WARREN COUNTY, OHIO

HAZARD MITIGATION PLAN

JANUARY 2021

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Record Of Changes

Date	Changes to Plan	Name of person recording changes

INTRODUCTION

The federal Disaster Mitigation Act of 2000 requires jurisdictions to develop and maintain a Multi-Hazard Mitigation Plan (MHMP) to remain eligible for certain federal disaster assistance and hazard mitigation funding programs. Renewal of the plan every five years is required to encourage the continual awareness of mitigation strategies. For the National Flood Insurance Program (NFIP) communities to be eligible for future mitigation funds, they must adopt the MHMP.

As Warren County expands and changes, challenging vulnerabilities must be addressed. Warren County will face numerous hazards in the future, both natural and manmade, and these hazards can result in disasters that impact citizens, businesses, and all levels of government. Over time, factors such as global warming and weather pattern changes can influence the frequency and intensity of weather events. By identifying hazards and taking appropriate steps to mitigate future vulnerabilities, growth and change can be done in a positive manner that will lessen the impact of future hazard events.

Hazard mitigation can be defined as the sustained actions taken to reduce or eliminate long-term risks to people and their property from hazards including natural or man-made disasters. Hazard mitigation planning is a proactive process built on assessing the hazards and applying effective strategies to complete preventive measures. It involves multiple stakeholders from Warren County jurisdictions and the State along with blending the public and private sector goals, objectives, and actions.

The main overall goal of the Warren County Hazard Mitigation Plan is to significantly reduce injuries and loss of life and to minimize damage to structures and property from disasters. It is also intended to reduce disruptions to society, better integrate hazard mitigation programs and policies, reduce the number of repetitive flood loss structures, and to promote education and outreach activities to create a culture of preparedness and hazard mitigation for Warren County businesses and residents.

HISTORY

In 2007, Warren County adopted its Local Hazard Mitigation Plan (LHMP), as required by the Disaster Mitigation Act of 2000. The 2007 LHMP provided a high-level overview of the hazards affecting the community. The hazards identified in the LHMP included wildland urban interface fires, drought, extreme temperatures, dam inundation, severe storms and flooding. The plan also included a vulnerability assessment and mitigation actions to decrease the impacts of these hazards to the community.

The 2015 Hazard Mitigation Plan contained many of the same elements of the 2007 LHMP, however, through the use of new research and information methods such as GIS mapping, the committee created a more comprehensive plan that focused on natural hazards and the limited resources available to apply to mitigation efforts.

The 2020 Hazard Mitigation Plan is similar in function to its predecessors, however the planning team focused more on education and collaboration with local jurisdictions, schools, businesses, and organizations to create mitigation strategies that will benefit local jurisdictions and reduce risk locally and to the county. The Planning Team designed a thorough approach to provide factual, evidence-based information on hazards, and to solicit comprehensive information and feedback from county stakeholders to determine mitigation priorities and strategies for action.

1. COMMUNITY PROFILE

BACKGROUND

The Community Profile summarizes the County's history and existing environmental and socioeconomic conditions. Environmental and socioeconomic factors include geography, topography, climate, population, economic, housing, and land use and development trends.

Warren County is in Southwestern Ohio. The County has a total land area of 400 mi². It is bound by Montgomery and Greene counties to the north, Butler County to the west, Clermont and Hamilton counties to the south, and Clinton County to the east.

Warren County was established March 24, 1803, by an act of the first General Assembly in Chillicothe, Ohio. This same act gave the County its name in honor of General Warren, who distinguished himself during the War of the Revolution. Warren, Butler and Montgomery counties were formed from territory formerly included in Hamilton County. Warren County was originally made up of three principal land subdivisions. The Virginia Military District comprised the eastern half, the Symmes Purchase made up the southwest corner and the Congress Lands were in the northwest corner. Warren County was originally divided into four townships: Franklin, Wayne, Deerfield and Hamilton Twps. [1]

The County Seat is in the City of Lebanon. The three-member board of County Commissioners is elected for a four-year term and is the legislative and executive body of the County. Warren County Commissioners hold title to all County properties, serve as the sole taxing authority for the County and control county purchasing. Most importantly, the Warren County Board of Commissioners is the budget and appropriating authority for County government, which includes all County agencies and elected officials (Sheriff, Auditor, Treasurer, Courts, Emergency Services, Telecommunications, etc.).

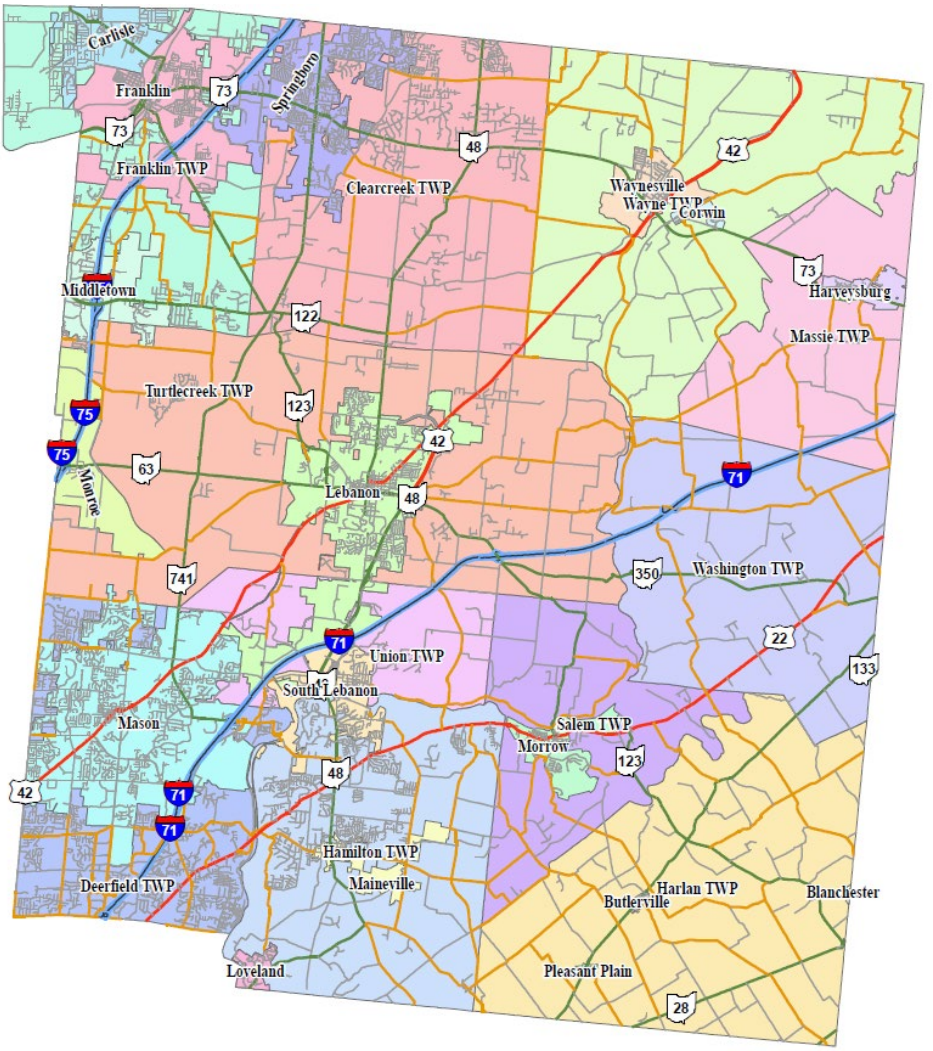
[1] *The History of Warren County, Ohio*, Unknown Author, W. H. Beers Company, Chicago, Illinois, 1882

1.1 JURISDICTIONS

There are 4 cities, 9 villages, and 11 townships in Warren County which make up 24 jurisdictions. There are also portions of 3 other cities in the county.

CITIES	VILLAGES	TOWNSHIPS
FRANKLIN	BUTLERVILLE	CLEARCREEK
LEBANON	CARLISLE	DEERFIELD
LOVELAND (PART)	CORWIN	FRANKLIN
MASON	HARVEYSBURG	HAMILTON
MIDDLETOWN (PART)	MAINEVILLE	HARLAN
MONROE (PART)	MORROW	MASSIE
SPRINGBORO	PLEASANT PLAIN	SALEM
	SOUTH LEBANON	TURTLECREEK
	WAYNESVILLE	UNION
		WASHINGTON
		WAYNE

Figure 1: Map of Warren County Jurisdictions



1.2 CLIMATE, GEOGRAPHY, RIVERS AND DAMS

CLIMATE

In Warren County, Ohio, the summers are warm and humid, the winters are very cold and windy, and it is partly cloudy year-round. Over the course of the year the temperature typically varies between 23°F and 85°F and is rarely below 7°F or above 92°F. The Average temperature for Warren County is 52.55°F. (*Source: weatherspark.com*).

Warren County receives approximately 41 inches of rain per year, which is more than the U.S. average at 38 inches per year. Average snowfall is 15 inches. The number of days with any measurable precipitation is approximately 115 days a year, and on average there are 178 sunny days per year in Warren County. The July average high temperature is around 85 degrees and the January average low temperature is 21 degrees.

Table 1: Warren County Average Climate

Climate Measurements	Warren County, Ohio	United States
Avg. Rainfall (in.)	41.3	38.1
Avg. Snowfall (in.)	14.7	27.8
Avg. Precipitation Days	115.0	106.2
Avg. Sunny Days	178	205
Avg. July High	85.1	85.8
Avg. Jan. Low	21.0	21.7
Comfort Index (higher=better)	7.2	7
UV Index	3.8	4.3
Avg. Elevation FT.	846	2,443

Source: ***http://www.bestplaces.net/climate/county/ohio/warren***

CLIMATE CHANGE

According to the state of Ohio Hazard Mitigation Plan, because of climate change the average temperature may increase 1 to 3 degrees Celsius over the next several decades. Projected change in the climate models indicate a clear tendency towards increased frequency of heat waves. Further cold- air outbreaks and other extreme cold spells will still occur but with reduced likelihood. Rainfall will increase variably across the Midwest over the next several decades with potential to increase 20-30% in the spring and winter months and increase in variability of precipitation in the summer and fall months. Some other affects include the likelihood of warmer nights and possibly warmer days leading to an increased susceptibility to pests. The warming will likely cause a reduction in crop yields and the evaporation / transpiration feedback will lead to less available water resources.

According to the National Weather Service Office in Wilmington, Ohio, the Southwest Ohio region is seeing a wetter trend and increase in occurrences of more extreme rain events. This could increase ground-level flooding, areal flooding, and flash flood events.

GEOGRAPHY

Warren County covers an area of approximately 410 square miles. The county is composed of rolling till plains with local end moraines. The highest elevation of 1,362 feet in Clearcreek with other elevations plummeting to much lower levels with abruptness in only a few points of the County. The County contains 50 different soil types, the majority of which are poorly drained clays and well-drained loams. The County is situated in the ecoregion known as the Eastern Corn Belt Plain. There are two distinct types of Eastern Corn Belt Plain topography located in Warren County. They are the Loamy High Lime Till Plains and pre-Wisconsinan Drift Plains. The majority of the County is comprised of Loamy High Lime Till Plains.

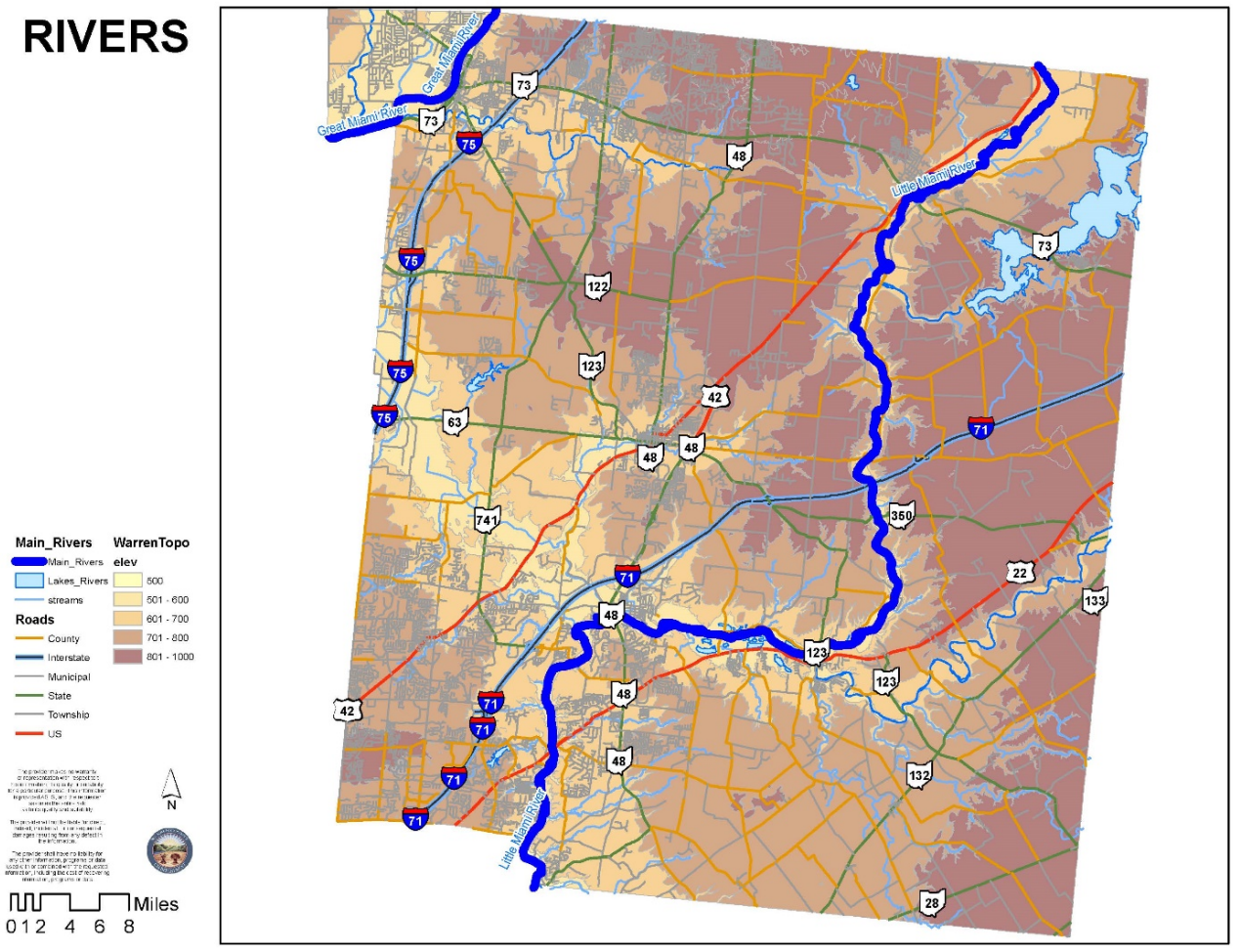
The western, northern and northeastern portions of Warren County contain the ecoregion known as Loamy High Lime Till Plains. This ecoregion contains soils that developed from loamy, limy, glacial deposits of Wisconsinan age. These soils typically have better natural drainage than those of surrounding ecoregions. Beech forests, oak-sugar maple forests and elm-ash swamp forests once grew on the nearly level terrain. Today, corn, soybean and livestock production is widespread.

The central and southeastern portions of Warren County contain the pre-Wisconsinan Drift Plain ecoregion. This ecoregion is differentiated from the surrounding ecoregions by its deeply leached, acidic, pre-Wisconsinan till and thin loess and widespread areas of nearly flat, very poorly drained soils with fragipans. In addition, some dissected areas occur. Originally, beech forests and elm-ash swamp forests were dominant. Today, soybeans are common and are well adapted to spring soil wetness. Corn, tobacco and livestock farming also occur.

RIVERS

Warren County has two major drainage basins: The Great Miami River and the Little Miami River. Streams that drain other parts of the County include Caesar Creek, Todd's Fork, Second Creek, Little Muddy Creek and Clear Creek. The County contains approximately 62,800 water acres, which consists of about 3,450 acres of lakes, and approximately 320 linear miles of streams and rivers. The Little Miami River is the first river in Ohio proposed for protection under the Federal Wild and Scenic Rivers Act, with planned areas for canoeing, picnicking and camping.

Figure 2: Depicts Warren County Rivers



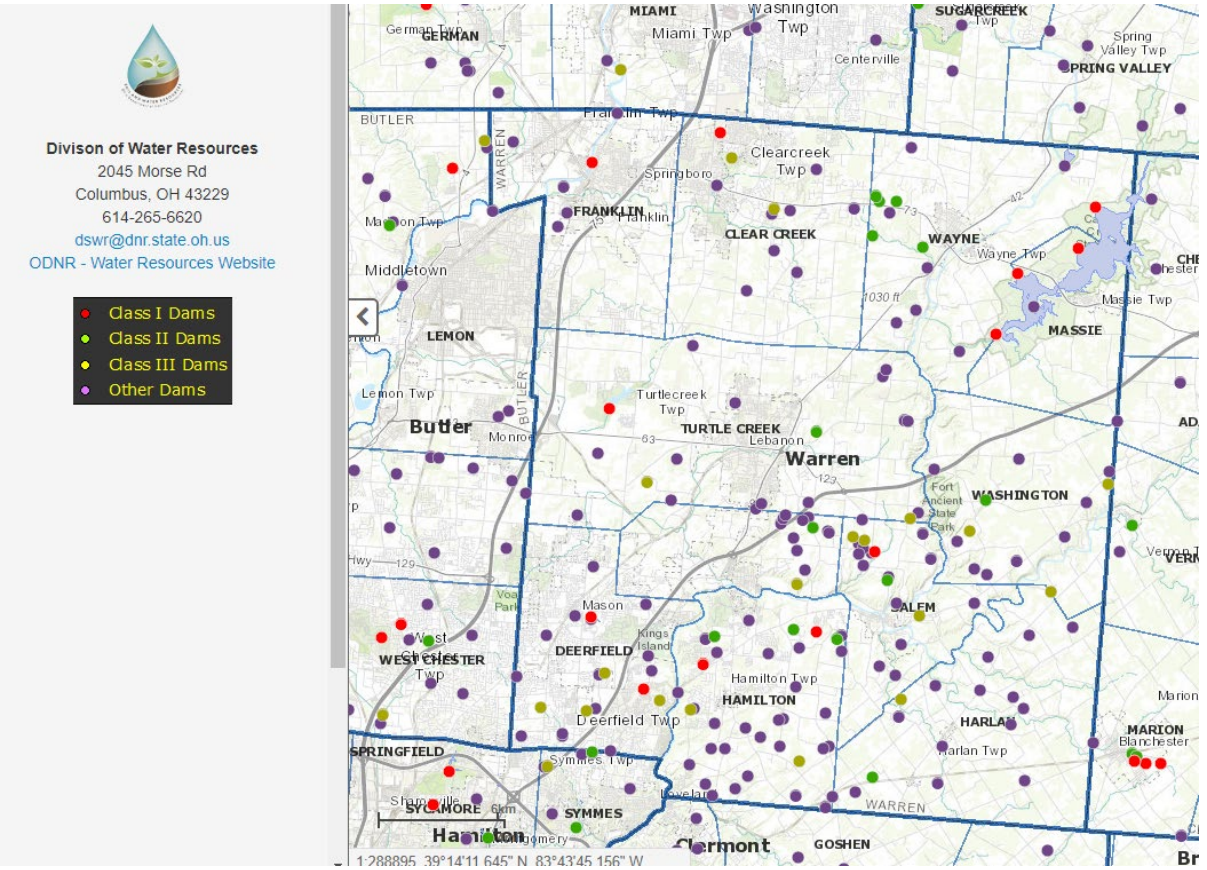
DAMS

Warren County has ten Class I dams. Of these ten dams, four of them are situated along Caesar Creek Lake. The other six are spread out across the county. Four of these dams are privately held, and two of those do not have approved Emergency Action Plans. In total, Warren County is home to 165 dams, including those that are exempt, unclassified or abandoned. Many of the 165 dams are situated along tributaries to creeks and were created for recreational purposes.

Table 2: Warren County Dam Classification

ODNR Class	Count
Class 1	10
Class 2	14
Class 3	22
Class 4	48
Not Classified	71
Total	165

Figure 3: Map of Warren County Dams



1.3 INFRASTRUCTURE, RAIL, PIPELINES AND UTILITIES

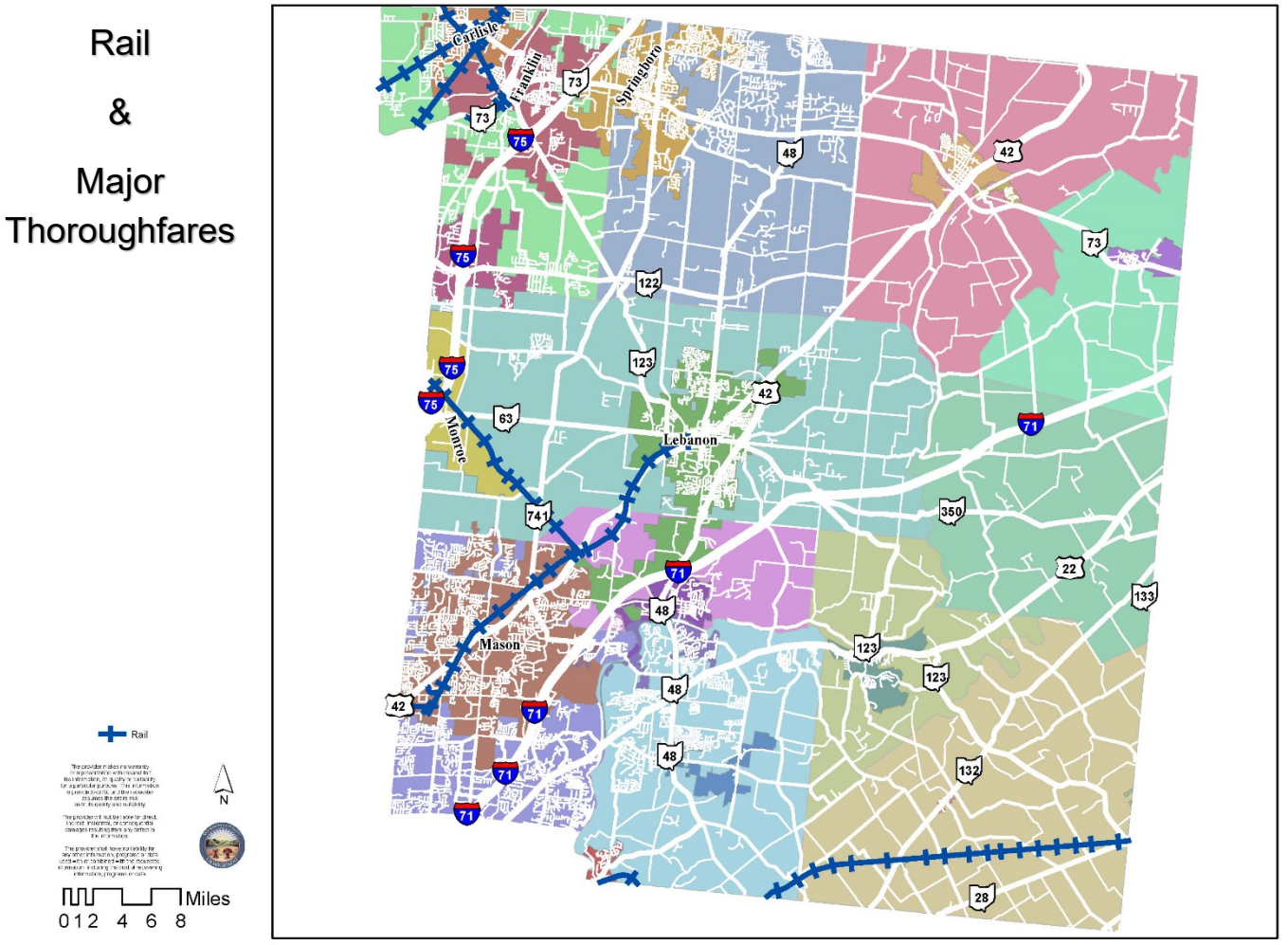
MAJOR THOROUGHFARES

Two major interstate highways run through the county: I – 75 through the Northwest corner and I-71 which runs from the Southwest corner to the Northeast. There are 2 US Routes (22 and 42) and 8 State Routes (28, 48, 63, 73, 122, 123, 132, and 741) that run through Warren County (depicted in Figure 4).

RAIL LINES

There are three major freight rail lines that run through Warren County: CSX and Norfolk-Southern mostly converging in the Northwestern portion of the county and Indiana and Ohio (formerly Genesis and Wyoming) in the Southeastern portion of the county. The city of Lebanon also operates a historic passenger rail line on the Lebanon Mason Monroe (LM&M) Railroad.

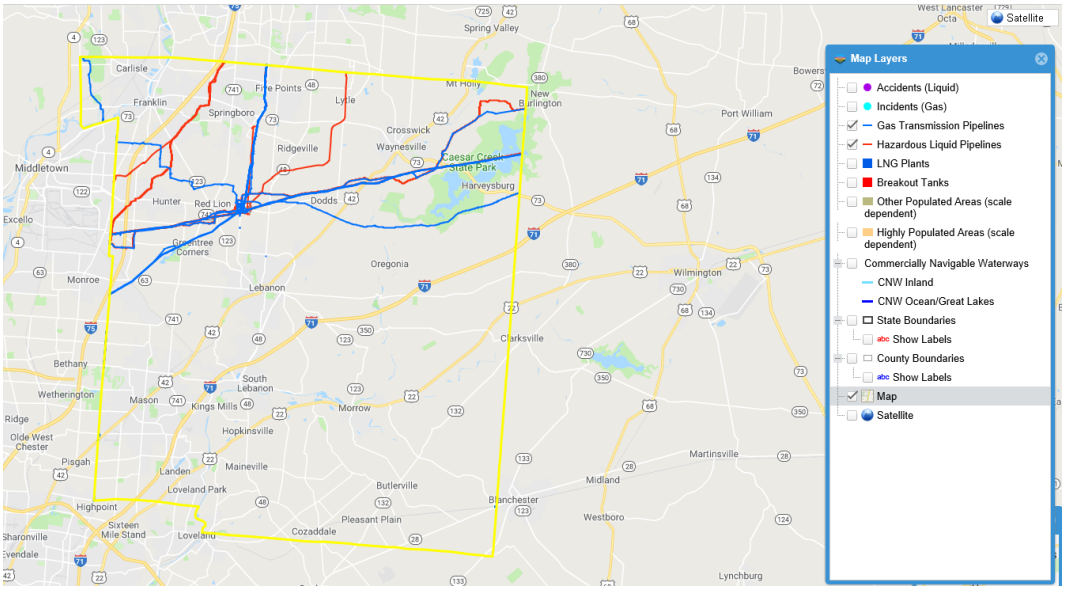
Figure 4: Map of Railways and Major Thoroughfares in Warren County



PIPELINES

There are 10 different pipeline companies who run underground pipe through Warren County. Many of these companies have distribution points that run through the area of State Route 122 and Hart Road. Three companies, Enterprise Products, Dominion Energy, and Enbridge Energy have office locations in that same area. Other companies have substations or own property at that location. (**Note: company names are accurate as of Fall 2019*)

Figure 5: Map of pipelines in Warren County



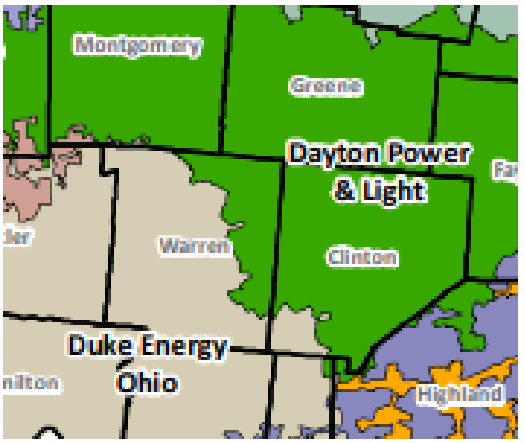
Source: National Pipeline Mapping System

UTILITIES

Electric

The electric power for Warren County is provided by three utility companies. Dayton Power and Light Company, Duke Gas and Electric, and Lebanon Municipal are the providers. Natural and bottled gas is provided by CGE, Columbia and Vectren. Warren County is part of the Knox Energy Cooperative Association, Inc.

Figure 6: Map of Electric Utility Providers in Warren County

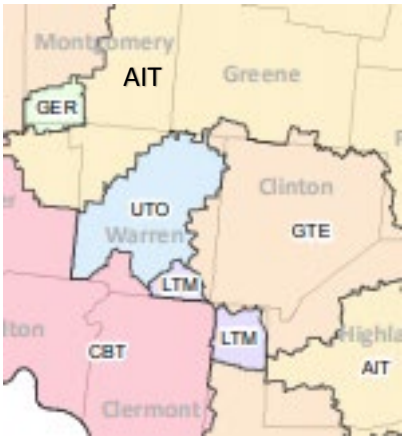


*Lebanon Municipal electric serves the city of Lebanon in Warren County
(*Source: Ohio Public Utilities Commission)*

Telephone Service

Phone companies that service Warren County include AT&T, Cincinnati Bell, Frontier North, Little Miami, and Century Link.

Figure 7: Map of Telephone Service Providers in Warren County



(*Source: Ohio Public Utilities Commission)*

(AIT) AT&T (CBT) Cincinnati Bell (GTE) Frontier North (LTM) Little Miami (UTO) UTO dba CenturyLink

Water and Wastewater

The primary groundwater source in Warren County is a buried valley aquifer composed of sand and gravel. This aquifer serves as an adequate water supply for both individual and public wells for several large water users in the County, such as Lebanon, Mason, Franklin, Western Water Company and Warren County Water Company.

The Warren County Water and Sewer Department is a regional water supplier that owns and operates two water treatment plants with a total Ohio EPA rated capacity of 12 million gallons per day. The treatment plants treat water from wells located along the Great Miami and Little Miami aquifers. The water is distributed from four booster pump stations through 500 miles of watermains to over 28,000 water customers. Fire protection and daily storage is provided from eight elevated storage tanks with a total storage volume of 13 million gallons.

The County serves the Villages of Corwin, Harveysburg, and Maineville, as well as portions of Clearcreek, Deerfield, Franklin, Hamilton, Turtlecreek, Union, and Wayne Twps. In addition to the water furnished by our plants the County purchases potable water from the City of Springboro, Village of Waynesville and the City of Cincinnati. Water for all residential and business customers in the city of Mason is supplied by Greater Cincinnati Water Works. The County has emergency water system interconnections with neighboring cities and villages including:

- Cincinnati
- Franklin
- Lebanon
- Middletown
- Springboro
- South Lebanon
- Waynesville

The Warren County Water and Sewer Department serves over 20,000 sewer customers throughout the County. It owns and operates four wastewater treatment plants with Ohio EPA permitted capacities of 12 million gallons per day, 120,000, 80,000 and 16,000 gallons per day. The County also has agreements with the Metropolitan Sewer District of Greater Cincinnati, Franklin Regional Wastewater Treatment Corporation and Butler County to provide wastewater treatment to portions of unincorporated areas of the County. The County maintains over 389 miles of sanitary sewers and 70 sewage pump stations.

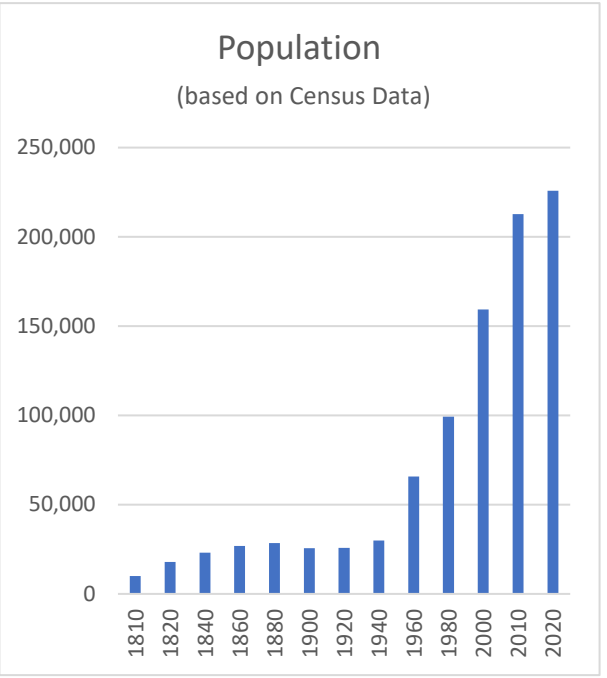
1.4 POPULATION AND DEMOGRAPHICS

As of 2018, the total estimated population of Warren County was 232,173. Warren County is semi-urban in nature and is considered part of the Cincinnati-Dayton metropolitan area. Warren County is the 10th largest county in Ohio. The area of highest population density is the unincorporated areas of Deerfield Twp and the City of Mason with a total of 74,075 people.

The population of Warren County has fluctuated between the years 1810 and 1950 and since then has steadily increased. Between the years 1950 and 1960, the population increased by 71%, which was the largest percentage change experienced in the County. The largest net change was experienced between the years 1990 and 2000, with an increase of 44,474 residents. Steady population increases are expected for Warren County through 2040 as depicted in the charts below.

Table 3: Total Population

Census				Estimated	
1800		1910	24,498	2013	219,244
1810	9,925	1920	25,716	2014	221,306
1820	17,837	1930	27,348	2015	223,900
1830	21,468	1940	29,894	2016	226,582
1840	23,141	1950	28,505	2017	228,859
1850	25,560	1960	65,711	2018	232,173
1860	26,902	1970	84,925		
1870	26,689	1980	99,276	**Projected**	
1880	28,392	1990	113,909	2020	225,770
1890	25,468	2000	159,383	2030	235,640
1900	25,584	2010	212,693	2040	239,060



Source Ohio Office of Research (2018)

Population per jurisdiction in Warren County *(gathered through US Census Bureau, population estimates division and through jurisdictional surveys)*.

Table 4: Population by Jurisdiction in Warren County

CITIES	2013 POPULATION	2018 POPULATION	VILLAGES	2013 POPULATION	2018 POPULATION	TOWNSHIPS	2013 POPULATION	2018 POPULATION
FRANKLIN	11,824	11,686	BUTLERVILLE	165	162	CLEARCREEK	*14.006*	15,847
LEBANON	20,425	20,727	CARLISLE	5,129	5,197	DEERFIELD	36,693	40,489
LOVELAND (PART)		*838	CORWIN	432	467	FRANKLIN	30,700	12,932
MASON	31,383	33,586	HARVEYSBURG	548	561	HAMILTON	21,018	23,454
MIDDLETOWN (PART)		*2,753	MAINEVILLE	1,012	1,090	HARLAN	4,771	4,921
MONROE (PART)		*143	MORROW	1,225	1,312	MASSIE	794	663
SPRINGBORO	16,616	*17,445	PLEASANT PLAIN	155	164	SALEM	3,248	3,601
			SOUTH LEBANON	4,266	4,600	TURTLECREEK	15,182	15,161
			WAYNESVILLE	2,921	3,136	UNION	4,777	2,625
						WASHINGTON	2,368	3,042
						WAYNE	5,405	5,571

***INDICATES THE POPULATION OF A JURISDICTION THAT RESIDES IN WARREN COUNTY**

Source US Census ACS Data

POPULATION ESTIMATES

Population estimates for Warren County (per the Ohio Development Services Agency) for the next 30 years are as follows:

2025	231,230
2030	235,640
2040	239,060

DEMOGRAPHICS

The demographics of Warren County's population are important to understanding the makeup of citizens in the county and to understanding any possible access or functional needs that may be encountered during emergency events. The breakdown of Warren County's population demographics is as follows: *(Source: Ohio Office of Research, 2018)*

Table 5: Population by Race

Population by race	Number	Percent
ACS Total Population	223,968	100%
White	199,068	88.9%
African American	7,940	3.5%
Native American	167	0.1%
Asian	11,619	5.2%
Pacific Islander	19	0.0%
Other	1,395	0.6%
Two or more races	3,770	1.7%
Hispanic	5,778	2.6%
Total Minority	29,919	12.9%

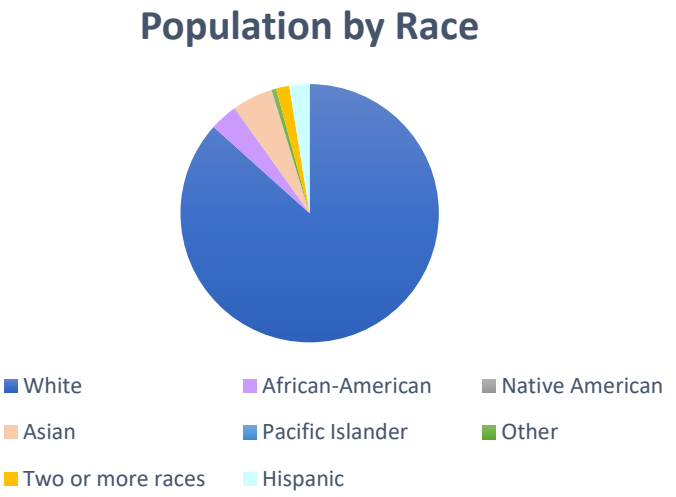


Table 6: Population by Age

Population by Age	Number	Percent
ACS Total Population	223,968	100%
Under 5 years	13,221	5.9%
5 to 17 years	44,219	19.8%
18 to 24 years	17,019	7.6%
25 to 44 years	56,668	25.3%
45 to 64 years	63,233	28.2%
65 years and more	29,508	13.2%
Median Age	39.1	

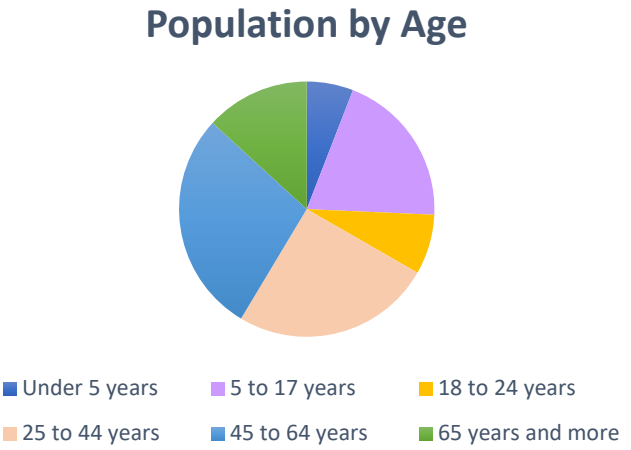


Table 7: Population by Education Attained

Education Attained	Number	Percent
Persons 25 years and over	149,409	100%
No high school diploma	10,151	6.8%
High school graduate	38,783	26.0%
Some college, no degree	24,753	16.6%
Associate degree	13,133	8.8%
Bachelor's degree	39,973	26.8%
Master's degree or higher	22,616	15.1%

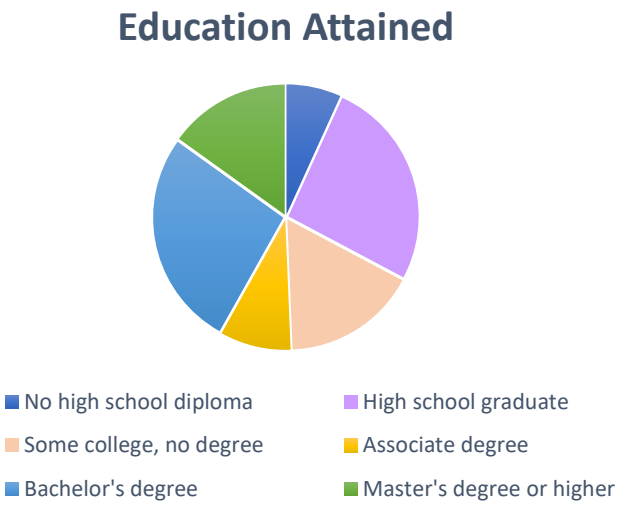
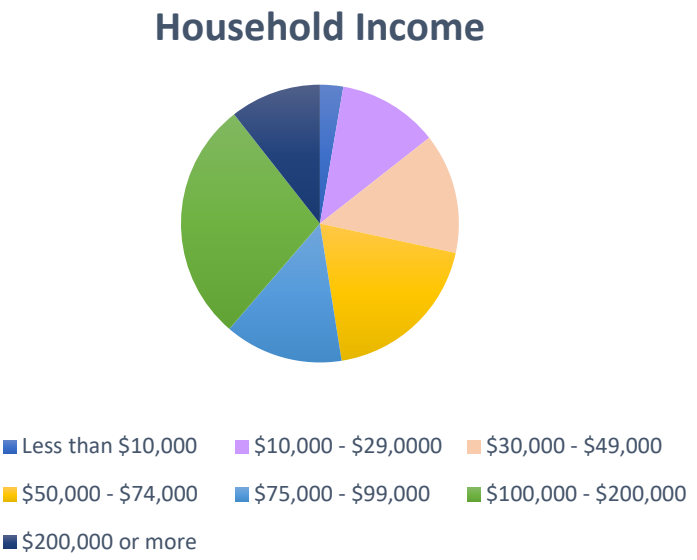


Table 8: Household Income Demographics

Household Income	Number	Percent
Total Households	90,704	100%
Less than $10,000	2,186	2.7%
$10,000 to $19,000	4,024	5.0%
$20,000 to $29,000	5,397	6.7%
$30,000 to $39,000	5,243	6.5%
$40,000 to $49,000	6,024	7.5%
$50,000 to $59,000	5,719	7.1%
$60,000 to $74,000	9,681	12.0%
$75,000 to $99,000	11,147	13.8%
$100,000 to $149,000	15,017	18.6%
$150,000 to $199,000	7,699	9.5%
$200,000 or more	8,567	10.6%
Median Household Income		$79,397



POPULATION TRENDS

Warren County jurisdictions were asked to complete a community profile which included evaluating population/ demographic changes over the last five years as well as forecasting the same changes over the next five years. Trends from those who responded were identified in Table 9.

Table 9: Population / Demographics Trends for Jurisdictions In Warren County

POPULATION / DEMOGRAPHICS TRENDS		
JURISDICTION	**TREND OVER LAST 5 YEARS**	**FUTURE TRENDS**
Turtlecreek Twp	Population has seen an increase	Continued increase in families moving into the area
Salem Twp.	Slight increase in population	Slight increase in population will continue
Hamilton Twp.	Population continues to grow each year with the demographics becoming more upper-middle class	Growth may begin to steady-off
Deerfield Twp.	6.6% population growth over last 5 years	Forecast 1% growth each of the next five years taking total population beyond 40,000
Maineville	Increase of 28% (or 305) persons	Increased population with increase in homes being built
Waynesville	Increase in population and income Decrease in residents living in poverty	Possible 8% increase in population.
Clearcreek Twp.	Becoming more suburban and less agricultural as land develops	Same
Mason	Slight population increase but not as fast as previous decades	Business community growth will bring increased diversity and population to the area
Springboro	Slight increase in population with similar demographics – increase in student population	Same

1.5 RESIDENTIAL HOUSING, HOME VALUES, LAND USE

According to the Warren County Profile prepared by the Office of Policy, Research and Strategic Planning, there are 84,853 housing units in Warren County. Of the total housing units, 80,704 are occupied and 4,149 are vacant. Most homes in Warren County are also owner-occupied (77.6 percent), with the remaining 22.4 percent categorized as renter-occupied units. More than 55.9% of the homes in Warren County were built between 1990 and 2018. An additional 21.1% of the homes were built between 1970 and 1989.

Table 10: Residential Housing Demographics

Housing Units	Number	Percent
Total Households	94,853	100%
Occupied housing units	90,704	95.1%
Owner Occupied	62,593	77.6%
Renter Occupied	18,111	22.4%
Vacant housing units	4,149	4.9%

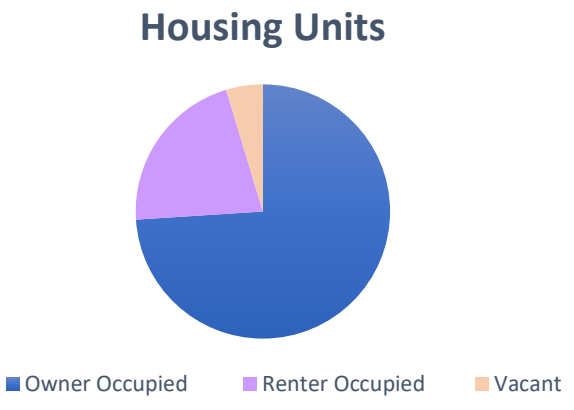
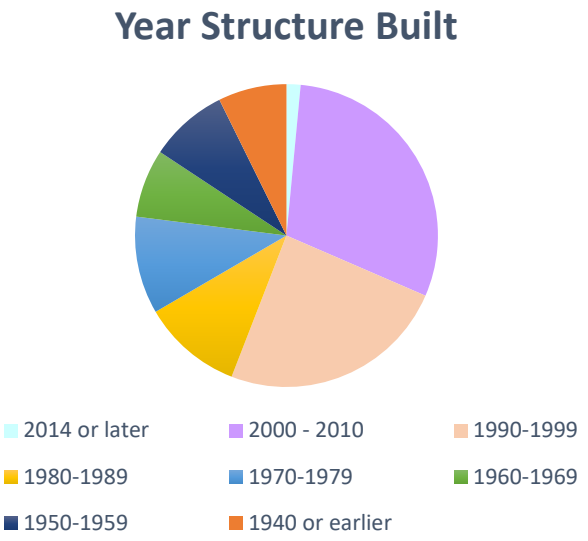


Table 11: Housing Demographics by Year of Structure

Year Structure Built	Number	Percent
Total Households	84,853	100%
Built 2014 or later	1,304	1.5%
Built 2010 to 2013	3,055	3.6%
Built 2000 to 2009	22,359	26.4%
Built 1990 to 1999	20,681	24.4%
Built 1980 to 1989	9,038	10.7%
Built 1970 to 1979	8,867	10.4%
Built 1960 to 1969	6,178	7.3%
Built 1950 to 1959	7,168	8.4%
Built 1940 to 1949	1,452	1.7%
Built 1939 or earlier	4,751	5.6%
Median Year Built		1992

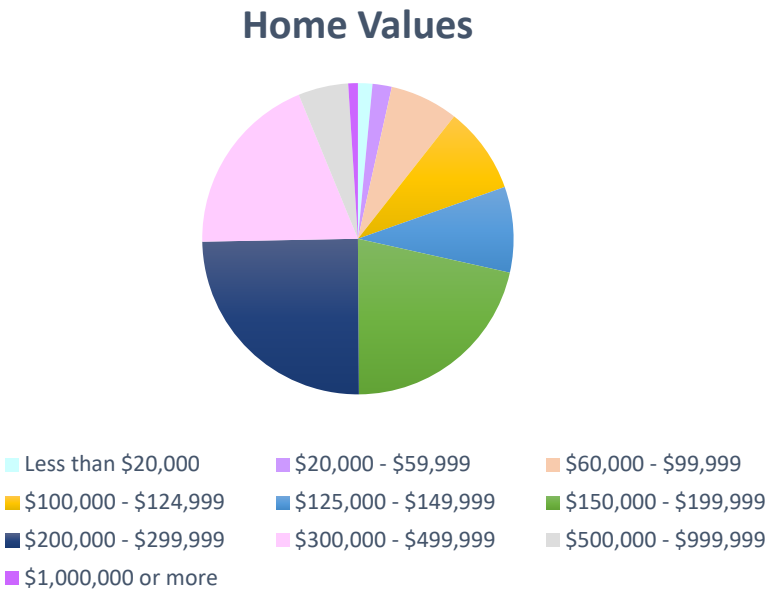


Along with traditional housing, there are several county residents who live in other facilities. There are 16 licensed nursing home facilities in Warren County with a total of 1,313 licensed beds. There are also 16 licensed assisted living facilities in the county with a total of 2,004 licensed beds.

According to the county health district and local jurisdictional representatives, there are additional unlicensed assisted living facilities being constructed throughout the county. This will increase congregate living settings in the county in the foreseeable future.

Table 12: Home Values in Warren County

Value for specified owner-occupied housing units	Number	Percent
Specified owner-occupied housing units	62,593	100%
Less than $20,000	969	1.5%
$20,000 to $39,999	549	0.9%
$40,000 to $59,999	705	1.1%
$60,000 to $79,999	1,501	2.4%
$80,000 to $99,999	2,960	4.7%
$100,000 to $124,999	5,624	9.0%
$125,000 to $149,999	5,581	8.9%
$150,000 to $199,999	13,388	21.4%
$200,000 to $299,999	15,519	24.8%
$300,000 to $499,999	11,965	19.1%
$500,000 to $999,999	3,226	5.2%
$1,000,000 or more	606	1.0%
Median Value		$200,100



LAND USE

Warren County contains approximately 260,900 land acres, of which approximately 60% is rural. Sixty-seven percent of the agriculture in Warren County is cropland.

Warren County Comprehensive Plan
In 2007, the Warren County Planning Commission drafted an updated Comprehensive Plan. This plan included information on land use, transportation, capital improvements, housing, economic development, and parks and recreation. The plan was formally adopted in 2011 by the County Board of Commissioners.

This plan also considers master plans already in place from other cities, villages and twps. Combining land use planning with economic development, thoroughfare planning, and housing plans will allow the county to sensibly move toward the future. The incorporation of data from this mitigation plan into future updates will only strengthen the comprehensive plan.

Table 13: Land Use in Warren County

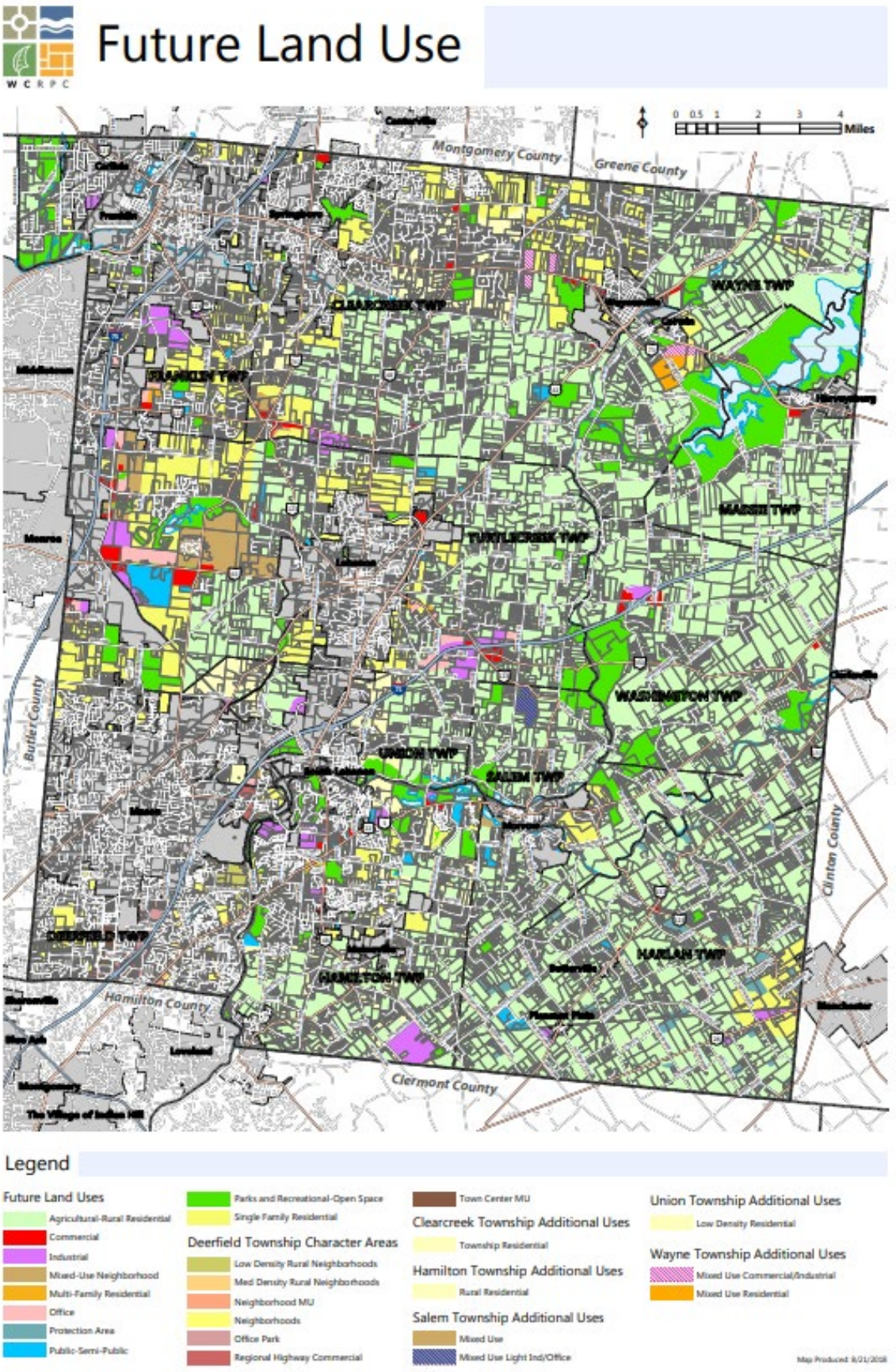
Land Use/Land Cover	Percent
Developed, Lower intensity	19.94%
Developed, Higher intensity	3.96%
Barren (Strip mines, gravel pits, etc.)	0.12%
Forest	29.94%
Shrub/Scrub and grasslands	0.51%
Pasture/Hay	19.92%
Cultivated Crops	23.46%
Wetlands	0.27%
Open Water	1.88%

Table 14: Agricultural Land Use in Warren County

Agriculture	
Land in farms (acres)	90,329
Number of Farms	925
Average size (acres)	98
Total cash Receipts	$47,671,000
Per farm	%51,536
Receipts for crops	$44,718,000
Receipts for livestock/products	$2,953,000

Source Ohio Office of Research (2018)

Figure 8: Map of Future Land Use for Warren County as provided by WC Economic Development



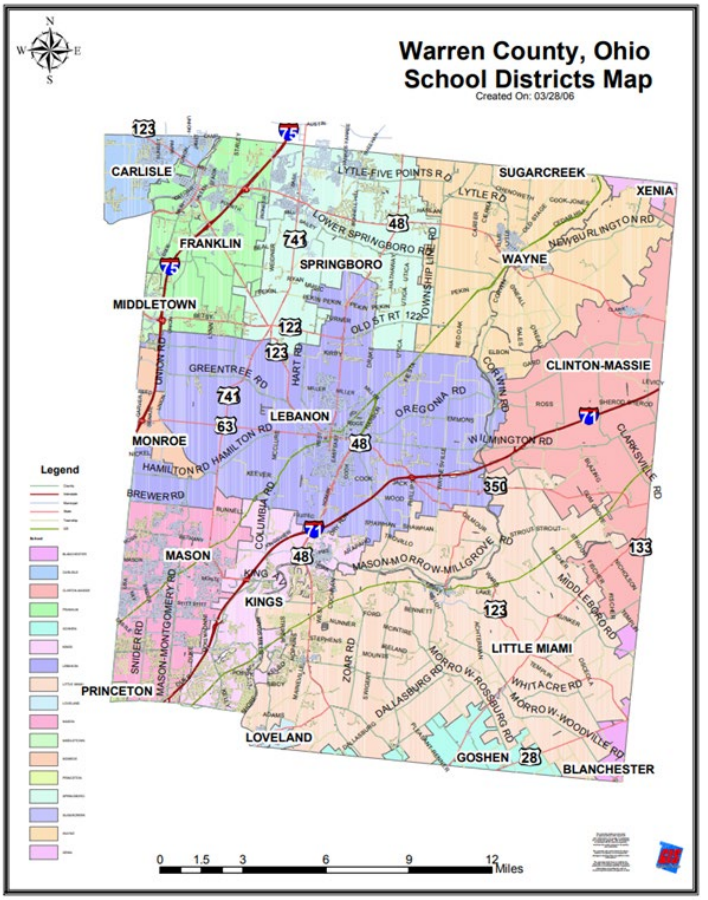
1.6 LIBRARIES AND SCHOOLS

There are 10 main public-school districts in Warren County, and 6 districts whose region extends into Warren County. There are 8 private schools with a footprint in or residents from Warren County and 9 alternative education facilities in Warren County. *(Source: Warren County Educational Service Center)*

Public School Districts

- **Carlisle Local School District**
- **Clinton-Massie Local School District**
  - *(also in Clinton)*
- **Franklin City School District**
- Goshen Local School District
  - (*primarily in Clermont)*
- **Kings Local School District**
- **Lebanon City School District**
- **Little Miami Local School District**
  - *(also in Clermont)*
- Loveland City School District
  - *(primarily in Clermont and Hamilton)*
- **Mason City School District**
- Middletown City School District
  - *(primarily in Butler)*
- Monroe Local School District
  - *(primarily in Butler)*
- Princeton City School District
  - *(primarily in Butler and Hamilton)*
- **Springboro Community School District**
  - *(also in Montgomery)*
- **Wayne Local School District**
- **Warren County Vocational School District**
- Xenia City School District
  - *(primarily in Greene and Clinton)*

Figure 9: Map of Warren County School Districts



Private Schools

- Bishop Fenwick High School – Franklin
- Lebanon Christian School – Lebanon
- Middletown Christian Schools – Franklin
- Montgomery Academy of Cinti – Deerfield Twp.
- St. Margaret of York School – Loveland
- Liberty Bible Academy – Mason
- St. Susanna Parish School – Mason
- Royalmont Academy – Mason
- St. Francis de Sales – Lebanon
- Chess Christian School – Clearcreek Twp.
- Cincinnati Hills Christian Academy – Deerfield Twp.

Other schools

- John K. Lazares alternative school
- Warren County Learning Center (Laura Ferrell)
- Warren County Learning Center (St. Mary)
- Mason Heights (Social Communication and Multi Disabilities Programs)
- Transition Living Classrooms
- Mary Haven Youth Center
- Warren County Juvenile Detention Center
- Greater Ohio Virtual School

Table 15: Educational Buildings in Warren County

Education	
Traditional public-school buildings	44
Students	35,261
Teachers (Full time equivalent)	2,167.4
Expenditures per student	$9,540
Graduation rate	96.6
Community/charter school buildings	0
Private Schools	11
Other Schools	9
Private or public universities	0
Colleges or Satellites	0
Ohio technical centers	1
Public Libraries (districts/ facilities)	5 / 6

Table 16: Public Library Buildings in Warren County

Warren County Public Libraries	
Franklin Public Library	Franklin
Lebanon Public Library	Lebanon
Mary L. Cook Public Library	Waynesville
Mason Public Library	Mason
Salem Twp Public Library	Morrow
Springboro Public Library	Springboro

1.7 BUSINESS AND INDUSTRY, WORK FORCE STATISTICS

According to the 2018 estimates from U.S. Census Data, there are 166,428 people over 18 years of age, of which 116,800 are in the labor force. Out of the 116,800 people in the labor force, 112,300 are employed, and 4,500 (3.9%) are un-employed. The median household income in Warren County is $79,397. The information below shows the breakdown of the Warren County workforce and the major employers in the county. *(Source: Ohio Office of Research, 2018)*

Table 17: Civilian Labor Force Statistics, 2014-2018

Civilian Labor Force	2018	2017	2016	2015	2014
Civilian Labor Force	116,800	116,300	114,600	112,300	110,900
Employed	112,300	111,500	109,800	107,700	105,400
Unemployed	4,500	4,500	4,800	4,700	5,500
Unemployment Rate	3.9	4.1	4.2	4.2	5.0

Table 18: Establishments, Employment, and Wages by Sector: 2017

Industrial Sector	Number of Institutions	Average Employment	Average Weekly Wage
Private Sector	4,732	81,767	$959
Goods-Producing	628	15,780	$1,166
Natural Resources & Mining	38	282	$696
Construction	351	3,422	$1,205
Manufacturing	238	12,077	$1,166
Service-Providing	4,105	65,987	$909
Trade, Transportation and Utilities	1,108	17,077	$831
Information	85	1,156	$1,462
Financial Services	490	4,777	$1,224
Professional and Business Service	1,058	15,210	$1,525
Education and Health Services	513	11,478	$752
Leisure and Hospitality	477	13,474	$319
Other Services	367	2,803	$765
Federal Government		305	$1,108
State Government		1,261	$1,211
Local Government		8,452	$854

Source: Warren County Office of Economic Development

Table 19: Largest and Notable Employers in Warren County

Civilian Labor Force	Category	Civilian Labor Force	Category
ADVICS Manufacturing Ohio	Manufacturing	Macy's Inc	Trade
Atrium Medical Center	Service	Mitsubishi Electric Automotive	Manufacturing
Cedar Fair / King's Island	Service	Mason Local Schools	Government
Cengage Learning Inc.	Service	Portion Pac Inc/Kraft Heinz	Manufacturing
Cintas Corp	Manufacturing	Proctor and Gamble Co.	Research & Development
L-3 Space and Sensors	Manufacturing	State of Ohio	Government
Luxxotica Group SpA	Manufacturing	WellPoint Inc/Anthem	Insurance

1.8 TOURISM, POINTS OF INTEREST, AND COMMUNITY FESTIVALS

TOURISM

Warren County is host to many attractions, points of interest, and community festivals that draw large crowds, require pre-planning, and may alter traffic patterns. The popularity of these attractions drives tourism in the county and increases the overall population at a given time.

Some of the highlighted attractions and events that increase tourism in Warren Count are as follows:

RECREATION AND ATTRACTIONS

- Kings Island: Theme park
- Western & Southern Open: Professional tennis tournament
- The Beach Water Park: Outdoor water park
- Great Wolf Lodge: Indoor water park resort
- Lebanon Mason Monroe Railroad: Nostalgic, themed train rides
- Fort Ancient: American Indian earthen mounds
- Cincinnati AVP Open: Professional beach volleyball tournament
- Ohio Renaissance Festival – Harveysburg
- Warren County Fair – Lebanon
- Warren County Sports Park

POINTS OF INTEREST

- The Golden Lamb: Ohio's oldest continuously operating inn – Lebanon
- Cincinnati Premium Outlets – Monroe
- Miami Valley Gaming – Lebanon
- Lebanon Raceway – Lebanon

COMMUNITY FESTIVALS

- Lebanon Horse Drawn Carriage Parade – Lebanon
- Lebanon Blues Festival – Lebanon
- Lebanon Country Music Festival – Lebanon
- Apple Fest - Lebanon
- Feast and Fall-y – Lebanon
- Red, Rhythm and Boom – Mason
- Sauerkraut Festival – Waynesville
- National Night Out – multiple communities
- Christmas in Springboro
- Devil's Staircase – Oregonia
- Celtic Festival – Waynesville
- Bellwether Music Festival – Harveysburg

PARKS

- Caesar's Creek State Park and Caesar's Creek Lake
- Armco Park
- Other smaller parks (as pictured in Figure 10)

Figure 10: Map of Warren County Parks

Future Land use and infrastructure improvements

Warren County jurisdictions were asked to complete a community profile which included providing information on land use, housing trends, economic, and business and industry improvements. The Warren County Department of Economic Development was also consulted, and the following developments / trends were identified by participating jurisdictions in Warren County:

Land Use / Housing Trends		
Jurisdiction	**Trend over last 5 years**	**Future trends**
Wayne Twp.	None noted	Trend in single family residential development on existing subdivision plots and taking over agricultural ground
Turtlecreek Twp.	Increase in subdivisions New housing / multi-use development	None noted
Salem Twp.	Very little change over last few years	Slight increase in single family housing development
Hamilton Twp.	Growth over last five years has been from commercial to residential	If growth continues to occur it will be younger, single-family homes
Deerfield Twp.	Increase in single family housing, some apartment, and hotel development	Redevelopment of existing properties, additional single-family development
Maineville	Increase in single family and elderly facilities	Increase in single family homes with larger lots
Waynesville	Additional housing development (average of additional 3 homes per year)	Average of additional 3 homes per year
Clearcreek Twp.	More single-family dwellings with smaller lot sizes	More residential development and service-type businesses Adding more useable park space from existing land is likely
Mason	Business community growth	Business community growth will continue to be a focus. This will bring increased commercial and modest housing growth
Lebanon	Mix of residential and industrial development	Increase in single-family housing
Springboro	Increase in assisted living and condos and steady single-family construction	Increase in multi-use developments and steady single-family construction

Infrastructure / Business Trends	
Jurisdiction	**Trend over next 5 years**
Wayne Twp.	• Road connectivity as subdivisions are approved • Bridge replacement on SR 73 • New Elementary School building planned
South Lebanon	• Additional school building needed in Morrow to serve South Lebanon students
Hamilton Twp.	• Increase in commercial development, increased demand for road expansion, increase in industry and commercial business • Widening of major state routes needed (SR 22&3 & SR 48) due to growth • Little Miami Schools will need expansion for growth of population
Deerfield Twp.	• New slip ramp to I71, new roundabouts planned • New retail and office businesses • New school development especially for Kings to deal with student population growth
Maineville	• Increase in small businesses and neighborhood businesses. Due to current layout, only a small area is set aside for businesses
Waynesville	• Water line replacement and plant update • Currently building a new PK-6th grade school
Clearcreek Twp.	• Better / wider road network • Service businesses increase • Increase in population will increase burdens on schools

Mason	• Continued pursuit of commercial growth, specifically high-tech and corporate headquarters • Roadway improvements • Municipal Center is under construction • School enrollment is expected to level off
Lebanon	• Some industrial development expected • New fire station • Various utility upgrades scheduled
Springboro	• Stable and possibly more required maintenance • Continual rehabilitation of water and sewer infrastructure • Expanding road system • Continued improvements to park land

1.9 Critical Infrastructure

The Planning Team determined that critical infrastructure is defined as facilities or systems that provide essential facilities, products, and services to the general public and that are necessary to preserve welfare and quality of life, or to fulfill emergency response or disaster recovery operations locally or nationally. The Hazard Mitigation Planning Committee was asked to define critical facilities and essential services (which are provided in the list below):

Critical Facilities
• Fire/EMS Departments • Law Enforcement Departments • Hospitals • National Corporations / Headquarters • Defense Contractors • Road Dept. Facility and Equipment • Schools • 911 Communication Centers • Buildings designated as storm / mass care shelters • Residential health care and assisted living facilities • State Prisons • Emergency supply facilities (food, fuel stations, banks, postal service, home improvement centers, etc.)

Critical Utilities
• Power Plants / Substations • Water Treatment Pants / Well field storage tanks • Wastewater Treatment Plants • Communications systems / towers • High Pressure Gas Lines

Critical Services / Other
• Traffic Signals • Government Services Buildings • Major roads and Bridges • Major Rail Lines • Levee Systems and Components • Private airfield

1.10 AUTHORITIES AND RESPONSIBILITIES

Warren County is updating the Hazard Mitigation Plan as required by 44 CFR Part 201.3 and the Robert T Stafford Disaster Relief and Emergency Assistance Act. In order for Warren County's plan update to be compliant with the Disaster Mitigation Act, the Warren County Board of County Commissioners will adopt this plan in January of 2021 with all participating jurisdictional governing bodies adopting this plan within that same year, pending approval from the Ohio Emergency Management Agency, as well as acceptance from the Federal Emergency Management Agency.

The County and jurisdictions adopting this plan are responsible for incorporating mitigation actions into existing plans and ordinances and considering mitigation actions in budgetary or grant cycles. Commissioners, public safety officials, floodplain administrators, engineers, and other community leadership partners are expected to use the information from the plan to enhance or uphold local, state, and federal rules, regulations, codes, ordinances, policies, plans, procedures, or other administrative instruments. Examples of how the components of the plan can enhance existing authorities and responsibilities are outlined below:

- **Building / Development Codes and Zoning Ordinances:** The HMP will provide information to enable Warren County and local jurisdictions to make decisions on appropriate building / development codes and ordinances. Appropriate building codes and ordinances can increase resilience against natural disasters.
- **Comprehensive / Master Plans:** The HMP will provide information that can be incorporated into the Land Use Elements for future land planning. Specific risk and vulnerability information from the Warren County HMP will assist to identify areas where development may be at risk to potential hazards.
- **Emergency Operations Plan (EOP):** The HMP highlights hazards that the County and its jurisdictions are vulnerable to. The priorities for hazards and strategies for mitigation can help highlight where emergency planning efforts can be concentrated.
- **Capital Improvements Plans:** The HMP will provide information to assist the county and jurisdictions with prioritizing capital projects, equipment purchases, and major studies that will sustain or improve community or county infrastructures.

2. PLANNING PROCESS

2.1 PLANNING PROCESS OVERVIEW

The Warren County Emergency Management Agency acted as the project coordinator to complete the five-year Hazard Mitigation Plan update. EMA personnel on the planning team consisted of:

- Melissa Bour, Director
- Lesli Holt, Operations Manager
- David Wood, LEPC Coordinator
- Kenneth Losekamp, EMA Planning Assistant
- Kevin Tribbe, EMA Volunteer Assistant

The planning process began in August of 2019 with a review of the 2015 Warren County All Hazards Mitigation Plan and projects. A review of the planning process was completed to determine whether the plan update would be awarded to a contractor or be completed in-house. It was determined that the plan update would be completed by EMA staff, to build collaborative relationships with the jurisdictions as well as public and private sector representatives.

To accomplish the 2021 Hazard Mitigation Plan update, WCEMA developed the mitigation strategy outlined below:

1. Review of the initial planning process:
   - Determined all Warren County EMA staff would be involved in the review and planning process
   - Reviewed the 2015 Warren County All Hazards Mitigation Plan
   - Reviewed relevant documents for the planning process including the State of Ohio Hazard Mitigation Plan, FEMA Hazard Mitigation Planning Handbook, and FEMA Local Mitigation Plan Review Guide
   - Reviewed the hazards to determine if there were any changes to be made or additional hazards to be added
   - Reviewed updated county plans including the Emergency Operations Plan, Disaster Recovery Plan, and updated countywide flood maps

2. Review of Risk Assessment Strategy Portion
   - Reviewed contents of hazard information from the 2015 Plan
   - Researched databases for additional hazard data for Warren County and confirmed data with appropriate parties where applicable (i.e. National Weather Service office in Wilmington for natural hazard data)
   - Determined if other hazards should be added and profiled
   - Updated last 5 years of data for all hazards
   - Reviewed repetitive losses for the county
   - Determined risk assessment strategy to rate hazards

3. Re-assessment of Hazard Vulnerability
   - Surveyed jurisdictions on current status including population, demographics, critical infrastructure, land use, trends, and points of interest
   - Surveyed jurisdictions on capabilities including planning, resources, and response to hazards
   - Scored hazards according to probability, impacts, and preparedness to determine jurisdictional risk
   - Compiled scores to determine county risk

4. Development of Goals and Objectives and Mitigation Actions
   - Developed goals and objectives for the mitigation strategy of the 2021 Hazard Mitigation Plan
   - Reviewed mitigation projects from the 2015 Plan and updated status
   - Developed list of projects for the 2021 Plan
   - Evaluated mitigation projects against vulnerability to determine priority
   - Reconciled mitigation projects with goals and objectives

5. Evaluate Plan Maintenance Process
   - Strengthened process to make it a stronger countywide collaborative effort

- Described the process of how local government can incorporate the mitigation strategy into other planning mechanisms
- Review and modify the process as necessary to continue public participation in the Plan

6. Draft Revised Plan Document
   - Reviewed by stakeholders
   - Modified as recommended by stakeholders

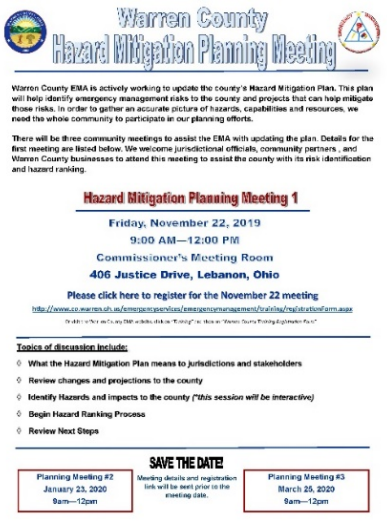
7. Plan Adoption
   - Review by State Emergency Management Agency and Federal Emergency Management Agency
   - Incorporate recommended revisions as necessary from State and Federal review
   - Formal adoption by the Warren County Board of County Commissioners
   - Formal adoption by all participating communities and special districts (where applicable)

For this plan update, the EMA desired to collaborate with jurisdictions and other agencies to provide a comprehensive guide for the hazards faced in the county. Meeting materials were produced and placed in binders for the jurisdictions to personalize for their specific hazards and mitigation projects. The following describes the process for meetings and binder contents:

Meeting	Meeting Subject	Binder Section	Binder Contents	Personalized Contents
Pre-Meeting	Email survey to jurisdictions	1	• Community profile sheet • Capability survey	• Profile sheet with population, demographic, and community-specific info. • Capability survey outlining plans and resources needed to respond to hazards.
1	Hazard Assessment and ranking	2	• Hazard-specific sheets containing history, probability, impacts, and causes of hazards that could occur in the county.	• Jurisdictional Hazard sheet • Hazard Ranking Sheet • Risk Assessment Worksheets
2	Propose Mitigation Projects to reduce risk and rate projects for viability and inclusion into the plan	3	• List of mitigation projects that could reduce risk to Warren County hazards • List of projects from the 2015 Hazard Mitigation Plan	• 2015 Hazard Mitigation Project list (jurisdictional-specific where applicable) • Mitigation Project Ranking Sheet
*3	*Finalize Projects & plan components, discuss grant opportunities and requirements*	*4/5*	• *Grant explanation sheet* • *Resource information about mitigation projects and actions*	• *Jurisdictional contact sheet for disasters* • *Any jurisdictional-specific notes*

** Meeting 3 was cancelled due to restrictions on gatherings during the COVID-19 pandemic. Contents of meeting items were sent to stakeholders for review and were published and placed in the jurisdictional binders.*

Flyer for Community Meeeting 1



Warren County
Hazard Mitigation Planning Meeting

Warren County EMA is actively working to update the county's Hazard Mitigation Plan. This plan will help identify emergency management risks to the county and projects that can help mitigate those risks. In order to gather an accurate picture of hazards, capabilities and resources, we need the whole community to participate in our planning efforts.

There will be three community meetings to assist the EMA with updating the plan. Details for the first meeting are listed below. We welcome jurisdictional officials, community partners , and Warren County businesses to attend this meeting to assist the county with its risk identification and hazard ranking.

Hazard Mitigation Planning Meeting 1

Friday, November 22, 2019
9:00 AM—12:00 PM
Commissioner's Meeting Room
406 Justice Drive, Lebanon, Ohio

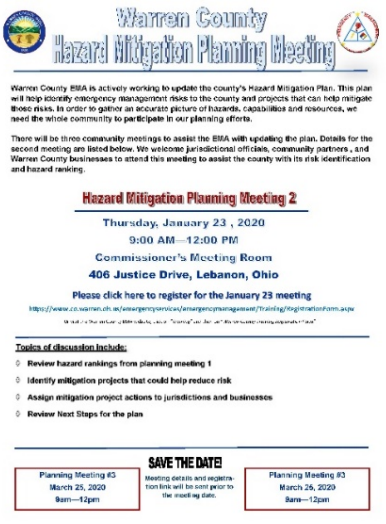
Please click here to register for the November 22 meeting
http://www.co.warren.oh.us/emergencyservices/emergencymanagement/training/registrationForm.aspx

Topics of discussion include:
- What the Hazard Mitigation Plan means to jurisdictions and stakeholders
- Review changes and projections to the county
- Identify Hazards and impacts to the county *(*this session will be interactive)*
- Begin Hazard Ranking Process
- Review Next Steps

SAVE THE DATE!

Planning Meeting #2 — January 23, 2020 — 9am—12pm
Meeting details and registration link will be sent prior to the meeting date.
Planning Meeting #3 — March 25, 2020 — 9am—12pm

Flyer for Community Meeeting 2



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There will be three community meetings to assist the EMA with updating the plan. Details for the second meeting are listed below. We welcome jurisdictional officials, community partners , and Warren County businesses to attend this meeting to assist the county with its risk identification and hazard ranking.

Hazard Mitigation Planning Meeting 2

Thursday, January 23 , 2020
9:00 AM—12:00 PM
Commissioner's Meeting Room
406 Justice Drive, Lebanon, Ohio

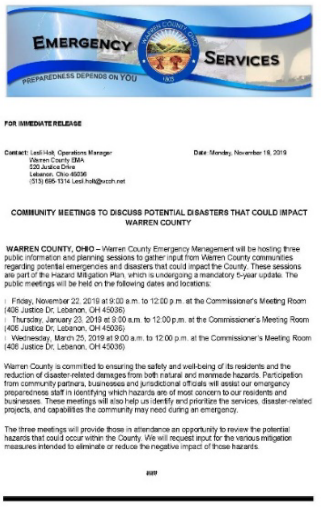
Please click here to register for the January 23 meeting
https://www.co.warren.oh.us/emergencyservices/emergencymanagement/training/registrationForm.aspx

Topics of discussion include:
- Review hazard rankings from planning meeting 1
- Identify mitigation projects that could help reduce risk
- Assign mitigation project actions to jurisdictions and businesses
- Review Next Steps for the plan

SAVE THE DATE!

Planning Meeting #3 — March 25, 2020 — 9am—12pm
Meeting details and registration link will be sent prior to the meeting date.
Planning Meeting #3 — March 25, 2020 — 9am—12pm

Press Release for Community Meetings



EMERGENCY SERVICES
PREPAREDNESS DEPENDS ON YOU

FOR IMMEDIATE RELEASE

Contact: Lesli Holt, Operations Manager
Warren County EMA
520 Justice Drive
Lebanon, Ohio 45036
(513) 695-1314 Lesli.holt@wcoh.net

Date: Monday, November 18, 2019

COMMUNITY MEETINGS TO DISCUSS POTENTIAL DISASTERS THAT COULD IMPACT WARREN COUNTY

WARREN COUNTY, OHIO – Warren County Emergency Management will be hosting three public information and planning sessions to gather input from Warren County communities regarding potential emergencies and disasters that could impact the County. These sessions are part of the Hazard Mitigation Plan, which is undergoing a mandatory 5-year update. The public meetings will be held on the following dates and locations:

- Friday, November 22, 2019 at 9:00 a.m. to 12:00 p.m. at the Commissioner's Meeting Room (406 Justice Dr, Lebanon, OH 45036)
- Thursday, January 23, 2019 at 9:00 a.m. to 12:00 p.m. at the Commissioner's Meeting Room (406 Justice Dr, Lebanon, OH 45036)
- Wednesday, March 25, 2019 at 9:00 a.m. to 12:00 p.m. at the Commissioner's Meeting Room (406 Justice Dr, Lebanon, OH 45036)

Warren County is committed to ensuring the safety and well-being of its residents and the reduction of disaster-related damages from both natural and manmade hazards. Participation from community partners, businesses and jurisdictional officials will assist our emergency preparedness staff in identifying which hazards are of most concern to our residents and businesses. These meetings will also help us identify and prioritize the services, disaster-related projects, and capabilities the community may need during an emergency.

The three meetings will provide those in attendance an opportunity to review the potential hazards that could occur within the County. We will request input for the various mitigation measures intended to eliminate or reduce the negative impact of those hazards.

###

2.2 PLANNING COMMITTEE / PUBLIC INVOLVEMENT

Warren County EMA scheduled three public planning meetings from November 2019 through March 2020. Meetings were announced via press release to local media sources, flyers handed out at public meetings and events*, postings on the EMA website, and flyers mailed to all jurisdictional elected officials. The following public planning meetings were held in the Commissioner's Meeting Room located at 406 Justice Drive in Lebanon which is centrally located in the county.

Meeting	Date	Purpose	Attending
1	November 22, 2019	Kick-Off Meeting/ Planning Meeting 1	Public / WCDES
2	January 23, 2020	Planning Meeting 2	Public / WCDES
3	*March 25, 2020*	*Planning Meeting 3*	*Public / WCDES*

Meeting 3 was cancelled due to restrictions on gatherings during the COVID-19 pandemic.

*The public was offered numerous opportunities to comment and provide input throughout the planning process. Meeting flyers (pictured above) were posted or handed out to invite public involvement at the following locations: the EMA booth at National Night Out event in Clearcreek Township, the Warren County Safety Council January 2020 meeting, Warren County Police and Fire Chief's Association October and January meetings, Mason School's Safety Assessment, Warren County Career Center's Safety Assessment, Warren County Benefits Fair, Regional Safety Summit, Warren County LEPC 4th Quarter 2019 meeting, Southwest Ohio Emergency Management Association of Ohio November 2019 meeting, King's School Safety Assessment, and postings in the Warren County Commissioner's Building lobby.

Meeting attendees were asked to evaluate the effectiveness of each planning meeting. This included providing comments about additional hazard or mitigation information that would assist with their planning or mitigation strategy efforts.

MITIGATION PLANNING COMMITTEE

The Mitigation Planning Committee was comprised of community leaders, public safety officials, business and industry employees, representatives of various agencies, county residents, and neighboring county and state emergency management personnel. For a full list of stakeholders who participated in the Hazard Mitigation Planning process see Appendix 1 (List of Participants), Appendix 1.2 (Community Participation) and 1.3 (Community Meeting Sign In Sheets).

Besides community meetings, Warren County EMA representatives also collaborated with the following agencies / organizations regarding hazard mitigation planning:

Agency / Group	Method of Collaboration	Discussion Topics
WC Economic Development (ED)	In-Person Meeting	○ Current and future land use trends ○ Growth statistics in the county ○ Role of E.D. in mitigation strategy and actions ○ Funding Sources for disaster recovery ○ Collaborated on sending meeting invites to local businesses ○ Relationship between ED, Regional Planning Commission, Port Authority, and WC Businesses
Warren County Telecommunications	In-Person Meeting	○ System upgrades that help mitigate communication losses ○ Upcoming projects that help mitigate infrastructure losses in the county
Warren County Soil and Water	In-Person meeting	○ Assistance with development of invasive species section of Meeting 1 (which was adapted and incorporated into the plan)
Warren County Health District	In-Person Meeting	○ Assistance with Development of infectious disease section of Meeting 1 (which was adapted and incorporated into the plan)

Agency / Group	Method of Collaboration	Discussion Topics
Warren County GIS	Email / Phone Calls	○ Assisted with map production and damage estimates for disasters
Warren County Schools	In-Person Safety Assessments & Attendance at Planning Meetings	○ State of school plans, processes, procedures, and building infrastructure ○ Response, recovery, and mitigation strategies for emergencies and disasters
Electric Utility Providers (DP&L and Duke)	Email / Phone Calls	○ Mitigation actions taken over the last five years ○ Updates in processes/procedures that contribute to mitigation
Ohio Department of Transportation	Email / Phone Calls	○ Mitigation actions taken over the last five years ○ Updates in processes/procedures that contribute to mitigation
Miami Conservancy District	Email / Phone Calls	○ Update on 2015 Mitigation Projects ○ Inclusion in the 2020 HMP planning process ○ Updates on the 2020 Mitigation Strategies
Water/Sewer Providers for Warren County (Cinti Water Works, Springboro Water, WC Water/Sewer)	Email / Phone Calls	○ Mitigation actions taken over the last five years ○ Updates in processes/procedures that contribute to mitigation
Railroad Companies (CSX)	Email / Phone Calls	○ Mitigation actions taken over the last five years ○ Updates in processes/procedures that contribute to mitigation
Village of Harveysburg	In-Person Meeting	○ Hazard Mitigation Planning Process ○ Funding sources for potential flooding issues
Warren County Fairgrounds	In-Person Meeting	○ Discuss emergency planning and mitigation actions that would reduce risk at the fairgrounds
The National Weather Service Office in Wilmington, OH	Emails / Phone Calls	○ Collaborated on severe weather data included in the meetings/plan ○ Asked for input on how climate change is affecting hazards in SW Ohio

Throughout the planning process the documents provided in the hazard profile section and the mitigation strategy section were reviewed by community stakeholders. This information was presented at community meetings one and two and were emailed to planning team members after the meetings so that they could review and provide additional content. After the review period ended, the revised information was placed into the Plan.

Once drafted, this plan was posted on Warren County EMA's website. County departments, jurisdictional representatives, and partner organizations were invited via email to review the draft plan and provide comments to Warren County EMA on its contents. The public was invited to do the same via social media post and notification to local media outlets.

2.3 PLAN ADOPTION AND RESOLUTION BY COMMISSIONERS

BOARD OF COUNTY COMMISSIONERS
WARREN COUNTY, OHIO

Resolution

Number_____ *Adopted Date*

IN THE MATTER OF RESOLUTION OF ADOPTING THE 2021 WARREN COUNTY HAZARD MITIGATION 5-YEAR PLAN UPDATE

WHEREAS, The Warren County Emergency Management Agency desires to be compliant with the Disaster Mitigation Act of 2000 and 44 CFR Section 201.6(d)(3). Said Act requires that a Hazard Mitigation Plan meeting program criterion be developed in order that the participating Warren County Communities and unincorporated areas of Warren County will be eligible for future pre-disaster and post-disaster mitigation program funds (i.e. Hazard Mitigation Grant Program, Flood Mitigation Assistance Program, etc.)

FURTHER, the mitigation planning regulation at 44 CFR Section 201.6(d)(3) states:

> A local jurisdictions must review and revise its Hazard Mitigation plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within five (5) years in order to continue to be eligible for mitigation project grant funding.

WHEREAS, the Warren County Emergency Management Agency established the Warren County Hazard Mitigation Planning Team and they have, through an organized planning process, identified local problems and mitigation activities to help reduce hazards, damages, and loss of life during a natural hazard event. Public meetings were held, and a Countywide Hazard Mitigation Plan update was prepared and submitted to the Ohio Emergency Management Agency for review and comment in August 2020. Said Plan has been completed per the Ohio Emergency Management Agency recommendations. Said Plan is on file at the office of Warren County Department of Emergency Services and is hereby formally adopted.

WHEREAS, by adopted Resolution, the Warren County Emergency Management Agency has entered into an agreement, in the manner provided by law, under the Ohio Revised Code, as amended, and has the power to coordinate and unify the comprehensive Emergency Management activities of the participants, thereof, including the various municipal corporations and unincorporated areas of Warren County, Ohio.

For the reasons stated in the preamble hereto, which is hereby declared to be an emergency measure and shall take effect and be in force from and after its passage by the Warren County Board of Commissioners, and its adoption by the participating municipalities of Warren County.

Mr. Grossmann–
Mr. Young -
Mrs. Jones -

Resolution adopted this day of 2020.

BOARD OF COUNTY COMMISSIONERS

Clerk

cc: Emergency Services (file)
*CI*A-Ohio Emergency Management Agency

2.4 PLAN ADOPTION BY JURISDICTION

Municipal Resolution No. _____

A RESOLUTION ADOPTING THE WARREN COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION 5 YEAR PLAN UPDATE

WHEREAS, Warren County has experienced severe damage from several natural hazards on many occasions in the past century, resulting in property loss, loss of life, economic hardship, and threats to public health and safety; and

WHEREAS, the Warren County Emergency Management Agency desires to be compliant with the Disaster Mitigation Act of 2000 and 44 CFR Section 201.6(d)(3). Said Act requires that a Hazard Mitigation Planning program criteria be developed in order that the participating Warren County communities and unincorporated areas of Warren County will be eligible for future pre-disaster and post-disaster Hazard Mitigation Grant Program (HMGP) funding.

FURTHER, the mitigation planning regulation at 44 CFR Section 201.6(d)(3) states:

A local jurisdiction must review and revise its Hazard Mitigation Plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within five (5) years in order to continue to be eligible for mitigation project grant funding.

WHEREAS, the Warren County Emergency Management Agency has established the Warren County Hazard Mitigation Planning Committee and they have, through an organized planning process, identified local problems and mitigation activities to help reduce hazards, damages, and loss of life during a natural hazard event; and

WHEREAS, the 2021 5-Year Plan Update recommends many hazard mitigation actions that will protect the people and property affected by the natural hazards that face Warren county; and

WHEREAS, the Warren County Hazard Mitigation Committee held monthly public planning meetings from November 2019 through March 2020 to review and revise the Plan as required by law; and will hereby be implemented, monitored, evaluated, and updated annually by the Warren County Hazard Mitigation Committee. The Warren County Board of Commissioners will be the public authority to promote and oversee the continued maintenance of this Plan.

NOW, THEREFORE, BE IT RESOLVED by the council of the village/city of _____, Warren County, Ohio, the majority of all members elected thereto concurring, that:

Section 1: The Warren County Hazard Mitigation 5-Year Plan Update is hereby adopted as the official Multi-Jurisdictional Plan of Warren County, Ohio. By participating in the Warren County Plan and county planning process this municipality will be eligible to make applications for Hazard Mitigation Grant Program funding

Section 2: The Warren County Emergency Management Agency has entered into an agreement, in the manner provided by law, under the Ohio Revised Code, as amended, and has the power to coordinate and unify the comprehensive emergency management activities of the participants, thereof, including the various municipal corporations and the unincorporated jurisdictions of Warren County, Ohio, and

Section 3: The respective County, City, and Village officials identified in the strategy of the 5-Year Hazard Mitigation Plan Update are hereby requested to participate in addressing the recommended mitigation actions assigned to them. These officials will report annually on their hazard mitigation activities, accomplishments, and progress to the Warren County Hazard Mitigation Committee under the direction of the Warren County Board of Commissioners.

Section 4: This resolution shall take effect and be in force from and after the earliest period allowed by law.

Passed/Adopted: _____ _____

Date President of Council

Attest: _____ _____

Clerk of Council Mayor

3.0 HAZARD IDENTIFICATION AND RISK ASSESSMENT

OVERVIEW

Warren County is prone to many natural hazards. The County has experienced considerable hazard events resulting in millions of dollars of damage. Warren County has put together a Hazard Mitigation Plan as an overall effort to reduce future exposure to damages and meet planning requirements of the Disaster Mitigation Act of 2000.

3.1 IDENTIFYING HAZARDS

Section 201.6(c)(2)(i) requires the risk assessment include a description of the type of hazards that can affect Warren County. This section of the plan presents a list of potential hazards that may likely impact Warren County. To determine the hazards that pose the greatest threat to the county, the Warren County Mitigation Committee updated the list of potential hazards by conducting a review of several key resources which include:

- Review of historical data on events that have occurred since the 2015 Plan update
- Review of 2015 Warren County Plan data
- Review of the State Hazard Mitigation Plan data
- Collaboration with community experts and agencies
- Review of past events and state and federally declared disasters
- Internet research

3.2 PROFILING HAZARDS

Section 201.6(c)(2)(i) requires that the risk assessment shall include a description of the location and extent of hazards that can affect Warren County including information on previous occurrences of hazard events, as well as the probability of future hazard events. The risk assessment relies upon information about past hazard events from published sources such as the National Oceanic and Atmospheric Administration (NOAA), the United States Geological Survey (USGS), United States Army Corp of Engineers (USACE), Ohio Emergency Management Agency (OEMA), Ohio Department of Natural Resources (ODNR), and Warren County records, as well as other agencies.

3.3 ASSESSING VULNERABILITY BY IDENTIFYING ASSETS AND CRITICAL INFRASTRUCTURE

Section 201.6(c)(2)(ii) requires a description of each jurisdiction's vulnerability to the hazards described and the description shall include an overall summary of each hazard and its impact on the community.

Each member of the Mitigation Planning Committee was asked to score the hazards across multiple categories (see Figure 11 for an example hazard ranking sheet). The criteria for each risk factor score was provided in an explanation sheet (see Figure 12). After reviewing the hazards and potential impacts, planning committee members filled out the ranking sheets according to risks and capabilities for their jurisdictions. Category scores were added together per jurisdiction and that raw score was multiplied by the probability score to show realistic weight of how the hazard affects Warren County. The final hazard rankings were compiled from an average of the individual ranking sheet scores.

The final hazard list includes 14 hazards for Warren County, which are listed in order of ranking:

1. Wind/Severe Storms	28.29	8. Dam Failures	16.36
2. Floods	26.02	9. Extreme Temperatures	15.61
3. Tornadoes	23.99	10. Earthquakes	13.63
4. Hazmat Incidents	21.86	11. Landslides	12.63
5. Winter Storms	20.36	12. Drought	12.07
6. Man-Made/ Terrorism Events	18.43	13. Infectious Disease Outbreaks	11.5
7. Invasive Species	16.50	14. Wildfires	9.41

Figure 11: Example of Hazard Ranking Sheet from Planning Meeting #1

			Severity = (magnitude-mitigation)					
	Probability	**Warning Time**	**Impact**				**Preparedness**	
	Likelihood of Event occurring	Amount of time the community has to prepare for the hazard	Property Impact	Spatial Extent	Population Impact	Economic Impact	Jurisdictional Response/ Capabilities/Assets	Mitigation efforts in place
	Based on relative data and/or current threats	Is there some lead time associated with the warning?	Physical losses and damages **Include 5 yr future land development impacts*	How large of an area would be impacted by a hazard event? Are impacts localized or regional?	Effect the hazard would have on the population. This includes injuries, deaths, and disruptions to quality of life	The impact the event will have on the local economy.	Includes plans, training, exercises, and equipment in place to respond to specific hazard. Also includes readiness of responders to specific hazard events.	Plans, Processes, Procedures, or equipment in place to reduce risk or the severity or impact of the specific hazard.
Example of Hazard Ranking Sheet	**1** = Unlikely **2** = Possible **3** = Likely **4** = Highly Likely	**1** = Public has DAYS of warning time before event **2** =Public has HOURS of warning time before event **3** = Public has **MINUTES** of warning time before event **4** = Public has **LITTLE** to **NO** warning time before event occurs.	**1 =** Affected **2 =** Minor **3 =** Major **4 =** Destroyed	**1** = **Negligible-** Less than 1% area affected **2** = **Small** - btwn 1% and 10% of area affected **3** = **Moderate** - btwn 10% and 50% area of area affected **4** = **Large** - btwn 50% & 100% of area affected	**1** = Minor **2** = Limited **3** = Critical **4** = Catastrophic	**1** = Minor **2** = Limited **3** = Critical **4** = Catastrophic	**1** = N/A **2** = Fully prepared and have capable resources **3** = somewhat prepared, have limited resources **4** = Not prepared, no resources	**1**= not needed **2** = Adequate Mitigation measures in place **3** = some mitigation measures in place **4** = very limited or no mitigation measures in place
Dam Failure								
Drought								
Earthquake								
Extreme Temperatures								
Flood								
Hazmat Incident								
Invasive Species								
Landslide								
Man-made / Terrorism								
Tornado								
Wildfire								
Wind / Severe Storm								
Winter Storm								

Copies of jurisdictional / agency completed hazard rankling sheets were filed with WCDES and provided in the mitigation binders given to HMP participants.

Figure 12: Risk Factor Criteria Explanation for Hazard Ranking Sheet

Warren County Hazard Mitigation Planning
RISK FACTOR CRITERIA EXPLANATION

RISK FACTOR CRITERIA				
RISK ASSESSMENT CATEGORY	**EXPLANATION**	**LEVEL**	**DEGREE OF RISK LEVEL**	**INDEX**
PROBABILITY	**What is the likelihood of a hazard event occurring in a given year?** Based on relative data and/or current threats.	**UNLIKELY**	Less than 1% annual probability	**1**
		POSSIBLE	Between 1 & 10% annual probability	**2**
		LIKELY	Between 10 &100% annual probability	**3**
		HIGHLY LIKELY	100% annual probability	**4**
WARNING TIME	**The amount of time that a community has to prepare for a specific hazard.**	**DAYS**	The public has days of warning time before the event occurs.	**1**
		HOURS	The public has hours of warning time before the event occurs.	**2**
		MINUTES	The Public has minutes of warning time before the event occurs.	**3**
		NO WARNING	The public may not have any advanced warning before event occurs.	**4**
PROPERTY IMPACT	**Degree of physical losses and damages that would occur to properties for the specific event.** **This ranking needs to include 5-year projections for land use trends and future development trends in order to assess future impact.*	**AFFECTED**	Properties may be affected by the event. Buildings may receive minimal damage to structure and/or contents and homes are habitable or business are operational without repairs.	**1**
		MINOR	Properties may be minorly affected by the event. Encompasses a wide range of damage that does not affect the structural integrity of the buildings.	**2**
		MAJOR	The building has sustained structural or significant damages, homes are uninhabitable, or businesses are not operational, and damages require extensive repairs.	**3**
		DESTROYED	Home or business is a total loss or damages to such an extent that repairs are not economically feasible.	**4**
SPATIAL EXTENT	***How large of an area could be impacted by a hazard event? Are impacts localized or regional?***	**NEGLIGIBLE**	Less than 1% of area affected	**1**
		SMALL	Between 1 & 10% of area affected	**2**
		MODERATE	Between 10 & 50% of area affected	**3**
		LARGE	Between 50 & 100% of area affected	**4**
POPULATION IMPACT	**Effect the hazard would have on the population. This includes injuries, deaths, and disruptions to quality of life** *(which could include power for medical equipment or other needs, access to clean water or food sources, access to heat or air, need for sheltering away from homes, etc.)*	**MINOR**	Very few injuries, if any. Minimal disruption of quality of life. Temporary shutdown of critical facilities.	**1**
		LIMITED	Minor injuries only. Some disruption to quality of life. Complete shutdown of critical facilities for more than one day.	**2**
		CRITICAL	Multiple deaths/injuries possible. Moderate disruption to quality of life. Complete shutdown of critical facilities for more than one week.	**3**
		CATASTROPHIC	High number of deaths/injuries possible. Complete shutdown of critical facilities for 30 days or more.	**4**
ECONOMIC IMPACT	**The impact the event will have on the local economy.** *This includes limited access to the area due to damaged infrastructure, limited access to schools or employers due to damages, limited tourism to boost the economy, etc.*	**MINOR**	Minor impact on local economy. Minor impact to infrastructure that could delay access to the community for a short period of time. Schools, businesses, and tourism remain open.	**1**
		LIMITED	Limited impact on the local economy. Retained access to a majority of infrastructure, schools and majority of businesses still open	**2**
		CRITICAL	Major impact on the local economy. Large portion of local infrastructure is moderately affected. Schools and many businesses are closed for a one week or longer. Tourism or other tax base affected.	**3**
		CATASTROPHIC	Catastrophic impact on the local economy. Majority of infrastructure is damaged or destroyed. Schools and many businesses are closed for longer than one week affecting childcare and employment. Tourism or other tax base is highly affected.	**4**

Warren County Hazard Mitigation Planning
RISK FACTOR CRITERIA EXPLANATION

RISK ASSESSMENT CATEGORY	EXPLANATION	LEVEL	DEGREE OF RISK LEVEL	INDEX
JURISDICTIONAL RESPONSE/ CAPABILITIES & ASSETS	**Jurisdictional response includes having plans in place that cover incident response, continuity of government, and recovery operations for the specific hazard event.** It also includes the level of training and readiness of those involved in incident response and the capabilities/ assets they must be able to adequately respond to and recover from the specific hazard event.	**FULLY PREPARED & HAVE CAPABLE RESOURCES**	Jurisdiction has prepared for hazard through planning, training, education, and exercises. Jurisdiction has enough resources on hand to respond to event.	**1**
		MODERATELY PREPARED & HAVE ACCESS TO ADEQUATE RESOURCES	Jurisdiction has prepared for event through training and planning. Jurisdiction has some resources available to respond to the event and can utilize nearby mutual aid to supplement needed equipment, personnel, and supplies.	**2**
		SOMEHWAT PREPARED WITH LIMITED ACCESS TO RESOURCES	Jurisdiction has planned for the event but has no special training, education, or exercises to prepare for the specific event. Jurisdiction can utilize mutual aid from other counties or through the state to supplement needed equipment, personnel, and supplies, but wait times and availability may be limited.	**3**
		NOT PREPARED OR NO ACCESS TO RESOURCES	Jurisdiction has no specific plans, training, exercises or education on the specific hazard. Jurisdiction may not have access to adequate equipment, personnel, and supplies within the first 48 -72 hours of event.	**4**
MITIGATION EFFORTS IN PLACE	**Includes plans, processes, and procedures for mitigating risks or effects from specific hazard events. This could include building code enforcement in hazard areas, trained personnel for hazard-specific events (i.e. floodplain manager)**	**MITIGATION MEASURES NOT NEEDED**	No mitigation measures are needed to lessen the risk of the specific hazard or to lessen the severity or impact of the specific hazard.	**1**
		ADEQUATE MITIGATION MEASURES IN PLACE	Jurisdiction has adequate mitigation measures in place to lessen the risk of the specific hazard or to lessen the severity or impact of the specific hazard. Limited or no mitigation measures are still needed to further lessen the risk or severity and impact of the specific hazard.	**2**
		SOME MITIGATION MEASURES IN PLACE	Some mitigation measures are in place to lessen the risk of the specific hazard or to lessen the severity or impact of the specific hazard. More mitigation measures are needed due to the risk or severity/impact of the specific hazard to this jurisdiction.	**3**
		VERY LIMITED OR NO MITIGATION MEASURES IN PLACE	Jurisdiction has very limited or no mitigation measures in place that would lessen the risk of the specific hazard or that would lessen the severity or impact of the specific hazard. Mitigation measures are needed based on risk, severity, or impact of the specific hazard event.	**4**

3.0 PROFILE OF EACH HAZARD

The Planning Team compiled extensive research from jurisdictional representatives, industry experts, and internet searches to determine hazard profiles for each hazard listed in the plan. The resulting hazard profiles were published and presented at community Planning Meeting 1 with copies published in the jurisdictional / agency binders. Profiles listed below are in order of the county's hazard ranking.

4.1 WIND /SEVERE STORMS

DEFINITION:

Severe thunderstorms are officially defined as storms capable of producing hail that is an inch or larger, wind gusts over 58 mph, or that could form a possible tornado. Severe storms can also be defined as any destructive summer weather event with the potential to damage property or cause loss of life.

PRIMARY SOURCES OF INFORMATION:

- *National Weather Service* - https://www.weather.gov/safety/thunderstorm-ww
- *National Centers for Environmental Information* - https://www.ncdc.noaa.gov/stormevents
- *Past Data* - https://w2.weather.gov/climate/index.php?wfo=

DESCRIPTION:

Types of wind:

Damaging winds are classified as those exceeding 50-60 mph. There are multiple types of wind that cause damage.

- **Straight-line wind** is a term used to define any thunderstorm wind that is not associated with rotation and is used mainly to differentiate from tornadic winds.
- **Downdraft** is a small-scale column of air that rapidly sinks toward the ground.
- **Macroburst** is an outward burst of strong winds at or near the surface with horizontal dimensions larger than 2.5 miles and occur when a strong downdraft reaches the surface. Macroburst winds begin over a smaller area and then spread over a wider area, sometimes producing damage similar to a tornado.
- **Microburst** is a small concentrated downburst that produces an outward burst of strong winds at or near the surface. Microbursts are small, less than 2.5 miles across, and short-lived, lasting only 5 to 10 minutes, with maximum windspeeds sometimes exceeding 100 mph. There are two kinds of microbursts: wet and dry. A wet microburst is accompanied by heavy precipitation at the surface. Dry microbursts, common in places like the high plains and the intermountain west, occur with little or no precipitation reaching the ground.
- **Downburst** is the general term used to broadly describe macro and microbursts. Downburst includes generally all localized strong wind events that are caused by a strong downdraft within a thunderstorm, while microburst simply refers to an especially small downburst that is less than 2.5 miles across.
- **Gust front** is the leading edge of rain-cooled air that clashes with warmer thunderstorm inflow. Gust fronts are characterized by a wind shift, temperature drop, and gusty winds out ahead of a thunderstorm.
- **Derecho** is a widespread, long-lived windstorm that is associated with a band of rapidly moving showers or thunderstorms. A typical derecho consists of numerous microbursts, downbursts, and downburst clusters. By definition if the wind damage swath extends more than 240 miles (about 400 kilometers) and includes wind gusts of at least 58 mph (93 km/h) or greater along most of its length, then the event may be classified as a derecho.
- **Haboob** is a wall of dust pushed out along the ground from a thunderstorm downdraft at high speeds.

Types of Thunderstorms:

- **Single-cell storms** are small, brief, weak storms that grow and die within an hour or so and may produce brief heavy rain and lightning. They are typically driven by heating of the atmosphere on a summer afternoon.
- **Multi-Cell storm** is a storm where updrafts form along the leading edge of rain-colored air that may produce hail, strong winds, brief tornadoes, and/or flooding. Individual cells usually last 30-60 minutes while the system may last for hours.

- **Squall line** is a group of storms arranged in a line often accompanied by squalls of high winds and heavy rain. Squalls tend to pass quickly and are less prone to produce tornadoes than supercells.
- **Supercell** is a long-duration and highly organized storm feeding off an updraft. Squall lines can be present as much as 20-60 minutes before a tornado forms.
- **Mesoscale Convective System (MCS)** is a collection of thunderstorms that act as a system. An MCS can spread across an entire state and last more than 12 hours.
- **Mesoscale Convective Complex** is a large, circular, long-lived cluster of showers and thunderstorms that emerge out of other storm types during late-night and early-morning hours.

Other potential factors resulting from thunderstorms:

- **Hail** is a form of precipitation consisting of solid ice that forms inside thunderstorm updrafts.
- **Lightning** is a large spark of electricity in the atmosphere between clouds, the air, or the ground.
- **Flash Flooding** is a result of a rapid rise of water over low-lying areas which can result from a large thunderstorm.

HISTORY / OCCURRENCES:

According to the National Centers for Environmental Information Storm Events Database, there have been nearly 300 severe wind events in Warren County since 1964. There have also been 43 instances of hail reported in Warren County during same timeframe (reference Appendix 2 for recorded storm events per jurisdiction.) These events only catalog storms with high winds and damage.

Occurrences

Table 20 depicts the reportable severe wind or thunderstorm events that have occurred in Warren County. Appendix 2 includes a more detailed description of storm events for the county broken down by region.

Table 20: Table of Reportable Severe Wind or Thunderstorm Events for Warren County

Severe Storm Event Type	Description	Number of Events	Injuries	Deaths	Property Damages
Thunderstorm	Wind gusts over 58mph, hail 1" or larger	25	1	0	$29,069,000
High Wind	Any wind damage under 58 mph (regardless if it was connected to a storm or not)	272	4	0	$1,570,500
Lightning	Direct or Indirect Strikes	5	6	3	$2,250,000
Hail	All hail events reported (regardless if it was connected to a storm or not)	32	0	0	$2,563,000
Total					**$35,452,500**

Source: NWS Wilmington and the National Center for Environmental Information (NCEI)

PROBABILITY OF OCCURRENCE / RISK:

[historical year where tracking began (1964)] subtracted by [current year (2019)] = **55** Years on Record
[Years on Record (55)] divided by [number of historical events (300)] = .183
It can be reasonably assumed that this type of event has occurred approximately 5.4 times per year from 1964 through 2019.

Probability of type per occurrence:

0-49 mph	50-59mph	60-69 mph	70+ mph
18%	72%	7%	2%

DAMAGES FROM WIND / SEVERE STORMS

Wind Speed Damages:

MPH	Description of Damage
39-46 mph	Twigs are broken from trees and cars veer on roads.
47-54 mph	Light structural damage occurs.
55-63 mph	Trees are uprooted, and considerable structural damage occurs.
64-75 mph	Widespread structural damage occurs.

Damage Extent:

Spatial Extent
Localized for small storm cells or widespread for supercell storms.
Estimated losses
According to the State of Ohio Hazard Mitigation Plan, the estimated property and crop loss (based on 2008-2017 data) to Warren County from several severe storms occurring over a year period could equal roughly $367,000. Combined with critical facility damages and hail damage, estimated damages could equal up to $861,000 annually. Average annual losses based on the last five years of reported damages equal $8,896.43, however, this amount could be as high as $800,000 if crop losses occur or mass tree removal is needed.
Critical Infrastructure Affected
Potentially all critical infrastructure could be affected by the impacts or cascading effects of wind/ severe storms.

WARNING:

The National Weather Service issues the following warning for severe storms and wind events:

- **Severe Thunderstorm Watch:** is issued by NOAA when severe thunderstorms are possible in and near the watch area. Winds 58 mph or higher and/or hail 1" or larger are possible in a severe thunderstorm.
- **Severe Thunderstorm Warning:** is issued when severe thunderstorms are occurring or are imminent in the warning area. Severe thunderstorms have wind 58 mph or higher and/or hail 1" or larger.
- **Wind Advisory**: indicates that strong wind gusts between 46 – 57 mph or sustained winds of 31-39 mph for an hour or longer are occurring. Wind Advisories are issues during non-convective weather patterns.
- **High Wind Watch**: issued when wind gusts of 58 mph or greater are expected.
- **High Wind Warning**: Sustained, strong winds of 40 mph or higher are expected for at least one hour or longer.
- **Dust Storm Warning**: A Dust Storm Warning is issued when visibility is of 1/2 mile or less due to blowing dust or sand, and wind speeds occur of 30 miles per hour or more.

CONDITIONS THAT MAY EXACERBATE OR MITIGATE THE EFFECTS OF WIND OR SEVERE STORMS:

Thunderstorms require three ingredients to form: Moisture, unstable air, and a source of lift. After a thunderstorm develops, there is a maturation stage consisting of updrafts and downdrafts. The warm air becomes unstable at this stage which is where severe weather occurs.

El Niño and La Niña patterns can affect the intensity of storms and their effects through their alterations of the jet streams which lift warm, moist air into the atmosphere.

4.2 FLOODS

DEFINITION:

Floods occur when water is delivered to a water body (i.e. stream, river, lake) at a rate and in an amount that is greater than normal. There are multiple ways in which floods can occur:

- By an overflow or inundation coming from a river or water body that causes or threatens damage
- Any relatively high streamflow overtopping the natural or artificial banks in any reach of a stream
- Through excessive amount of rainfall in a short period of time in one location

PRIMARY SOURCES OF INFORMATION:

- *National Weather Service* - https://www.weather.gov/safety/flood-hazards
- *Past Data:* https://www.weather.gov/iln/events

DESCRIPTION

Types of floods:

- **Flash floods** – generally develop within 6 hours of the immediate cause (which could include heavy rain, slow-moving thunderstorms, ice or debris jams, and levee or dam failure). These floods exhibit a rapid rise of water over low-lying areas or a large amount of water that cannot be absorbed in urban areas. Flash flooding can cause small streams to become rapid, violent rivers, and can produce rapid runoff over mountainous terrain.
- **River Flooding** – occurs when river levels rise and overflow their banks or edges of their main channel and inundate areas that are normally dry. River flooding can be caused by heavy rainfall, dam failures, rapid snowmelt and ice jams.
- **Burn Scars / debris flows** – in areas where wildfires have occurred, vegetation may have been burned away and soil properties may have been altered, leaving behind bare ground that tends to repel water (which is called a burn scar). When rain falls over a burn scar the ground is unable to absorb the moisture, leaving the water to collect or run across the surface of the ground towards the lowest point.
- **Urban flooding** - is the result of development and the ground's decreased ability to absorb excess water without adequate drainage systems in place. Typically, this type of flooding occurs when land uses change from fields or woodlands to roads and parking lots. Urbanization can increase runoff two to six times more than natural terrain. The flooding of developed areas may occur when the amount of water generated from rainfall and runoff exceeds a storm water system's capability to remove it.
- **Ice / debris Jams** - are stationary accumulations of ice or debris that restrict flow. As ice or debris moves downstream, it may get caught on obstructions to the water flow. When this occurs, water can be held back, causing upstream flooding. When the jam finally breaks, flash flooding occurs downstream.

Flood Stage Categories:

Flood categories are terms defined for each gage location that describe or categorize the observed or expected severity of flood impacts in the corresponding stream segment or nearby stream. The severity of flooding at a given stage is not necessarily the same at all locations along a stream due to varying channel / bank characteristics of the stream. The flood categories used in the NWS are minor, moderate, and major flooding, but all three of the flood categories do not necessarily exist for each gage location. Record flooding is flooding that equals or exceeds the highest stage of discharge at a given site during the period of record keeping.

- **Action Stage** - the stage which, when reached by a rising stream, represents the level where the NWS or a partner / user needs to take some type of mitigation action in preparation for possible significant hydrologic activity. The type of action taken varies for each gage location. Gage data should be closely monitored by any affected people.
- **Flood Stage** - an established gage height for a given location, above which a rise in water surface level begins to create a hazard to lives, property, or commerce. The issuance of flood advisories or warnings is linked to flood stage. Not necessarily the same as bankfull stage.
- **Moderate Flood stage -** is defined to have some inundation of structures and roads near the stream. Some evacuations of people and / or transfer of property to higher elevations may be necessary.
- **Major Flood stage-** is defined to have extensive inundation of structures and roads. Significant evacuations of people and / or transfer of property to higher elevations are necessary.

HISTORY / OCCURRENCES:

Warren County has been a part of 34 Federal Disaster Declarations that included flooding. The county has been able to avoid the bulk of the damages associated with flood events of this magnitude; however, there have been occurrences of localized riverine and urban flooding, impacting residents and their property.

Table 21: Recorded Flooding Occurrences in Warren County

LOCATION	DATE	MAGNITUDE	DEATH	INJURY	PROPERTY DAMAGE		LOCATION	DATE	MAGNITUDE	DEATH	INJURY	PROPERTY DAMAGE
Warren County	4/29/1996	Flood	0	0	$3,000		Mason	6/6/2001	Flash Flood	0	0	$3,000
Warren County	4/29/1996	Flash Flood	0	0	$2,000		Warren County	6/6/2001	Flash Flood	0	0	$10,000
Warren County	5/4/1996	Flash Flood	0	0	$10,000		Waynesville	6/12/2001	Flash Flood	0	0	$3,000
Warren County	5/11/1996	Flood	0	0	$0		Mason	7/17/2001	Flash Flood	0	0	$604,000

LOCATION	DATE	MAGNITUDE	DEATH	INJURY	PROPERTY DAMAGE		LOCATION	DATE	MAGNITUDE	DEATH	INJURY	PROPERTY DAMAGE
Deerfield TWP	5/11/1996	Flash Flood	0	0	$3,000		Mason	8/11/2001	Flash Flood	0	1	$0
Warren County	6/1/1997	Flood	0	0	$1,000,000		Warren County	12/17/2001	Flood	0	0	$0
Warren County	6/1/1997	Flash Flood	0	0	$10,000		Warren County	5/7/2002	Flood	0	0	$0
Mason	6/18/1997	Flash Flood	0	0	$5,000		Warren County	7/23/2002	Flood	0	0	$2,000
Mason	7/14/1997	Flash Flood	0	0	$100,000		Warren County	7/27/2002	Flood	0	0	$2,000
Loveland Park	7/22/1997	Flash Flood	0	0	$500,000		Five Points	7/27/2002	Flash Flood	0	0	$8,000
Warren County	4/16/1998	Flash Flood	0	0	$2,000,000		Warren County	9/27/2002	Flood	0	0	$0
Warren County	4/16/1998	Flood	0	0	$0		Warren County	9/27/2002	Flood	0	0	$0
Warren County	1/3/2000	Flash Flood	0	0	$10,000		Warren County	11/10/2002	Flood	0	0	$0
Morrow	2/13/2000	Flash Flood	0	0	$5,000		Warren County	5/10/2003	Flood	0	0	$0
Warren County	2/18/2000	Flood	0	0	$0		Lebanon	6/16/2003	Flash Flood	0	0	$20,000
Mason	5/18/2001	Flash Flood	0	0	$5,000		Warren County	6/17/2003	Flood	0	0	$30,000
Warren County	7/10/2003	Flood	0	0	$0		Lebanon	5/21/2010	Flash Flood	0	0	$1,000
Warren County	7/15/2003	Flood	0	0	$0		Lebanon	5/21/2010	Flash Flood	0	0	$10,000
Warren County	8/15/2003	Flood	0	0	$0		Stubbs Mills	4/19/2011	Flood	0	0	$1,000
Warren County	9/2/2003	Flood	0	0	$0		Lebanon	12/5/2011	Flood	0	0	$1,000
Warren County	9/2/2003	Flood	0	0	$0		Socialville	1/17/2012	Flood	0	0	$1,000
Warren County	1/4/2004	Flood	0	0	$0		Crosswick	1/26/2012	Flood	0	0	$1,000
Warren County	1/4/2004	Flood	0	0	$0		Mason	7/6/2013	Flash Flood	0	0	$1,000
Warren County	1/4/2004	Flood	0	0	$0		Springboro	7/6/2013	Flash Flood	0	0	$1,000
Warren County	5/19/2004	Flood	0	0	$0		S. Lebanon	7/6/2013	Flood	0	0	$10,000
Warren County	1/5/2005	Flood	0	0	$10,000		Union Village	7/6/2013	Flash Flood	0	0	$1,000
Warren County	1/5/2005	Flash Flood	0	0	$20,000		Lebanon	12/22/2013	Flood	0	0	$0
Warren County	1/5/2005	Flood	0	0	$10,000		Lebanon/Morrow	3/1/2017	Flood	0	0	$0
Warren County	1/11/2005	Flood	0	0	$10,000		Warren County	4/28-29/2017	Flash Flood	0	0	$0
Warren County	3/28/2005	Flood	0	0	$0		Springboro	6/14/2017	Flood	0	0	350,000
Warren County	6/30/2005	Flood	0	0	$0		Loveland	6/23/2017	Flash Flood	0	0	$0
Lebanon	3/12/2006	Flash Flood	0	0	$0		Lebanon	7/13/2017	Flood	0	0	$0
Maineville	4/7/2006	Flash Flood	0	0	$0		Mason	11/6/2017	Flood	0	0	$0
Mason	6/26/2007	Flood	0	0	$0		Warren County	4/3/2018	Flood	0	0	$0
Kings Mills	3/4/2008	Flood	0	0	$3,000		Franklin	6/8/2018	Flood	0	0	$0
Socialville	3/18/2008	Flood	0	0	$5,000		Lebanon	9/3/2018	Flood	0	0	$60,000
South Lebanon	3/18/2008	Flash Flood	0	0	$30,000		Morrow	2/7/2019	Flood	0	0	$0
Warren County	5/15/2008	Flood	0	0	$2,000		Waynesville	2/7/2019	Flood	0	0	$0
Mason	6/26/2009	Flash Flood	0	0	$20,000		Lebanon	6/17-18-2019	Flood	0	0	$0
Morrow	8/4/2009	Flash Flood	0	0	$15,000		Waynesville	6/17-18-2019	Flood	0	0	$0
Lebanon	5/21/2010	Flash Flood	0	0	$2,000		S. Lebanon	7/3/2019	Flood	0	0	$0
	Totals									**0**	**1**	**$4,900,000**

Repetitive loss properties

A Repetitive Loss property (RL) is any insurable building for which two or more claims of more than $1,000 were paid by the National Flood Insurance Program within a rolling 10-year period, since 1978. A Severe Repetitive Loss property is one which the program has made at least four payments for building / contents of more than $5,000 or at least two building-only payments that exceed the value of the property.

Table 22: Repetitive Loss Properties

Community Name	Occupancy	Zone	Tot Building Payment	Tot Contents Payment	Losses	Total Paid
LEBANON, CITY OF	SINGLE FMLY	X	$4,123.32	$0	2	$4,123.32
MASON, CITY OF	BUSI-NONRES	C	$33,638.38	$933.8	3	$34,572.18
MORROW, VILLAGE OF	SINGLE FMLY	A11	$,2720	$530	2	$,3250
SOUTH LEBANON, VILLAGE OF	SINGLE FMLY	AE	$182,856.08	$29,008.19	4	$211,864.27
SOUTH LEBANON, VILLAGE OF	SINGLE FMLY	AE	$22,323.05	$2,128.3	4	$24,451.35
SOUTH LEBANON, VILLAGE OF	SINGLE FMLY	AE	$14,446.02	$0	2	$14,446.02
SOUTH LEBANON, VILLAGE OF	SINGLE FMLY	AE	$67,491.72	$2,509.61	5	$70,001.33
SOUTH LEBANON, VILLAGE OF	SINGLE FMLY	AE	$15,693.56	$16,189.48	3	$31,883.04
SPRINGBORO, CITY OF	OTHR-NONRES		$1,459.79	$11119.26	2	$12,579.05
WARREN COUNTY*	SINGLE FMLY	X	$34,162.35	$1,159.66	3	$35,322.01
WARREN COUNTY*	SINGLE FMLY	A14	$5,389.38	$0	2	$5,389.38
WARREN COUNTY*	SINGLE FMLY	X	$72,888.41	$45,073.09	2	$117,961.50
WARREN COUNTY*	SINGLE FMLY	AE	$17,958.61	$0	2	$17,958.61
WARREN COUNTY*	SINGLE FMLY	A02	$5,327.56	$0	2	$5,327.56
		Total	**$476354.91**	**$108,651.40**	36	**$585,006.30**

Source: State of Ohio Mitigation Plan 2019

Historic crests of Warren County Rivers:

Figure 13: Historic Crests of The Great Miami River at Franklin

Historic Crests

- 16.70 ft on 01/22/1937
- 16.60 ft on 03/06/1963
- 17.60 ft on 01/22/1959
- 16.50 ft on 01/07/2005

Last five years

- 10.07 ft on 04/12/2013
- 15.59 ft on 12/22/2013
- 14.33 ft on 02/25/2018
- 14.50 ft on 04/05/2018

Great Miami River at Franklin

Flood Categories (in feet)

Categories	Feet	# instances	Probability per event
Major Flood Stage:	22	0	<1%
Moderate Flood Stage:	17	1	12%
Flood Stage:	14	6	75%
Action Stage:	11	1	12%

22 Feet - Miami Conservancy flood protective levees would be overtopped, resulting in flooding of protected areas of Franklin. Many homes and businesses of Carlisle between the railroad tracks and the river are flooded. Areas most impacted would be west of the river, though areas of Franklin between Main Street and the river along the east bank.

18 Feet - This is roughly equal to the FEMA 1 percent flood. Flood waters extend into yards of numerous homes in areas of Carlisle between the railway tracks and the river on the west bank...with water into the lowest lying homes of this area. Areas of Franklin protected by Miami Conservancy District Levees do not flood until stages at and above 22 feet.

17 Feet - Portions of Dayton-Oxford Road flood, with flood water nearing homes near Carlisle along Dayton-Oxford Road. Areas of Franklin protected by Miami Conservancy District Levees do not flood until stages at and above 22 feet.

16 Feet - In addition to flooding onto low areas of Oxford Road near the railway bridge, water floods basements of riverside apartments along Dayton-Oxford Road. Water extends nearly to Dayton-Oxford Road itself in Carlisle. Areas of Franklin protected by Miami Conservancy District Levees do not flood until stages at and above 22 feet.

15 Feet - In addition to flooding along low areas of Oxford Road near the railway bridge, water approaches riverside apartments along Dayton-Oxford Rd, and flooding of basement apartments may occur. Areas of Franklin protected by Miami Conservancy District Levees do not flood until stages at and above 22 feet.

14 Feet - Flooding occurs along Oxford Road at the railway underpass.

Figure 14: Historic Crests of The Little Miami River at King's Mills

Historic Crests

- 27.20 ft on 03/05/1897
- 33.70 ft on 03/26/1913
- 24.30 ft on 03/19/1933
- 22.10 ft on 05/14/1933
- 24.78 ft on 01/22/1937
- 26.77 ft on 01/25/1937
- 26.77 ft on 04/20/1940
- 24.20 ft on 03/20/1943
- 26.54 ft on 03/06/1945
- 20.05 ft on 07/22/1958
- 31.80 ft on 01/22/1959
- 23.30 ft on 05/09/1961
- 25.68 ft on 03/05/1963
- 25.50 ft on 03/10/1964
- 24.85 ft on 05/24/1968
- 21.80 ft on 09/14/1979
- 19.60 ft on 04/10/1994
- 20.00 ft on 05/11/1996
- 20.00 ft on 06/01/1997
- 24.00 ft on 04/16/1998
- 17.90 ft on 02/18/2000
- 17.80 ft on 06/06/2002
- 21.00 ft on 01/05/2004

Last five years

- 16.90 ft on 12/22/2013
- 17.28 ft on 04/29/2017
- 20.35 ft on 03/01/2017
- 20.52 ft on 11/06/2017
- 22.10 ft on 02/25/2018
- 19.80 ft on 02/06/2019
- 19.67 ft on 02/08/2019

Little Miami River at King's Mills

Flood Categories (in feet)

Categories	Feet	# instances	Probability per event
Major Flood Stage:	31	2	5%
Moderate Flood Stage:	24	11	29%
Flood Stage:	17	24	63%
Action Stage:	13	1	2%

33 Feet - Major flooding in South Lebanon covers about one third of the town, with water several feet deep into homes and businesses between Broadway Street and the river. The Village of Morrow also experiences moderate flooding along streets close to the river and along Todd Fork Creek. Kings Mills Road near Foster is also severely flooded.

31 Feet - Major flooding occurs in South Lebanon, especially buildings between McKinley St. and the river. Water is several feet deep into many homes. Flood waters are several feet deep along Mason-Morrow-Millgrove Rd, as well as on Front St. in Morrow.

30 Feet - This is roughly equal to the FEMA 1 percent flood. Much of South Lebanon between East Pike Street and the river is flooded, including backwater flooding along Turtle Creek and Dry Run. Long stretches of Mason Morrow Millgrove Road are also flooded, as well as much of the village of Morrow.

26 Feet - South Lebanon incurs the worst of the flooding, with homes inundated along South Main St and King Ave in South Lebanon. Long stretches of Mason-Morrow-Millgrove Road is flooded, as well as Front Street in Morrow. Water spills onto Kings Mills Road near Foster.

24 Feet - Flooding along portions of South Main Street, South High Street & King Avenue in South Lebanon is a foot deep or more. Basement flooding of several feet occurs in riverfront homes of South Lebanon. Flooding also occurs along Front and Miami Streets in Morrow and becomes worse along portions of Mason-Morrow-Millgrove Rd. Todd Fork Creek in Morrow experiences backwater flooding resulting in flooding along Front Street and other low-lying roads in Morrow.

• 20.00 ft on 01/06/2005 • 19.00 ft on 03/28/2005 • 18.75 ft on 03/02/2007 • 23.95 ft on 03/19/2008 • 17.33 ft on 04/20/2011 • 16.40 ft on 05/03/2011 • 20.60 ft on 12/06/2011 19.05 ft on 05/02/2012		**22 Feet** - Low-lying roads are affected in South Lebanon including South Main and McKinley Streets and King Avenue. Some homes near the river incur basement flooding in South Lebanon. Lowland flooding can be expected elsewhere in Warren County near the Little Miami River including Mason-Morrow-Millgrove Road. **19.5 Feet** - Flooding can be expected near Turtle Creek in South Lebanon. Roads affected by the flooding include Broadway, McKinley and Pike Streets. **19 Feet** - Flood waters begin to approach low-lying roads in Foster and South Lebanon, in addition to flooding along Front Street in Morrow, Stubbs Mills Road and stretches of Mason Morrow Millgrove Road. **18 Feet** - Several areas along Mason Morrow Millgrove Road are flooded, as well as Front Street in Morrow and Stubbs Mills Road. Portions of Rogers Park in South Lebanon is flooded. **17 Feet** - Flooding of lowland areas occurs from South Lebanon to Foster. Portions of Mason-Morrow-Millgrove Road also flood, as well as Stubbs Mills Road near the river. Front Street in Morrow floods.

Figure 15: Historic Crests of The Little Miami River at Spring Valley

Historic Crests	Last five years	Little Miami River at Spring Valley
• 13.97 ft on 04/20/1920 • 12.60 ft on 01/19/1927 • 16.80 ft on 2/06/1929 • 14.08 ft on 03/19/1933 • 13.55 ft on 09/03/1935 • 15.50 ft on 3/20/1943 • 15.65 ft on 3/06/1945 • 14.71 ft on 06/02/1947 • 16.47 ft on 2/14/1948 • 16.12 ft on 1/05/1949 • 13.88 ft on 01/06/1950 • 15.34 ft on 02/03/1950 • 16.75 ft on 1/27/1952 • 19.20 ft on 01/21/1959 • 19.14 ft on 3/05/1963 • 15.79 ft on 3/10/1964 • 13.21 ft on 02/24/1975 • 14.51 ft on 06/29/1980 • 14.53 ft on 06/06/1981 • 14.00 ft on 01/31/1982 • 12.09 ft on 05/02/1983 • 14.47 ft on 01/05/2004 • 13.72 ft on 01/06/2005 • 13.91 ft on 03/20/2008 • 13.71 ft on 06/05/2008 • 12.34 ft on 12/06/2011	• 11.12 ft on 12/22/2013 • 11.15 ft on 02/21/2014 • 11.66 ft on 05/22/2014 • 11.14 ft on 06/21/2015 • 11.03 ft on 12/29/2015 • 12.27 ft on 11/07/2017 • 12.88 ft on 02/25/2018 • 12.87 ft on 04/04/2018 • 12.41 ft on 02/08/2019	**Flood Categories (in feet)** Categories / Feet / # instances / Probability per event Major Flood Stage: 17 / 2 / 6% Moderate Flood Stage: 14 / 14 / 40% Flood Stage: 11 / 19 / 54% Action Stage: 9 / - / - **15 Feet** Some homes and businesses near Spring Valley, Roxanna, Oregonia and Corwin are impacted by flooding, possibly first floor level flooding. High water covers long stretches of Corwin Road near the river, as well as Waynesville, New Burlington and Middletown Roads. **14 Feet** Flood waters approach businesses and some homes near Spring Valley, Roxanna, Oregonia, Corwin and east of Waynesville. Flooding continues along portions of Corwin Road near the river, as well as Waynesville, New Burlington and Middletown Roads. Much of Wayne Township in Warren County is flooded along the river. **13 Feet** High water impacts low areas near Spring Valley, Roxanna, Corwin and east of Waynesville. Flood waters approach homes very close to the river, and widespread bottom land flooding occurs. Water floods Corwin Rd, Waynesville Rd and Middletown Rd near the river. **12 Feet** Water rises into low-lying areas close to the river near Spring Valley, Roxanna and east of Waynesville. Water floods Corwin Road, as well as Waynesville and Middletown Roads. **11 Feet** Flooding impacts short areas of Middletown and Waynesville Roads, in addition to Corwin Road and Corwin Park. Backwater flooding may impact Route 725 in Sugarcreek township. **10 Feet** Corwin Road and Corwin Park are flooded.

PROBABILITY OF OCCURRENCE / RISK:

Reported flood events over the past 23 years provide an acceptable framework for determining future occurrence in terms of frequency for such events. The probability of the County and its municipalities experiencing a flood event can be difficult to quantify but based on historical record of 83 flood events since 1996, it can reasonably be assumed that this type of event has occurred once every .28 years from 1996 - 2019.

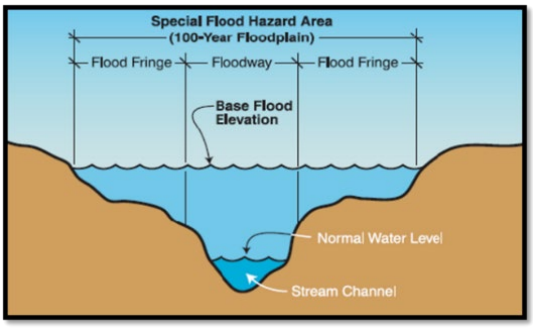
- [(Current Year) 2019] subtract [(Historical Year) 1996] = 23 Years on Record
- [(Years on Record) 23] divided by [(Number of Historical Events) 83] = .28
- It can be reasonably assumed that this type of event has occurred nearly three times per year in Warren County.

Flood Risk by location:

Most known floodplains in the United States have been mapped by FEMA, which administers the National Flood Insurance Program (NFIP). When a flood study is completed for the NFIP, the information and maps are assembled into a Flood Insurance Study (FIS). A FIS is a compilation and presentation of flood risk data for specific water courses, lakes, and coastal flood hazard areas within a community and includes causes of flooding.

The National Flood Insurance Program (NFIP), for which Flood Insurance Rate Maps (FIRM) are published, identifies the 1% annual chance flood. This 1% annual chance flood event is used to delineate the Special Flood Hazard Area (SFHA) and identify Base Flood Elevations. Figure 16 illustrates these terms. The SFHA serves as the primary regulatory boundary used by FEMA and Warren County.

Figure 16: Base Flood Elevation Illustration ***(Source: FEMA)***



Warren County has several building codes and development regulations in place to reduce flood risk for new construction, substantial improvements, or other man-made changes. The Warren County Building Department, as the floodplain administrator for the County, determines if new construction must meet certain flood zone construction criteria.

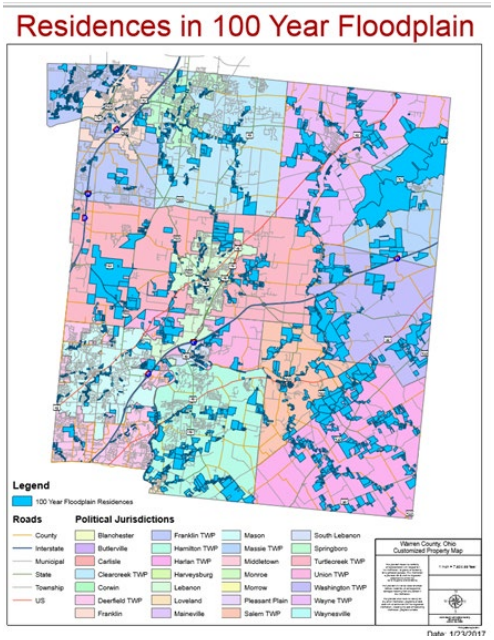
The Building Department has authority to perform Flood Zone Determinations per Flood Damage Prevention Resolution, Sections ***307.37*** and ***307.85***. Upon application for a development permit, the application and plans are reviewed to determine whether the site of the proposed structure is within any Special Flood Hazard Area (SFHA) designated by FEMA on regulatory Flood Insurance Rate Maps (FIRMs).

The following displays communities in Warren County and their status of participation in NFIP. *Source: FEMA*

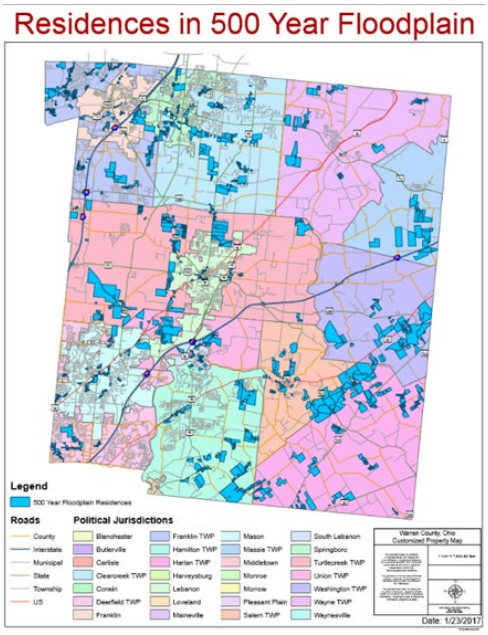
Jurisdiction	NFIP Participation	CID # (Community Identifier)
Village of Bulterville	No *(structures are not in flood hazard area)*	390719#
Village of Carlisle	Yes	390606B
Village of Corwin	No *(structures are not in flood hazard area)*	390555#
City of Franklin	Yes	390556B
Village of Harveysburg	No *(structures are not in flood hazard area)*	390833#
City of Lebanon	Yes	390557#
Village of Maineville	No *(structures are not in flood hazard area)*	390934#
City of Mason	Yes	390559#
City of Monroe	Yes	390042B
Village of Morrow	Yes	390561#
Village of Pleasant Plain	No *(structures are not in flood hazard area)*	unknown
Village of South Lebanon	Yes	390563#
City of Springboro	Yes	390564#
Village of Waynesville	Yes	390565#
Warren County	Yes	390757B

FEMA produces flood maps that display risks to structures in the 100-year and 500-year floodplains. Warren County Graphic Information Systems (GIS) department produced maps displaying the risks to Warren County Residents.

See Appendix 3 for larger map



See Appendix 4 for larger map



DAMAGES FROM FLOODS:

Damages related to flooding on the Little Miami and Great Miami Rivers can be found in Figures 13,14, and 15 (on pages 44-45).

Damage Extent:

Spatial Extent
Localized or Wide-Spread, depending on type and severity
Estimated losses
According to the State of Ohio Hazard Mitigation Plan, A Hazus Level 2 run on a 100-year flood event estimates Warren County will have 886 structures affected with an estimated building loss of $31,784,842.00.
Critical Infrastructure Affected
Critical infrastructure located in low-lying areas or near waterways will most likely be affected by flooding. This could include critical facilities, utilities, and services. According to the State of Ohio Hazard Mitigation Plan, there are 16 state-owned critical facilities in the 100-year floodplain that could be affected by a 100-year flood.

WARNING:

The National Weather Service has multiple levels of warning the public for possible floods:

- ***Flood Watch*** - A Flood Watch is issued to indicate current or developing conditions that are favorable for flooding. A watch is typically issued within several hours to days ahead of the onset of possible flooding. In situations where a river or stream is expected to be the main source of the flooding, forecast confidence may allow for a Flood Watch to be issued several days in advance.
- ***Flash Flood Watch*** – Flash Flood Watch is issued to indicate current or developing conditions that are favorable for flash flooding. The occurrence is neither certain nor imminent. A watch is typically issued within several hours to days ahead of the onset of possible flash flooding.
- ***Flood Advisory*** - A Flood Advisory is issued when a flood event warrants notification but is less urgent than a warning. Advisories are issued for conditions causing significant inconvenience, and if caution is not exercised, could lead to situations that may threaten life and/or property.
- ***Flood Warning*** - A Flood Warning is issued to inform the public of flooding that poses a serious threat to life and/or property. A Flood Warning may be issued hours to days in advance of the onset of flooding based on forecast conditions. Floods occurring along a river usually contain river stage (level) forecasts.
- ***Flash Flood Warning*** - A Flash Flood Warning is issued to inform the public, emergency management and other agencies that flash flooding is in progress, imminent, or highly likely. Flash Flood Warnings are urgent messages as dangerous flooding can develop very rapidly, with a serious threat to life and/or property. Flash Flood Warnings are usually issued minutes to hours in advance of the onset of flooding.

CONDITIONS THAT MAY EXACERBATE OR MITIGATE THE EFFECTS OF FLOODS:

The following factors will affect the severity of a flood:

- **Impermeable surfaces**: Excessive amounts of paved areas of other surfaces upstream or in the community can increase the amount and rate of water runoff. Development affects the runoff of stormwater and snowmelt when buildings and parking lots replace natural vegetation, which would normally absorb water.
- **Steeply sloped watersheds**: In hilly and mountainous areas, a flood may occur after heavy rain.
- **Constrictions**: Re-grading or filling within or on the edge of floodplains obstructs flood flows, backing up floodwaters onto upstream and adjacent properties.
- **Obstructions**: Bridges, culverts, and other obstructions can block flood flow and trap debris, causing increased flooding upstream and increased velocity downstream.
- **Debris**: Debris from the watershed, such as trees, rocks, and parts of damaged buildings increases the hazard possessed by moving water.
- **Contamination**: Water will pick up whatever was on the ground within the floodplain, such as soil, road oil, farm and lawn chemicals, and animal waste. It can also be caused by inundated wastewater treatment plants, and the presence of hazardous material storage in the flood plain.
- **Soil saturation**: Rainfall in areas already saturated with water will increase runoff.
- **Velocity**: High velocity flooding (with the speed of moving water greater than 5 feet per second) can erode stream banks, lift buildings off their foundations, and scour away soils around bridge supports and buildings.

4.3 TORNADOES

DEFINITION:

A tornado is a violently rotating column of air extending from a thunderstorm to the ground. Thunderstorms and hurricanes spawn tornadoes when cold air overrides a layer or warm air, causing the warm air to rise rapidly. The winds produced from hurricanes, earthquake induced fires, and wildfires have also been known to produce tornadoes. Tornadoes develop very rapidly and may dissipate just as quickly. Most tornadoes are on the ground for less than 15 minutes.

Tornado season generally runs from March through August; however, tornadoes can strike at any time of the year if the essential conditions are present. *(Reference the National Weather Service – Tornado Definition)*

PRIMARY SOURCES OF INFORMATION:

- *National Weather Service* - *https://www.weather.gov/safety/tornado*
- *Past Data* - https://w2.weather.gov/climate/index.php?wfo=

DESCRIPTION:

EF Scale Number	Wind Speed (MPH)	Type of Damage Possible
EF0	65-85	**Minor damage**: Peels surface (shingles, metal strips, etc.) off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e., those that remain in open fields) are always rated EF0
EF1	86-110	**Moderate damage**: Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111-135	**Considerable damage**: Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	136-165	**Severe damage**: Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	166-200	**Devastating damage**: Well-constructed houses and whole frame houses completely leveled; cars thrown, and small missiles generated.
EF5	>200	**Extreme damage**: Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m (300 ft.); steel reinforced concrete structure badly damaged; high-rise buildings have significant structural deformation.

Previous tornado occurrences recorded for Warren County were recorded under the old Fujita Tornado Damage Scale. Damages for the old scale are listed below:

F Scale Number	Wind Speed (MPH)	Type of Damage Possible
F0	<73	**Light damage:** Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.
F1	73-112	**Moderate damage**: Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
F2	113-157	**Considerable damage**: Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
F3	158-206	**Severe damage**: Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
F4	207-260	**Devastating damage**: Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.
F5	261-318	**Incredible damage**: Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yds); trees debarked; incredible phenomena will occur.

HISTORY / OCCURRENCES:

Table 23: History of Recorded Tornado Events in Warren County

LOCATION	DATE	SCALE	DEATH	INJURY	PROPERTY DAMAGE		LOCATION	DATE	SCALE	DEATH	INJURY	PROPERTY DAMAGE
Warren Co.	6/26/1956	F1	0	0	$2,500		Loveland Park	4/9/1999	F1	0	0	$3,000,000
Warren Co.	5/22/1959	F0	0	0	$2,500		Maineville	4/9/1999	F2	0	0	$2,500,000
Warren Co.	5/10/1969	F3	0	10	$250,000		Cozzadale	8/24/1999	F0	0	0	$25,000
Warren Co.	4/3/1974	F4	0	0	$250,000		Morrow	8/30/2005	F0	0	0	$25,000
Warren Co.	4/3/1974	F2	0	9	$2,500,000		Carlisle	7/11/2006	F1	0	0	$200,000
Warren Co.	5/18/1974	F1	0	0	$25,000		Maineville	7/11/2006	F0	0	0	$10,000
Warren Co.	4/2/1975	F2	0	3	$2,500,000		Blackhawk	3/23/2012	EF0	0	0	$20,000
Warren Co.	6/24/1976	F0	0	0	$250,000		Lebanon	5/1/2012	EF0	0	0	$5,000
Warren Co.	10/1/1977	F0	0	0	$250,000		Genntown	5/1/2012	EF0	0	0	$10,000
Warren Co.	6/2/1990	F4	0	0	$25,000,000		Harlan Twp	5/23/2012	EF0	0	0	
Warren Co.	9/14/1990	F2	0	4	$2.500.000		Clarksville	5/23/2012	EF0	0	0	
Warren Co.	8/20/1991	F0	0	0	$25,000		Harveysburg	5/24/2017	EF0	0	0	
Warren Co.	7/12/1992	F1	0	0	$250,000		Waynesville	5/24/2017	EF1	0	0	
									Totals	**0**	**26**	**$39,595,000**

PROBABILITY OF OCCURRENCE/ RISK:

[historical year where tracking began (1956)] subtracted by [current year (2019)] = **63** Years on Record
[Years on Record (63)] divided by {number of historical events (26)] = **2.42**
It can be reasonably assumed that this type of event has occurred once every 2.42 years from 1956 - 2019.

Probability of Type per occurrence:

EF0	EF1	EF2	EF3	EF4	EF5
48%	*24%*	*16%*	*4%*	*8%*	*<1%*

DAMAGES FROM TORNADOES:

	EF0	EF1	EF2	EF3	EF4	EF5
House	Loss of roof covering material, gutters or awning, loss of metal siding	Broken glass in doors and windows, Uplift or roof deck and loss of roof covering material (<20%), collapse of chimney, garage doors collapse inward, failure of porch or carport.	Entire house shifts off foundation, large sections of roof structure removed, most walls remain standing.	Most walls collapse except small interior rooms.	All walls collapse.	Destruction of engineered and/or well-constructed residence; slab swept clean.
Institutional Buildings	Minor visible damage.	Loss of roof covering (<20%), damage to penthouse roof and walls, loss of rooftop HVAC equipment, broken glass in doors or windows.	Uplift of lightweight roof deck & insulation, significant loss of roofing material (>20%), Façade components torn from structure, damage to curtain walls/ other wall cladding.	Uplift or precast concrete roof slabs, uplift of metal deck with concrete fill slab, collapse of some top building exterior.	Significant damage to building.	Significant damage to building envelope.

	EF0	EF1	EF2	EF3	EF4	EF5
Educational Institutions	Minor visible damage. Loss of Roof covering (<20%).	Broken windows, exterior door failures, uplift of metal roof decking, significant loss of roofing material (<20%); loss of rooftop HVAC.	Collapse of tall masonry walls at gym, cafeteria, or auditorium. Uplift or collapse of light steel roof structure.	Collapse of exterior walls on top floor. Most Interior walls of top color collapse.	Total destruction of a large section of building envelope.	
Electric Transmission Lines	Minor visible damage.	Broken wood or cross member	Wood poles leaning	Broken wood poles		

Damage extent:

Spatial Extent
Localized to tornado path
Estimated losses
According to the State of Ohio Hazard Mitigation Plan, the average estimated losses per tornado event equals approximately $3million to state owned or leased facilities. The State estimates that based on the probability of future events, estimated ANNUAL losses from tornadoes in Warren County will equal approximately $1.5 million. It can be reasonably assumed that the damages to public and private entities could equal as much from the effects of tornadoes.
Critical Infrastructure Affected
Potentially all critical facilities, utilities, and services could be affected in a localized area from a tornado event. Critical utilities are most likely to be affected by the impacts from tornadoes.

WARNING:

The National Weather Service has two levels of warning the public for possible tornadoes:

- **Tornado Watch** - Tornadoes are possible in and near the watch area. Watches are issued by the Storm Prediction Center for counties where tornadoes may occur. The watch area is typically large, covering numerous counties or even states.
- **Tornado Warning** – A tornado has been sighted or indicated by weather radar, thus implying imminent danger to life and property. Warnings are issued by the local forecast office (for Warren County that is the National Weather Service Office in Wilmington, Ohio). Warnings typically encompass a much smaller area around the size of a town or small county.

CONDITIONS THAT MAY EXACERBATE OR MITIGATE THE EFFECTS OF TORNADOES:

The nature of tornadoes is that they strike at random. While it is known that some areas of the country experience tornadoes more than others, predicting exactly what parts of the community have a greater chance of being struck by a tornado is difficult. Homes and businesses may be built in accordance with local building codes that consider the effects of minimum design wind speeds for the local area. In most inland tornado-prone regions, the building-code design wind speed is 115mph.

Ohio has been determined to be prone to high wind speed hazards as depicted by the American Society for Engineers (ASCE) design wind speed map (shown in graphic).

Figure 17: Wind Zones in the United States

4.4 HAZARDOUS MATERIALS INCIDENTS

DEFINITION:

According to the Ohio Environmental Protection Agency, hazardous materials can be defined in different ways depending upon the law or regulation administered by the Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), the Department of Transportation (DOT), and the U.S. Nuclear Regulatory Commission (NRC).

- The Institute for Hazardous Materials Management defines hazardous materials as "any item or agent (biological, chemical, radiological, and/or physical), which has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors."
- OSHA's definition includes any substance or chemical which is a health hazard or a physical hazard, including carcinogens, toxic agents, irritants, corrosives, and sensitizers, as well as agents that interact to be harmful to the human body, explosive, or flammable.
- The EPA's definition includes the OSHA definition. It adds "any item or chemical which can cause harm to people, plants, or animals when released into the environment".
- The DOT defines hazardous materials as any item or chemical which, when being transported or moved in commerce, is a risk to public safety or the environment.

PRIMARY SOURCES OF INFORMATION:

- *Institute of Hazardous Materials Management - https://www.ihmm.org/about-ihmm/what-are-hazardous-materials*
- *Occupational Safety and Health Administration - https://www.osha.gov/laws-regs/standardinterpretations/1996-11-07*
- *Environmental Protection Agency - https://www.epa.gov/sites/production/files/2014-09/documents/cleannrt10_12_distiller_complete.pdf*
- *ODOT - https://www.fmcsa.dot.gov/regulations/hazardous-materials/how-comply-federal-hazardous-materials-regulations*

DESCRIPTION:

Hazardous materials are present countywide, and risk is primarily associated with the transport of materials by highway and / or rail. As found in the 2019 Warren County Hazardous Materials Annex of the Emergency Operation Base Plan, there are 158 sites within the county that store / utilize hazardous materials.

HISTORY / OCCURRENCES:

Warren County has not experienced a significantly large-scale hazardous material incident at a fixed site or during transport that resulted in multiple deaths or serious injuries, although there have been many minor releases that have put local firefighters, hazardous materials teams, emergency management, and local law enforcement into action to try to stabilize these incidents and prevent or lessen harm to Warren County residents.

Table 24: History of Recorded Hazardous Materials Incidents in Warren County

Location	Date	Description of Incident
25 Jacamar Court, Springboro	2/4/2015	Large structure fire occurred at a house with numerous hazardous chemicals inside. Site became a USEPA Superfund site. Took 2 months and $386,000 to clean up.
I-71 SB MM 24.6	8/30/2016	Semi fire resulted in unknown amount of diesel fuel spilled and saturated a 16' diameter area of grass to a depth of 1"
Lebanon, Ohio	11/3/2016	Superservice tractor involved in single vehicle accident, approximately 100 gallons of diesel fuel spilled onto roadway, creek and a concrete drainage line to a retention pond at Superservice Lebanon Ohio.
Harlan Twp.	8/2/2017	Approximately 100 gallons diesel fuel spilled
8500 Claude Thomas Rd, Franklin Ohio	8/8/2017	Unknown amount of asphalt/bitumen spilled
Tradewinds Beverage, Carlisle Ohio	8/22-8/23/2017	Diluted acid and alkali solution, high TDS water from reverse osmosis condensate, water softener backflush leaked into a patch of grass next to building, vegetation impacted.
Speedway at Kings Mills Rd., Mason Ohio	9/28/2017	Approximately 30 gals. Of fuel spilled.

Location	Date	Description of Incident
9691 Waterstone Blvd. Deerfield Twp. Ohio	7/12/2018	815 lbs. of unknown chemical released due to a fire
Franklin-Trenton Rd. (North Well Field)	9/7/2018	Hazmat incident. Mixing of chemicals.
3000 Henkle Dr. Lebanon Ohio	10/2/2018	300 gallons of unknown chemical spilled
327 Industrial Dr. Franklin Ohio	11/7/2018	350 Gallons of paint into waterway
7250 Franklin-Trenton Rd. Franklin Ohio	3/29/2019	Approximately 30 gallons. Drilling fluid released into low flow waterway
106 Cross Creek Ln, Hamilton Twp.	4/2/2019	20 gallons of cutting oil spilled
5234 SR 63 Turtlecreek Twp.	5/21/2019	100 gallons diesel fuel spill
MM 29, I-75. City of Monroe	6/6/2019	90 gallons diesel fuel spill
1852 Socialville Fosters Rd. Deerfield Twp.	8/14/2019	25000 gallons sewage
2159 (4859) Blk Nixon Camp Rd. Salem Twp.	9/26/2019	135 gallons transformer oil

**Data is from 2015 – fall 2019*

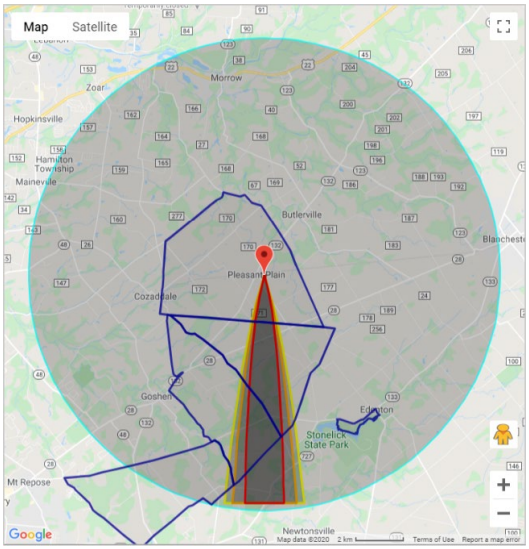
PROBABILITY OF OCCURRENCE / RISK:

Incidents involving releases of hazardous materials are not assigned a probability of occurrence like natural hazards, however, past data can be used to characterize the likelihood of future incidents. Based on data, Warren County has a high likelihood of having a release of hazardous materials. Sources of these incidents could be transportation routes, fixed facilities, pipelines, illegal dumping, chemical misapplication, illegal drug labs, and incidents caused by natural occurrences.

DAMAGES FROM HAZARDOUS MATERIALS EVENTS:

The most hazardous chemical in Warren County is Anhydrous Ammonia, stored at a facility in the Pleasant Plan area. Given a release of this chemical over a one-hour period, the following areas (shown in figure 18) would be affected:

Figure 18: Plume modeling of Anhydrous Ammonia leak



This plume model includes clear weather with a release over 60 minutes. The plume includes 7,541 residents, 7,525 households, and 11 blocks of affected area. This affected area also includes numerous businesses, equestrian stables, a farm, and a private airport.

Damage Extent:

Spatial Extent
Localized
Estimated losses
It is difficult to estimate losses from a hazardous materials event due to the variables including chemical(s) involved, duration of exposure, and cascading effects from a release or accident. For the scenario above, if houses were to become damaged from impacts of a release the estimated cost (based on the number of households and the median house value for Pleasant Plain would equal approximately $300,000.
Critical Infrastructure Affected
There could be critical facilities and service affected by a hazardous materials event. Critical infrastructure could also be affected should the incident occur on rail or highway.

WARNING:

Since hazardous materials events are usually the result of accident or malfunction, there is typically little-to-no warning when an event is going to occur. If threats of an event are present, the state or regional fusion center will share intelligence with the proper authorities responsible for public safety.

Based on Warren County Hazardous Materials plan there are three levels of hazardous material response. Based upon the level of response the public will be given warning of hazardous materials events via the following methods:

- Emergency Alert System (EAS)
- Integrated Public Alert & Warning System (IPAWS)
- Local Media

CONDITIONS THAT MAY EXACERBATE OR MITIGATE THE EFFECTS OF HAZARDOUS MATERIALS EVENTS:

Based on the Warren County Hazardous Materials plan the following will affect the severity of a hazardous material incident:

- Time of day: Affects the population and number of commuters within Warren County. During normal business hours there may be a higher number of individuals affected by a hazardous materials release.
- Weather: Can positively or negatively affect a hazardous materials release based on type of chemical and type and severity of weather.
- Geography: Terrain and waterways can affect how contaminants or spills move through the affected area. Warren County also has rural, suburban and urban areas, which can affect the movement of hazardous materials releases and / or the affected population.

Examples of mitigation actions for hazardous materials that your jurisdiction can do:

- Jurisdictional fire inspections of facilities that contain hazardous materials.
- Training between first responders and chemical facilities for response to a chemical incident.
- Maintaining up to date Safety Data Sheets (SDS).

4.5 WINTER STORMS

DEFINITION:

A winter storm is a combination of heavy snow, blowing snow, and / or dangerous wind chills. Winter storms can be life-threatening.

PRIMARY SOURCES OF INFORMATION:

National Weather Service - https://www.weather.gov/safety/winter
Past Data - https://w2.weather.gov/climate/index.php?wfo=iln
NOAA Storm Events Database - https://www.ncdc.noaa.gov/stormevents/

DESCRIPTION:

- **Blizzards** – dangerous winter storms that are a combination of blowing snow and wind that cause very low visibility. Can be caused by heavy snowfalls or by strong winds that pick-up snow that has already fallen, creating a ground blizzard.
- **Ice Storm** – results in an accumulation of at least .25” of ice on exposed surfaces.
- **Snow Squalls** – brief, intense snow showers accompanied by strong, gusty winds. Usually last for short duration and cause whiteout visibility and rapidly deteriorating road conditions.
- **Freezing Rain** – occurs when the layer or freezing air is so thin that the raindrops do not have enough time to freeze before reaching the ground. Instead, the water freezes on contact with the surface, creating a coating of ice on whatever the raindrops contact.

HISTORY / OCCURRENCES:

The National Centers for Environmental Information and the National Weather Service Office in Wilmington have identified significant winter storm events between 1996 and 2018.

Table 25: History of Recorded Winter Storm Events in Warren County

Date	EVENT TYPE	DEATHS	INJURIES	Property Damage	Crop Damage	EVENT NARRATIVE
1/4/1996	Heavy Snow	0	0	$4,000	$0	A quick moving Alberta Clipper system brought around 4"of light and fluffy snow to a portion of southern Ohio between Dayton and Cincinnati.
1/6/1996	Winter Storm	0	0	$500,000	$0	Developed near the Gulf Coast and moved up the East Coast. System produced 14.3" of snowfall in the Greater Cincinnati Area. Some areas had 30 continuous hours of snowfall.
1/11/1996	Heavy Snow	0	0	$1,000	$0	A fast-moving low-pressure system tracked from the Mid-Mississippi Valley to the KY-TN border. Total wet snow accumulations were near 4".
3/6/1996	Ice Storm	0	0	$0	$0	Roadways became coated with a layer of ice, and then light snow fell on the ice making it difficult for drivers to see the ice in many locations. Numerous accidents occurred over a large area. An eight car and truck pileup occurred on a bridge in Warren county, closing the bridge for a few hours.
1/24/1997	Ice Storm	0	0	$0	$0	A strong surge of moisture moved north into the Ohio valley during the morning hours. Temps were at or just below the freezing mark for several hours while rain fell. Roads quickly became icy during the morning rush hour causing numerous traffic accidents. Several roads were closed due to one-quarter inch of ice accumulation.
3/9/1999	Heavy Snow	0	0	$0	$0	Low pressure brought abundant moisture northward into an arctic air mass producing very heavy snow. The heaviest snow fell between midnight and 8:00 am with snowfall rates of 1 to 2 inches an hour at times. Accumulations ranged from 5 to 10 inches"
1/19/2000	Heavy Snow	0	0	$0	$0	A fast-moving low-pressure system brought a band of heavy snow across central and southern Ohio. Many locations received 5 to 6 "with the NE corner of Warren County receiving 6-7".
1/19/2000	Heavy Snow	0	0	$0	$0	A fast-moving low-pressure system brought a band of heavy snow across central and southern Ohio. Many locations received 5 to 6 "with the NE corner of Warren County receiving 6-7".
12/13/2000	Ice Storm	0	0	$0	0	A weak low-pressure system brought freezing rain to the region. Widespread ice accumulations of one-quarter to one-half inch of ice occurred.
12/22-24/2004	Heavy Snow	0	0	2.2M	0	Swatch of heavy snow cut across Ohio valley. Snowfall totals for 24-hour period exceeded 12" in some portions of Warren County.
2/6/2007	Heavy Snow	0	0	$0	0	7" of snow was measured in both Morrow and Lebanon.
2/13/2007	Ice Storm	0	0	$0	0	A quarter to a half inch of ice was measured in Lebanon and Maineville. Thousands of trees were damaged and numerous power outages occurred.
4/6/2007	Frost / Freeze	0	0	$0	$540,000	Unseasonably warm temperatures for an extended period in March allowed much of the Ohio Valley to begin its agricultural growing season early. In early April, a cold snap with low temperatures dropping into the low 20s caused crops to freeze. The initial estimate of 16.74 million in crop damage was split evenly between 31 Ohio counties.
1/27/2009	Heavy Snow	0	0	$0	0	Mason measured 9.6" of snow. Ice accumulations across the county ranged from 4/10" to 8/10".
2/3/2009	Heavy Snow	0	0	$0	0	7.5" of snow fell in Mason, while only an inch and a half was measured in Lebanon.
2/5/2010	Heavy Snow	0	0	$0	0	Snow ranged from 3.8" in the south at Landen and Kings Mills, to 4" in Mason, up to 6" at the county garage in Lebanon and 8.5 "to the north in Springboro.
2/9/2010	Heavy Snow	0	0	$0	0	The county garage in Lebanon measured 7.5" of snow. A NWS employee in Maineville measured 7", and 6.4" fell in Kings Mills.
2/15/2010	Heavy Snow	0	0	$0	0	The county garage in Lebanon measured 8" of snowfall. A spotter measured 5.8" in Landen.
1/11/2011	Heavy Snow	0	0	$0	0	An employee located west of Clarksville measured 6.1" of snowfall. Law enforcement in Lebanon measured 5". A spotter located 2 miles northeast of Springboro measured 3.5"of snowfall.
1/20/2011	Heavy Snow	0	0	$0	0	An employee in Maineville measured 5.5" of snowfall. 5" fell at the ODOT garage in Lebanon, while spotters in Lebanon and Mason measured 4.5" and 4.4" of snow, respectively.
2/1/2011	Ice Storm	0	0	$0	0	½" of ice was measured 3 miles south of Springboro. In and around Lebanon, NWS employees measured ¼" and 3/10" of ice.

Date	EVENT TYPE	DEATHS	INJURIES	Property Damage	Crop Damage	EVENT NARRATIVE
1/21/2013		0	10	$2.200,000	$0	A highly unstable air mass produced deep convective snow showers that produced snow squalls during the late morning into the afternoon. These isolated squalls caused whiteout conditions on area roadways. Four major pileups resulted in over 175 vehicle crashes on the interstate system, causing numerous injuries and one fatality. A 52-car pileup on I-75 between Cincinnati and Dayton occurred between the Middletown and Monroe exits and injured 10 people.
2/20/2015	Heavy Snow	0	0	$0	$0	A winter storm that dropped up to 7" in the Warren County area resulted in a downed power line in the Waynesville area. This line caused more than 2,100 customers in Waynesville and Spring Valley to lose power. The power restored within 5 hours of the crews being dispatched.
11/14/2018	Ice Storm	0	0	$0	$0	An employee reported large branches down near Harveysburg. ¼" of ice was measured in both Clarksville and Genntown with several large branches down. The CoCoRaHS observer south of Mason measured 3/10" of ice, as did a spotter in Maineville and social media report from Landen.
Totals		**0**	**10**	**$2,035,000**	**$540,000**	

**There has been 1 Federal Disaster Declaration on record that included Warren County related to Snow Removal*

PROBABILITY OF OCCURRENCE / RISK:

Criteria for NWS to issue an alert requires at least 4" of snow or greater or ¼" ice or greater covering at least 50% of the county or encompassing most of the population.

According to the National Weather Service, a review of the last five years of recorded events shows that there have been 11 instances of 4" of snow or greater and 1 instance of ¼" of ice or greater. *(Note: alert issuances are not necessarily considered "significant events" as listed above in the history section)*.

[historical year where tracking began (2013)] subtracted by [current year (2019)] = 6 Years on Record
[Years on Record (6)] divided by {number of historical events (12)] = .5
It can be reasonably assumed that this type of event has occurred twice every year from 2013 through 2019.

DAMAGES AND IMPACTS FROM WINTER STORMS:

Winter storms can affect roadways, utilities, the economy, and can cause loss of life, frostbite, and freezing conditions. Winter storms can also cause loss of power, impassible roads, and employee unavailability which could affect operations of critical facilities. Cascading effects from winter storms could also include flooding (following significant snow melts) and ice jams (that occur when a rapid melt follows an ice event).

While cold temperatures and power losses can render a structure uninhabitable for a time, they are unlikely to cause structural damages. Snow and ice accumulation, however, can impact structures and infrastructure. Older structures (those constructed before 1970 in particular) are more susceptible to the impacts from winter weather due to older construction and insulation methods.

Damage Extent:

Spatial Extent
Localized or Wide-Spread, depending on type and severity of storm
Estimated losses
According to the State of Ohio Hazard Mitigation Plan, the estimated annual damages in Warren County from a winter storm event equal approximately $322,000. Damages to state owned or leased critical facilities caused by winter storms could equal approximately $150 million. Since damages would be widespread from winter weather events, it can be reasonably assumed that damages to public and private property could average between $322,000 up to $150 million (or greater depending on the event).
Critical Infrastructure Affected
Critical utilities are the most likely to be impacted by winter storm events due to freezing or heavy snow. Critical services may be impacted by winter storms if infrastructure such as roads and bridges are impassible. Critical facility operations may be impacted, but the likelihood of building damages to critical facilities due to winter storms remains low

WARNINGS:

The National Weather Service issues the following warnings for Winter Storms:

Advisories: Be Aware

- **Winter Weather Advisory -** issued when snow, blowing snow, ice, sleet, or a combination of these wintry elements is expected but conditions should not be hazardous enough to meet warning criteria.
- **Freezing Rain Advisory -** issued when light ice accumulation (freezing rain and / or freezing drizzle) is expected but will not reach warning criteria. Expect a glaze on roads resulting in hazardous travel.

Watches: Be Prepared

- **Blizzard Watch -** issued when there is a potential for falling and / or blowing snow with strong winds and extremely poor visibilities. This can lead to whiteout conditions and make travel very dangerous.
- **Winter Storm Watch -** issued when conditions are favorable for a significant winter storm event (heavy sleet, heavy snow, ice storm and blowing snow or a combination of events.)

Warnings: Take Action

- **Blizzard Warning** - issued for frequent gusts greater than or equal to 35 mph accompanied by falling and / or blowing snow, frequently reducing visibility to less than 1/4 mile for three hours or more. A Blizzard Warning means severe winter weather conditions are expected or occurring
- **Winter Storm Warning**- issued for a significant winter weather event including snow, ice, sleet or blowing snow or a combination of these hazards. Travel will become difficult or impossible in some situations.
- **Ice Storm Warning -** issued for ice accumulation of around 1/4 inch or more. This amount of ice accumulation will make travel dangerous or impossible and likely lead to snapped power lines and falling tree branches. Travel is strongly discouraged.

CONDITIONS THAT MAY EXACERBATE OR MITIGATE THE EFFECTS OF A WINTER STORM:

El Niño and La Niña are weather patterns that occur every few years. The water temperatures associated with these weather patterns can push warmer or colder air through the jet streams toward different parts of the country.

El Niño and La Niña patterns can affect winter conditions in the Ohio Valley. Because of its geographic location, Warren County can be susceptible to warmer, drier conditions in El Niño years and wetter, warmer winters in La Niña patterns.

4.6 MAN-MADE / TERRORISM EVENTS

DEFINITION:

According to the Federal Bureau of Investigation (FBI), domestic terrorism is violent, criminal acts committed by individuals and / or groups to further ideological goals stemming from domestic influences, such as political, religious, social, racial, or environmental nature. International terrorism includes violent, criminal acts by individuals and / or groups who are inspired by, or associated with, designated foreign terrorist organizations or nations.

PRIMARY SOURCES OF INFORMATION:

- *Federal Bureau of Investigation* - https://www.fbi.gov/investigate/terrorism
- *U.S. Department of Homeland Security* - https://www.dhs.gov/xlibrary/assets/prep_biological_fact_sheet.pdf

DESCRIPTION:

Terrorism or civil unrest events have generally been localized within a single jurisdiction. Coordinated events have occurred historically throughout the world, greatly expanding the number of affected jurisdictions. Based on the nature of the event, several jurisdictions may respond to an incident.

Below are different typed of terrorism:

- **Domestic terrorism** – Violent, criminal acts committed by individuals and / or groups to further ideological goals stemming from domestic influences, such as those of a political, religious, social, racial, or environmental nature.
- **Cyberterrorism:** is an electric attack using one computer system against another, and attack can be directed towards computers, networks, or entire systems. A cyber-attack may last minutes to days. Homeland Security, the FBI, the FCC, and the DOGJ are often involved in developing countermeasures that focus on reducing the threat, vulnerability, and the likelihood of attack.
- **Agroterrorism:** is a direct, generally covert contamination of food supplies or the introduction of pests and / or disease agents to crops and livestock. An agricultural-based terror attack can last days to months. (U.S. Department of Homeland Security)
- **Biological Attack:** is the intentional release of a pathogen (disease causing agent) or biotoxin (poisonous substance produced by a living organism) against humans, plants, or animals.
- **Chemical Terrorism:** includes the use of nerve agents, choking agents, blood agents, or blister agents, to attack normal bodily functions of the nervous, respiratory, circulatory, and skin, respectively. Usually, an act of chemical-based terror lasts only minutes.
- **Active Aggressor:** is an armed individual or group of individuals that is intending to cause harm or inflict terror on a civilian population. An active aggressor (or group) may be armed with guns, knives, bombs, or any other weapon / implement that may be used to inflict harm.
- **Civil Unrest** – Spontaneous disruption of normal, orderly conduct and activities in urban areas, or outbreak of rioting or violence that is of a large nature is referred to as civil unrest.

History / Occurrences:

- On June 9th, 2016 an active shooter shot their father and a Sheriff's Deputy before fleeing the scene.

Probability of occurrence / Risk:

Because there is only one recorded terrorism event in Warren County, the probability of occurrence is low, however with societal issues on the rise the probability of a lone individual causing harm to the public is moderate.

Damages and impacts from Man-Made / Terrorism Events:

There are many different types of terrorism with varying levels of impacts.

- Chemical incidents are unlikely to have significant effects on utilities and would cause minimal debris, however the effects to people and the environment could be widespread and significant.
- Biological incidents are unlikely to have significant effects on utilities and environment and would not likely cause any debris. These incidents would, however, have a significant impact on people, and could cause impacts on critical facilities such as hospitals and schools.
- Radiological incidents are unlikely to cause debris (unless tied to an explosive device). These incidents have the potential to cause large impacts on the environment, utilities, people, and critical infrastructure such as water systems.
- Nuclear incidents are unlikely to cause large amounts of debris; however, the effects are likely to have significant impacts on people, utilities, critical infrastructure, and the environment.
- Explosive incidents have the potential to impact utilities, people, critical infrastructure, and the environment. These incidents would cause debris, potentially in large amounts.

Damage Extent: *this assessment will focus on explosive events*

Spatial Extent
Localized, unless critical utilities or waterways (lifelines) are affected.
Estimated losses
Estimating losses depends on the location and severity of the explosive device. Assuming the largest congregate employer in Warren County was targeted, the estimated losses for that building sustaining a large explosive attack would be between $2-$3 million.
Critical Infrastructure Affected
Potentially any critical infrastructure could be affected by the effects of man-made / terrorism events. Specific examples are listed above.

WARNING:

U.S. Department of Homeland Security will utilize the National Terrorism Advisory System (NTAS) alert to provide timely, detailed information to the public, government agencies, first responders, airports and other transportation hubs, and the private sector.

- NTAS Bulletins describe current developments or general trends regarding threats of terrorism
- NTAS Elevated Alerts warn of a credible threat against the United States
- NTAS Imminent Alerts warn of credible, specific and impending terrorism threats against the United States

CONDITIONS THAT MAY EXACERBATE OR MITIGATE MAN-MADE / TERRORISM EVENTS:

Intelligence / information sharing via the Cincinnati Fusion Center can help mitigate a man-made incident by providing information gathering and recognition of indicators and warnings; intelligence analysis and production and intelligence and information sharing and dissemination.

4.7 INVASIVE SPECIES

DEFINITION:

- **Harmful Species -** are species that have potential negative impacts on the environment and economy. Harmful species are both native and invasive and can cause significant ecological, public health, or economic harm. The National Oceanic and Atmospheric Administration (NOAA) defines an invasive species as "an organism that causes ecological or economic harm in a new environment and is not native." Their growth is often encouraged through human activity.
- **Land-dwelling (Terrestrial) Invasive Plants:** are non-native plants that grow in non-aquatic habitats, including agricultural fields, rangelands, forests, urban landscapes, wildlands, and along waterways.
- **Land-dwelling (Terrestrial) Invasive Vertebrates:** are non-native members of three subphylum vertebrata (animals with a backbone) who spend most of their lives on land.
- **Land-dwelling (Terrestrial) Invasive Invertebrates:** are animals that lack a vertebral column (backbone). Insects are the most common invasive terrestrial invertebrate, but it also includes other arthropods, mollusks (such as snails and slugs), and nematodes (roundworms).
- **Water-dwelling (Aquatic) Invasive Species:** are non-native plants, animals, and other organisms that have evolved to live primarily in water (aquatic habitats) rather than on land (terrestrial habitats).

PRIMARY SOURCES OF INFORMATION:

- Warren County Health District:
- http://warrencounty.oh.networkofcare.org/ph/library/article.aspx?hwid=uf4420
- http://warrenchd.com/lyme-disease-cases-continue-to-increase-in-ohio
- Ohio Department of Natural Resources - http://ohiodnr.gov/invasivespecies
- Ohio Department of Agriculture - https://agri.ohio.gov/wps/portal/gov/oda/divisions/plant-health/invasive-pests/invasives
- Ohio State University - https://senr.osu.edu/extensionoutreach/invasive-species

DESCRIPTION:

List of Invasive / Harmful Species found or have the potential to be found in Warren County

Harmful Species:	Invasive Land-Dwelling Invertebrates:
- Ticks*	- Emerald Ash Borer*
- Mosquitoes*	- Asian Long-horned Beetle*
Invasive Land-Dwelling Plants:	- Gypsy Moth*
- Honeysuckle (Amur*, Morrow, and Tartarion)	- Hemlock Wooly Adelgid
- Poison Hemlock	- Thousand Cankers Disease/Walnut Twig Beetles
Invasive Land-Dwelling Vertebrates	- Spotted Lantern Fly
- Feral Swine*	**Invasive Water-Dwelling Species:**
	- Zebra Mussel

*Description of invasive / harmful species impact included in this section *Red Text indicates species is in Warren County*

Below are examples of potential hazards, their descriptions, and associated impacts:

- ***Emerald Ash Borer (EAB)*** – is an invasive species that targets natural occurring and landscaped North American ash trees. The EAB can eliminate an entire tree species from forest or urban environments. Native ash borers typically target weakened ash trees, but the EAB can impact healthy trees of any age. Because the pest has established itself throughout all of Ohio, in July 2011 ODA lifted the quarantine regulations in place for emerald ash borer **within** the state. Ohio is still inside the Federal quarantine boundary, and the movement of EAB regulated articles cannot exit the quarantine boundaries without Federal permits.

  The Emerald Ash Borer can be found in all parts of Warren County. They can be transported by affected logs or firewood being carried into an area. Ash borers usually attack a tree first in the upper parts of the canopy. The first signs of EAB attacks are vertical cracks in the bark, usually accompanied by woodpecker damage and canopy (leaves at the top of the tree) thinning. Under the loose bark there may be S- shaped tunnels.



- ***Gypsy Moth*** – is an invasive species that defoliates tress, and can impact oak, spruce, hemlock, and other trees, with oak trees being the preferred hosts. The gypsy moth is one of the most destructive insect pests threatening the forests and ornamental plants of Ohio. The impact of gypsy moths includes forest ecosystem degradation, economic losses to businesses, loss of recreational opportunities in areas severely defoliated, reduced private property values, and nuisance from gypsy moth caterpillars. Since 1990, the Ohio Department of Agriculture has been conducting gypsy moth suppression projects in the generally infested areas of the state, combined with pheromone trapping and eradication projects in areas not considered generally infested.

  The gypsy moth caterpillars can be identified by five pairs of blue dots followed by six pairs of red dots lining their backs. They can be dispersed naturally with newly hatched caterpillars hanging from silken threads blowing in the wind to other trees, or they can be transported when an infested area of a car, recreational vehicle, lawn furniture, logs, nursery stock or other outdoor items are brought into the area.

  Gypsy moth infestation could be determined by the number of insects on trees or the level of defoliation (missing leaves). The Gypsy moth has not yet been identified in Warren County, however multiple counties in Ohio have reported infestations and the spread is moving from Eastern toward Western Ohio.

Source: Ohio Department of Agriculture Examples of Damages

- ***Asian Longhorned Beetle*** - also known as the Asian cerambycid beetle. In June 2011, the first Ohio infestation in trees was discovered near the village of Bethel in Clermont County. The insect was previously found associated with solid wood packing and crating materials in warehouses located in Cincinnati, Columbus, and Loudonville. However, an infestation of living host trees has never been detected in these cities. ALB is a serious pest of hardwood trees in its native environment where it has few natural enemies. In the U.S., where no natural enemies exist, the insect is extremely destructive to our trees and forests. Beetles will attack both stressed and healthy trees, which makes them an even greater threat.

  Asian longhorned beetles can be identified by their bullet shaped bodies, shiny black and white spots, and long striped antennae. Infestation of this pest can be identified by chewed round depressions in the bark of a tree, pencil-sized round tree holes, excessive sawdust buildup near tree bases, and unseasonable yellowed or drooping leaves. Tunneling will also be present in fallen branches or cut wood after the beetle has chewed and

laid its eggs in its tunnel channels. The Asian Longhorned Beetle can be transported to an area through transportation of firewood or logs, solid wood packing material, wood debris and trimmings, and other lumbers materials (even if beetles are not visible). *Source:USDA*

- ***Amur Honeysuckle*** – is an invasive species that stands about 6-15 ft at maturity, stems have a hollow pith (center), pair of tubular flowers less than an inch long are borne along the stem in leaf axils. Amur Honeysuckle is a noxious woody shrub, introduced in southern Ohio in the late 1950s but is now rampant across the state and throughout much of the Eastern United States. Amur Honeysuckle has no significant disease or pest problem, however, it will take over an area within a few years of initial seeding, by a combination of its rapid growth rate, arching growth habit, and ability to prolifically reseed itself nearby. The only positive in terms of control is that its root system is shallow during the first several years of its life, so plants can literally be pulled up or dug out with relative ease, if caught early enough.

- ***Feral swine***- refers to the Eurasian Wild Boar and neglected domestic swine. While feral swine have not been reported in Warren County, they have been reported nearby and may find their way into the county. Potential impacts include the destruction of soybean and corn crops, damage to soil quality and root strength through rooting, degradation to water quality through wallowing which leads to silt and bacterial contamination of downstream waterways, predation on smaller, native animals, erosion of soil which can lead to the growth of invasive plant species and outcompeting native animals. *Source: Ohio State University extension office*

Figure 1. Feral swine.
Photo courtesy of USDA Wildlife Services.

Figure 6b. Rooting damage to lawn.
Photo courtesy of USDA Wildlife Services.

Figure 8. Rooting damage to corn field.
Photo courtesy of USDA Wildlife Services.

- ***Mosquitoes-*** West Nile virus is a type of virus that is spread by mosquitoes. The infection it causes may be so mild that people don't even know they have it. But in rare cases, West Nile leads to severe illness that affects the brain or spinal cord. People older than 50 are at the highest risk for serious problems from West Nile. Most people fully recover from West Nile. But some people who get a severe infection have permanent problems such as seizures, memory loss, and brain damage. A few people die from it.

  Most often, mosquitoes spread the virus by biting birds infected with the virus and then biting people. Mosquitoes can also spread the virus to other animals, such as horses. About 80 out of 100 people who have West Nile have no symptoms. When symptoms do appear, they start 2 to 15 days after the mosquito bite. Officials said there have been 429,516 mosquitoes submitted and 1,498 positive West Nile virus sample pools found statewide.

  Warren County Health District traps and tests pools of mosquitos around the county annually. In 2018, there were 78 confirmed pools of West Nile Virus in pools of mosquitos. In 2019, there has been 1 reported positive

case of West Nile Virus (in Waynesville) from tested pools of mosquitos. The change in numbers can be attributed to hotter, dryer weather conditions that mitigated mosquito breeding grounds.

- ***Ticks-*** Ticks are small spiderlike animals (arachnids) that bite to fasten themselves onto the skin and feed on blood. Ticks live in the fur and feathers of many birds and animals. Tick bites occur most often during early spring to late summer and in areas where there are many wild animals and birds. Most ticks don't carry diseases, and most tick bites don't cause serious health problems, but it is important to remove a tick as soon as you find it. Removing the tick's body helps you avoid diseases the tick may pass on during feeding. Removing the tick's head helps prevent an infection in the skin where it bit you. Many of the disease's ticks carry cause flu-like symptoms, such as fever, headache, nausea, vomiting, and muscle aches. Symptoms may begin from 1 day to 3 weeks after the tick bite. Sometimes a rash or sore appears along with the flu-like symptoms. Ticks are found worldwide and can carry many diseases, such as Lyme disease.

There have been 21 confirmed cases of Lyme disease caused by tick bites between 2000 – 2016 (but there may be more that are unconfirmed). *Figure 19: Map of Lyme Disease Reports in Ohio (2009-2018)*

- ***Zebra Mussel -*** The zebra mussel is a small shellfish named for the striped pattern on its shell. However, color patterns can vary to the point of having only dark or light-colored shells with no stripes. This mussel is typically found attached to objects, surfaces, or other mussels by threads extending from underneath the shells. Although similar in appearance to the quagga mussel (*Dreissena bugensis*), the two species can be distinguished by their shell morphology. When placed on a surface, zebra mussels are stable on their flattened underside while quagga mussels, lacking a flat underside, will fall over.

  Zebra Mussels are harmful bioengineers that spread quickly by way of attaching to watercraft that moves from place to place and by water currents. They are filter feeders, straining water for the food they need. Unwanted food is rejected and bound into pellets that, in heavily colonized areas, provide food for native as well as other aquatic invasive species. Large concentrations of Zebra mussels can also deprive water bodies of oxygen and nutrients needed to sustain certain ecosystems and species. Human impacts from zebra mussels can clog water intakes for municipalities and industries, foul boat hulls, motors, and water-related equipment. Damages can decrease property values. Sharp shells can litter beaches, cut feet, and affect recreation and tourism.

  The Zebra mussel can be found in the Little Miami river watershed near the Warren / Hamilton County line and in Caesar Creek Lake. They have been partly implicated as a source of decline to Caesar Creek's native mussel population due to resource competition with the invasive species.

Source: USGS

History / Occurrences

There is no history / data of invasive or harmful species causing a significant impact to Warren County.

Probability of occurrence / Risk:

Because there is no history / data of invasive or harmful species causing a significant impact to Warren County, the probability of occurrence is very low.

Damages and impacts from Invasive Species:

The impacts from evasive species that could be in Warren County are listed in the species descriptions above.

Damage Extent:

Spatial Extent
Localized, but if left unmitigated could become widespread
Estimated losses
If deforestation is required due to invasive species, the estimated losses could be up to or exceed $1 million.
Critical Infrastructure Affected
It is unlikely that critical infrastructure would be affected by an invasive species outbreak, however if water-borne species were introduced into the water supply or treatment areas, the impact could be great.

Warning:

There are no warnings for harmful species. Lists of invasive species are available on the ODNR website http://ohiodnr.gov/invasivespecies. Members of the community that observe or have questions about an occurrence report your sightings to the ODA website https://www.eddmaps.org/

Conditions that may exacerbate or mitigate the effects of harmful / invasive species:

Warmer weather will increase the number of insects during the annual cycle. Most invasive species outbreaks are caused by accidental or intentional human activity. For mosquitos, warmer temperatures combined with increased rainy seasons increase water pools which are breeding grounds for mosquitos.

Examples of mitigation actions for invasive / harmful species that your jurisdiction can do:

- Work with local conservation organizations to provide public education about harmful / invasive species
- Removal of dead trees that could be a hazard to person and property
- Report suspected harmful / invasive species immediately to the proper authority so they can be checked and eradicated
  - Contact the Ohio University Extension Office for Warren County – 513-695-1311 or
  - Contact Warren County Soil and Water – 513-695-1337

4.8 DAM / LEVEE FAILURES

Definition:

A dam is defined as a barrier constructed across a watercourse for the purpose of storage, control, or diversion of water. Dams typically are constructed of earth, rock, concrete, or mine tailings. A dam failure is the collapse, breach, or other failure, often resulting in down-stream flooding.

A levee is any artificial barrier that will divert or restrain the flow of a stream or other body of water for the purpose of protecting an area from inundation by flood waters. A levee breach results when a portion of the levee breaks away, providing an opening for water to flood the landward side of the structure.

Primary Sources of Information:

- National Inventory of Dams(USACE) *https://nid.sec.usace.army.mil/ords/f?p=105:1::::::*
- Ohio Department of Natural Resources *http://ohiodnr.gov/*

DESCRIPTION:

In the state of Ohio, the **Ohio Department of Natural Resources** (ODNR) has combined the description and potential damages of Dam Failures into one classification system. The potential downstream hazard is broken into four classes.

Dam Classification

- **Class I** – Total storage volume greater than 5,000-acre ft. or a height of greater than 60 ft.
  Sudden failure would result in probable loss of life, serious hazard to health, structural collapse of at least one residence or one commercial or industrial business.
  *Class I dams must have an inundation study, Emergency Action Plan, and inundation maps.
- **Class II** – Total storage volume greater than 500-acre ft. or a height of greater than 40 ft.
  Sudden failure would result in disruption of public water supply or wastewater treatment facility, release of health hazard industrial or commercial waste or other health hazards, floodwater damage to homes, businesses, and industrial structures. Flooding of high-value property, damage to major roads and critical access points, damage to railroads or other public utilities, probable damage to downstream dams or levees of high value. (Note: no probable loss of human life).
- **Class III**- Total storage volume of greater than 50-acre ft. or a height of greater than 25 ft.
  Sudden failure would result in damage to low value non-residential structures, local roads, agricultural crops and livestock.
- **Class IV-** Total storage volume of 50-acre ft. or less and height of 25 ft. or less.
  Sudden failure would result in losses restricted mainly to the dam and immediate surrounding property. Human loss of life is not probable.

Levee Classification *(Source: http://water.ohiodnr.gov/safety/dam-safety)*

- **Class I** – Probable loss of human life, structural collapse of at least one residence or one commercial or industrial business.
- **Class II** – Disruption of public water supply or wastewater treatment facility, or other health hazards; flooding of residential, commercial, industrial, or publicly owned structures; flooding of high-value property; damage or disruption to major roads including but not limited to interstate and state highways, and the only access to residential or other critical areas such as hospitals, nursing homes, or correctional facilities as determined by the chief; damage or disruption to railroads or public utilities.
- **Class III** – Property losses including but not limited to rural buildings not otherwise described in this rule; damage or disruption to local roads including but not limited to roads not otherwise listed as major roads.

In Warren County ODNR has classified 165 dams:

Class 1 Dams	Class 2 Dams	Class 3 Dams	Class 4 Dams
10	15	23	48

There are also 4 abandoned dams, 10 unclassified dams, and 55 exempt dams per ODNR.
The **National Inventory of Dams** also classifies dams by the level of hazard they present:

- High Hazard Potential classification – loss of human life is likely if the dam fails.
- Significant hazard potential classification – no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns.

In Warren County, the National Inventory of Dams has classified 22 dams in the High or Significant Potential Hazard Category

*Table 26: **High Hazard** Potential Dams (8 in Warren County)*

Dam Name	River/Lake	City	Owner	Storage / Class	Year	Last Inspection	EAP Status	Potential Impacts
Caesar Creek Lake Dam (Saddle dam #3)	Caesar Creek	Oregonia	Federal	242,200 Acre ft Class I	1976	6/8/2015	Not noted	Affects structures within Oregonia, Morrow, and South Lebanon within 2 hours. Water flows south through Warren, Hamilton, and Clermont counties and reaches all the way down to Lunken Field in Cincinnati.
Caesar Creek Lake Dam (Saddle dam #2)	Caesar Creek	Oregonia	Federal	242,200 Acre ft Class I	1976	6/8/2015	Not noted	

Dam Name	River/Lake	City	Owner	Storage / Class	Year	Last Inspection	EAP Status	Potential Impacts
Remick Lake Dam	Tributary to Clear Creek	Springboro	Private	44 Acre ft Class I	1966	3/31/2016	No Plan	Per Appendix 5, multiple residential and commercial structures inundated. State Route 741 overtopped.
Shaker Run Dam	Shaker Creek	Armco Park	Private	6,124 Acre ft Class I	1973	6/15/2016	Approved 6/12/2007	Several commercial bldgs and homes along Shaker and Garver Rds are inundated, railroad levee overtopped near RS22400, Corrections Facility Treatment plant and bldgs. and Monroe water treatment plant affected.
Lilley Lake Dam	Tributary to Halls Creek	Oregonia	Private	210 Acre ft Class I	1954	10/16/2014	No Plan	Map search shows mostly farmland and some residences affected.
Sunrise Lake Dam	Tributary to Bear Run	Foster	Private	257 Acre ft Class I	1931	11/12/2014	Approved 5/2/2013	11 structures (business and residential could incur a few feet of water
Landen Farm Lake Dam	Simpson Creek	Foster	Private	1,400 Acre ft Class I	1975	10/8/2014	Approved 9/24/2014	Kings Mills Rd inundated, nearby residential area inundated, Socialville Foster Rd overtopped
Pine Hill Lake Dam	Tributary to Muddy Creek	Mason	Local Govt.	194 Acre ft Class I	1952	11/6/2014	Approved 1/24/2011	Couple feet of water in 5 structures along Kings Mills and US Rte 42

*Table 27: **Significant Risk** Potential Dams (14 in Warren County)*

Dam Name	River/Lake	City	Owner	Storage	Year	Last Inspection	EAP Status	Potential Impacts
Classicway Farm Lake Dam	Tributary to little Miami River	South Lebanon	Private	73 Acre ft Class II	1965	11/12/2014	No Plan	Map search shows mostly farmland and some residences affected. Ford Rd. affected
Bel-Wood Country Club Lake No. 2 Dam	Tributary to Bigfoot Run	South Lebanon	Private	44.6 Acre ft Class II	1965	11/12/2014	No-Plan	Map search shows golf course affected. Western Water nearby and residences may be affected.
Oeder lake No. 3 Dam	Tributary to Bigfoot Run	South Lebanon	Private	199 Acre ft Class II	1953	11/4/2014	Approved 9/25/2015	State Rte. 22 / 3 residences may incur flooding
Votel Lake Dam	Tributary to Turtle Creek	Lebanon	Private	97.3 Acre ft Class II	1954	11/6/2014	Approved 1/18/2013	Flooding of businesses, residential access and walking bridge, rural building, and local road.
Walnut Hills Lake Dam	Tributary to North Fork	Oregonia	Private	28.1 Acre ft Class II		10/30/2014	No Plan	Map search shows State Rte. 73 affected. Some nearby homes and businesses also affected.
Cold Springs Fishing Lake Dam	Tributary to Newman Run	Oregonia	Private	59.5 Acre ft Class III		11/6/2014	Approved 6/15/2016	Roadways only, no structures impacted
Stoneybrook Farm Lake Dam	Tributary to Newman Run	Oregonia	Private	76.4 Acre ft Class IV	1968	11/6/2014	No Plan	Map search shows E. Lower Springboro Rd., nearby businesses affected.
Arnett Lake No. 1 Dam	Tributary to North Fork	South Lebanon	Private	57.1 Ft Class II	1967	10/30/2014	No Plan	Map search shows St. Rte. 73, nearby businesses and one local home affected.
Stolle Lake Dam	Tributary to Newman Run	South Lebanon	Private	144 Acre ft Class II	1960	10/30/2014	No Plan	Damage will be restricted to the dam itself and rural agricultural land.
Arnett Lake No. 2 Dam	Tributary to North Fork	South Lebanon	Private	30 Acre ft Class II	1967	10/30/2014	No Plan	Map search shows St. Rte. 73, nearby businesses and one local home affected.
Anderson Lakes Farm Dam No. 1	Tributary to Little Miami River	Morrow	Private	33.6 Acre ft Class II		10/16/2014	Approved 10/16/2014	Water overtops Waynesville Rd and State Rt. 123.
Cincinnati Semiconductor Lake Dam	Tributary to Little Miami River	Morrow	Private	82.4 Acre ft Class II		11/12/2014	No Plan	Map search shows Grandin Rd., local businesses affected. Water may stretch to homes on Grandin Ridge Dr.
Fenwick Home Company Lake Dam	Tributary to Stony Run	Senior	Private	21.5 Acre ft Class II	1969	11/4/2014	No Plan	Map search shows Knights of Columbus campground, Route 350, and houses along 350 and on Arabian Dr..affected.
Goodrich Lake Dam	Tributary to Dry Run	South Lebanon	Private	44.2 Acre ft Class II	1994	11/6/2014	Approved 2/9/2012	Flooding of structures in south Lebanon, roadways

In Warren County, the National Levee Database identifies 3 levees:

Table 28: Levees Located in Warren County

Levee Name	River/Lake	City	Total Miles	Owner	Population	Structures	Property Value
Franklin LFP – FRAL1	Great Miami River	Franklin	.98 miles	Miami Conservancy District	553	207	$74.4M
Franklin LFP – FRAL 2	Great Miami River	Franklin	1.47 miles	Miami Conservancy District	714	308	$162M
Franklin LFP – FRAR1	Great Miami River	Franklin	.87 miles	Miami Conservancy District	434	156	$50M
Village of Monroe 1	Millers Creek	Monroe	.41 miles	Undefined	15	11	$33.4M

Causes of a Dam Failure: (Source: Ohio Department of Natural Resources)

- **Overtopping** – is often a precursor of dam failure. National Statistics show that overtopping due to inadequate spillway design, debris blockage of spillways, or settlement of the dam crest account for 34% of all U.S. dam failures.
- **Foundation Defects and Slope Instability** – this includes settlement and slope instability which cause about 30% of all dam failures.
- **Piping** – is internal erosion by seepage which often occurs around hydraulic structures, such as pipes and spillways, through animal burrows, around roots of woody vegetation, and through cracks in dams, dam accessories, and dam foundations.

Causes of a Levee Failure: (Source: U.S. Army Corps of Engineers)

- **Overtopping** – the level of floodwater is higher than the height of the levee. Overtopping can cause significant damage if the land side of the levee is not armored or reinforced, the water can undercut the levee and cause it to collapse or breach.
- **Erosion** – the force of water on a levee can cause it to fail by eroding the water side of the levee through wave action or scouring. Under extreme pressure, the water can push the levee from its original position.
- **Breach** – a section of the levee collapses, breaks, or is washed away allowing water to flow through the levee. A breach can be caused by an object hitting the levee or an object on the levee, such as a tree or building falls and pulls part of the levee out with it. Unexpected breaches can cause rapid flooding.
- **Drainage System Failure** - the bulk of the water remains on the water side of the levee, but damages can occur to nearby properties.

HISTORY / OCCURRENCES:

Table 29: History of Recorded Dam Failures in Warren County

NID No.	STRUCTURE NAME	INCIDENT DATE	INCIDENT	DAM FAILURE
	Water's Edge Dam (type II)	1993	Dam was rebuilt after failure	Yes
OH00547	Lilley Lake Dam (type IV)	02/08/2001	Inadequate Spillway Capacity	No
	Pine Hill Lake Dam (type I)	2001	Emergency spillway flowed	Yes
	Remick Lake Dam (Type I)	08/2019	Inadequate safety measures	No

PROBABILITY OF OCCURRENCE / RISK:

There have been two recorded dam failures in Warren County out of the recorded 165 dams. The probability of future occurrences for regulated dams is reduced due to proactive preventive actions in compliance with Ohio Department of Natural Resources Dam Safety Program, therefore, the probability of dam failure in Warren County is low.

DAMAGES AND IMPACTS FROM DAM FAILURES:

The impacts from dam and levee failures are similar to flood events. Most impacts will be due to excessive water escaping the dam / levee. The extent of water impact is a consideration in the classification of each dam / levee.

Damage Extent:

Spatial Extent
Localized or Wide-Spread, depending on classification of dam / levee and level of breach

Estimated losses
According to the State of Ohio Hazard Mitigation Plan, a failure of the levees in Warren County would result in an estimated $240 million in damages. State owned dam failures (which accounts for less than 1% of Warren County's dam inventory) would result in an estimated $270,000 in damages. Additional damages for county structures and infrastructure could result in millions of dollars in damages.
Critical Infrastructure Affected
Potentially all critical infrastructure located in the inundation zone from a dam would be impacted by a dam breach or failure. Appendix 5 shows the impact of dam breaches from Class I and Class II on critical infrastructure in the county.

WARNING:

There are three classifications of dam alert status that should be listed in all Class I dam Emergency Action Plans. The dam owner is responsible for activating the dam alert status and notifying the appropriate authorities.

- **Monitor** – A hazardous condition exists, requiring investigation and corrective action; potential for failure is being assessed; corrective measures are underway.
- **Watch** – Potential failure situation is developing.
- **Warning** – Dam failure is occurring or is imminent.

Levee breach or failure will be identified by the City of Franklin or the Miami Conservancy District.

CONDITIONS THAT MAY EXACERBATE OR MITIGATE DAM / LEVEE FAILURE:

- Debris Blockage – of spillways can cause overtopping of dams
- Settlement of dam crest
- Foundation defects (including settlement and slope instability)
- Internal erosion caused by seepage

Gaps remain in some qualitative and quantitative data for levees, which will affect a community's ability to gauge risk and implement successful risk communication. Such data gaps exacerbate existing state and community-specific levee safety issues, such as estimating levee maintenance costs, which affect future funding priorities; and completing accurate risk assessments among the various counties containing such structures in their jurisdictions.

4.9 EXTREME TEMPERATURES

DEFINITION:

Extreme Temperatures are those that are outside the norm for a particular region and that last for an extended period of time. According to the National Weather Service, temperature alerts are issued when there is a threat to life or environment. The following describe how the weather service identifies extreme temperatures:

PRIMARY SOURCES OF INFORMATION:

- *National Weather Service* - https://www.weather.gov/safety/heat, https://www.weather.gov/safety/cold
- *Past Data* - https://w2.weather.gov/climate/index.php?wfo=iln

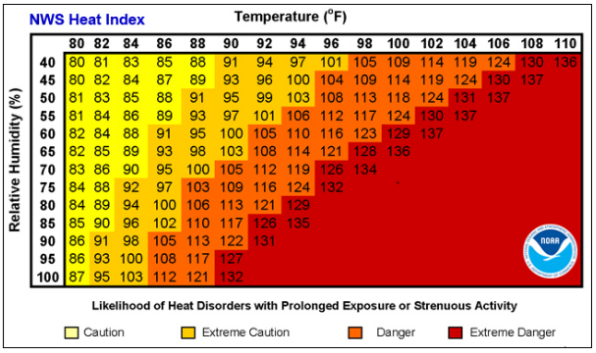
DESCRIPTION:

Heat:

A heat wave is a period of unusually hot weather that typically lasts two or more days. Heat waves are generally the result of trapped air. To be considered a heat wave, the temperatures must be outside the historical averages for a given area.

Figure 20: National Weather Service Heat Index Chart

The Heat Index is a measure of how hot it really feels when relative humidity is factored in with the actual air temperature. The National Weather Service Office in Wilmington will initiate alert procedures when the heat index is expected to exceed 100° for a prolonged period of time.

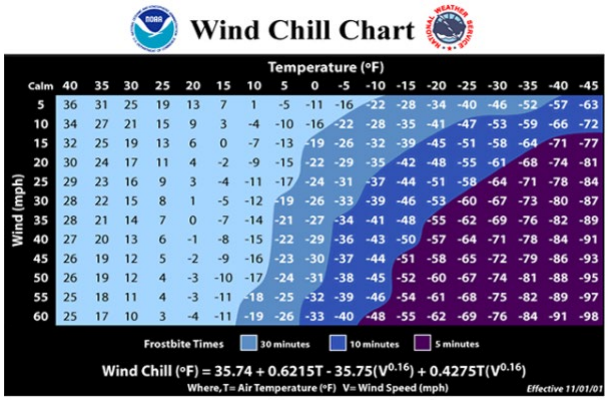


Cold:

The magnitude of extremely cold temperatures is generally measured through the Wind Chill Temperature Index. Wind chill is the term used to describe the rate of heat loss on the human body resulting from the combined effect of cold temperatures and wind. As winds increase, heat is carried away from the body at a faster rate, driving down skin and body temperature. The National Weather Service office in Wilmington will initiate alert procedures for wind chills when they are below -10°F for prolonged periods of time.

Figure 21: National Weather Wind Chill Chart

Note: wind chill does not impact inanimate objects like car radiators and exposed water pipes because these objects cannot cool below the actual air temperature. Frost / freeze alerts are initiated when conditions will affect the environment or other objects. The National Weather Service Office in Wilmington will initiate frost alert procedures for prolonged periods under 36°F during frost / freeze season.



History / Occurrences:

According to the National Weather Service office in Wilmington, Warren County averages about 5-7 extreme cold or heat events per year.

Probability of Occurrence / Risk:

According to the National Weather Service office in Wilmington, the following is the probability for extreme temperature events in Warren County:

Wind Chill	Heat
• Advisory – on average, 4 to 5 days per winter • Warning – on average 1 to 2 days per winter	• Advisory – on average 3 to 4 days per summer • Warning – on average 1 to 2 days per summer

**It is important to note that there is tremendous variability in the frequencies listed above. Some years there is no data reaching criteria, some years there are 7-10 days (depending on weather pattern and its longevity).*

Damages and Impacts from Extreme Temperatures:

Damage Extent:

Spatial Extent
Widespread effects on people and environment, localized effects on utilities
Estimated losses
It is difficult to estimate losses due to extreme temperatures. Agriculture may be affected, which could cause losses in thousands or millions of dollars. Power outages could cause losses from repairs or replacement of equipment or operation of shelters to maintain public safety.
Critical Infrastructure Affected
Potentially all critical infrastructure could be affected by the effects of wind / severe storms.

WARNING:

The National Weather Service issues the following warnings for Extreme Heat Events:

- **Excessive Heat Outlooks** – issued when the potential exists for an excessive heat event in the next 3-7 days.
- **Heat Advisory** – issued within 12 hours of the onset of extremely dangerous heat conditions (typically when the maximum heat index temperature is expected to be 100°F or higher for at least 2 days and where nighttime air temperatures don't drop below 75°F).
- **Excessive Heat Watch** – issued when conditions are favorable for an excessive heat event in the next 24 to 72 hours. A watch is used when the risk of a heat wave has increased but its occurrence and timing is still uncertain.
- **Excessive *Heat Warning*** – issued within 12 hours of the onset of extremely dangerous heat conditions (typically when the maximum heat index temperature is expected to be 100°F or higher for at least 2 days and where nighttime air temperatures do not drop below 75°).

The National Weather Service issues the following warnings for Extreme Cold Events:

- **Wind Chill Advisory -** issued when seasonably cold wind chill values (but not extremely cold values) are expected or occurring.
- **Wind Chill Watch -** issued when dangerously cold wind chill values are possible.
- **Wind Chill Warning -** issued when dangerously cold wind chill values are expected or occurring.

CONDITIONS THAT MAY EXACERBATE OR MITIGATE THE EFFECTS OF EXTREME TEMPERATURES:

Winter storm conditions can exacerbate cold temperatures. El Niño and La Niña patterns, can also exacerbate temperatures.

El Niño and La Niña are weather patterns that occur every few years. The water temperatures associated with these weather patterns can push warmer or colder air through the jet streams toward different parts of the country.

La Niña, caused by cooler than normal ocean temperatures, can cause cooler winter temperatures. Extended La Niña patterns can exacerbate wind chills into extreme temperatures. Conversely, El Niño patterns, caused by warmer than normal ocean temperatures, can contribute to extreme heat in the Ohio Valley.

4.10 EARTHQUAKES

DEFINITION:

An earthquake is a sudden, rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. For hundreds of millions of years, the forces of plate tectonics have shaped Earth as the huge plates that form the Earth's surface move slowly over, under, and past each other. Sometimes the movement is gradual. At other times, the plates are locked together, unable to release the accumulating energy. When the accumulated energy grows strong enough, the plates break free, causing the ground to shake.

PRIMARY SOURCES OF INFORMATION:

- ODNR - http://geosurvey.ohiodnr.gov/earthquakes-ohioseis/seismic-risk-in-ohio

DESCRIPTION:

Table 30: Earthquake Description and Damages

Earthquake Magnitude and Intensity				
Magnitude (M_w)	Intensity (Modified Mercalli Scale)	Description	Perceived Shaking	Potential Damage
1.0 – 3.0	I	I. Not felt except by very few people under especially favorable conditions.	Not felt	None
3.0 – 3.9	II – III	II. Felt by a few people, especially those on upper floors of buildings. Suspended objects may swing.	Weak	None
		III. Felt quite noticeably indoors. Many do not recognize it as an earthquake. Standing motorcars may rock slightly.	Weak	None

Earthquake Magnitude and Intensity				
Magnitude (M_w)	Intensity (Modified Mercalli Scale)	Description	Perceived Shaking	Potential Damage
4.0 – 4.9	IV – V	IV. Felt by many who are indoors; felt by a few outdoors. At night, some awakened. Dishes, windows, and doors rattle.	Light	None
4.0-4.9	IV-V	V. Felt by nearly everyone; many awakened. Some dishes and windows broken; some cracked plaster; unstable objects overturned.	Moderate	Very Light
5.0 – 5.9	VI – VII	VI. Felt by everyone; many frightened and run outdoors. Some heavy furniture moved; some fallen plaster or damaged chimneys. Damage negligible in well-constructed buildings; considerable damage in poorly constructed buildings.	Strong	Light
		VII. Most people alarmed and run outside. Damage negligible in well-constructed buildings; considerable damage in poorly constructed buildings.	Very Strong	Moderate
6.0 – 6.9	VII – IX	VIII. Damage slight in special designed structures; considerable in ordinary buildings; great in poorly built structures. Heavy furniture overturned. Chimneys, monuments, etc. may topple.	Severe	Moderate to Heavy
		IX. Damage considerable in specially designed structures. Buildings shift from foundations and collapse. Ground cracked. Underground pipes broken.	Violent	Heavy
7.0 and Higher	VIII and Higher	X. Some well-built wooden structures destroyed. Most masonry structures destroyed. Ground badly cracked. Landslides on steep slopes.	Extreme	Very Heavy
		XI. Few, if any, masonry structures remain standing. Railroad rails bent; bridges destroyed. Broad fissure in ground.	Extreme	Very Heavy
		XII. Virtually total destruction. Waves seen on ground. Objects thrown into the air.	Extreme	Very Heavy

History / Occurrences:

Ohio has had 200 earthquakes with epicenters in Ohio that have been felt since 1776. In addition, several earthquakes with origins outside Ohio have also been felt in the state. Most of these earthquakes have been felt only locally and have caused no damage or injuries.

There have been two recorded earthquakes with the epicenters occurring on the border of Warren and an adjacent county (earliest seismic recording data as of 1776).

Table 31: History of Recorded Earthquake Events in Warren County

Magnitude	Intensity	Location	Year
3.5	IV	Border of Warren and Montgomery Counties (Chautauqua area)	1834
3.3	II	Border of Warren, Butler, and Hamilton Counties (West Chester/Mason Areas)	1936

Source: Ohio Geological Survey, 2012 Earthquake epicenters Ohio and Adjacent Areas.

Probability of Occurrence / Risk:

A great difficulty in determining the probability of large earthquakes in the eastern United States is that the recurrence interval (the time between large earthquakes) is commonly very long, on the order of hundreds or even thousands of years. As the historic record in most areas, including Ohio, is only on the order of about 200 years it is nearly impossible to estimate the maximum magnitude or the frequency of earthquakes at any particular site.

Ohio is on the periphery of the New Madrid Seismic Zone. Effects from earthquakes on this fault line in the past have been felt in Ohio and some, which were estimated at 8.0 on the Richter scale, were of enough intensity to topple chimneys in Cincinnati.

The most important variables affecting earthquake damage are the intensity of the ground shaking caused by the quake coupled with the quality of the engineering of structures in the region.

Buildings most susceptible to shaking damage:

- Soft-story apartments and condos that have large openings on the first floor for garage doors and windows to accommodate parking or commercial space, and housing on upper floors (built prior to recent codes)
- Older, pre-WWII homes and homes built before the 1980's are more susceptible to damage due to their lack of bolting mechanisms to the foundation
- Mobile homes
- Unreinforced masonry buildings – with no steel reinforcing within a masonry wall. Most buildings before 1933 are not reinforced (depending on local code enforcement)

Infrastructure susceptible to damage from earthquakes (*Source: Congressional Research Service*)

- Bridges built before 1992 (were most likely not built to seismic standards nor have been retrofitted)

Causes of Earthquakes in Ohio:

The origins of Ohio Earthquakes appear to be associated with ancient zones of weakness in the Earth's crust that formed during rifting and continental collision events about a 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.

DAMAGES AND IMPACTS FROM EARTHQUAKES:

Warren County has many aging buildings and infrastructure which are susceptible to damages from shaking in an earthquake. Due to its low seismic risk, building codes do not require seismic bracing, which also leaves structures and infrastructure at risk for damages from earthquakes.

Damage Extent:

Spatial Extent
Localized to older structures and infrastructure if shaking is minimal. Widespread if magnitude is severe.
Estimated losses
According to the State of Ohio Hazard Mitigation Plan, a 5.0 magnitude earthquake with its epicenter in Lebanon would result in estimated losses of $1.9 BILLION dollars. *See Tables 3,5, and 11 from the State Hazus Report submitted below*
Critical Infrastructure Affected
A 5.0 magnitude earthquake in Warren County could affect a substantial amount of critical infrastructure, specifically utilities, older structures, and treatment plants.

Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	130.96	0.28	60.77	0.36	72.36	0.84	37.02	1.47	8.88	1.38
Commercial	1449.60	3.05	698.46	4.12	701.72	8.13	305.52	12.16	75.71	11.77
Education	51.47	0.11	22.63	0.13	23.30	0.27	9.06	0.36	2.54	0.40
Government	35.12	0.07	18.80	0.11	22.96	0.27	9.30	0.37	2.81	0.44
Industrial	543.04	1.14	247.58	1.46	277.00	3.21	131.95	5.25	31.44	4.89
Other Residential	1654.29	3.49	685.24	4.04	510.05	5.91	203.73	8.11	47.68	7.41
Religion	172.22	0.36	69.81	0.41	60.22	0.70	27.41	1.09	7.33	1.14
Single Family	43417.44	91.49	15155.94	89.37	6960.43	80.67	1789.42	71.19	466.77	72.57
Total	47,454		16,959		8,628		2,513		643	

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	0	0	0	0
Schools	61	10	0	22
EOCs	0	0	0	0
PoliceStations	12	2	0	3
FireStations	19	3	0	5

Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	3.4425	37.7714	4.0797	2.9653	48.2589
	Capital-Related	0.0000	1.4681	34.4508	2.5311	0.7745	39.2245
	Rental	22.9678	9.5299	18.9795	1.5005	1.6065	54.5842
	Relocation	80.1744	5.5874	29.1489	6.7413	12.7639	134.4159
	Subtotal	**103.1422**	**20.0279**	**120.3506**	**14.8526**	**18.1102**	**276.4835**
Capital Stock Losses							
	Structural	159.7397	15.4162	46.6336	22.5167	15.5512	259.8574
	Non_Structural	622.1120	85.9449	119.1868	68.9755	38.0457	934.2649
	Content	251.4669	27.0333	66.6960	49.8804	22.1048	417.1814
	Inventory	0.0000	0.0000	2.0580	9.4326	0.4273	11.9179
	Subtotal	**1033.3186**	**128.3944**	**234.5744**	**150.8052**	**76.1290**	**1623.2216**
	Total	**1136.46**	**148.42**	**354.93**	**165.66**	**94.24**	**1899.71**

WARNING:

There are early warning systems for earthquakes that can provide up to tens of seconds of warning prior to shaking arriving. The time required to detect and issue an earthquake warning is dependent on distance between the earthquake source and the closest seismic network station, the transfer of information to the regional network, the detection and characterization of an earthquake, and the shaking intensity threshold used to issue an alert (*Source: USGS.gov*). Typically, those who don't live in active seismic zones will receive little-to-no warning before the shaking of an earthquake arrives.

CONDITIONS THAT MAY EXACERBATE OR MITIGATE THE EFFECTS OF EARTHQUAKES:

The nature of earthquakes is that they strike randomly with no notice and varying intensities. There is one unnamed fault line in the northwest potion of Warren County.

Figure22: USGS Earthquake Hazard Zones

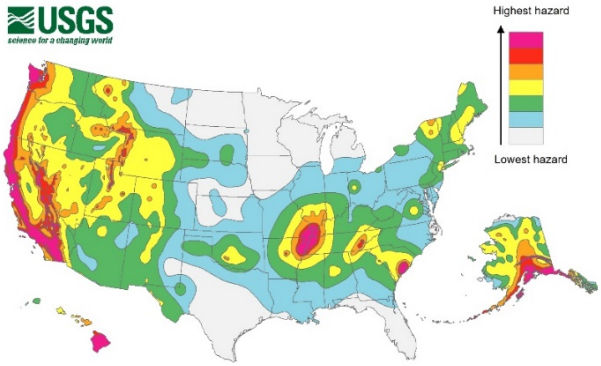


Figure 23: Map of Fault Lines in Ohio

Modified from Division of Geological Survey Map PG-23, 2002). This map portrays a number of deep faults and other structures that have been identified by a variety of geologic studies. Some faults are well known, whereas others are speculative. Very few of them are visible at the surface. The Fort Wayne (Anna) rift in Western Ohio is the site of numerous historic earthquakes.

There are some human-caused events that can affect the environment conducive to causing earthquakes. Mining, dam building and fracking can intensify conditions that can lead to earthquakes.

A point to consider:

Ohio lies on the outermost boundaries of the New Madrid fault, centrally located at New Madrid, Missouri. This fault has created significant activity over the last 200 years with the most intense activity occurring in the years 1811-1812. Two earthquakes estimated to be 7's on the Richter scale hit the New Madrid fault which caused damage to chimneys as far north as Cincinnati. Seismologists estimate the New Madrid Seismic Zone has a 25 to 40 percent chance of producing a significant earthquake in the next 50 years. A significant earthquake of 7 or 8 magnitude on the fault could render enough shaking to produce light to moderate shaking in Warren County.

4.11 LANDSLIDES / EROSION

DEFINITION:

A landslide is defined as any downward and outward movement of soil and rock material on slopes that significantly impacts infrastructure or personal property.

Erosion is defined as the gradual wearing away of earthen materials which are transported by natural forces such as wind and water.

PRIMARY SOURCES OF INFORMATION:

- *Ohio EMA HMP - https://ema.ohio.gov/Documents/OhioMitigationPlan/SOHMP_Sec_2_5.pdf*
- *USGS Maps - https://usgs.maps.arcgis.com/apps/webappviewer/index.html?id=ae120962f459434b8c904b456c82669d*
- *Ohio Department of Natural Resources - http://geosurvey.ohiodnr.gov/portals/geosurvey/PDFs/GeoFacts/geof08.pdf*
- *NASA - https://earthobservatory.nasa.gov/images/89937/a-global-view-of-landslide-susceptibility*

DESCRIPTION:

There are four main types of landslides that occur in Ohio:

- Rotational Slump: the movement of a mass of weak rock or sediment as a block unit along a curved slip plane. In Ohio, these types of slides commonly involve hundreds of thousands of cubic yards of material and extend for hundreds of feet.
- Earthflow: involves rock, sediment, or weathered surface materials moving downslope in a mass. The rate of movement of an earthflow is generally quite slow.
- Rockfall: an extremely rapid, potentially dangerous downslope movement of earth materials. Large blocks of massive bedrock suddenly become detached from a cliff or steep hillside and free fall in a rolling, bounding, or sliding manner downslope
- Debris flow: a rapid mass movement in which loose soil, rock, and sometimes organic matter combine with water to form a slurry that flows downslope.

Types of Erosion

- Physical erosion described the process of rocks changing their physical properties without changing their basic chemical properties. Landslides are a form of erosion.
- Erosion by water can occur when rain, rivers, floods, lakes, and the ocean carry away bits of soil and sand and slowly wash away the sediment.
- Erosion by wind is a process where wind transports dust, sand, and ash from one place to another. Wind can also erode material until little remains at all.
- Erosion by ice is caused when glaciers scape against the ground below eroding the ground and rocks.
- Thermal erosion describes the erosion of permafrost along a river or coastline. Warm temperatures can cause ice-rich permafrost to break off coastlines in huge chunks, carrying topsoil and vegetation with them.

History / Occurrences:

At any time, there are multiple landslides along Warren County roads that are monitored and remediated by local, county, and state maintenance departments. Two of the more notable landslides are:

Table 32: History of Recorded Landslide Events in Warren County

LOCATION	DATE	Event
Warren Co.	11/12/2018	Wilmington Road
Warren Co.	4/20/2019	State Route 123

There are three reported cases of land erosion that have potential to significantly impact localized property:

Table 33: Reported Cases of Land Erosion in Warren County

Location	Description
4109 Mason-Morrow – Millgrove Road (Morrow)	Land is eroding away due to velocity of Little Miami River in high water situations
60 Lorain Ave (Harveysburg)	Land is eroding away from property due to stormwater drainage issues
Miami View Drive	Land is eroding on residential properties due to Great Miami River Flow

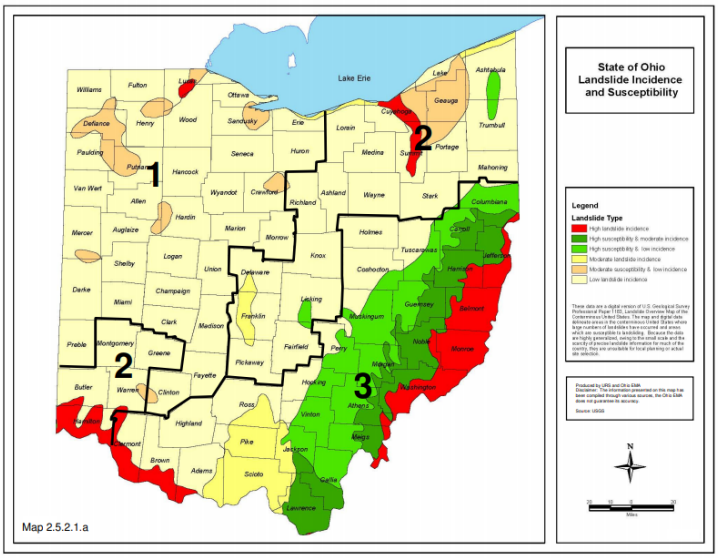
**There may be additional cases that have not been reported for the purpose of this assessment*

Probability of Occurrence / Risk:

The probability of a landslide occurring in Warren County is very low. Erosion is an on-going, but isolated occurrence. According to the State of Ohio Hazard Mitigation Plan, if a landslide were to occur in Warren County, it would most likely occur in the central eastern portion (which is more hilly in nature).

Figure 24: Map of Landslide Incidence and Susceptibility in Ohio

State of Ohio Hazard Mitigation Plan



Damages and Impacts from Landslides / Erosion

Slow moving landslides can affect manmade structures and infrastructure whether they are directly on or near a landslide. Landslide damage can affect lifelines and access routes of the immediate area or other surrounding locations. Fast-moving landslides such as debris flows are the most destructive type of landslide to structures as they often occur without precursors or warnings and move too quickly for mitigation measures to be enacted.

Erosion can cause a loss of land space and may impact any structure build too close to a river or stream.

Damage Extent:

Spatial Extent
Localized
Estimated losses
According to the State of Ohio Hazard Mitigation Plan, Warren County's potential damages resulting from landslides could equal $143,151 for jurisdictions affected. Erosion can contribute to these damages.
Critical Infrastructure Affected
Any critical infrastructure in the path of a landslide could be affected by damages caused by the slide.

Warning:

There are very little warnings of landslides / erosion but incidents at a location are the best indication of future events.

Conditions that may exacerbate or mitigate the effects of a Landslide / Erosion:

Flooding is the primary contributor to erosion. Heavy rainfall or snowmelt can precipitate erosion. Precipitation, thawing, wildfires, and flooding can exacerbate landslide conditions.

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

- **Steep slope**: All landslides move downslope under the influence of gravity. Therefore, steep slopes, cliffs, or bluffs are a required element leading to a landslide, especially in conjunction with one or more of the conditions listed below.
- **Jointed rocks**: Fractures in rocks allow surface moisture to penetrate and weaken it. When the moisture freezes, it pries the rock masses apart at the joint.
- **Weak Geologic Materials** such as fine-grained, permeable rock or sediment, clay or shale units subject to groundwater penetration, or natural zones of weakness such as bedding planes and fault planes.
- **Climatic Conditions**: Periods of heavy rainfall, excess snowmelt, or other events where water is accumulated, saturate the zone above the normal water table and cause a landslide.

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

- **Vibrations** such as those from human-caused like blasting or the passing of a heavy truck or from natural events like earthquakes, although no such occurrence has been documented in Ohio.
- **Oversteepened slope** caused by undercutting by stream or wave erosion, by human construction activities, or by the addition of fill material to the upper portion of a slope. This disturbs the equilibrium of a stable slope and causes the angle of stability to be exceeded.
- **Increased weight on a slope** caused by the addition of large amounts of fill, the construction of a building or other structure, or an unusual increase in precipitation, either from heavy rains or from artificial alteration of drainage patterns.
- **Removal of vegetation** and trees, because of the loss of roots which tend to hold the rock or sediment in place and soak up excess moisture.

4.12 DROUGHTS

Definition:

A drought is defined as a shortage of water over an extended period. Drought is a natural hazard, with a slow onset that evolves over months or even years.

PRIMARY SOURCES OF INFORMATION:

- The National Oceanic and Atmospheric Administration's (NOAA) National Integrated Drought Information System (NIDIS) program https://www.drought.gov/drought/
- National Weather Service - https://www.weather.gov/safety/drought
- National Drought Mitigation Center (NDMC) University of Nebraska Lincoln works with NOAA and USDA to produce the US Drought Monitor report(system)

DESCRIPTION:

There are multiple types of droughts:

- **Meteorological drought** – based on the degree of dryness or rainfall deficit & the length of dry period.
- **Hydrological drought** – based on the impact of rainfall deficits on the water supply such as stream flow, reservoir and lake levels, and ground water table decline.
- **Agricultural drought** – refers to impact on agriculture by factors such as rainfall deficits, soil and water deficits, reduced ground water, or reservoir levels needed for irrigation.
- **Socioeconomic drought** – considers the impact of drought conditions (meteorological, agricultural, or hydrological drought) on supply and demand of some economic goods such as fruits, vegetables, grains, and meat. Socioeconomic drought occurs when the demand for an economic good exceeds supply as a result of weather-related deficit in water supply.

Drought classification and possible impacts:

There are a few different methods for measuring drought, but no standard measurement is recognized by all agencies:

- **The Standard Precipitation Index (SPI)** shows actual precipitation compared to the probability of precipitation for various timeframes. The SPI is used for short-term agricultural and long-term hydrological applications. A drought occurs any time the SPI is continuously negative and reaches an intensity of d-1.0 or less. The event ends when the SPI becomes positive.
- **The Palmer Drought Severity Index (PDSI)** uses temperature and precipitation data to estimate dryness. It is a standardized index that spans -10 (dry) to +10 (wet) and is the most effective method in determining long-term drought. Many U.S. government agencies and states rely on the PDSI to trigger drought relief programs and responses.
- **The National Drought Mitigation Center** established a US Drought Monitor which classifies droughts on a numeric system similar to the Fujita Scale for tornadoes. The scale measures from abnormally dry conditions (D0) through exceptional wide-spread drought (D4). The USDM's weekly report uses this classification scale in combination with a color-coded map to provide a tool for decision making and drought planning.

Figure 25: National Drought Mitigation Center Palmer Drought Severity Index

Palmer Drought Severity Index

DROUGHT SEVERITY	RETURN PERIOD (YEARS)	DESCRIPTION OF POSSIBLE IMPACTS	DROUGHT MONITORING INDICES		
			Standardized Precipitation Index (SPI)	NDMC* Drought Category	Palmer Drought Index
Minor Drought	3 to 4	Going into drought; short-term dryness slowing growth of crops or pastures; fire risk above average. Coming out of drought; some lingering water deficits; pastures or crops not fully recovered.	-0.5 to -0.7	D0	-1.0 to -1.9
Moderate Drought	5 to 9	Some damage to crops or pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing or imminent, voluntary water use restrictions requested.	-0.8 to -1.2	D1	-2.0 to -2.9
Severe Drought	10 to 17	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed	-1.3 to -1.5	D2	-3.0 to -3.9
Extreme Drought	18 to 43	Major crop and pasture losses; extreme fire danger; widespread water shortages or restrictions	-1.6 to -1.9	D3	-4.0 to -4.9
Exceptional Drought	44 +	Exceptional and widespread crop and pasture losses; exceptional fire risk; shortages of water in reservoirs, streams, and wells creating water emergencies	Less than -2	D4	-5.0 or less

Source: National Drought Mitigation Center

HISTORY / OCCURRENCES:

The National Centers for Environmental Information (NCEI) Storm Events Database contains records of significant weather phenomena having enough intensity to cause loss of life, injuries, significant property damage, and / or disruption to commerce. According to the NCEI Storm Events Database, Warren County has had only 2 occurrences of long-term drought, significant enough to cause major crop loss between 1950 and 2019. At the time of reporting, there was no monetary estimates available.

Table 34: History of Recorded Long-Term Drought Events in Warren County

LOCATION	DATE	TYPE	DEATH	INJURY	PROPERTY DAMAGE	CROP DAMAGE
Warren Co.	7/1/1999	Drought	0	0	0.00K	Not available
Warren Co.	8/1/1999	Drought	0	0	0.00K	Not available
		TOTALS:	**0**	**0**	**$0**	

Source: NOAA National Centers for Environmental Information

The weekly palmer drought indices maps indicate prolonged and abnormal moisture deficiency or excess. According to these maps, Warren County experienced 46 moderately drought stage weeks and 4 severe drought weeks from 2005 – 2019.

Table 35: History of Moderate or Severe Drought Events in Warren County with El Niño years indicated

	Indicate El Niño years
Week of June 16th, 2007 – Moderate Drought Stage	Week of November 8th, 2008 – Moderate Drought Stage
Week of June 23rd, 2007 – Moderate Drought Stage	Week of November 15th, 2008 – Moderate Drought Stage
Week of June 30th, 2007 – Moderate Drought Stage	Week of November 15th, 2008 – Moderate Drought Stage
Week of August 11, 2007 – Moderate Drought Stage	Week of November 29th, 2008 – Moderate Drought Stage
Week of August 18th, 2007 – Moderate Drought Stage	Week of December 6th, 2008 – Moderate Drought Stage
Week of August 25th, 2007 – Moderate Drought Stage	Week of December 13th, 2008 – Moderate Drought Stage
Week of September 1st, 2007 – Moderate Drought Stage	Week of February 21st, 2009 – Moderate Drought Stage
Week of September 8th, 2007 – Moderate Drought Stage	Week of February 28th, 2009 – Moderate Drought Stage
Week of September 15th, 2007 – Moderate Drought Stage	Week of March 14th, 2009 – Moderate Drought Stage
Week of September 22nd, 2007 – Moderate Drought Stage	Week of March 28th, 2009 – Moderate Drought Stage
Week of September 29th, 2007 – Moderate Drought Stage	Week of April 25th, 2009 – Moderate Drought Stage
Week of October 6th, 2007 – Moderate Drought Stage	Week of May 30th, 2009 – Moderate Drought Stage
Week of October 13th, 2007 – Severe Drought Stage	Week of September 25th, 2010 – Moderate Drought Stage
Week of October 13th, 2007 – Severe Drought Stage	Week of October 9th, 2010 – Moderate Drought Stage
Week of October 16th, 2010 – Moderate Drought Stage	Week of January 29th, 2011 – Moderate Drought Stage
Week of October 23rd, 2010 – Moderate Drought Stage	Week of July 21st, 2012 – Moderate Drought Stage
Week of October 30th, 2010 – Moderate Drought Stage	Week of August 4th, 2012 – Moderate Drought Stage
Week of November 6th, 2010 – Severe Drought Stage	Week of August 18th, 2012 – Moderate Drought Stage
Week of November 13th, 2010 – Severe Drought Stage	Week of September 1st, 2012 – Moderate Drought Stage
Week of November 20th, 2010 – Moderate Drought Stage	Week of December 1st, 2012 – Moderate Drought Stage
Week of December 25th, 2010 – Moderate Drought Stage	Week of September 24th, 2019 – Moderate Drought Stage
Week of October 16th, 2010 – Moderate Drought Stage	Week of October 1st, 2019 – Moderate Drought Stage
Week of January 1st, 2011 – Moderate Drought Stage	Week of October 8th, 2019 – Moderate Drought Stage
Week of January 8th, 2011 – Moderate Drought Stage	Week of October 19th, 2019 – Moderate Drought Stage
Week of January 15th, 2011 – Moderate Drought Stage	*Source:* https://www.ncdc.noaa.gov/temp-and-precip/drought/weekly-palmers/
Week of January 22nd, 2011 – Moderate Drought Stage	

The weekly palmer drought indices show that there were 46 instances of moderate drought conditions and 4 instances of severe drought between 2005 - 2019. The longest periods of drought occurred in El Niño years, which affect the jet stream and temperature conditions. It can be reasonably assumed that there will be periods of moderate to severe drought in Warren County during El Niño years and short periods of moderate to severe drought during other years where precipitation is low, and temperatures are high.

There have been three Federal declarations for drought-related issues, specifically to crops for the state of Ohio that included Warren County.

- 1/26/2009 the USDA designated 65 Ohio counties as primary natural disaster areas due to damages and losses created by recent drought. (Source USDA Press Release No. 1409.09)
- 9/16/2010 the USDA designated 41 counties in Ohio as primary natural disaster areas due to damages and losses caused by recent drought. (Source USDA Press Release No. 0099.10)
- 8/15/2012 The USDA designated 9 counties in Ohio as primary natural disaster areas due to damages and losses caused by recent drought. (Source USDA Press Release No. 0129.12)
  (Data pulled from https://droughtreporter.unl.edu/advancedsearch/reports.aspx)

Probability of Occurrence / Risk:

Due to the nature of drought, it is hard to predict the probability of occurrence per event. Reviewing the data from the history in Warren County, the following can be assumed:

[(Current Year) 2019] subtracted by [(Historical Year) 1950] = 69 Years on Record
[(Years on Record) 69] divided by [(Number of Historical Events) 5] = <1 occurrence of significant drought per 13 years.
It can be reasonably assumed that the occurrence of drought is low in Warren County.

Damages and Impacts from Drought:

Figure 25 (p. 76) shows the impact of certain drought stages on the Palmer Drought Severity Index.

Damage Extent:

Spatial Extent
Widespread
Estimated losses
Based on historical data and Warren County's amount of agriculture, if a drought severely impacted half of Warren County's crops, the estimated impact would equal $22 million.
Critical Infrastructure Affected
Drought could impact certain critical utilities (either directly or indirectly through overuse, causing sporadic outages).

Warning:

The National Integrated Drought Information System (NIDIS) reports current drought conditions in different regions of the United States. The Midwest Drought Early Warning System depicts current drought conditions in the Midwest, including the Ohio Valley.

The US Drought Monitor is a weekly product that provides a general summary of seasonal drought conditions. The US Seasonal Drought Outlook shows predicted trends for areas currently in drought, as well as areas where new droughts may develop. Drought events develop over time and can be classified according to multiple different scales (as indicated in the tables above). By the time a drought has been classified, its affects may already be felt by the people and environment.

Conditions that may exacerbate or mitigate the effects of droughts:

Although climate is a primary contributor to hydrological drought, other factors such as changes in land use, land degradation, and the construction of dams all affect the hydrological characteristics of a particular region. Since geographic regions are interconnected by natural systems, the impact of drought may extend well beyond the borders of the precipitation-deficit areas.

Changing weather patterns can also affect drought. El Niño patterns, caused by seasonably warmer ocean temperatures, can contribute to warmer, drier conditions in the Ohio Valley. As indicated by the weekly Palmer Indices, there are longer periods of drought in Warren County during El Niño years.

4.13 INFECTIOUS DISEASE OUTBREAKS

Definition:

An infectious disease outbreak is an outbreak as one that is caused by micro-organisms, such as bacteria, viruses and parasites. A vector-borne disease is an infectious disease that is transmitted to humans by blood-feeding arthropods, including ticks, mosquitoes and fleas, or in some cases by mammals (e.g. rabies).

Primary Sources of Information:

- Ohio Department of Health (ODH)
- U.S. Centers for Disease Control and Prevention (CDC)

DESCRIPTION:

- Infectious disease dynamics depend on a range of factors, including land use, human behavior, climate, efficacy of healthcare services, population dynamics of vectors, population dynamics of intermediate hosts and the evolution of the pathogens themselves
- Many of these diseases require continuous monitoring, as they present seasonal threats to the general population. An epidemic emerges when an infectious disease occurs suddenly in numbers that are in excess of normal expectancy. Infectious disease outbreaks put a strain on the healthcare system and may cause continuity issues for local businesses. These outbreak incidents are a danger to emergency responders, healthcare providers, schools, and the public. This can include influenza (e.g. H1N1), pertussis, West Nile virus, and many other diseases.

HISTORY / OCCURRENCES:

Pandemic influenza, considered to be a global outbreak, spread quickly around the world and was observed in 1918, 1957, 1968 and in 2009 with the novel H1N1 strain. The 2009 H1N1 outbreak affected Warren County and the rest of Ohio. The great influenza epidemic of 1918 killed millions worldwide and would likely cause hundreds to thousands of deaths in Ohio should a similar outbreak occur today. It is anticipated that a more serious strain of the usual flu will occur some year and that vaccines might not be ready in time to combat rapid spread.

**Note: The hazard identification and ranking were completed prior to the Worldwide COVID-19 pandemic of 2020 (thus its full information cannot be included in this plan, however it is counted in the chart below).*

Table 36: History of Recorded Infectious Disease Outbreaks in Warren County

Year	# of Community Outbreaks	# of Foodborne Outbreaks	# of Healthcare-Associated	# of Institutional Outbreaks	# of Waterborne Outbreaks	# of Zoonotic Outbreaks
2020	*30	0	0	0	0	0
2016	0	0	1	4	1	0
2015	0	0	0	0	0	0
2014	0	0	0	6	0	0
2013	0	0	0	0	0	0
2012	1	0	0	1	0	0
2011	0	0	0	0	0	0
2010	0	0	0	0	0	0
2009	0	0	0	0	0	0
2008	1	3	0	1	0	0
2007	0	0	0	0	1	0

Source: Ohio Department of Health
**current number of outbreaks from COVID 19 as of 7/27/2020*

PROBABILITY OF OCCURRENCE / RISK:

Due to the nature of infectious disease outbreaks, it is difficult to predict when they may occur. There are some infectious diseases, such as influenza and norovirus, that have a predictable and known seasonality where there are an increased number of occurrences.

DAMAGES AND IMPACTS FROM INFECTIOUS DISEASE OUTBREAKS:

Damage Extent:

Spatial Extent
Localized or widespread depending on cause, type of disease, and method of spread
Estimated losses
Infectious diseases can affect supply lines and the economy if restrictions and quarantines are put into place. The 2020 pandemic has cost Warren County millions in economic losses. Another pandemic of national magnitude can cost the county millions in losses and thousands in PPE / supply purchases.
Critical Infrastructure Affected
Infectious diseases can be injected into critical supply lines such as water and the environment. Critical services can also be affected if personnel are affected by infectious diseases.

WARNING:

Early warning systems include timely surveillance systems that collect information on epidemic-prone diseases in order to trigger prompt public health interventions. The World Health Organization Strategic Health operations Centre (SHOC) monitors global public health events around the clock and facilitates international collaboration during public health emergencies and daily operations. WHO utilizes the Early Warning Alert and Response Network (EWARN) to rapidly detect and respond to potential outbreaks of epidemic-prone diseases. The Centers for Disease Control and Prevention (CDC) performs 24/7 outbreak surveillance, to warn the United States of potential outbreaks. State, regional, and local public health will receive alerts from the CDC on suspected outbreaks. They also receive information from hospitals and healthcare agencies of suspected cases of epidemiological concern which they report up through regional, state, and national channels.

CONDITIONS THAT MAY EXACERBATE OR MITIGATE THE EFFECTS OF INFECTIOUS DISEASE OUTBREAKS:

There are multiple factors that may exacerbate or mitigate the spread of infectious disease. Ensuring that the population has been vaccinated for those diseases that are vaccine preventable is an evidence-based practice to reduce the number of infectious diseases. Educating the public on standard precautions such as washing your hands and covering your mouth when you cough can help to prevent the spread of disease.

4.14 WILDFIRES

DEFINITION:

Wildfire events are unwanted wildland fires, including unauthorized human-caused fires, escaped debris burns, and other ignition sources that lead to fire over wildland areas. Throughout Ohio, communities are increasingly concerned about wildfire safety as increased development and subsequent fire control practices have affected the natural cycle of the ecosystem. Wildland fires affect grass, forest, and brush lands, as well as any structures located within them. Human access to wildland areas, such as urban development in forested areas, increases the risk of fire due to a greater chance for human carelessness.

PRIMARY SOURCES OF INFORMATION:

- *Ohio Department of Forestry (a division of ODNR): http://forestry.ohiodnr.gov/wildfire*

DESCRIPTION:

The magnitude and severity of a wildfire event is measured by calculating the number of acres burned in a specific wildfire event and the severity of the burn classifications[2]. The below burn severity classifications have been adapted from USDA Natural Resources Conservation Service.

- **Low Fire Severity (Type III)**
  Primarily occurs on rangeland and is indicated by decaying leaves and branches with debris partially burned. Soil may be an abnormal color and standing trees may have some brown needles. Natural recovery with root crowns and no significant erosion are likely.
- **Medium Fire Severity (Type II)**
  Primarily occurs on steep, lightly timbered slopes with grass and is indicated by some sediment delivery. A medium severity fire is indicated by burned needles, dark-colored ash, brown or reddish-brown soil up to two inches deep, charring on small stumps and blackened lower halves of trees. Most roots and perennial grasses will re-sprout after a Type II Wildfire and some vegetation will recover within 1-5 years. Soil erosion is more likely to occur with a Type II (or above) wildfire due to lack of ground cover.
- **High Fire Severity (Type I)**
  Primarily occurs in unprotected drainages on steep, timbered, north or east slopes with dense forest canopy. A high severity wildfire is indicated by gray or white ash, absence of stumps or small fuel items, reddish-orange or dark soils up to 2 inches deep with the soil being physically affected (such as crystallization, crusting, or clustered), burned roots on vegetation, and standing trees are reduced to charcoal up to 1 inch deep. Natural

[2] Natural Resources Conservation Service burn intensity classifications can be used to estimate soil heating by vegetative and physical conditions. Wildfire burn intensity is useful in preparing rehabilitation plans for properties and other post-fire activities.

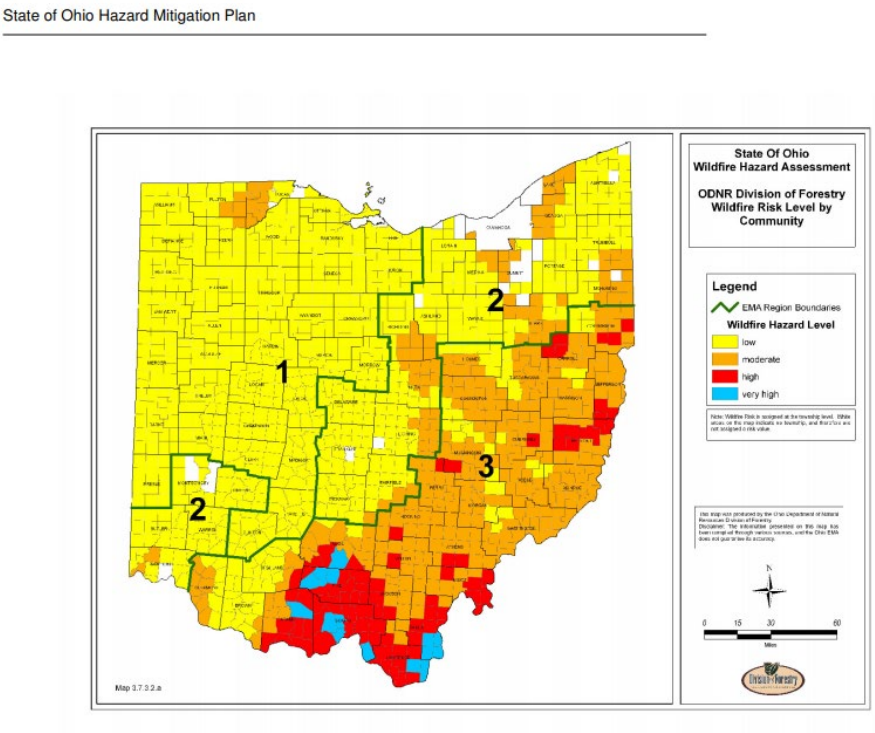
vegetation will have a hard time recovering from Type I wildfires with only some deep roots re-sprouting which could take up to five or ten years. Soil erosion may be significant.

History / Occurrences:

There has not been a documented (per Ohio Department of Natural Resources) wildfire events in Warren County. Although Ohio has had several wildfires throughout the state, the region near Warren County has not yet sustained any substantial damage attributed to fires for as long as records have been maintained. Most of the wildfire risk in Ohio is located in the southern southeastern and eastern parts of the state (Region 3 of State of Ohio Wildfire Hazard Assessment). Warren County lies within Region 2 of the State of Ohio Wildfire Hazard Assessment, which is outside of the ODNR Wildfire protection area boundary.

- Between January 1st of 1997 and November 20th of 2007 there have been 8,235 wildfires in Ohio which burned 42,622 acres. (ODNR)

Figure 26: State of Ohio Map of Wildfire Hazard Assessment



Probability of Occurrence / Risk:

There is no historical precedence in Warren County to determine frequency, though the probability of wildfires will increase as climate change impacts increase in the region, possibly resulting in drier or more windy conditions.

Damages and Impacts from Wildfires:

Damage Extent:

Spatial Extent
Most likely localized. Sufficient water capability and urbanized areas to keep from spreading county-wide.
Estimated losses
According to the State of Ohio Hazard Mitigation Plan, Warren County is in the low hazard level zone for wildfire. The total number of critical facilities that could sustain damages equals approximately $159 million. Additional damages to residential neighborhoods and other businesses could equal twice that amount.
Critical Infrastructure Affected
Potentially all critical infrastructure in the localized area could be affected by the effects of wildfire.

WARNINGS:

There are a few different warning types for wildfires:

- **Fire Weather Watch**: means critical fire weather conditions are possible but not imminent or occurring. A fire weather watch, alerts land managers and the public that upcoming weather conditions could result in extensive wildland fire occurrence or extreme fire behavior.
- **Red Flag Warning**: is issued when fire conditions are ongoing or expected to occur shortly. NWS issues Red flag Warnings in conjunction with land management agencies to alert land managers to an ongoing or imminent critical fire weather pattern.
- **Extreme Fire behavior**: implies a wildfire is likely to rage out of control. It is often hard to predict these fires because they behave erratically, sometimes dangerously. In order to receive the extreme fire behavior alert, one of the following criteria must be met:
    - The fire must be fast-moving
    - Prolific crowning or spotting
    - Presence of fire whirls
    - Strong convection column

CONDITIONS THAT MAY EXACERBATE OR MITIGATE THE EFFECTS OF WILDFIRES:

Ohio's wildfire seasons occur primarily in the spring (March, April and May) before vegetation has "greened-up" and the fall (October and November) when leaf drop occurs. During these times and especially when weather conditions are warm, windy and with low humidity, cured vegetation is particularly susceptible to burning. Fuel (vegetation, woody debris), weather (wind, temperature, humidity) and topography (hills and valleys) can combine to present an extreme danger to unwary civilians and firefighters in the path of a wildfire. *(Source: ODNR Division of Forestry)*

Most wildfires in Ohio are caused by human action or accident. Public education about wildfire risks could assist with mitigating certain wildfire incidents.

5.0 Mitigation Strategy

The mitigation strategy describes how the community will accomplish the mission of the planning process, which is to reduce risk. In this section, mitigation goals and objectives were assigned, and mitigation actions were updated / amended, identified, evaluated, and prioritized.

5.1 Mitigation Goals

Through the planning process, Warren County jurisdictions and stakeholders determined the county is prone to 14 major hazards. After reviewing and prioritizing those hazards, the planning team identified 5 goals representing the County's long-term mission to achieve successful mitigation efforts and reduce overall risk to life, property, and the environment from the effects of the 14 identified hazards. The associated objectives are specific to this mitigation plan and contain strategies and steps to assist communities attain the goals that are listed in this plan.

Goal 1: Promote public awareness of hazard risks and available mitigation options

a. Improve public outreach and access to hazard information, data, and maps to enhance understanding of natural hazards and the risks they pose.
b. Improve public knowledge of natural and man-made hazards and protective measures so individuals appropriately prepare for and respond to such hazards.

Goal 2: Avoid or reduce the potential for life loss, injury and health issues to Warren County residents from hazard events

a. Identify and reduce the health and safety impacts of hazards on vulnerable populations.
b. Promote enforcement of state and local building codes and support other structural interventions to reduce vulnerability.
c. Improve and promote systems that provide early warning communications during and prior to an emergency.
d. Adopt and enforce public policies to promote resilient development and enhance safe construction in high hazard areas.
e. Increase ability to shelter population before and after disaster events
f. Incorporate effective mitigation strategies into capital improvement projects.

Goal 3: Protect all forms of infrastructure including transportation, utilities, and waterways from being compromised by hazard events.

a. Implement mitigation programs that protect and sustain the reliability of lifelines systems to minimize impacts from hazards and expedite recovery in an emergency.
b. Improve / create redundancies for critical networks such as water, transportation, energy, sewer, digital, data and power, and communications.
c. Promote greater collaboration and communication between infrastructure partners regarding known or possible issues that could affect Warren County infrastructure.

Goal 4: Encourage mitigation activities to increase the disaster resilience of institutions, private companies, and systems essential to the functions of Warren County

a. Encourage Continuity of Operations planning to assist Warren County jurisdictions, businesses, and private companies sustain operations and recover more quickly following hazard events.
b. Form partnerships to leverage and share resources prior to and following hazard events.
c. Improve understanding of available funding sources for mitigation efforts
d. Partner with private sector to promote structural and non-structural hazard mitigation as a part of standard business practices.

Goal 5: Increase the ability of local government to serve the community during and after hazard events.

a. Increase knowledge for jurisdictional leaders and departments relative to disaster planning and mitigation activities.
b. Consider the impacts of hazards on future land use decisions in jurisdictions by coordinating with other planning mechanisms.

5.2 Mitigation Strategies and Actions

The goals listed above, as well as the hazards assessed for this plan, influenced the development of actions the county and participating jurisdictions can take to mitigate the impacts of the identified hazards and their effects. Plan participants assessed over 150 hazard mitigation strategies / actions compiled from FEMA documents, neighboring county mitigation plans, the 2015 Warren County Hazard Mitigation Plan, and suggestions from participating communities and stakeholders during a workshop held in January 2020. The results of that workshop are included in this section of the plan.

Updates on previous projects

Prior to identifying new projects for the 2020 plan, participants were asked to indicate the status of mitigation actions included in the previous plan, listing whether each project was complete, deleted, deferred, or ongoing. Those that were listed as ongoing or deferred were given explanation of whether they should be included in the current plan update.

Table 37 (pages 86-90) lists the projects in the 2015 county Hazard Mitigation Plan (in order of hazard ranking) and their status.

In addition to the mitigation strategies listed in the 2015 plan, the following activities were completed to support mitigation in the Warren County: *(Note this list is not all inclusive as other projects may have been completed but not reported to Warren County EMA to include in this plan)*

- Jurisdictional mitigation projects:
  - The Village of Waynesville has installed a new outdoor warning siren.
  - The Village of Waynesville, City of Mason, and Hamilton and Deerfield Townships have all built new fire department facilities.
  - The village of Carlisle has begun building a new K-12 school to replace old, unsecure school buildings.
  - The City of Franklin has created a task force for helping people with opioid and other addictions.
- County Mitigation projects:
  - The county Communications Center and Emergency Management Agency were moved into a new facility. The Emergency Operations Center was also moved to this facility and equipment was upgraded to better serve the county in times of disaster.
  - River gauges were installed on the Little Miami River at State Route 48 and at Todds Fork to better forecast river levels and provide advanced warning to residents at risk for flooding.
  - Improvements were made to the county EMA website to help educate the public about emergencies and disasters.
  - Warren County EMA performed multiple public education and outreach events talking about hazard mitigation.
  - Increased usage of social media for educational information and emergency notifications.
  - Use of IPAWS for emergency notifications to the public.
  - Improved volunteer management process by supporting creation of a county Citizen Emergency Response Team.
  - Improved plans and processes for internal emergency management operations and disaster operations.
  - Performed Safety Assessments for Warren County School Districts.
  - Updated the county Emergency Operations Base Plan and the county Disaster Recovery Plan.
  - Warren County Sheriff's Department has conducted annual training with local police agencies.
  - Warren County School Districts have conducted quarterly fire drills in conjunction with local fire authorities and annual emergency drills.
  - The County Engineer's Department continued maintenance and improvements on county roadways and bridges.
- Water and Sewer projects (as reported by Warren County Water and Sewer Department, Cincinnati Water Works, and Springboro Water)
  - Ongoing maintenance of Emergency Action Plans (EAP).
  - On-going maintenance of security, alarms and power outage systems for flood and wind events.

    - Maintain water disruption/treatment plans.
    - Following Ohio EPA mandated continency plans.
- Electric Company mitigation projects (as reported by Duke Energy and Dayton Power & Light (aka Vectren Energy)
    - Improved understanding/training of Incident Command System (ICS) processes.
    - Routine inspections and maintenance of power transmission systems.
    - Multiple hazard response plans.
    - Smart Grid Technology to improve outage identification.
    - Significant trained resources to meet surge requirements.
    - Trimming trees and vegetation away from transmission lines for high wind events.
- Ohio Department of Transportation mitigation projects
    - Improved road monitoring and additional OHGO cameras.
    - Expansion of GPS/AVL technology to optimize route scheduling.
    - Ongoing culvert and road inspections.
    - Review of engineering data to identify corrective actions.

5.3 Capability Assessment

The capability assessment identifies current activities used to mitigate hazards. This includes policies, regulations, procedures, programs, and projects that contribute to the reduction of damages from a hazardous event. The following section identifies existing plans and mitigation capabilities within the communities listed in this plan.

Planning Assessment

	Master Plan	Capital Improvement Plan	Economic Development Plan	Local EOP	Continuity of Ops Plan	Transportation Plan	Stormwater Management Plan
Butlerville	-	-	-	-	-	-	-
Carlisle	-	-	-	-	-	-	-
Clearcreek Twp.	Yes	No	No	Yes	No	No	No
Corwin							
Deerfield Twp.	Yes	Yes	Yes	Yes	No	No	Yes
Franklin	-	-	-	-	-	-	-
Franklin Twp.	No	No	No	No	No	No	No
Hamilton Twp.	Yes	No	Yes	Yes	No	No	No
Harlan Twp.	-	-	-	-	-	-	-
Harveysburg	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lebanon	Yes	Yes	No	Yes	Yes	Yes	Yes
Loveland	-	-	-	-	-	-	-
Maineville	Yes	No	No	Yes	No	No	Yes
Massie	-	-	-	-	-	-	-
Mason	Yes	Yes	Yes	No	No	Yes	Yes
Middletown	-	-	-	-	-	-	-
Monroe	-	-	-	-	-	-	-
Morrow	Yes	No	Yes	Yes	No	No	No
Pleasant Plain	-	-	-	-	-	-	-
Salem Twp.	-	-	-	-	-	-	-
South Lebanon	-	-	-	-	-	-	-
Springboro	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Turtlecreek Twp.	Yes	Yes	Yes	Yes	No	No	Yes
Union Twp.	-	-	-	-	-	-	-
Washington Twp.	-	-	-	-	-	-	-
Wayne Twp.	Yes	Yes	No	-	-	Yes	-
Waynesville	Yes	Yes	No	Yes	Yes	No	Yes

- *Equals "did not assess" or answer*

Ordinance Assessment

	Zoning Ordinance	Subdivision Ordinance	Floodplain Ordinance	Natural Hazard Specific Ordinance	Flood Insurance Rate Maps	Acquisition of land for open space
Butlerville	-	-	-	-	-	-
Carlisle	-	-	-	-	-	-
Clearcreek Twp.	Yes	Yes	Yes	Yes	Yes	Yes
Corwin	-	-	-	-	-	-
Deerfield Twp.	Yes	No	No	No	No	Yes
Franklin	-	-	-	-	-	-
Franklin Twp.	Yes	Yes	Yes	Yes	Yes	Yes
Hamilton Twp.	Yes	No	No	No	No	Yes
Harlan Twp.	-	-	-	-	-	-
Harveysburg	Yes	Yes	No	No	No	No
Lebanon	Yes	Yes	Yes	Yes	Yes	Yes
Maineville	Yes	Yes	Yes	Yes	Yes	No
Massie	-	-	-	-	-	-
Mason	Yes	Yes	Yes	Yes	Yes	Yes
Morrow	Yes	Yes	Yes	No	Yes	Yes
Pleasant Plain	-	-	-	-	-	-
Salem Twp.	-	-	-	-	-	-
South Lebanon	-	-	-	-	-	-
Springboro	Yes	No	Yes	Yes	Yes	Yes
Turtlecreek Twp.	No	No	No	No	No	No
Union Twp.	-	-	-	-	-	-
Washington Twp.	-	-	-	-	-	-
Wayne Twp.	Yes	Yes	Yes	No	No	Yes
Waynesville	Yes	Yes	Yes	No	No	No

- *Equals "did not assess" or answer*

Financial Assessment

	Capital Improvement	Authority to levy taxes	Fees for utilities	Impact fees for new development`	Stormwater Utility Fee	General obligation or tax bonds	Private Funding	Community development Block Grant	Other Federal Funding
Butlerville	-	-	-	-	-	-	-	-	-
Carlisle	-	-	-	-	-	-	-	-	-
Clearcreek Twp.	Yes	No	No	No	No	Yes	Yes	Yes	Yes
Corwin	-	-	-	-	-	-	-	-	-
Deerfield Twp.	-	-	-	-	-	-	-	-	-
Franklin	-	-	-	-	-	-	-	-	-
Franklin Twp.	Yes	No	No	No	No	No	No	No	Yes
Hamilton Twp.	Yes	Yes	No	No	No	Yes	No	Yes	Yes
Harlan Twp.	-	-	-	-	-	-	-	-	-
Harveysburg	-	-	-	-	-	-	-	-	-
Lebanon	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Maineville	Yes	Yes	Yes	-	Yes	Yes	-	Yes	Yes
Massie	-	-	-	-	-	-	-	-	-
Mason	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Morrow	Yes	Yes	Yes	-	-	-	-	Yes	Yes
Pleasant Plain	-	-	-	-	-	-	-	-	-
Salem Twp.	-	-	-	-	-	-	-	-	-
South Lebanon									

	Capital Improvement	Authority to levy taxes	Fees for utilities	Impact fees for new development`	Stormwater Utility Fee	General obligation or tax bonds	Private Funding	Community development Block Grant	Other Federal Funding
Springboro	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Turtlecreek Twp.	-	-	-	No	-	Yes	-	-	-
Union Twp.	-	-	-	-	-	-	-	-	-
Washington Twp.	-	-	-	-	-	-	-	-	-
Wayne Twp.	Yes	-	No	No	No	No	No	Yes	-
Waynesville	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes

- *Equals "did not assess" or answer*

Administrative and Technical Assessment

	Planning Commission	Mitigation Planning Committee	Maintenance Programs	Mutual Aid Agreements
Butlerville	-	-	-	-
Carlisle	-	-	-	-
Clearcreek Twp.	Yes	No	Yes	Yes
Corwin	-	-	-	-
Deerfield Twp.	No	No	Yes	Yes
Franklin	-	-	-	-
Franklin Twp.	No	No	No	Yes
Hamilton Twp.	No	Yes	Yes	Yes
Harlan Twp.	-	-	-	-
Harveysburg	Yes	No	Yes	No
Lebanon	Yes	No	Yes	Yes
Maineville	Yes	Yes	Yes	Yes
Massie	-	-	-	-
Mason	Yes	No	Yes	Yes
Morrow	Yes	No	Yes	Yes
Pleasant Plain	-	-	-	-
Salem Twp.	-	-	-	-
South Lebanon	-	-	-	-
Springboro	Yes	No	Yes	Yes
Turtlecreek Twp.	No	No	Yes	Yes
Union Twp.	-	-	-	-
Washington Twp.	-	-	-	-
Wayne Twp.	Yes	No	Yes	Yes
Waynesville	Yes	No	Yes	Yes

- *Equals "did not assess" or answer*

Table 37 – Update on 2015 Projects

Extreme Temperatures

Purchase generators to continue to supply power to heating / cooling shelters in the event of temperature extremes			
Jurisdiction:	**Status:**	**Comments:**	
Village of Carlisle	Deferred	Incorporated into 2020 projects	

Winter Storms

Review needs and purchase (if necessary) equipment for snow removal.					
Jurisdiction:	**Status:**	**Comments:**	**Jurisdiction:**	**Status:**	**Comments:**
Village of Butlerville	Deleted	Part of on-going maintenance	Village of Maineville	Deleted	Not participating in 2020 plan projects at this time
Village of Carlisle	Deleted	Part of on-going maintenance	City of Mason	Deleted	Part of on-going maintenance
Village of Corwin	Deleted	Not participating in 2020 plan projects at this time	City of Monroe	Deleted	Part of on-going maintenance
City of Franklin	Deleted	Part of on-going maintenance	Village of Morrow	Deleted	Part of on-going maintenance
Village of Harveysburg	Deleted	Part of on-going maintenance	Village of Pleasant Plain	Deleted	Part of on-going maintenance
City of Lebanon	Deleted	Part of on-going maintenance	Village of South Lebanon	Deleted	Part of on-going maintenance
City of Loveland	Deleted	Deleted due to being in Clermont County's plan.	Village of Springboro	Deleted	Part of on-going maintenance
Village of Waynesville	Deleted	Part of on-going maintenance			
Develop a resource manual that can be used to inventory emergency resources that can be deployed to aid in the event of a severe winter storm					
City of Mason	Ongoing	New project number 106.			
Purchase additional generators so that more critical facilities can operate if/when the power is disrupted as a result of winter / summer storms					
City of Lebanon	Deleted	Project no longer needed			

Earthquake

Promote equipment fastening within municipal facilities			
Jurisdiction:	Status:	Comments:	
City of Springboro	Deleted	Updated equipment purchased with proper weight to reduce movement.	
Review Building codes and evaluate low cost earthquake resistant features			
Village of Maineville	Deleted	Not participating in 2020 plan projects at this time.	
Utilize state-developed program explaining the potential for earthquakes, as well as the potential damages from those earthquakes. The brochure includes information pertaining to measures to take to safe-proof homes and other structures from the potential effects of earthquakes			
Village of Morrow	Deleted	Not a jurisdictional priority at this time.	

Summer Storms

Install uninterruptable power supplies on critical electronic equipment in municipal facilities			
Jurisdiction:	Status:	Comments:	
City of Springboro	Completed	All traffic signals and main building have backup generators installed.	
Install surge protectors on sensitive electronic equipment in municipal facilities			
Village of South Lebanon	Deleted	Not participating in 2020 plan projects at this time	
Promote the use of special roofing shingles designed to interlock and resist uplift forces for both new construction and retrofits			
City of Monroe	Deferred	New Project 26	

Tornado

Continue to expand and strengthen the outdoor warning siren coverage in Warren County and its jurisdictions					
Jurisdiction:	Status:	Comments:	Jurisdiction:	Status:	Comments:
Village of Harveysburg	Deleted	Twp has siren on firehouse			
Undertake safe room installation projects, where applicable, to protect citizens from effects of tornadoes and straight-line winds					
Village of Butlerville	Deferred	New project number 25.	Village of Maineville	Deleted	Not participating in 2020 plan projects at this time
Village of Carlisle	Deleted	Not needed at this time.	City of Mason	Deferred	New project number 25.
Village of Corwin	Deleted	Not participating in plan	City of Monroe	Deleted	Lack of Funding
City of Franklin	Deleted	Not a priority in Franklin	Village of Morrow	Deleted	Lack of resources to complete this project.
Village of Harveysburg	Deferred	Pending grants. New project number 25.	Village of South Lebanon	Deleted	Lack of Funding
City of Lebanon	Deleted	No Longer needed	Village of Springboro	Deleted	No local funding available.
City of Loveland	Deleted	Deleted due to being in Clermont County's plan.	Village of Waynesville	Deleted	Not a priority
Seek funding to build tornado / high wind shelters in areas surrounded by vulnerable populations					
Village of Pleasant Plain	Ongoing	New project number 25.			
Reduce damages resulting from straight line winds / tornadoes by providing warning to citizens to store loose / unsecured items on property in advance of the storm					
Village of Butlerville	Ongoing	New project number 129.	Village of Maineville	Deleted	Not participating in 2020 plan projects at this time
Village of Carlisle	Deleted	Will get info from county EMA	City of Mason	Ongoing	New project number 129.
Village of Corwin	Deleted	Not participating in 2020 plan projects at this time	City of Monroe	Completed	
City of Franklin	Deleted	Will get info from county EMA	Village of Morrow	Completed	Updated tornado siren was installed within the last yr.
Village of Harveysburg	Deleted	Will get info from county EMA	Village of Pleasant Plain	Ongoing	New project number 129.
City of Lebanon	Completed		Village of South Lebanon	Deleted	Not participating in 2020 plan projects at this time
City of Loveland	Deleted	Deleted due to being in Clermont County's plan.	Village of Springboro	Ongoing	New project number 129.
Village of Waynesville	Deleted	Will get info from county EMA			
Encourage residents to secure yard items, or stored items including oil, gasoline, and propane tanks that may be swept away by high winds					
Village of Butlerville	Ongoing	New project number 5.	Village of Maineville	Deleted	Not participating in 2020 plan projects at this time
Village of Carlisle	Deleted	Will get info from county EMA	City of Mason	Ongoing	New project number 5.
Village of Corwin	Deleted	Not participating in 2020 plan projects at this time	City of Monroe	Completed	
City of Franklin	Deleted	Will get info from county EMA	Village of Morrow	Completed	
Village of Harveysburg	Deleted	Already do public education	Village of Pleasant Plain	Ongoing	New project number 5.
City of Lebanon	Completed		Village of South Lebanon	Deleted	Not participating in 2020 plan projects at this time
City of Loveland	Deleted	Deleted due to being in Clermont County's plan.	Village of Springboro	Ongoing	New project number 5.
Village of Waynesville	Deleted	Will get info from county EMA			
Reduce the risk of mobile home damage by promoting the use of tie-downs with ground anchors for the appropriate soil types					
Village of Morrow	Ongoing	New project number 26.			

Drought

Develop a mutual aid agreement/planning mechanism to provide water in drought events that may impact local aquifers, to include the Old Mason Water Treatment Facility.					
Jurisdiction:	Status:	Comments:	Jurisdiction:	Status:	Comments:
City of Mason	Deleted	Not needed at this time			
Promote the use of water saving techniques (such as low-flow showerheads and toilets)					
City of Loveland	Deleted	Deleted due to being in Clermont County's plan.			
Examine ordinances that can be written to prioritize or control water use during emergency drought conditions					
City of Middletown	Deleted	Deleted due to being in Butler County's plan.			

Flood

Development of building codes which restrict building structures within the floodplain.					
Jurisdiction:	Status:	Comments:	Jurisdiction:	Status:	Comments:
Village of Butlerville	Ongoing	New project number 34.	City of Mason	Completed	
Village of Carlisle	Ongoing	New project number 34.	City of Monroe	Completed	
City of Franklin	Completed		Village of Morrow	Completed	Reflected in village zoning code.
City of Lebanon	Completed		Village of South Lebanon	Deleted	Not participating in 2020 plan projects at this time
City of Loveland	Deleted	Covered in Clermont's plan	Village of Springboro	Deleted	City follows FEMA regulations.
Village of Maineville	Deleted	Not participating in 2020 plan projects at this time	Village of Waynesville	Deleted	Already in local codes
Development of building codes which restrict building structures in areas with wandering streams.					
Village of Butlerville	Ongoing	New project number 34.	City of Mason	Completed	
Village of Carlisle	Ongoing	New project number 34.	City of Monroe	Completed	
City of Franklin	Completed		Village of Morrow	Deleted	Not needed
City of Lebanon	Completed		Village of South Lebanon	Deleted	Not participating in 2020 plan projects at this time
City of Loveland	Deleted	Covered in Clermont's plan	Village of Springboro	Deleted	City follows FEMA
Village of Maineville	Deleted	Not participating in 2020 plan projects at this time	Village of Waynesville	Deleted	Already in local codes
Update Warren County Flood Damage Prevention Regulations that would allow the County to better regulate construction within the 100-year floodplain.					
Village of Butlerville	Ongoing	New project number 34.	City of Mason	Completed	
Village of Carlisle	Ongoing	New project number 34.	City of Monroe	Completed	
City of Franklin	Completed		Village of Morrow	Deleted	County will handle
City of Lebanon	Completed		Village of South Lebanon	Deleted	Not participating in 2020 plan projects at this time
City of Loveland	Deleted	Covered in Clermont's plan	Village of Springboro	Deleted	City follows FEMA regulations.
Village of Maineville	Deleted	Not participating in 2020 plan projects at this time	Village of Waynesville	Deleted	County will handle
Continually assess the areas that are affected during flood events to best determine proper land use in those areas					
Village of Butlerville	Ongoing	New project number 16.	Village of Maineville	Deleted	Not participating in 2020 plan projects at this time
Village of Carlisle	Deleted	Not needed at this time	City of Mason	Ongoing	New project number 16.
Village of Corwin	Deleted	Not participating in 2020 plan projects	City of Monroe	Ongoing	New project number 16.
City of Franklin	Deleted	Maintenance item	Village of Morrow	Completed	
Village of Harveysburg	Deferred	New project number 16.	Village of Pleasant Plain	Ongoing	New project number 16.
City of Lebanon	Ongoing	New project number 16.	Village of South Lebanon	Deleted	Not participating in 2020 plan projects
City of Loveland	Deleted	Covered in Clermont's plan	Village of Springboro	Ongoing	New project number 16.
Village of Waynesville	Deleted	Not needed at this time			

Flood (cont.)

Jurisdiction:	Status:	Comments:	Jurisdiction:	Status:	Comments:
Ensure NFIP requirements are being met concerning repairs, renovations, and remodeling of structures located in the regulatory floodplain					
Village of Carlisle	Deleted	Floodplain Managers job description			
Update existing flood damage prevention ordinances (As they relate to 44 CFR 60.3)					
City of Franklin	Completed				
Acquisition / Demolition of the Village of South Lebanon Administration building and the Warren County Sheriff's Office South Lebanon Outpost					
Village of South Lebanon	Deleted	Not participating in 2020 plan projects at this time			
Identify need for and install stormwater systems to address flood concerns.					
Village of Butlerville	Deferred	New project number 16.	Village of Maineville	Deleted	Not participating in 2020 plan projects at this time
Village of Carlisle	Deleted	Lack of funding	City of Mason	Ongoing	New project number 16.
Village of Corwin	Deleted	Not participating in 2020 plan projects at this time	City of Monroe	Deferred	New project number 16.
City of Franklin	Ongoing	New project number 16.	Village of Morrow	Ongoing	New project number 16.
Village of Harveysburg	Deferred	New project number 16.	Village of Pleasant Plain	Deferred	New project number 16.
City of Lebanon	Ongoing	New project number 16.	Village of South Lebanon	Deleted	Not participating in 2020 plan projects at this time
City of Loveland	Deleted	Deleted due to being in Clermont County's plan.	Village of Springboro	Ongoing	New project number 16.
Village of Waynesville	Deferred	New project number 35.			
Identify need for and install culverts to protect vulnerable roadways.					
Village of Butlerville	Deferred	New project number 16.	Village of Maineville	Deleted	Not participating in 2020 plan projects at this time
Village of Carlisle	Deleted	Lack of funding	City of Mason	Ongoing	New project number 16.
Village of Corwin	Deleted	Not participating in 2020 plan projects at this time	City of Monroe	Deferred	New project number 16.
City of Franklin	Ongoing	New project number 16.	Village of Morrow	Completed	
Village of Harveysburg	Deferred	New project number 16.	Village of Pleasant Plain	Deferred	New project number 16.
City of Lebanon	Ongoing	New project number 16.	Village of South Lebanon	Deleted	Not participating in 2020 plan projects at this time
City of Loveland	Deleted	Deleted due to being in Clermont County's plan.	Village of Springboro	Deleted	Limited vulnerable roads, generally curb and gutter.
Village of Waynesville	Deferred	New project number 35.			
Conduct Demolition/Removal projects for two Mason City owned buildings that were flooded in the 2001 event.					
City of Mason	Deleted	1 building has been removed, 1 remains for training.			
Place depth markers on frequently flooded roads to advise travelers of flooding depths					
Village of Morrow	Ongoing	New project number 153.			
Identify structure inventory for properties at-risk to flood (especially properties located in the special flood hazard area/1% annual chance area)					
Village of Carlisle	Completed				
Determine the need for upgrades/enhancements to the storm sewers in the City of Lebanon					
City of Lebanon	Ongoing	New project number 19.			

Wildfire

Jurisdiction:	Status:	Comments:	Jurisdiction:	Status:	Comments:
Promote fuel reduction in areas prone to wildfires					
Village of Corwin	Deleted	Not participating in 2020 plan projects at this time			

Dam Failure

Jurisdiction:	Status:	Comments:	Jurisdiction:	Status:	Comments:
Coordinate with dam owners to ensure that their inundation mapping and response plans are being kept up to date					
City of Mason	Completed				
Develop land use strategies to promote the safe use of land downstream from dams					
Village of Waynesville	Deleted	County is handling dams.			
During any and all new dam construction, encourage the completion of a critical flood engineering analysis by a professional engineer licensed in the State of Ohio					
Village of Waynesville	Deleted	County is handling dams.			

Mitigation Strategies and Actions for the 2020 Plan

A mitigation strategy workshop was conducted on January 23, 2020.The purpose of the meeting was to review the mitigation strategy goals and objectives and to choose mitigation projects that would reduce risks to the hazards identified in the plan.

Projects that were chosen by participants were evaluated and scored for their inclusion in the plan. Project evaluations were based on the percentage of population benefitted, cost of the strategy, cost benefit of the initiative, feasibility of implementation, environmental impact, probability of community acceptance, and the time to complete the project. Once all factors were considered, the jurisdiction assigned an interest score to determine if the project would be included in the plan. This process resulted in a list of 71 strategies and actions for the 2020 plan. The list of mitigation strategies by hazard is included in Table 38 (pp. 92-95). A more comprehensive list sorted by jurisdictional priority is provided in Appendix 6 (pp. 116-130).

To determine jurisdictional priority for projects, all scores were added, and the sum multiplied by a hazard priority number (with multi-Hazard Projects receiving the highest number and the lowest ranking hazard, wildfires, receiving the lowest number).The total combined score per project was divided by 100 to determine the priority of each project per jurisdiction. An example of the hazard ranking sheet with scoring is included in Figure 27.

Figure 27: Example Hazard Mitigation Project Scoring / Priority Sheet

WCEMA Mitigation Projects 2020		Percentage of Population Benefited Based on relative data and/or estimates **1** = 0% to 25% **2** = 26% to 50% **3** = 51% to 75% **4** = 76% to 100%	Cost of Initiative Monetary cost to implement the project based upon estimates and quotes **1 =** Additional funding sources are needed to implement project **2 =** Funding is possible through re-allocation of funds or cost spread over multiple years required **3 =** Project could be funded w ith existing budget	Cost Benefit of Initiative The cost benefit includes any possible outcomes that the project may produce **1** = Long term benefits are difficult to quantify **2** = Project impact w ill be visible over a long-term period **3** = Project w ill have an immediate benefit impact on reduction of risk to life and property	Feasibility of Implementation Involves how easy a project may be to complete including: physical location, scope of project, cost and expenses **1** = Very difficult to implement **2** = Somew hat difficult to implement **3** = Relatively easy to implement **4** = Implementation has no anticipated difficulty	Environmental Impact Some projects may contain a component w here any w ork that is preformed must meet guidelines that limit or reduce the environmental impacts **1** = Major changes that affect the environment **2** = Minor changes that affect the environment **3** = Changes affect only specific terrain or territories **4** = No environmental impact	Probabilty of Community Acceptance May inlvolve surveying the community, analyzing demographic information, and/or determining the need for the project in a specific area **1** = 0% to 25% **2** = 26% to 50% **3** = 51% to 75% **4** = 76% to 100%	Time to Complete Projects Estimated time to complete the project including the total time needed upon receiving funding until completition of project **1** = Continuous project **2** = Greater than 3 years **3** = 1 year to 3 years **4** = Less than 1 year	Jurisdictional/ Organization Interest Does your jurisdiction/organization have interest in moving forward with this mitigation project. **1 =** Interested in project how ever w ill not be able to produce the funds or resources necessary **2 =** Would like to move forw ard w ith this project	Hazard Applied To	**Priority Score**
Project #	Description/Location	1 - 4	1 - 3		1 - 4				1 - 2	1-13	Sum x hazard score / .10 (rounded to nearest whole number)
6	Shelter-in-place education	4	3	1	3	4	4	1	2	13	28.6
12	Shelters	2	3	1	2	3	3	3	2	13	24.7
13	support debris management plan development in local jurisdictions	1	3	1	3	4	4	1	2	13	24.7
18	education for local officials on disasters	2	3	1	3	4	4	1	2	13	26
19	tracking damages for future events	2	3	2	3	4	4	1	2	13	27.3
23	intelligence and information sharing	4	3	1	3	4	3	1	2	13	27.3
40	public educations about illicit discharge	4	3	1	3	4	4	1	2	10	22
54	Designate an ILO	4	3	1	3	4	4	4	2	7	17.5

Copies of jurisdictional / agency mitigation project sheets were filed with WCDES and provided in the mitigation binders given to HMP participants.

Table 38 lists the projects in the 2020 county Hazard Mitigation Plan in order of hazard ranking. Additionally, Appendix 6 (starting on Page 115) breaks down the projects by jurisdiction and provides more specific detail.

Table 38: 2020 Mitigation Project List

Project Number:	Project:	Interested Organizations:	Goal / Objective
MULTI-HAZARD			
1	Identify and install hazard notification systems (consider device-neutral systems as well as conventional notification systems)**To also include consideration for person's with access and functional needs.**	Mason	1A,1B,2C
2	Increase the use of social media to warn residents and visitors of extreme weather and man-made events.	Carlisle, Lebanon, Monroe, Turtlecreek, WC Regional Planning	1A,1B,2C
3	Procure generators and transfer switches for critical facilities such as admin and public safety buildings, schools, etc.	Butlerville, Carlisle, Franklin, Franklin Township, Harlan, Lebanon, Mason, Monroe, Pleasant Plain, Turtlecreek, Wayne, WC Career Center (x2)	2A,3A,3B
4	Develop a plan for evacuating populations at any given time. **To also include consideration for person's with access and functional needs.**	Deerfield, WC Regional Planning, WC Sheriff's Office	1A,1B
5	Protect propane tanks or other external fuel sources.	Butlerville, Deerfield, Harlan, Mason, Pleasant Plain, Springboro, Turtlecreek	2B,2F
6	Educate the public on what “shelter in place” means and how this action is performed.	Deerfield, Franklin, Hamilton, Lebanon, Monroe, Wayne, WC Emergency Services, WC Sheriff's Office	1B,2E
7	Develop education programs for residents, tourists, businesses, etc. for hazard-specific threats.	Hamilton, Lebanon	1A,1B,5A
12	Build/establish shelters with generators that can serve displaced citizens. Include how animals (domestic and rural) will be addressed in sheltering.	Carlisle, Monroe, WC Emergency Services	2A,2E
13	Collaborate with visitor's bureau and other local businesses that draw in tourists/visitors to provide hazard preparedness and response information.	WC Emergency Services	1A,1B,2A,2C
14	Require event planners to incorporate emergency and disaster planning into their event plans and to submit a copy of this plan to local elected and public safety officials.	Deerfield	1A,1B,4A
15	Adopt a debris management plan that allows the jurisdiction to recover quicker from hazard events.	Deerfield, Franklin Township, Mason, Monroe, Turtlecreek	2A,3A,4B
16	Develop/upgrade storm water drainage systems and maintenance to guide surface water and increase capacity.	Butlerville, Deerfield, Franklin, Franklin Township, Harlan, Harveysburg, Lebanon, Mason, Monroe, Morrow, Pleasant Plain, Springboro, Turtlecreek, Wayne,	3A,4A
18	Encourage on-going education for seasoned and newly elected officials to familiarize them with the disaster cycle of prevention, preparedness, mitigation, response and recovery.	Carlisle, WC Emergency Services, WC Regional Planning	5A
19	Track and trend locations that have received damage from hazard events in order to more adequately identify mitigation options to prevent further damages.	Butlerville, Deerfield, Harlan, Lebanon, Mason, Monroe, Pleasant Plain, Springboro, Turtlecreek, Wayne, WC Emergency Services	1A,2A,5B
20	Support and increase participation in Sky Warn Program.	Carlisle	1A,1B,2A,2C
21	Conduct all-hazard vulnerability assessments at critical infrastructures.	WC Sheriff's Office	4A,4B,4C

Project Number:	Project:	Interested Organizations:	Goal / Objective
23	Develop and maintain an intelligence and information sharing platform with private and public agencies to identify and reduce threats/hazards.	WC Emergency Services	2A,2B,3C,4B
24	Establish MOU's to provide potable and non-potable water to meet the public's needs.	Franklin Township	3C,4B
25	Install safe rooms to shelter the population during tornado events.	Butlerville, Harlan, Harveysburg, Mason, Pleasant Plain, Wayne	2A,2E
26	Adopt and enforce building codes for residential and commercial construction that prevents wind damage	Monroe, Morrow, Waynesville,	2B,4A
27	Promote Ohio's Safe Room Application program to residents for installation of tornado safe rooms in their homes.	Wayne	1B,5A
28	Assist jurisdictional plan for debris management, mass sheltering, and animal sheltering operations.	Clearcreek, WC Health District, WC Regional Planning, WC Sheriff's Office	1A,1B,2A,2E,3A,5A
129	Reduce damages resulting from straight line winds/tornadoes by providing warning to citizens to store loose/unsecured items on property in advance of the storm	Butlerville, Deerfield, Harlan, Mason, Pleasant Plain, Springboro, Turtlecreek	1A,2B,2C,2D
FLOODING/ DAMS			
30	Relocate structures or systems in flood prone or hazard areas - especially those properties identified as historically or culturally significant to the community.	Carlisle, Waynesville	2A,2B,2D,2F,5B
31	Purchase properties susceptible to repeated flooding, remove structures, and enforce permanent restrictions on development.	Waynesville	2A,2B,2D,5B
32	Provide information to property owners in flood-prone areas on the need for NFIP coverage.	Deerfield, Lebanon, Turtlecreek, Waynesville, WC Regional Planning	1B,4C
33	Install and support additional river gauges, especially in communities with repetitive flood events or repetitive (flood) loss structures.	Lebanon	2A,3B
34	Adopt or amend zoning ordinance for better floodplain regulations.	Butlerville, Carlisle, Deerfield, Harlan, Pleasant Plain, Turtlecreek, WC Regional Planning	2B,5B
35	Conduct an upgrade study on storm/sewer line mitigation options.	Waynesville	2A,3A,3C
36	Conduct engineering/impact studies for flood mitigation.	Carlisle, Monroe	5B
38	Conduct regular maintenance for flood control structures such as dams/levees.	Carlisle	4B,4C,5B
39	Develop inspection and regular maintenance programs on dams in coordination with local dam owners.	WC Health District	2F,3A
80	Conduct analyses and flood studies to identify risks, evaluate removal of existing structures in flood zone, and/or identify other potential structural or nature-based solutions to mitigate flooding in Franklin.	Miami Conservancy District	2A,3A
149	Conduct Stream Restoration and Floodplain enhancement via Re-establish/remove fill to enhance floodplain, natural channel design.	Miami Conservancy District	3A,5B
150	Conduct buyout program / acquisition - Relocation of the Franklin Carlisle Great Miami River Overflow	Miami Conservancy District	3A,5B
151	Conduct buyout / demolition of Carlisle and / or Franklin properties susceptible to flood losses	Miami Conservancy District	3A,5B
153	Place depth markers on frequently flooded roads to advise travelers of flooding depths	Morrow	1A,1B,3A

Project Number:	Project:	Interested Organizations:	Goal / Objective
HAZARDOUS MATERIALS			
40	Create public education campaign about illicit discharge and how to report spills.	Carlisle, WC Emergency Services, WC Health District, WC Regional Planning	1A,1B,3A
42	Conduct jurisdictional fire inspections of facilities that contain hazardous materials.	Carlisle	2B,2F,4A,4D
43	Develop and conduct training between first responders and chemical facilities for response to a chemical incident.	Butlerville, Harlan, Pleasant Plain, WC Regional Planning, WC Sheriff's Office	1B,2A,4B
44	Conduct a commodity flow study to determine the amount of hazardous materials that travel through communities/county.	Carlisle, Wayne, WC Sheriff's Office,	2A,3A,3B,3C,5A
45	Require public permitting process to include calling 811 and providing a copy of their dig ticket.	Franklin, Lebanon	1A,1B,2D,3A
46	Promote use of 811 to residents and businesses that sell products that require digging.	Monroe, Wayne	1A,1B,2D,3A
WINTER STORMS			
47	Enhance existing snow removal equipment and supplies.	Carlisle, Franklin Township, Monroe, Morrow	3A,3C,4A,4B
48	Evaluate and retrofit older buildings, especially large span buildings that may have inadequate snow load tolerances.	Butlerville, Harlan, Pleasant Plain	2A,2B,5B
51	Install or plant snow fences or "living snow fences" (rows of trees or vegetation) to limit blowing and drifting of snow over critical roadway segments.	Carlisle, Franklin, WC Regional Planning	2A,3A
106	Develop a resource manual that can be used to inventory emergency resources that can be deployed to aid in the event of a severe winter storm	Mason	1B,3C,4A,5A
MAN-MADE EVENTS			
52	Install physical protective measures for critical infrastructures. (i.e. fences, lighting, bollards, etc.)	Carlisle, Franklin	2A,3A,5B
53	Develop a training and education program for active aggressor incidents in facilities.	Monroe, Turtlecreek, WC Regional Planning, WC Sheriff's Office	1A,1B,2A,4B,5A
54	Designate an Intelligence Liaison Officer (ILO) to help facilitate intelligence and information sharing regarding man-made events/threats.	WC Emergency Services, WC Health District	1A,3C,5A
56	Develop an active public reporting system for suspicious activity.	WC Sheriff's Office	1A,1B,5A
INVASIVE SPECIES			
58	Develop jurisdictional educational programs for public works (and other applicable) employees to better identify and report possible invasive species.	Carlisle	1B,5A,5B
59	Remove infected vegetation or organisms to eradicate invasive species.	Carlisle	1A,5B
60	Increase Public Health prevention and awareness programs for disease caused by invasive species for county residents.	WC Health District, WC Regional Planning	1A,1B

Project Number:	Project:	Interested Organizations:	Goal / Objective
EXTREME TEMPERATURES			
61	Acquire warming and / or cooling equipment for facilities with inadequate systems or for response to power outages.	Carlisle	1A,2A,2B,3A,3B,3C,4A,4B
62	Establish and implement water conservation programs.	Carlisle	2A,3A,3B,3C,5B
63	Establish ordinances on non-essential use of water during drought conditions.	WC Sheriff's Office	3A,3B,3C,4A,4B
EARTHQUAKES			
64	Safeguard and harden critical infrastructure systems to meet seismic design standards for "lifelines".	Carlisle	2B,2D,2F,3A,3B,4A
65	Conduct a public building seismic study to determine which buildings are more at risk for damages from an earthquake.	Carlisle	1B,2A,2B,4A
LANDSLIDES			
66	Establish natural means (such as tree planting and conservation) that protects steep slopes from landslides.	Carlisle	2A,3A
69	Install stream bank erosion prevention methods.	Franklin Township	2F,3A
INFECTIOUS DISEASES			
70	Develop plans to respond to infectious diseases, including but not limited to reporting illnesses, social distancing, telecommuting, and facility closures.	WC Regional Planning	2A,4C,5A
71	Promote seasonal influenza vaccination and facilitate on-campus vaccination clinics.	Carlisle	1A,1B,2A,4B,5A
WILDFIRES			
74	Clear fuel loads created by downed trees and dry brush.	Carlisle	2A,3A,5B
76	Promote conservation of open space or wildland-urban boundary zones to separate developed areas from high-hazard areas.	WC Regional Planning	1B,2B,2F,5B
78	Construct defensible zones around power lines, oil and gas lines, and other infrastructure systems.	WC Regional Planning	3A,3C,5B
79	Establish wildfire mitigation planning requirements for large scale developments or planned unit developments.	WC Regional Planning	1B,2A,2B,2D,4D
157	Seek State and Federal Grants for the purpose of purchasing and training on better firefighting equipment	Local Fire Chiefs	4C,5A
160	Support and promote Ohio Department of Natural Resources Burn Ordinances	Local Fire Chiefs	1A,1B,4B,5A

6.0 Plan Maintenance

The multi-jurisdictional County Hazard Mitigation Plan is a prerequisite for receipt of Hazard Mitigation Assistance Grant Project Funds under the Disaster Mitigation Act of 2000. FEMA has established mitigation planning requirements for local jurisdictions to meet. Each plan must demonstrate that the proposed mitigation actions are the result of a thorough planning process that describes the inherent risk and the capabilities of Warren County and its jurisdictions.

It is the intention of the Warren County Hazard Mitigation Planning Team to support pre-disaster planning and project activities that can help reduce risk and mitigate future disaster costs for the County. It is also expected that current and future mitigation planning efforts will consist of collaborative, enhanced processes between local and state partners from the public and private sectors.

6.1 Plan Incorporation

The Warren County Hazard Mitigation Plan will be adopted by all municipalities that chose to participate. Additional entities, including townships, may also choose to adopt the plan. After jurisdictions have adopted the plan, their signed resolutions or ordinances will be added to the plan as an appendix.

6.2 Monitoring the Plan

The Warren County Department of Emergency Services under the direction of the Warren County Board of Commissioners shall monitor the plan. This includes routine collection of the status of projects listed in the plan, and whether those projects have been completed, deleted, are ongoing, unchanged, or deferred. New projects will also be added where appropriate based on changing risk levels and / or perceived or actual hazard events. Updates will be obtained through annual survey and through collaboration with local public safety officials.

6.3 Evaluating and Updating the Plan

To ensure the plan continues to provide appropriate risk-reduction strategies, it is necessary to regularly evaluate and update it. The core planning team will be responsible for monitoring the status of the plan and gathering appropriate parties to report of the status of mitigation actions on an annual basis. This will be done through electronic survey to stakeholders and in-person surveys at county fire chief's meetings. The public will continue have the opportunity to provide feedback on the plan, as it will be available through the Warren County EMA and Ohio EMA websites and will be available for review at the EMA booth at public events. EMA will utilize other opportunities as they present themselves to solicit feedback from stakeholders and public sources. Warren County EMA will publicly announce updates to the plan as part of the review process, utilizing media, social media, and other methods for posting meeting announcements in the County.

The Warren County Board of Commissioners shall be the responsible party for updating the County's Hazard Mitigation Plan. It shall be updated by addendum either annually or as updates are needed due to changes in risk or risk-reduction strategies. The plan updates will include a record of changes including:

- Status of mitigation activity items
- Changes in prioritization of mitigation action items
- New mitigation activities / items to be added and the priority of the activities/items
- Descriptions of why any actions / items have been deleted or deferred
- One year prior to the expiration of the 5-year FEMA plan approval date, the Plan shall be reevaluated and reviewed per the 5-year planning update process as required by law

6.4 Plan Integration

Hazard mitigation practices must be incorporated within existing plans, projects, and programs. The involvement of all departments, private non-profits, private industry, and appropriate jurisdictions is necessary in order to discover mitigation opportunities within existing or planned projects and programs. Each community will be responsible for updating and integrating elements of the plan into their own respective plans and ordinances. WCDES will be responsible for notifying county departments of the completed Hazard Mitigation Plan so that the respective departments can update their internal documents to reflect the county's mitigation strategy.

APPENDICES

APPENDIX 1 – LIST OF PARTICIPANTS IN THE 2020 HMP PLANNING PROCESS

Title	First Name	Last Name	Agency	Community Survey	Capability Survey	1st Meeting / Hazard Ranking	2nd Meeting	Mitigation Project Updates	Additional Contact with EMA
Safety Director	Tim	Abbott	Duke Energy						x
Fire Chief	Steve	Agenbroad	Clearcreek Twp. Fire Dept.				x		
Zoning Inspector	Stephanie	Austin	Warren County Building / Zoning			x			
Lieutenant	Paul	Bernard	Wayne F.D. / W.C. Telecom			x			x
Director of Support Operations	Gene	Blake	Little Miami Local School District			x	x		
Trustee	Ralph	Blanton	Salem Twp.	x					
Township Administrator	Tammy	Boggs	Turtlecreek Twp.	x	x	x	x	x	
Safety and Risk Coordinator	Jed	Bookman	Sunrise Cooperative			x			
Director	Melissa	Bour	WCDES			x	x		
Director	Chris	Brausch	Warren County Water and Sewer						x
Director	Thomas	Breckel	Clinton County EMA			x			
Fire Chief	Bryan	Brumagen	City of Mason F.D.	x	x	x	x	x	
City Manager	Scott	Brunka	City of Lebanon	x	x				
Sergeant	James	Burn	City of Lebanon Police Dept.			x			
Director of Services	Dan	Casson	Village of Carlisle			x			
Township Administrator	Brent	Centers	Hamilton Twp.	x	x	x	x		
Township Administrator	Matt	Clark	Clearcreek Twp.	x	x	x	x	x	
SW Regional Supervisor	Phillip S.	Clayton	Ohio EMA				x		
Director	Molly	Conley	SWCD						x
Police Chief	Gary	Copeland	Village of Waynesville	x	x	x	x	x	
Service Hydrologist / Meteorologist	Julia	Dian-Reed	NOAA / NWS			x			
Township Administrator	Gus	Edwards	Wayne Twp.	x	x		x	x	
Fire Chief	Chris	Eisele	Deerfield Twp. F.D.	x	x	x	x	x	
Director of Facility Operations	Kim	Fladung	Warren County Career Center			x	x	x	
Village Administrator	Donald	Fugate	Village of Harveysburg	x	x			x	
Public Works Director	Mike	Hanna	Village of Morrow			x	x		
Fire Chief	Michael T.	Hannigan	Franklin Twp.		x	x	x		
Director	Matt	Haverkos	Butler County EMA			x			
District 8 Regional Supervisor	Chuck	Hecht	Ohio Department of Transportation						x
Assistant Administrator / Director of Public Works	Kenny	Hickey	Hamilton Twp.			x	x	x	
Director Public Works	Billy	Highfill	Deerfield Twp.					x	
WC EMA Operations Manager	Lesli	Holt	WCDES			x	x		
Service Supervisor	Jim	Houston	Deerfield Twp.					x	
Building Electrical Inspector 3	Gary	Hubbs	WC Building Dept.			x			
Fire Chief	Mike	Jameson	Turtlecreek Twp. F.D.			x	x	x	
Fire Chief	Steve	Johnson	City of Lebanon			x	x	x	
Product and Services Manager	John	Kappesser	Duke Electric						x
Zoning Inspector	Ron	Kilburn	Village of Morrow			x	x	x	
Supervisor	Tony	Ledford	Village of South Lebanon				x		
Assistant Fire Chief	David	Leverage	City of Monroe			x	x	x	

APPENDIX 1 – LIST OF PARTICIPANTS IN THE 2020 HMP PLANNING PROCESS

Title	First Name	Last Name	Agency	Community Survey	Capability Survey	1st Meeting / Hazard Ranking	2nd Meeting	Mitigation Project Updates	Additional Contact with EMA
WC EMA Planning Assistant	Kenny	Losekamp	WCDES			x	x		
Director of Business Affairs	Matt	Luecke	Kings LSD			x	x		
Operations Director	Pete	Mason	Board of DD			x	x	x	
Grants Administrator	Susanne	Mason	WC Solid Waste				x		
Director, FMS &CSO	John	McKinney	Atrium Medical Center			x			
Project Manager	Terry	Morris	Springboro Water						x
Environmental Planner	Doug	Obringer	Warren County Regional Planning				x	x	
Analyst	Alan	O'Meara	DPL						x
Lieutenant	Brian	Payne	WCSO			x			
Lieutenant	Michael	Perry	City of Franklin F.D.				x	x	
Chief Operating Officer	Todd	Petrey	City of Mason Schools			x	x		
City Manager	Chris	Pozzuto	City of Springboro	x	x	x		x	
Manager of Technical Services	Barry	Puskas	Miami Conservancy District		x	x	x	x	
Emergency Response Coordinator	Dustin	Ratliff	Warren County Health District			x	x	x	x
Specialist	Sam	Reed	Ohio EMA			x			
Hydrologist / Meteorologist	Julia	Reed	NOAA / NWS			x	x		x
Director	Jeff	Rhein	Mental Health Recovery			x			
Chief	Andy	Riddiough	JEMS			x	x		
Chief Deputy	Barry	Riley	WCSO				x	x	
Business Manager	Rodney	Roberts	Franklin City Schools			x	x		
Police Chief	Will	Rogers	Village of Carlisle P.D.			x	x	x	
Road Superintendent	Rob	Rose	Franklin Twp.			x	x		
Superintendent	Mike	Sander	Franklin City Schools			x	x		
Highway Superintendent & Cemetery Supervisor	Josh	Sandlin	Union Township				x		
Trustee	Paul	Schaefer	Washington Twp.	x			x		
Director	Matt	Schnipke	Warren County Economic Develop.						x
Clinical Coordinator	Katie	Schuler	UC Health WC Hospital			x	x		
Building Electrical Supervisor	Ron	Sempsrott	WC Building and Zoning			x	x		
Assistant City Manager	Karisa	Steed	City of Franklin	x			x	x	
Township Administrator	Traci	Stivers	Franklin Twp.		x		x	x	
Battalion Chief	Anthony	Terrace	City of Lebanon Fire Dept.			x			
Planning and Zoning	Jackie	Terwilliger	Village of Maineville	x	x				
Firefighter/Paramedic	Greg	Thomas	City of Mason F.D.				x		
Stormwater Manger	Jeff	Thomas	Deerfield Twp.					x	
WC EMA Volunteer	Kevin	Tribbe	WCDES			x	x		
Fire Captain	Nathan	Urban	Clearcreek Twp. Fire Dept.			x	x		
Chief, Township Administrator	Dusty	Vinup	Harlan Twp., Butlerville, Pleasant Plan					x	x
Senior Planner	Robert	Ware	Warren County Regional Planning				x	x	
Village Administrator	Caroline	Whitacre	Village of Morrow			x			
Chief of Police	Russ	Whitman	City of Franklin				x	x	
WC EMA LEPC / Grants Coordinator	David	Wood	WCDES			x	x		
Technician	Sabrina	Wyrick	Warren County GIS						x

COMMUNITY PARTICIPATION

("X" INDICATES PARTICIPATION BY ATTENDANCE OR SUBMISSION OF DOCUMENTATION TO EMA)

Jurisdiction:	1st Meeting	2nd Meeting	Community Profile	Capability Survey	Hazard Ranking	Mitigation Projects
Butlerville						x
Carlisle	x	x			x	x
Corwin	Not participating in the 2020 Plan					
Franklin	x	x	x			x
Harveysburg			x	x		x
Lebanon	x	x	x	x	x	x
Loveland (partially in Warren County)	Not participating in the 2020 Plan					
Maineville	x		x	x	x	
Mason	x	x	x		x	x
Middletown (Partially in Warren County)	Not participating in the 2020 Plan					
Monroe (Partially in Warren County)	x	x			x	x
Morrow	x	x				
Pleasant Plain			x			x
South Lebanon		x				
Springboro	x		x	x	x	x
Waynesville	x	x	x	x	x	x
Clearcreek Township	x	x	x	x	x	x
Deerfield Township	x	x	x	x	x	x
Franklin Township	x	x			x	x
Hamilton Township	x	x	x	x	x	x
Harlan Township						x
Massie Township						
Salem Township			x			x
Turtle Creek Township	x	x	x	x	x	x
Union Township		x				x
Washington Township		x	x			x
Wayne Township	x	x	x	x	x	x

Meeting 1 Attendance

Meeting 1

Table No.	First Name	Last Name	Agency	Email Address	Signature
3	Matt	Luecke	Kings School District	mluecke@kingslocal.net	[illegible]
3	Tim	Spinner	Kings School District	tspinner@kingslocal.net	
3	Bryan	Brumagen	Mason Fire	bbrumagen@masonoh.org	[illegible]
4	Gene	Blake	Little Miami Local School District	gblake@lmsdoh.org	[illegible]
1	Amanda	Myers	City of Franklin P.D.	amyers@franklinohio.org	
4	Jackie	Terwilliger	Village of Maineville	jackieterwilliger@maineville-oh.com	
2 or 3	David	Leverage	City of Monroe F.D.	leveraged@monroeohio.org	[illegible]
	Steve	Allen			
	Stephanie	Austin	Warren County Zoning	stephanie.austin@co.warren.oh.us	[illegible]
	Michelle	Tegtmeier	Warren County Zoning		
	Thomas	Breckel	Clinton Co. EMA	tbreckel@clintonsheriff.com	[illegible]
	Matt	Haverkos	Butler Co. EMA	haverkosm@butlercountyohio.org	[illegible]
	Jim	Bolen	Butler Co. EMA	bolenja@butlercountyohio.org	
4	Caroline	Whitacre	Village of Morrow	caroline.whitacre@vil.morrow.oh.us	[illegible]
4	Ron	Kilburn	Village of Morrow		[illegible]
4	Mike	Hanna	Village of Morrow		

Meeting 1

Table No.	First Name	Last Name	Agency	Email Address	Signature
4	Jed	Bookman	Sunrise Cooperative	jedbookman@sunriseco-op.com	[illegible]
1	Donald	Fugate	Village of Harveysburg	admin@villageofharveysburg.org	
	Barry	Riley	WCSO	barry.riley@wcsooh.org	
3	Chris	Eisele	Deerfield Twp. F.D.	ceise@deerfieldtwp.com	
2	Michael	Hannigan	Franklin Twp. F.D.	mhannigan@ftfd.org	[illegible]
2	Will	Rogers	Atrium Medical Center	wlrogers@premierhealth.com	[illegible]
	Regan	Noble	Enterprise Products Pipeline	rlnoble@eprod.com	
	Brian	Payne	WCSO	brian.payne@wcsooh.org	[illegible]
	Molly	Conley	SWCD	molly.conley@co.warren.oh.us	
3	Todd	Petrey	Mason Schools	petreyt@masonohioschools.com	[illegible]
3	Jonathan	Cooper	Mason Schools	Cooperj@masonohioschools.com	
	Phil	Clayton	Ohio EMA	pclayton@dps.ohio.gov	
	Kim	Fladung	WC Career Center	kim.fladung@mywccc.org	[illegible]
2	Rodney	Roberts	Franklin City Schools	rroberts@franklincityschools.com	[illegible]
2	Michael	Sander	Franklin City Schools	msander@franklincityschools.com	[illegible]
1	Nathan	Urban	Clearcreek F.D.	nathan.urban@clearcreektownship.com	[illegible]

Meeting 1

Table No.	First Name	Last Name	Agency	Email Address	Signature
Senior Hydrologist/ Meteorologist	Julia	Reed	NOAA/NWS	jal	[illegible]
Emergency Response Coordinator	Dustin	Ratliff	WCHD	dratliff@wcchd.com	[illegible]
Lieutenant	Paul	Bernard	Wayne F.D.		[illegible]
2	TBD	TBD	Carlisle		
City Manager	Chris	Pozzuto	Springboro	Pozzuto@cityofspringboro.com	[illegible]
Township Administrator	Matt	Clark	Clearcreek Admin	mclark@clearcreektownship.com	[illegible]
Director	Jeff	Rhein	Mental Health and Recovery	jrhein@mhrswcc.org	[illegible]
Operations Director	Pete	Mason	Board of DD	Pete.Mason@warrencountydd.org	[illegible]
Building/Electrical Inspector 3	Gary	Hubbs	WC Building Dept.	gary.hubbs@co.warren.oh.us	[illegible]
Director, EMS & CSO	Justin	McKinney	Atrium Medical Center	jumckinney@premierhealth.com	[illegible]
Township Administrator	Tammy	Boggs	TT		
Public Works Director	Mike	Hanna	Village of Morrow		[illegible]
Chief	Andy	Riddiough	JEMS	ariddiough@jems15.org	[illegible]
Manager of Technical Services	Barry	Pisha	MCD	bpisha@mcdwater.org	[illegible]
Building Electrical Supervisor	Ron	Sennett	Bldg/Zoning	Ron.Sennett@co.oh.us	[illegible]
Clinical Coordinator	Katie	Schuler	UC Health WCH	katie.schuler@uchealth.com	[illegible]

Meeting 1

Table No.	First Name	Last Name	Agency	Email Address	Signature
[illegible]	Anthony	Terrace	Lebanon	ATerrace@lebanonohio.gov	[illegible]
[illegible]	DAN	Casson	Carlisle	dcasson@carlisle-oh.org	Dan Casson
Zoning	Stephanie	Austin	Zoning	Steph	
[illegible]	Mike	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	James	[illegible]	[illegible]	[illegible]	[illegible]
Township Administrator	Brett	Custers	Hamilton Township	bcusters@hamilton-township.org	[illegible]
[illegible]	Kenny	Hickey	Hamilton Township	khickey@hamilton-township.org	[illegible]
Chief	Gary	Copeland	Waynesville	gcopeland@waynesville-ohio.org	[illegible]
	Rob	Rose	Franklin Twp	rob.rose@franklintownshipwc.us	[illegible]

Meeting 2 Attendance

Sign in sheet for Hazard Mitigation Meeting 2
1/23/2020

	Name	Home Agency or Organization	E-Mail	Check if you would like to reveive a calendar invite to March's Meeting
Clinical Coordinator	Katie Schuler	UC Health	Katie.schuler@uchealth.com	✓
Police Chief	Will Rogers	Carlisle	wrogers@carlisleoh.org	✓
Chief Deputy	Barry Riley	Warren Cty Sheriff's Off.	Barry.Riley@wcsooh.org	✓
Trustee	Paul Schaefer	Washington Twp Trustee	pauls416@yahoo.com	✓
Chief operating officer	Todd Petrey	Mason Schools		
Firefighter/Paramedic Inspector	Greg Thomas	Mason F.D.		
Fire Chief	Bryan Brumagen	Mason F.D.		

Sign in sheet for Hazard Mitigation Meeting 2
1/23/2020

	Name	Home Agency or Organization	E-Mail	Check if you would like to reveive a calendar invite to March's Meeting
Manager, Technical Services	Barry Puskas	Miami Conservancy Dist.	bpuskas@mcdwater.org	✓
Director of Support Operations	Gene Blake	Little Miami Local S.D.	GBLAKE@LMSDOH.ORG	✓
Township Administrator	Brent Centers	Hamilton Township	bcenters@hamilton-township.org	✓
Ass. Administrator Director of Public Works	Kenny Hickey	Hamilton Township	Khickey@hamilton-township.org	✓
Fire Chief	Steve Johnson	City of Lebanon	SJOHNSON@lebanonohio.gov	✓
Assistant Fire Chief	David Leverage	City of Monroe	leveraged@monroeohio.org	✓
Fire Chief	Chris Eisele	Deerfield	feise@deerfieldtwp.com	✓
Director of School business affairs	Matt Luecke	Kings LSD	mluecke@kingslocal.net	✓
Senior Planner	Robert Ware	Warren County Reg. Planning	robert.ware@co.warren.oh.us	✓
Environmental Planner	Doug Obringer	WCRPC	doug.obringer@co.warren.oh.us	✓

Sign in sheet for Hazard Mitigation Meeting 2
1/23/2020

	Name	Home Agency or Organization	E-Mail	Check if you would like to reveive a calendar invite to March's Meeting
Fire Captain	Nathan Urban	Clearcreek Township	nathan.urban@clearcreektownship.com	YES
Director of facility operations	Kim Fladung	Warren Co. Career Center	Kim.Fladung@mywccc.org	YES
Zoning Inspector	Ron Kilburn	Village of Morrow	zoning@vil.oh.us	YES
Township Administrator	Matt Clark	Clearcreek Township	mclark@clearcreektownship.com	Yes
Fire Chief	Steve Agenbroad	Clearcreek F.D.	steve.agenbroad@clearcreektownship.com	

Sign in sheet for Hazard Mitigation Meeting 2
1/23/2020

	Name	Home Agency or Organization	E-Mail	Check if you would like to reveive a calendar invite to March's Meeting
Supervisor	Tony Ledford	Village of S. Leb	TLedford@Slebanonohio.org	✓
Highway Superintendent & cemetery supt.	Josh Sandlin	union twp	Josh.Sandlin@uniontwp.com	✓
	Mike Hanna	Morrow	MikeHanna604@yahoo.com	✓
		~~Morrow~~		
	David Wood			
	Kenny Losekamp			
	Kevin Tribbe			
	Melissa Baur			
	Lesli Hoit			

Sign in sheet for Hazard Mitigation Meeting 2
1/23/2020

	Name	Home Agency or Organization	E-Mail	Check if you would like to reveive a calendar invite to March's Meeting
	Rob Rose	Franklin Township	rob.rose@franklintownshipohio.us	✓
Fire Chief	Michael T Hannigan	Franklin Township	Michael.Hannigan@franklintownshipohio.us	✓
Township Administrator	Tammy Boggs	Turtlecreek Twp.	tboggs@turtlecreektownship.org	✓
Fire Chief	Mike Jameson	Turtlecreek	chief33@turtlecreektownship.org	✓
Chief	Andy Riddiough	JEMS	ariddiough@jems15.org	✓
Business Manager	Rodney Roberts	Franklin City Schools	rroberts@franklincityschools.com	✓
Superintendent	Mike Sander	Franklin City Schools	msander@franklincityschools.com	✓
Township Administrator	Traci Stivers	Franklin Twp	Traci.Stivers@franklintownshipohio.us	✓
Police Chief	Russ Whitman	City of Franklin	Rwhitman@franklinohio.org	✓
Police Chief	Gary Copeland	Waynesville	gcopeland@waynesville-ohio.org	✓
Township Administrator	Gus Edwards	Wayne Township	gusedwards@waynetownship.us	✓
Assistant City Manager	Karisa Steed	City of Franklin	ksteed@franklinohio.org	✓
Grant Administrator	Susanne Mason	WC Solid Waste	masosu@co.warren.oh.us	✓
Operations Director	Peter Mason	WC Board of DD	pete.mason@warrencountydd.org	✓
Building Electrical Supervisor	Ron Sempsrott	WC Building & Zoning	Ron.Sempsrott@co.warren.oh.us	✓
Service Hydrologist Meteorologist	Julia Dian-Reed	National Weather Svc	julia.dian-reed@noaa.gov	✓
Lieutenant	Michael Perry	City of Franklin Fire	mperry@franklinohio.org	✓
Emergency Response Coordinator	Dustin Ratliff	WC Health District	dratliff@wchd.com	✓
SW Regional Supervisor Ohio EMA	Phillip S. Clayton	Ohio EMA	psclayton@dps.ohio.gov	✓

NORTHEAST REGION
WAYNESVILLE/ WAYNE TWP/ CORWIN/ CROSSWICK / HAMMEL / EDGETOWN

LOCATION	DATE	MAGNITUDE	DEATHS	INJURIES	DAMAGES
Waynesville	6/19/1994	0	0	0	$50,000
Corwin	5/28/1995	0	0	0	$3,000
Waynesville	5/10/1996	50	0	0	$5,000
Waynesville	7/2/1997	50	0	0	$15,000
Waynesville	6/12/1999	50	0	0	$2,000
Waynesville	7/9/1999	50	0	0	$5,000
Waynesville	5/18/2000	50	0	0	$5,000
Waynesville Arpt	6/2/2000	51	0	0	$5,000
Waynesville	6/2/2000	52	0	0	$0
Waynesville	9/20/2002	50	0	0	$3,000
Waynesville	8/27/2003	50	0	0	$3,000
Waynesville	5/27/2004	55	0	0	$3,000
Waynesville	6/28/2005	50	0	0	$3,000
Waynesville	6/30/2005	50	0	0	$6,000
Waynesville	4/14/2006	50	0	0	$3,000
Waynesville	6/22/2006	50	0	0	$3,000
Waynesville	1/8/2008	50	0	0	$2,000
Hammel / Waynesville	6/28/2008	50	0	0	$10,000
Crosswick / Wayne Twp	11/17/2013	50	0	0	$1,000
Crosswick / Wayne Twp	6/19/2014	65	0	0	$25,000
Crosswick / Wayne Twp	4/8/2015	63	0	0	$0
Crosswick / Wayne Twp	6/18/2015	50	0	0	$500
Hammel / Waynesville	7/14/2015	50	0	0	$1,000
Hammel / Waynesville	7/14/2015	50	0	0	$0
Waynesville Arpt	5/29/2016	50	0	0	$2,000
Edgetown / Waynesville	6/23/2016	65	0	0	$75,000
Edgetown / Waynesville	6/23/2016	70	0	0	$75,000
Crosswick / Wayne Twp	6/23/2016	70	0	0	$25,000
Crosswick / Wayne Twp	1/10/2017	50	0	0	$1,000
Hammel / Waynesville	6/27/2019	50	0	0	$2,000
Total		30 events			$333,500

Hail Events for Waynesville Area

LOCATION	DATE	MAGNITUDE	DEATHS	INJURIES	DAMAGES
Waynesville	5/14/1997	1	0	0	$0
Waynesville	4/22/1998	1.75	0	0	$0
Waynesville	6/2/2000	1	0	0	$0
Waynesville	5/30/2009	1	0	0	$10,000
Waynesville	6/10/2011	1	0	0	$0
Total		5 events			$10,000

NORTHEAST REGION cont.

HARVEYSBURG

LOCATION	DATE	MAGNITUDE	DEATHS	INJURIES	DAMAGES
Harveysburg	7/19/1998	60	0	0	$10,000
Harveysburg	9/18/2002	60	0	0	$25,000
Harveysburg	6/28/2008	50	0	0	$3,000
Harveysburg	8/14/2010	52	0	0	$1,000
Harveysburg	5/31/2013	50	0	0	$1,000
Harveysburg	1/10/2017	50	0	0	$2,000
Totals		6 events			$42,000

No reported significant hail events for Harveysburg

OREGONIA

LOCATION	DATE	MAGNITUDE	DEATHS	INJURIES	DAMAGES
Oregonia	8/8/2012	50	0	0	$3,000
Oregonia	9/7/2012	50	0	0	$1,000
Oregonia	6/16/2018	50	0	0	$4,000
Oregonia	6/28/2019	50	0	0	$1,000
Total		4 events			$9,000

No reported significant hail events for Oregonia or Wellman

WELLMAN

LOCATION	DATE	MAGNITUDE	DEATHS	INJURIES	DAMAGES
Wellman	4/20/2011	55	0	0	$7,000
Wellman	8/8/2011	50	0	0	$1,000
Wellman	6/23/2016	61	0	0	$55,000
Total		3 events			$63,000

NORTHWEST REGION

SPRINGBORO / CLEARCREEK

LOCATION	DATE	MAGNITUDE	DEATHS	INJURIES	DAMAGES
Springboro	6/21/1994	0	0	0	$5,000
Ridgeville	8/15/1996	50	0	0	$5,000
Springboro	3/13/2001	50	0	0	$2,000
Springboro	6/12/2001	60	0	0	$6,000
Springboro	5/25/2002	50	0	0	$5,000
Springboro	7/27/2002	50	0	0	$2,000
Springboro	6/13/2004	50	0	0	$3,000
Springboro	6/30/2005	50	0	0	$5,000
Springboro	4/14/2006	50	0	0	$3,000
Springboro	5/15/2007	56	0	0	$5,000
Springboro	1/8/2008	50	0	0	$3,000
Springboro	5/31/2008	50	0	0	$2,000
Five Pts	6/28/2008	50	0	0	$3,000
Springboro	5/31/2013	50	0	0	$1,000
Springboro	6/23/2014	50	0	0	$5,000
Springboro	5/30/2015	50	0	0	$1,000
Springboro	6/18/2015	50	0	0	$2,000
Five Pts	6/18/2015	50	0	0	$2,000
Five Pts	7/13/2015	50	0	0	$1,000
Springboro	6/23/2016	61	0	0	$10,000
Springboro	6/23/2016	70	0	0	$100,000
Five Pts	6/23/2016	61	0	0	$7,000
Springboro	4/12/2019	56	0	0	$7,000
Springboro	4/12/2019	56	0	0	$25,000
Springboro	4/12/2019	56	0	0	$15,000
Springboro	4/12/2019	56	0	0	$10,000
Springboro	4/12/2019	56	0	0	$2,000
Total		27 events			$237,000

One hail event caused $8,000 damage in Springboro (6/28/2008)

CARLISLE

LOCATION	DATE	MAGNITUDE	DEATHS	INJURIES	DAMAGES
Carlisle	9/20/2000	60	0	0	$450,000
Carlisle	7/13/2016	50	0	0	$2,000
Carlisle	8/27/2016	50	0	0	$1,000
Total		3 events			$453,000

FRANKLIN/FRANKLIN TOWNSHIP

LOCATION	DATE	MAGNITUDE	DEATHS	INJURIES	DAMAGES
Township	8/28/1993	0	0	0	$5,000
Franklin	6/17/1994	0	0	0	$50,000
Franklin	7/20/1994	0	0	0	$5,000
Franklin	8/24/1996	60	0	0	$0
Franklin	5/6/1999	52	0	1	$13,000
Franklin	7/26/1999	50	0	0	$7,000
Franklin	9/18/2002	50	0	0	$3,000
Franklin	4/4/2003	50	0	0	$5,000
Franklin	4/3/2007	50	0	0	$20,000
Franklin	5/15/2007	50	0	0	$7,000
Franklin	7/10/2007	50	0	0	$6,000
Franklin	6/2/2010	60	0	0	$20,000
Franklin	6/29/2012	50	0	0	$2,000
Franklin	6/29/2012	50	0	0	$25,000
Franklin	10/31/2013	55	0	1	$10,000
Franklin	6/8/2018	50	0	0	$10,000
Franklin	6/8/2018	50	0	0	$500
Franklin	6/16/2018	50	0	0	$2,000
Total		18 Events			190,500

SOUTHWEST REGION

MORROW AREA

LOCATION	DATE	MAGNITUDE	DEATHS	INJURIES	DAMAGES
Morrow	7/26/1995	0	0	0	$2,000
Morrow	6/18/1996	60	0	0	$5,000
Morrow	7/28/1997	70	0	0	$25,000
Morrow	6/12/1999	50	0	0	$3,000
Morrow	4/20/2000	50	0	0	$5,000
Morrow	9/20/2000	51	0	0	$5,000
Morrow	9/20/2000	50	0	0	$5,000
Cozaddale	4/2/2006	65	0	0	$80,000
Morrow	8/3/2006	50	0	0	$3,000
Morrow	6/17/2007	50	0	0	$3,000
Morrow	7/18/2007	50	0	0	$2,000
Morrow	8/4/2010	50	0	0	$1,000
Morrow	8/14/2010	50	0	0	$1,000
Morrow	5/22/2011	50	0	0	$5,000
M- Frith Arpt	8/15/2016	48	0	0	$1,000
M- Frith Arpt	8/15/2016	50	0	0	$2,000
M- Frith Arpt	7/5/2018	50	0	0	$5,000
Rossburg	10/6/2014	50	0	0	$2,000
Rossburg	5/20/2018	50	0	0	$4,000
Rossburg	4/14/2019	50	0	0	$1,000
Stubbs Mills	8/14/2010	50	0	0	$1,000
Stubbs Mills	4/29/2014	50	0	0	$1,000
Stubbs Mills	7/18/2015	50	0	0	$2,000
Total		23 events			$164,000

One incident of hail reported in Morrow with no damages reported.

MAINEVILLE

LOCATION	DATE	MAGNITUDE	DEATHS	INJURIES	DAMAGES
Maineville	5/28/1995	0	0	0	$3,000
Maineville	4/29/1996	52	0	0	$2,000
Maineville	6/22/1998	50	0	0	$10,000
Maineville	4/20/2000	50	0	0	$10,000
Maineville	10/24/2001	52	0	0	$0
Maineville	9/20/2002	50	0	0	$3,000
Maineville	6/9/2004	50	0	0	$5,000
Maineville	6/28/2008	50	0	0	$3,000
Maineville	5/21/2010	50	0	0	$1,000
Maineville	7/11/2011	50	0	0	$1,000
Maineville	6/29/2012	50	0	0	$1,000
Maineville	7/14/2015	50	0	0	$1,000
Maineville	6/23/2016	50	0	0	$500
Maineville	8/15/2016	50	0	0	$1,000
Maineville	5/20/2018	50	0	0	$3,000
Maineville	5/30/2018	50	0	0	$2,000
Total		16 events			$46,500

Hail Events for Maineville

LOCATION	DATE	MAGNITUDE	DEATHS	INJURIES	DAMAGES
Maineville	4/19/2002	1	0	0	$2,500,000
Maineville	6/2/2009	1	0	0	$0
Maineville	5/22/2011	1	0	0	$0
Maineville	4/16/2013	1.25	0	0	$0
Maineville	4/16/2013	1.25	0	0	$0
Total		5 events			$2,500,000

SOUTHEAST REGION

MASON

LOCATION	DATE	MAGNITUDE	DEATHS	INJURIES	DAMAGES
Mason	7/14/1997	50	0	0	$3,000
Mason	6/14/2000	57	0	0	$10,000
Mason	6/16/2000	55	0	0	$18,000
Mason	6/16/2000	52	0	0	$4,000
Mason	11/9/2000	63	0	0	$15,000
Mason	5/12/2002	50	0	0	$5,000
Mason	6/8/2003	50	0	0	$5,000
Mason	9/27/2003	78	0	0	$4,000,000
Mason	7/10/2004	50	0	0	$5,000
Mason	8/20/2005	50	0	0	$5,000
Mason	7/31/2006	50	0	0	$3,000
Mason	8/24/2008	50	0	0	$6,000
Mason	6/2/2010	50	0	0	$1,000
Mason	6/21/2010	50	0	0	$1,000
Mason	8/4/2010	50	0	0	$1,000
Mason	10/26/2010	60	0	0	$1,000
Mason	4/20/2011	52	0	0	$0
Mason	6/29/2012	50	0	0	$1,000
Mason	7/24/2012	52	0	0	$0
Mason	7/24/2012	50	0	0	$5,000
Mason	12/21/2013	50	0	0	$1,000
Mason	10/6/2014	52	0	0	$2,000
Mason	5/20/2018	50	0	0	$5,000
Mason	5/31/2018	50	0	0	$1,000
Mason	7/5/2018	50	0	0	$3,000
Total		25 events			$4,101,000

One hail incident reported for Mason with no damages reported

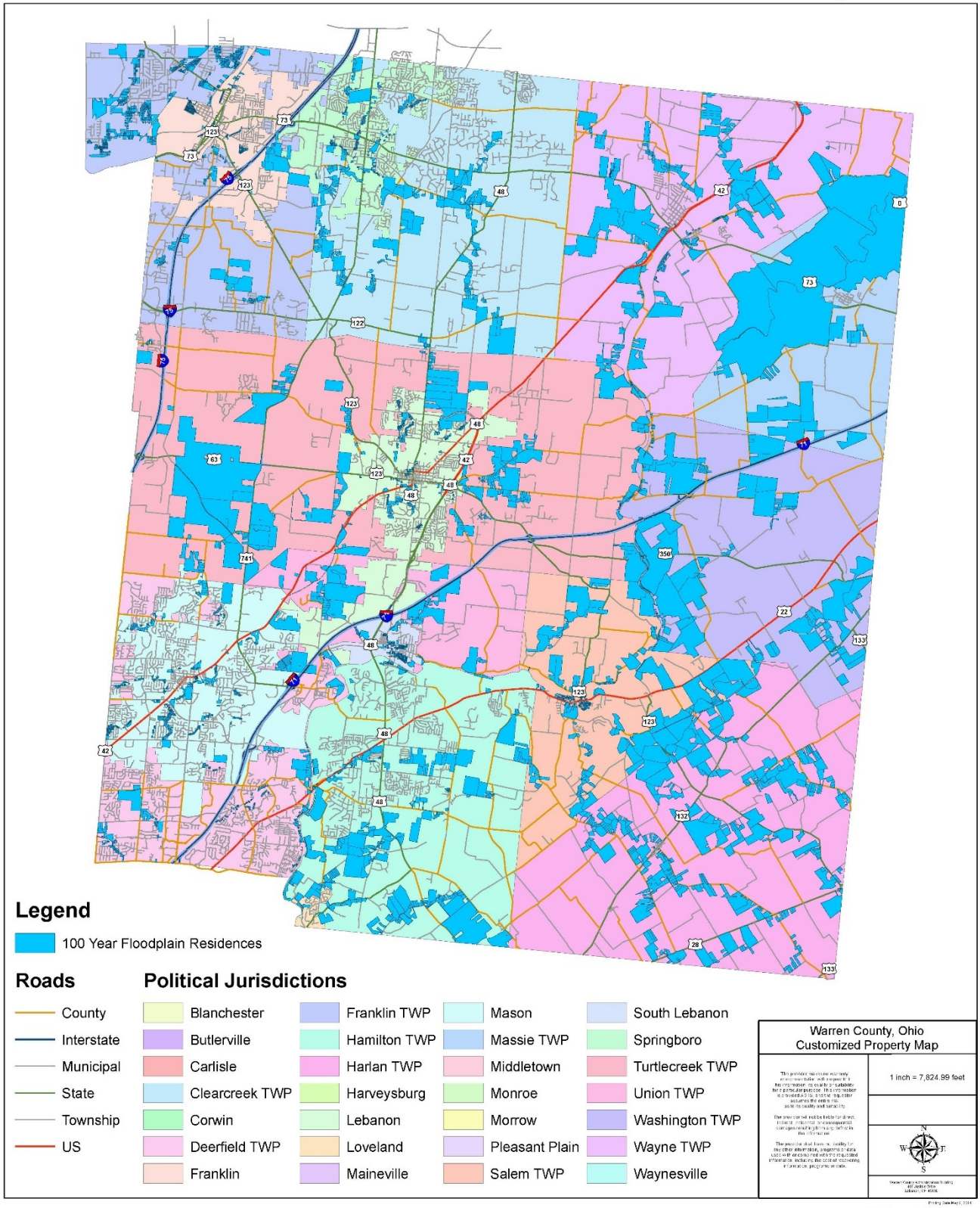
DEERFIELD TWP/FOSTERS/MURDOCK/HAM TWP.

LOCATION	DATE	MAGNITUDE	DEATHS	INJURIES	DAMAGES
Deerfield Twp.	6/18/1994	0	0	0	$5,000
Murdock / Ham Twp	6/18/2015	60	0	0	$25,000
Murdock / Ham Twp	6/18/2015	50	0	0	$2,000
Fosters / Ham Twp	8/15/2016	50	0	0	$2,000
Fosters / Ham Twp	8/15/2016	50	0	0	$1,500
Fosters / Ham Twp	7/10/2017	50	0	0	$1,000
Socialville	2/11/2009	50	0	0	$5,000
Total		7 events			$41,500

LOVELAND PARK

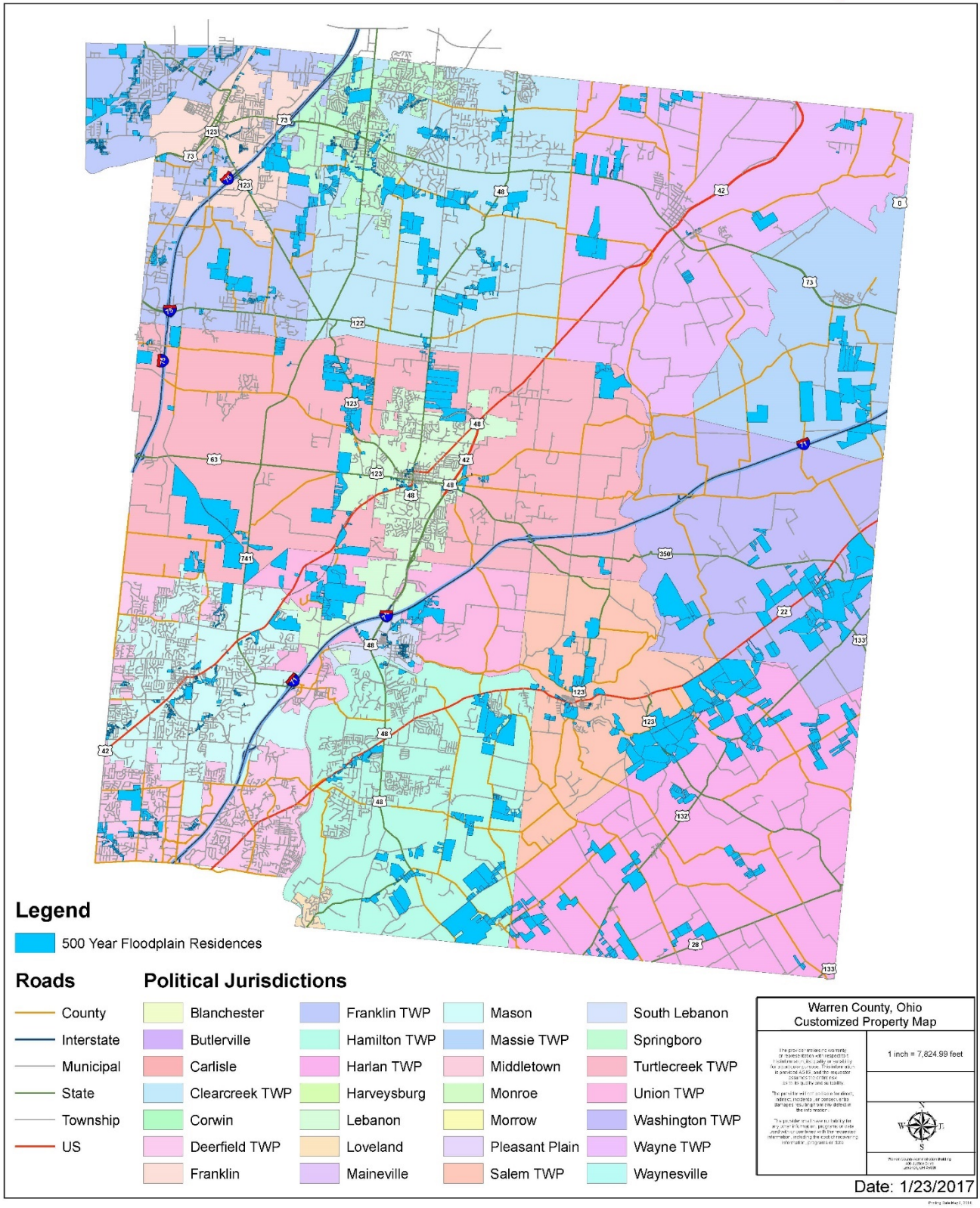
LOCATION	DATE	MAGNITUDE	DEATHS	INJURIES	DAMAGES
Loveland Park	6/29/2012	52	0	0	$0
Loveland Park	6/12/2015	50	0	0	$1,000
Loveland Park	8/15/2016	50	0	0	$1,000
Total		3 events			$2,000

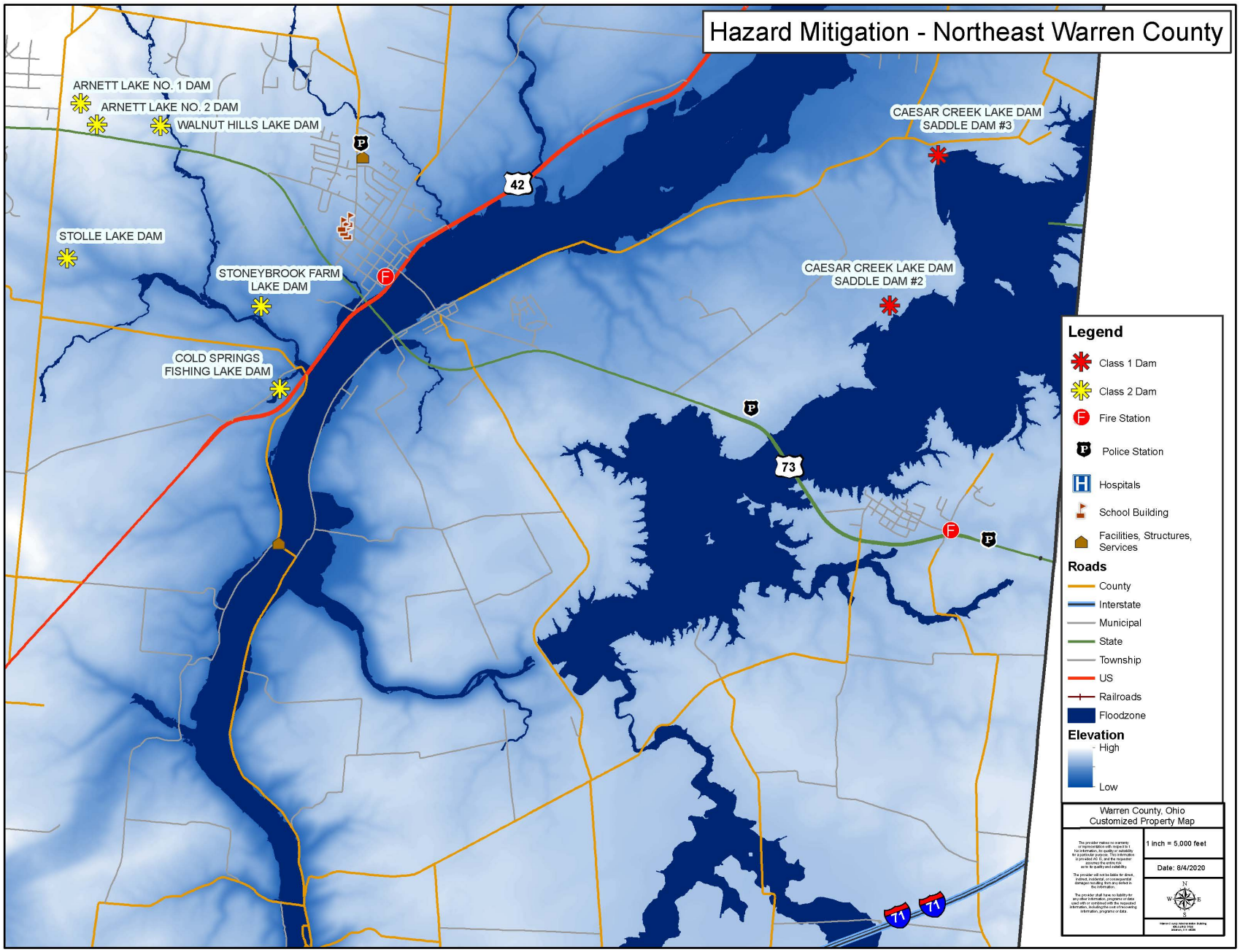
Residences in 100 Year Floodplain

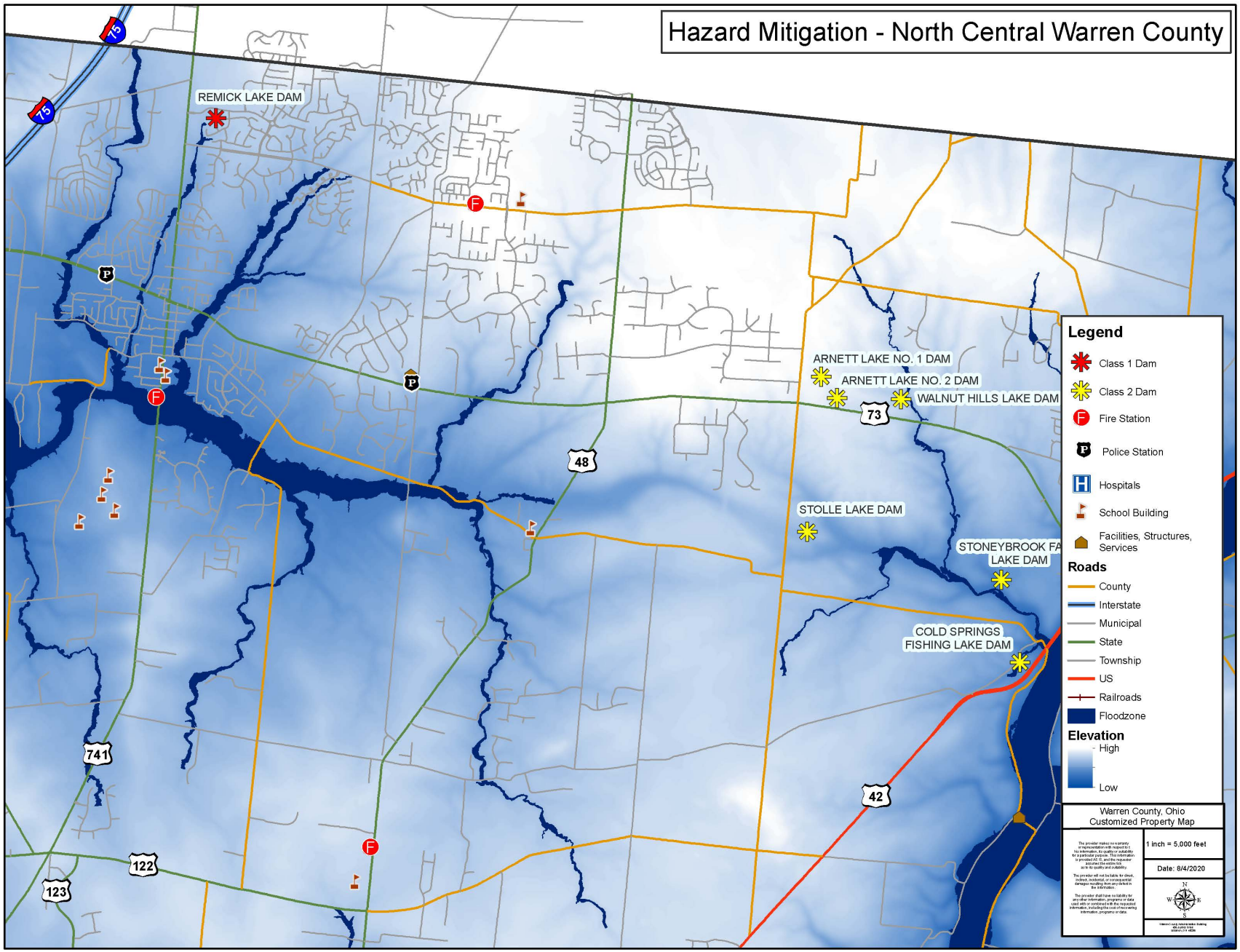


Date: 1/23/2017

Residences in 500 Year Floodplain




Hazard Mitigation - Northeast Warren County
ARNETT LAKE NO. 1 DAM
ARNETT LAKE NO. 2 DAM
WALNUT HILLS LAKE DAM
STOLLE LAKE DAM
STONEYBROOK FARM LAKE DAM
COLD SPRINGS FISHING LAKE DAM
CAESAR CREEK LAKE DAM SADDLE DAM #3
CAESAR CREEK LAKE DAM SADDLE DAM #2
42
73
71
Legend
Class 1 Dam
Class 2 Dam
Fire Station
Police Station
Hospitals
School Building
Facilities, Structures, Services
Roads
County
Interstate
Municipal
State
Township
US
Railroads
Floodzone
Elevation
High
Low
Warren County, Ohio
Customized Property Map
1 inch = 5,000 feet
Date: 8/4/2020


Hazard Mitigation - North Central Warren County
REMICK LAKE DAM
ARNETT LAKE NO. 1 DAM
ARNETT LAKE NO. 2 DAM
WALNUT HILLS LAKE DAM
STOLLE LAKE DAM
STONEYBROOK FA
LAKE DAM
COLD SPRINGS
FISHING LAKE DAM
75
73
48
741
42
122
123
Legend
Class 1 Dam
Class 2 Dam
Fire Station
Police Station
Hospitals
School Building
Facilities, Structures, Services
Roads
County
Interstate
Municipal
State
Township
US
Railroads
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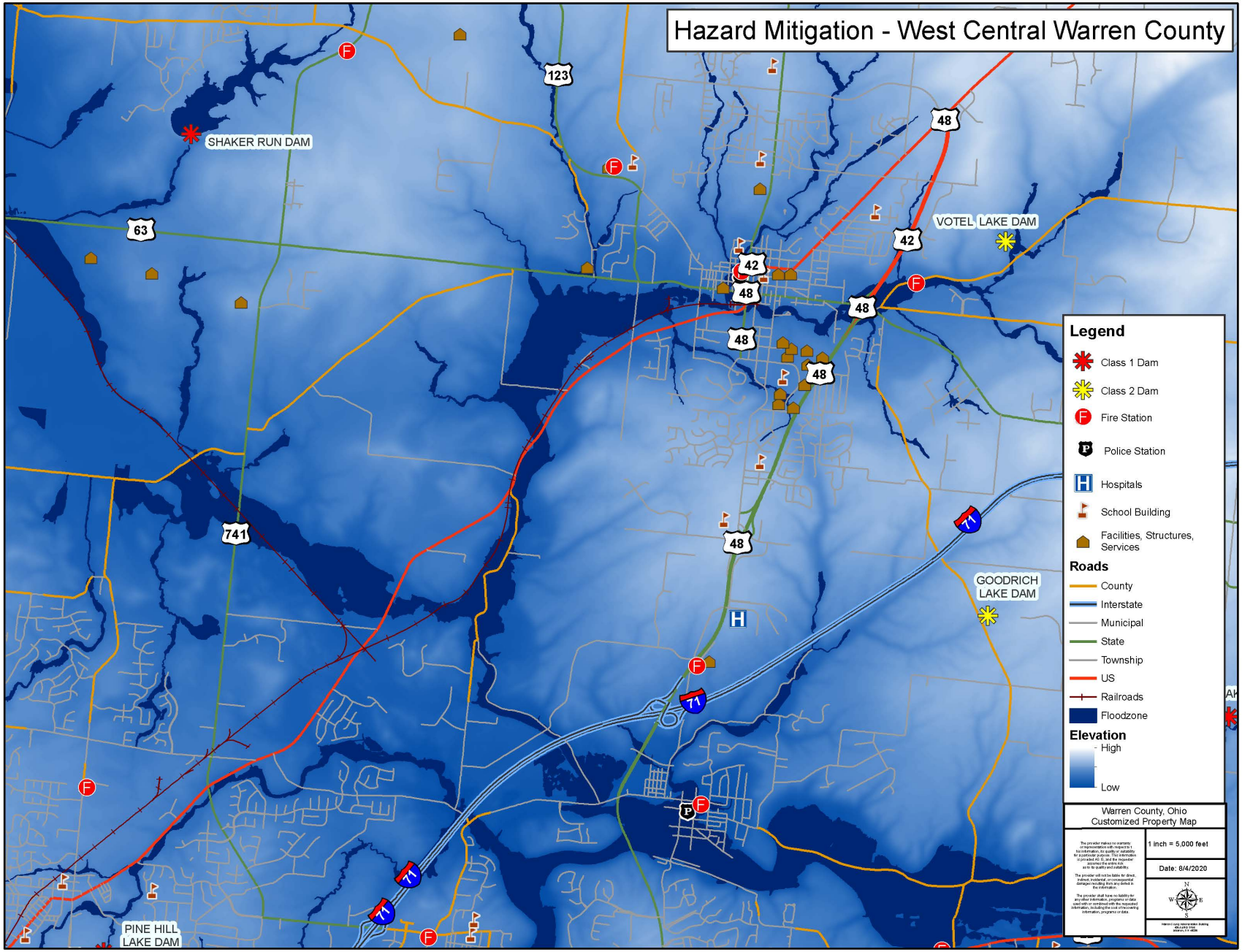
Hazard Mitigation - West Central Warren County
SHAKER RUN DAM
VOTEL LAKE DAM
GOODRICH LAKE DAM
PINE HILL LAKE DAM
123
63
741
48
42
71
Legend
Class 1 Dam
Class 2 Dam
Fire Station
Police Station
Hospitals
School Building
Facilities, Structures, Services
Roads
County
Interstate
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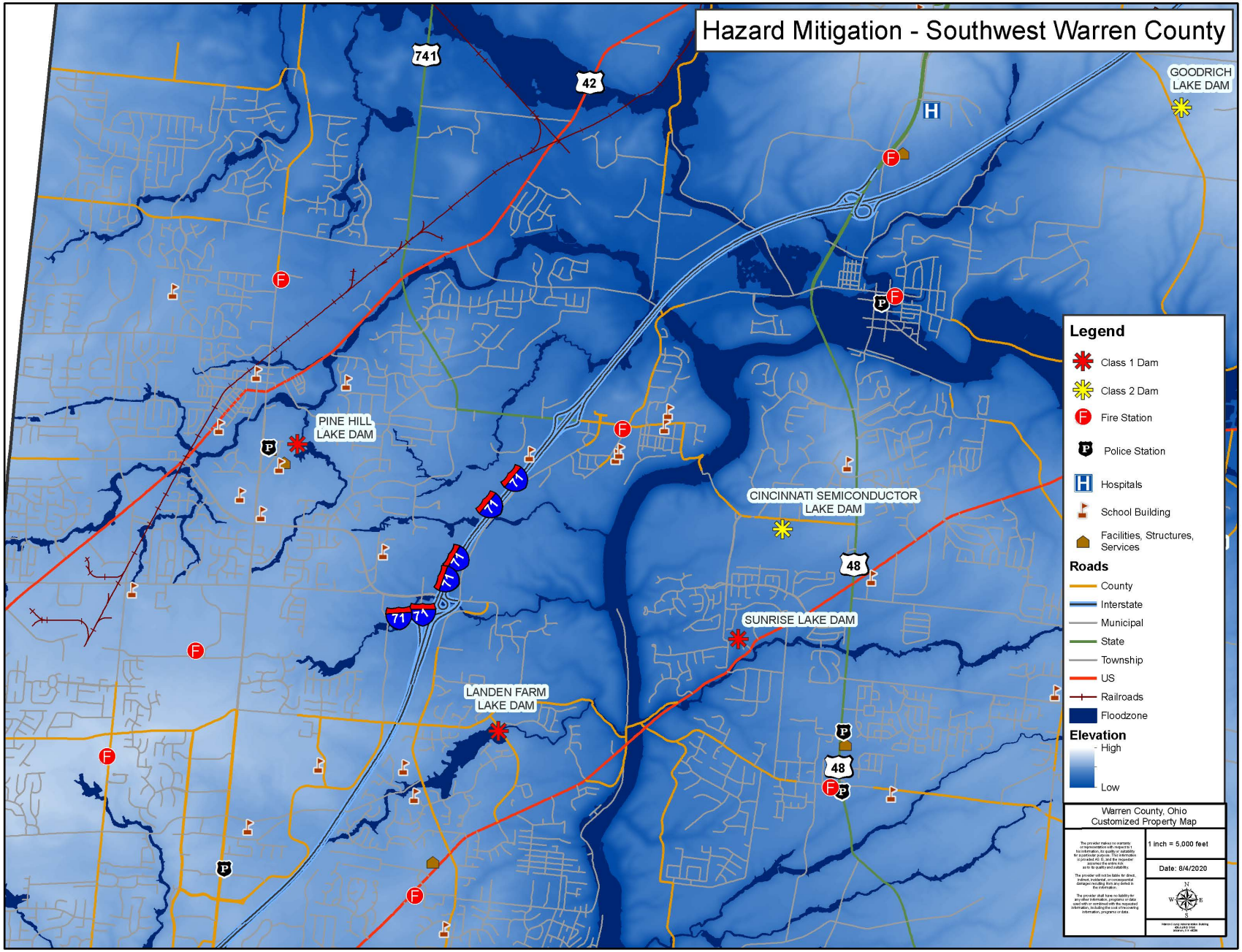
Hazard Mitigation - Southwest Warren County
741
42
GOODRICH LAKE DAM
PINE HILL LAKE DAM
CINCINNATI SEMICONDUCTOR LAKE DAM
SUNRISE LAKE DAM
LANDEN FARM LAKE DAM
48
71
Legend
Class 1 Dam
Class 2 Dam
Fire Station
Police Station
Hospitals
School Building
Facilities, Structures, Services
Roads
County
Interstate
Municipal
State
Township
US
Railroads
Floodzone
Elevation
High
Low
Warren County, Ohio
Customized Property Map
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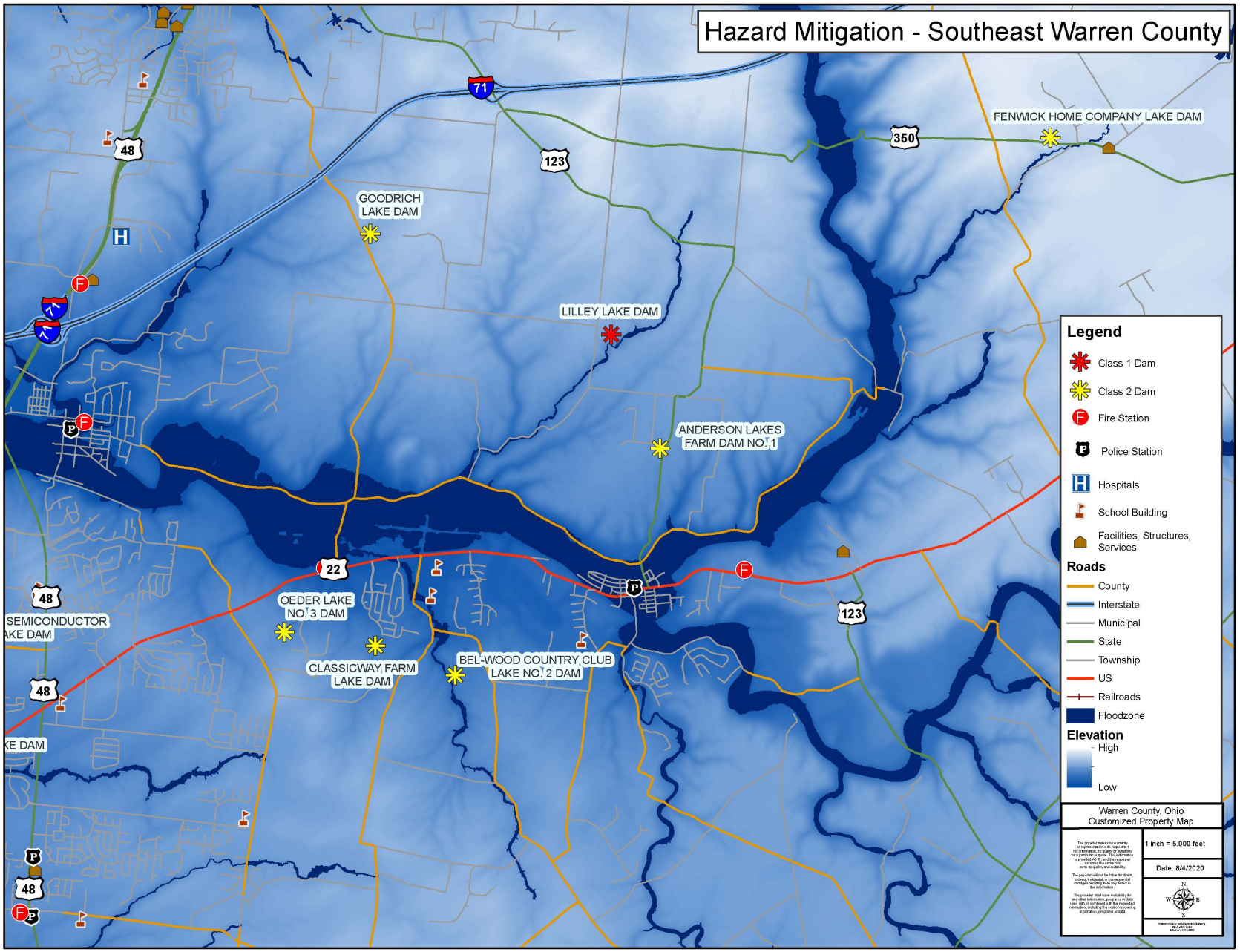
Hazard Mitigation - Southeast Warren County
FENWICK HOME COMPANY LAKE DAM
GOODRICH LAKE DAM
LILLEY LAKE DAM
ANDERSON LAKES FARM DAM NO. 1
OEDER LAKE NO. 3 DAM
CLASSICWAY FARM LAKE DAM
BEL-WOOD COUNTRY CLUB LAKE NO. 2 DAM
SEMICONDUCTOR
Legend
Class 1 Dam
Class 2 Dam
Fire Station
Police Station
Hospitals
School Building
Facilities, Structures, Services
Roads
County
Interstate
Municipal
State
Township
US
Railroads
Floodzone
Elevation
High
Low
Warren County, Ohio
Customized Property Map
1 inch = 5,000 feet
Date: 8/4/2020

Mitigation Action #	Hazard Applied to	Goal / Objective	Action	Resp Party	Time Frame	Funding Source	Jurisdictional Priority
Village of Butlerville							
3	Multi-Hazard	2A,3A,3B,	Procure generators and transfer switches for critical facilities such as admin and public safety buildings, schools, etc.	Administrator / Fire Chief	Less Than 1 Year	Grants	33
16	Multi-Hazard	3A,4A	Develop / upgrade storm water drainage systems and maintenance to guide surface water and increase capacity.	Administrator / Fire Chief	Greater Than 3 Years	Grants	31
19A	Multi-Hazard	1A,2A,5B	Develop and conduct training between first responders and chemical facilities for response to a chemical incident.	Assistant Fire Chief	Continuous Project	Existing Funds	26
5	Multi-Hazard	2B,2F	Protect propane tanks or other external fuel sources.	Administrator / Fire Chief	Less Than 1 Year	Existing Funds	25
43	Hazardous Materials Incident	1B,2A,4B	Develop and conduct training between first responders and chemical facilities for response to a chemical incident.	Assistant Fire Chief	Continuous Project	Existing Funds	25
129A	Tornado	1A,2B,2C,2D	Reduce damages resulting from straight line winds / tornadoes by providing warning to citizens to store loose/unsecured items on property in advance of the storm.	Administrator / Fire Chief	Continuous Project	Grants	25
34A	Flooding / Dam	2B,5B	Adopt or amend zoning ordinance for better floodplain regulations.	Administrator / Fire Chief	Greater Than 3 Years	Existing Funds	24
25	Wind / Severe Storms and Tornadoes	2A,2E	Install safe rooms to shelter the population during tornado events.	Administrator / Fire Chief	1 to 3 Years	Grants	19
48	Winter Storms	2A,2B,5B	Evaluate and retrofit older buildings, especially large span buildings that may have inadequate snow load tolerances.	Administrator / Fire Chief	1 to 3 Years	Grants	19
Village of Carlisle							
20	Multi-Hazard	1A,1B,2A,2C	Support and increase participation in Sky Warn Program.	Village Manager	Less Than 1 Year	Existing Funds	36
18	Multi-Hazard	5A	Encourage on-going education for seasoned and newly elected officials to familiarize them with the disaster cycle of prevention, preparedness, mitigation, response and recovery.	Village Manager	Less Than 1 Year	Existing Funds	35
2	Multi-Hazard	1A,1B,2C	Increase the use of social media to warn residents and visitors of extreme weather and man-made events.	Village Manager	Less Than 1 Year	Existing Funds	34

Mitigation Action #	Hazard Applied to	Goal / Objective	Action	Responsible Party	Time Frame	Funding Source	Jurisdictional Priority
Village of Carlisle cont.							
3	Multi-Hazard	2A,3A,3B	Procure generators and transfer switches for critical facilities such as admin and public safety buildings, schools, etc.	Village Manager	Less Than 1 Year	Grants	30
12	Multi-Hazard	2A,2E	Build/establish shelters with generators that can serve displaced citizens. Include how animals (domestic and rural) will be addressed in sheltering.	Village Manager	1 to 3 Years	Grants	27
40	Hazardous Materials Incident	1A,1B,3A	Create public education campaign about illicit discharge and how to report spills.	Village Manager / Floodplain Administrator	Continuous Project	Existing Funds	23
42	Hazardous Materials Incident	2B,2F,4A, 4D	Conduct jurisdictional fire inspections of facilities that contain hazardous materials.	Fire Chief	Continuous Project	Existing Funds	22
30	Flooding / Dam	2A,2B,2D, 2F,5B	Relocate structures or systems in flood prone or hazard areas - especially those properties identified as historically or culturally significant to the community.	Village Manager / Floodplain Administrator	1 to 3 Years	Grants	21
36	Flooding / Dam	5B	Conduct engineering / impact studies for flood mitigation.	Village Manager / Floodplain Administrator	1 to 3 Years	Grants	20
44	Hazardous Materials Incident	2A,3A,3B ,3C,5A	Conduct a commodity flow study to determine the amount of hazardous materials that travel through communities / county.	Service Dept.	Continuous Project	Grants	20
47	Winter Storms	3A,3C,4A, 4B	Enhance existing snow removal equipment and supplies.	Service Dept.	Continuous Project	Existing Funds	18
34	Flooding / Dam	2B,5B	Adopt or amend zoning ordinance for better floodplain regulations.	Zoning Official	Greater Than 3 Years	Existing Funds	17
38	Flooding / Dam	4B,4C,5B	Conduct regular maintenance for flood control structures such as dams / levees.	Village Manager / Floodplain Administrator	Continuous Project	Existing Funds	15
51	Winter Storms	2A,3A	Install or plant snow fences or "living snow fences" (rows of trees or vegetation) to limit blowing and drifting of snow over critical roadway segments.	Service Dept.	Continuous Project	Existing Funds	14
52	Man-Made Events	2A,3A,5B	Install physical protective measures for critical infrastructures. (i.e. fences, lighting, bollards, etc.)	Service Dept.	Continuous Project	Grants	13

Mitigation Action #	Hazard Applied to	Goal / Objective	Action	Responsible Party	Time Frame	Funding Source	Jurisdictional Priority
Village of Carlisle cont.							
58	Invasive / Harmful Species	1B,5A,5B	Develop jurisdictional educational programs for public works (and other applicable) employees to better identify and report possible invasive species.	Village Admin	Continuous Project	Existing Funds	11
59	Invasive / Harmful Species	1A,5B	Remove infected vegetation or organisms to eradicate invasive species.	Service Dept.	Continuous Project	Existing Funds	10
62	Extreme Temperatures / Drought	2A,3A,3B, 3C,5B	Establish and implement water conservation programs.	Village Admin	Greater Than 3 Years	Existing Funds	9
61	Extreme Temperatures / Drought	1A,2A,2B, 3A,3B,3C, 4A,4B	Acquire warming and/or cooling equipment for facilities with inadequate systems or for response to power outages.	Village Admin	Greater Than 3 Years	Existing Funds	8
65	Earthquakes	1B,2A,2B,4A	Conduct a public building seismic study to determine which buildings are more at risk for damages from an earthquake.	Village Admin	Continuous Project	Existing Funds	7
64	Earthquakes	2B,2D,2F, 3A,3B,4A	Safeguard and harden critical infrastructure systems to meet seismic design standards for "lifelines".	Village Admin	Continuous Project	Grants	6
66	Landslides / Erosion	2A,3A	Establish natural means (such as tree planting and conservation) that protects steep slopes from landslides.	Service Dept.	Continuous Project	Grants	5
71	Infectious Disease Outbreak	1A,1B,2A, 4B,5A	Promote seasonal influenza vaccination and facilitate on-campus vaccination clinics.	Village Admin/ Fire Chief	Continuous Project	Existing Funds	4
74	Wildfires	2A,3A,5B	Clear fuel loads created by downed trees and dry brush.	Fire Chief	Continuous Project	Existing Funds	1
Clearcreek Township							
28	Wind / Severe Storms and Tornadoes	1A,1B,2A, 2E,3A,5A	Assist jurisdictional plan for debris management, mass sheltering, and animal sheltering operations.	Fire Chief	Less Than 1 Year	Existing Funds	29
Deerfield Township							
14	Multi-Hazard	1A,1B,4A	Require event planners to incorporate emergency and disaster planning into their event plans and to submit a copy of this plan to local elected / public safety officials.	Organizer	Less Than 1 Year	Grants	33
5	Multi-Hazard	2B,2F	Protect propane tanks or other external fuel sources.	Property Owner	Continuous Project	Existing Funds	30
6	Multi-Hazard	1B,2E	Educate the public on what “shelter in place” means and how this action is performed.	Fire Department	Continuous Project	Existing Funds	29
15	Multi-Hazard	2A,3A,4B	Adopt a debris management plan that allows the jurisdiction to recover quicker from hazard events.	Township	1 to 3 Years	Grants	27

Mitigation Action #	Hazard Applied to	Goal / Objective	Action	Responsible Party	Time Frame	Funding Source	Jurisdictional Priority
Deerfield Township cont.							
19	Multi-Hazard	1A,2A,5B	Develop and conduct training between first responders and chemical facilities for response to a chemical incident.	Fire Department / Property Owner	Continuous Project	Existing Funds	26
32	Flooding / Dam	1B,4C	Provide information to property owners in flood-prone areas on the need for NFIP coverage.	Fire Department / Zoning	Continuous Project	Existing Funds	25
129	Tornado	1A,2B,2C,2D	Reduce damages resulting from straight line winds/tornadoes by providing warning to citizens to store loose/unsecured items on property in advance of the storm.	Fire Department	Continuous Project	Grants	25
34	Flooding / Dam	2B,5B	Adopt or amend zoning ordinance for better floodplain regulations.	Zoning	Greater Than 3 Years	Existing Funds	24
4	Multi-Hazard	1A,1B	Develop a plan for evacuating populations at any given time. **To also include consideration for person's with access and functional needs.**	Fire Department	Continuous Project	Existing Funds	22
16A	Multi-Hazard	3A,4A	Develop/upgrade storm water drainage systems and maintenance to guide surface water and increase capacity.	Zoning	Continuous Project	Grants	17
Franklin Township							
3	Multi-Hazard	2A,3A,3B,	Procure generators and transfer switches for critical facilities such as admin and public safety buildings, schools, etc.	Township Administrator	Less Than 1 Year	Grants	33
24	Multi-Hazard	3C,4B	Establish MOU's to provide potable and non-potable water to meet the public's needs.	Township Administrator	1 to 3 Years	Grants	30
15	Multi-Hazard	2A,3A,4B	Adopt a debris management plan that allows the jurisdiction to recover quicker from hazard events.	Township Administrator	Less Than 1 Year	Grants	27
16	Multi-Hazard	3A,4A	Develop / upgrade storm water drainage systems and maintenance to guide surface water and increase capacity.	Service Dept.	Continuous Project	Existing Funds	25
47	Winter Storms	3A,3C,4A,4B	Enhance existing snow removal equipment and supplies.	Service Dept.	Continuous Project	Existing Funds	20
69	Landslides / Erosion	2F,3A	Install stream bank erosion prevention methods.	Township Administrator	Continuous Project	Grants	5
City of Franklin							
3	Multi-Hazard	2A,3A,3B,	Procure generators and transfer switches for critical facilities such as admin and public safety buildings, schools, etc.	Public Works	Less Than 1 Year	Existing Funds	31
6	Multi-Hazard	1B,2E	Educate the public on what "shelter in place" means and how this action is performed.	Public Works	Continuous Project	Existing Funds	31

Mitigation Action #	Hazard Applied to	Goal / Objective	Action	Responsible Party	Time Frame	Funding Source	Jurisdictional Priority
City of Franklin cont.							
45	Hazardous Materials Incident	1A,1B,2D,3A	Require public permitting process to include calling 811 & providing a copy of their dig ticket.	Public Works	Continuous Project	Existing Funds	24
16	Multi-Hazard	3A,4A	Develop/upgrade storm water drainage systems and maintenance to guide surface water and increase capacity.	Public Works	Continuous Project	Grants	23
51	Winter Storms	2A,3A	Install or plant snow fences or "living snow fences" (rows of trees or vegetation) to limit blowing and drifting of snow over critical roadway segments.	Public Works	Continuous Project	Existing Funds	16
52	Man-Made Events	2A,3A,5B	Install physical protective measures for critical infrastructures. (i.e. fences, lighting, bollards, etc.)	Public Works / Police Chief	Continuous Project	Grants	13
Hamilton Township							
6	Multi-Hazard	1B,2E	Educate the public on what “shelter in place” means and how this action is performed.	Township Administrator / Fire Chief	Less Than 1 Year	Existing Funds	31
7	Multi-Hazard	1A,1B,5A	Develop education programs for residents, tourists, businesses, etc. for hazard-specific threats.	Township Administrator / Fire Chief	Less Than 1 Year	Existing Funds	31
Harlan Township							
3	Multi-Hazard	2A,3A,3B,	Procure generators and transfer switches for critical facilities such as admin and public safety buildings, schools, etc.	Administrator / Fire Chief	Less Than 1 Year	Grants	33
16	Multi-Hazard	3A,4A	Develop/upgrade storm water drainage systems and maintenance to guide surface water and increase capacity.	Administrator / Fire Chief	Greater Than 3 Years	Grants	31
19A	Multi-Hazard	1A,2A,5B	Develop and conduct training between first responders and chemical facilities for response to a chemical incident.	Assistant Fire Chief	Continuous Project	Existing Funds	26
5	Multi-Hazard	2B,2F	Protect propane tanks or other external fuel sources.	Administrator / Fire Chief	Less Than 1 Year	Existing Funds	25
43	Hazardous Materials Incident	1B,2A,4B	Develop and conduct training between first responders and chemical facilities for response to a chemical incident.	Assistant Fire Chief	Continuous Project	Existing Funds	25
129A	Tornado	1A,2B,2C,2D	Reduce damages resulting from straight line winds/tornadoes by providing warning to citizens to store loose/unsecured items on property in advance of the storm.	Administrator / Fire Chief	Continuous Project	Grants	25
34A	Flooding / Dam	2B,5B	Adopt or amend zoning ordinance for better floodplain regulations.	Administrator / Fire Chief	Greater Than 3 Years	Existing Funds	24
25	Wind / Severe Storms and Tornadoes	2A,2E	Install safe rooms to shelter the population during tornado events.	Administrator / Fire Chief	1 to 3 Years	Grants	19
48	Winter Storms	2A,2B,5B	Evaluate and retrofit older buildings, especially large span buildings that may have inadequate snow load tolerances.	Administrator / Fire Chief	1 to 3 Years	Grants	19

Mitigation Action #	Hazard Applied to	Goal/ Objective	Action	Responsible Party	Time Frame	Funding Source	Jurisdictional Priority
Village of Harveysburg							
16	Multi-Hazard	3A,4A	Develop/upgrade storm water drainage systems and maintenance to guide surface water and increase capacity.	Fire Chief	Greater than 3 years	Grants	20
25	Wind	2A,2E	Install safe rooms to shelter the population during tornado events.	Fire Chief	1 to 3 Years	Grants	19
City of Lebanon							
3	Multi-Hazard	2A,3A,3B	Procure generators and transfer switches for critical facilities such as admin and public safety buildings, schools, etc.	Fire Chief	Less Than 1 Year	Grants	31
6	Multi-Hazard	1B,2E	Educate the public on what "shelter in place" means and how this action is performed.	City Manager / Fire Chief	Less Than 1 Year	Existing Funds	31
7	Multi-Hazard	1A,1B,5A	Develop education programs for residents, tourists, businesses, etc. for hazard-specific threats.	City Manager / Fire Chief	Less Than 1 Year	Existing Funds	31
2	Multi-Hazard	1A,1B,2C	Increase the use of social media to warn residents and visitors of extreme weather and man-made events.	City Manager	Less Than 1 Year	Existing Funds	29
19	Multi-Hazard	1A,2A,5B	Develop and conduct training between first responders and chemical facilities for response to a chemical incident.	Engineer / Public Works Director	1 to 3 Years	Existing Funds	29
32	Flooding / Dam	1B,4C	Provide information to property owners in flood-prone areas on the need for NFIP coverage.	City Manager / Floodplain Administrator	Less Than 1 Year	Existing Funds	22
33	Flooding / Dam	2A,3B	Install and support additional river gauges, especially in communities with repetitive flood events or repetitive (flood) loss structures.	City Manager / Floodplain Administrator	Less Than 1 Year	Existing Funds	22
16	Multi-Hazard	3A,4A	Develop/upgrade storm water drainage systems and maintenance to guide surface water and increase capacity.	Engineer / Public Works Director	Continuous Project	Grants	18
45	Hazardous Materials Incident	1A,1B,2D, 3A	Require public permitting process to include calling 811 and providing a copy of their dig ticket.	City Manager	Less Than 1 Year	Existing Funds	18
City of Mason							
15	Multi-Hazard	2A,3A,4B	Adopt a debris management plan that allows the jurisdiction to recover quicker from hazard events.	Safety Director / Fire Chief	Less Than 1 Year	Existing Funds	33
1	Multi-Hazard	1A,1B,2C	Identify and install hazard notification systems (consider device-neutral systems as well as conventional notification systems)	Safety Director / Fire Chief	Less Than 1 Year	Existing Funds	27
3	Multi-Hazard	2A,3A,3B	Procure generators and transfer switches for critical facilities such as admin and public safety buildings, schools, etc.	Safety Director / Fire Chief	Less Than 1 Year	Existing Funds	26

Mitigation Action #	Hazard Applied to	Goal/ Objective	Action	Responsible Party	Time Frame	Funding Source	Jurisdictional Priority
City of Mason cont.							
129A	Tornado	1A,2B,2C,2D	Reduce damages resulting from straight line winds / tornadoes by providing warning to citizens to store loose / unsecured items on property in advance of the storm.	Safety Director / Fire Chief	Continuous Project	Existing funds	25
106A	Winter Storms	1B,3C,4A,5A	Develop a resource manual that can be used to inventory emergency resources that can be deployed to aid in the event of a severe winter storm.	Safety Director / Fire Chief	Less Than 1 Year	Existing funds	23
16A	Multi-Hazard	3A,4A	Develop / upgrade storm water drainage systems and maintenance to guide surface water and increase capacity.	Safety Director / Fire Chief	Greater than 3 years	Grants	20
5A	Multi-Hazard	2B,2F	Protect propane tanks or other external fuel sources.	Safety Director / Fire Chief	Less Than 1 Year	Existing funds	18
19A	Multi-Hazard	1A,2A,5B	Develop and conduct training between first responders and chemical facilities for response to a chemical incident.	Safety Director / Fire Chief	Less Than 1 Year	Existing funds	18
25	Wind / Severe Storms and Tornadoes	2A,2E	Install safe rooms to shelter the population during tornado events.	Safety Director / Fire Chief	Greater Than 3 Years	Grants	18
City of Monroe							
2	Multi-Hazard	1A,1B,2C	Increase the use of social media to warn residents and visitors of extreme weather and man-made events.	City Manager	Continuous Project	Existing Funds	33
6	Multi-Hazard	1B,2E	Educate the public on what “shelter in place” means and how this action is performed.	Fire	Continuous Project	Existing Funds	33
3	Multi-Hazard	2A,3A,3B	Procure generators and transfer switches for critical facilities such as admin and public safety buildings, schools, etc.	Public Works	Less Than 1 Year	Grants	31
26	Wind / Severe Storms and Tornadoes	2B,4A	Adopt and enforce building codes for residential and commercial construction that prevents wind damage.	Development	Less Than 1 Year	Existing Funds	31
46	Hazardous Materials Incident	1A,1B,2D,3A	Promote use of 811 to residents and businesses that sell products that require digging.	Public Works	Less Than 1 Year	Existing Funds	28
12	Multi-Hazard	2A,2E	Build/establish shelters with generators that can serve displaced citizens. Include how animals (domestic and rural) will be addressed in sheltering.	Fire	1 to 3 Years	Grants	27
15	Multi-Hazard	2A,3A,4B	Adopt a debris management plan that allows the jurisdiction to recover quicker from hazard events.	Public Works	Continuous Project	Existing Funds	26
19	Multi-Hazard	1A,2A,5B	Develop and conduct training between first responders and chemical facilities for response to a chemical incident.	Fire	Continuous Project	Existing Funds	26

Mitigation Action #	Hazard Applied to	Goal/ Objective	Action	Responsible Party	Time Frame	Funding Source	Jurisdictional Priority
City of Monroe cont.							
36	Flooding / Dam	5B	Conduct engineering / impact studies for flood mitigation.	Public Works	Less Than 1 Year	Existing Funds	24
16	Multi-Hazard	3A,4A	Develop / upgrade storm water drainage systems and maintenance to guide surface water and increase capacity.	Public Works	Greater Than 3 Years	Grants	22
47	Winter Storms	3A,3C, 4A, 4B	Enhance existing snow removal equipment and supplies.	Public Works	1 to 3 Years	Grants	20
53	Man-Made Events	1A,1B,2A, 4B,5A	Develop a training and education program for active aggressor incidents in facilities.	Fire	1 to 3 Years	Existing Funds	16
Morrow							
47	Winter Storms	3A,3C,4A, 4B	Enhance existing snow removal equipment and supplies.	Zoning Inspector / Public Works	1 to 3 Years	Existing Funds	20
16A	Multi-Hazard	3A,4A	Develop/upgrade storm water drainage systems and maintenance to guide surface water and increase capacity.	Public Works	Greater than 3 years	Grants	13
26A	Wind / Severe Storms and Tornadoes	2B,4A	Adopt and enforce building codes for residential and commercial construction that prevents wind damage.	Zoning Inspector	Continuous Project	Existing Funds	12
153A	Flood	1A,1B,3A	Place depth markers on frequently flooded roads to advise travelers of flooding depths.	Public Works	1 to 3 Years	Existing Funds	11
Village of Pleasant Plain							
3	Multi-Hazard	2A,3A,3B	Procure generators and transfer switches for critical facilities such as admin and public safety buildings, schools, etc.	Administrator / Fire Chief	Less Than 1 Year	Grants	33
16	Multi-Hazard	3A,4A	Develop/upgrade storm water drainage systems and maintenance to guide surface water and increase capacity.	Administrator / Fire Chief	Greater Than 3 Years	Grants	31
19A	Multi-Hazard	1A,2A,5B	Develop and conduct training between first responders and chemical facilities for response to a chemical incident.	Assistant Fire Chief	Continuous Project	Existing Funds	26
5	Multi-Hazard	2B,2F	Protect propane tanks or other external fuel sources.	Administrator / Fire Chief	Less Than 1 Year	Existing Funds	25
43	Hazardous Materials Incident	1B,2A,4B	Develop and conduct training between first responders and chemical facilities for response to a chemical incident.	Assistant Fire Chief	Continuous Project	Existing Funds	25
129A	Tornado	1A,2B,2C, 2D	Reduce damages resulting from straight line winds / tornadoes by providing warning to citizens to store loose / unsecured items on property in advance of the storm.	Administrator / Fire Chief	Continuous Project	Grants	25
34A	Flooding / Dam	2B,5B	Adopt or amend zoning ordinance for better floodplain regulations.	Administrator / Fire Chief	Greater Than 3 Years	Existing Funds	24

Mitigation Action #	Hazard Applied to	Goal/ Objective	Action	Responsible Party	Time Frame	Funding Source	Jurisdictional Priority
Village of Pleasant Plain cont.							
25	Wind / Severe Storms and Tornadoes	2A,2E	Install safe rooms to shelter the population during tornado events.	Administrator / Fire Chief	1 to 3 Years	Grants	19
48	Winter Storms	2A,2B,5B	Evaluate and retrofit older buildings, especially large span buildings that may have inadequate snow load tolerances.	Administrator / Fire Chief	1 to 3 Years	Grants	19
City of Springboro							
5A	Multi-Hazard	2B,2F	Protect propane tanks or other external fuel sources.	Community Relations Director	Less Than 1 Year	Grants	34
129A	Tornado	1A,2B,2C, 2D	Reduce damages resulting from straight line winds / tornadoes by providing warning to citizens to store loose / unsecured items on property in advance of the storm.	Community Relations Director	Less Than 1 Year	Grants	31
16A	Multi-Hazard	3A,4A	Develop / upgrade storm water drainage systems and maintenance to guide surface water and increase capacity.	City Engineer	1 to 3 Years	Grants	25
19A	Multi-Hazard	1A,2A,5B	Develop and conduct training between first responders and chemical facilities for response to a chemical incident.	City Engineer	1 to 3 Years	Grants	25
Turtlecreek Township							
2	Multi-Hazard	1A,1B,2C	Increase the use of social media to warn residents and visitors of extreme weather and man-made events.	Township Administrator	1 to 3 Years	Existing Funds	34
3	Multi-Hazard	2A,3A,3B	Procure generators and transfer switches for critical facilities such as admin and public safety buildings, schools, etc.	Township Administrator	Greater Than 3 Years	Existing Funds	27
15	Multi-Hazard	2A,3A,4B	Adopt a debris management plan that allows the jurisdiction to recover quicker from hazard events.	Township Administrator	1 to 3 Years	Grants	27
53	Man-Made Events	1A,1B,2A, 4B, 5A	Develop a training and education program for active aggressor incidents in facilities.	Warren County Sheriff's Office	Less Than 1 Year	Existing Funds	15
5	Multi-Hazard	2B,2F	Protect propane tanks or other external fuel sources.	Fire Chief	1 to 3 Years	Existing Funds	13
16	Multi-Hazard	3A,4A	Develop / upgrade storm water drainage systems and maintenance to guide surface water and increase capacity.	Public Works	Greater than 3 years	Grants	13
19	Multi-Hazard	1A,2A,5B	Develop and conduct training between first responders and chemical facilities for response to a chemical incident.	Fire Chief	1 to 3 Years	Existing Funds	13
129A	Tornado	1A,2B,2C, 2D	Reduce damages resulting from straight line winds / tornadoes by providing warning to citizens to store loose / unsecured items on property in advance of the storm.	Township Administrator	Continuous Project	Existing Funds	12

Mitigation Action #	Hazard Applied to	Goal/Objective	Action	Responsible Party	Time Frame	Funding Source	Jurisdictional Priority
Turtlecreek Township cont.							
32	Flooding/Dam	1B,4C	Provide information to property owners in flood-prone areas on the need for NFIP coverage.	Township Administrator	Continuous Project	Existing Funds	11
34	Flooding/Dam	2B,5B	Adopt or amend zoning ordinance for better floodplain regulations.	Zoning Official	Continuous Project	Existing Funds	11
Wayne Township							
3	Multi-Hazard	2A,3A,3B	Procure generators and transfer switches for critical facilities such as admin and public safety buildings, schools, etc.	Administrator	1 to 3 Years	Existing Funds	30
6	Multi-Hazard	1B,2E	Educate the public on what "shelter in place" means and how this action is performed.	Fire Chief	1 to 3 Years	Existing Funds	30
19A	Multi-Hazard	1A,2A,5B	Develop and conduct training between first responders and chemical facilities for response to a chemical incident.	Fire Chief	1 to 3 Years	Existing Funds	26
27	Wind / Severe Storms and Tornadoes	1B,5A	Promote Ohio's Safe Room Application program to residents for installation of tornado safe rooms in their homes.	Administrator and Fire Chief	Less Than 1 Year	Existing Funds	25
46	Hazardous Materials Incident	1A,1B,2D, 3A	Promote use of 811 to residents and businesses that sell products that require digging.	Administrator	Less Than 1 Year	Existing Funds	22
16	Multi-Hazard	3A,4A	Develop / upgrade storm water drainage systems and maintenance to guide surface water and increase capacity.	County Engineer	Continuous Project	Grants	20
25A	Wind / Severe Storms and Tornadoes	2A,2E	Install safe rooms to shelter the population during tornado events.	Administrator	Continuous Project	Grants	20
44	Hazardous Materials Incident	2A,3A,3B, 3C,5A	Conduct a commodity flow study to determine the amount of hazardous materials that travel through communities / county.	Administrator	Less Than 1 Year	Grants	17
Village of Waynesville							
26	Wind/Severe Storms and Tornadoes	2B,4A	Adopt and enforce building codes for residential and commercial construction that prevents wind damage.	Telecom	Less Than 1 Year	Existing Funds	34
31	Flooding / Dam	2A,2B,2D, 5B	Purchase properties susceptible to repeated flooding, remove structures, and enforce permanent restrictions on development.	Village Administrator	Less Than 1 Year	Existing Funds	28
32	Flooding / Dam	1B,4C	Provide information to property owners in flood-prone areas on the need for NFIP coverage.	Village Administrator	Less Than 1 Year	Existing Funds	28
30	Flooding / Dam	2A,2B,2D, 2F, 5B	Relocate structures or systems in flood prone or hazard areas - especially those identified as historically or culturally significant to the community.	Village Administrator	1 to 3 Years	Existing Funds	23
35	Flooding / Dam	2A,3A,3C	Conduct an upgrade study on storm/sewer line mitigation options.	Public Works	1 to 3 Years	Existing Funds	21

Mitigation Action #	Hazard Applied to	Goal/ Objective	Action	Responsible Party	Time Frame	Funding Source	Jurisdictional Priority
Miami Conservancy District							
80	Flooding / Dam	2A,3A	Conduct analyses and flood studies to identify risks, evaluate removal of existing structures in flood zone, and / or identify other potential structural or nature-based solutions to mitigate flooding in Franklin.	Technical and Engineering Services	1 to 3 Years	Grants	20
149A	Flooding / Dam	3A,5B	Conduct Stream Restoration and Floodplain enhancement via Re-establish / remove fill to enhance floodplain, natural channel design.	Technical and Engineering Services	1 to 3 Years	Grants	21
151A	Flooding / Dam	3A,5B	Conduct Buyout / Demolition of Carlisle and / or Franklin properties susceptible to flood losses.	Engineering and Property	1 to 3 Years	Grants	20
150A	Flooding / Dam	3A,5B	Conduct Buyout / Acquisition - Relocation of the Franklin & Carlisle Great Miami River Overflow.	Engineering and Property	Greater Than 3 Years	Existing Funds	18
Warren County Career Center							
3	Multi-Hazard	2A,3A,3B	Procure generators and transfer switches for critical facilities such as admin and public safety buildings, schools, etc.	Director of Facility Operations	Less Than 1 Year	Grants	29
3	Multi-Hazard	2A,3A,3B	Procure generators and transfer switches for critical facilities such as admin and public safety buildings, schools, etc.	Director of Facility Operations	Less Than 1 Year	Grants	29
Warren County Health District							
28	Wind / Severe Storms and Tornadoes	1A,1B,2A, 2E,3A,5A	Assist jurisdictional plan for debris management, mass sheltering, and animal sheltering operations.	Sanitarian Supervisor	Less Than 1 Year	Existing Funds	30
39	Flooding / Dam	2F,3A	Develop inspection and maintenance programs on dams in coordination with dam owners.	Sanitarian Supervisor	Less Than 1 Year	Existing Funds	26
40	Hazardous Materials	1A,1B,3A	Create public education campaign about illicit discharge / reporting spills.	Sanitarian Supervisor	Less Than 1 Year	Existing Funds	26
54	Man-Made Events	1A,3C,5A	Designate an Intelligence Liaison Officer (ILO) to help facilitate intelligence and information sharing regarding man-made events / threats.	Sanitarian Supervisor	1 to 3 Years	Existing Funds	16
60	Invasive / Harmful Species	1A,1B	Increase Public Health prevention and awareness programs for disease caused by invasive species for county residents.	Sanitarian Supervisor	Less Than 1 Year	Existing Funds	15
Warren County Regional Planning Commission							
2	Multi-Hazard	1A,1B,2C	Increase the use of social media to warn residents / visitors of severe weather & man-made events.	Environmental planner (EP) Subdivision Specialist (SS) EP / SS	1 to 3 Years	Existing Funds	31

Mitigation Action #	Hazard Applied to	Goal/ Objective	Action	Responsible Party	Time Frame	Funding Source	Jurisdictional Priority
Warren County Regional Planning Commission cont.							
4	Multi-Hazard	1A,1B	Develop a plan for evacuating populations at any given time.	EP / SS	1 to 3 Years	Existing Funds	30
28	Wind / Severe Storms and Tornadoes	1A,1B,2A, 2E,3A,5A	Assist jurisdictional plan for debris management, mass sheltering, and animal sheltering operations.	EP / SS	1 to 3 Years	Existing Funds	29
34	Flooding / Dam	2B,5B	Adopt or amend zoning ordinance for better floodplain regulations.	EP / SS	1 to 3 Years	Existing Funds	28
43	Hazardous Materials Incident	1B,2A,4B	Develop and conduct training between first responders and chemical facilities for response to a chemical incident.	EP / SS	Less Than 1 Year	Existing Funds	27
18	Multi-Hazard	5A	Encourage on-going education for seasoned and newly elected officials to familiarize them with the disaster cycle of prevention, preparedness, mitigation, response and recovery.	EP / SS	1 to 3 Years	Existing Funds	26
32	Flooding / Dam	1B,4C	Provide information to property owners in flood-prone areas on the need for NFIP coverage.	EP / SS	Continuous Project	Existing Funds	24
40	Hazardous Materials Incident	1A,1B,3A	Create public education campaign about illicit discharge and how to report spills.	EP / SS	Continuous Project	Existing Funds	23
53	Man-Made Events	1A,1B,2A, 4B,5A	Develop a training and education program for active aggressor incidents in facilities.	EP / SS	Continuous Project	Existing Funds	17
51	Winter Storms	2A,3A	Install or plant snow fences or "living snow fences" (rows of trees or vegetation) to limit blowing and drifting of snow over critical roadway segments.	EP / SS	1 to 3 Years	Existing Funds	16
60	Invasive / Harmful Species	1A,1B	Increase Public Health prevention and awareness programs for disease caused by invasive species for county residents.	EP / SS	Continuous Project	Existing Funds	14
70	Infectious Disease Outbreak	2A,4C,5A	Develop plans to respond to infectious diseases, including but not limited to reporting illnesses, social distancing, telecommuting, and facility closures.	EP / SS	Continuous Project	Existing Funds	5
76	Wildfires	1B,2B,2F,5B	Promote conservation of open space or wildland-urban boundary zones to separate developed areas from high-hazard areas.	EP / SS	Continuous Project	Existing Funds	2
78	Wildfires	3A,3C,5B	Construct defensible zones around power lines, oil and gas lines, and other infrastructure systems.	EP / SS	Continuous Project	Existing Funds	2
79	Wildfires	1B,2A,2B, 2D,4D	Establish wildfire mitigation planning requirements for large scale developments or planned unit developments.	EP / SS	Continuous Project	Existing Funds	2

Mitigation Action #	Hazard Applied to	Goal/ Objective	Action	Responsible Party	Time Frame	Funding Source	Jurisdictional Priority
Warren County Sheriff's Office							
4	Multi-Hazard	1A,1B	Develop a plan for evacuating populations at any given time.	Chief Deputy	1 to 3 Years	Existing Funds	30
6	Multi-Hazard	1B,2E	Educate the public on what "shelter in place" means and how this action is performed.	Chief Deputy	1 to 3 Years	Existing Funds	29
21	Multi-Hazard	4A,4B,4C	Conduct all-hazard vulnerability assessments at critical infrastructures.	Chief Deputy	Continuous Project	Existing Funds	30
28	Wind / Severe Storms and Tornadoes	1A,1B,2A, 2E,3A,5A	Assist jurisdictional plan for debris management, mass sheltering, and animal sheltering operations.	Chief Deputy	1 to 3 Years	Existing Funds	24
43	Hazardous Materials Incident	1B,2A,4B	Develop and conduct training between first responders and chemical facilities for response to a chemical incident.	Chief Deputy	1 to 3 Years	Existing Funds	20
44	Hazardous Materials Incident	2A,3A,3B, 3C,5A	Conduct a commodity flow study to determine the amount of hazardous materials that travel through communities/county.	Chief Deputy	Continuous Project	Grants	17
53	Man-Made Events	1A,1B,2A, 4B,5A	Develop a training and education program for active aggressor incidents.	Chief Deputy	Less Than 1 Year	Existing Funds	18
56	Man-Made Events	1A,1B,5A	Develop an active public reporting system for suspicious activity.	Chief Deputy	Greater Than 3 Years	Existing Funds	15
63	Extreme Temperatures / Drought	3A,3B,3C, 4A,4B	Establish ordinances on non-essential use of water during drought conditions.	Chief Deputy	Greater Than 3 Years	Existing Funds	7
Warren County Emergency Services							
6	Multi-Hazard	1B,2E	Develop a plan for evacuating populations at any given time.	Emergency Services Director	Continuous Project	Existing Funds	29
54	Man-Made Events	1A,3C,5A	Conduct a commodity flow study to determine the amount of hazardous materials that travel through communities/county.	Emergency Services Director	Less Than 1 Year	Existing Funds	28
19	Multi-Hazard	1A,2A,5B	Develop and conduct training between first responders and chemical facilities for response to a chemical incident.	Emergency Services Director	Continuous Project	Existing Funds	27
18	Multi-Hazard	5A	Assist jurisdictional plan for debris management, mass sheltering, and animal sheltering operations.	Emergency Services Director	Continuous Project	Existing Funds	26
23	Multi-Hazard	2A,2B,3C, 4B	Conduct a commodity flow study to determine the amount of hazardous materials that travel through communities/county.	Emergency Services Director	Continuous Project	Existing Funds	26
12	Multi-Hazard	2A,2E	Educate the public on what "shelter in place" means and how this action is performed.	Emergency Services Director	1 to 3 Years	Existing Funds	25
13	Multi-Hazard	1A,1B,2A, 2C	Conduct hazard vulnerability assessments on critical infrastructures.	Emergency Services Director	Continuous Project	Existing Funds	25
40	Hazardous Materials Incident	1A,1B,3A	Conduct a commodity flow study to determine the amount of hazardous materials that travel through communities/county.	Emergency Services Director	Continuous Project	Existing Funds	24

APPENDIX 7

COPIES OF LOCAL RESOLUTIONS ADOPTING THE 2020 HAZARD MITIGATION PLAN