility with low to moderate incidence of landslides (see Figure 2.4 above).

The primary hazards associated with landslides in Morgan County are road slips and river erosion due primarily to flooding and heavy rains. These events are an annual occurrence in Morgan County and have been increasing in recent years, causing more damage than the county and its jurisdictions can feasibly repair on their own. Landslides and rock falls primarily damage state and local roads and can impede traffic creating concerns about the movement of emergency vehicles or the ability to evacuate people if necessary. River erosion is most significant around Malta and McConnelsville.

The Villages of Malta and McConnelsville appear to be most susceptible to landslides due primarily to the movement of people and traffic in the area. Many structures in the Villages are located on relatively flat ground near steep slopes on land that is subject to slippage and or flooding. Areas along State Route 78 in McConnelsville are especially vulnerable to natural land subsidence. The Villages of Chesterhill and Stockport also report multiple road slips along area roadways. In addition, survey respondents reported increasing road slips in the County as a priority hazard of concern. Warning signs alerting motorists to the potential for slippage have been placed in appropriate locations in the County. Large landslides, carrying lots of debris and causing significant structural damages are not historically known to occur in the County.

Past Occurrences

Rock-falls and road slips are an annual occurrence in Morgan County with some events causing significant damage and inconvenience to residents. Most recently, Morgan County was included in a state disaster declaration (DR-4424) issued on April 8, 2019 for severe storms, flooding and landslides that impacted southern and southeastern counties in Ohio from February 5-13, 2019. The County received a total of $595,902.45 in disaster assistance as shown in Table 2.6.

Table 2.6-Morgan County Disaster Assistance (DR4424)

Jurisdiction	Total Eligible Projects	Total Obligated
County Engineer	13	$354,517.25
Bloom Twp	3	$19,886.37
Center Twp	2	$40,242.30
Morgan Twp	2	$34,161.91
Windsor Twp	4	$81,222.50
York Twp	2	$58,500.32
Marion Twp	2	$7,371.80

The Morgan County Herald reported on February 27, 2019 that State Route 376 was closed due to landslides in the area as a result of these rain events. The landslide was the largest the area has ever experienced measuring 600 feet long and 900 feet from the road to the top of the landslide. The road between McConnelsville and Stockport was closed for an extended period of time as continued land movement and large boulders moving at the top of the hill created a safety issue. The asphalt had cracked across the entire width of the road and was moving toward the Muskingum River. This road closure significantly impacts both the movement of students to and from the local junior high and high schools and is the main route to Riverside Landings nursing home and several county offices. The detour added approximately 30 minutes in commute time each way for students and

significantly reduced emergency services response time. Repairs were made and the road re-opened in July 2020. The estimated cost of repairs is $7,845,225.

Table 2.7-Morgan County Disaster Assistance (DR-4360)

Jurisdiction	Total Eligible Projects	Total Obligated
County Engineer	14	$ 1,859,598.87
Homer Twp	3	$ 48,522.21
Marion Twp	6	$ 145,846.19

On April 17, 2018, Morgan County was included in a state disaster declaration (DR-4360) for severe storms, flooding, mudslides and landslides that occurred between February 14-25, 2018 that impacted southern and southeastern Ohio. The County received $2,053,967.27 in disaster assistance as shown in Table 2.7.

On August 9, 2017, the Ohio Department of Transportation (ODOT) began a landslide repair project on State Route 607 between State Route 60 and State Route 78 in Morgan County, closing approximately 500 feet of road. The slip was excavated and replaced with new embankment, dump rock and asphalt. The total cost of the repair is not available and took approximately 6 weeks to complete.

ODOT currently reports a landslide remediation project along another stretch of State Route 376 is slated to begin Summer 2020. The project will repair a landslide along the roadway where a large section of pavement in the southbound lane has broken and slid down the steep embankment forcing traffic down to one lane. Repair will consist of the installation of a wall and pavement and guardrail repair. The project is located at approximately mile marker 12.9 north of the Village of McConnelsville and is estimated to cost $1,170,000.

Photo 4: Photo looking South on SR 376 at landslide area on West side of SR 376

Figure 2.5-Photo taken from ODOT's Environmental Review documentation

found at:
https://www.transportation.ohio.gov/wps/portal/gov/odot/projects/projects/107255

Probability of Future Events

According to ODOT's Geohazards Landslide Inventory Map (dated 3/10/2020), which reveals the number and rating of moderately and highly rated landslides impacting Ohio's roadways, Morgan County is ranked in the top 2 counties of the most impacted roads with 1,033 total landslides. The County is moderately ranked for rockfalls, with 125 events. Based on data available from ODOT and the USGS discussed previously, as well as local historical information, the probability of the County experiencing a landslide event in any given year is nearly 100%.

Vulnerability Analysis

Landslides are natural hazards that have the potential to cause significant structural damage. Historically damages associated with landslides in Morgan County have been confined to roads and associated underground utilities and is the only reliable information we have to assess vulnerability. There have been no known structural damages, injuries or loss of life associated with landslides. Economic impacts associated with road closures due to landslides are not significant as detours allow for the continued movement of people and freight in the county. The primary concern of these road closures are associated with the provision of efficient emergency services to vulnerable populations in the County. Based on the known damages that have occurred over the last 3 years, the county could encounter damages from $1,000,000 to potentially $4,000,000 during any given event.

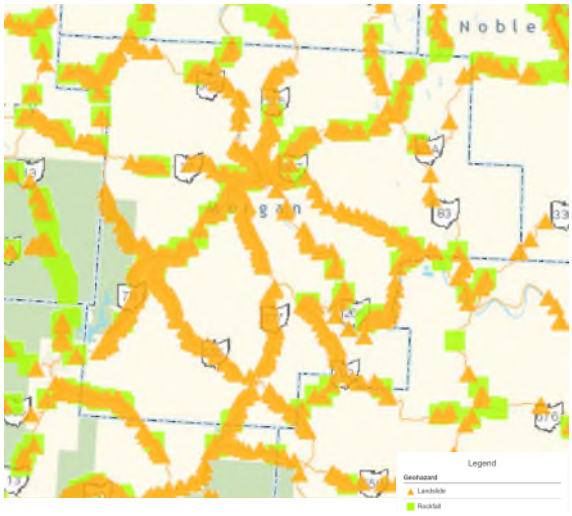


Figure 2.6: ODOT Geohazards Landslide Inventory Map

Source: https://gis.dot.state.oh.us/tims/Map/Geotech

2.3.2 Severe Summer Storms

Severe storms likely to affect Morgan County include hailstorms, windstorms, heavy rains and severe thunderstorms. These events typically affect several individual locations during one event. Serious injury or death can occur during severe storms due to its effect on motor vehicle accidents, wind damage or other cascading effects. A severe storm may also result in moderate damage to private property and public facilities.

Thunderstorms

A severe thunderstorm is the result of a violent form of convection wherein cold, upper air falls and warm, moist air rises. As the warm air rises, cumulonimbus clouds can develop and turn into severe thunderstorms with strong winds, lightning, heavy rain and hail. Such storms can cause damage from wind, hail, heavy rainfall (including flooding) and/or lightning strikes. Thunderstorms are generally a seasonal hazard and can be expected to occur every year. According to the National Weather Service, the most active thunderstorm season in Ohio is late spring and early summer.

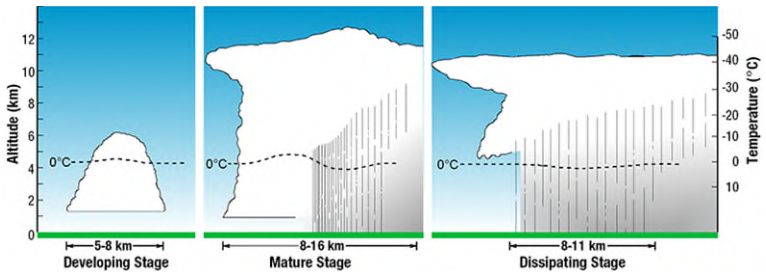


Illustration from The National Severe Storms Laboratory at https://www.nssl.noaa.gov/education/svrwx101/thunderstorms/

Figure 2.7: Formation of Severe Thunderstorms

There are 3 stages in the life cycle of a thunderstorm: developing,

mature and dissipating as shown in Figure 2.7. During the developing stage cumulus clouds are pushed upwards by a rising column of air (updraft). There is little to no rain during this phase but there may be occasional lightning.

Thunderstorms enter the mature stage when the updraft continues to feed the storm and precipitation begins to fall creating a downdraft. As the downdraft and rain-cooled air moves out along the ground it forms a front or gusty line of winds. This is the stage where hail, heavy rain, frequent lightning, strong winds and tornados are most likely to develop. Eventually, a large amount of precipitation is produced and the updraft is overcome by the downdraft beginning the dissipation stage. On the ground, the front moves out a long distance from the storm and cuts off the warm moist air that was feeding the thunderstorm. At this point, rainfall begins to decrease but lightning remains a danger (https://www.nssl.noaa.gov/education/svrwx101/thunderstorms/).

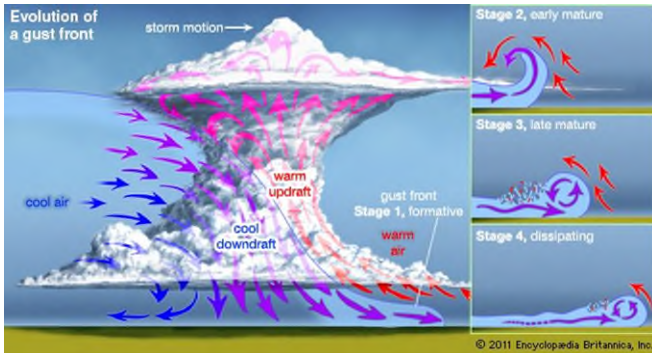


Figure 2.8: Development of a gust front from a thunderstorm
Source: *www.britannica.com/science/windstorm*

Lightning

Lightning is a natural occurrence of electricity of very short duration and high voltage between a cloud and the ground and is a key component of thunderstorms. It is often accompanied by a bright flash and thunder. Tall objects such as trees, skyscrapers, utility poles and mountains are commonly struck by lightning, but lightning can also strike at ground-level, depending on where the electrical charges accumulate in the atmosphere.

Hail

Hail is a type of precipitation made of frozen rain which falls in showers from cumulonimbus clouds. The precipitation is made of hailstones or hard pellets of snow and ice that can vary in size from ¼ inch diameter (pea-sized) to 4 ½ inches (grapefruit-sized). If the air temperature close to the ground is warm, the hail can partially melt creating sleet or freezing rains. Hail is typically associated with severe thunderstorms and/or severe winter storms. Hail can be very damaging to property, particularly cars and can be deadly to people and livestock. Hail that covers roadways is especially hazardous to drivers and pedestrians by creating an icy roadway much like winter weather events.

Windstorms

A windstorm is a storm marked by high winds or violent gusts, sometimes called wind shears or microbursts but with little or no rain. Extreme windstorm events are associated with hurricanes, severe thunderstorms and derechos-a widespread, long-lived, straight line windstorm associated with a land-based, fast-moving group of severe thunderstorms. Sustained wind speeds during a windstorm typically exceed 34 mph,

generating much higher wind gusts. Windstorms may last for a few minutes when caused by downbursts from thunderstorms or they may last for hours to several days when they result from large-scale weather systems, caused by either large differences in atmospheric pressure across a region or strong jet stream winds overhead. Severe weather is frequently the cause of long-lasting windstorms as these low-pressure systems have large horizontal pressure differences and are always accompanied by strong jet-stream winds.

Severe storms are generally measured in terms of wind speeds, rainfall amounts or hail stone size and often occur simultaneously or in quick succession. A storm is considered severe if wind speeds reach 58 mph and/or produce hail that is 1-inch in diameter or greater or if funnel clouds and/or tornados are produced. Rainfall rates greater than 2-inches per hour are also used to indicate severe storms. Heavy rains associated with severe storms primarily contribute to flooding which is discussed below.

Location

Severe storms can affect all areas and jurisdictions of Morgan County, often striking multiple individual areas at the same time and can vary in intensity and type. For instance, a severe storm can produce thunderstorms in one area of the County with heavy rain and lightning, while at the same time, producing hail or high winds in another.

Past Occurrences

Severe storms including thunderstorms and windstorms are an annual occurrence in Morgan County. According to the *National Climate Data Center's (NCDC) Storm Events Database*, 137 severe storm events have been reported for Morgan County between September 1961 and August 2019 as shown in Table 2.8. There were 92 thunderstorm events, many of which included high winds and lightning; 8 heavy rain events; 30 hail storm events producing hail stones from 0.75 to 1.5 inches; 17 reports of high or strong winds including 1 EF-0 tornado that touched down at Rose Farm in 2010. Prior to that, 1 tornado was reported in 1928 and another in 1950. Reported damages include downed trees and utility lines causing blocked roads and power outages. Limited real property loss has been reported. No injuries or deaths have been reported.

Table 2.8: Summary of Severe Storm History (1961-2019)

Event	Total Incidents	Total Damages	Crop Loss	Total Deaths	Total Injuries
Thunderstorms	92	$867,500	$40,073	0	0
Windstorms	17	$140,000	None reported	0	0
Hail Storms	30	$1,000	None reported	0	0
Heavy Rain	8	$0.00	None reported	0	0
Total:	**137**	**$1,000,800**	**$40,073**	**0**	**0**

Since the most recent plan update in 2012, 24 thunderstorm events, 4 windstorms and 8 hailstorms have been reported by the *NCDC Storm Events Database* in Morgan County. In 2013 there were 3 severe weather events reported, 2 of which produced thunderstorms and high winds and 1 produced hail. Property damages were reported in the amount of $25,000. In 2014, there were 3 severe storms, 1 produced 1-inch hailstones, 1 produced a thunderstorm with 50 knot winds and 1 produced a windstorm with gusts up to 60 mph. Reported damages included downed trees and power outages in the amount of $12,000. In 2016, 8 severe weather events were reported. There were 2 windstorms, 2 hailstorms and 4 thunderstorms with high winds. Reported property damages for all events was $37,000.

A cold front moved through the evening of April 2, 2016 bringing strong winds with gusts of 45-55 mph. The event caused $25,000 in damages due to fallen trees and limbs and blown debris that blocked roads. On 7/15/16 thunderstorms that developed ahead of a cold front produced 1.5-inch hail in Morgan County, cracking the windshield of a vehicle. Five severe thunderstorms generating winds up to 50 knots were reported in 2017 causing $6,500 in damages due to downed trees. In 2018 6 severe weather events moved into Morgan County producing showers and thunderstorms. Four of these events also produced 1-inch hail stones. Damages due to downed trees totaled $3,000 from these events. In 2019, 11 severe weather events were reported in Morgan County producing thunderstorms and strong winds. One event produced hail. The most significant event occurred on 2/24/19 when a warm front lifted northward into Ohio on 2/23/19 producing widespread showers and isolated thunderstorms due to the close proximity of an approaching cold front. Local reports of 1-1.5 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 40-50 knots. Combined with soggy ground, these winds led to power outages due to downed trees and power lines. Thousands of customers lost power and it took several days for all service to be restored. Damages from this event were reported at $25,000.

Morgan County has received 2 federal disaster declarations for severe weather:

April-May 2011 (DR-4002).

On April 19 and 20, high winds, tornadoes and hail caused at least $43 million in insured losses, with more than 8,100 claims filed to date in Ohio. Then, from April 22 to April 28, the outbreak of storms affecting Ohio caused at least $80 million in insured losses with 15,500 claims statewide. After a storm-ridden first quarter, Ohioans faced another round of storms in May that caused even more extensive losses. Statewide preliminary estimates find that insurance companies racked up losses totaling $322-400 million from the May 20-26 storms. According to the Ohio Insurance Institute this is the third costliest natural disaster to hit the state in recent times, behind the April 3-4, 1974 Xenia tornado super-outbreak and the September 14, 2008 Hurricane Ike windstorm. The same system responsible for the intense May 22 EF-5 tornado in Joplin, Mo., caused extensive damage as it moved through Ohio. At least nine tornadoes were confirmed in Ohio from May 23-26, including five EF-1 tornadoes with maximum winds between 90-105 mph. Widespread rain, hail and damaging winds were reported throughout the state. According to FEMA, Morgan County received public assistance in the amount of $256,045. State reports indicate that $125,000 went to the County Engineer for Category C (road structure repairs and replacement, drainage, earthwork, bridge inspections, repair and replacement) work and a total of $175,000 went to Center, Marion, Morgan and Malta Townships for similar civil engineering work.

June-July 2011 (DR-4077).

A line of fast-moving severe thunderstorms with powerful winds swept through the state in the late afternoon of June 29, 2012 leaving widespread damage, down utility poles and electric wires, leaving thousands without electricity. Winds up to 80 miles per hour were reported by the National Weather Service in certain areas. Extreme heat, combined with prolonged power outages created a great concern for residents, especially the elderly and medically fragile populations. State reports indicate that Morgan County received public assistance in the amount of $57,602 that went was intended for Category B work (emergency protective measures) for debris removal. This derecho event caused heavy crop damages but no other structural damages or injuries were reported. The Muskingum-Morgan Farm Services Agency reports that 23 applicants received $40,073 for debris removal associated with this storm.

Probability of Future Occurrences

According to the *NOAA Storm Events Database*, there have been 137 severe storms of various types in Morgan County since 1961. These events include severe thunderstorms, high winds, heavy rains and hail. Multiple severe storm events occur in the county on annual basis.

Vulnerability Assessment and Loss Estimation

Much of the damages associated with severe thunderstorms include downed power lines, fallen trees and other debris that cause structural damage. During the past 7 years, storm damages totaled just over $867,000 or $124,000 annually. In addition, damage to buildings and contents is also potentially high, due primarily to power surges associated with lightning strikes. Using HAZUS property values as estimates, the potential building exposure for the county is shown in Table 2.9.

Table 2.9-Building Exposure by Occupancy for Morgan County-Thunderstorms

Building Type	Number of Structures	Value
Residential	3,234	$48,890,000
Non-Residential	1,024	$5,316,4000
Critical Facilities	25	$11,587,000
TOTAL:	**4,282**	**$113,641,000**

Hailstorms are a significant hazard throughout all of Morgan County. However, these events have historically caused little to no structural damage to the county's assets, except for a possible broken window, dented automobile or damaged heating and cooling equipment. Table 2.10 shows the potential for structural damages in the event of hailstorms.

Table 2.10-Building Exposure by Occupancy for Morgan County-Hailstorms

Building Type	Number of Structures	Value
Residential	809	$25,711,000
Non-Residential	257	$13,417,000
Critical Facilities	6	$8,800,000
TOTAL:	**1,071**	**$47,928,000**

Actual damages associated with windstorms during the past 7 years have totaled $140,000 or $20,000 annually and included downed trees and power lines and power outages.

2.3.3 Severe Winter Storms

A winter storm is a weather event in which a combination of heavy snow, blowing snow and or dangerous wind chills affect an area. These storms can also produce high winds, sleet and ice. There are several types of winter storms including blizzards, ice storms, lake effect storms and snow squalls. Morgan County can be impacted by winter storms in varying degrees from late fall to early spring.

A blizzard is a dangerous winter storm that includes a combination of blowing snow and wind gusts of 35 mph or more resulting in low visibilities. Sustained winds and visibilities of ¼ mile or less for at least 3 hours are required for an event to be considered a blizzard. Heavy snowfall and severe cold often accompany blizzards, but they are not required.

Lake effect storms form as cold, dry air masses move over the Great Lakes region, picking up moisture as it moves across the lakes. The heavy, wet air produces heavy snowfalls in areas generally to the south and east of the Lakes.

Snow squalls are brief, intensive snow showers generally accompanied by strong, gusty winds and significant snow accumulations.

Other forms of winter precipitation that can cause hazardous conditions include snow (flurries, showers or blowing snow), sleet and freezing rain and ice. A significant accumulation of freezing rain over several hours is considered an ice storm.

Winter storms are typically measured by the amount of precipitation (i.e. snowfall, freezing rain and ice), associated winds and extreme cold temperatures. Snowfall in excess of 6-inches is typically considered disruptive. Heavy showers of freezing rain and ice are one of the most dangerous types of winter storms, as little as 0.04 inches of freezing rain can paralyze a region making driving extremely hazardous, downing trees and damaging utility lines.

Location

A severe winter storm can affect the entire county at the same time, bringing virtually all County operations to a stand-still. Due to the rural nature of the region, Morgan County is highly vulnerable to the wide-ranging effects of snowstorms, blizzards, ice storms, and severe cold snaps. This type of hazard creates a difficult emergency response effort due to adverse road conditions, which impede or prohibit vehicle movement.

The higher elevations of the county appear to be more susceptible to severe winter storms. Driving is treacherous during winter storms as roadways freeze and become covered with snow and slush. During severe winter storms, heavy snow may cause property damage and power outages. Also, the aforementioned adverse driving conditions may lead to additional property damage and injuries due to

accidents. Roads are sometimes blocked, stranding some rural residents from the incorporated areas where medical and other emergency services are centered.

Past Occurrences

Research indicates that winter storms are the third leading weather threat in Ohio. The storms of 1950 and 1978 were of a duration that required extensive mass sheltering and statewide emergency response and recovery efforts. A total of 269 winter storms from 1923-1994 have been classified as severe, resulting in 2 Disaster Declarations for the state and county.

Great Blizzard of 78: January 26-28, 1978 (EM-3055)

The entire state of Ohio received a Presidential Disaster Declaration during 1978 due to severe blizzard conditions. This event occurred in January 1978, closing homes and businesses for a week and caused the deaths of 51 people, making it one of the deadliest winter storms in Ohio history. Beginning on January 26th, the storm produced heavy snow fall and hurricane-like wind gusts of 50-70 mph creating bitter cold temperatures and drifting snow across the entire state of Ohio, ending January 28th. Public assistance funds across the state totaled $3,546,669.

February-March 2003 (DR-1453).

The February 2003 snow and ice storms that hammered several states from the Mid-Atlantic to New England resulted in preliminary insured losses of about $20 million in Ohio. According to Property Claims Service of the Ohio Insurance Institute, this was part of three winter storms during the first quarter of 2003 that blanketed 15 states, causing $1.3 billion in insured losses. Federal funds were awarded to Morgan County for public assistance in the amount of $559,241. These funds were used to reimburse the county for equipment, labor and materials associated with snow removal from that event.

According to the NOAA Storm Event Record, 81 severe winter weather events have been reported in Morgan County since 1996 as summarized in Table 2.11 below:

Table 2.11: Summary of Winter Weather (1996-2019)

Event	Total Incidents	Total Property Loss	Injuries	Death	Crop Loss
Extreme Cold/Wind Chill	28	$76,000	0	0	0
Frost/Freeze	4	None reported	0	0	0
Heavy Snow	18	$10,000	0	0	0
Ice Storm	3	$5000	0	0	0
Winter Storm	16	$15,000	0	0	0

Winter Weather	12	None reported	0	0	0
Total:	81	$106,000	0	0	0

Local officials reported a storm event in 2004, whereby 16 inches of snow fell, affecting the entire County. Another storm event in January 2009, where approximately 1-inch of ice covered the ground and extreme cold temperatures affected the entire county leading to power outages in the extreme rural areas of the county that lasted for several days. Another reported storm event occurred in January 2012 when an ice storm came through the area, covering many areas of the County in ½-inch of ice and again caused power outages that lasted for several days. No damages were reported during any of these events.

Probability of Future Occurrences

Multiple winter weather events, in varying degrees, are an annual occurrence affecting Morgan County and its jurisdictions.

Vulnerability Assessment and Loss Estimation

Damage as a result of winter storms often is associated with snow and ice weight, leading to the downing of trees and utility poles, roof damages, power outages, etc. as well as those associated with hazardous driving conditions. Extreme cold temperatures and blizzard conditions can lead to personal injuries such as hypothermia, frostbite or even death. These events have not historically caused wide-spread property damage in Morgan County but have caused significant disruption to daily life due to repeated power outages and treacherous road conditions.

Based on reported data, real property damages are low, averaging $4,609 per year due to winter weather events. Based on the HAZUS property values for the county, the total building exposure for the county is shown in Table 2.12 below:

Table 2.12: Building Exposure by Occupancy for Morgan County-Severe Winter Storm

Building Type	Number of Structures	Value	Percent of Total
Residential	2,731	$470,246,000	80.9%
Non-Residential	564	$99,168,000	16.8%
Critical Facilities	81	$25,929,000	2.4%
TOTAL	**3,376**	**$595,343,000**	**100.0%**

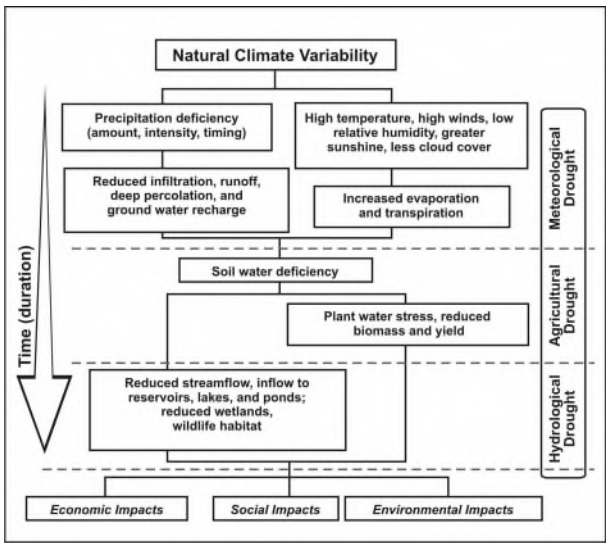
2.3.4 Drought and Extreme Heat

Drought occurs when there is below-average precipitation over an extended period of time, affecting hydrological and agricultural concerns. Drought is equally as likely to occur in one area of the county as any other. The effects of drought vary greatly depending on several factors including land use (agricultural production vs. urbanization), economy (how dependent is the community on agricultural production), geology (presence of aquifers or ground water sources that limit well production) and water source (public water systems vs. private wells or cisterns), (Ohio State Hazard Mitigation Plan, p. 2-168).

There are generally 4 types of drought: meteorological, hydrological, agricultural and socio-economic. Hydrological and agricultural droughts are most common in Morgan County, often occurring simultaneously.

Meteorological drought is the departure of precipitation from normal that causes two other types of drought that negatively affect an area. Hydrological drought occurs when below average amounts of precipitation affects the water table, potentially affecting drinking water supplies. Agricultural drought occurs when there is not enough soil moisture to support crop growth or good pasture conditions. Socioeconomic drought considers the impact of other drought conditions on the supply and demand of some goods such as fruits, vegetables and grains. Socioeconomic drought occurs when the demand for these goods exceeds the supply as a result of a weather-related deficit in water supply (www.weather.gov). Figure 2.9 shows the drought cycle and the relationship between the different types of drought.

Figure 2.9: Drought Cycle



Source: https://drought.unl.edu/Education/DroughtIn-depth/TypesofDrought.aspx

Drought is typically measured using the Palmer Drought Severity Index (PDSI). The PDSI was developed by meteorologist Wayne Palmer in 1965 and is a measurement of dryness based on recent precipitation and temperature. The index is based on a supply and demand model of soil moisture, taking into account more than just temperature and precipitation at a specific location. The index has proven effective in determining long-term drought but is less reliable in determining short-term drought conditions (*Source: https://en.wikipedia.org/wiki/Palmer_drought_index)*. The PDSI is used by State and Federal agencies to determine the need for drought relief programs. See Table 2.13 for the PDSI Classifications.

Table 2.13-Palmer Drought Severity Index Classification

4.0 or more	Extremely wet
3.0 to 3.99	Very wet
2.0 to 2.99	Moderately wet
1.0 to 1.99	Slightly wet
0.5 to 0.99	Incipient wet spell
0.49 to -0.49	Near normal
-0.5 to -0.99	Incipient dry spell
-1.0 to -1.99	Mild drought
-2.0 to -2.99	Moderate drought
-3.0 to -3.99	Severe drought
-4.0 or less	Extreme drought

Extreme Heat

Extreme heat is defined as temperatures hovering 10 degrees or more above the average high for a region that lasts for several weeks. Humid or muggy conditions, which add to the discomfort of high temperatures, occur when a dome of high atmospheric pressure traps hazy, damp air near the ground. Excessively dry and hot conditions can provoke dust storms and low visibility. Droughts occur when a long period passes without substantial rainfall. A heat wave combined with a drought is a very dangerous situation.

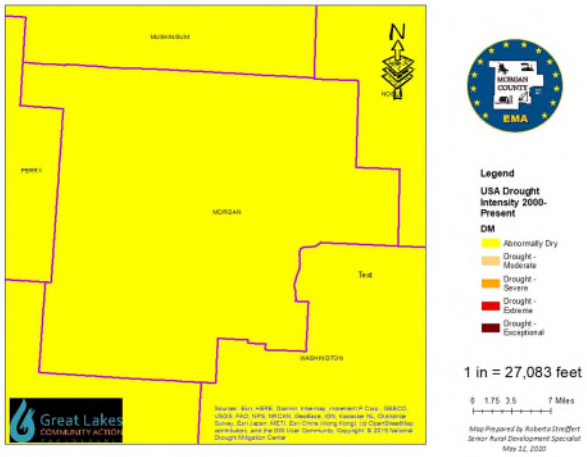
Extreme heat can have devastating consequences. It is difficult to quantify the exact total number of deaths associated with a heat wave as there are a number of other health risks to individuals associated with exposure to excessive heat, particularly in vulnerable populations such as the homeless, children, the elderly and those who work under extreme conditions. Table 2.14 below defines these risks and some of the symptoms associated with each health risk.

Table 2.14-Health Risks associated with Extreme Heat Conditions

Health Hazard	Symptoms
Sunburn	Redness and pain. In severe cases: swelling of skin, blisters, fevers and headaches.
Dehydration	Excessive thirst, dry lips and slightly dry mucous membranes
Heat Cramps	Painful spasms, usually in muscles of legs and abdomen and possible heavy sweating
Heat Exhaustion	Heavy sweating; weakness; cold, pale and clammy skin; possible fainting and vomiting
Heat Stroke	High body temperature (104°F or higher), hot and dry skin, rapid and strong pulse and possible coma

Agricultural losses to crops and livestock would primarily be affected during periods of drought and adverse health conditions in individuals are primarily associated with extreme heat conditions.

Figure 2.10-USDA Drought Intensity Map (2010-Present)



History

All areas of Morgan County are equally susceptible to drought conditions during the summer and autumn months due to the significant lack of rainfall and/or other precipitation. These drought conditions often affect local farmers, both commercial and family farmers as well as local water supplies where wells can run dry and rivers run low resulting in a reduction of public

water supplies. According to the USDA Drought Intensity Map shown in Figure 2.10, Morgan County has been in a period of abnormally dry conditions since 2010 as reported by the National Drought Mitigation Center. Extended widespread droughts and extreme heat conditions are fairly infrequent in Morgan County; however, brief local events are common and can be severe in some cases.

According to the NOAA Storm Events Database, Morgan County has suffered 5 events of drought between 1999 and 2002 and 18 events of heat and extreme heat conditions from 1997 and 2011, as summarized in Table 2.16 below. Twelve of the extreme heat conditions occurred during the months of January –March where unseasonably warm weather conditions, lasting several days spread across the county. Much higher than average temperatures were recorded, reaching into the 80's for several days in some cases, but did not reach dangerous conditions that would affect individuals. No injuries or deaths were reported as a result of any of these events. No other damages or crop losses were reported.

Table 2.15: Summary of Drought and Extreme Heat (1997-2011)

Event	Total Incidents	Total Property Loss	Injuries	Deaths	Crop Loss
Heat/Extreme Heat	18	None reported	0	0	0
Drought	5	None reported	0	0	0
Total:	23	-	0	0	0

Two long-term droughts affecting almost all of the United States also impacted Morgan County.

1988-1989 North American Drought

The drought of the late 1980's followed a milder drought in the Southeastern United States and California the year before. This drought spread from the Mid-Atlantic, Southeast, Midwest, Northern Great Plains and Western United States. It was widespread, unusually intense and accompanied by heat waves which killed around 4,800 to 17,000 people across the United States and also killed livestock across the country. One particular reason that the Drought of 1989 became very damaging was that farmers might have farmed on land which was marginally arable. Another reason was the pumping of groundwater near the depletion mark. The Drought of 1989 destroyed crops almost nationwide, residents' lawns went brown and water restrictions were declared many cities. This drought was catastrophic for multiple reasons; it continued across the Midwest States and North Plains States during 1989, not officially ending until 1990.

2012 North American Drought

The 2012-2013 North American drought is an expansion of the 2010–2012 United States drought which began in the spring of 2012, when the lack of snow in the United States caused very little snow melt to absorb into the soil. The drought includes most of the US and included Ohio. Among many counties, Morgan County was designated with moderate drought conditions by mid-June. It has been equaled to similar effects as the droughts in the 1930s and 1950s but it had not been in place as long. However, the

drought inflicted catastrophic economic ramifications. In most measures, the drought has exceeded the 1988-1989 North American drought, which is the most recent comparable drought.

On July 30, 2012, the Governor of Ohio sent a memorandum to the USDA Ohio State Executive Director requesting primary county natural disaster designations for eligible counties due to agricultural losses caused by drought and additional disasters during the 2012 crop year. The USDA reviewed the Loss Assessment Reports and determined that there were sufficient production losses in 85 counties to warrant a Secretarial disaster designation. On September 5, 2012, Morgan County was one of those designated counties.

According to the US Department of Agriculture Farm Service Agency in Zanesville, Ohio, Morgan County suffered considerable losses in 2012 due to excessive heat and drought that affected all crops. In conjunction with the drought, damage was sustained due to the June 29th Derecho event, sometimes caused by meteorological conditions that generate droughts. Through the Farm Service Agency, Emergency Cost Share funding for farmers, there were 23 applicants that received $77,971 in cost share assistance ranging from 50% to 75% of incurred costs. For the Derecho event, 23 applicants received $40,073 in cost share assistance for approximately 60% of incurred costs. Tables 2.16 and 2.17 below summarize the crop and fruit and vegetable production damages reported by the Farm Service Agency:

Table 2.16-2012 Crop Losses

CROP	LOSS RANGE	ACREAGE
Hay	75% of normal to 20% with the average of 45% of normal	18,000
Pasture	75% of normal to 20% with the average of 45% of normal	2,500
Corn	Up to 95%	12,000
Soybean	10%	5,000

Table 2.17-2012 Fruit and Vegetable Losses

FRUITS & VEGETABLES	LOSS RANGE	ACREAGE
Apples	50%	75
Peaches	90%	35
Plums	100%	35
Pears	95%	15
Raspberries & Blackberries	75%	15
Strawberries	0%	10
Vegetables	55%	350

Probability of Future Events

The probability of future droughts is difficult to predict and is rarely the result of a single cause. Seasons of drought and extreme heat can potentially occur during any particular year when climatic conditions are conducive and can affect all areas of Morgan County leading to agricultural losses and decreases in municipal and local water supplies. Heat waves are generally increasing in frequency and severity due to the effects of climate change and Morgan County can expect this trend to continue. While these impacts are difficult to predict, the Center for Climate and Energy Solutions predicts that average daily high and low

temperatures could increase 5-10 degrees F by mid-century. Additional studies project that the annual number of days with a heat index above 100 degrees F will double and days with a heat index above 105 degrees F will triple over the same time period (www.c2es.org/content/heat-waves-and-climate-change/).

Vulnerability Assessment and Loss Estimation

Morgan County and its jurisdictions are susceptible to the effects of drought and extreme heat in varying degrees. Extreme heat conditions can exacerbate other types of disasters such as drought and wildfires. Financial losses to structures are not generally associated with drought and extreme heat conditions, however, the loss of crops and livestock are. Definitive financial losses are not readily available. However, the Muskingum-Morgan Farm Services Agency reports that 23 applicants received $77,971 in cost share assistance in 2012 related to crop losses.

Health-related effects to both humans and animals are also difficult to project and quantify. Extreme heat is becoming one of the leading causes of weather-related deaths in the United States. In addition, other heat related illnesses can exacerbate health problems in vulnerable populations, particularly the homeless, elderly and low-income individuals that may have limited ability for cooling. Hot days are also associated with increases in cardiovascular and respiratory complications as well as kidney disease. In extreme temperatures, air quality is also affected as hot and sunny days can increase ozone levels in the atmosphere and the increased use of air conditioning requires more electricity which can emit other types of air pollution including particulates.

Drought and extreme heat conditions are mitigated through the Morgan County Health Department's public education and other informational releases. There are also a number of cooling centers available throughout the County for at-risk populations during extreme heat conditions. The Morgan County Health Department reports that no injuries, illnesses or fatalities have been reported due to extreme heat and drought conditions.

2.3.5 Flooding

A flood is an overflow of water from the banks of a river or the shores of lakes and oceans that submerges land that is usually dry, known as the floodplain. Flooding normally occurs due to excessive precipitation and is dependent on many factors, including drainage basin characteristics, antecedent soil moisture conditions, weather patterns, land cover, urbanization and many others. Flooding is considered the most frequent and costly natural hazard in the United States.

According to the National Severe Storms Laboratory, there are 6 types of floods: riverine, coastal, storm surge, inland and flash flooding. River flooding occurs when water levels rise over the top of riverbanks due to excessive rain from tropical storm systems, persistent thunderstorms over the same area for an extended period of time, combined rainfall and snowmelt or an ice jam. A coastal flood is caused by higher than average high tide and worsened by heavy rainfall and onshore winds. Storm surge is an abnormal rise in water in coastal areas over and above the regular astronomical tide caused by forces generated from the winds, rains and low atmospheric pressure of a severe storm, generally a hurricane. Extreme flooding can occur over a large area especially when storm surge coincides with normal high tide. Inland flooding occurs

when moderate precipitation accumulates over several days, intense precipitation falls over a short period of time or a river overflows because of an ice jam, debris flow or a dam or levee failure. A flash flood is caused by heavy or excessive rainfall in a short period of time, generally less than 6 hours. Flash floods are generally characterized by raging torrents after heavy rains rip through river beds, urban streets or mountain canyons (https://www.nssl.noaa.gov/education/svrwx101/floods/types/). The primary types of flooding that affect Morgan County are flash flooding and riverine.

Location

Morgan County is located in 2 watersheds: Muskingum and Hocking Rivers. The County is susceptible to flooding along the paths of the Muskingum River, which flows near the Villages of Malta, McConnelsville and Stockport and often floods the section of State Route 60 that runs adjacent to the river just within the northern corporate limits of McConnelsville. Flooding of Wolf Creek is also often reported to the north of the Village of Chesterhill along the intersection of County Roads 82 and 52. A section of County Road 42 that runs adjacent to Bald Eagle Run, near the Village of Stockport is also often affected by riverine flooding.

Figure 2.11: Morgan County Watersheds

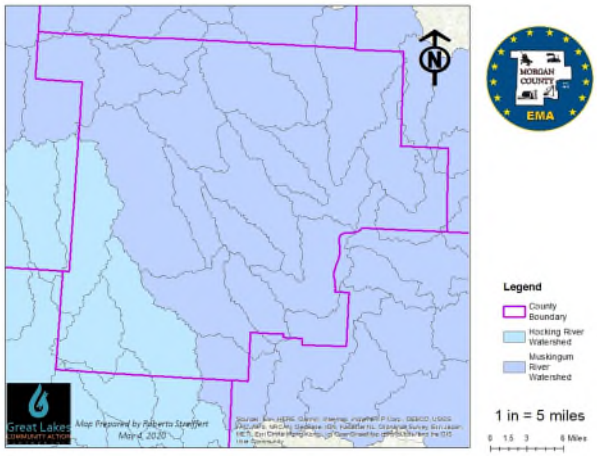
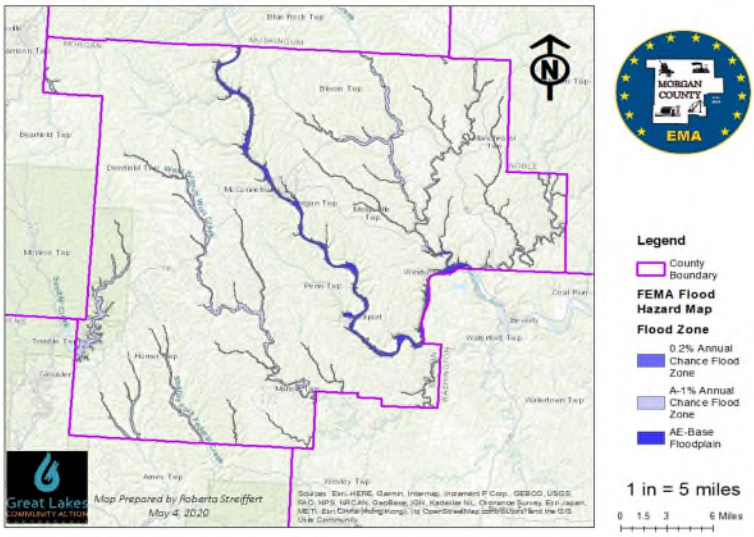


Figure 2.12: FEMA Flood Hazard Map



Morgan County has 62 miles of floodplain associated with the Muskingum River and its tributaries. Areas near the path of the Muskingum River are particularly low-lying areas. The Villages of Stockport and Chesterhill appear to be moderately susceptible to flooding in general terms. However, the Village of McConnelsville, which is located in a low-lying area along the Muskingum, appears to be especially susceptible to flooding. The Village of Malta, which also contains many low-lying areas along the river, is also susceptible to the effects of flooding. Many areas in these villages that are repeatedly flooded are above Muskingum Lock and Dam No. 7, which is located just south of

McConnelsville. However, while flooding is a prominent hazard in these villages, the critical facilities located in them, such as the Malta-McConnelsville Fire Department are located above the floodplain.

Morgan County and its jurisdictions participate in the National Flood Insurance Program (NFIP), except for the Village of Chesterhill where no floodplain areas are mapped. Table 2.18 provides the NFIP status for communities in Morgan County based on the Community Status Book dated 6/2/2020. Participation in this program allows for the provision of flood insurance for vulnerable properties in the County.

Table 2.18: NFIP Community Status Report

Community	Initial FHBM Identified	Initial FIRM Identified	Current Effective Map Date	Reg-Emer Date
Morgan County	1/10/1975	11/2/1990	9/19/2012	11/2/1990
McConnelsville	5/17/1974	7/1/1987	9/19/2012	7/1/1987
Malta	4/5/1974	9/1/1987	9/19/2012	9/1/1987
Stockport	8/30/1974	8/1/1987	9/19/2012	8/1/1987
Chesterhill	n/a	n/a	9/19/2012	n/a

History

The County has a long history of flooding events of 25 and 100-year returns. According to the NOAA Storm Event Record, there have been 43 flooding events in the County from 3/1/1997 to 8/8/2019. Recent events include a strong cold front resulting in strong thunderstorms on 8/8/2019 causing flash flooding in Chesterhill where a portion of County Road 80 was washed out. The event caused $10,000 in damages. A slow-moving cold front on 7/6/2019 produced 2-3 inches of rain near McConnelsville causing sections of State Routes 78, 376 and 669 to close due to high water. Property damages were reported in the amount of $6,000. On 6/19/19 a low pressure system moved into the area that generated showers and thunderstorms resulting in flash flooding around McConnelsville. Poor drainage issues in McConnelsville led to rising waters along several roadways and one property in the Village suffered minor yard and garage flooding. This event caused $6,000 in damages. Heavy rains on February 12-13, 2019 led to minor flooding along the Muskingum River due to soils being saturated from a previous flooding event. State Route 60 flooded near McConnelsville, also impacting State Route 669 near Malta and the cemetery on the southwest side of McConnelsville. The river rose above its 11-foot flood stage, cresting at 12 feet, during the afternoon of the 12th, before returning to is banks in the evening of the 13th. The event caused $4,000 in damages. Several waves of low pressure brought localized heavy rains into the County on 2/7/2019 resulting in widespread, minor flooding near McConnelsville, causing high water along State Routes 60 and 669. The Muskingum River crested at 11.5 feet just after midnight on 2/8 before returning to its banks that morning. The event caused $10,000 in damages. A warm front moved through the area on 4/3/2018 bringing in a round of showers and thunderstorms, lingering throughout most of the day. A strong cold front pushed through the evening with strong to severe thunderstorms that led to flooding along the Muskingum River in McConnelsville on the 4th. The river crested at the flood stage of 11 feet just after sunrise but quickly receded. The event caused minor flooding along State Route 669. No damages were reported. A rain event on 2/16/18 and 2/17/18 led to flooding along Mans Fork Creek closing State Route 78 between McConnelsville and State Route 83. The Muskingum River at McConnelsville rose above its

flood stage, cresting at 11.2 feet at 3 pm and returned to its banks just after sunset that evening. Property damages in the amount of $1,000 were reported. A period of warm temperatures on January 20th -24th, 2018 caused river ice to start breaking up and flowing resulting in an ice jam on the Muskingum River on January 23rd. Localized flooding occurred along the river between McConnelsville and Stockport. Property damages in the amount of $2,000 were reported. A period of warm temperatures on January 10-12, 2018, along with 2-inches of rain caused river ice to start breaking up and flowing. An ice jam occurred on the Muskingum River near Stockport on the 14th, which caused localized flooding along the river between McConnelsville and Stockport. Several roads were closed and water rose around several homes. Property damages in the amount of $5,000 were reported. A flash flooding event on 7/23/2013, due to several rounds of showers and thunderstorms in the McConnelsville area and north, resulted in small stream and creek flooding causing in $7,000 in damages. A complex of showers and thunderstorms formed on 7/9/2013 and moved through the western portions of Morgan County resulting in flooded roads and small stream and creek flooding. Property damages were reported in the amount of $10,000. On 6/27/2013 small clusters of thunderstorms moved over a portion of Morgan County near Triadelphia bringing 2.2 inches of rain in 3 hours. Rain estimates of over 3 inches fell near Joetown. Small streams flooded roads resulting in $10,000 in damages.

Major flooding events in the County in January and June 1998 resulted in a Presidential Disaster Declaration made on June 28, 1998 from a severe thunderstorm with 3-day rain totals of 6 to 12 inches. The lower Muskingum crested 1 to 2 feet above flood stage from McConnelsville towards its mouth in Washington County. There have been 3 other major flooding events since 1999 as documented by local officials. Two of these events occurred in January 2005, whereby excessive snowmelt caused significant flooding along State Route 60 and one occurred in October 2004. According to the *National Climate Data Center's Storm Events Database*, there were 6 reports of flooding events in Morgan County between October 1, 2006 and July 30, 2012. One event occurred on 1/15/07 in Eagleport. Excessive rains flooded creeks and streams feeding into the swollen Muskingum River causing numerous road closures. No evacuations were required, and flood damages were minimal. In 2008, on 3/4 and 3/19 flooding occurred in Durant and Deavertown. In both events, small stream flooding from excessive rains led to road closures and limited damages. On 5/2/2010, a flood event occurred in Bishopville. Small stream flooding due to excessive rains led to road closures, some small bridges and culverts were washed out causing approximately $15,000 in damages. Two men drowned in Morgan County near the Athens County line when their car was washed away while on a fishing trip. Two flash flood events were reported in Morgan County on 7/3/2011 and 8/25/2011. Both of these events occurred in Bishopville and were caused by heavy rains that fell and caused localized flooding of roads and small streams.

The County has received 3 disaster declarations for flooding.

January 2004 (DR-1507).

Extended rains during the period of January 3-5, 2004 led to high water and flooding in a number of counties across Ohio extending from Hamilton County in the southwest to Jefferson and Columbiana Counties in the northeast. Although the National Weather Service reported that the rain had stopped, rivers rose until cresting occurred on January 11, 2004. When the Muskingum River was near flood stage, the County requested, and received, assistance from Ohio National Guard in evacuating several people,

including a dialysis patient transported to a hospital in Zanesville. With closings on SR 376 South of McConnelville, SR 669, Eagleport to Malta, SR 60 in downtown McConnelsville, SR 78 between McConnelsville and SR 83, County authorities issued a Declaration of Emergency for the situation. A local shelter was opened in Malta following reports of residential damages in areas adjacent to the Muskingum River. During recovery from this event, Morgan County received public assistance in the amount of $454,010. These funds were used to make road repairs where roads had slipped, to upgrade and repair culverts to improve drainage and to conduct a stream erosion stabilization project.

August-September 2004 (DR-1556).

Remnants of Hurricanes Frances and Ivan crossed Ohio during September 2004, resulting in flooding in eastern Ohio and large amounts of rain to the entire eastern United States. Heavy rain moved into the East-Southeastern portions of the state on September 8 and 9. These rains led to flooding in 15 counties; including Morgan County. Several forecast points within Ohio were either already in flood or forecast to exceed flood stages within two days. Multiple township, county, and state roadways were subject to closings due to high waters.

Flooding occurred at additional points along the Hocking River, Tuscarawas River, Mahoning River, Muskingum River, Cuyahoga River, and Nimishillen Creek. Affected rivers crested in the evening of September 9. In Morgan County, flooding was reported in Deerfield Township, and McConnellsville. A preliminary estimate was made that 39 residential structures were damaged, but none were destroyed.

In McConnelsville, the Muskingum River crested at 13.45 feet. 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's department. An 85-year-old woman was rescued from her flooded mobile home along the Muskingum River. 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. In Morgan County, around 142 homes had minor damage. One furniture store in McConnelsville had flood waters inside. During recovery from this event, Morgan County received public assistance in the amount of $475,686. These funds were used to make road repairs where roads had slipped and to upgrade and repair culverts to improve drainage.

February 2005 (DR-1580).

Snowmelt and widespread precipitation began across Ohio in the evening of January 5, 2005 and continued for a few days. Temperatures in the northern part of the state (in areas north of I-70) were cold enough for freezing rain, sleet and snow. Rain showers, snow showers, or a wintry mix followed the front on January 7. This was due to an upper level system and associated surface low pressure system, with a warm front that brought more precipitation back into Ohio. This new system moved rapidly through the Ohio Valley and added more precipitation. This latest system had greater effects on the southern part of the state than the last front that passed through the state. Flood watches and warnings were issued for parts of southern Ohio. A mixture of freezing rain, rain, and snow showers was forecast for northern parts of Ohio and a Winter Weather Advisory was issued for west central and northern central Ohio. Accumulations of up to 1 to 2 inches of snow were forecast in the north. A total of 62 Ohio counties were declared in this

disaster. ODNR dispatched fast water rescue crews on January 6, 2005 to McConnelsville. It was reported that 10 families need to be evacuated due to rising water. Rescues crews from Cambridge and Alum Creek remained in to assist the McConnelsville Fire Department. ODNR's Team 3 was on scene and at the Cottonwood trailer park located south of McConnelsville, checking trailers for possible occupants. During recovery from this event, Morgan County received public assistance in the amount of $1,185,036. These funds were used to make road repairs, including resurfacing, to roads damaged from flood waters. Funds were also used to install new culverts and repair and upgrade existing culverts to improve drainage.

Table 2.19-Flooding History (1997-2019)

Event	Total Incidents	Total Property Loss	Total Crop Loss	Total Deaths	Total Injuries
Flash Flooding	15	$589,000	0	0	0
Flood	20	$5,498,000	0	3	0
Heavy Rain	6	$0.00	0	0	0
Ice Jam	2	$7,000	0	0	0
Total:	43	$6,094,000	0	3	0

Probability of Future Occurrences

Multiple flooding events are an annual occurrence, to varying degrees, in Morgan County.

Vulnerability Assessment and Loss Estimation

Loss estimates were calculated by HAZUS MH based on a 100-year flood event.

General Building Stock

HAZUS estimates that there are 8,272 buildings in the County which have an aggregate total replacement value of $1,459,000,000. Tables 2.20 represents the distribution of the value relative to general occupancy for Morgan County. Tables 2.21 and 2.22 show the distribution of potential property damages for the 100-year and 25-year flood events.

Table 2.20-Building Exposure by Occupancy for Morgan County

Occupancy	Exposure	Percent of Total
Residential	$1,152,454,000	79.0%
Commercial	$135,637,000	9.3%
Industrial	$87,087,000	6.0%
Agricultural	$20,313,000	1.4%
Religion	$27,875,000	1.9%
Government	$11,334,000	0.8%
Education	$24,335,000	1.7%
Total	$1,459,035,000	100%

Table 2.21-Building Exposure by Occupancy for 100-Year Flood

Occupancy	Exposure	Percent of Total
Residential	$591,118,000	83.7%
Commercial	$58,871,000	8.3%
Industrial	$30,715,000	4.3%
Agricultural	$9,161,000	1.3%
Religion	$6,974,000	1.0%
Government	$2,184,000	0.3%
Education	$7,440,000	1.1%
Total	**$706,463,000**	**100%**

Table 2.22-Building Exposure by Occupancy for 25-Year Flood

Occupancy	Exposure	Percent of Total
Residential	$559,814,000	83.7%
Commercial	$54,216,000	8.1%
Industrial	$31,146,000	4.7%
Agricultural	$8,211,000	1.2%
Religion	$5,978,000	0.9%
Government	$2,184,000	0.3%
Education	$7,440,000	1.1%
Total	**$668,989,000**	**100%**

General Building Stock Damages

HAZUS estimates that approximately 40 buildings will be at least moderately damaged and 5 buildings will be completely destroyed during the 100-year flood event and 25 buildings will be moderately damaged and 4 buildings will be completely destroyed during the 25-year flood event. No damages to essential facilities are anticipated in either the 25 or 100-year flood scenario.

Debris Generation

HAZUS estimates the amount of debris that will be generated by a flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc) and 3) Foundations (concrete slab, concrete block, rebar, etc). The distinction is made because of the different types of material handling equipment required to manage the debris.

During the 100-year flood scenario, the model estimates that a total of 4,831 tons of debris will be generated. Of that total, Finishes comprise 1,708 tons (35.3%), Structural comprises 1,659 tons (34.3%) and Foundations comprise 1,463 tons (30.2%). If the debris tonnage is converted to an estimated number of truckloads, it will require 194 truckloads (25 tons/truck) to remove the debris generated by a flood. In the 25-year flood scenario, the model estimates that a total of 3,368 tons of debris will be generated. Of that, finishes accounts for 1.365 tons (41%), Structural accounts for 1,033 tons (31%) and foundation accounts for 969 tons (29%), requiring 135 truckloads at 25 tons/truck to remove the debris generated by the flood event.

Shelter Requirements

HAZUS estimates the number of households that are expected to be displaced in a 100-Year flood event and the associated potential evacuation. HAZUS also estimates those displaced people that will require accommodations in public shelters. During the 100-year flood scenario, the model estimates 195 households (586 persons) will be displaced due to a flood. Displacement includes households evacuated from within or a very near the inundated area. Of these, 2 people will seek temporary shelter. During the 25-year flood scenario, it is estimated that 166 households (497 persons) will be displaced and 2 will seek temporary shelter.

Economic Loss

HAZUS estimates the total economic loss for a flood of this magnitude at 46.94 million dollars, which represents 6.64% of the total replacement value of the building losses, shown below in Table 4.8.

Building losses are broken into 2 categories: direct building losses and business interruption losses. The direct building losses include estimates to repair or replace the damages caused to the building and its contents. The business interruption losses are the losses associated with the inability to operate a business because of the damage sustained by a flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of a flood.

The total building related losses during the 100-year flood scenario are estimated at $31,170,000 and the business interruption losses are estimated at $15,760,000. These losses are summarized (in millions of dollars) in Table 2.23 below:

Table 2.23-Summary of Total Losses, 100 Year Flood

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	16.22	1.28	0.21	0.38	18.09
	Content	6.83	3.95	0.43	1.74	12.96
	Inventory	0.00	0.04	0.05	0.04	0.12
	Subtotal	**23.05**	**5.28**	**0.69**	**2.15**	**31.17**
Business Interruption						
	Income	0.01	3.79	0.01	0.60	4.41
	Relocation	4.03	0.55	0.00	0.25	4.83
	Rental Income	1.11	0.44	0.00	0.02	1.57
	Wages	0.02	3.32	0.01	1.60	4.96
	Subtotal	**5.17**	**8.10**	**0.02**	**2.48**	**15.76**
ALL	**Total**	**28.22**	**13.38**	**0.71**	**4.63**	**46.94**

The total building related losses during the 25-year flood scenario are estimated at $25,800,000 and the business interruption losses are estimated at $13,700,000. These losses are summarized (in millions of dollars) in Table 2.24 below:

Table 2.24 -Summary of Total Losses, 25 Year Flood

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	12.58	1.18	0.34	0.29	14.39
	Content	5.26	3.75	0.76	1.44	11.21
	Inventory	0.00	0.05	0.12	0.03	0.21
	Subtotal	**17.84**	**4.99**	**1.23**	**1.75**	**25.80**
Business Interruption						
	Income	0.00	3.38	0.01	0.52	3.91
	Relocation	3.29	0.50	0.01	0.25	4.05
	Rental Income	0.91	0.39	0.00	0.02	1.32
	Wages	0.01	3.03	0.02	1.37	4.43
	Subtotal	**4.21**	**7.29**	**0.03**	**2.17**	**13.70**
ALL	**Total**	**22.05**	**12.28**	**1.26**	**3.92**	**39.50**

Repetitive Loss Structures

The following table lists the properties by jurisdiction in Morgan County that have been identified as repetitive loss structures according to FEMA, dated 12/24/20.

Table 2.25-Repetitive Loss Structures

Community	Mitigated	NFIP Insured	Occupancy	Rated Flood Zone	Total Payments	Average Payment	Total Losses
Morgan Co*	NO	NO	Single Fam	X	$23,744	$11,872	2
Morgan Co*	YES	NO	Single Fam	AE	$204,087	$51,022	4
Malta	NO	NO	Single Fam		$3,414	$1,707	2
McConnelsville	NO	NO	Condo	AE	$24,497	$8,166	3
McConnelsville	NO	YES	Single Fam	A	$17,251	$8,760	2
McConnelsville	NO	YES	Commercial	AE	$60,304	$20,101	3
Morgan Co	NO	NO	Single Fam		$3,803	$1,902	2
Morgan Co	NO	NO	Single Fam		$21,774	$7,258	3
Morgan Co	NO	NO	Single Fam		$15,280	$5,093	3
Morgan Co	NO	NO	Single Fam	AE	$41,443	$13,814	3
Morgan Co	NO	NO	Single Fam	AE	$33,546	$11,182	3
Morgan Co	NO	NO	Single Fam	AE	$39,968	$19,984	2
Morgan Co	NO	YES	Single Fam	A	$63,257	$21,086	3
Morgan Co	NO	YES	Single Fam	AE	$25,611	$12,806	2
Morgan Co	YES	NO	Single Fam	AE	$38,942	$12,981	3
Morgan Co	NO	NO	Single Fam	AE	$17,487	$8.744	2
Morgan Co	NO	NO	Single Fam	X	$40,982	$20,491	2
Morgan Co	NO	YES	Single Fam	AE	$24,824	$12,412	2

Morgan Co	NO	NO	Single Fam	AE	$36,432	$18,216	2
Morgan Co	YES	NO	Single Fam		$29,549	$14,774	2
Morgan Co	NO	NO	Single Fam	AE	$22,844	$11,422	2
Morgan Co	NO	NO	Single Fam	X	$13,741	$6,871	2
Morgan Co	NO	NO	Single Fam	AE	$73,354	$36,677	2
				TOTAL:	$876,405	$337,340	56

*Indicates severe a repetitive loss structure

2.3.6 Epidemic

An epidemic is the widespread occurrence of an infectious disease, spreading rapidly within a given population. Epidemics are generally caused by several factors including a change in the ecology of the host population, a genetic change in the pathogen or the introduction of an emerging pathogen to a host population. An epidemic occurs when the immunity of either an established pathogen or a newly emerging (novel) pathogen in a host population is suddenly reduced and the transmission threshold is exceeded. An epidemic is generally restricted to one location, but if it spreads to other countries and affects a substantial number of people it is termed a *pandemic*.

There are 5 modes of disease transmission: contact (direct and/or indirect), droplet, airborne, vector and common vehicle. Direct contact transmission is the most common mode of transmission and occurs when pathogens are transferred by direct physical contact with an infected person. Indirect contact transmission involves the transfer of pathogens through a contaminated object such as gloves, medical equipment or other instruments. Other objects within an infected person's home or environment can also lead to indirect contact transmission. Droplet transmission involves the transmission of microorganisms from the respiratory tract during coughing, sneezing or during aerosol procedures such as suctioning. These droplets are propelled short distances, entering the nasal or oral mucosa of a new host. Some of these microorganisms can also survive on objects in the immediate environment before entering a new host. Airborne transmission is the spread of infection by droplet nuclei or dust in the air. These microorganisms remain suspended in the air and are widely dispersed by air currents, making control of the disease transmission most difficult. Common vehicle transmission refers to the transmission of a disease through a contaminated source such as food, medication, IV fluids or shared equipment that transmits infection to multiple hosts. Vector-borne transmission refers to infections caused by animals and insects, such as West Nile Virus and Dengue Fever (www. professionals.wrha.mb.ca).

A pandemic occurs when an infectious disease is spread to other countries and affects a substantial number of people. The current COVID 19 pandemic is on par to be one of the deadliest pandemics to strike the United States since the 1918 (H1N1) Spanish Flu pandemic. The Centers for Disease Control and Prevention (CDC) is currently applying the *Pandemic Intervals Framework* for tracking the phases of an influenza pandemic to the COVID 19 crisis. The framework outlines 6 phases of a pandemic (https://www.cdc.gov/mmwr/preview/mmwrhtml/rr6306a1.htm):

- Phase 1: Investigation-a new type of virus is identified and investigated in animal or human, anywhere in the world, that is thought to have implications for human health.

- Phase 2: Recognition-increased cases or cluster of cases are identified along with increased potential for person to person transmission.
- Phase 3: Initiation-cases of the virus are confirmed with both efficient and sustained person to person transmission.
- Phase 4: Acceleration-the new virus infects susceptible people. Public health officials may take measures such as closing schools, encouraging social distancing and offering anti-viral or vaccines if available.
- Phase 5: Deceleration-there is consistently decreasing rates of infections across the United States.
- Phase 6: Preparation-after the pandemic has subsided, public health officials continue to monitor the virus and prepare for another wave of illness.

Location

Epidemics can develop with little or no warning and quickly erode the capacity of local medical care providers. A fast-developing epidemic can last several days and extend into weeks or even months in extreme cases. An epidemic has the potential to affect the entire County but is more probable to occur in densely populated areas, such as the Villages of McConnelsville and Malta, especially at facilities containing large numbers of occupants such as nursing homes and assisted living facilities that serve the elderly and individuals with underlying conditions that can worsen the effects of an illness.

Local History of Past Occurrences

There are no known documented epidemics in Morgan County. However, at the writing of this report, the Country is currently struggling with the COVID 19 pandemic. To date, Morgan County has seen 77 cases of the COVID 19 illness since March 2020 with 5 hospitalizations and no reported deaths.

Probability of Future Occurrences

The most likely epidemics that could affect Morgan County include influenza (bird flu, H1N1 virus, etc.), West Nile Virus and more recently, COVID 19. Cases of influenza are reported annually but does not reach the status of an epidemic. The probability of future outbreaks of COVID 19 are currently unknown, however, health experts speculate that the virus will continue to spread throughout the world to varying degrees until or if a vaccine is made available. The impact of such outbreaks will be dependent on a number of factors including density of populations, age and susceptibility to respiratory diseases due to the presence of underlying conditions such as heart disease and asthma.

Vulnerability Assessment and Loss Estimation

Given that there are no documented epidemics in Morgan County and the economic impacts of the current COVID 19 pandemic are not yet known, it is difficult to estimate vulnerability and potential damages. Given the low population density of Morgan County, the overall number of cases should remain low. However, the county's aging population and lack of medical facilities could contribute to a disproportionate number of serious illness and deaths.

A severe epidemic has the potential to cause serious illness or death to large numbers of people but would cause no damage to private property or structural damage to public facilities. The impact on individuals could also be economic due to the inability of an infected person to go to work and the shuttering of non-

essential businesses to help curb the spread of the disease. In a worst-case scenario, cascading effects could lead to civil unrest, food and fuel shortages or utility failure due to large numbers of people being unable to provide services.

Epidemics are mitigated through the State of Ohio and Morgan County Health Department's public education and other informational releases to stop the spread of disease.

2.3.7 Earthquakes

An earthquake is a sudden motion or trembling of the surface of the earth resulting from a sudden release of energy in the Earth's lithosphere that creates seismic waves. This typically occurs along fault lines, areas where two blocks of earth called plates, move past one another underground but also by other effects such as volcanic activity, landslides, mine blasts and nuclear tests. Recently, earthquakes have been linked to hydraulic fracturing in parts of Ohio. The severity of the effects of an earthquake is dependent on the amount of energy released from the fault or epicenter and can be felt far beyond the site of its occurrence. Earthquakes usually occur without warning and after just a few seconds can cause massive damage and extensive casualties. Common effects of earthquakes are ground motion and shaking, surface fault ruptures and ground failure. Damages related to earthquakes include rattling foundations, falling debris and can topple buildings, bridges and culverts in severe cases.

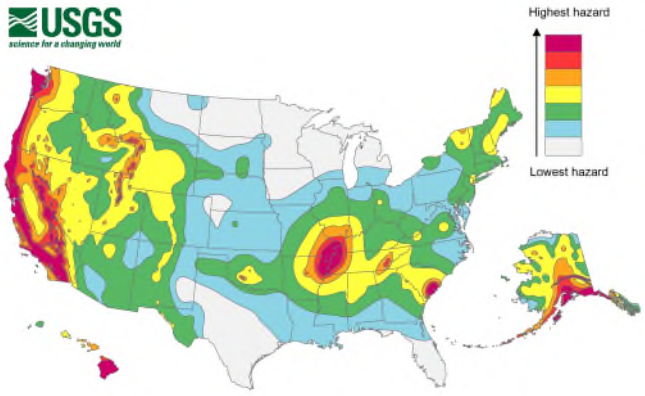


Figure 2.13: USGS National Seismic Hazard Map

Ohio is rated as a low hazard area according to the USGS (2018) Seismic Hazard Long-term Model, shown in Figure 2.13. The model shows peak ground accelerations having a 2% probability of being exceeded in 50 years for a firm rock site and are based on seismicity and fault-slip rates as well as the frequency of earthquakes of various magnitudes.

The severity of an earthquake is measured using the Modified Mercalli Scale as shown in Table 2.26 below:

Table 2.26-Modified Mercalli Scale and Description

Intensity	Shaking	Description/Damage
I	Not felt	Not felt except by very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest, especially on the upper floors of buildings.

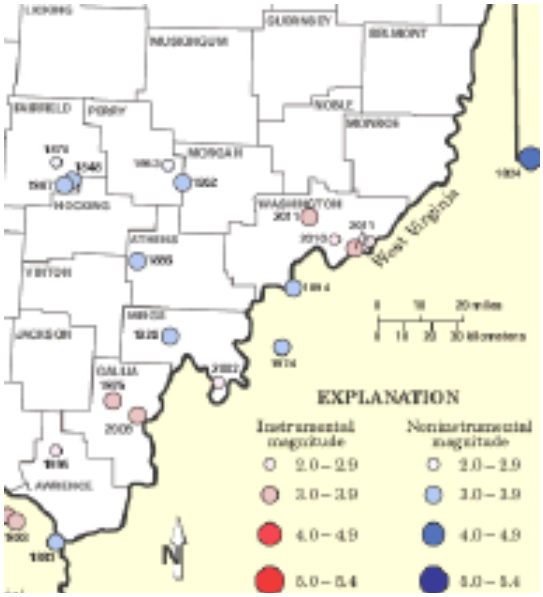
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations are similar to the passing of a truck.
IV	Light	Felt indoors by many, outdoor by few during the day. At night, some are awakened. Dishes, windows and doors are disturbed; walls make cracking sounds. Sensation like heavy truck striking building. Standing motor cars are rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened at night. Some dishes, windows are broken. Unstable objects overturned and pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage is slight.
VII	Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys are broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage is great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments and walls. Heavy furniture is overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage is great in substantial buildings with partial collapse and buildings are shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Table found at: www.dev-acquisition.cr.usgs.gov/learn/topics/mercalli.php

According to the ODNR's Division of Geologic Survey, the origin of earthquakes in Ohio is not well known and difficult to predict. Those in Ohio appear to be associated with ancient zones of weakness in the earth's crust that formed during the continental collision and mountain-building events about one billion years ago. These zones are characterized by deeply buried and poorly known faults, some of which serve as the sites for periodic release of strain that is constantly building up in the North American continental plate due to continuous movement of the tectonic plates that make up the Earth's crust (*Source: https://ohiodnr.gov/wps/wcm/connect/gov/5dc770e3-bde7-4122-9cbb-003ceaacb3db/EL+9-Earthquakes+in+Ohio_WEB_rev+2020-Final.pdf?MOD=AJPERES&CVID=n8UZuZW*)

History of Past Occurrences

Figure 2.14-ODNR Earthquake Epicenter Map



Historically, earthquake activity has been isolated and virtually non-existent in Morgan County. However, the state of Ohio is rated as MM IV on the Modified Mercalli scale of earthquake intensity, therefore, earthquake hazards must be taken into consideration.

According to the ODNR Epicenters in Ohio Map (2012), a 3.0-3.9 mbLg magnitude earthquake was reported in Morgan County in 1952 near the Perry County Line in proximity to the unincorporated community of Deavertown, as shown in Figure 2.14. No other earthquake activity has been reported.

Source: Ohio Division of Geologic Survey, 2012, Earthquake epicenters map in Ohio and adjacent areas—color version: Ohio Department of Natural Resources, Division of Geologic Survey Map EG-2, generalized page-size version, 1p., scale 1:2,000,000

Probability of Future Occurrences

The only reported earthquake in Morgan County occurred 68 years ago, therefore the probability of future occurrence is unlikely, but possible.

Vulnerability Analysis and Loss Estimation

Loss estimates were calculated by HAZUS MH based on a 5.0 magnitude earthquake at a depth of 5 kilometers, with the Village of McConnelsville as the epicenter.

Building Damage

HAZUS estimates that there are 8,272 buildings in the County which have an aggregate total replacement value of $1,459,000,000. HAZUS MH estimates that approximately 3,887 buildings will be at least moderately damaged. There are an estimated 162 buildings that will be damaged beyond repair. Tables 2.27 and 2.28 below summarize the total building exposure and the expected building damage by occupancy for the scenario.

Table 2.27-Building Exposure by Occupancy for Morgan County

Occupancy	Exposure	Percent of Total
Residential	$1,152,454,000	79.0%
Commercial	$135,637,000	9.3%
Industrial	$87,087,000	6.0%
Agricultural	$20,313,000	1.4%
Religion	$27,875,000	1.9%

Government		$11,334,000	0.8%
Education		$24,335,000	1.7%
	Total	$1,459,035,000	100%

Table 2.28-Building Exposure for the Scenario

Occupancy	None	Slight	Moderate	Extensive	Complete
Residential	3,687	1,890	1,367	543	133
Commercial	103	79	100	52	16
Industrial	34	24	32	18	5
Agricultural	29	19	26	15	4
Religion	22	12	12	7	2
Government	7	5	7	3	1
Education	6	4	6	3	1
Total:	3,887	2,033	1,550	640	162

Fire and Debris Generation

Fires can often occur after an earthquake of this magnitude. HAZUS MH estimates that there will be no ignitions for the County.

HAZUS also estimates the amount of debris that would be generated by an earthquake. The model estimates that a total of 60,000 tons of debris will be generated, requiring approximately 2,400 truckloads (at 25 tons/truck) for removal. Of the total, 53% comprises wood debris, with the remainder being comprised of reinforced concrete and steel.

Shelter Requirements and Casualties

HAZUS estimates that the number of households expected to be displaced in the event of an earthquake and the number of displaced people that will require accommodation in temporary public shelters. The model estimates a total of 92 households, of which, 62 individuals will seek temporary accommodation in public shelters.

HAZUS estimates the number of people that will be injured or killed by an earthquake. Casualties are broken down into 4 security categories, as follows:

- Security Level 1-Injuries that will require medical attention but hospitalization is not required.
- Security Level 2-Injuries will require hospitalization but are not considered life-threatening.
- Security Level 3-Injuries will require hospitalization and can become life-threatening if not treated promptly.
- Security Level 4-Victims are killed by earthquake.

Casualty estimates are given for 3 times of the day: 2 AM, 2 PM and 5 PM. These times represent periods of the day that different sectors of the community are at their peak occupancy loads. The 2 AM estimate considers the residential occupancy of the community, the 2 PM estimate considers the educational, commercial and industrial sectors and 5 PM represents the peak commute time. Table 2.29 below,

summarizes the estimated residential casualties for an earthquake event in Morgan County at 2PM, representing the worst-case scenario.

Table 2.29-Estimated Residential Casualties (2PM)

	Level 1	Level 2	Level 3	Level 4
Residential	12	3	1	1
Non-residential	54	12	1	3
Total:	66	15	2	4

Economic and Building Related Losses

HAZUS MH estimates that the total economic loss for the County due to an earthquake is $281,160,000, including building and lifetime related losses based on regional inventory.

Building losses are broken into 2 categories: direct building losses and business interruption losses. The direct building losses include estimates to repair or replace the damages caused to the building and its contents. The business interruption losses are the losses associated with the inability to operate a business because of the damage sustained by an earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of an earthquake.

The total building related losses during the 5-mag earthquake scenario are estimated at $144,818,100 and the business interruption losses are estimated at $30,786,100. These losses are summarized in Table 2.30 below:

Table 2.30-Summary of Total Estimated Losses

Category	Area	Residential	Commercial	Industrial	Others	Total
Income Losses						
	Wage	420,500	4,023,400	455,800	449,600	5,349,300
	Capital-Related	179,300	3,599,000	270,000	126,900	4,175,900
	Rental	3,292,000	1,806,900	125,700	229,500	5,454,100
	Relocation	10,395,500	2,731,900	781,300	1,898,100	15,806,800
	Subtotal	**14,286,500**	**12,161,200**	**1,633,500**	**2,704,100**	**30,786,100**
Capital Stock Losses						
	Structural	14,932,200	4,382,100	2,367,200	3,007,200	24,688,700
	Non-Structural	56,756,300	12,053,600	7,757,800	6,076,700	82,644,400
	Content	21,001,100	6,514,200	4,942,300	3,627,700	36,085,300
	Inventory	0.00	205,100	1,061,600	133,000	1,399,700
	Subtotal	**92,689,600**	**23,155,000**	**16,128,900**	**12,846,600**	**144,818,100**
ALL	**Total**	**106,970,000**	**35,320,000**	**17,760,000**	**15,550,000**	**175,600.000**

Transportation and Utility Lifeline Losses

HAZUS estimates the direct repair costs of utility and transportation networks for the scenario.

Table 2.31-Summary of Estimated Utility Losses

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
		Transportation Networks		
Highway	Segments	$307,547,100	$0.00	$0.00
	Bridges	$39,877,000	$665,500	1.67
	Tunnels	$0.00	$0.00	$0.00
	Subtotal	**$347,424,100**	**$665,500**	
Railways	Segments	$14,018,400	$0.00	0.00
	Bridges	$107,100	$200	0.19
	Tunnels	$0.00	$0.00	0.00
	Facilities	$0.00	$0.00	0.00
	Subtotal	**$14,125,500**	**$200**	
Airport	Facilities	$21,302,000	$7,445,500	34.95
	Runways	$75,928,000	$0.00	0.00
	Subtotal	**$14,125,500**	**$200**	
	Total	**$458,780,000**	$8,110,000	
		Utility Systems		
Potable Water	Pipelines	$0.00	$0.00	0.00
	Facilities	$34,965,000	$12,125,700	34.68
	Distribution Lines	**$82,292,600**	**$2,200,600**	2.67
	Subtotal	**$117,257,600**	**$14,326,300**	
Wastewater	Pipelines	$0.00	$0.00	0.00
	Facilities	$489,510,000	$71,445,400	14.60
	Distribution Lines	$49,375,600	$1,105,400	2.24
	Subtotal	**$538,885,600**	**$72,550,800**	
Natural Gas	Pipelines	$0.00	$0.00	0.00
	Facilities	$0.00	$0.00	0.00
	Distribution Lines	**$3**2,917,000	$378,700	1.15
	Subtotal	**$32,917,000**	**$378,700**	
Electrical Power	Facilities	$115,500,000	$10,158,200	8.79
	Subtotal	**$115,500,000**	**$10,158,200**	
Communication	Facilities	$105,000	$26,200	24.95
	Subtotal	**$105,000**	**$26,200**	
	Total	**$804,670,000**	**$97,440,000**	

Despite the potential for fairly significant damages due to an earthquake, given the low probability of a future occurrence and the lack of available planning and financial resources in the County, the planning committee does not consider earthquakes a significant hazard and will not consider additional mitigative strategies at this time.

2.3.8 Hazardous Materials Incident

Hazardous materials can include explosives, flammable and combustible substances, poisons and radioactive materials. Emergencies can happen during production, storage, transportation, use of, and disposal of these materials. A hazardous materials incident is a type of safety incident that involves the uncontrolled release of hazardous materials into an environment in which humans are or could be present or that otherwise has the potential to put human or environmental safety at risk.

Hazardous materials are classified in several different ways. The US Department of Transportation uses the following 9 classes:

Table 2.32-USDOT Hazardous Materials Classification

Classification	Description
Class 1	Explosives
Class 2	Gases
Class 3	Flammable Liquids (and combustible liquids)
Class 4	Flammable solids; substances liable to spontaneous combustion; substances which, on contact with water, emit flammable gases
Class 5	Oxidizing substances and organic peroxides
Class 6	Toxic (poisonous) substances
Class 7	Radioactive materials
Class 8	Corrosive substances
Class 9	Miscellaneous dangerous goods/hazardous materials and articles

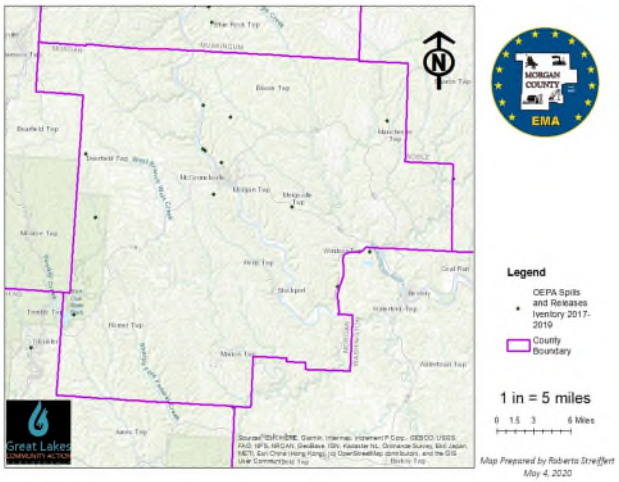
Hazardous materials vary greatly in the types of health risks they pose to humans including: thermal-risks from exposure to temperature extremes; radiological-exposure to radioactive materials; asphyxiation results from exposure to materials that reduce oxygen levels that may cause suffocation; chemical harm-exposure to chemicals, including poisons and corrosives, injuries and illnesses vary by material; biological harm-results from exposure to biological materials, including bacteria, viruses and biological toxins; and, mechanical harm-exposure or contact with fragmentation or debris scattered because of a pressure release, explosion or boiling liquid expanding vapor explosion (https://www.fema.gov/media-library-data/1566393023589-8134367aaf67f65c7a159453c0b8c27b/Hazardous_Materials_Incidents.pdf).

Hazardous materials are stored in a number of different containers including drums, cans, jars, pipes and other vessels. Some releases are incidental and does not threaten the health or safety of the general public or environment. A release that requires action by first responders or other outside agencies is considered an emergency response.

Local History of Past Occurrences

According to the Ohio EPA's Spills and Releases Inventory, 12 incidents have been reported in Morgan County since 2017 as shown in Figure 2.15. These spills have included crude oil, hydrocarbons, urea, bentonite/drilling mud, motor oil and hydrogen. None of these spills were significant and were handled locally by the Morgan County EMA.

Figure 2.15-Ohio EPA Spills and Release Inventory



Vulnerability Assessment and Loss Estimation

The county is vulnerable to hazardous materials spills due to the movement of these substances along state routes in and through the county. Hazardous materials spills can occur anywhere in the county making them difficult to predict, but are most likely to occur along state routes and in McConnelsville where the majority of manufacturing facilities operate. Past incidences have not caused significant damage to structures, people or the environment and have been easily handled through existing EMA protocols. There are no known losses associated with hazardous materials spills in the County. The Planning Committee does not consider hazardous material releases to be a significant hazard in the County as historically these events have been handled by the County EMA without incident and will not consider additional mitigative strategies at this time.

2.3.9 Wildfires

A wildfire is an uncontrolled, unplanned fire spreading through vegetative fuels, exposing and possibly consuming structures and typically occurring in rural and other natural areas. They often begin unnoticed, spread quickly and are usually signaled by dense smoke that fills the area for miles around. Vegetation, grasses, brush and trees fuel wildfires. There are 2 major causes of wildfires: natural (dry climates, lightning, volcanic eruption) and human-caused (arson, power-line arcs, discarded cigarettes and sparks from equipment or campfires).

According to the Ohio State Hazard Mitigation Plan, an average of 1,000 wildfires burn up to 6,000 acres of forest and grassland within ODNR's Division of Wildlife Protection Area. This area includes all 200,000 acres of Ohio's 21 State Forests as well as privately owned lands within the district.

Location

Figure 2.16-ODNR Wildlife Protection Areas

Morgan County is included in ODNR's Wildfire Protection Area (updated 2019) that encompasses much of eastern and central Ohio, see Figure 2.16. According to the Ohio Division of Forestry, there are several factors that can contribute to the start of wildfires in Morgan County including arson, equipment fires, campfires, and lightning. Morgan County contains a great deal of forestland, with several recreational campsites and other attractions in designated areas such as the AEP ReCreation Area, Burr Oak State Park and the Wolf Creek Wildlife Area, which is a 3,638-acre wildlife area that lies nine (9) miles southwest of McConnelsville on State Route 78. Campfires, coupled with large numbers of visitors and a large proportion of trees, make wildfires a potential hazard for Morgan County.

According to the Ohio State Hazard Mitigation Plan, Morgan County is part of Region 3, representing the highest risk of wildfires in the state, due primarily to the abundant forest areas and grasslands. Population distribution and socio-cultural aspects are also cited as reasons for increased risk of wildfires in this region.

Areas such as Burr Oak State Park and the Wolf Creek Wildlife Area are particularly susceptible to wildfires, as discussed above. However, none of the municipal areas appear to be at a significantly higher risk of wildfires than the majority of Morgan County.

Local History

According to data compiled by the State of Ohio EMA, there were 51 documented wildfires in Morgan County between 2010 and 2017. These fires burned a total of 298 acres, averaging 5.84 acres/event.

Probability of Future Occurrences

Wildfires are an annual event in Morgan County. Based on historical documentation, the county can anticipate an average of 5 fires per year.

Vulnerability and Loss Estimation

According to USDA's Wildfire Hazard Potential Map (see Figure 2.17), Morgan County is rated as having a very-low to low potential for wildfires. However, this can change quickly with climatic conditions. A prolonged period of drought and high heat may dry up many areas of the county and add them to the amount of fuel for a potentially destructive wildfire. Long-term climate change is also expected to impact these conditions that exacerbate wildfires.

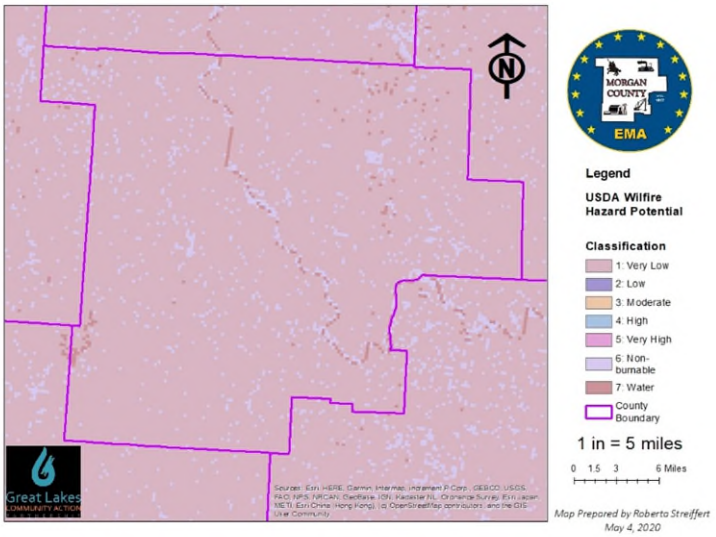


Figure 2.17-USDA Wilfire Hazard Potential Map

Morgan County falls into the classes of Ag Land and Hardwood in regard to fuel types. Both classes are considered to be low hazards in terms of wildfires.

Morgan County is susceptible to wildfires due to the abundance of agricultural, forest and open areas in the county. Wildfires are an annual occurrence in the county but have historically not consumed much land or property and there are no documented deaths or injuries. Members of the volunteer fire departments confirm that small brush fires are a common occurrence during the dry summer months, in what is typically known as the "burning season." These small brush fires are usually handled by local fire departments and often do not cause damage to structures. However, the threat is present that these brush fires could burn out of control and consume many structures, as well as a portion of the nearly 14,000 acres of forestland that exists in Morgan County.

Loss estimates are not readily available as there are no documented damages from past events as most of the wildfires in the county have occurred in open areas. Wildfires can start anywhere in the county when conditions are favorable. Due to this unpredictable nature it is hard to assess vulnerability and estimate losses. However, if a small wildfire were to burn out of control and into a populated area, there is the potential to cause significant structural damages, injury and possible death. The Planning Committee does not consider dam failure to be a significant hazard in the County as any wildfires in the county are handled by local fire departments without incidents and will not consider additional migitative measures at this time.

2.3.10 Dam Failure

A dam failure occurs when the barrier constructed across a waterway fails or otherwise does not obstruct or retain the flow of water, which can rapidly result in a large area of completely inundated land.

Dams are man-made structures designed to obstruct or restrain waters that may cause flooding downstream. These structures are generally made with concrete or earthen material. The failure of these dams often results in a flooding event. Dams are classified by 2 conditions, height and storage. Dams are classified 1 thru 4 based on the combination of height and storage as shown in Table 2.33 below. Class I

dams provide the highest potential for significant loss of life and structural damage to high value properties including residential, industrial and public utilities in the event of failure and will be the only classification that will be analyzed further. According to the Ohio Department of Natural Resources (ODNR), Class I dams are identified as *"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 and (b) Structural collapse of at least one residence or one commercial or industrial business."*

Table 2.33-Ohio and Federal Dam Classification Systems

Ohio Dam Classification	Description	Corresponding Federal Classification
Class I	Probable loss of life, serious hazard to health, structural damage to high value property (i.e. homes, industries, major public utilities)	High
Class II	Flood water damage to homes, businesses, industrial structures (no loss of life envisioned), damage to state and interstate highways, railroads, only access to residential areas.	Significant
Class III	Damage to low value, non-residential structures, local roads, agricultural crops and livestock	Significant
Class IV	Losses restricted mainly to the dam	Low

Source: http://water.ohiodnr.gov/safety/dam-safety

According to the Ohio State Hazard Mitigation Plan, there are 68 dams in Morgan county including 4-Class I dams, 10-Class II and 3-Class III dams. The remaining dams are unclassified.

Location

According the ODNR's Dam Locator Map, there are 4 Class I dams, 10 Class II dams and 3 Class III dams in Morgan County. Two of the Class I dams are located in the northwest corner of the county and are owned by the Village of Crooksville, another one in the northeast corner of the county and the last one near the Village of Stockport. Class II dams in the county are generally located in the northeast portion of county within the American Electric Power (AEP) ReCreation Land. These impoundments are a result of historical strip-mining activities and currently used for recreation and tailings. The land is managed in

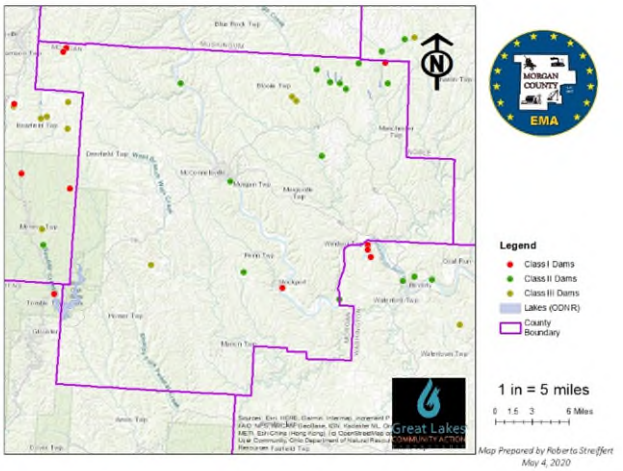


Figure 2.18-ODNR Dam Locator Map

Source: https://gis2.ohiodnr.gov/MapViewer/?config=ohiodams

conjunction with the Ohio Department of Natural resources, Division of Wildlife. There are 3 dams located in the Muskingum River that are owned by ODNR and used for recreation and hydroelectric power generation. None of these dams are actually owned by Morgan County or its jurisdictions, complicating options to effectively implement mitigation strategies. The inventory of Class I-III dams from ODNR is shown in Table 2.34 below.

Table 2.34-Inventory of Dams in Morgan County

NAME	Class	OWNER	LOCATION	AFFECTED AREA	PURPOSE
Crooksville Reservoir Dam No. 1	I	Village of Crooksville	Northwest corner of Morgan County approximately 18 miles north west of McConnelsville	Dry Run	Recreation
Crooksville Reservoir Dam No. 2	I	Village of Crooksville	Northwest corner of Morgan County approximately 18 miles north west of McConnelsville	Dry Run	Recreation
Stockport Mill Country Inn Water Power Project (Muskingum River Lock and Dam No 6)	I	ODNR	West end of Lock 6 on Muskingum River in the Village of Stockport	Muskingum River	Hydroelectric power generation
Ohio Power Company Pond MM-62	I	American Electric Power	Approximately 1 mile northeast of the Windy Hill Campground, off SR 83 and Lincoln Hwy	Northeastern Morgan County	Limited Recreation-light camping and fishing
Halley Pond Dam	II	Private	Approximately 3 miles north west of the Village of Stockport along State Route 266.	Tributary to Aldridge Run (Wolf Creek)	Physical, cultural and historic feature
Muskingum River Lock and Dam No.7	II	ODNR, Division of Parks and Recreation	Southwest side of Village of McConnelsville	Muskingum River	Recreation
Muskingum River Lock and Dam No. 8	II	ODNR, Division of Parks and Recreation	Approximately 7 mile north of McConnelsville along State Route 60	Muskingum River	Recreation

Ohio Power Company Pond MMV-11 Dam	II	American Electric Power	Approximately 15 miles south and east of McConnelsville adjacent to State Route 60	Tributary to Meigs Creek	Tailings
Horse Run No. 1 Dam MB-42	II	American Electric Power	Approximately adjacent to Sand Hollow Campgrounds on the northwest side, 0.5 miles east of SR 284 and TR 944	Northeastern Morgan County	Limited Recreation-light camping and fishing
Ohio Power Company Pond MM-52	II	American Electric Power	Approximately 2 miles southeast of Sawmill Road Campground	Northeastern Morgan County	Limited Recreation-light camping and fishing
Ohio Power Company Pond MB-46	II	American Electric Power	Approximately 1.25 miles west of Windy Hill Campground	Northeastern Morgan County	Limited Recreation-light camping and fishing
Horse Run No. 3 Dam MB-40	II	American Electric Power	Approximately 0.75 miles east of Sand Hollow Campground	Northeastern Morgan County	Limited Recreation-light camping and fishing
Ohio Power Company Pond MB 165	II	American Electric Power	Approximately 1.25 miles southeast of Sand Hollow Campground and 0.50 miles west of Hook Lake Campground	Northeastern Morgan County	Limited Recreation-light camping and fishing
Ohio Power Company Pond MB 115	II	American Electric Power	Approximately 1.25 miles northwest of Sand Hollow Campground	Northeastern Morgan County	Limited Recreation-light camping and fishing
Comstock Pond Dam	III	Private	Approximately 10 miles south west of McConnelsville	Tributary to West Branch Wolf Creek	
Ohio Power Company Pond MB-141 Dam	III	American Electric Power	Located on Weaver's Haul Road, approximately 10 miles north east of McConnelsville along State Route 78 to County Road 952	Tributary to Mans Fork	Tailings

Ohio Power Company Pond MB-144 Pond	III	American Electric Power	Located on Weaver's Hull Rd, approximately 9 miles north and east of McConnelsville off of State Route 78	Tributary to Mans Fork	Tailings

Of these dams, 2 are located adjacent to municipal areas, Muskingum Lock and Dam No. 7 outside of McConnelsville and Muskingum Lock and Dam No. 6 located at Stockport. Failure of either of these dams would not necessarily affect these villages as surface water in the County flows generally south-southeast. Therefore, areas south of each of these communities would likely be impacted which are not densely populated limiting structural damages and injuries.

Several of these dams are located within the AEP ReCreation area, which encompasses approximately 54,000 acres in northeastern Morgan County. No homes, critical facilities or other sensitive structures are located in this area. Flooding would be the likely outcome in the event of a dam failure. In terms of losses that might occur as the result of a dam failure, the percentage of parcels and associated values are negligible in comparison with the entire County.

Local History

According to the Ohio State Hazard Mitigation Plan, there is one documented dam failure in Morgan County. This incident occurred in 1950 when the Wolf Creek Dam failed due to heavy rains and flooding. Downstream damages were reported in terms of roads being washed away but it is difficult to discern if the damages were a direct result of flooding caused by the dam failure or the heavy rains. Two other incidents were reported by local officials. In 1950, the Crooksville Reservoir #1 was noted as probably overtopping with no down-stream damages reported. In 1984, a slide was noted in the downstream slope in Crooksville Reservoir #2. The slide was repaired and no damages were reported. No other incidents or damages have been reported

Probability of Future Occurrences

The likelihood of a dam failure occurring in Morgan County is unlikely, but possible.

Vulnerability Assessment and Loss Estimation

Vulnerability and losses are difficult to estimate due to the fact that there has only been 1 reported incident of a dam failure since 1950. Loss estimates from this event are not known, but there were some reported infrastructure losses due to the washing away of roads, but no loss of critical infrastructure.

The likeliest effect of a dam failure would be flooding. Class I dams, characterized as "high hazard potential" dams, would be expected to cause the most significant down-stream damages, including injuries or loss of life. Of the 4 Class I dams in the county, only the Muskingum River Lock and Dam #6 and Ohio Power Company Pond MM-62 have an approved EAP as of June 2018, however "data is subject to agreements where it cannot be published publicly". The ODNR holds the record of these EAP's.

Three of the 4 Class I dams are located in remote areas of northwestern (Ohio Power Company Pond) and northeastern (Crooksville Reservoir 1 & 2) Morgan County which is not densely populated. Significant structural damages or injuries would not be anticipated in the event of a failure. Failure of Muskingum

Lock and Dam #6 in Stockport would likely result in downstream flooding, away from the Village and other densely populated areas. Significant structural damages or injuries would not be anticipated.

The Muskingum Lock and Dam No. 8 is located along the Muskingum River north of the Villages of McConnelsville and Malta. If this dam failed, the Villages could expect some minor flooding. The Village of Stockport is located downstream of Muskingum Lock and Dam #7. If the dam were to fail, the likely impact would be river flooding in Stockport.

The remaining Class II and III dams in the County are located primarily in recreation and rural areas where only limited transient populations are located and are sufficiently isolated from municipal areas where no residential, non-residential or critical facilities are located, no structural losses are anticipated in the event of a dam failure.

2.3.11 Mine Subsidence

Underground mining of coal began in Ohio in the early 1800's and continues to this day. Most of Ohio's mines existed in the eastern and southern parts of the state, including Morgan County. Other underground mining activities that have and continue to occur in the state include limestone, salt, gypsum and more recently fracking of natural gas. Mining creates voids under the earth's surface that can lead to subsidence. Subsidence, in the context of mining, is the lowering of the Earth's surface due to collapse of bedrock and unconsolidated materials (sand, gravel, silt and clay) into underground mined areas.

Mine subsidence can cause foundation damage to buildings, disrupt underground utilities and be a potential risk to human life. The majority of underground mines in Ohio are coalmines; as a result, Ohio has a history of coalmine subsidence problems dating back to at least 1923. There are 2 types of subsidence: 1) pit, also called sinkhole (more properly refers to solution collapse features in limestone) or pothole and 2) sag or trough. Pit subsidence is characterized by an abrupt sinking of the surface, resulting in a circular steep-sided, craterlike feature that has an inward drainage pattern. It is often associated with the roof collapse in mines that have total overburden (overlying unconsolidated material and rock) of less than 165 feet, weak roof rock of shale or mudstone, and a ratio of unconsolidated-material thickness to rock thickness of less than 1.2 feet. Sag subsidence is a gentle, gradual settling of the surface. It is associated with pillar crushing or pillar punching of deeper mines (overburden of more than 75 feet). Sag-subsidence features may fill with water if the surface of the subsidence intersects the water table.

Mine subsidence can be controlled by several factors, including the height of mined-out area, the width of unsupported mine roof, the thickness of overburden, competency (strength) of bedrock, pillar dimensions, hydrology, fractures/joints, and time.

Mine subsidence, much like an earthquake, is a geologic hazard that can strike with little or no warning and can result in catastrophic and costly damages. Unlike an earthquake, mine subsidence is normally an isolated incident that only affects a few people. However, if a mine collapses under a highway, lives, infrastructure and industries are subject to potential damage.

Location

According to information published by the Ohio Department of Natural Resources, the only area of Morgan County that may see significant subdivision is the northwest portion where abandoned underground mines may be linked to mine subsidence. None of these mines are located under any of the municipal areas in the County. Therefore, no loss of life or structural damage would be expected in the event of mine subsidence.

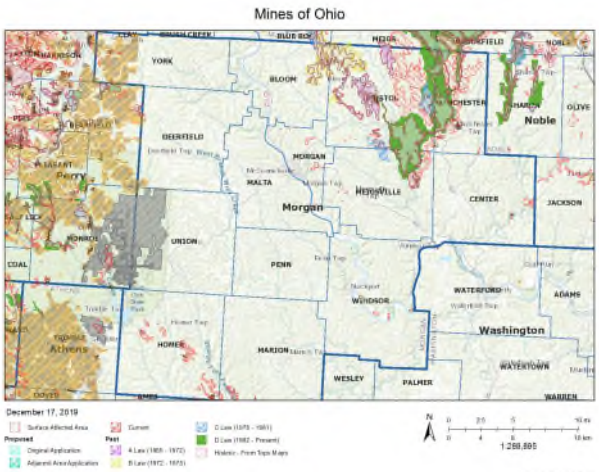


Figure 2.19-ODNR Mine Location Map

Local History

Morgan County does have a history of underground coal mining, but all of these mines have been abandoned. The majority of mining activities that have occurred in the County are surface mining. Underground mining activities that can contribute to mine subsidence have occurred in the northwestern portion of the county in York and Deerfield Townships; however, there are no known occurrences of failure in Morgan County.

Probability of Future Occurrence

Given the type of mines in Morgan County and the fact that there is no history of failure, potential future events are essentially non-existent.

Vulnerability Assessment and Loss Estimation

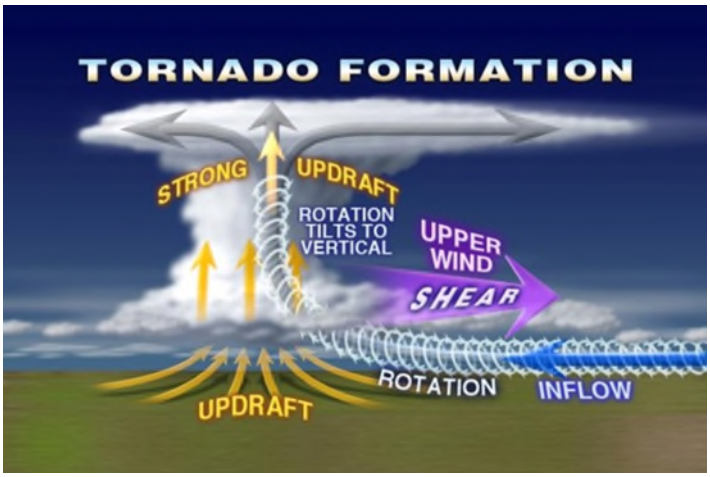
Due to the fact that the areas of the county vulnerable to mine subsidence are located in areas of limited population and are sufficiently isolated from municipal areas where no residential, non-residential or critical facilities are located, no structural losses or injuries would be anticipated in the event of a mine failure. In addition, there are no reports of mine subsidence in the County, therefore the Planning Committee does not consider mine subsidence to be a significant hazard and will not consider potential mitigative measures to reduce its impacts at this time.

2.3.12 Tornado

The National Weather Service defines a tornado as a violently rotating column of air touching the ground attached to the base of a thunderstorm. A tornado is not necessarily visible; however, low pressure caused by high wind speeds and rapid rotation usually cause water vapor in the air to condense into cloud droplets, resulting in the formation of a visible funnel clouds. If these funnel clouds reach the ground, tornados will form, but not all funnel clouds evolve into tornados, sometimes making it difficult to tell the difference.

Tornados generally come from a class of thunderstorms known as supercells containing mesocyclones-an area of organized wind rotation a few miles up in the atmosphere. These storms can also include very heavy rain, frequent lightning, strong wind gusts and hail. These tornados generally follow a recognizable life cycle that begins when increasing rainfall drags an area of quickly descending air that accelerates as it approaches the ground and drags the supercell's mesocyclone towards the ground with it. The next phase is the formation phase where the rotating cloud base lowers, becoming a funnel, that kicks up dust and debris as it reaches the ground. As the warm air feeding the tornado grows, it reaches the mature stage, lasting a few minutes to more than an hour and causes the most damage. Finally, the tornado enters the dissipation stage where the downdraft feeding the storm wraps around, choking off the air supply, weakening and ending the tornado. The dissipation phase generally only lasts a few minutes.

Figure 2.20: Formation of a Tornado



Source: www.mfhstornadoinfo.weebly.com/life-cycle.html

Tornado magnitude is measured using the Enhanced Fujita (EF) scale. The scale rates the intensity of tornados based on the damage they cause on a level of EF 0 to EF 5. The Enhanced Fujita scale replaces the Fujita scale that was developed by Theodore Fujita in 1971, being revised to better align wind speeds more closely with associated storm damages as shown in Table 2.35.

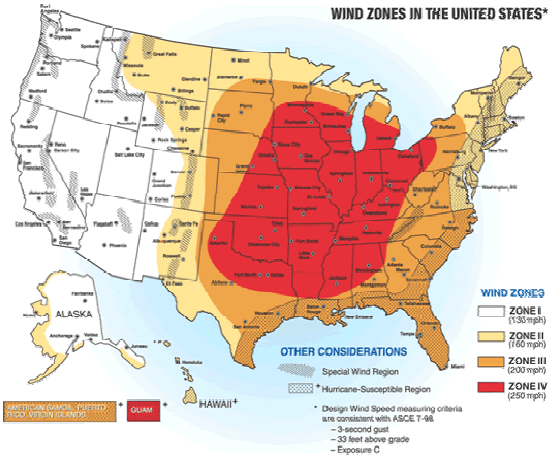
Table 2.35-Enhanced Fujita Scale

EF Scale	Wind Speed	Typical Damage
0	65-85 mph	Minor damage. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow rooted trees pushed over.
1	86-100 mph	Moderate damage. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
2	111-135 mph	Considerable damage. Roofs torn off from well-constructed houses; foundations of frame houses shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
3	136-165 mph	Severe damage. Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; tree debarked; heavy cars lifted off the ground and thrown; structures with weak foundations are badly damaged.

4	166-200 mph	Devastating damage. Well-constructed and whole frame houses completely leveled; some frame houses may be swept away; cars and other large objects thrown and small missiles generated.
5	>200 mph	Incredible damage. Well-built frame houses with foundations swept clean of debris; steel-reinforced concrete structures are critically damaged; tall buildings collapse or have severe structural deformations; cars, trucks and trains can be thrown up to 1 mile.

Tornados are the most violent and unpredictable of atmospheric storms, capable of tremendous destruction with wind speeds of 250 mph or more. They are most hazardous in populated areas and can occur at any time of the day and during any season. Damage paths can be in excess of 1 mile wide and 50 miles long.

Figure 2.21: FEMA Wind Zones in the U.S.



Local History

Ohio is located on the eastern edge of what is commonly known as "tornado alley". According to the FEMA Wind Zones Map of the United States (see Figure 2.21), Ohio is located in the Zone IV wind zone and as such, tornados have been identified as a hazard in Morgan County. According to the Ohio State Hazard Mitigation Plan, the frequency of tornado activity varies greatly depending on which county you are in. The counties of Wood, Van Wert, Lorain, Richland and Franklin see the most frequent tornados.

Tornados in Morgan County are virtually non-existent having only 3 recorded incidents since 1928; however, this wind zone places Morgan County in a category that could experience devastating tornados with wind speeds up to 250 mph, which indicates that significant damage will be sustained to structures with solid foundations. While limited mountainous terrain in Morgan County often serves to break up tornados that actually form and touch down, tornados could occur in the flat open areas of the County.

According to the *National Climate Data Center's (NCDC) Storm Events Database*, 1 tornado event was reported for Morgan County between October 1, 2007 and December 3, 2019.

The first confirmed tornado in Morgan County since 1950 occurred on 9/16/2010 in Rose Farm on the western edge of the County. A tornado that touched down in eastern Perry County continued into western Morgan County, where it dissipated. Several downed trees and large branches were found on McKinley Street, 3 houses suffered minor damage and 1 vehicle was destroyed. Electricity was out for over 24 hours in the area. This tornado was categorized as an EF 0 and caused approximately $60,000 in damages. Prior to 1950, only one other tornado was reported in Morgan County in June of 1928. Details and loss estimated from that event are not known.

Probability of Future Occurrences

Tornados are non-spatial hazards and can occur whenever and wherever conditions are favorable and can affect all areas and jurisdictions of the County. They tend to occur primarily during the spring and summer but can develop at any time of the year. Because of these characteristics, it is difficult to predict the exact risk to Morgan County and its jurisdictions. Based on historical data, tornados are not a significant hazard in the County and extensive damages and/or injuries would not be anticipated.

Vulnerability Assessment and Loss Estimation

While tornados can cause significant damage to structural assets, it is almost impossible to predict vulnerability and damages due to the inherent characteristics of how and when tornados develop. Based on past events, tornados in Morgan County tend to strike in flatter, rural areas of the County limiting exposure to structural damages and injuries or fatalities. Based on historical data, future tornado events are unlikely, but possible.

2.3.13 Sink Holes

According to the USGS, a sinkhole is a depression in the ground that has no natural external surface drainage. During rain events, water stays inside the sinkhole and typically drains into the subsurface. They are common where rock below the surface is limestone, carbonate rock, salt beds or rocks that can naturally be dissolved by groundwater circulating through them. Sinkholes can vary from a few feet to hundreds of acres and from less than 1 to more than 100 feet deep. Typically sinkholes form so slowly that little change is noticeable, but feel sudden when a collapse does occur.

There are generally 3 types of sinkholes. Dissolution sinkholes form in areas where water dissolves limestone or dolomite under a soil covering by enlarging natural openings in the rock joints, fractures and bedding planes. Cover-subsidence sinkholes form where voids in the underlying limestone allows more settling of the soil to create larger surface depressions. Cover-collapse sinkholes form where so much soil settles down into voids in the limestone that the ground collapses. These collapses can occur abruptly causing catastrophic damages.

Human-induced land use activities related to development and construction such as groundwater pumping, changing land surface and shifting natural drainage patterns can also cause sinkholes in susceptible areas due to the substantial weight of new structures and the imbalance of ground water pressure that helps to keep surface soils in place.

Location and Past Occurrences

Morgan County does not have a long history of sinkholes; however, recent small sinkholes have been reported in a few locations in rural areas of the county.

Probability of Future Events

The probability of future occurrences is difficult to predict given that this is not a wide-spread event and the cause of these sinkholes is not yet fully understood in the county.

Vulnerability and Loss Estimation

Due to the unpredictable nature of sinkholes in general, it is difficult to assess vulnerability and losses. If sinkholes continue to form in the rural areas of the county, then losses would be minimal. Neither the County nor its jurisdictions have the resources to commit to mitigation strategies around this hazard at this time.

2.3.14 Invasive Species

The National Wildlife Federation defines an invasive species to be any kind of living organism, an amphibian, plant, insect, fish, fungus, bacteria or even an organism's seeds or eggs, that is not native to an ecosystem and that can harm the environment, economy or human health. Invasive species are primarily spread by human activities such as ballast water or propellers of ships; in wood through shipping pallets and crates; as exotic pets, while some ornamental plants can spread into natural areas and become invasive.

As reported in the Ohio State Mitigation Plan, according to ODNR's Division of Natural Areas and Preserves, of the approximately 2,300 species of plants in Ohio, approximately 78% are native or have occurred in Ohio before the time of substantial European settlement (1750). The remaining 506 species are considered non-native, having been introduced for erosion control, horticulture, forage crops, medicinal use, wildlife foods or by accident. Without natural predators or other controls, non-native plants are able to spread quickly and force out native plants. As reported in the SHMP, the top 10 invasive plant species in Ohio are:

Bush Honeysuckles	Japanese Honeysuckle
Autumn-Olive	Japanese Knotweed
Buckthorns	Multi-flora Rose
Common Reed Grass	Purple Loosestrife
Garlic Mustard	Reed Canary Grass

Aquatic invasive species include both plants and animals that have been introduced into local waterways and have become harmful to native species and their habitats. These species may live entirely within or partially within an aquatic habitat. Below is a list of the top aquatic invasive species in Ohio:

Asian carp (Bighead carp, Silver carp, Black carp, Diploid Grass carp)	Ruffe
Curlyleaf Pondweed	Red Swamp Crayfish
Hydrilla	Sea Lamprey
Round Goby	White perch
	Zebra Mussel

As reported in the SHMP, the ODNR, Division of Forestry cites that one of the most invasive species in Ohio is the Emerald Ash Borer, an Asian beetle part of a group of metallic wood-boring beetles. This beetle affects all species of native ash tree found in Ohio, which have little to no resistance to this pest that was unintentionally introduced into southeastern Michigan many years ago. The larvae feed on the living portion of the tree, restricting the tree's ability to move essential water and nutrients throughout the tree, killing it within 3-5 years.

Local History

Invasive species are found in all counties of Ohio, particularly the Emerald Ash Borer beetle. According to the EDDMapS from the University of Georgia (www.eddmaps.org), there has been 871 records of invasive species in Morgan County including 3 records of the Ash Borer beetle, since 2003. Most of these accounts are found in the south-western portion of the County in and adjacent to the Wayne National Forest.

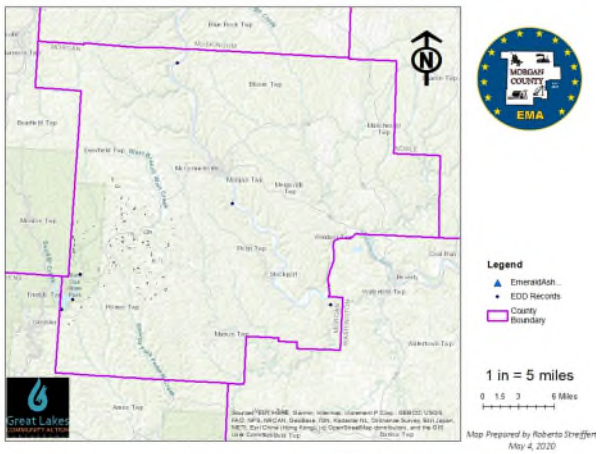


Figure 2.22-Invasive Species Map

Vulnerability and Loss Estimation

There are 14,000 acres of Wayne National Forest located in Morgan County. In addition, of the 270,000 total acres of land in the county, 254,000 of those are agricultural, recreational or include other natural areas that are most susceptible to the impacts of invasive species.

Infestations of invasive species are not likely to cause structural damages; however, economic losses associated with agricultural production is possible. Ecological damages are likely in the forested areas of the county. Given the limited potential for significant structural damages and the lack of available planning and financial resources in the County, the Planning Committee does not consider invasive species to be a significant hazard due to its sporadic nature and lack of historical events. Mitigative measures to reduce their impacts will not be considered at this time.

3.1 Overview

According to FEMA's Local Hazard Mitigation Planning Handbook all communities must develop a mitigation strategy that outlines how the community will accomplish the goals of the plan and reduce losses identified in the risk assessment. FEMA identifies 4 types of mitigation actions as follows: local plans and regulations, structure and infrastructure projects, natural systems management, and education and awareness programs. During the development of the mitigation strategy the Planning Committee considered the following:

- Identified applicable mitigation goals and strategies based on stakeholder participation including the public interest surveys.
- Mitigation strategies focused on those actions that addressed specific risks and vulnerabilities in each jurisdiction, keeping in mind the inherent limitations for planning and financing mitigation activities county-wide.
- Reviewed the progress of the previously adopted mitigation goals and action plans and re-evaluated those strategies based upon the updated information from the risk assessment and vulnerability assessment for each hazard.
- The committee members were reminded to view their strategies in light of the likelihood of a hazard occurrence in their jurisdictions, the extent of the occurrence and the impact of those hazards on their jurisdictions.
- Members were asked to provide feedback regarding completion, addition and deletion of action items and other hazard mitigation projects.
- Strategies were prioritized based on an assessment of the social, technical, administrative, political, legal, economic and environmental feasibility of each individual jurisdiction.

The mitigation strategy is comprised of 3 main components as outlined in the *FEMA Local Mitigation Planning Handbook:*

- Goals: general guidelines that describe what the community wants to achieve, generally these are broad policy statements that represent the vision for reducing or avoiding losses from hazard impacts
- Objectives: identifies the specific strategy to achieve stated goals. Unlike goals, objectives are specific and measurable.
- Actions: the specific actions to achieve stated goals and objectives. Actions are prioritized in an action plan that prioritizes action steps, identifies responsible parties as well necessary resources to implement a specific action item.

3.2 Status of Past Mitigation Efforts

Mitigation activities were developed during the 2012 Plan Update. Goals and actions were developed on the 3 primary hazards that impact the county: flooding, severe winter storms and severe thunderstorms as well as multi-hazards.

Multi-Hazards

There are a number of activities that the County undertakes that addresses multiple hazards. Items such as public education programs, collaboration with other entities on disaster awareness and response, integration of mitigation with existing plans, pursue opportunities for funding of migration activities and the protection of critical facilities are all key components of a successful mitigation program.

Flood

All applicable incorporated areas within the County also have established floodplain management programs as a part of the National Flood Insurance Program (see Table 3.1, below). Most generally, jurisdictional requirements for construction and other development within identified floodplain areas mimic the Flood Damage Prevention Regulations adopted by the Board of County Commissioners.

Table 3.1-NFIP Participating Communities

CID	Community Name	Current Effective Map Date	Date Community moved from Emergency to Regular Phase
39115 C0161-164	Village of McConnelsville	9/19/2012	7/1/1987
39115 C 0161D/ 0163D	Village of Malta	9/19/2012	9/1/1987
39115 C 0425 D	Village of Chesterville	9/19/2012	n/a
39115 C 0291D	Village of Stockport	9/19/2012	8/1/1987

Morgan County has completed its map modernization program as required by NFIP Compliance. Development of floodplain areas in the County are regulated by Resolution # 2012-266 and are based on the state minimum requirements for development. This Resolution regulates any and all new construction within a floodplain in the County. All other jurisdictions within Morgan County have adopted similar regulations. These rules were adopted and are enforced as part of the county's continuing participation in the National Flood Insurance Program. Flood hazard areas within the County (both incorporated and unincorporated) are identified by the Federal Emergency Management Agency (FEMA) from Flood Insurance Studies conducted by the Ohio Department of Natural Resources. Flood Insurance Rate Maps (FIRM) and other flood data form the foundation of these reports.

Educational information for citizens on post-flood disaster activities (cleanup procedures, managing water/food supplies contaminated by flood waters, etc.) are also available from public entities such as the Morgan County Health Department and the Morgan County Emergency Management Agency.

The Morgan County Emergency Management Agency's *Emergency Operations Plan* addresses mitigation activities for flooding from both preventative and response perspectives. Information from the National Weather Service to County citizens is provided through the Morgan County Emergency Management Agency's Emergency and Mass Notification System, local news media, and the National Oceanic and Atmospheric Administration (NOAA) weather radio system.

Additionally, Manufactured Home Park Rules (Chapter 3701-27 of the Ohio Administrative Code) require that all manufactured homes placed within a manufactured home park in a 100-year floodplain after November of 1992 must comply with stipulated blocking requirements. The rules also require that all manufactured homes placed in a manufactured home park after June 1, 1979, must secure the home with tie-downs in accordance with manufacturer's specifications.

Severe Winter Storm

Existing mitigation activities relating to severe winter storms come in the form of preliminary notification and post-disaster response. Public information of an impending severe winter storm is provided by the Morgan EMA Emergency and Mass Notification System, area news media affiliates and the National Oceanic and Atmospheric Administration (NOAA) weather radio system based on predictions from the National Weather Service.

Severe Thunderstorms

Existing mitigation activities relating to severe thunderstorms come in the form of preliminary notification and post-disaster response. Public information of an impending severe winter storm is provided by the Morgan EMA Emergency and Mass Notification System, area news media affiliates and the National Oceanic and Atmospheric Administration (NOAA) weather radio system based on predictions from the National Weather Service.

Table 3.2 summarizes the 2012 Mitigation Actions and their current status, as evaluated by the Planning Committee. These actions are classified by:

- Completed-strategy was completed as written and will not be included in new plan.
- Revised-strategy has been modified, re-written or combined with another strategy, separated into multiple strategies or otherwise modified and included in new plan.
- Ongoing-strategy has not been achieved in its entirety and is included in the new plan.
- Deleted-strategy was determined not feasible or necessary and has been removed from consideration in this plan update.

Table 3.2-Status of 2012 Mitigation Actions

Strategy	Status
Hazard Type: All Goal: Reduce impacts of all hazards in Morgan County	
Objective: Enhance public informational and educational programs for both pre and post-disaster situations	
Actions:	
Identify existing types and methods of distribution of natural disaster information	Revised-public information releases and methods of distribution will be assessed and revised as appropriate for all hazards identified.
Assess completeness of public information and update as necessary	
Assess strategies for dissemination of public information and modify as necessary	
Identify any necessary sources of funding	
Implement enhanced public education information	On-going
Objective: Strengthen existing partnerships among all public and private entities in Morgan County	
Actions:	
Identify all existing and potential partnerships with state and local agencies, organizations and subdivisions that have some involvement in disaster mitigation	Completed
Develop strategies to expand partnerships	Completed
Initiate and maintain formed partnerships	On-going-locally the EMA has strong relationships, including mutual aid agreements with its jurisdictions and emergency service organizations. These relationships are expected to continue.
Objective: Modify existing Morgan County Plans that are influenced by natural disasters with any necessary mitigation considerations	
Actions:	
Identify all pertinent plans for Morgan County where mitigation could potentially be a component	Completed
Identify and contact primary planning constituents of selected planning effort	Completed

Cooperatively develop constructive mitigation language for proposed inclusion within applicable laws	Deleted-neither Morgan County nor its jurisdictions undertake planning activities, therefore this activity is not needed.
Submit formal proposals for additions of mitigation language within appropriate laws	
Establish and maintain cooperative relationships with relevant planning constituents	On-going-Morgan County EMA coordinates its planning efforts with local jurisdictions and agencies. EMA participates with local emergency services providers to include mitigation activities into their SOP's when being reviewed and updated
Objective: Improve natural disaster mitigation impacting critical facilities	
Actions:	
Identify all critical facilities in the County	Completed
Determine existing mitigation initiatives within these facilities	Completed
Identify potential mitigation initiatives within these facilities	Completed
Initiate cooperative assessments of potential initiatives with applicable relevant critical facilities	Deleted-neither the county nor its jurisdiction have the necessary resources to complete this task.
Assist pertinent critical facilities in the development and submission of formal mitigation projects	On-going-the county will assist its jurisdictions with identifying funding mechanisms and applications as appropriate
Objective: Ensure adequate power is available to operate critical facilities and communications systems during response to a natural disaster	
Actions:	
Identify facilities that require fuel powered generators	Completed
Assess potential funding sources and assist pertinent facilities with accessing resources to install fuel powered generators in strategic locations in the county	Continued
Hazard Type: Flooding Goal: Reduce impacts of flooding on Morgan County	
Objective: Reduce impacts of flooding on Muskingum Watershed	
Actions:	

Conduct mitigation activities for repetitive loss structures	On-going
Develop stricter floodplain regulations	Deleted-neither the county nor its jurisdictions intend to develop stricter regulations at this time
Complete NFIP Map Modernization	Completed
Create county program (continuous) for stream maintenance	Deleted-current maintenance activities are appropriate to reduce the impacts of flooding in the county.
Educate land owners as to their responsibility for stream maintenance	
Increase public awareness of hazards of flash flooding	Revised-combined with multi-hazard goals for public education and awareness activities
NFIP Compliance Activities: update and revise floodplain regulations and Flood Insurance Rate Maps	On-going-new maps were recently released and are being reviewed for changes.
NFIP Compliance Activities: assist local jurisdictions with adoption of new regulations and FIRM's	
Hazard Type: Severe Thunderstorms Goal: reduce the impacts of severe thunderstorms and high winds on Morgan County and its residents	
Objective: provide public outreach and awareness of storm dangers	
Actions:	
Continue public awareness campaigns of thunderstorms and windstorms in Morgan County	Revised-combined with multi-hazard goals for public education and awareness activities
Clarify what severe weather means	
Increase public awareness of the different storm levels and what they mean	
Hazard Type: Severe Winter Storms Goal: reduce the impacts of severe winter weather on Morgan County and its residents	
Objective: provide public outreach and awareness of storm dangers	
Actions:	
Continue public awareness campaigns regarding what the different storm levels mean	Revised-combined with multi-hazard goals for public education and awareness activities

3.3 Risk Priorities

Risk Priorities

The Hazard Identification and Risk Assessment identified 17 hazards that could impact Morgan County. The assessment considered the cause and effects of the identified hazards including the frequency and severity of past events and the damages that could occur should an event impact the county or its jurisdictions. As a result, the planning committee determined that the primary hazards affecting the county include landslides and erosion, drought and extreme heat, flooding and severe weather events.

Given the limited planning, financial and technical resources to conduct mitigation activities, the Planning Committee will focus its mitigation efforts on those hazards that strike most frequently, cause the most damage and can be prevented or lessened through feasible mitigation activities. The planning team focused on prioritizing those activities that could realistically be accomplished and would result in actual reduction in potential and real losses. The remaining hazards will not be considered until such time as additional studies are developed and resources can be made available for mitigative action other than the implementation of enhanced public education and awareness programs that cover "multiple hazards".

Since the primary hazards affect the County in its entirety, and none of the local jurisdictions administer zoning or building codes and do not have planning commissions or the financial resources to devote to mitigation activities, mitigation actions will be undertaken primarily as a County-wide effort. Local jurisdictions will coordinate mitigation efforts with county agencies and provide support and resources as appropriate.

3.4 Mitigation Goals and Strategies

This section identifies the prioritized mitigation goals and strategies for each jurisdiction and includes action type, lead agency, timelines and potential funding for each action. The mitigation actions were developed in accordance with the following types of mitigation strategies (in no particular order): 1) regulatory and planning; 2) property protection; 3) natural resource protection; 4) structure and infrastructure projects; and 5) public education and awareness as described in FEMA's Hazard Mitigation Ideas resource guide. The lead agency is the entity tasked with ensuring that local officials look for opportunities to implement strategies over the 5-year planning period. The timeline is the timeframe in which individual strategies should be implemented, however based on the availability of funding or changes in priorities as other critical projects emerge may impact the proposed timelines. Several funding sources may be used to undertake hazard mitigation activities depending on the type of project. Some of those sources include: Community Development Block Grant (CDBG), Flood Mitigation Assistance Grant (FMA), Pre-disaster Mitigation Grant (PDM), Severe Repetitive Loss Grant (SRL), Hazard Mitigation Grant Program (HMGP), Repetitive Flood Claims Program (RFC), Homeland Security Grant Program (HSGP), Clean Ohio Grant (COG) as well as local and state funds. Individual jurisdictions in Morgan County will need to coordinate with the Morgan County EMA and/or Development Office to assess eligibility for funding.

Planning team members and representatives from local jurisdictions worked collaboratively to develop the goals and strategies. GLCAP drafted a list of strategies based on stakeholder input and presented them to the planning committee and other interested parties. Mitigation actions were developed based on projects

thought to be the most feasible and the most beneficial to hazard reduction. Due to the impacts of the COVID-19 epidemic this activity was conducted via Google survey. Respondents were asked to rank strategies on a scale from lowest priority to highest priority and were also given a "no priority option". The priority strategies were tabulated and presented to the stakeholders for final review and approval. Appendix B provides general information gathered from the public related to hazard effects and general ideas on strategy implementation. These were used to help guide the committee's decision but are not meant to reveal a set of actions that would be implemented. Tables 3.3-3.7 identify the goals and strategies of each jurisdiction in Morgan County. Strategy priorities are defined by their task number. Many are similar, but not identical across the County. Based on individual community characteristics and disaster history, the prioritization of hazards and priority mitigation strategies varied.

Priority mitigation projects will only be implemented if the maximum benefits outweigh the associated costs of the proposed projects. The Planning Committee performed a general assessment of each mitigation measure that might require FEMA funding. Detailed cost-benefit analysis of each mitigation activity will be required during the project planning phase in order to determine economic feasibility. Projects will also be evaluated for eligibility and feasibility based on social and environmental impact, technical feasibility and any other criteria that measure project effectiveness. This detailed evaluation of projects will be performed during the pre-application phase of any grant request. Further, project implementation will be subject to the availability of FEMA grants and other sources of funds as well as local resources. Projects that are determined to be infeasible during this detailed review will be re-evaluated by the Planning Committee for re-scheduling or deletion.

3.4.1 Morgan County

Morgan County is located in the Appalachian Region of southeast Ohio which is part of the western foothills of the Appalachian Mountains. The area is characterized by steep hills and valleys, rugged terrain, and deep river gorges. Soils in the area tend to be thin and not very fertile. These geographic conditions contribute to the primary hazards impacting Morgan County such as landslides, erosion and flooding. Weather related events tend to exacerbate impacts to the county and its jurisdictions due to these conditions.

Riverine and flash flooding due to heavy rains, ice jams and snow melts is a primary concern for the county and generally occurs along the Muskingum River impacting the Villages of McConnelsville, Malta and Stockport and other rural areas. These events scour the riverbank leading to erosion and contribute to landslides that wash out local roads.

All of Morgan County is susceptible to severe storms and other natural occurrences that can lead to power outages, property damages, endanger lives and interrupt the well-being of residents and workers.

There are several two lane state highways that are heavily traveled by trucks, trailers and local traffic. The main route through Morgan County is State Route 60 that runs adjacent to the Muskingum River. Freight-related traffic may be carrying hazardous materials and/or volatile compounds as well as retail goods. Due to the topography of the county, many roads, both state and local have limited visibility due to hills and curves making it difficult to see oncoming traffic and increasing the possibility for accidents. Severe weather events and road slips can increase this risk and can lead to devastating accidents.

Table 3.3-County Mitigation Goals and Strategies

Priority	Action Type	Lead Agency	Start Date	End Date	Funding
Goal 1. Morgan County will reduce the negative effects of erosion along the Muskingum River					
Task 1.1-The county will identify and map areas of unstable soils along the Muskingum River					
	Planning and Regulatory	County Engineer	1/1/21	1/1/26	Local
Task 1.2-The county will prioritize areas for mitigation and identify and assess potential bank stabilization techniques for financial and technical feasibility					
	Planning and Regulatory	County Engineer	1/1/21	1/1/26	Local, CDBG, FMA, PDA, HMGP, Others
Goal 2. Morgan County will reduce the negative effects of severe storms on critical facilities					
Task 2.1-The County will assess the feasibility of installing lightning protection devices and other methods such as lightning rods and grounding on communications and other critical infrastructure					
	Structure and Infrastructure	County Engineer	1/1/21	1/1/26	Local, PDM, CDBG
Task 2.2-The County will install and maintain surge protection on critical electronic equipment					
	Structure and Infrastructure	County Engineer	1/1/21	1/1/26	Local, HMGP
Goal 3. Morgan County will reduce the negative effects of winter weather events on residents and county facilities					
Task 3.1-Plan for and maintain adequate road clearing equipment in order to clear roads of snow, ice and debris in an efficient manner after a severe weather event					
	Structure and Infrastructure	County Engineer	1/1/21	1/1/26	Local
Task 3.2-Work with partners to identify and plan for the specific needs of at-risk populations that may be exceptionally vulnerable in the event of long-term power outages					
	Planning and Regulatory	County EMA	1/1/21	1/1/26	Local
Task 3.3-Assess need and feasibility of adding insulation to walls and attics in critical facilities and other government buildings					
	Structure and Infrastructure	County Engineer	1/1/21	1/1/26	Local, HMGP, CDBG
Task 3.4-Assess need and feasibility of retrofitting public buildings to withstand snow loads and prevent roof collapse					
	Structure and Infrastructure	County Engineer	1/1/21	1/1/26	Local, HMGP, CDBG
Task 3.5-Continue to provide regular and updated information for the public about the dangers of severe winter weather impacts including safety issues associated with alternative heating sources.					
	Public Education and Awareness	County EMA	1/1/21	1/1/26	Local
Goal 4. Morgan County will reduce the negative effects of drought and extreme heat					
Task 4.1-The county will work with partners to develop and implement regulations and/or public education programs related to drought for residents and agriculture					
	Regulation and Public Awareness	County EMA	1/1/21	1/1/26	Local, Other TBD

Task 4.2-The county will work with partners and local jurisdictions to provide public information on water saving techniques such as low flow toilets and showerheads, fixing leaks in plumbing and other water saving conservation measures				
Public Education and Awareness	County EMA	1/1/21	1/1/26	Local
Task 4.3-Work with partners to educate farmers on soil and water conservation practices				
Public Education and Awareness	County EMA	1/1/21	1/1/26	Local
Task 4.4-Work with partners to identify drought conditions to monitor such as precipitation, temperature, water levels, soil moisture, etc.				
Planning and Regulatory	County EMA	1/1/21	1/1/26	Local
Goal 5. Morgan County will reduce the negative effects of flooding on the county and its jurisdictions				
Task 5.1-The county will protect and improve natural areas that serve as mitigation features such as wetlands and floodplains through the use of regulation, land acquisition, conservation easements and/or public education				
Natural Systems Protection	County Floodplain Manager	1/1/21	1/1/26	Local, FMA
Task 5.2-The county will reduce the impacts of flooding by assessing storm water conveyance capacity and identify potential for repairs and improvement				
Structure and infrastructure	County Engineer	1/1/21	1/1/26	Local, Others TBD
Task 5.3-Designate a floodplain manager and/or CRS coordinator for the county who achieves certified flood manager certification to improve floodplain management				
Planning and Regulatory	County Engineer	1/1/21	1/1/26	Local
Task 5.4-The county will provide enhanced public education and information by conducting outreach to owners of repetitive loss properties on incentives to acquire flood insurance and mitigation techniques to protect vulnerable properties.				
Public Education and Awareness	County Floodplain Manager	1/1/21	1/1/26	Local
Task 5.5-Protect water and wastewater facilities by identifying facilities located in flood prone areas and assessing the need and feasibility for flood proofing				
Property Protection	County Floodplain Manager	1/1/21	1/1/26	Local
Task 5.6-Conduct mitigation activities for repetitive loss structures by assessing the potential for acquisition/demolition/retrofitting flood prone properties				
Property Protection	County Floodplain Manager	1/1/21	1/1/26	CDBG, FEMA, Others
Goal 6. Morgan County will reduce the impacts of all hazards on the County and its jurisdictions				
Task 6.1-Reduce response times for safety services during and after a hazard event				
Planning and Regulatory	County EMA	1/1/21	1/1/26	Local
Task 6.2-Continue enhanced public education and outreach to inform the public of the dangers associated with natural hazards and how to implement private mitigation and safety strategies				
Public Education and Awareness	County EMA	1/1/21	1/1/26	Local

Task 6.3-The county will advocate for the use of the county-wide "Code Red" system for public notification of weather-related events and other emergencies				
Public Education and Awareness	County EMA	1/1/21	1/1/26	Local
Task 6.4-Identify most at-risk critical facilities and evaluate potential for mitigation techniques				
Planning and Regulatory	County Engineer	1/1/21	1/1/26	Local, PDA, HMGP
Task 6.5-Assess feasibility to relocate or retrofit public buildings in hazard-prone areas				
Property Protection	County Engineer	1/1/21	1/1/26	Local, HMGP
Task 6.6-Asses the use of special tax assessments to discourage builders from constructing in hazard areas				
Planning and Regulatory	County Commissioners	1/1/21	1/1/26	Local
Task 6.6 -Develop GIS system to identify and map hazard areas and events to further assess community vulnerability				
Planning and Regulatory	County GIS	1/1/21	1/1/26	Local
Goal 7. Morgan County will reduce the impacts of dam failure on the County and its jurisdictions				
Task 7.1-Coordinate with dam owners to ensure that regular maintenance and/or rehabilitation of dams is being conducted. Assist with funding applications as needed.				
Structure and Infrastructure	County Engineer	1/1/21	1/1/26	Local, OWDA, HHPD
Task 7.2-Obtain inundation mapping for high hazard potential dams in the county and all jurisdictions with Class I dams (https://www.fema.gov/sites/default/files/2020-08/fema_dam-safety_inundation-mapping-flood-risks.pdf)				
Planning and Regulatory	County Engineer/GIS	1/1/21	1/1/26	Local
Task 7.3-Coordinate with Class I dam owners to develop EAP's as appropriate and provide funding assistance as needed.				
Planning and Regulatory	County EMA	1/1/21	1/1/26	Local, OWDA, HHPD
Goal 8. Morgan County will reduce the impacts of tornados on the County and its jurisdictions				
Task 8.1-Assess feasibility to install residential and community safe rooms				
Structure and Infrastructure	County Engineer/EMA	1/1/21	1/1/26	Local, Others TBD

3.4.2 Village of McConnelsville

The Village of McConnelsville is the County seat for Morgan County where most government and safety services are located. It is also the employment and retail hub for the county. It is located along State Route 60 which is how most goods and freight move through the county. McConnelsville is located adjacent to the Muskingum River and is vulnerable to effects of flash and riverine flooding. The village struggles to keep up with maintenance and improvement of its old and outdated infrastructure as well as eliminating abandoned and unused buildings that often become casualties of severe weather events. Power outages

are also common during extreme weather events making it more difficult to respond during and after an emergency. The Village has identified the following mitigation goals and strategies:

Table 3.4-McConnelsville Mitigation Goals and Strategies

Priority	Mitigation Action	Lead Agency	Start Date	End Date	Funding
Goal 1. The Village of McConnelsville will reduce the negative impacts of flooding					
Task 1.1-The Village will manage flooding and protect property through improved maintenance of storm sewers and drainage systems where it will alleviate flooding					
Property Protection		Village Administrator	1/1/21	1/1/26	Local, CDBG, OPWC
Task 1.2-The Village will coordinate with the county to protect and enhance natural areas to reduce flooding, clear debris from waterways and maintain ditches to reduce flooding and facilitate drainage					
Natural Systems Protection		Village Administrator	1/1/21	1/1/26	Local, PDM, FMA, CDBG, others
Task 1.3-The Village will coordinate with the county to identify culverts and other storm drainage structures for repair/replacement					
Structure and Infrastructure		Village Administrator	1/1/21	1/1/26	CDBG, Local, PDM
Task 1.4-The Village will coordinate public information releases with the County on the risks of flooding and private property protection					
Public Education and Awareness		Village Administrator	1/1/21	1/1/26	Local
Task 1.5-The Village will coordinate with the county to identify need for flood-proofing critical facilities including water and wastewater facilities in the Village.					
Property Protection		Village Administrator	1/1/21	1/1/26	Local, PDM, FMA, Others
Task 1.6-Conduct mitigation activities for repetitive loss structures by assessing the potential for acquisition/demolition/retrofitting flood prone properties					
Property Protection		Village Administrator	1/1/21	1/1/26	CDBG, FEMA, Others
Task 1.7-Conduct mitigation activities for repetitive loss structures by assessing the potential for acquisition/demolition/retrofitting flood prone properties					
Property Protection		Village Administrator	1/1/21	1/1/26	CDBG, FEMA, Others
Goal 2. The Village of McConnelsville will reduce the negative impacts of severe storms					

Task 2.1- The Village will coordinate with the county to assess the vulnerability of critical facilities to damage from severe weather and identify the potential for mitigation				
Property Protection	Village Administrator	1/1/21	1/1/26	Local, PDM, CDBG
Task 2.2-The Village will coordinate with the county to increase public awareness of the risks associated with severe storms				
Public Education and Awareness	Village Administrator	1/1/21	1/1/26	Local
Goal 3. The Village of McConnelsville will reduce the negative effects of landslides and erosion				
Task 3.1- The Village will coordinate with the County Engineer to identify areas susceptible to erosion and assess potential bank stabilization options				
Structure and Infrastructure	Village Administrator	1/1/21	1/1/26	Local
Goal 4. The Village of McConnelsville will reduce the negative effects of multiple hazards				
Task 4.1-The village will coordinate with the county to improve and maintain communications as it relates to public outreach and emergency messages and as it facilitates collaboration between first responders before, during and after hazard events and emergencies				
Public Education and Awareness	Village Administrator	1/1/21	1/1/26	Local
Task 4.2-The village will advocate the use of the county-wide "Code Red" system for public notification of weather-related events and other emergencies				
Public Education and Awareness	Village Administrator	1/1/21	1/1/26	Local
Task 4.3-The village will provide and maintain adequate communications equipment for first responders to ensure proper communication during emergencies				
Public Education and Awareness	Village Administrator	1/1/21	1/1/26	Local, HSGP
Task 4.4-The village will advocate that property owners purchase adequate property, casualty and flood insurance to help cover the cost of property repair and replacement after hazard events				
Property Protection	Village Administrator	1/1/21	1/1/26	Local
Task 4.5-The Village will coordinate with the county to implement GIS hazard event tracking system				
Planning and Regulatory	Village Administrator	1/1/21	1/1/26	Local
Goal 5. The Village will reduce the impacts of dam failure on its residents				
Task 5.1-Coordinate with the County Engineer and dam owners to ensure that regular maintenance and/or rehabilitation of dams is being conducted. Assist with funding applications as needed.				
Structure and Infrastructure	Village Administrator	1/1/21	1/1/26	Local, OWDA, HHPD
Task 5.2-Coordinate with Class I dam owners to develop EAP's as appropriate and provide funding assistance as needed.				
Planning and Regulatory	Village Administrator	1/1/21	1/1/26	Local, OWDA, HHPD

Goal 6. The Village of McConnelsville will reduce the impacts of tornados on its residents				
Task 6.1-Assess feasibility to install residential and community safe rooms				
Structure and Infrastructure	Village Administrator	1/1/21	1/1/26	Local, Others TBD

3.4.3 Village of Malta

The Village of Malta is located adjacent to the Village of McConnelsville on the western side of the Muskingum River. The Village is vulnerable to the effects of riverbank erosion, road slips, riverine and flash flooding events and power outages. The village struggles to keep up with maintenance and improvement of its old and outdated infrastructure as well as eliminating abandoned and unused buildings that often become casualties of severe weather events. Malta has identified the following mitigation goals and strategies:

Table 3.5-Malta Goals and Mitigation Strategies

Priority	Mitigation Action	Lead Agency	Start Date	End Date	Funding
Goal 1. The Village of Malta will reduce the negative effects of landslides (road slips) and erosion					
Task 1.1-The Village will coordinate with the county engineer to identify repair and funding options for the current road slip on Front Street/County Road 2.					
Structure and Infrastructure		Village Administrator	1/1/21	1/1/26	Local, OPWC, ODOT, HMGP, Others
Task 1.2-The Village will coordinate with the County Engineer to identify areas susceptible to erosion and assess potential bank stabilization options					
Natural Systems Protection		Village Administrator	1/1/21	1/1/26	Local, HMGP, Others
Goal 2. The Village of Malta will reduce the negative impacts of flooding					
Task 2.1-The Village will manage flooding and protect property through improved maintenance of storm sewers and drainage systems where it will alleviate flooding					
Property Protection		Village Administrator	1/1/21	1/1/26	Local, CDBG, OPWC
Task 2.2-The Village will coordinate with the county to protect and enhance natural areas to reduce flooding, clear debris from waterways and maintain ditches to reduce flooding and facilitate drainage					
Natural Systems Protection		Village Administrator	1/1/21	1/1/26	Local, PDM, FMA, CDBG, others

Task 2.3-The Village will coordinate with the county to identify culverts and other storm drainage structures for repair/replacement				
Structure and Infrastructure	Village Administrator	1/1/21	1/1/26	CDBG, OPWC, Local
Task 2.4-The Village will coordinate public information releases with the County on the risks of flooding and private property protection				
Public Education and Awareness	Village Administrator	1/1/21	1/1/26	Local
Task 2.5-The Village will coordinate with the county to identify need for flood-proofing critical facilities including water and wastewater facilities in the Village.				
Property Protection	Village Administrator	1/1/21	1/1/26	Local, FMA, Others
Task 2.6-Conduct mitigation activities for repetitive loss structures by assessing the potential for acquisition/demolition/retrofitting flood prone properties				
Property Protection	Village Administrator	1/1/21	1/1/26	CDBG, FEMA, Others
Goal 3. The Village of Malta will reduce the negative effects of multiple hazards				
Task 3.1-The village will ensure that adequate power is available for critical facilities during emergencies by purchasing and installing backup generators at the water treatment plant				
Structure and Infrastructure	Village Administrator	1/1/21	1/1/26	Local, CDBG, OPWC, Others
Task 3.2-The village will coordinate with the county to improve and maintain communications as it relates to public outreach and emergency messages and as it facilitates collaboration between first responders before, during and after hazard events and emergencies				
Public Education and Awareness	Village Administrator	1/1/21	1/1/26	Local
Task 3.3-The village will advocate the use of the county-wide "Code Red" system for public notification of weather-related events and other emergencies				
Public Education and Awareness	Village Administrator	1/1/21	1/1/26	Local
Task 3.4-The village will provide and maintain adequate communications equipment for first responders to ensure proper communication during emergencies				
Public Education and Awareness	Village Administrator	1/1/21	1/1/26	Local
Task 3.5-The village will advocate that property owners purchase adequate property, casualty and flood insurance to help cover the cost of property repair and replacement after hazard events				
Property Protection	Village Administrator	1/1/21	1/1/26	Local, HSGP
Task 3.6-The Village will coordinate with the county to implement GIS hazard event tracking system				
Planning and Regulatory	Village Administrator	1/1/21	1/1/26	Local

Goal 4. The Village of Malta will reduce the impacts of tornados on the County and its jurisdictions				
Task 4.1-Assess feasibility to install residential and community safe rooms				
Structure and Infrastructure	Village Administrator	1/1/21	1/1/26	Local, Others TBD

3.4.4 Village of Stockport

The Village of Stockport is located south of the Village of McConnelsville along State Routes 376 and 266. The Village is also located on the western bank of the Muskingum River and is susceptible to the impacts of road slips, hazardous materials incidents and severe storms. The village is located in a remote location away from county emergency services and resources, relying heavily on volunteer fire and EMS personnel, therefore they must establish and maintain disaster resiliency and self-sufficiency.

Table 3.6-Stockport Goals and Mitigation Strategies

Priority	Mitigation Action	Lead Agency	Start Date	End Date	Funding
Goal 1. The Village of Stockport will reduce the negative effects of severe storms					
Task 1.1-The Village will coordinate with the county to assess the vulnerability of critical facilities to damage from severe weather and identify the potential for mitigation					
Property Protection		Village Administrator	1/1/21	1/1/26	Local, PDM, CDBG, others
Task 1.2-The Village will coordinate with the county to increase public awareness of the risks associated with severe storms					
Public Education and Awareness		Village Administrator	1/1/21	1/1/26	Local
Task 1.3-The Village will advocate for and implement programs to trim trees, clear ditches and streams of debris and other actions to protect property from storm damages					
Property Protection		Village Administrator	1/1/21	1/1/26	Local
Goal 2. The Village of Stockport will reduce the negative impacts of landslides and erosion					
Task 2.1-The Village will coordinate with the County Engineer and township trustees to identify repair options in areas of road slips and wash outs, specifically S. River Road/County Road 2					
Structure and Infrastructure		Village Administrator	1/1/21	1/1/26	Local
Task 2.2-The Village will coordinate with the County Engineer and EMA to identify potential sources of funding					
Structure and Infrastructure		Village Administrator	1/1/21	1/1/26	Local, OPWC, ODOT, HMGP, Others
Goal 3. The Village of Stockport will reduce vulnerability to damages from hazardous materials spills and incidents					
Task 3.1-The Village will coordinate with the County and other agencies to ensure adequate training of its first responders in response and management of hazardous materials spills					

Planning and Regulatory	Village Administrator	1/1/21	1/1/26	Local, Other
Task 3.2-The village will ensure adequate mutual aid agreements are in place for assistance in the event of a spill				
Planning and Regulatory	Village Administrator	1/1/21	1/1/26	Local
Task 3.3-The village will ensure adequate signage is in place to help vehicles hauling hazardous materials move through the village safely and efficiently				
Property Protection	Village Administrator	1/1/21	1/1/26	Local, ODOT, others
Goal 4. The Village of Stockport will reduce the negative effects of multiple hazards				
Task 4.1-The village will ensure that adequate power is available for critical facilities during emergencies by purchasing and installing backup generators at the community center, fire station and utilities				
Structure and Infrastructure	Village Administrator	1/1/21	1/1/26	Local, CDBG, others
Task 4.2-The village will coordinate with the county to improve and maintain communications as it relates to public outreach and emergency messages and as it facilitates collaboration between first responders before, during and after hazard events and emergencies				
Public Education and Awareness	Village Administrator	1/1/21	1/1/26	Local
Task 4.3-The village will advocate the use of the county-wide "Code Red" system for public notification of weather-related events and other emergencies				
Public Education and Awareness	Village Administrator	1/1/21	1/1/26	Local
Task 4.4-The village will provide and maintain adequate communications equipment for first responders to ensure proper communication during emergencies				
Public Education and Awareness	Village Administrator	1/1/21	1/1/26	Local, HSGP
Task 4.5-The village will advocate that property owners purchase adequate property, casualty and flood insurance to help cover the cost of property repair and replacement after hazard events				
Property Protection	Village Administrator	1/1/21	1/1/26	Local
Task 4.6-The Village will coordinate with the county to implement GIS hazard event tracking system				
Planning and Regulatory	Village Administrator	1/1/21	1/1/26	Local
Goal 5. The Village will reduce the impacts of dam failure on its residents				
Task 5.1-Coordinate with the County Engineer and dam owners to ensure that regular maintenance and/or rehabilitation of dams is being conducted. Assist with funding applications as needed.				
Structure and Infrastructure	Village Administrator	1/1/21	1/1/26	Local, OWDA, HHPD
Task 5.2-Coordinate with Class I dam owners to develop EAP's as appropriate and provide funding assistance as needed.				
Planning and Regulatory	Village Administrator	1/1/21	1/1/26	Local, OWDA, HHPD
Goal 6. The Village will reduce the impacts of tornados on its residents				

Task 6.1-Assess feasibility to install residential and community safe rooms				
Structure and Infrastructure	Village Administrator	1/1/21	1/1/26	Local, Others TBD
Goal 7. The Village will reduce the impacts of flooding on its residents				
Task 7.1-Conduct mitigation activities for repetitive loss structures by assessing the potential for acquisition/demolition/retrofitting flood prone properties				
Property Protection	Village Administrator	1/1/21	1/1/26	CDBG, FEMA, Others

3.4.5 Village of Chesterhill

The Village of Chesterhill is a small village located southwest of the Village of McConnelsville along State Routes 377 and 555. The village is vulnerable to the effects of drought and extreme heat, severe storms and road slips. The village is located in a remote location away from county emergency services and resources, relying heavily on volunteer fire and EMS personnel, therefore they must establish and maintain disaster resiliency and self-sufficiency.

Table 3.7-Chesterhill Goals and Mitigation Strategies

Priority	Mitigation Action	Lead Agency	Start Date	End Date	Funding
Goal 1. The Village of Chesterhill will reduce the negative effects of extreme heat					
Task 1.1-The village will reduce the negative effects of extreme heat on vulnerable populations by ensuring access to cooling centers during times of extreme heat					
Planning and Regulatory		Village Administrator	1/1/21	1/1/26	Local, CDBG
Task 1.2-The Village will coordinate with the county to provide public informational releases on the location and hours of cooling centers					
Public Education and Awareness		Village Administrator	1/1/21	1/1/26	Local
Task 1.3-The Village will coordinate with the Fire Department and other partners to identify vulnerable populations and provide information on assistive services including rides to cooling centers					
Public Education and Awareness		Village Administrator	1/1/21	1/1/26	Local
Task 1.4-The Village will coordinate with the county to provide public information on water saving techniques such as low flow toilets and showerheads, fixing leaks in plumbing and other water conservation measures.					
Public Education and Awareness		Village Administrator	1/1/21	1/1/26	Local
Goal 2. The Village of Chesterhill will reduce the negative effects of severe storms					
Task 2.1-The Village will coordinate with the county to assess the vulnerability of critical facilities to damage from severe weather and identify the potential for mitigation					
Property Protection		Village Administrator	1/1/21	1/1/26	Local

Task 2.2-The Village will coordinate with the county to increase public awareness of the risks associated with severe storms				
Structure and Infrastructure	Village Administrator	1/1/21	1/1/26	Local
Task 2.3-The Village will advocate for and implement programs to trim trees, clear ditches and streams of debris and other actions to protect property from storm damages				
Property Protection	Village Administrator	1/1/21	1/1/26	Local
Goal 3. The Village of Chesterhill will reduce the negative impacts of landslides and erosion				
Task 3.1-The Village will coordinate with the County Engineer and township trustees to identify repair options in areas of road slips and wash outs				
Structure and Infrastructure	Village Administrator	1/1/21	1/1/26	Local
Task 3.2-The Village will coordinate with the County Engineer and EMA to identify potential sources of funding				
Structure and Infrastructure	Village Administrator	1/1/21	1/1/26	Local, OPWC, ODOT, HMGP, Others
Goal 4. The Village of Chesterhill will reduce the negative effects of multiple hazards				
Task 4.1-The village will coordinate with the county to improve and maintain communications as it relates to public outreach and emergency messages and as it facilitates collaboration between first responders before, during and after hazard events and emergencies				
Public Education and Awareness	Village Administrator	1/1/21	1/1/26	Local
Task 4.2-The village will advocate the use of the county-wide "Code Red" system for public notification of weather-related events and other emergencies				
Public Education and Awareness	Village Administrator	1/1/21	1/1/26	Local
Task 4.3-The village will provide and maintain adequate communications equipment for first responders to ensure proper communication during emergencies				
Public Education and Awareness	Village Administrator	1/1/21	1/1/26	Local, HSGP
Task 4.4-The village will advocate that property owners purchase adequate property, casualty and flood insurance to help cover the cost of property repair and replacement after hazard events				
Property Protection	Village Administrator	1/1/21	1/1/26	Local
Task 4.5-The Village will coordinate with the county to implement GIS hazard event tracking system				
Planning and Regulatory	Village Administrator	1/1/21	1/1/26	Local
Goal 5. The Village will reduce the impacts of tornados on its residents				
Task 5.1-Assess feasibility to install residential and community safe rooms				
Structure and Infrastructure	Village Administrator	1/1/21	1/1/26	Local, Others TBD

3.5 Implementation

This mitigation strategy was developed as part of a multi-jurisdictional hazard mitigation plan. That being said, the responsibility for plan implementation lies with each individual jurisdiction. The actions included in the individual county and municipalities' mitigation strategy are designed to address the vulnerabilities identified during the risk assessment and include measures that may include structural projects and non-structural activities such as planning and regulatory activities as well as public education and outreach initiatives designed to protect property and reduce risk to residents.

Due to the limited financial and technical capacity of the county and its municipalities, the identified strategies are general actions that could be taken to help reduce the negative impact of natural and human caused disasters. Morgan County's villages will likely need to coordinate with County agencies such as the EMA, Engineer's office and Development office in order to convert an action item into a specific project that is technically and financially feasible.

The Morgan County EMA is the entity that is responsible for monitoring plan implementation as described in Section 1.4.

4.1 Overview

Plan adoption is the final step of the mitigation planning process. Morgan County followed all formal planning processes for state and federal plan review and approval as well as local jurisdiction adoption. This section outlines the plan approval process and identifies the relevant dates of plan approval, adoption and expiration.

4.2 Federal and State Plan Approval

After extensive review by the Planning Team, local jurisdictions and the general public, the Mitigation Plan was submitted to Ohio Emergency Management Agency's Mitigation Branch on 12/23/2020. The Ohio EMA provided comments on the plan on 2/2/2021 and 3/25/2021. The County EMA and GLCAP incorporated recommendations and revisions from the State EMA and prepared the plan for submission for review and final approval. Conditional plan approval, pending adoption of the plan, was issued on March 30,2021.

4.3 Local Adoption

After the conditional plan approval was received from FEMA, the Morgan County EMA initiated the local plan adoption process, which began with formal adoption of the plan by the Morgan County Commissioners. Following adoption by the county, all incorporated communities were asked to formally adopt the plan through local legislative action. A sample resolution was provided to each community to assist in this process. Each jurisdiction formally adopted the plan by resolution as shown on Table 4.1 below. A copy of the adoption resolutions for each Village is included in Appendix F.

Table 4.1-Local Plan Adoption

Jurisdiction	Date of Adoption
Morgan County	4/5/2021
Village of McConnelsville	6/1/2021
Village of Malta	5/3/2021
Village of Stockport	
Village of Chesterhill	

Upon adoption by the county, FEMA issued final plan approval on 4/29/2021. The completed plan was uploaded on Ohio EMA's (SHARRP) portal on 5/27//2021.

4.4 Plan Expiration

The Morgan County Hazard Mitigation Plan will expire 5 years from the date of FEMA approval which is 4/29/2026. The plan maintenance process will proceed during the 5-year period as described in Section 1.4 of this report.