



Clermont County Facebook

# CLERMONT COUNTY ALL-HAZARDS MITIGATION PLAN

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November 2019

PREPARED FOR:  
Clermont County EMA  
2279 Clermont Center Drive  
Batavia, OH 45103



PREPARED BY:  
Burton Planning Services  
252 Electric Avenue  
Westerville, Ohio 43081  
[www.burtonplanning.com](http://www.burtonplanning.com)



## TABLE OF CONTENTS

Chapters & Sections	Page
1 Introduction .....	1
2 History and Demographics .....	8
3 Planning Process .....	27
4 Hazard Risk Assessment.....	36
4.1 Severe Storms .....	38
4.2 Tornadoes .....	42
4.3 Flooding.....	49
4.4 Utility/Power Failure .....	58
4.5 Hazardous Materials .....	60
4.6 Winter Storms.....	63
4.7 Landslides.....	67
4.8 Dam Failure .....	73
4.9 Invasive Species .....	87
4.10 Terrorism .....	91
4.11 Extreme Temperatures .....	94
4.12 Drought .....	100
4.13 Wildfire.....	105
4.14 Earthquakes .....	108
5 Hazard Mitigation.....	116
6 Schedule and Maintenance.....	134
Appendices .....	136
A – Historical Hazard Events .....	137
B – Matrix Scoring Spreadsheet .....	220
C – Critical Facilities List.....	241
D – Sources .....	244
E – FEMA Flood Maps .....	248
F – Meeting Documentation.....	262

List of Figures	Page
Figure 1.1: Clermont County Land Uses .....	4
Figure 1.2: Clermont County Landcover .....	6
Figure 1.3: Clermont County Jurisdictions and Major Features.....	7
Figure 2.1: Grant’s Birthplace .....	9
Figures 2.2: Lytle Dairy House at Harmony Hill.....	10
Figures 2.3: Loveland Castle.....	10
Figure 4.2.1: Average Annual Number of Tornadoes per State (2005-2014) .....	46
Figure 4.2.2: Worst-Case Scenario Tornado in Clermont County .....	48

## TABLE OF CONTENTS

Figure 4.3.1: Flood Hazard Map .....	50
Figure 4.6.1: Winter Storm Occurrences by Month, 1996-2018.....	64
Figure 4.7.1: State of Ohio Landslide Incidence and Susceptibility Map.....	68
Figure 4.7.2: State of Ohio Structure Total Geohazards Landslide Inventory.....	70
Figure 4.7.3: State of Ohio Structure Total Geohazards Rockfall Inventory.....	71
Figure 4.8.1: Location of Clermont County Dams.....	74
Figure 4.9.1: Asian Longhorn Beetle .....	87
Figure 4.9.2: Emerald Ash Borer.....	87
Figure 4.9.3: Kudzu Plant and Kudzu Bug.....	88
Figure 4.9.4: Brown Marmorated Stink Bug .....	88
Figure 4.9.5: Gypsy Moth .....	88
Figure 4.9.6: Feral Swine Wallows.....	89
Figure 4.11.1: Heat Index Chart.....	94
Figure 4.11.2: Wind Chill Chart.....	96
Figure 4.12.1: Drought Monitor for the State of Ohio, August 2012 and August 2019 .....	101
Figure 4.12.2: Palmer Drought Severity Index for the United States in July of 2012 .....	103
Figure 4.13.1: ODNR Division of Forestry Wildfire Risk Level by Township .....	106
Figure 4.14.1: Map of Deep Structures in Ohio .....	110
Figure 4.14.2: Location of Seismometers in Ohio .....	111
Figure 4.14.3: Earthquake Epicenters in Ohio.....	112
Figure 4.14.4: Chance of Potentially Minor-Damage Ground Shaking in 2018 .....	113
Figure 4.14.5: Probability of Earthquakes in the United States .....	114

List of Tables	Page
Table 1.1: Clermont County Townships .....	2
Table 1.2: Clermont County Cities and Villages .....	2
Table 2.1: Communication Outlets .....	10
Table 2.2: Utilities in Clermont County .....	11
Table 2.3: County/Township population growth estimates between 2010 Census and 2016 ACS ...	12
Table 2.4: Clermont County Population Totals 2010-2017 .....	13
Table 2.5: Clermont County Housing Statistics 2016 Estimate .....	13
Table 2.6: Clermont County Income Statistics 2016 Estimate.....	13
Table 2.7: Amelia Village Population Totals 2010-2017 .....	14
Table 2.8: Amelia Village Housing Statistics 2016 Estimate.....	14
Table 2.9: Amelia Village Income Statistics 2016 Estimate .....	14
Table 2.10: Village of Batavia Population Totals 2010-2017.....	15
Table 2.11: Village of Batavia Housing Statistics 2016 Estimate .....	15
Table 2.12: Village of Batavia Income Statistics 2016 Estimate .....	15
Table 2.13: Village of Bethel Population Totals 2010-2017 .....	16
Table 2.14: Village of Bethel Housing Statistics 2016 Estimate.....	16
Table 2.15: Village of Bethel Income Statistics 2016 Estimate .....	16
Table 2.16: Village of Chilo Population Totals 2010-2017 .....	17
Table 2.17: Village of Chilo Housing Statistics 2016 Estimate .....	17
Table 2.18: Village of Chilo Income Statistics 2016 Estimate.....	17
Table 2.19: Village of Felicity Population Totals 2010-2017.....	18
Table 2.20: Village of Felicity Housing Statistics 2016 Estimate .....	18
Table 2.21: Village of Felicity Income Statistics 2016 Estimate .....	18
Table 2.22: City of Loveland Population Totals 2010-2017 .....	19
Table 2.23: City of Loveland Housing Statistics 2016 Estimate .....	19
Table 2.24: City of Loveland Income Statistics 2016 Estimate.....	19



## TABLE OF CONTENTS

Table 2.25: City of Milford Population Totals 2010-2017 .....	20
Table 2.26: City of Milford Housing Statistics 2016 Estimate .....	20
Table 2.27: City of Milford Income Statistics 2016 Estimate .....	20
Table 2.28: Village of Moscow Population Totals 2010-2017 .....	21
Table 2.29: Village of Moscow Housing Statistics 2016 Estimate .....	21
Table 2.30: Village of Moscow Income Statistics 2016 Estimate .....	21
Table 2.31: Village of Neville Population Totals 2010-2017 .....	22
Table 2.32: Village of Neville Housing Statistics 2016 Estimate .....	22
Table 2.33: Village of Neville Income Statistics 2016 Estimate .....	22
Table 2.34: Village of New Richmond Population Totals 2010-2017 .....	23
Table 2.35: Village of New Richmond Housing Statistics 2016 Estimate .....	23
Table 2.36: Village of New Richmond Income Statistics 2016 Estimate .....	23
Table 2.37: Village of Newtonsville Population Totals 2010-2017 .....	24
Table 2.38: Village of Newtonsville Housing Statistics 2016 Estimate .....	24
Table 2.39: Village of Newtonsville Income Statistics 2016 Estimate .....	24
Table 2.40: Village of Owensville Population Totals 2010-2017 .....	25
Table 2.41: Village of Owensville Housing Statistics 2016 Estimate .....	25
Table 2.42: Village of Owensville Income Statistics 2016 Estimate .....	25
Table 2.43: Village of Williamsburg Population Totals 2010-2017 .....	26
Table 2.44: Village of Williamsburg Housing Statistics 2016 Estimate .....	26
Table 2.45: Village of Williamsburg Income Statistics 2016 Estimate .....	26
Table 3.1: Existing Authorities and Regulations in Clermont County's Municipalities .....	30
Table 3.2: Participating Representatives & Jurisdictions .....	32
Table 4.1.1: Severe Storm Events in Clermont County since 1960 .....	39
Table 4.1.2: Structure Vulnerability due to Severe Storms .....	40
Table 4.2.1: Fujita Tornado Damage Scale .....	42
Table 4.2.2: Enhanced Fujita Tornado Damage Scale .....	43
Table 4.2.3: Summary of Damages due to Tornadoes in Clermont County .....	45
Table 4.2.4: Damages Associated with Worst-Case Scenario Tornado .....	47
Table 4.3.1: Community Participation in NFIP .....	51
Table 4.3.2: Repetitive Loss Properties .....	52
Table 4.3.3: Table of Repetitive Loss Properties by Occupancy Type .....	55
Table 4.3.4: Building-Related Economic Loss Estimates for 100-Year Flood (Hazus Level 2) .....	56
Table 4.3.5: Crop Loss Estimates for 100-Year Flood (Hazus Level 2) .....	56
Table 4.5.1: EHS Spills .....	61
Table 4.6.1: Summary of Winter Events in Clermont County by Event Type .....	65
Table 4.6.2: Structure Vulnerability due to Winter Storms .....	66
Table 4.7.1: Potential for Loss to Structures due to Landslide in Clermont County .....	73
Table 4.8.1: Clermont County Dam Inventory .....	75
Table 4.8.2: Number of Class I Dams within Clermont County's Drainage Basin, by County .....	84
Table 4.11.1: Extreme Temperature Terminology .....	95
Table 4.11.2: Summary of Extreme Temperature Events in Clermont County .....	97
Table 4.11.3: Structure Vulnerability due to Extreme Temperature .....	98
Table 4.12.1: Palmer Drought Severity Index Classifications .....	102
Table 4.12.2: Commodity Loss Statistics between 2011 and 2012 .....	104
Table 4.13.1: Structure Vulnerability due to Wildfire .....	107
Table 4.14.1: Modified Mercalli Intensity Scale .....	108
Table 4.14.2: Structure Vulnerability due to Earthquakes .....	114
Table 5.1: Hazard Priorities .....	117
Table 5.2: Hazard Mitigation Actions and Priorities by Hazard .....	120

# 1 | Introduction

## 1.1 Overview

Historically, natural hazards have caused significant damage to both private property and public infrastructure within Clermont County. The County consistently strives to reduce risk and protect the lives and property of its citizens by addressing mitigation, preparedness, response, and recovery for natural hazards.

Clermont County's most recent hazard mitigation plan, the Clermont County All-Hazards Mitigation Plan Update, was adopted on March 5, 2014 following adoption by the Clermont County Board of Commissioners. The 2014 All-Hazards Mitigation Plan Update is set to expire in March of 2019. This plan serves as an update to the 2014 Plan. Under the Disaster Mitigation Act of 2000 (DMA2K), local jurisdictions must have a disaster mitigation plan in effect to receive Mitigation Grant funds from the Federal Emergency Management Agency (FEMA) in the event of a natural or man-made disaster. This Plan meets the criteria as established by FEMA in the DMA2K and provides the County and its participating municipalities with a comprehensive guide for future mitigation efforts to combat the hazards that affect their communities. All townships and incorporated municipalities are represented in this Plan and are listed below in **Tables 1.1 and 1.2**. **Figure 1.3** also displays the townships and jurisdictions in Clermont County. As the City of Loveland is located in Clermont, Hamilton, and Warren Counties, Loveland participated in the 2018 Hamilton County Multi-Hazard Mitigation Plan and decided to not participate in this Clermont County All-Hazards Mitigation Plan.

**Table 1.1: Clermont County Townships**

<b>Townships</b>
Batavia Township
Franklin Township
Goshen Township
Jackson Township
Miami Township
Monroe Township
Ohio Township
Pierce Township
Stonelick Township
Tate Township
Union Township
Washington Township
Wayne Township
Williamsburg Township

**Table 1.2: Clermont County Cities and Villages**

<b>Cities &amp; Villages</b>
City of Loveland
City of Milford
Amelia Village
Village of Batavia
Village of Bethel
Village of Chilo
Village of Felicity
Village of Moscow
Village of Neville
Village of New Richmond
Village of Newtonsville
Village of Owensville
Village of Williamsburg

This Plan is composed of six sections that collectively detail the methods, analysis, and discussion surrounding the various hazards that threaten Clermont County and its jurisdictions. These six sections are as follows:

1. This **Introduction** (Section 1) provides a discussion about the general purpose and goals that Clermont County wishes to achieve throughout the development and implementation of this Plan. This section also includes a summary of the Plan's contents.
2. Section 2, **History and Demographics**, includes a brief description of Clermont County and each of the jurisdictions participating in this Plan, including their history, population, and other general information.

3. The process for the development of this Plan is detailed in Section 3, **Planning Process**. This section includes details about the formation of this Plan, including a description of who participated, how the community was involved, which hazards were included in the Plan and why, as well as how the Plan was developed through public meetings, reviews, and evaluations.
4. Section 4 contains the **Hazard Identification and Risk Assessment (HIRA)**. This section provides detailed descriptions and a corresponding analysis for each hazard that could potentially affect the County. Excluded hazards are also documented, along with the rationale for exclusion from the Plan. The nature, location, extent, historical impact, vulnerability, and likelihood of occurrence for each hazard are provided for each hazard.
5. The goals, strategies, and actions for the County are then outlined in Section 5, **Hazard Mitigation**. The proposed actions are presented in tables, categorized by the associated hazard and community, and then ranked from highest to lowest priority based on feedback received from County officials and participating jurisdictions and stakeholders.
6. The final section of this Plan, **Schedule and Maintenance**, provides a summary of the proposed Plan adoption, integration, and maintenance schedule.

The resulting All-Hazard Mitigation Plan will be submitted to the Ohio EMA and subsequently FEMA for their review. The participating jurisdictions will then review the Plan for adoption following review by these agencies. This updated Plan will allow Clermont County to:

- Assist local communities with reducing risks by identifying vulnerabilities and developing strategies to lessen and/or eliminate the effects of a potential hazard;
- Build partnerships and reduce duplication of efforts among organizations with similar or overlapping goals;
- Create more sustainable and disaster-resistant communities;
- Communicate needs to state and federal officials when funding becomes available, particularly after a disaster; and,
- Increase public awareness of local hazards and disaster preparedness.

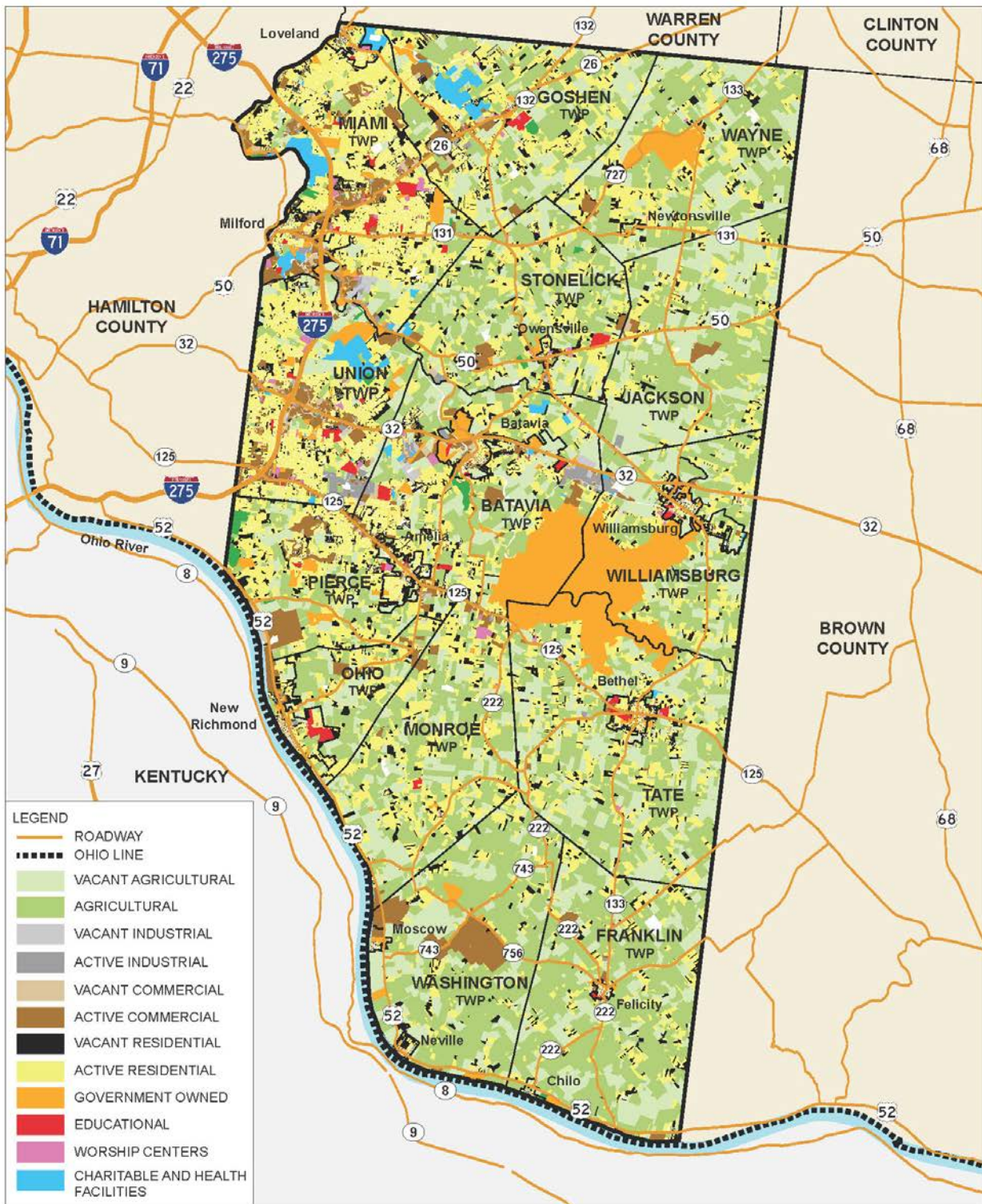
### 1.2 Setting

Clermont County is a suburban and rural county in southwestern Ohio, approximately 460 square miles in area. The County, which is situated on the eastern edge of Cincinnati, is bounded by Hamilton County to the west, Warren County to the north, Clinton County to the northeast, Brown County to the east, and the Ohio River to the south. Clermont County contains two cities, 11 villages, and 14 townships (see **Tables 1.1-1.2**). The Village of Batavia serves as the County seat.

The County is comprised of five major land use types, including Agricultural, Commercial, Exempt (Government, Education, Religion), Industrial, and Residential. These land uses are displayed in **Figure 1.1**. According to the Clermont County Comprehensive Plan, approximately 85 percent of the parcels within Clermont County are classified as Residential, and Agricultural and Residential land uses together make up 85 percent of the County's land area.



Figure 1.1: Clermont County Land Uses





**Figure 1.2** shows landcover in Clermont County. Northwest Clermont County, including Miami and Union Townships contains the most developed land relative to the rest of the County, while the northeastern portion of the County, including Wayne and Jackson Townships, have the highest density of cultivated crops. The County is largely comprised of deciduous forest in the undeveloped and uncultivated areas.

### 1.3 County Features

Major roadways – Interstates (I), US Routes (US), and State Routes (SR) – in Clermont County include I-275, US-50, US-52, SR-28, SR-32, SR-48, SR-125, SR-126, SR-131-, SR-132, SR-133, SR-222, SR-231, SR-276, SR-286, SR-450, SR-727, SR-743, SR-749, SR-756, and SR-774. The County contains 73.97 miles of National Highway System roadway, including 13.88 miles of Interstate roads, 25.49 miles of US routes, and 24.60 miles of State Routes (ODOT). In total, Clermont County has approximately 267.11 center-line miles of Interstate, US, and State Routes corresponding to 677.49 lane miles. On these roads, there are 3,081,854 vehicle miles travelled annually.

Clermont County has two major U.S. Bike Routes (USBR), including USBR-25 and USBR-21, which travel along the southern edge of the County near the Ohio River. Additionally, Clermont County contains two railroad lines – the Genesee and Wyoming Railroad and the Cincinnati East Terminal Railroad. The former crosses into and out of the northwest corner of Goshen Township from Warren County, and the latter traverses the County east-west through Williamsburg and Batavia.

The Federal Aviation Administration (FAA) has record of three heliports and nine airports located within Clermont County. The Clermont County Airport, located in Batavia, is the only public airport in the County, and it is owned by the Clermont County Commissioners. The Greater Cincinnati Metropolitan area is served by the Cincinnati/Northern Kentucky International Airport (CVG), a Class 1 Commercial Airport located in Hebron, Kentucky, which is approximately 30 miles outside of Batavia.

Major natural features in the County include the Ohio River, East Fork State Park, and William H. Harsha Lake, as well as Stonelick State Park and Stonelick Lake. Other significant water features in the County include Little Miami River, East Fork Little Miami River, William H. Harsha Lake, Big Indian Creek, Bullskin Creek, Cloverlick Creek, O'Bannon Creek, Ninemile Creek, Stonelick Creek, Tenmile Creek, and Twelvemile Creek.

**Figure 1.3** shows the townships and jurisdictions, as well as the major roadways and waterways within Clermont County.

Figure 1.2: Clermont County Landcover

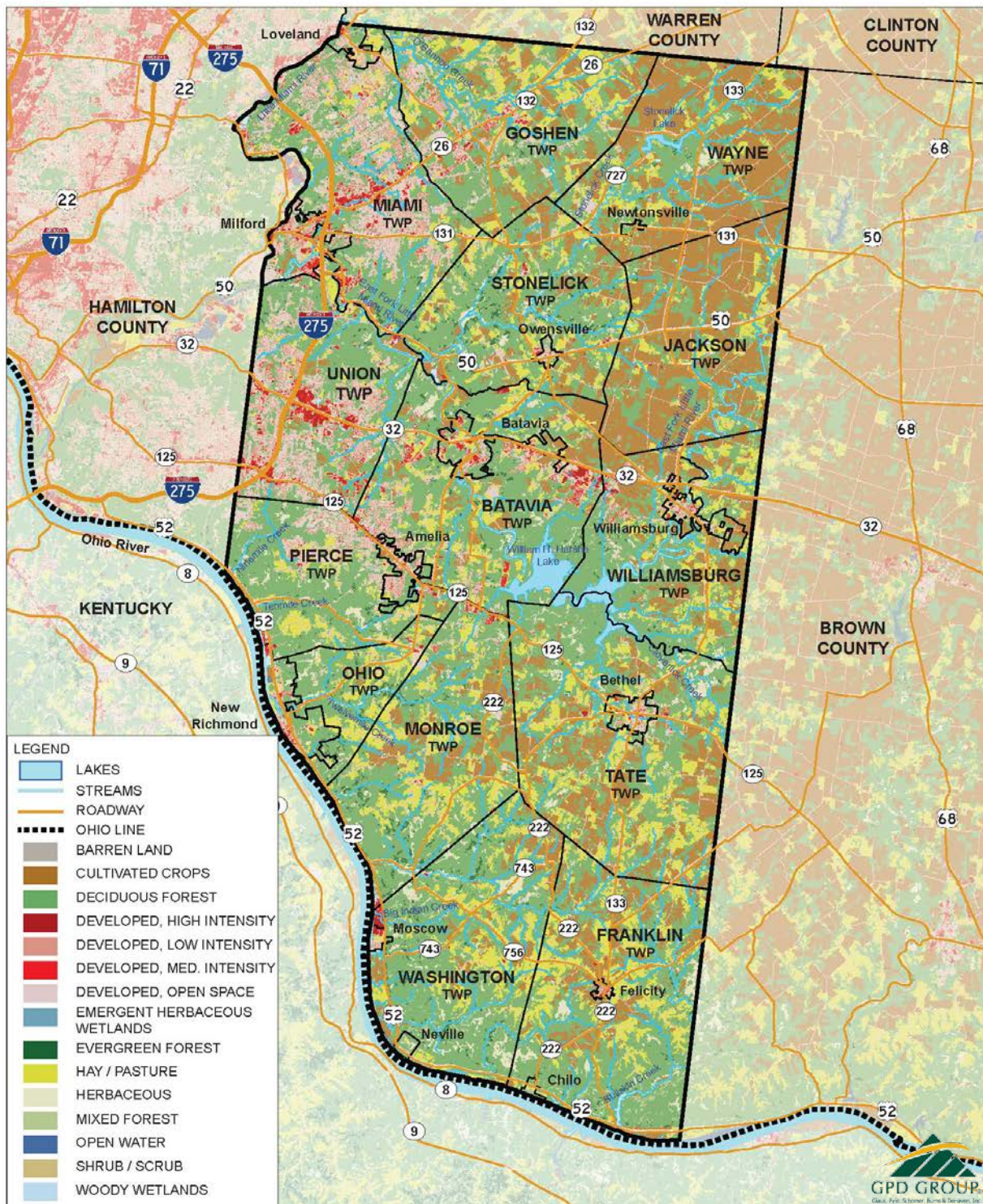
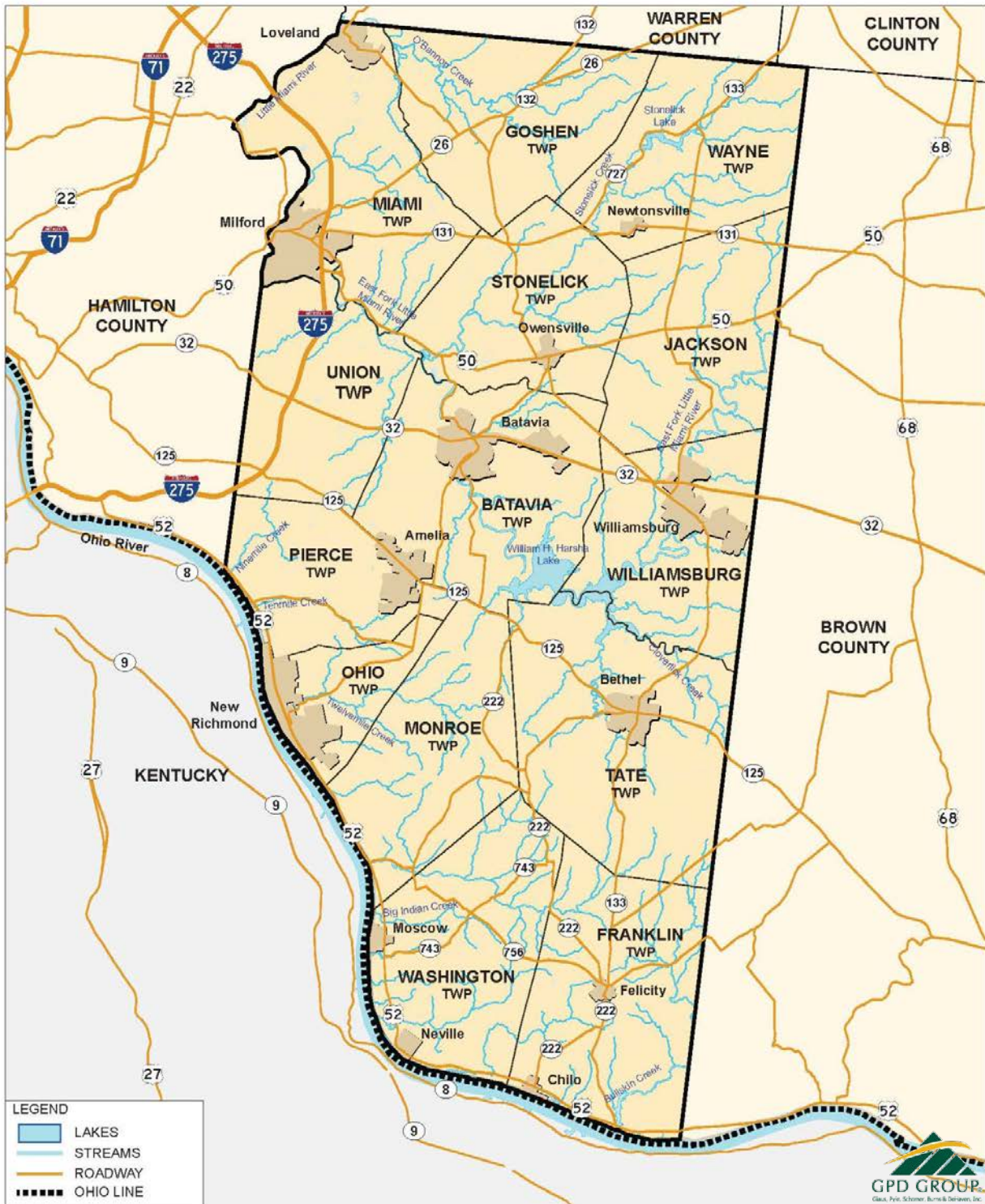




Figure 1.3: Clermont County Jurisdictions and Major Features



## 2 | History and Demographics



### 2.1 History

Clermont County was established in December of 1800, becoming the seventh of Ohio's 88 counties. Initially composed of five large townships, the County currently contains 14 townships, two cities, and 11 villages. The County Seat was originally placed in Williamsburg, where it remained until 1823 before being moved to New Richmond. New Richmond remained the County Seat for a year, and on February 24, 1924, Batavia was named the third and final County Seat of government. Early settlements dating back to the early 19<sup>th</sup> century include: Denhamstown (later known as Bethel), Witham's settlement (later called Withamsville), Miami Township, Hageman's Mills (later Milford), Stonelick Township, Chilo, Goshen Township, Felicity, Moscow, Point Isabel, and Amelia.

Clermont County was home to many Native American tribes including the Shawnee, Miami, Delaware, Mingo, Ottawa, Cherokee, and Wyandot. The largest frontier battle in Clermont County was the Battle of Grassy Run, which took place on April 10, 1792. Additionally, as a county north of the Ohio River, Clermont County has many communities that were prominent stops in the Underground Railroad, including New Richmond, Felicity, and Moscow. Clermont County is also known for being the birthplace of Ulysses S. Grant. General Grant's birthplace is on the U.S. National Register of Historic Places along with nearly 30 other properties in the County (**Figure 2.1**).

**Figure 2.1: Grant's Birthplace**



There are a variety of information sources about the cultural resources and historical properties that provide more details about the unique history of Clermont County, including several historical societies and museums:

- Clermont County Historical Society: *Clermont County Historical Society Museum & Archives*
- Clermont County Public Library
- Bethel Historical Society Museum: *Grant Memorial Building*
- Chilo Lock 34 Visitor Center and Museum: "Living and Working with the Ohio River"
- Goshen Township Historical Society: *The Anchorage*
- Goshen Log Cabin
- Greater Milford Area Historical Society: *Promont Mansion Museum*
- Harmony Hill Association: *Harmony Hill Museum (Figure 2.2)*
- Historic New Richmond: *Ross-Growdy House Museum*
- Loveland Castle and Museum (**Figure 2.3**)
- Loveland Historical Museum: *Bonaventure*
- Owensville Historical Society: *Museum and Log Cabin*
- Tri-State Warbird Museum
- Ulysses S. Grant's Birthplace

Figures 2.2-2.3: Lytle Dairy House at Harmony Hill (left) and Loveland Castle (right)



### 2.2 Communication Outlets

Clermont County is served by several newspapers and periodicals, including:

- Cincinnati Business Courier
- Cincinnati Magazine
- Community Press
- Cincinnati Enquirer
- Clermont Sun
- Loveland Magazine
- Bethel Journal
- Milford Miami Advertiser

Additional County communication outlets including websites, television, radio, and social media are listed in **Table 2.1**, below:

**Table 2.1: Communication Outlets**

<b>Website</b>	<a href="http://www.clermontcountyohio.gov/">http://www.clermontcountyohio.gov/</a>
<b>Twitter</b>	@ClermontCounty
<b>Facebook</b>	Clermont County Ohio Government
<b>Television</b>	WLWT – Channel 5 (Local News)
	WCPO – Channel 9 (Local News)
	WKRC – Channel 12 (Local News)
	WXIX – Channel 19 (Local News)
	WCET – Channel 48 (Public Access)
	Clermont 19 (Time Warner Cable/Spectrum)
<b>Radio</b>	WLW – 700 AM – Local News Radio
	WVXU – 91.7 FM – National Public Radio

## 2.3 Utilities

**Table 2.2,** below, provides a list of several utilities that serve Clermont County, along with their contact information:

**Table 2.2: Utilities in Clermont County**

Utility	Phone Number	Alternative Phone Number
<b>Telephone and Cable</b>		
AT&T	800-222-0300	
Cincinnati Bell Telephone	513-541-9042	513-566-4101
Exede	855-863-6566	
Frontier	513-842-7031	
InternetProviders	877-932-1554	
Spectrum	800-677-9767	513-644-8982
<b>Gas and Electric</b>		
Auxier Gas	513-724-7700	
Bethel Electric Public Works	513-734-2243	Extension 3
Duke Energy	800-544-6900	
Electronic Testing Consultants	513-891-8758	
Ferrellgas	513-575-1400	913-661-1500
Lykins Oil Company	513-831-8820	800-875-8820
Milford Electric Supply	513-453-0208	
Ohio Valley Electric Corp.	740-289-7200	513-553-4246
Rich Energy Inc.	513-271-1460	
<b>Water</b>		
Bethel Water	513-734-2243	
Brown County Rural Water	937-375-4106	
City of Loveland Water	513-683-0150	
Clermont County Water Resources	513-732-7970	513-479-4031
Felicity Water	513-876-2013	
Metropolitan Sewer District	513-244-1300	
Milford Water and Sewer	513-248-5081	
New Richmond Water and Sewer	513-553-4146	
Tate-Monroe Water Association Inc.	513-734-2236	
Western Water Company	513-899-3211	513-722-1682
Williamsburg Water and Sewer	513-724-2244	
<b>Waste</b>		
CSI/Republic	800-543-1339	
Rumpke	877-732-7970	

## 2.4 Demographics Overview

The 2016 American Community Survey (ACS), provided by the U.S. Census, offers population estimates for all townships within Clermont County. **Table 2.3**, below, displays the population estimates for the 2010 Census compared to the estimates provided by the 2016 ACS, as well as the expected percent change in population. These estimates show the population of Clermont County growing by nearly two percent between 2010 and 2016. While most townships were projected to have a positive population growth over these years, Washington Township was expected to have a decline in population.

A more detailed description of population, housing, and income demographics for Clermont County and each municipality are discussed on the following pages.

**Table 2.3: County/Township population growth estimates between 2010 Census and 2016 ACS**

FIPS Code	County/Township	Total Population 2010 Census	Total Population 2016 ACS	2010-2016	
				Change	Percent Change
025	Clermont County	197,363	201,092	3,729	1.89%
025	Batavia Township	23,280	23,716	436	1.87%
025	Franklin Township	4,188	4,220	32	0.76%
025	Goshen Township	15,505	15,704	199	1.28%
025	Jackson Township	2,980	3,037	57	1.91%
025	Miami Township	40,848	41,702	854	2.09%
025	Monroe Township	7,828	7,889	61	0.78%
025	Ohio Township	5,192	5,256	64	1.23%
025	Pierce Township	14,349	14,650	301	2.10%
025	Stonelick Township	5,890	6,005	115	1.95%
025	Tate Township	9,357	9,544	187	2.00%
025	Union Township	46,416	47,472	1,056	2.28%
025	Washington Township	2,278	2,234	-44	-1.93%
025	Wayne Township	4,885	4,937	52	1.06%
025	Williamsburg Township	5,746	5,865	119	2.07%



### 2.5 Clermont County

Tables 2.4 to 2.6, below, display demographic data for Clermont County provided by the U.S. Census' American Factfinder. This data includes population trends, housing statistics, and family income statistics for the County.

**Table 2.4: Clermont County Population Totals 2010-2017**

Year & Source	Population Total
2010 Census	197,363
2011 ACS Estimate	196,731
2012 ACS Estimate	197,543
2013 ACS Estimate	198,417
2014 ACS Estimate	199,450
2015 ACS Estimate	200,285
2016 ACS Estimate	201,092
2017 ACS Estimate	204,214

**Table 2.5: Clermont County Housing Statistics 2016 Estimate**

Housing Statistics	Number
Total Housing Units	81,711
Occupied Housing Units	75,236
Vacant Housing Units	6,475
Homeowner Vacancy Rate	1.9
Rental Vacancy Rate	7.0

**Table 2.6: Clermont County Income Statistics 2016 Estimate**

Family Income Statistics	Number of Households
Less than \$10,000	3,762
\$10,000 to \$14,999	3,235
\$15,000 to \$24,999	6,771
\$25,000 to \$34,999	7,223
\$35,000 to \$49,999	9,630
\$50,000 to \$74,999	14,746
\$75,000 to \$99,999	10,006
\$100,000 to \$149,999	11,586
\$150,000 to \$199,999	4,815
\$200,000 or more	3,460
Median Family Income	\$61,265
Mean Family Income	\$78,529

### 2.6 Amelia Village

The Amelia Village, which lies in Batavia and Pierce Townships, was incorporated in 1900. **Tables 2.7 to 2.9**, below, display demographic data for the Amelia Village provided by the U.S. Census' American Factfinder. This data includes population trends, housing statistics, and family income statistics for the Village. The ACS estimates Amelia's population grew by 169 individuals between the 2010 Census and 2017 - a growth of 3.5 percent.

**Table 2.7: Amelia Village Population Totals 2010-2017**

Year & Source	Population Total
2010 Census	4,801
2011 ACS Estimate	4,841
2012 ACS Estimate	4,858
2013 ACS Estimate	4,880
2014 ACS Estimate	4,903
2015 ACS Estimate	4,915
2016 ACS Estimate	4,942
2017 ACS Estimate	4,970

**Table 2.8: Amelia Village Housing Statistics 2016 Estimate**

Housing Statistics	Number
Total Housing Units	1,972
Occupied Housing Units	1,829
Vacant Housing Units	143
Homeowner Vacancy Rate	0.0
Rental Vacancy Rate	8.6

**Table 2.9: Amelia Village Income Statistics 2016 Estimate**

Family Income Statistics	Number of Households
Less than \$10,000	204
\$10,000 to \$14,999	15
\$15,000 to \$24,999	326
\$25,000 to \$34,999	116
\$35,000 to \$49,999	154
\$50,000 to \$74,999	449
\$75,000 to \$99,999	204
\$100,000 to \$149,999	319
\$150,000 to \$199,999	42
\$200,000 or more	0
Median Family Income	\$52,628
Mean Family Income	\$58,719

### 2.7 Village of Batavia

The Village of Batavia, which is located in Batavia Township, was incorporated in 1842. As the County Seat, Batavia is home to the County Court House and Administration Building, Convention and Visitor's Bureau, Library and other County services. **Tables 2.10 to 2.12**, below, display demographic data for the Village of Batavia provided by the U.S. Census' American Factfinder. This data includes population trends, housing statistics, and family income statistics for the Village. The ACS estimates a population growth of 159 individuals between the 2010 Census and 2017 – a growth of nearly 10.5 percent.

**Table 2.10: Village of Batavia Population Totals 2010-2017**

Year & Source	Population Total
2010 Census	1,509
2011 ACS Estimate	1,635
2012 ACS Estimate	1,638
2013 ACS Estimate	1,645
2014 ACS Estimate	1,649
2015 ACS Estimate	1,652
2016 ACS Estimate	1,659
2017 ACS Estimate	1,668

**Table 2.11: Village of Batavia Housing Statistics 2016 Estimate**

Housing Statistics	Number
Total Housing Units	782
Occupied Housing Units	655
Vacant Housing Units	127
Homeowner Vacancy Rate	2.6
Rental Vacancy Rate	22.3

**Table 2.12: Village of Batavia Income Statistics 2016 Estimate**

Family Income Statistics	Number of Households
Less than \$10,000	54
\$10,000 to \$14,999	40
\$15,000 to \$24,999	79
\$25,000 to \$34,999	70
\$35,000 to \$49,999	91
\$50,000 to \$74,999	150
\$75,000 to \$99,999	78
\$100,000 to \$149,999	63
\$150,000 to \$199,999	17
\$200,000 or more	13
Median Family Income	\$49,398
Mean Family Income	\$62,245

### 2.8 Village of Bethel

The Village of Bethel is located in Tate Township and was established in 1798. **Tables 2.13 to 2.15**, below, display demographic data for the Village of Bethel provided by the U.S. Census' American Factfinder. This data includes population trends, housing statistics, and family income statistics for the Village. The ACS estimates the population of Bethel grew by 74 individuals between the 2010 Census and 2017 – a growth of 2.7 percent.

**Table 2.13: Village of Bethel Population Totals 2010-2017**

Year & Source	Population Total
2010 Census	2,711
2011 ACS Estimate	2,724
2012 ACS Estimate	2,730
2013 ACS Estimate	2,742
2014 ACS Estimate	2,751
2015 ACS Estimate	2,756
2016 ACS Estimate	2,769
2017 ACS Estimate	2,785

**Table 2.14: Village of Bethel Housing Statistics 2016 Estimate**

Housing Statistics	Number
Total Housing Units	1,244
Occupied Housing Units	1,091
Vacant Housing Units	153
Homeowner Vacancy Rate	2.0
Rental Vacancy Rate	7.2

**Table 2.15: Village of Bethel Income Statistics 2016 Estimate**

Family Income Statistics	Number of Households
Less than \$10,000	88
\$10,000 to \$14,999	75
\$15,000 to \$24,999	181
\$25,000 to \$34,999	148
\$35,000 to \$49,999	142
\$50,000 to \$74,999	277
\$75,000 to \$99,999	87
\$100,000 to \$149,999	93
\$150,000 to \$199,999	0
\$200,000 or more	0
Median Family Income	\$40,677
Mean Family Income	\$46,831



### 2.9 Village of Chilo

Situated along the Ohio River, the Village of Chilo is located on the southern edge of Clermont County in Franklin Township. **Tables 2.16 to 2.18**, below, display demographic data for the Village of Chilo provided by the U.S. Census' American Factfinder. This data includes population trends, housing statistics, and family income statistics for the Village. Chilo is the smallest jurisdiction within the County with an estimated population of 66 in 2017 – an estimated growth of 3 individuals and 4.8 percent since the 2010 Census.

**Table 2.16: Village of Chilo Population Totals 2010-2017**

Year & Source	Population Total
2010 Census	63
2011 ACS Estimate	63
2012 ACS Estimate	63
2013 ACS Estimate	64
2014 ACS Estimate	64
2015 ACS Estimate	64
2016 ACS Estimate	64
2017 ACS Estimate	66

**Table 2.17: Village of Chilo Housing Statistics 2016 Estimate**

Housing Statistics	Number
Total Housing Units	56
Occupied Housing Units	28
Vacant Housing Units	28
Homeowner Vacancy Rate	0.0
Rental Vacancy Rate	0.0

**Table 2.18: Village of Chilo Income Statistics 2016 Estimate**

Family Income Statistics	Number of Households
Less than \$10,000	0
\$10,000 to \$14,999	4
\$15,000 to \$24,999	0
\$25,000 to \$34,999	5
\$35,000 to \$49,999	8
\$50,000 to \$74,999	5
\$75,000 to \$99,999	0
\$100,000 to \$149,999	5
\$150,000 to \$199,999	0
\$200,000 or more	1
Median Family Income	\$39,375
Mean Family Income	\$57,118

### 2.10 Village of Felicity

The Village of Felicity, which was established in 1836, is located in the center of Franklin Township. **Tables 2.19 to 2.21**, below, display demographic data for the Village of Felicity provided by the U.S. Census' American Factfinder. This data includes population trends, housing statistics, and family income statistics for the Village. According to the ACS, the population of Felicity was expected to grow by 24 individuals, or 2.9 percent, between the 2010 Census and 2017.

**Table 2.19: Village of Felicity Population Totals 2010-2017**

Year & Source	Population Total
2010 Census	818
2011 ACS Estimate	822
2012 ACS Estimate	824
2013 ACS Estimate	826
2014 ACS Estimate	831
2015 ACS Estimate	832
2016 ACS Estimate	836
2017 ACS Estimate	842

**Table 2.20: Village of Felicity Housing Statistics 2016 Estimate**

Housing Statistics	Number
Total Housing Units	446
Occupied Housing Units	404
Vacant Housing Units	42
Homeowner Vacancy Rate	4.1
Rental Vacancy Rate	5.5

**Table 2.21: Village of Felicity Income Statistics 2016 Estimate**

Family Income Statistics	Number of Households
Less than \$10,000	99
\$10,000 to \$14,999	60
\$15,000 to \$24,999	54
\$25,000 to \$34,999	41
\$35,000 to \$49,999	53
\$50,000 to \$74,999	64
\$75,000 to \$99,999	23
\$100,000 to \$149,999	10
\$150,000 to \$199,999	0
\$200,000 or more	0
Median Family Income	\$23,942
Mean Family Income	\$31,172

### 2.11 City of Loveland

The City of Loveland is located in the northwest corner of Clermont County, as well as in Hamilton and Warren Counties. Loveland was incorporated as a village in 1876 with a population of less than 800 residents and became a city with an adopted charter in 1961 following a population surge in the 1950s. **Tables 2.22 to 2.24**, below, display demographic data for the City of Loveland provided by the U.S. Census' American Factfinder. This data includes population trends, housing statistics, and family income statistics for the City. It should be noted that this data describes the population, housing, and income statistics for the entirety of Loveland, including parts of the City located in surrounding counties. Overall, the ACS estimates the City of Loveland's population grew by 689 individuals, an estimated growth of 5.7 percent between the 2010 Census and 2017. The City of Loveland is not participating in this plan.

**Table 2.22: City of Loveland Population Totals 2010-2017**

Year & Source	Population Total
2010 Census	12,081
2011 ACS Estimate	12,076
2012 ACS Estimate	12,159
2013 ACS Estimate	12,270
2014 ACS Estimate	12,367
2015 ACS Estimate	12,550
2016 ACS Estimate	12,689
2017 ACS Estimate	12,770

**Table 2.23: City of Loveland Housing Statistics 2016 Estimate**

Housing Statistics	Number
Total Housing Units	5,149
Occupied Housing Units	4,898
Vacant Housing Units	251
Homeowner Vacancy Rate	0.0
Rental Vacancy Rate	3.5

**Table 2.24: City of Loveland Income Statistics 2016 Estimate**

Family Income Statistics	Number of Households
Less than \$10,000	305
\$10,000 to \$14,999	192
\$15,000 to \$24,999	267
\$25,000 to \$34,999	327
\$35,000 to \$49,999	541
\$50,000 to \$74,999	997
\$75,000 to \$99,999	622
\$100,000 to \$149,999	955
\$150,000 to \$199,999	351
\$200,000 or more	341
Median Family Income	\$69,355
Mean Family Income	\$93,425

### 2.12 City of Milford

The City of Milford is located on the western border of Clermont County and extends into Hamilton County. Milford was incorporated as a village in 1836 and became a city in 1971. **Tables 2.25 to 2.27**, below, display demographic data for the City of Milford provided by the U.S. Census' American Factfinder. This data includes population trends, housing statistics, and family income statistics for the City. It should be noted that this data describes the population, housing, and income statistics for the entirety of Milford, including parts of the City located in Hamilton County. Altogether, the ACS estimates that Milford grew by 178 individuals between the 2010 Census and 2017 – a population growth of 2.7 percent.

**Table 2.25: City of Milford Population Totals 2010-2017**

Year & Source	Population Total
2010 Census	6,709
2011 ACS Estimate	6,704
2012 ACS Estimate	6,693
2013 ACS Estimate	6,688
2014 ACS Estimate	6,888
2015 ACS Estimate	6,875
2016 ACS Estimate	6,883
2017 ACS Estimate	6,887

**Table 2.26: City of Milford Housing Statistics 2016 Estimate**

Housing Statistics	Number
Total Housing Units	3,255
Occupied Housing Units	3,021
Vacant Housing Units	234
Homeowner Vacancy Rate	2.8
Rental Vacancy Rate	1.7

**Table 2.27: City of Milford Income Statistics 2016 Estimate**

Family Income Statistics	Number of Households
Less than \$10,000	277
\$10,000 to \$14,999	156
\$15,000 to \$24,999	490
\$25,000 to \$34,999	404
\$35,000 to \$49,999	485
\$50,000 to \$74,999	347
\$75,000 to \$99,999	313
\$100,000 to \$149,999	380
\$150,000 to \$199,999	116
\$200,000 or more	53
Median Family Income	\$38,418
Mean Family Income	\$61,868

### 2.13 Village of Moscow

The Village of Moscow is located along the Ohio River in Washington Township. Founded in 1816, the Village is known as a major center of the Underground Railroad. **Tables 2.28 to 2.30**, below, display demographic data for the Village of Moscow provided by the U.S. Census' American Factfinder. This data includes population trends, housing statistics, and family income statistics for the Village. The ACS estimates the Village grew by 5 individuals between the 2010 Census and 2017 – an estimated population growth of 2.7 percent.

**Table 2.28: Village of Moscow Population Totals 2010-2017**

Year & Source	Population Total
2010 Census	185
2011 ACS Estimate	187
2012 ACS Estimate	187
2013 ACS Estimate	187
2014 ACS Estimate	187
2015 ACS Estimate	187
2016 ACS Estimate	188
2017 ACS Estimate	190

**Table 2.29: Village of Moscow Housing Statistics 2016 Estimate**

Housing Statistics	Number
Total Housing Units	60
Occupied Housing Units	47
Vacant Housing Units	13
Homeowner Vacancy Rate	2.6
Rental Vacancy Rate	28.6

**Table 2.30: Village of Moscow Income Statistics 2016 Estimate**

Family Income Statistics	Number of Households
Less than \$10,000	13
\$10,000 to \$14,999	5
\$15,000 to \$24,999	4
\$25,000 to \$34,999	0
\$35,000 to \$49,999	4
\$50,000 to \$74,999	8
\$75,000 to \$99,999	6
\$100,000 to \$149,999	7
\$150,000 to \$199,999	0
\$200,000 or more	0
Median Family Income	Not Available
Mean Family Income	\$46,506



### 2.14 Village of Neville

The Village of Neville is located along the Ohio River in Washington Township, south of the Village of Moscow. **Tables 2.31 to 2.33**, below, display demographic data for the Village of Neville provided by the U.S. Census' American Factfinder. This data includes population trends, housing statistics, and family income statistics for the Village. With a population of 100 in the 2010 Census, the Village of Neville is the second smallest municipality in Clermont County. While the Village's population was expected to remain stagnant for much of 2010-2017, the ACS did predict a growth of 3 percent by 2017.

**Table 2.31: Village of Neville Population Totals 2010-2017**

Year & Source	Population Total
2010 Census	100
2011 ACS Estimate	100
2012 ACS Estimate	100
2013 ACS Estimate	100
2014 ACS Estimate	102
2015 ACS Estimate	102
2016 ACS Estimate	102
2017 ACS Estimate	103

**Table 2.32: Village of Neville Housing Statistics 2016 Estimate**

Housing Statistics	Number
Total Housing Units	43
Occupied Housing Units	34
Vacant Housing Units	9
Homeowner Vacancy Rate	0.0
Rental Vacancy Rate	26.7

**Table 2.33: Village of Neville Income Statistics 2016 Estimate**

Family Income Statistics	Number of Households
Less than \$10,000	0
\$10,000 to \$14,999	0
\$15,000 to \$24,999	1
\$25,000 to \$34,999	8
\$35,000 to \$49,999	2
\$50,000 to \$74,999	1
\$75,000 to \$99,999	0
\$100,000 to \$149,999	0
\$150,000 to \$199,999	0
\$200,000 or more	5
Median Family Income	\$34,375
Mean Family Income	\$99,029

### 2.15 Village of New Richmond

Founded in 1814, the Village of New Richmond is located along the Ohio River in Ohio and Pierce townships. **Tables 2.34 to 2.36**, below, display demographic data for the Village of New Richmond provided by the U.S. Census' American Factfinder. This data includes population trends, housing statistics, and family income statistics for the Village. As the largest of Clermont County's Villages, New Richmond had a population of 2,582 in 2010. The ACS predicts the population of New Richmond grew by 90 individuals between the 2010 Census and 2017, an estimated population growth of 3.5 percent.

**Table 2.34: Village of New Richmond Population Totals 2010-2017**

Year & Source	Population Total
2010 Census	2,582
2011 ACS Estimate	2,610
2012 ACS Estimate	2,618
2013 ACS Estimate	2,628
2014 ACS Estimate	2,637
2015 ACS Estimate	2,644
2016 ACS Estimate	2,659
2017 ACS Estimate	2,672

**Table 2.35: Village of New Richmond Housing Statistics 2016 Estimate**

Housing Statistics	Number
Total Housing Units	1,158
Occupied Housing Units	982
Vacant Housing Units	176
Homeowner Vacancy Rate	0.0
Rental Vacancy Rate	4.6

**Table 2.36: Village of New Richmond Income Statistics 2016 Estimate**

Family Income Statistics	Number of Households
Less than \$10,000	82
\$10,000 to \$14,999	52
\$15,000 to \$24,999	109
\$25,000 to \$34,999	75
\$35,000 to \$49,999	183
\$50,000 to \$74,999	143
\$75,000 to \$99,999	149
\$100,000 to \$149,999	123
\$150,000 to \$199,999	58
\$200,000 or more	8
Median Family Income	\$47,245
Mean Family Income	\$62,309

### 2.16 Village of Newtonsville

The Village of Newtonsville is located in northeastern Clermont County within Wayne Township. **Tables 2.37 to 2.39**, below, display demographic data for the Village of Newtonsville provided by the U.S. Census' American Factfinder. This data includes population trends, housing statistics, and family income statistics for the Village. The Village of Newtonsville was the only municipality in Clermont County with an estimated negative population growth between the 2010 Census and 2017. Specifically, the ACS estimates the Village was reduced by 18 individuals – a decline of 4.6 percent.

**Table 2.37: Village of Newtonsville Population Totals 2010-2017**

Year & Source	Population Total
2010 Census	392
2011 ACS Estimate	365
2012 ACS Estimate	364
2013 ACS Estimate	364
2014 ACS Estimate	367
2015 ACS Estimate	370
2016 ACS Estimate	370
2017 ACS Estimate	374

**Table 2.38: Village of Newtonsville Housing Statistics 2016 Estimate**

Housing Statistics	Number
Total Housing Units	149
Occupied Housing Units	144
Vacant Housing Units	5
Homeowner Vacancy Rate	0.0
Rental Vacancy Rate	0.0

**Table 2.39: Village of Newtonsville Income Statistics 2016 Estimate**

Family Income Statistics	Number of Households
Less than \$10,000	11
\$10,000 to \$14,999	8
\$15,000 to \$24,999	18
\$25,000 to \$34,999	25
\$35,000 to \$49,999	11
\$50,000 to \$74,999	33
\$75,000 to \$99,999	16
\$100,000 to \$149,999	21
\$150,000 to \$199,999	0
\$200,000 or more	1
Median Family Income	\$46,250
Mean Family Income	\$55,481

### 2.17 Village of Owensville

Established in 1836 with the name of “Boston”, the Village of Owensville is located in Stonelick Township. **Tables 2.40 to 2.42**, below, display demographic data for the Village of Owensville provided by the U.S. Census’ American Factfinder. This data includes population trends, housing statistics, and family income statistics for the Village. The ACS estimates that the Village of Owensville grew by 24 individuals between the 2010 Census and 2017, with a population growth of 3.0 percent.

**Table 2.40: Village of Owensville Population Totals 2010-2017**

Year & Source	Population Total
2010 Census	794
2011 ACS Estimate	799
2012 ACS Estimate	801
2013 ACS Estimate	805
2014 ACS Estimate	809
2015 ACS Estimate	810
2016 ACS Estimate	813
2017 ACS Estimate	818

**Table 2.41: Village of Owensville Housing Statistics 2016 Estimate**

Housing Statistics	Number
Total Housing Units	491
Occupied Housing Units	435
Vacant Housing Units	56
Homeowner Vacancy Rate	0.0
Rental Vacancy Rate	13.2

**Table 2.42: Village of Owensville Income Statistics 2016 Estimate**

Family Income Statistics	Number of Households
Less than \$10,000	59
\$10,000 to \$14,999	67
\$15,000 to \$24,999	90
\$25,000 to \$34,999	54
\$35,000 to \$49,999	38
\$50,000 to \$74,999	45
\$75,000 to \$99,999	45
\$100,000 to \$149,999	33
\$150,000 to \$199,999	1
\$200,000 or more	3
Median Family Income	\$25,938
Mean Family Income	\$39,722

### 2.18 Village of Williamsburg

Located on the eastern border of Clermont County, the Village of Williamsburg is located in Williamsburg Township in the Valley of the East Fork of the Little Miami River. Williamsburg was founded in 1796 and is both the oldest settlement in Clermont County and the location of the first County Seat. **Tables 2.43 to 2.45**, below, display demographic data for the Village of Williamsburg provided by the U.S. Census' American Factfinder. This data includes population trends, housing statistics, and family income statistics for the Village. The ACS estimates the population of Williamsburg grew by 64 individuals between the 2010 Census and 2017 – a population growth of 2.6 percent.

**Table 2.43: Village of Williamsburg Population Totals 2010-2017**

Year & Source	Population Total
2010 Census	2,490
2011 ACS Estimate	2,502
2012 ACS Estimate	2,508
2013 ACS Estimate	2,518
2014 ACS Estimate	2,526
2015 ACS Estimate	2,529
2016 ACS Estimate	2,541
2017 ACS Estimate	2,554

**Table 2.44: Village of Williamsburg Housing Statistics 2016 Estimate**

Housing Statistics	Number
Total Housing Units	1,003
Occupied Housing Units	885
Vacant Housing Units	118
Homeowner Vacancy Rate	2.7
Rental Vacancy Rate	2.7

**Table 2.45: Village of Williamsburg Income Statistics 2016 Estimate**

Family Income Statistics	Number of Households
Less than \$10,000	42
\$10,000 to \$14,999	94
\$15,000 to \$24,999	110
\$25,000 to \$34,999	97
\$35,000 to \$49,999	120
\$50,000 to \$74,999	204
\$75,000 to \$99,999	89
\$100,000 to \$149,999	98
\$150,000 to \$199,999	12
\$200,000 or more	19
Median Family Income	\$48,102
Mean Family Income	\$57,284



# 3 | Planning Process

### 3.1 Methodology

This chapter details the process involved in the development of the Clermont County All-Hazards Mitigation Plan Update, including a description of who participated in the process, how community involvement was incorporated, what hazards were included in the Plan and why, and how the Plan was composed through stakeholder and public meetings, research, reviews, and evaluations.

### 3.2 Integration of the 2014 All-Hazards Mitigation Plan

The 2014 All-Hazards Mitigation Plan was routinely integrated into the Local Emergency Planning Committee (LEPC) meetings. The following LEPC meetings have been held since the drafting of the 2014 All-Hazards Mitigation Plan:

- January 15, 2015 – The LEPC continued to work on getting all Villages and Townships to adopt the 2014 All-Hazards Mitigation Plan.
- April 23, 2015 – The LEPC confirmed that all participating Villages and Townships had adopted the 2014 All-Hazards Mitigation Plan Update.
- July 17, 2015 – The EMA presented on the Emergency Operations Base Plan, which incorporates the hazard analyses from the 2014 All-Hazards Mitigation Plan as well as countywide mitigation actions.
- January 26, 2017 – The EMA again presented on the Emergency Operations Base Plan, which incorporates the hazard analyses from the 2014 All-Hazards Mitigation Plan as well as countywide mitigation actions.
- July 20, 2017 – The EMA reported that the County would be applying for funding to update to 2014 All-Hazards Mitigation Plan.
- January 15, 2018 - The EMA again presented on the Emergency Operations Base Plan, which incorporates the hazard analyses from the 2014 All-Hazards Mitigation Plan as well as countywide mitigation actions.
- September 27, 2018 – The EMA reported that funding had been received for the update to the 2014 All-Hazards Mitigation Plan.

The County hosted various meetings with communities to discuss mitigation actions after flooding, tornadoes, and a hazardous material spill on the Ohio River. Additionally, the County hosted meetings with communities along the Ohio River to discuss mitigation actions before two Ohio River floods in 2015 and 2018.

### 3.3 Existing Plans and Regulations

Preparation for this All-Hazards Mitigation Plan Update included the review of existing planning documents for Clermont County. Pertinent information from these documents was incorporated into this Plan Update. Utilized documents included:

- Building Codes
- Zoning Codes and Regulations
- County Special Purpose Flood Damage Regulations, dated May 25, 2012
- Hazardous Materials Plan
- Subdivision Regulations
- Water Management & Sediment Control Regulations
- Airport Zoning Regulations
- Clermont County Comprehensive Plan

Additionally, the Clermont County Emergency Operations Plan (EOP) addresses the County's planned response to extraordinary emergency situations associated with natural, technological, and human-caused disasters by establishing a framework for an effective system of comprehensive emergency management. The EOP is intended to facilitate coordination across agencies and jurisdictions within Clermont County, particularly between local, state, and federal agencies.

The County will integrate the data, information, goals, and mitigation actions established by this All-Hazard Mitigation Plan Update into other codes, regulations, plans, and studies, as appropriate, including the documents listed above. The Local Emergency Planning Committee (LEPC) will incorporate this Plan in their regular meetings. This integration will be implemented through members of the Core Planning Team whose organization is charged with the development of the regulation and its enforcement. Each jurisdiction participating in this plan follows a similar process.

#### **3.4 Clermont County Authority to Adopt Plan**

Clermont County is updating the All-Hazards Mitigation Plan as required by 44 CFR Part 201.3 and the Robert T. Stafford Disaster Relief and Emergency Assistance Act. In order for Clermont County's All-Hazard Mitigation Plan Update to be compliant with the Disaster Mitigation Act, the Clermont County Board of County Commissioners and participating jurisdictional governing bodies will adopt this plan upon approval from the Ohio Emergency Management Agency, as well as acceptance from the Federal Emergency Management Agency. **Table 3.1** provides a list of existing authorities by community.

Documentation of plan approval is located in **Appendix F**.

**Table 3.1: Existing Authorities and Regulations in Clermont County's Municipalities**

Community	Planning Commission	Comprehensive Plan	Floodplain Regulation	Building Codes	Zoning Ordinances	Capital Budget	Public Works Budget
Clermont County	Yes	Yes	Yes	Yes	Yes	General Fund	Limited in-kind wages only.
City of Loveland	Yes	Yes	Yes	Yes	Yes	General Fund	Limited in-kind wages only.
City of Milford	Yes	Yes	Yes	Yes	Yes	General Fund	Limited in-kind wages only.
Amelia Village	Yes	Yes	Yes	Yes	Yes	General Fund	Limited in-kind wages only.
Village of Batavia	No	No	Yes	Yes	Yes	General Fund	Limited in-kind wages only.
Village of Bethel	No	No	Yes	Yes	Yes	General Fund	Limited in-kind wages only.
Village of Chilo	No	No	Yes	Yes	Yes	General Fund	Limited in-kind wages only.
Village of Felicity	No	No	Yes	Yes	Yes	General Fund	Limited in-kind wages only.
Village of Moscow	Yes	No	Yes	Yes	Yes	General Fund	Limited in-kind wages only.
Village of Neville	No	No	Yes	Yes	Yes	General Fund	Limited in-kind wages only.
Village of Newtonsville	No	No	Yes	Yes	Yes	General Fund	Limited in-kind wages only.
Village of Owensville	No	No	Yes	Yes	Yes	General Fund	Limited in-kind wages only.
Village of Williamsburg	Yes	No	Yes	Yes	Yes	General Fund	Limited in-kind wages only.

### 3.4 Local Jurisdiction Participation & Notification Process

All incorporated jurisdictions within Clermont County, as well as agencies that work within the County or incorporated jurisdictions and neighboring counties received notification of the mitigation planning process. The Clermont County EMA Office created a master list of jurisdictions and agencies that should participate in this planning effort. The comprehensive list was reviewed to ensure that all the appropriate agencies and jurisdictions would be invited to participate in this effort. A Core Group representing a wide array of political subdivisions, as well as agencies and private businesses, was notified of the mitigation planning process. Those notified are listed below. Additionally, **Table 3.2** lists the participating jurisdictions and representatives and how they participated.



#### **Clermont County**

- Clermont County Auditor
- Clermont County Community and Economic Development
- Clermont County EMA
- Clermont County Engineer
- Clermont County GIS
- Clermont County Office of Public Information
- Clermont County Park District
- Clermont County Public Health
- Clermont County Sheriff's Office
- Clermont County Soil and Water Conservation District
- Clermont County Water Resources Department

#### **City and Village Members**

- City of Loveland
- City of Milford
- Village of Amelia
- Village of Batavia
- Village of Bethel
- Village of Chilo
- Village of Felicity
- Village of Moscow
- Village of Neville
- Village of New Richmond
- Village of Newtonsville
- Village of Owensville
- Village of Williamsburg

#### **Township Members**

- Batavia Township
- Franklin Township
- Goshen Township
- Jackson Township
- Miami Township
- Monroe Township
- Ohio Township
- Pierce Township
- Stonelick Township
- Tate Township
- Union Township
- Washington Township
- Wayne Township
- Williamsburg Township

#### **Local Schools and Universities**

- Clermont County Educational Service Center
- Clermont County OSU Extension

#### **Private Organizations**

- Duke Energy
- Mercy Clermont Hospital
- The Health Collaborative
- Cincinnati Bell

#### **Other Agencies**

- Ohio Department of Transportation (ODOT)
- Ohio Emergency Management Agency (OEMA)
- Ohio Kentucky Indiana Regional Council of Governments (OKI)
- Hamilton County Emergency Management Agency

### 3 | PLANNING PROCESS

**Table 3.2: Participating Representatives & Jurisdictions**

Community/Organization	Representative(s)	Meetings Attended
<i>County</i>		
Clermont County Board of County Commissioners	Becky Ehling, County Safety Coordinator	1
Clermont County Building Department	Carl Lamping, Building Code Enforcement & Floodplain Manager	3, 4
Clermont County Community and Economic Development	Andy Kuchta, Director	1, 2 & 3
Clermont County Emergency Management Agency	Pam Haverkos, Director Laurie Schlueter, Program Manager Doug Baumgartner, Program Manager	1, 2, 3 & 4
Clermont County Engineer's Office	Heath Wilson, Engineer	1
Clermont County Geographical Information Systems (GIS)	Kelly Perry, GIS Administrator	1 & 2
Clermont County Local Emergency Planning Committee (LEPC)	Brooke Matzen	1
Clermont County Park District	Chris Clingman, Director	1, 2 & 3
Clermont County Public Health	Tim Kelly, Assistant Health Commissioner Mackinzie Dickman, Emergency Response Coordinator	3
Clermont County Sheriff's Office	Paul Kamphaus, Captain	2
Clermont County Soil & Water Conservation District	Jake Hahn, Technician John McManus, Administrator	1, 2 & 4
Clermont County Water Resources Department	Lyle Bloom, Director Connie Miller, Executive Assistant	1, 2
<i>Cities and Villages</i>		
City of Milford	Jamey Mills, Chief of Police	2
Amelia Village	John Hyder, Administrative Coordinator	*
Village of Batavia	Alan Ausman, Mayor	*
Village of Bethel	Travis Dotson, Village Administrator	*
Village of Chilo	Billy Stevenson III	*
Village of Felicity	Randy Myers, Mayor	*
Village of Moscow	Andrew Gephardt, Village Administrator	2, 3 & 4
Village of Neville	Cecil Collins, Jr., Mayor	*
Village of New Richmond	Vince Bee, Fire/EMS Chief	3
Village of Newtonsville	Kevin Pringle, Mayor	*
Village of Owensville	Rick McEvoy, Mayor	*
Village of Williamsburg	Mary Ann Lefker, Mayor	*

*\*These representatives were unable to attend the Core Planning Committee meetings in person, so they participated via the online surveys and through direct conversations with the County Emergency Management Agency Director, Pam Haverkos, as documented in **Appendix F**.*

In addition to these Core Planning Committee members, the Hamilton County Emergency Management Agency was invited to participate in planning efforts and review the Draft Plan. As such, Hamilton

County reviewed the Plan and submitted a letter indicating their comments, which is located in **Appendix F**.

### 3.5 Meetings

The planning process included a Kick-Off Meeting between the Planning Team and Clermont County EMA, four Core Planning Committee Meetings, and two Public Meetings. The following section details the information discussed and collected at the meetings.

#### 3.5.1 Kick-Off Meeting/Core Planning Committee Meeting 1: October 11, 2018

The Kick-Off Meeting took place on Thursday, October 11, 2018 from 1:30 PM to 3:30 PM at the Clermont County Emergency Operations Center (2279 Clermont Center Drive, Batavia, Ohio 45103). 23 people were in attendance, including people from the State, County, Municipalities, non-profit/institutions, and private sector. The sign-in sheet for the Kick-Off Meeting is located in **Appendix F**.

During the Kick-Off Meeting, stakeholders were provided with an overview of hazard mitigation planning, including federal requirements for the process, a list of potential types of hazards, and benefits of hazard mitigation planning. Attendees also reviewed the federal funding opportunities and eligible activities for hazard mitigation and planning. The planning process and schedule for the All-Hazards Mitigation Plan Update was reviewed, providing attendees with a list of major milestones and important dates such as the dates for the two public meetings.

The last topic discussed at the Kick-off Meeting was the role of the Core Planning Committee. Specifically, attendees discussed what input they needed to provide initially, next steps, what additional people/organizations/disciplines should be included in the planning process, the best methods for engaging current stakeholders, and additional methods for how to best engage the public.

**Appendix F** provides a more detailed set of notes and responses from the Kick-Off Meeting.

#### 3.5.2 Core Planning Committee Meeting 2: November 15, 2018

The Core Planning Committee Meeting 2 took place on Thursday November 15, 2018 at the Clermont County Engineer's Office (2381 Clermont Center Drive, Batavia, Ohio 45103) at 3:30 PM, prior to the first Public Meeting.

All attendees, including the Clermont County EMA Director, Consultant team members, and stakeholders introduced themselves and their organization and representative communities. The attendees were provided with an overview of the hazard mitigation planning process and the role of the Core Planning Committee in this process. They were also updated on the status of the plan and provided with a schedule of upcoming events. A list of up to date data research was displayed for attendees, as well as a list of what information was needed from them in the form of surveys. The following surveys were completed by the stakeholders:

1. **Goals Survey** – This survey asked stakeholders to review the goals of the 2014 Clermont County All-Hazards Mitigation Plan Update and determine if they thought the goals should remain unchanged for the 2019 Plan, if they should not be included, or if they had any modifications to the goals. There was also an opportunity for stakeholders to list any new or additional goals they would like added to the Plan.
2. **Hazard Priority Survey** – This survey asked stakeholders to rank the hazards included in the 2014 Clermont County All-Hazards Mitigation Plan Update from 0 to 5, with 0 meaning the hazard should not be included in the 2019 Plan and 5 meaning the hazard poses the greatest

threat to the County. Stakeholders were also provided a list of potential hazards that could be added to the Plan if stakeholders thought they should be included. Stakeholders were asked to rank the potential additions 0 to 5 to determine if they should be included in the 2019.

3. **Risk Assessment Survey** – This survey asked stakeholders to assess the level of risk for each hazard based on several factors, including frequency, average duration of response, average speed of onset, average magnitude, impact on businesses, impact on people, and impact on property.

Stakeholders also discussed county-wide mitigation actions from the 2014 Plan related to Flooding, Severe Storms, Tornadoes, and Invasive Species. A complete list of mitigation actions from the 2014 Clermont County All-Hazards Mitigation Plan Update will be sent to the points of contact for each community for their assessment of the status of each action.

*Copies of the completed surveys, as well as the sign-in sheet and detailed notes of the stakeholders' discussion on the county-wide mitigation actions can be found in Appendix F: Meeting Documentation.*

#### 3.5.3 Public Meeting 1

Public Meeting 1 occurred on Thursday November 15, 2018 at the Clermont County Engineer's Office (2381 Clermont Center Drive, Batavia, Ohio 45103) at 5:00 PM following the Core Planning Committee Meeting 2. The meeting was posted in the Cincinnati Enquirer ([www.cincinnati.com](http://www.cincinnati.com)) on November 12, 2018 (see Notice in **Appendix F**). Two members of the public attended, as well as several stakeholders (see sign-in sheet in **Appendix F**). A reporter from the Clermont Sun also was in attendance.

Attendees were provided with an outline of the hazard mitigation planning process, including details on why hazard mitigation plans are necessary. They were also updated on the status of the 2019 Clermont County All-Hazards Mitigation Plan and provided with a schedule of upcoming events. A list of up-to-date data research was displayed for attendees, as well as a list of what information was needed from them in the form of surveys. Attendees were asked to complete the following surveys:

1. **Goals Survey** – This survey asked members of the public to review the goals of the 2014 Clermont County All-Hazards Mitigation Plan Update and determine if they thought the goals should remain unchanged for the 2019 Plan, if they should not be included, or if they had any modifications to the goals. There was also an opportunity for members of the public to list any new or additional goals they would like added to the Plan.
2. **Hazard Priority Survey** – This survey asked members of the public to rank the hazards included in the 2014 Clermont County All-Hazards Mitigation Plan Update from 0 to 5, with 0 meaning the hazard should not be included in the 2019 Plan and 5 meaning the hazard poses the greatest threat to the County. Members of the public were also provided a list of potential hazards that could be added to the Plan if stakeholders thought they should be included. Members of the public were asked to rank the potential additions 0 to 5 to determine if they should be included in the 2019.
3. **Public Opinion Survey** – This anonymous and voluntary survey asked the public to inform the hazard mitigation planning process by providing individual-level feedback on hazards within Clermont County. The survey collected feedback on Hazard and Disaster Information, Community Vulnerabilities and Hazard Mitigation Strategies, Mitigation and Preparedness Activities at the Household level, and provided space for the public to leave general comments.



### 3.5.4 Core Planning Committee Meeting 3: January 23, 2019

The Core Planning Committee Meeting 3 took place on Wednesday, January 23, 2019 at the Pierce Township Administration Building (950 Locust Corner Road, Cincinnati, Ohio 45245) at 3:30 PM, held just prior to the second Public Meeting.

The meeting began with a brief status update for the plan, including a review of the schedule. Members of the Core Planning Committee who represented communities or institutions who had not yet submitted previous surveys were given the opportunity to do so. The following surveys were completed by the stakeholders:

1. **New Mitigation Actions Survey** – This survey lists potential new mitigation actions, broken down by hazard type. The stakeholders first decided whether the new mitigation action applied to their community. If the action did apply to their community, they provided ratings on cost-effectiveness, technical feasibility, environmental soundness, immediate need, and total risk reduction. The stakeholders were also able to provide written comments on each new mitigation action. Finally, the stakeholders were able to suggest and rate their own mitigation actions at the end of the survey.

### 3.5.5 Public Meeting 2: January 23, 2019

Public Meeting 2 occurred on Wednesday, January 23, 2019 at the Pierce Township Administration Building (950 Locust Corner Road, Cincinnati, Ohio 45254) at 5:00 PM. The meeting was posted in the Cincinnati Enquirer ([www.cincinnati.com](http://www.cincinnati.com)) on January 11, 2019.

Attendees worked directly with the Project Team and were able to ask questions about the planning process and about individual new mitigation actions. Attendees were asked to complete the following surveys:

1. **New Mitigation Actions Survey** – This survey lists potential new mitigation actions, broken down by hazard type. Members of the public first decided whether the new mitigation action applied to their community. If the action did apply to their community, they provided ratings on cost-effectiveness, technical feasibility, environmental soundness, immediate need, and total risk reduction. Members of the public were also able to provide written comments on each new mitigation action. Finally, public attendees were able to suggest and rate their own mitigation actions at the end of the survey.

### 3.5.6 Core Planning Committee Meeting 4: July 31, 2019

The Core Planning Committee Meeting 4 took place on Wednesday, July 31, 2019 at the County Emergency Operation Center (2279 Clermont Center Drive, Batavia, Ohio) at 1:30 PM.

The meeting included a review of the hazard mitigation planning process and requirements, an overview of the Plan and each of its chapters, an overview of the participating stakeholders, an overview of the hazard priorities, and a detailed review of the mitigation actions. The meeting closed with an introduction to the public comment period, which began on July 24, 2019. No surveys were provided during this meeting.

### **3.5.7 Planning Process**

Stakeholder input was critical for determining the priorities of hazards, as well as which hazards were included or excluded from the Plan. Mine Subsidence was excluded based on stakeholder's input. Additionally, tropical storms and hurricanes were included in the Severe Storm discussion. Feedback from the stakeholders determined the prioritization of mitigation actions, as well as which mitigation actions were relevant to Clermont County and their communities.

# 4 | Hazard Risk Assessment

### 4.1 Severe Storms

#### 4.1.1 Description

Severe storm events may include severe thunderstorms, high wind, hail, and lightning. While tornadoes and flooding may also be categorized as severe storm-related events, they have been broken out as separate categories for this Plan. For the purposes of this Plan, this section will also include discussion on the impacts of remnants of hurricanes and tropical storms on Clermont County.

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

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

Lightning is caused by a rapid discharge of electrical energy that has built up in the atmosphere between clouds, the air, or the ground. Lightning strikes can be either direct or indirect. A direct strike is when lightning strikes a building or a specific zone, which can result in fusion points melting holes of varying sizes at the point of impact of materials with high resistivity. An indirect lightning strike is when lightning causes power surges that disrupt electrical equipment.

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

Hail is a type of frozen precipitation that occurs when thunderstorm updrafts carry raindrops upward into extremely cold atmospheric zones where they freeze before falling to the ground. The resulting hailstones can fall at speeds greater than 100 miles per hour and range in size from smaller than 0.50 inches (the size of a pea) to 4.5 inches (the size of a softball). (Source: NWS).

#### 4.1.2 Location

Severe storms are a County-wide hazard, meaning all of Clermont County is susceptible to severe weather.

#### 4.1.3 Extent

Severe storm events have the potential to create severe damage within Clermont County. Across the United States, lightning is responsible for approximately 50 deaths annually, as well as hundreds of injuries. (Source: NOAA). Winds have the potential to cause damage by bringing down tree limbs and generating widespread power outages. Both strong winds and hail can yield property damage.

People living in mobile homes are especially at risk for injury and death due to strong winds. Even anchored mobile homes can be seriously damaged if winds gust over 80 mph.

### 4.1.4 History

According to the National Oceanic and Atmospheric Administration (NOAA), there have been 196 thunderstorm wind events, eight high wind events, three strong wind events, six lightning events, and 68 hail events recorded in Clermont County since 1960. These events resulted in over \$33 million in property damages and \$550,000 in crop damages. Additionally, one death and five injuries were reported as a result of severe storms in Clermont County. These events are summarized in **Table 4.1.1**, below. A complete list of severe storm events can be found in **Appendix A**.

**Table 4.1.1: Severe Storm Events in Clermont County since 1960**

Severe Storm Event Type	Number of Events	Injuries	Deaths	Property Damages	Crop Damages
Thunderstorm Wind	196	0	0	\$2,492,500	\$0
High Wind	8	0	1	\$22,644,000	\$0
Strong Wind	3	0	0	\$38,000	\$0
Lightning	6	5	0	\$61,000	\$0
Hail	68	0	0	\$2,700,000	\$550,000
<b>Total</b>	<b>281</b>	<b>5</b>	<b>1</b>	<b>\$33,189,000</b>	<b>\$550,000</b>

Of these severe storm events, several were severe enough to result in a Federal Disaster Declaration; public assistance received was documented by the Ohio EMA. In the last ten years, Federal Disaster Declarations were filed for the following events impacting Clermont County (as provided by FEMA and the NCDC):

#### ***April 4 – May 15, 2011***

Federal Disaster Number DR-4002: Severe storms and flooding were reported in multiple counties in Southern Ohio. 21 counties in Ohio, including Clermont County, received a total of \$44,506,071 in public assistance as a result of this disaster event.

#### ***September 14, 2008***

Federal Disaster Number DR-1805: Clermont County received \$920,409 in public assistance from severe storms associated with Hurricane Ike. 33 counties in Ohio received \$48,124,981 in public assistance as a result of the storm.

#### ***August 29 – October 1, 2005***

Federal Emergency Number EM-3250: All 88 counties in Ohio, including Clermont County, were included in the federal declaration from remnants of Hurricane Katrina. Ohio counties received \$2,499,103 in public assistance as a result of this event.



### 4.1.5 Probability

According to the National Climatic Data Center (NCDC), there have been 281 severe storm events reported in Clermont County since 1960, with total losses reaching more than \$33.7 million. This averages out to five to six severe storm events per year with average annual combined property and crop damages of \$571,847.

### 4.1.6 Vulnerability Assessment

#### *Infrastructure Impact*

Above-ground infrastructure is at risk for storm damage by wind and falling debris. For infrastructure, high winds and hail are the most damaging part of a severe storm. High winds can strip bark from trees and detach limbs. If large branches fall, they can damage buildings and supporting above-ground infrastructure. In the most severe storms with high winds, large trees can be uprooted and have the potential to fall on buildings, including houses, which can cause harm or death.

Utilities are at risk for damage by severe storms, as well. Electrical lines are spread throughout the County connecting homes, businesses, and other facilities to one another. Severe storms in Clermont County are likely to down tree limbs and generate other debris that can affect above-ground electrical lines, causing power outages. Downed power lines that are still live are extremely hazardous and can cause death by electrocution.

#### *Population Impact*

According to the American Community Survey's 2017 population estimates, the population of Clermont County is approximately 204,214. Summer storms are random in nature and affect the entire area of the County. Everyone within the County should be prepared during a storm event. Populations residing in mobile home parks are particularly vulnerable and should seek out shelters.

#### *Property Damage*

Due to the non-site-specific nature of this hazard, **Table 4.1.2** lists all structures within Clermont County as having potential impacts from Severe Storms. Based on historical data, it is estimated that average annual property damage cost is \$571,847 per year.

**Table 4.1.2: Structure Vulnerability due to Severe Storms (Source: Clermont County)**

Structure Type	Number	Value of Vulnerable Structures (\$)		
		Building	Land	Total
Residential	79,609	2,672,123,490	856,164,310	3,528,287,800
Non-Residential	16,783	932,290,820	376,870,880	1,309,161,700
Critical Facilities	3,041	299,480,190	100,246,570	399,726,760
<b>Total</b>	<b>99,433</b>	<b>3,903,894,500</b>	<b>1,333,281,760</b>	<b>5,237,176,260</b>

#### *Loss of Life*

While loss of life is rare due to severe weather, it is a possibility. According to NOAA, severe storms, including Thunderstorm Wind, High Wind, Strong Wind, Lightning, and Hail were responsible for one death and five injuries due to events that passed through Clermont County since 1950.

#### *Economic Losses*

Severe storms usually cause minor damage to structures, such as blowing shingles off roofs, downed branches breaking windows or falling onto buildings and above-ground infrastructure. More severe

damage may also result. Of the 281 severe storm events since 1950, 14 of the 196 Thunderstorm Wind events, two of the eight High Wind events, one of the three Strong Wind events, one of the six lightening events, and five of the 68 hail events resulted in property damage over \$20,000. According to NOAA, the costliest storms include the remnants of Hurricane Ike in September of 2008, which caused \$22.6 million in property damage and a hail event in Milford on April 19, 2002, which caused \$2.5 million in property damage.

### **4.1.7 Land Use and Development Trends**

Severe storms have the potential to occur anywhere in the county. All development that has occurred since the previous plan and all future development are likely to be impacted by severe storms. There are 16,920 more residential properties and 3,062 more non-residential properties across the County as compared to the 2014 All Hazards Plan Update.

### 4.2 Tornadoes

#### 4.2.1 Description

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

In general, the midsection of the United States experiences a higher rate of tornadoes than other parts of the country because of the recurrent collision of moist, warm air moving north from the Gulf of Mexico with colder fronts moving east from the Rocky Mountains. Supercells, which form from rotating thunderstorms, are the most destructive variety of tornado with wind speeds that top 200 mph. According to the National Weather Service (NWS), tornadoes are the most destructive of all atmospheric phenomena.

Tornado Watches are often issued by the Storm Prediction Center (SPC) in Norman, Oklahoma when conditions are favorable for the development of tornadoes. Watches are usually issued for four to eight hours. During a watch, people in the watch area should be prepared to move to a safe place immediately if threatening weather approaches.

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

#### 4.2.2 Location

Tornadoes are a county-wide hazard in Clermont County, potentially affecting all areas and jurisdictions.

#### 4.2.3 Extent

Tornadoes are measured by damage scale for their winds, with greater damage equating to greater wind speed. The original Fujita Tornado Damage Scale (F-scale) was developed in 1971, without much consideration to a structure’s integrity or condition as it relates to the wind speed required to damage it. The original F-Scale classifications are shown in **Table 4.2.1**, below.

**Table 4.2.1: Fujita Tornado Damage Scale**

Scale	Wind Estimate (MPH)	Typical Damage
F0	<73	<b>Light Damage:</b> Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.
F1	73-112	<b>Moderate damage:</b> Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.

## 4 | HAZARD RISK ASSESSMENT

Scale	Wind Estimate (MPH)	Typical Damage
F2	113-157	<b>Considerable damage:</b> 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	<b>Severe damage:</b> 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	<b>Devastating damage:</b> Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.
F5	261-318	<b>Incredible damage:</b> Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yards); trees debarked; incredible phenomena may occur.

After it was determined the process of rating damages caused by tornadoes was lacking a sufficient number of objective criteria, the Enhanced F-Scale (EF-scale) was developed and took effect on February 1, 2007. The EF-scale starts with the original F-scale and then classifies tornado damage across 28 different types of damage indicators. These indicators mostly involve building/structure type and are assessed at eight damage levels from one to eight. Therefore, construction types and their relative strengths and weaknesses are incorporated into the EF classification given to a particular tornado. The most intense damage within the tornado path will generally determine the EF-scale given to the tornado. **Table 4.2.2**, below, lists the classifications under each scale. The wind speeds listed are estimates based on damage rather than measurements.

**Table 4.2.2: Enhanced Fujita Tornado Damage Scale**

Fujita Scale			Derived EF Scale		Operational EF Scale	
F Number	Fastest ¼-mile (MPH)	3-Second Gust (MPH)	EF Number	3-Second Gust (MPH)	EF Number	3-Second Gust (MPH)
0	40-72	45-78	0	65-85	0	65-85
1	73-112	79-117	1	86-109	1	86-110
2	113-157	118-161	2	110-137	2	111-135
3	158-207	162-209	3	138-167	3	136-165
4	208-260	210-261	4	168-199	4	166-200
5	261-318	262-317	5	200-234	5	200+

The EF-scale remains a set of wind estimates based on damage, not measurements. It uses three-second gusts, estimated at the point of damage, based on a judgment of eight levels of damage to the 28 indicators. These estimates vary with height and exposure. The three-second gust is not the same as wind in standard surface observations. Standard measurements are taken by weather stations in open exposures, using a directly measured, “one-minute mile” speed.

There are no plans by National Oceanic Atmospheric Administration or the National Weather Service to re-evaluate the historical tornado data using the enhanced scale. Therefore, this Plan and subsequent plans will reference both scales until a complete switchover is deemed necessary.

### 4.2.4 History

Since 1950, Clermont County has had 21 tornado events, resulting in 4 deaths and 51 injuries. These events have caused at least \$12.6 million in property damage and \$2,000 in crop damage. The four most damaging tornadoes are described below; they were selected to illustrate the worst-case scenarios, including the two events that resulted in deaths and events costing \$1 million or more in property damages. All events are summarized in **Table 4.2.3**, and the additional events not described below are included in **Appendix A**.

#### *March 1, 2017*

At 3:38 AM, an EF1 tornado was recorded near Bairsville in Pierce Township. The first sign of tornadic damage was observed on Locust Corner Road in Pierce Township near the Pierce Township Nature Area where several trees were snapped. A power pole was also snapped on the corner of Locust Corner Road and Wagner Road. Damage continued on Locust Corner Road near the Pierce Township Park. Damage was mostly in the form of snapped trees and downed tree branches. Several evergreen trees were also uprooted. Further east, beginning at the intersection of Lewis Road and Locust Lake Road, tree damage continued and was more significant. Structural damage was also observed at the 1300 block of Locust Lake Road.

The most significant damage occurred to a home which had its roof completely lifted off and displaced into the backyard. Damage here was estimated to be EF1 in nature, with maximum winds near 110 MPH. Other homes further east on Locust Lake Road also suffered damage, including shingles ripped off and several instances of siding partially or completely removed from multiple sides of several structures. Multiple trees also fell onto one of the homes, resulting in roof damage. To the east of Locust Lake Road, any structural damage was more sporadic and primarily consisted of shingles torn from a few homes on Maple Avenue and South Klein Avenue. A few trees were snapped as far east as Amelia Park Drive and Mount Holly Road. Chilo Lock 34 Park also suffered wind damage. \$400,000 in property damage was reported by the NCDRC; however, the Clermont Sun reports damages greater than \$1,000,000; and the County EMA's estimate of damages supports the numbers reported by the Sun. Damages reported by the Clermont Sun include mobile homes, commercial buildings, and agricultural buildings. The Pierce Township Cemetery also lost dozens of tombstones. The cost of cleanup and replacing the tombstones has not been released. No deaths or injuries were recorded (Sources: NCDRC, Clermont Sun).

#### *March 2, 2012*

At 4:46 PM, an EF3 tornado moved into Clermont County from Pendleton County. The tornado hit the Village of Moscow. The tornado continued on the ground across Clermont County through Washington, Franklin, and Tate townships, crossing into Brown County at 4:58 PM. The tornado then lifted south of Hamersville in western Brown County. This tornado caused extensive damage to structures and trees along its entire path on both sides of the Ohio River. Numerous homes were very heavily damaged or destroyed. Many homes lost their roofs, having complete exterior wall failure. Some modular homes were completely removed from their foundations, lifted, and thrown in excess of 100 yards where they were destroyed. The damage in Ohio from this tornado was consistent with maximum winds estimated at 160 mph in Clermont County. The tornado traveled a total of 11.04 miles in Clermont County. This tornado resulted in 3 deaths, 13 injuries, and \$5.66 million in property damage (Source: NCDRC).

This tornado resulted in a State Disaster Declaration for which townships and villages within Clermont County received funds. Funds were made available through the State Disaster Relief Program, U.S. SBA low-interest loans, and State Individual Assistance (Source: NCDRC).



## 4 | HAZARD RISK ASSESSMENT

### *July 2, 1997*

At 7:30 PM, a multiple vortex, F3 tornado tracked across the southern part of Clermont County, starting near Moscow. While no injuries or deaths were reported as a result, \$2 million in property damage was recorded. The tornado damaged or destroyed 56 mobile homes and 27 single family homes. Several barns and sheds were destroyed, and numerous trees were downed (Source: NCDC).

### *April 23, 1968*

At 12:56 PM, an F4 tornado touched down in Clermont County, causing one death, 29 injuries, and \$2.5 million in property damage (Source: NCDC).

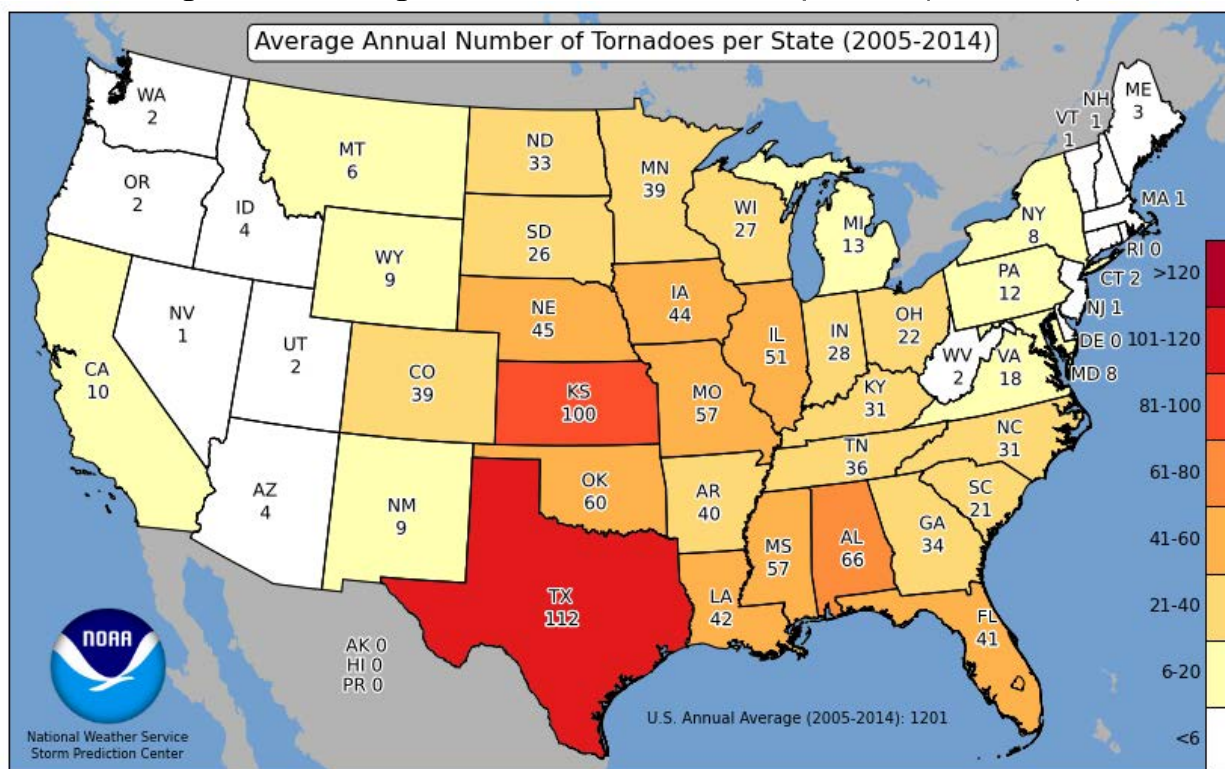
**Table 4.2.3: Summary of Damages due to Tornadoes in Clermont County**

Date of Event	Scale	Deaths	Injuries	Property Damage	Crop Damage
2/25/2018	EF1	0	0	\$85,000	\$0
3/26/2017	EF1	0	0	\$30,000	\$0
<b>3/1/2017</b>	<b>EF1</b>	<b>0</b>	<b>0</b>	<b>\$1,000,000</b>	<b>\$0</b>
9/7/2012	EF0	0	0	\$40,000	\$0
<b>3/2/2012</b>	<b>EF3</b>	<b>3</b>	<b>13</b>	<b>\$5,660,000</b>	<b>\$0</b>
5/23/2011	EF0	0	0	\$30,000	\$0
5/30/2009	EF0	0	0	\$1,000	\$0
7/11/2006	F0	0	0	\$0	\$2,000
7/11/2006	F1	0	0	\$100,000	\$0
8/24/1999	F0	0	0	\$25,000	\$0
<b>7/2/1997</b>	<b>F3</b>	<b>0</b>	<b>0</b>	<b>\$2,000,000</b>	<b>\$0</b>
5/8/1996	F0	0	0	\$30,000	\$0
8/5/1995	F1	0	0	\$30,000	\$0
6/2/1990	F2	0	0	\$250,000	\$0
4/8/1980	F1	0	2	\$250,000	\$0
6/12/1978	F0	0	0	\$25,000	\$0
6/12/1978	F1	0	0	\$25,000	\$0
6/24/1976	F0	0	0	\$250,000	\$0
8/9/1969	F3	0	7	\$250,000	\$0
<b>4/23/1968</b>	<b>F4</b>	<b>1</b>	<b>29</b>	<b>\$2,500,000</b>	<b>\$0</b>
4/15/1953	F1	0	0	\$25,000	\$0
<b>Total</b>	<b>-</b>	<b>4</b>	<b>51</b>	<b>\$12,606,000</b>	<b>\$2,000</b>

### 4.2.5 Probability

Between 2005 and 2014, Ohio averaged 22 tornadoes per year (**Figure 4.2.1**). The Ohio River Valley, which encompasses Clermont County, is a “preferred storm track” along which thunderstorms are likely to form. This increases the possibility of tornadoes in this area.

**Figure 4.2.1: Average Annual Number of Tornadoes per State (2005-2014)**



Since 1953, Clermont County has recorded 21 tornadoes, which amounts to one tornado approximately every three years – or a 33 percent chance of a tornado occurring each year.

### 4.2.6 Vulnerability Assessment

#### *Infrastructure Impact*

Above ground infrastructure is at risk for damage due to the high winds of a tornado. Tornadoes can strip a tree of bark and detach limbs. If large branches fall, they can damage buildings and supporting above-ground infrastructure. Large trees, upwards of 200 feet tall, can be uprooted and can fall on buildings or through houses which can cause serious harm or death.

Utilities that are above-ground are at risk for damage by tornadoes. Electrical lines are spread throughout the County connecting homes, businesses, and other facilities to one another. Large branches from trees or other debris can strike above-ground electrical lines, causing power outages. In addition, downed electrical lines can be extremely hazardous and cause death by electrocution.

Additionally, roads throughout Clermont County can be affected by downed trees, branches, or other debris. Larger debris or trees will take more time and effort to remove and can adversely affect the flow of traffic until safely removed.

The eight wastewater facilities in Clermont County can also experience backup and blockages if debris falls into the tanks.

### ***Population Impact***

According to the American Community Survey's 2017 population estimates, the population of Clermont County is approximately 204,214. Severe storms and the associated tornadoes are random in nature and have the potential to occur anywhere in the County. Everyone within the County should be prepared for a tornado. People residing in mobile homes are particularly vulnerable and should have a plan in place.

### ***Property Damage***

Since 1950, there have been a total of 21 tornado events, resulting in over \$12.6 million in property damage and \$2,000 in crop damage. Eight of these events have caused \$250,000 or more of property damage. The greatest property damage was incurred March 2, 2012 when an EF3 tornado caused \$5.6 million in damage. The average annual property damage cost averages to \$185,382.

### ***Loss of Life***

According to NOAA, the 21 tornado events experienced by Clermont County since 1950 have resulted in four deaths and 51 injuries. This data averages to one death every 17 years and one injury every 1.3 years, although there is a potential for loss of life or injury during or after any tornado event.

### ***Economic Losses***

Tornadoes can cause major damage to structures and roads. Higher severity tornadoes have the potential to cause complete destruction of structures. Debris also has the potential to cause damage to structures by breaking windows, damaging walls, or falling directly onto buildings and above-ground infrastructure. Damages to utilities and roads may also cause economic damage due to business closures, destruction of goods that require electricity, and halting economic activity.

**Figure 4.2.2** simulates an extremely destructive, worst-case scenario EF5 tornado and its impacts in to County assets and infrastructure. The worst-case scenario is simulated by running the EF5 tornado on a straight path through the most populated areas of the county. This theoretical scenario is performed to determine maximum potential damage within the County. **Table 4.2.4** categorizes the damages that would result from such a tornado.

**Table 4.2.4: Damages Associated with Worst-Case Scenario Tornado**

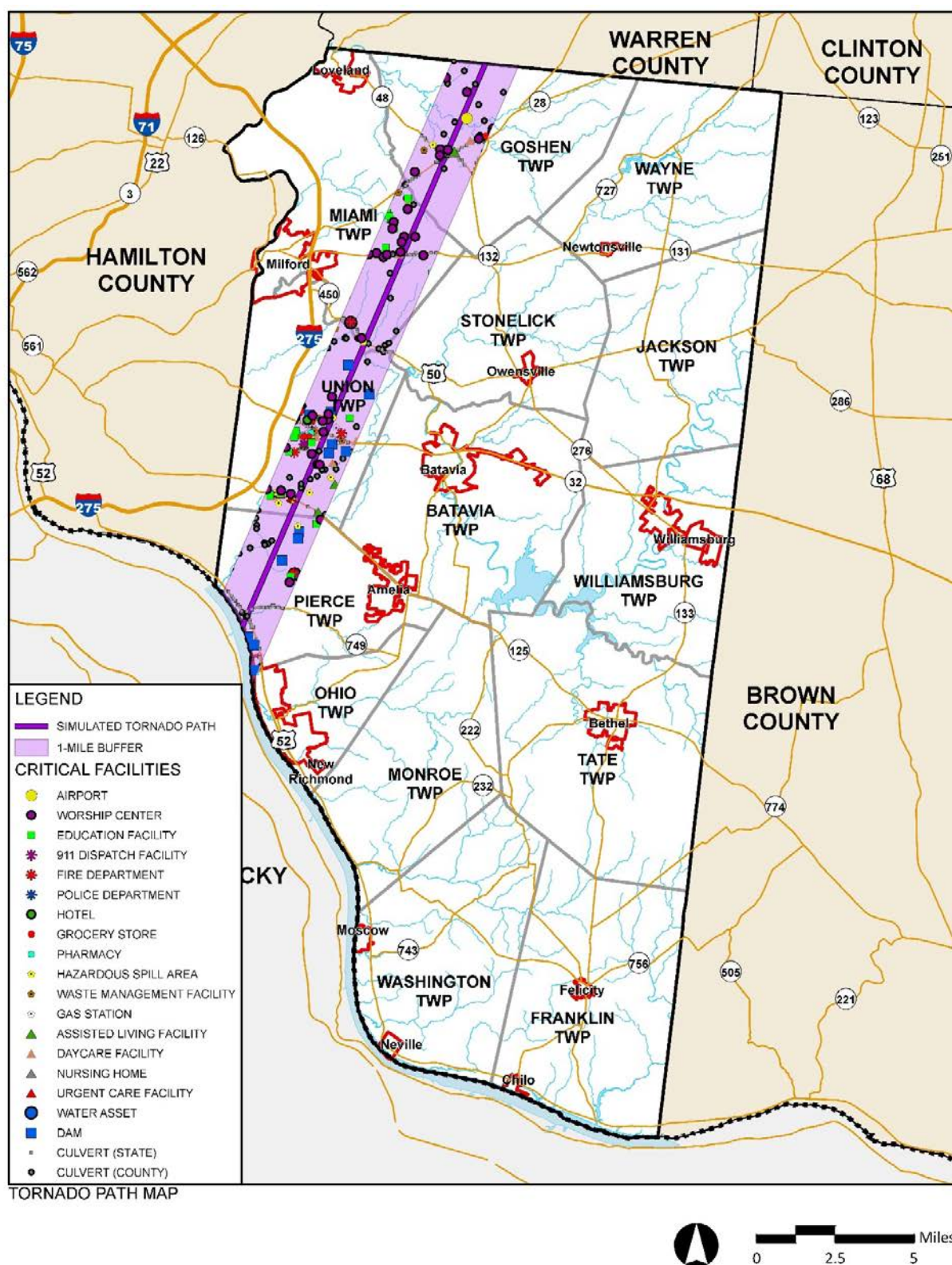
Type	Number of Properties Impacted	Value of Properties Impacted
Residential	15,112	\$702,289,580
Non-Residential	1,779	\$261,287,320
Critical Facilities	271	\$77,463,160
<b>Total</b>	<b>16,891</b>	<b>\$963,576,900</b>

### **4.2.7 Land Use and Development Trends**

Tornadoes can occur anywhere. Any development that has occurred since that previous plan and any future development has the potential to be impacted by tornadoes. The 2014 All Hazards Plan Update considered all properties in the County as vulnerable properties for tornados. There are 16,920 more residential properties and 3,062 more non-residential properties across the County as compared to the 2014 All Hazards Plan Update.



Figure 4.2.2: Worst-Case Scenario Tornado in Clermont County



### 4.3 Flooding

#### 4.3.1 Description

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

Urban flooding is a relatively new type of flood. These floods can occur in areas of development that have a high level of impervious surfaces, such as concrete. The level of development and the level of storm water management practices impact the severity of urban flooding.

Common flood-related terms include:

- **100-Year Flood:** A flood that has a 1% chance to occur each year. The elevation of the water from the 100-year flood is called the Base Flood. Mitigation strategies should be based on the base flood elevation.
- **Floodplain:** Any area that has the potential to flood from any source.
- **Floodway:** Sometimes referred to as a ‘regulatory floodway.’ FEMA defines a flood way as “the channel of a River or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.”

#### 4.3.2 Location

Flooding can occur throughout Clermont County. Some floods will be limited to the flood plain areas, but flash floods and urban floods can occur almost anywhere. The 100-year flood plain can be seen in **Figure 4.3.1: Flood Hazard Map**.

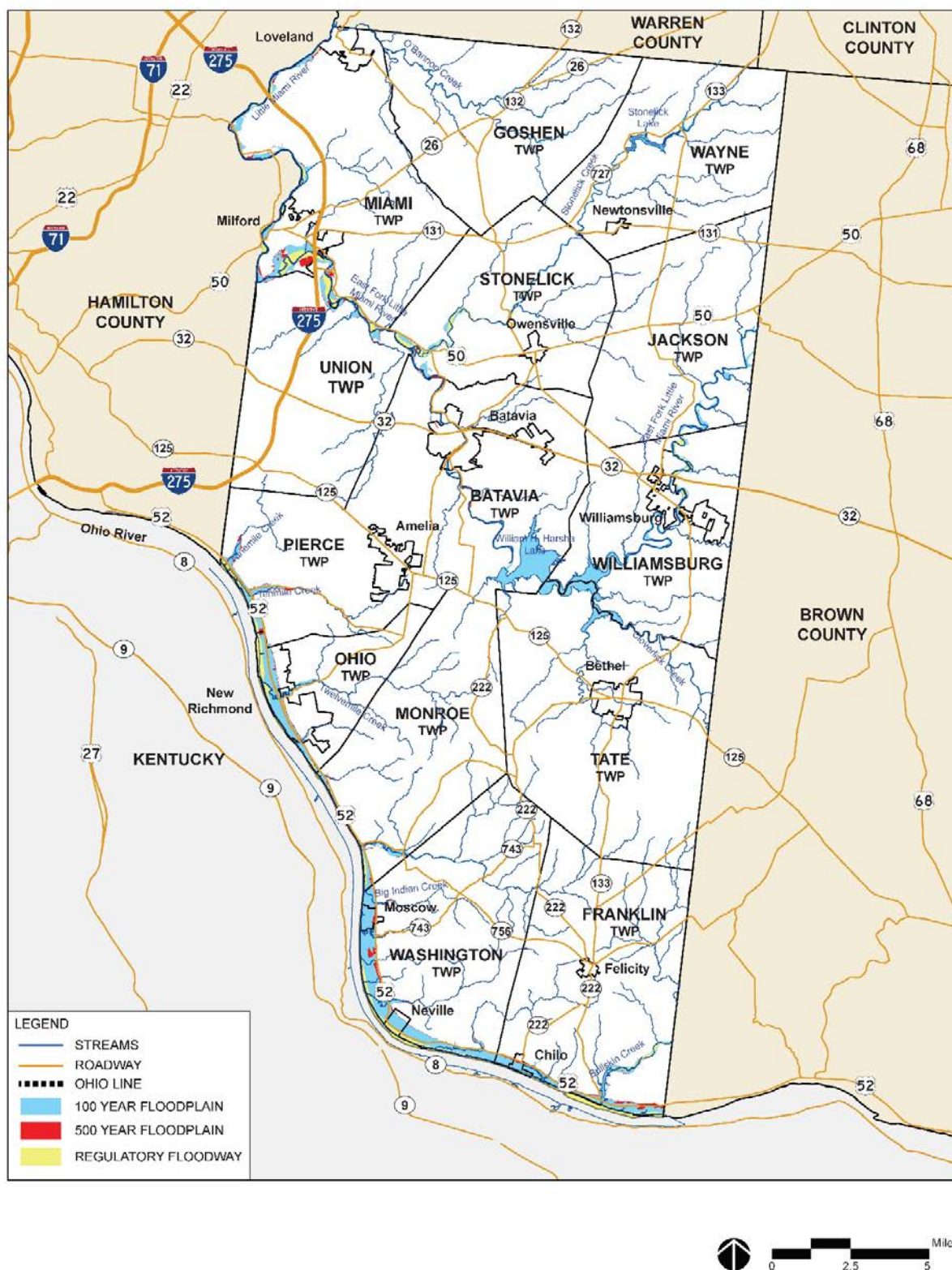
#### 4.3.3 Extent

Clermont County currently has 65 flood insurance maps. These were most recently updated in February 2010.

Clermont County has Special Purpose Flood Damage Reduction Regulations in effect. The purpose of this plan includes the protection of human life and health, minimizing the expenditure of public money for flood control projects, minimizing the need for rescue and relief efforts, minimizing prolonged business interruptions, minimizing the damage to public facilities and utilities, ensuring that those who occupy flood hazard areas assume responsibility, minimizing the impact of development on the natural and beneficial values of the floodplain, preventing floodplain uses that are hazardous or environmentally incompatible, and meeting the community participation requirements of the National Flood Insurance Program.



Figure 4.3.1: Flood Hazard Map



## 4 | HAZARD RISK ASSESSMENT

Clermont County, as well as eight communities within the County, participate in the NFIP. As of the current effective FEMA maps, there are four communities within the County that do not participate in the NFIP as they have been considered areas of “minimal flood hazard” according to FEMA. **Table 4.3.1** displays communities in Clermont County and their status of participation in the NFIP.

**Table 4.3.1: Community Participation in NFIP (Source: FEMA)**

Community	Init FHBM Identified	Init FIRM Identified	Current Effective Map Date	Reg-Emer Date	Tribal
Clermont County	12/02/1977	04/15/1981	03/16/2006	04/15/1981	No
City of Loveland	02/01/1974	09/01/1978	02/17/2010	09/01/1978	No
City of Milford	02/08/1974	01/16/1981	02/17/2010	01/16/1981	No
Amelia Village	Not included in NFIP, “Area of minimal flood hazard” (FEMA)				
Village of Batavia	05/07/1976	02/04/1981	03/16/2006	02/04/1981	No
Village of Bethel	Not included in NFIP, “Area of minimal flood hazard” (FEMA)				
Village of Chilo	11/02/1973	01/16/1981	03/16/2006	01/16/1981	No
Village of Felicity	Not included in NFIP, “Area of minimal flood hazard” (FEMA)				
Village of Moscow	02/08/1974	03/15/1977	03/16/2006	03/15/1977	No
Village of Neville	11/23/1973	09/29/1978	03/16/2006	09/29/1978	No
Village of New Richmond	03/01/1974	05/01/1979	03/16/2006	05/01/1979	No
Village of Newtonsville	Not included in NFIP, “Area of minimal flood hazard” (FEMA)				
Village of Owensville	Not included in NFIP, “Area of minimal flood hazard” (FEMA)				
Village of Williamsburg	03/29/1974	02/04/1981	03/16/2006	02/04/1981	No

**Table 4.3.2** shows the repetitive loss properties in Clermont County, Ohio. FEMA defines a repetitive loss property as an insurable building for which two or more claims of more than \$1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978. FEMA defines a severe repetitive loss property as a single family property that is covered under flood insurance by the NFIP and has incurred flood-related damage for which four or more separate claims payments have been paid under flood insurance coverage, with the amount of each claim payment exceeding \$5,000 and with cumulative amount of such claims payments exceeding \$20,000; or for which at least two separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property.

## 4 | HAZARD RISK ASSESSMENT

Table 4.3.2: Repetitive Loss Properties

Community Name	Occupancy	Zone *	Total Building Payment	Total Contents Payment	Losses	Total Paid	Average Pay
<i>Severe Repetitive Loss Properties</i>							
CLERMONT COUNTY	SINGLE FMLY	AE	\$33,297	\$0	4	\$33,297	\$8,324
NEW RICHMOND, VILLAGE OF	SINGLE FMLY	AE	\$175,843	\$12,100	5	\$187,943	\$37,589
<i>Repetitive Loss Properties</i>							
BATAVIA, VILLAGE OF	2-4 FAMILY	A	\$3,249	\$0	2	\$3,249	\$1,625
BATAVIA, VILLAGE OF	OTHER RESID	A	\$7,336	\$110	4	\$7,446	\$1,862
CLERMONT COUNTY	2-4 FAMILY	B	\$17,888	\$0	3	\$17,888	\$5,963
CLERMONT COUNTY	SINGLE FMLY	A14	\$15,823	\$620	2	\$16,443	\$8,221
CLERMONT COUNTY	SINGLE FMLY	X	\$22,397	\$16,208	2	\$38,605	\$19,303
CLERMONT COUNTY	SINGLE FMLY	B	\$38,843	\$6,018	2	\$44,860	\$22,430
CLERMONT COUNTY	SINGLE FMLY	AE	\$32,609	\$0	2	\$32,609	\$16,305
CLERMONT COUNTY	SINGLE FMLY	B	\$22,685	\$0	5	\$22,685	\$4,537
CLERMONT COUNTY	SINGLE FMLY	B	\$30,936	\$11,642	2	\$42,578	\$21,289
CLERMONT COUNTY	SINGLE FMLY	AE	\$43,084	\$10,000	2	\$53,084	\$26,542
CLERMONT COUNTY	SINGLE FMLY	A	\$4,369	\$3,500	2	\$7,869	\$3,935
CLERMONT COUNTY	SINGLE FMLY	AE	\$71	\$2,933	2	\$3,005	\$1,502
CLERMONT COUNTY	OTHR-NONRES	C	\$113,452	\$214,518	2	\$327,970	\$163,985
LOVELAND, CITY OF	SINGLE FMLY	A14	\$2,179	\$4,998	2	\$7,177	\$3,589
LOVELAND, CITY OF	OTHER RESID	X	\$10,268	\$0	2	\$10,268	\$5,134
LOVELAND, CITY OF	ASSMD CONDO	A14	\$29,966	\$5,117	3	\$35,084	\$11,695
LOVELAND, CITY OF	SINGLE FMLY	AE	\$12,261	\$235	3	\$12,496	\$4,165
NEW RICHMOND, VILLAGE OF	BUSI-NONRES	AE	\$155,568	\$0	3	\$155,568	\$51,856

## 4 | HAZARD RISK ASSESSMENT

Community Name	Occupancy	Zone *	Total Building Payment	Total Contents Payment	Losses	Total Paid	Average Pay
NEW RICHMOND, VILLAGE OF	SINGLE FMLY	AE	\$27,512	\$0	2	\$27,512	\$13,756
NEW RICHMOND, VILLAGE OF	SINGLE FMLY	EMG	\$5,078	\$865	2	\$5,943	\$2,972
NEW RICHMOND, VILLAGE OF	SINGLE FMLY	A21	\$21,651	\$0	3	\$21,651	\$7,217
NEW RICHMOND, VILLAGE OF	SINGLE FMLY	AE	\$46,434	\$0	7	\$46,434	\$6,633
NEW RICHMOND, VILLAGE OF	SINGLE FMLY	AE	\$11,073	\$0	2	\$11,073	\$5,536
NEW RICHMOND, VILLAGE OF	OTHR-NONRES	EMG	\$20,857	\$43,273	2	\$64,129	\$32,065
NEW RICHMOND, VILLAGE OF	SINGLE FMLY	C	\$11,086	\$6,126	2	\$17,212	\$8,606
NEW RICHMOND, VILLAGE OF	SINGLE FMLY	A21	\$8,300	\$9,912	2	\$18,212	\$9,106
NEW RICHMOND, VILLAGE OF	SINGLE FMLY	A21	\$44,427	\$0	4	\$44,427	\$11,107
NEW RICHMOND, VILLAGE OF	OTHR-NONRES	EMG	\$0	\$17,173	2	\$17,173	\$8,587
NEW RICHMOND, VILLAGE OF	SINGLE FMLY	A	\$15,278	\$0	2	\$15,278	\$7,639
NEW RICHMOND, VILLAGE OF	SINGLE FMLY	AE	\$48,208	\$0	3	\$48,208	\$16,069
WILLIAMSBURG, VILLAGE OF	ASSMD CONDO	A	\$91,782	\$591,897	3	\$683,679	\$227,893

\*Zone Types:

- 100-Year Floods: A=special flood hazard area (SFHA), no base flood elevation provided; A14/21=SFHA, base flood elevation provided; AE=SFHA, base flood elevation provided (newer designation); B=area of moderate flood hazard, base flood of little hazard
- 500-Year Floods: C=area of minimal flood hazard, X=area of minimal flood hazard (newer designation)
- EMG=Emergency Program (initial phase of participation in NFIP without flood hazard information)

### 4.3.4 History

There have been 68 flash floods recorded since 1996, as well as 48 floods. There is also record of an impactful flood in 1937. Floods since 1996 have caused two deaths and \$4.1 million in property damage; for flash floods, there have been no recorded deaths or injuries but there have been property damages totaling \$2.3 million. The following historic flooding events are selected to illustrate the most severe floods since 1996 based on fatalities and property damage. Additionally, the most recent flood in Clermont County is included. Episode narratives were provided by the National Climatic Data Center (NCDC) at the National Oceanic and Atmospheric Administration (NOAA). For descriptions of all recorded flood events, see **Appendix A**.

#### ***Milford, Ohio Flooding on June 8, 2018***

Scattered thunderstorms developed ahead of an upper level disturbance in a moist and unstable air mass. Some of the storms produce torrential rainfall with amounts as high as four to five inches. High water was covering the road along US-50 near Milford Parkway. Water was over the road near the intersection of SR-131 and US-50. Some minor debris was deposited on the road.

#### ***Cedron, Ohio Flooding on June 9, 2010***

Heavy rain allowed for Bullskin Creek in Franklin Township to rise. Two boys, ages 8 and 11, were killed when they were swept away in the rising water after they went to look at the high water (Source: NCDC).

#### ***Countywide Flooding on March 2, 1997***

Heavy rainfall occurred across Southern Ohio, including Clermont County, and Northern Kentucky on March 1-2, 1997 with areas along the Ohio River receiving up to 12 inches of rainfall. The River rose rapidly reaching a crest of 59.8 feet at Portsmouth at 10:00 PM on March 4, 1997. Flood stage is 50.0 feet. Further downstream at Meldahl Dam, the River crested at 61.3 feet at 7:00 PM on March 6, 1997. Flood stage is 51.0 feet. In Cincinnati, the River crested at 64.7 feet at 11:00 PM on March 5, 1997. Many towns were flooded from Portsmouth to Cincinnati and thousands of people were

#### ***Countywide Flooding on January 23, 1996***

By January 23, 1996 many tributaries to the Ohio River had already crested and were receding back within their banks; however, a significant rain event occurred on January 23, 1996, bringing over two inches of rain to South Central areas with lesser amounts to the north. Many tributaries were pushed back into flood on January 23, 1996, and the flood crest moved downstream on the Ohio River. While most tributaries only experienced minor to moderate flooding, backwater flooding from the Ohio resulted in major flooding along some of the tributaries. The Little Miami River was flooded particularly bad just east of Cincinnati. Evacuations took place near the confluence of the Ohio and Little Miami Rivers on January 24, 1996 as the Ohio River crest travelled through Cincinnati. Cincinnati eventually crested during the evening of January 24, 1996 at 57.3 feet, while flood stage is 52 feet. This was the highest crest in Cincinnati since March 1979 (Source: NCDC)

### 4.3.5 Probability

There were 48 floods listed on the National Climatic Data Center's records for Clermont County between the years 1996 to 2018, or a 22-year period, which averages to two flood events occurring per year. On average, annual flooding events amounted to over \$186,090 in property damage. The data showed that some years had as many as seven floods while other years had no floods in the National Climatic Data Center's records. Clermont County has also experienced 68 flash floods since 1996, or approximately three flash flood events every year. On average, annual flash flooding events amounted to over \$104,136 in property damage.



### 4.3.6 Vulnerability Assessment

#### *Infrastructure Impact*

Floods can impact roadways, including interstates and state routes by blocking them due to high water or by filling them with debris. In a 100-year flood scenario, damages to potable water, wastewater, electric power, and communications facilities could be as high as \$2 million.

#### *Population Impact*

Flood models in Hazus indicate that 1,200 people from 422 households could be displaced by a flood at the 100-year flood level. In addition, there are an estimated 50 people who would be seeking short term shelter after a 100-year flood event.

#### *Property Damage*

Due to the potential for countywide flash flooding, all structures within the County may suffer damage from floods or flash floods. The damages to all repetitive loss properties in the County are caused by flooding. There were more than \$4 million in property damage from the flood events on record. **Table 4.3.3** shows a summary of losses for repetitive loss properties and severe repetitive loss properties by occupancy type.

**Table 4.3.3: Table of Repetitive Loss Properties by Occupancy Type**

Jurisdiction	Total Number of Properties	Single Family Residential	Multi-Family Residential	Non-Residential	Total Payments
<i>Severe Repetitive Loss Properties</i>					
Clermont County	1	1	0	0	\$33,297.40
New Richmond, Village of	1	1	0	0	\$187,943.10
<i>Repetitive Loss Properties</i>					
Clermont County	11	9	1	1	\$607,595.75
Batavia, Village of	2	0	2	0	\$10,695.00
Loveland, City of	4	2	2	0	\$65,025.41
New Richmond, Village of	13	10	0	3	\$492,818.71
Williamsburg, Village of	1	0	1	0	\$683,678.76

A future 100-year flood exposes \$43 million in property values. Damages to buildings, contents, and inventories could result in as much as \$15 million in damages and losses. Twenty percent of exposed buildings and 33 percent of exposed contents are estimated to be lost or damaged by a 100-year flood. The use facing the most potential damage is single family residential properties, which could suffer as much as \$2 million in damages. Government services could lose as much as \$5 million in building contents. **Table 4.3.4** displays the Building-Related Economic Loss Estimates for a 100-year flood.

## 4 | HAZARD RISK ASSESSMENT

**Table 4.3.4: Building-Related Economic Loss Estimates for 100-Year Flood (Hazus Level 2) (Millions of Dollars)**

Area	Residential	Commercial	Industrial	Others	Total
<i><b>Building Loss</b></i>					
Number of Buildings	89,161	3,460	469	13,503	105,817
Building	\$36.42	\$28.17	\$5.56	\$1.51	\$71.65
Content	\$20.74	\$54.44	\$10.97	\$6.46	\$92.61
Inventory	\$0.00	\$0.81	\$1.44	\$0.15	\$2.40
<b>Subtotal</b>	<b>\$57.16</b>	<b>\$83.41</b>	<b>\$17.96</b>	<b>\$8.13</b>	<b>\$166.66</b>
<i><b>Business Interruption</b></i>					
Income	\$0.92	\$48.19	\$0.23	\$1.79	\$51.12
Relocation	\$6.05	\$11.00	\$0.29	\$0.40	\$17.73
Rental Income	\$3.46	\$8.30	\$0.04	\$0.05	\$11.86
Wage	\$2.17	\$32.43	\$0.41	\$7.28	\$42.29
<b>Subtotal</b>	<b>\$12.59</b>	<b>\$99.92</b>	<b>\$0.98</b>	<b>\$9.52</b>	<b>\$123.01</b>
<b>Total</b>	<b>\$69.75</b>	<b>\$183.33</b>	<b>\$18.94</b>	<b>\$17.65</b>	<b>\$289.66</b>

***Repetitive Loss Properties:*** Repetitive loss properties (and severe repetitive loss properties) can strain the National Flood Insurance Fund, reducing financial preparedness for catastrophic events. Because of this, FEMA attempts to eliminate or reduce these properties through federal and state programs and policies.

***Structures within 100-Year Floodplain:*** Using parcel data from Clermont County with a Hazus analysis indicated that there were an estimated 95 buildings that will be at least moderately damaged by a 100-year flood.

### ***Loss of Life***

There is potential for flooding to create serious conditions that may lead to loss of life. Floods in Clermont County have caused two deaths since 1996. Both deaths occurred in one event.

### ***Economic Losses***

Floods can halt economic activity, block roadways, and destroy agricultural crops. Contents in manufacturing, agriculture, high technology institutes, and medical institutes can also be destroyed. Crop losses are expected from a 100-year flood. **Table 4.3.5** breaks down losses over time for each crop.

**Table 4.3.5: Crop Loss Estimates for 100-Year Flood (Hazus Level 2) (Millions of Dollars)**

Crop	Day 1 Loss	Day 3 Loss	Day 7 Loss	Day 14 Loss	Max Total
Corn	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Corn Silage	\$0.00	\$107.29	\$143.06	\$143.06	\$143.06
Soybeans	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Wheat	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Wheat, Winter	\$0.00	\$268.09	\$357.46	\$357.46	\$357.46
<b>Total</b>	<b>\$0.00</b>	<b>\$375.39</b>	<b>\$500.52</b>	<b>\$500.52</b>	<b>\$500.52</b>

### **4.3.7 Land Use and Development Trends**

Flash floods can occur anywhere and are especially likely in highly developed areas. Any development that has occurred since the previous plan and any new development has a chance to be impacted by flash flooding. Floods are limited to floodplains and flood-prone areas. Clermont County maintains Flood Plain Regulations in compliance with the National Floodplain Insurance Program per FEMA requirements. Any development that occurs within flood plains is likely to be flooded.

There are 1,413 more structures within the FEMA defined floodplain as compared to the 2014 All Hazards Mitigation Plan Update.

### 4.4 Utility/Power Failure

#### 4.4.1 Description

Clermont County is concerned with electrical blackouts as a hazard to the County. Utility failure refers to the loss of electric power (blackouts), water, sewage, natural gas, or other utilities. These are primarily caused by system overload or lack of updated infrastructure. Power failures are generally caused by natural events, such as severe storms, ice storms, tornadoes, and high winds. These power failures are common and are not easily mitigated due to the random nature of storms. However, the infrastructure can be updated to reduce the amount and frequency of these power outages (2012 Clermont County All-Hazards Mitigation Plan).

#### 4.4.2 Location

Depending on the cause, blackouts can be isolated or countywide. There are two electric providers in the County: Duke Energy and the Ohio Valley Electric Corp. Natural gas is provided by Duke Energy, Auxier Gas, Lykins Oil Co., Ferrelgas, and Rich Energy. Utility failures can occur in any area where the utility is provided.

#### 4.4.3 Extent

Utility failures due to damaged infrastructure have the potential to impact large areas of the County through the loss of utilities that provide necessary services for the population. Loss of electric or gas can affect household temperatures, which can lead to severe dehydration or possibility to loss of life if outdoor temperatures are extreme. Additionally, utility failure affecting the water service has the potential to lead to contamination of the water supply. Some properties in Clermont County are dependent on electrical power for other types of utilities, including water from cisterns and wells. During a power failure, those properties may need to be given priority for electrical power restoration.

#### 4.4.4 History

The County has a record of one Utility Failure event occurring January 1-19, 2018. During this event, the County lost telephone service to Administration, Heritage, Corcoran, and Carriage House buildings. Service was restored on January 19, 2018.

While the County has not experienced any power outages from non-natural hazard events beyond the one utility failure above, parts of Ohio have experienced blackouts. The Cleveland area, for instance, has experienced two blackouts in 2003 and 2009. In 2003, the blackout was caused by the deteriorating system and transmission lines, as well as mismanaged computer systems. Lines could not support the overload. In 2009, lightning struck a power plant, which stopped pumping water. Approximately 1.5 million people lost power as a result.

#### 4.4.5 Probability

The County has a record of one utility failure in the last year. As there were no previous indications that a widespread utility failure had occurred, it is likely that utility failures in the form of power outages will occur throughout any given year due to severe storms, ice storms, and other natural hazards. Probability of these natural hazards can be found in their respective sections.

#### 4.4.6 Vulnerability Assessment

##### *Infrastructure Impact*

In the event of a utility failure caused by downed power lines, roads may be closed. Utility infrastructure may also suffer long-term damage as a result of such an event.

### ***Population Impact***

Extensive utility failures can threaten the health and safety of the public. During extreme temperature events, the impacts on residents are heightened. Loss of utilities that provide air conditional or heat can create a safety hazard, especially for children and older populations. The County and/or communities should have a plan in place for how to notify and assist residents in case of utility failure.

### ***Property Damage***

Direct property damage may result from downed power lines directly. Fires may also occur because of downed power lines.

### ***Loss of Life***

Loss of life from the loss of electricity can occur. Those who depend on electricity for necessary medical treatment are at risk. Critical facilities such as hospitals and nursing homes should be prepared in the event of a utility failure, as they manage sensitive populations that may be reliant on utilities. Downed power lines can also lead unsafe environments with live electric lines that have the potential to lead to loss of life.

Vulnerable populations may also be at risk during long-term utility failures, such as those with medical needs at home or those who are vulnerable to cold exposure.

### ***Economic Losses***

Blackouts are often caused by systems that are aging and deteriorating, and updates to these systems may require additional funds. Economic loss can occur because of reduced commercial activity. Goods that need electricity or other utilities for preservation may also be lost. If widespread blackouts occur, people may not be able to work, and wages or income may be lost as a result.

### **4.4.7 Land Use and Development Trends**

Utility failure can impact any development. All development that has occurred since the previous plan and all development in the future can be impacted by utility failure. There are 16,920 more residential properties and 3,062 more non-residential properties across the County, as compared to the 2014 All Hazards Plan Update, that may be impacted by utility failure.

### 4.5 Hazardous Materials

#### 4.5.1 Description

According to the Ohio Environmental Protection Agency (EPA), hazardous materials can be defined in different ways depending on the law or regulation administered by the U.S. EPA, the Occupational Safety and Health Administration (OSHA), the U.S. 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 U.S. 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 U.S. 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.

The Ohio EPA indicates that there are five categories in which materials can be hazardous, including acute, chronic, fire, reactive, or sudden release of pressure. The NRC regulates materials that produce ionizing radiation, which includes by-product material and radioactive substances.

The Emergency Planning and Right to Know Act, or EPCRA, was passed as Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA), which requires a facility that processes, uses or stores extremely hazardous substances or hazardous substances as classified by the OSHA hazard communication standard. This is also codified in the Ohio Revised Code (ORC) Chapter 3750 and the Ohio Administrative Code Chapter 3750.

Clermont County has a Hazardous Materials Plan which outlines the mitigation, preparedness, response, and recovery actions to a hazardous materials spill or release. The plan was developed in accordance with Ohio Revised Code 3750.

#### 4.5.2 Location

Hazardous material spills can occur wherever hazardous materials are stored and during shipment to these facilities. The surrounding areas can also be impacted by these spills. As of 2018, Clermont County had record of 84 hazardous substance (HS) facilities in the County and 41 extremely hazardous substance (EHS) facilities (Source: Clermont County EMA, reported March 2019 for 2018 calendar year). Clermont County has a record of the location of these facilities, which can be made available upon request. Hazardous materials-related events are most likely to occur on roadways and active rail lines that serve as shipping routes and are used for commercial transportation and in any areas near HS facilities and or EHS facilities.

#### 4.5.3 Extent

The Ohio EPA keeps account of EHS facilities because they have a higher probability of spills due to the higher amounts of hazardous materials at their sites. Each potential hazardous material has varying levels of toxicity. The concentration of these materials should be measured in parts-per-million



to determine whether they present a threat. Many chemicals are safe at low amounts and low concentrations but can become dangerous and even toxic at high amounts and concentrations. Additionally, some chemicals can be flammable and can become more volatile when exposed to oxygen. In ground spills, untreated chemical and waste spills can contaminate the soil and drinking water, creating toxic environmental conditions. Corrosive, flammable, or explosive chemicals can create infrastructure damage depending on the location, amount spilled, and the circumstances of the incident. In worst-case scenarios, large spills can trigger evacuations of residents and close transportation routes used for hazardous materials transportation, which can also affect local residents.

### 4.5.4 History

Clermont County has recorded seven EHS spills between 1996 and 2018, which are reported in **Table 4.5.1** (Source: Ohio EPA). Clermont County has record of all reported hazardous materials spills since 1996, which the public can request through the Local Emergency Planning Committee (LEPC).

**Table 4.5.1: EHS Spills**

Reported Date	Location	Chemical	Quantity	EHS
12/29/2015	Batavia Township	Chlorine	Approx. 16 lbs	Yes
08/08/2013	Wayne Township	Aviation fuel / fungicide	Approx. 200 gal	Yes
08/19/2014	Pierce Township	#2 Diesel	9,000 gal	Yes
04/19/2009	Union Township	Copper 2 Phthalocyanine	20 gal	Yes
02/07/2009	N/A	Hydrazine 35% solution	< 200 gal	Yes
03/20/2007	N/A	Sulfuric Acid	190 gal	Yes
04/07/1998	Monroe Township	Ammonia	100 lbs	Yes
05/15/1996	Batavia Township	Xylene	50 gal	Yes
01/28/1996	Pierce Township	Sulphur Trioxide	Unknown	Yes

### 4.5.5 Probability

Due to the random and unpredictable nature of hazardous materials accidents, specific probabilities of occurrence are not reported for this hazard. Due to their unpredictable nature, hazardous materials spills should be considered to have a somewhat likely chance of occurring.

### 4.5.6 Vulnerability Assessment

A hazard vulnerability analysis has been completed for each EHS facility as part of Clermont County's Hazardous Materials Plan.

### ***Infrastructure Impact***

Roadways, waterways, and ground water may be impact by hazardous materials spills. Road closures may occur as a direct or indirect result of hazardous materials spills.

### ***Population Impact***

The local population may be directly exposed to hazardous materials. If a large spill occurs, some residents may need to be evacuated and given shelter elsewhere.

### ***Property Damage***

Depending on the chemical, property damage is likely. The properties most likely to be damaged are those that are located near EHS facilities and roadways and active rail lines that serve as shipping routes and are used for commercial transportation.

### ***Loss of Life***

While some hazardous materials can be toxic, loss of life from hazardous materials spills are unlikely, but not impossible.

### ***Economic Losses***

Economic losses can occur from the loss of hazardous materials that may be needed in manufacturing or for other processes. Road closures may lead to slowed commerce, and businesses impacted by hazardous materials spills may suffer property damage, damage to goods, or be required to close.

## **4.5.7 Land Use and Development Trends**

Development that has occurred since the previous plan and any future development near hazard materials storage facilities may be impacted by hazardous materials spills. The 2014 All Hazards Mitigation Plan Update does not quantify the number of structures that are at risk to hazardous materials spills.

### 4.6 Winter Storms

#### 4.6.1 Description

Winter storms are events that have snow, sleet, or freezing rain as their primary type of precipitation. While the precipitation itself is typically not dangerous, frozen roads and exposure to cold can cause death and injury. A winter storm forms under the right combination of three causes:

- **Cold Air:** Below freezing temperatures in the clouds and near the ground are necessary to make snow and/or ice.
- **Lift:** Atmospheric lift to raise the moist air into the clouds and cause precipitation. This is often a result of warm air colliding with cold air, which pushes the warm air over the cold dome, creating a “front”. Air flowing up a mountainside is another example of a lift.
- **Moisture:** Moisture forms clouds and precipitation. Air blowing across a body of water, such as a large lake or ocean, is a common source of moisture.

There are four categories of winter storms:

1. **Blizzards:** Blizzards are generated by a combination of blowing snow and winds over 35 MPH, which together result in low visibility of one quarter mile or less for at least three hours. Heavy snowfalls often accompany blizzards but are not required. At times, strong winds can pick up snow that has already fallen, creating a ground blizzard.
2. **Ice Storms:** Ice storms result when at least 0.25 inches of ice accumulates on exposed surfaces. The ice creates hazardous driving and walking conditions, and tree branches and powerlines can easily snap under the weight of the ice.
3. **Lake Effect Storms:** Lake Effect Storms form when a cold, dry air mass moves over the Great Lakes region and air picks up significant moisture from the Great Lakes. The moisture-laden air typically deposits the water as snow in areas to the south and east of the Lakes.
4. **Snow Squalls:** Snow squalls are brief, intense snow showers accompanied by strong, gusty winds. During a snow squall, large amounts of snow may accumulate.

Winter storms may result in a variety of precipitation, including snow, sleet, and freezing rain. There are five different types of snow that may fall, including snow flurries, snow showers, snow squalls, blowing snow, and blizzards. Precipitation falls as snow when the air temperature remains below freezing throughout the atmosphere. Sleet falls when snowflakes partially melt as they fall and then refreeze before they reach the ground. Freezing rain falls when snowflakes melt completely before reaching the surface and refreeze upon contact with anything that is at or below freezing temperature (0°C or 32°F).

Cloud patterns and the movement of winter storms can be tracked using satellite, and radar can be used to track the motion of precipitation and to determine what types of precipitation are falling. Doppler radar can also show the wind direction.

#### 4.6.2 Location

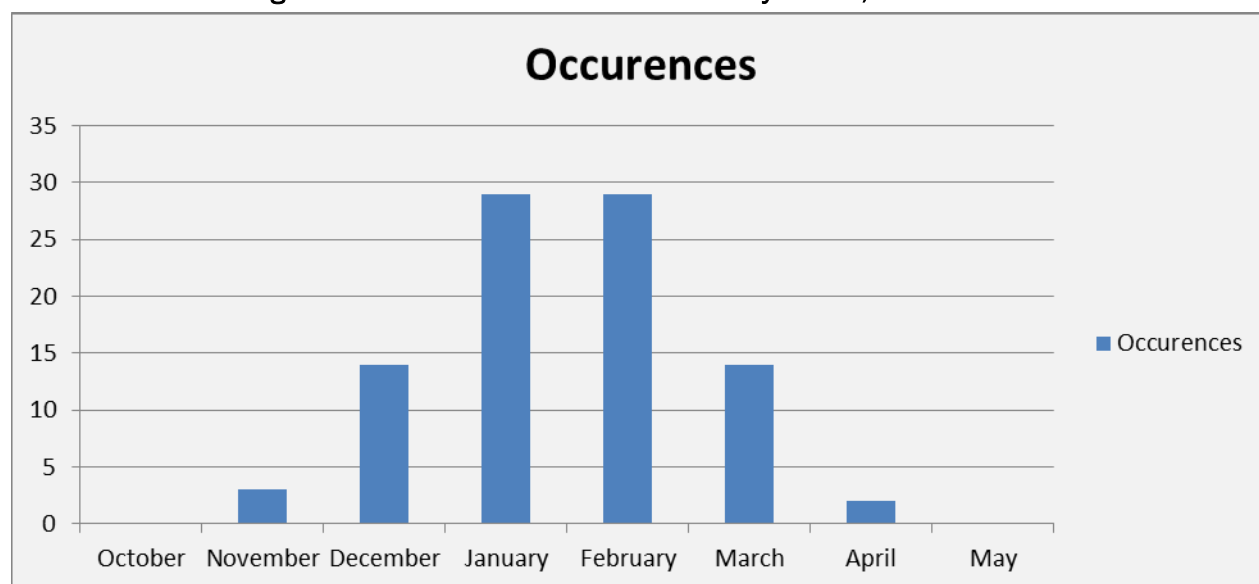
Winter storms are typically large events that will impact the entire County and have the potential to impact multiple counties.

### 4.6.3 Extent

Heavy snow has the potential to severely impact operations in the County by stranding commuters, closing airports, stopping the flow of supplies, and disrupting emergency and medical services. Accumulation of snow can cause roofs to collapse and knock down trees and power lines. Exposure to the cold for extended periods of time may cause frostbite or hypothermia (see **Extreme Temperatures** for more details on extreme cold as a hazard to Clermont County).

According to data collected from NOAA, Clermont County experiences most winter storms, including ice storms, heavy snow, and winter weather, in January and February. Since 1996, 29 winter storm events have been recorded in both January and February, while only 14 winter storms have been documented in both December and March (**Figure 4.6.1**, below). Accordingly, 31.9 percent of winter storm events occurred in January, 31.9 percent of winter storm events occurred in February, 15.4 percent of winter storm events occurred in both December and March, 3.3 percent of winter storm events occurred in November, and 2.2 percent of winter storm events occurred in April. Winter weather has not been recorded in May through October of these years, which is why they are excluded from **Figure 4.6.1** below.

**Figure 4.6.1: Winter Storm Occurrences by Month, 1996-2018**



### 4.6.4 History

Clermont County has recorded 91 winter storm events since 1996, which is the earliest date on record with NOAA. Some of these winter storms were large enough to impact multiple areas in the State. These events include ice storms, heavy snow, and winter weather. Within Clermont County, these storms caused \$500,000 in property damages, one fatality, and one injury. There were no reported crop damages.

The winter storms described below are the events for which Federal Disaster Declarations were filed in Clermont County. A summary of winter storm events by type of event is included at the end (**Table 4.6.1**). The remaining storms on record can be found in **Appendix A**.

### ***March 7-9, 2008***

Federal Emergency Number EM-3286: A record severe snowstorm hit Clermont County and 16 other counties in Ohio. Clermont County received \$124,386 in funds for expenses incurred from snow removal.

### ***December 22, 2004 – February 1, 2005***

Federal Disaster Number DR-1580: Clermont County received \$278,285 in Public Assistance from a large snowstorm. The snowstorm left more than 20 inches of snow in some areas and then was followed by unseasonable warmer temperatures in January 2005, which caused flooding and mudslides. 62 counties were included the federal list of declared counties. Approximately 3,700 private structures were damaged or destroyed throughout Ohio. The estimated damage occurring statewide from this event was \$780,900.

### ***February 14 – March 15, 2003***

Federal Disaster Number DR-1453: Significant Winter Storm drops about four inches of snow in Clermont County. Multiple counties received Public Assistance through FEMA.

**Table 4.6.1** provides a summary of damage, deaths, and injuries that resulted from the winter storm, heavy snow, ice storm, and winter weather events in Clermont County since 1996.

**Table 4.6.1: Summary of Winter Events in Clermont County by Event Type**

Event Type	Number of Events	Property Damage	Crop Damage	Deaths	Injuries
Winter Storm	35	\$500,000	\$0	0	0
Heavy Snow	11	\$1,000	\$0	0	0
Ice Storm	6	\$0	\$0	1	1
Winter Weather	45	\$0	\$0	0	0
<b>Total</b>	<b>97</b>	<b>\$501,000</b>	<b>\$0</b>	<b>1</b>	<b>1</b>

### **4.6.5 Probability**

Since 1996, there have been a total of 97 winter storm events, including winter storms, heavy snow, ice storms, and winter weather. This averages to four to five events annually with annual property damages of \$22,773. Like other events, there are years with more than the average and years with no reported winter storms.

### **4.6.6 Vulnerability Assessment**

#### ***Infrastructure Impact***

Similar to severe storms, critical facilities and other infrastructure can be impacted most directly by winter storms through power outages. Critical facilities for which power is crucial (i.e. hospitals, nursing homes, etc.) can be greatly impacted by winter storms and precautions must be taken for the provision of emergency generators. Additionally, roads and sidewalks may be covered by snow and ice in these events, creating dangerous driving and walking conditions. Utility outages may result from heavy winds, freezing temperatures, and accumulation of heavy snow and ice on utility lines.

### *Population Impact*

According to the American Community Survey's 2017 population estimates, the population of Clermont County is approximately 204,214. All residents of Marion County are expected to be impacted by severe winter storms. In addition, the risk of vehicle crashes becomes high during such events due to slippery, ice-covered roads, poor visibility, or deep snow accumulation. Motorists should avoid travel unless absolutely necessary during such winter weather conditions.

### *Property Damage*

Winter storms have the potential to damage property. Accumulation of heavy snow and ice can cause damage to roofs, even causing roofs to collapse, and tree limbs can fall onto personal property. Extreme low temperatures associated with winter storms can also freeze the water in pipes which could cause them to explode. All buildings in the County are exposed and vulnerable to winter storms.

NOAA has recorded a total of \$501,000 in property damage as a result of winter storm events since 1996. Only one event has resulted in a significant cost in property damage since 1996. As a result, the average annual property damage cost is \$22,773. Due to the non-site-specific nature of this hazard, all structures within Clermont County are potentially impacted by Winter Storms, so **Table 4.6.2** lists the numbers and costs of all structures within Clermont County.

**Table 4.6.2: Structure Vulnerability due to Winter Storms (Source: Clermont County)**

Structure Type	Number	Value of Vulnerable Structures		
		Building	Land	Total
Residential	79,609	\$2,672,123,490	\$856,164,310	\$3,528,287,800
Non-Residential	16,783	\$932,290,820	\$376,870,880	\$1,309,161,700
Critical Facilities	3,041	\$299,480,190	\$100,246,570	\$399,726,760
<b>Total</b>	<b>99,433</b>	<b>\$3,903,894,500</b>	<b>\$1,333,281,760</b>	<b>\$5,237,176,260</b>

### *Loss of Life*

Loss of life related to winter storm events can be attributed to dangerous conditions that are generated by the severe weather. These conditions include icy roads that create dangerous driving conditions, heavy snow that requires exertion to clear via shoveling, and prolonged exposure to cold which can cause hypothermia (Source: NOAA). A total of one death and one injury have been reported in direct association with winter storm events in Clermont County; however, there may also be indirect deaths that occur from winter storms that are not reported.

### *Economic Losses*

Economic losses can occur from businesses shutting down for potentially long periods of time. Economic activity can be completely halted during winter storms, including transportation of goods. Electricity outages may lead to spoiled goods. Since winter storms occur during the winter season, damages to crops are unlikely.

## **4.6.7 Land Use and Development Trends**

Winter storms can occur anywhere. Any development that has occurred since that previous plan and any future development has the potential to be impacted by winter storms. There are 16,920 more residential properties and 3,062 more non-residential properties across the County as compared to the 2014 All Hazards Plan Update.



### 4.7 Landslides

#### 4.7.1 Description

The Ohio Department of Natural Resources (ODNR) defines a landslide as a general term for a range of downslope movements of earth materials. While some of these slides occur rapidly (within seconds), others can take several hours, weeks, or longer to develop. The ODNR Division of Geological Survey indicates that there are three main types of landslides:

1. **Rotational Slump:** This type of landslide is characterized by the movement of a mass of weak rock or sediment as a block unit along a curved slip plane. The slumps generated by this type of landslide are the largest in Ohio, with a rotational slump often involving hundreds of thousands of cubic yards of material and extending for hundreds of feet. This type of landslide develops slowly relative to other landslides and commonly require several months or even years to reach stability. Occasionally, they may move more rapidly and achieve stability in a few hours.
2. **Earthflow:** This type of landslide is the most common in Ohio and are often small in size relative to the rotational slump. An earthflow typically moves a weathered mass of rock or sediment downslope as a collective mass which forms an irregular topography of ridges or swales. An earthflow moves slowly relative to other landslides.
3. **Rockfall:** This type of landslide occurs rapidly when large blocks of massive bedrock suddenly detach from a cliff or steep hillside and travel downslope in free fall or a rolling, bounding, or sliding manner until a position of stability is achieved.

Landslides are often caused by one or more of the following conditions:

1. Steep Slopes
2. Jointed Rocks
3. Fine-grained, permeable rock or sediment
4. Clay or shale units subject to lubrication
5. Large amounts of water

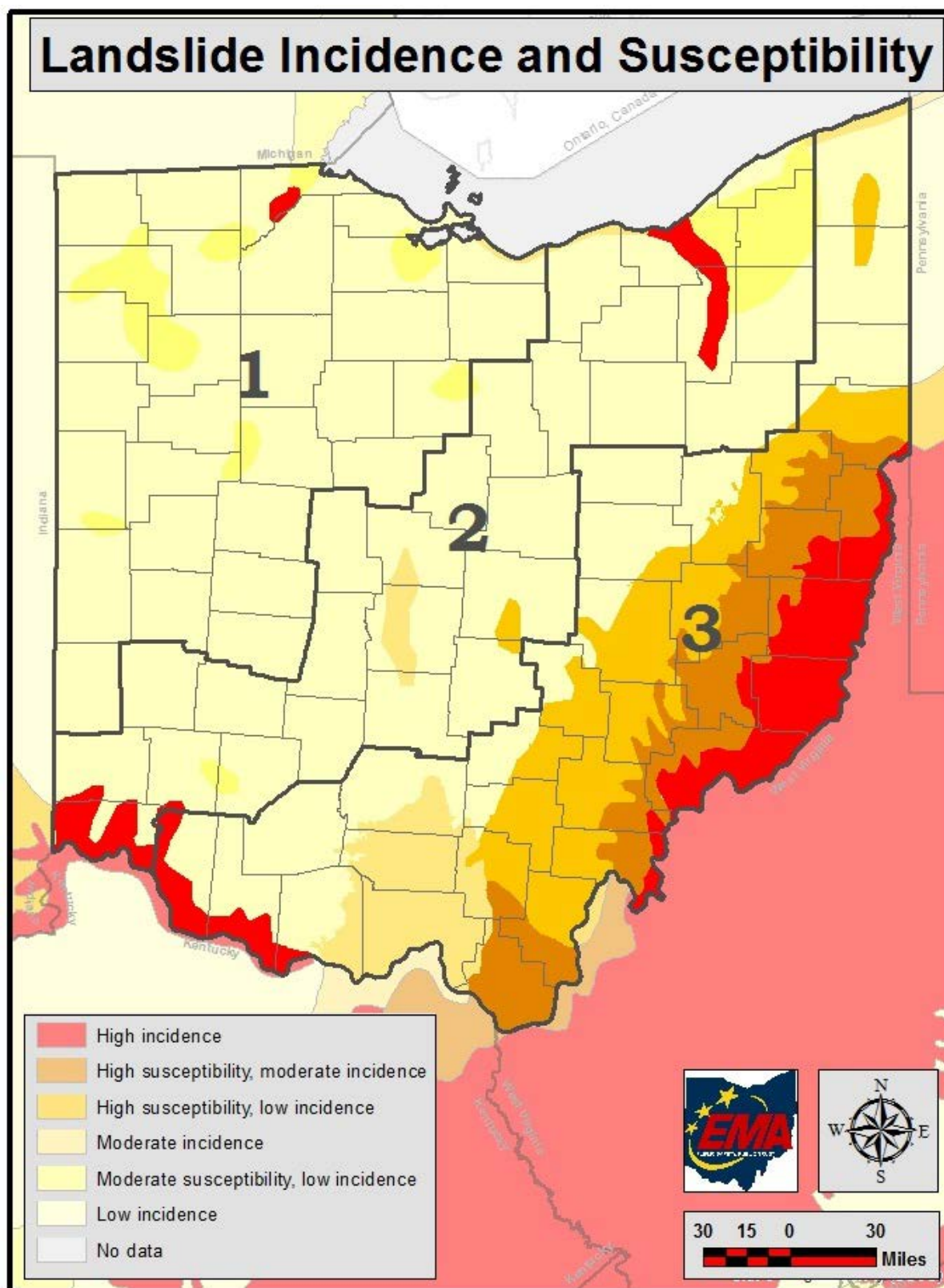
Although an area might possess one or more of the above conditions, landslides require a trigger that will initiate the downslope movement of the soil. The list of triggers includes both human and natural caused events such as vibrations, over-steepened slopes, increased weight on a slope, and removal of vegetation and trees.

#### 4.7.2 Location

According to the ODNR, landslides are a significant problem in many areas of Ohio, including the Cincinnati area, which has one of the highest per-capita costs due to landslide damage of any city in the United States.

The State of Ohio Enhanced Hazard Mitigation Plan (2019) provided a Landslide Incidence and Susceptibility Map, shown below in **Figure 4.7.1**. This map shows that the southern and western areas of Clermont County exhibit a high landslide incidence (shown in red) compared to the rest of the State. While these areas have a high landslide incidence, the remainder of the central and northeastern areas of the County have a low landslide incidence.

Figure 4.7.1: State of Ohio Landslide Incidence and Susceptibility Map (Source: Ohio EMA)



### 4.7.3 Extent

Severity of landslides is measured by a combination of loss of life, property and other infrastructure damage. Landslides have the potential to damage roadways, buildings, and other infrastructure throughout the County. Rockfalls can constitute a major hazard along Ohio roadways, posing a risk to life, property, and traffic safety. There is also potential for a chain reaction initiated by a landslide that can cause greater impacts.

### 4.7.4 History

According to the previous County Mitigation Plan, there have been six reported and repaired landslides in Clermont County (most dates not provided). The following provides a list of past road landslides that have been reported and repaired in Clermont County:

#### ***Felicity Cedron Slide***

This landslide was 300 feet in length and cost \$125,900 to repair. The landslide was repaired using drilled shafts into bedrock.

#### ***Nine Mile Slide***

This landslide was 400 feet in length and cost \$168,200 to repair. The landslide was repaired using drilled shafts and a “t-wall”.

#### ***Benton Road Slide***

This landslide was 300 feet in length and cost \$240,600 to repair. The repair was performed using drilled shafts into bedrock.

#### ***Clermontville Laurel Slide***

This landslide was 400 feet in length and cost \$459,000 to repair. The landslide was repaired using drilled shafts into bedrock on both the uphill and downhill sides.

#### ***Clermontville Laurel Slide***

This landslide occurred north of Boat Run in 2011.

In addition, there has been one recent recorded landslide in Clermont County:

#### ***2018 Flood Landslide***

According to the Clermont County Engineer’s Office, no action has been taken to address this landslide. Cost estimates and repair methods have not been determined.

Lastly, according to the State of Ohio Enhanced Hazard Mitigation Plan (2019), the Ohio Department of Transportation (ODOT) recorded landslide-related events that are currently impacting the State’s highway system. **Figure 4.7.2** shows the moderately and highly rated landslide inventory, and **Figure 4.7.3** shows the rockfall inventory. According to this information, Clermont has recorded 39 landslides and 48 rockfall events that have affected the highway system.

Figure 4.7.2: State of Ohio Total Geohazards Landslide Inventory (Source: Ohio EMA)



OHIO DEPARTMENT OF  
TRANSPORTATION

Total Geohazards:  
Landslide Inventory

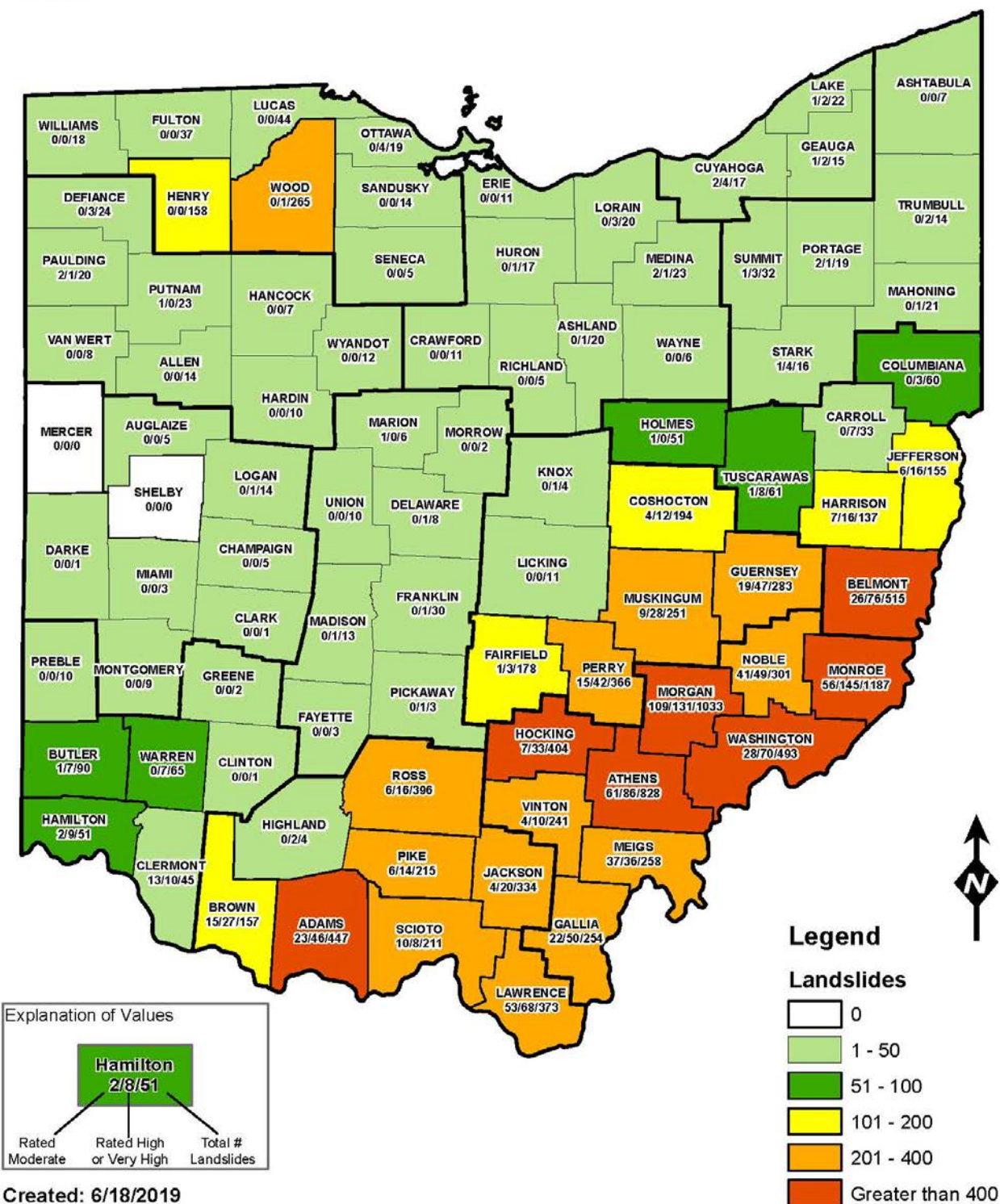


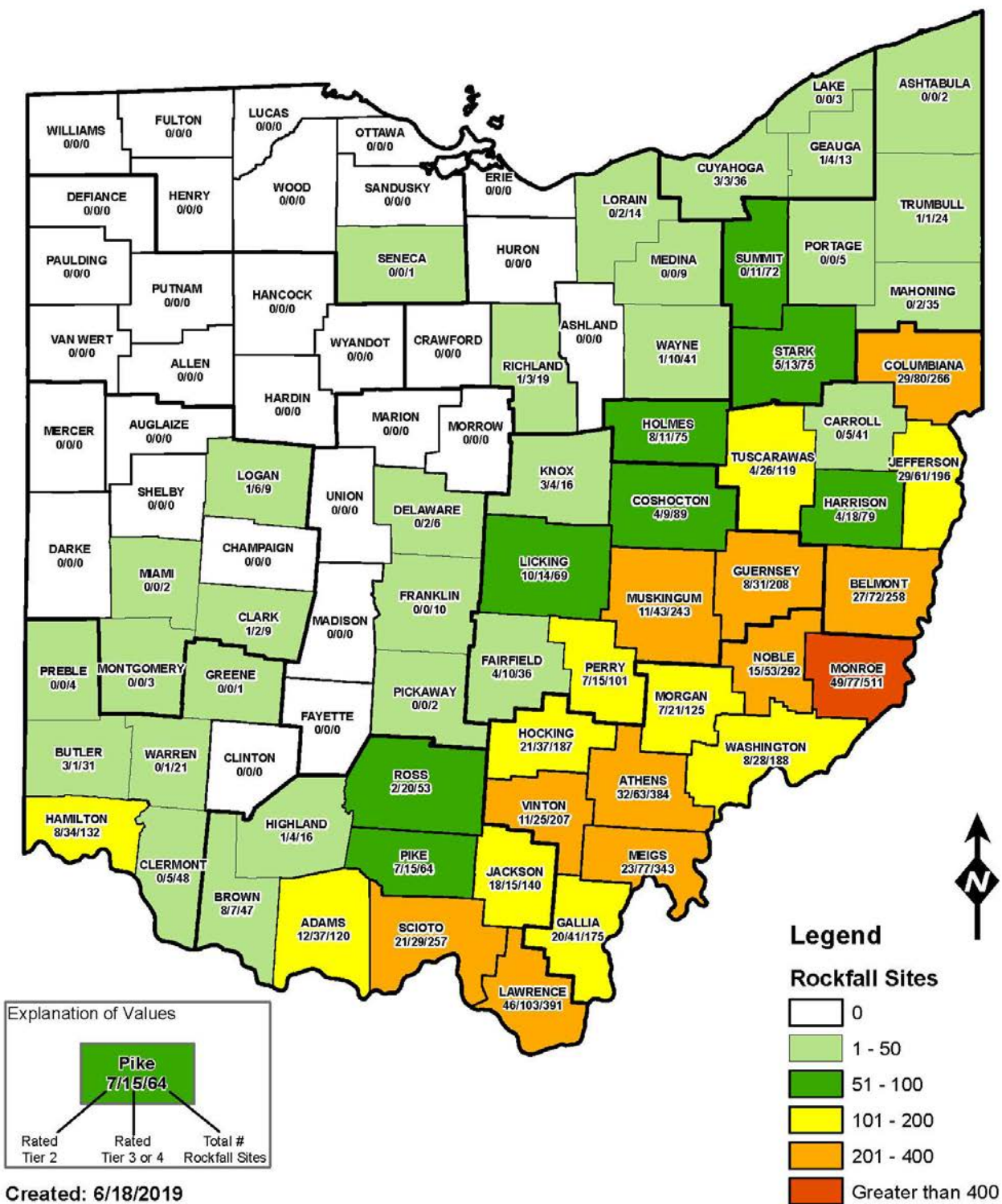


Figure 4.7.3: State of Ohio Total Geohazards Rockfall Inventory (Source: Ohio EMA)



OHIO DEPARTMENT OF  
TRANSPORTATION

Total Geohazards:  
Rockfall Inventory





### 4.7.5 Probability

The Clermont County Engineer's Office and the Ohio Department of Transportation (ODOT) fix landslides every year that affect Clermont County's infrastructure. The Clermont County 2014 All-Natural Hazards Mitigation Plan indicated that together they repair an average of five landslides annually at an average cost of \$250,000 each. This results in an estimated annual infrastructure repair cost of \$1.25 million.

### 4.7.6 Vulnerability Assessment

#### *Infrastructure Impact*

Landslides have the potential to significantly impact infrastructure in Clermont County. Specifically, landslides could have a major impact on County roadways. These impacts can cause minor injuries and potentially close roadways for emergency repair. The total estimated loss for state-owned facilities is \$1,166,732 (Table 4.7.1).

**Table 4.7.1: Potential for Loss to Structures due to Landslide in Clermont County (Source: Ohio EMA)**

<b>Average Structure Value:</b>	\$116,673
<b>Total Estimated Loss:</b>	\$1,166,732

#### *Population Impact*

Since the most common type of landslide in Ohio is the slow-moving Earthflow landslide, the immediate impact to the population is low. However, due to the destructive potential of a landslide, site specific evacuations might be required if the landslides are near structures. The greatest potential impact to the population is the sudden transportation facility impacts. These impacts can either cut off evacuation routes or cause crashes on roadways.

#### *Property Damage*

According to the Ohio EMA, there is high potential for property damage to individual property due to landslides in Clermont County. As mentioned above and indicated in Table 4.7.1, there is a total estimated property damage value of \$1,166,732.

In addition, according to the State of Ohio Enhanced Hazard Mitigation Plan (2019), there are 23 critical facilities in Clermont County that are located in high incidence areas and are exposed to risk from landslides with a total replacement value of \$3.7 million.

#### *Loss of Life*

Since the most common type of landslide in Ohio is the slow-moving Earthflow landslide, the immediate impact to the population and risk of death is low.

#### *Economic Losses*

In 2011, the Ohio EMA estimated the average structural value in Clermont County to be \$116,673. This figure combined with the High potential for loss meant the Ohio EMA estimated Clermont County's total loss due to Landslides to be \$1,166,732. The Ohio EMA estimates the region within which Clermont County is located (Region 3) has the highest potential losses in the State.

### 4.7.7 Land Use and Development Trends

Landslides are more likely to occur in areas with steep slopes. Development that has occurred since the previous plan near steep slopes is at risk for landslides. Any new development built near steep slopes is also at risk. Future land use plans should take slope into consideration. According to the 2019 State of Ohio Hazard Mitigation Plan, there are 23 exposed structures in Clermont County, 13 more properties as compared to the 2014 All Hazards Mitigation Plan Update.

### 4.8 Dam Failure

#### 4.8.1 Description

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

Dams can fail for one or a combination of the following reasons:

- Overtopping caused by floods that exceed the capacity of the dam
- Structural failure of materials used in dam construction
- Movement and/or failure of the foundation supporting the dam
- Settle and cracking of concrete or embankment dams
- Inadequate maintenance and upkeep
- Deliberate acts of sabotage

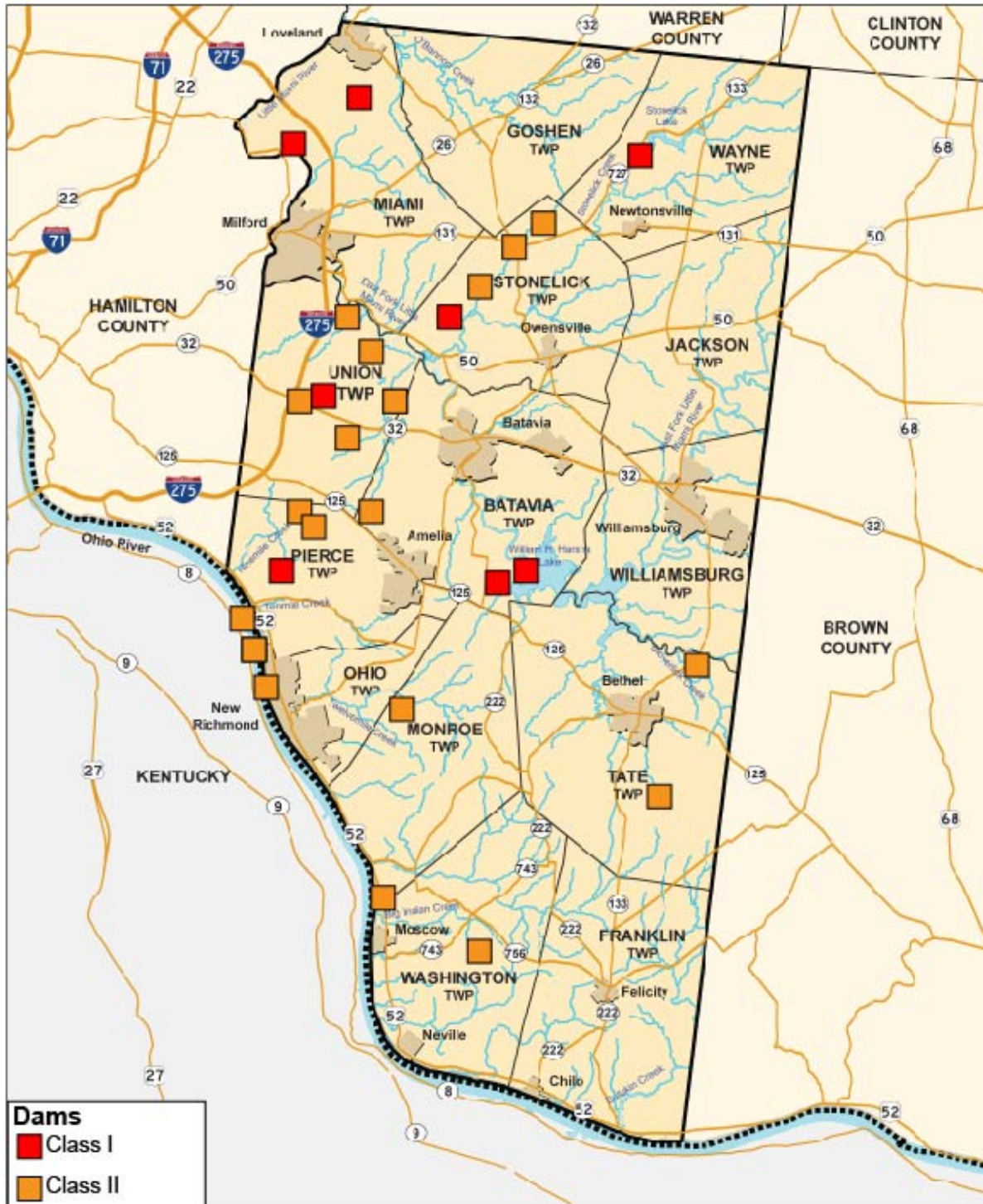
According to Ohio Administrative Code Rule 1501:21-13-01 (2010), dams are classified as either Class I-IV dams based on the following criteria:

- Class I: Dams having a total storage volume greater than 5,000 acre-feet or a height of greater than 60 feet.
- Class II: Dams having a total storage volume greater than 500 acre-feet or a height of greater than 40 feet.
- Class III: Dams having a total storage volume greater than 50 acre-feet or a height of greater than 25 feet.
- Class IV: Dams having a total storage volume of 50 acre-feet or less and a height of 25 feet or less.

#### 4.8.2 Location

The locations of Class I and Class II dams, as registered with the Ohio Department of Natural Resources (ODNR), throughout Clermont County can be seen on the map in **Figure 4.8.1**, below. These dams are also listed in **Table 4.8.1**.

**Figure 4.8.1: Location of Clermont County Dams**



## 4 | HAZARD RISK ASSESSMENT

Table 4.8.1: Clermont County Dam Inventory (Source: ODNR)

Class	Name	Stream	Owner Type	Drainage (Acres)	Township	EAP (as of 10/2018)
I	Equinus (Legendary Run) Lake Dam	Tributary to Ninemile Creek	Private	109	Pierce	Approved 1/31/02
I	Willowbrook Lake Dam	Tributary to Salt Run	Private, Assn.	13	Union	Approved 8/25/06
I	William H. Harsha Lake Dam	East Fork Little Miami River	Public, Federal	218,880	Batavia	No
I	Clermont Golf Limited Lake Dam	Bares Run	Private	220	Miami	Approved 11/17/98
I	East Fork Lake Saddle Dam	East Fork Little Miami River - Offstream	Public, Federal	N/A	Batavia	No
I	Stonelick Lake Dam	Stonelick Creek	Public, State	14,656	Wayne	Approved 1/5/11
I	Galley Hill Lake Dam	Tributary to Stonelick Creek	Private	38	Stonelick	Approved 9/24/18
I	Marge Schott Lake Dam	Tributary to The Little Miami	Private	166	Miami	Approved 2/1/02
II	Fugate Lake Dam	Tributary to Poplar Creek	Private	24	Tate	No
II	Glen Ridge Lake Dam	Tributary to Salt Run	Private, Assn.	348	Union	No
II	Glen Willow Lake Dam	Tributary to Shayler Run	Industrial	195	Union	No
II	Royal Oak Golf Course Pond No. 1 Dam	Tributary to Ninemile Creek	Private	120	Pierce	Approved 9/27/10
II	Royal Oak Golf Course Pond No. 2 Dam	Tributary to Ninemile Creek	Private	85	Pierce	Approved 9/27/10

## 4 | HAZARD RISK ASSESSMENT

Class	Name	Stream	Owner Type	Drainage (Acres)	Township	EAP (as of 10/2018)
II	Sedimentation Pond No. 1 Dam	Tributary to Little Indian Creek	Utility	165	Washington	No
II	Bristol Lake Dam	Shayler Run	Private	118	Batavia	No
II	Zimmer Waste Water Pond Complex Dam	Ohio River - Offstream	Utility	15	Monroe	No
II	Beckjord Ash Pond C Dam	Ohio River - Offstream	Utility	103	Pierce	Approved 1/6/17
II	Beckjord Ash Pond C Ext. Dam	Ohio River - Offstream	Utility	58	Ohio	Approved 1/6/17
II	Powell Crosly Lake Dam	Tributary to Salt Run	Private, Assn.	35	Union	No
II	Lower East Fork Equalization Basin	Little Miami River East Fork	Public, Local	2.7	Miami	No
II	Hamilton County Anglers Lake Dam	Tributary to Shayler Run	Private	185	Union	No
II	Wiemeyer Lake Dam	Tributary to Lick Fork	Private	19	Stonelick	No
II	Strader Lake Dam	Tributary to Ferguson Run	Private	205	Monroe	No
III	Sugar Hill Gun Club Lake Dam	Tributary to Indian Creek	Private	470	Tate	No
III	Bethel Upground Reservoir No. 2	Cloverlick Creek - Offstream	Public, Local	10.9	Tate	No
III	Catman Blues Fishing Lake Llc	Tributary to Twelvemile Creek	Private	107	Monroe	No
III	White Lake Dam	Tributary to Tenmile Creek	Private	102	Pierce	No
III	Locust Lake Dam	Tributary to Tenmile Creek	Private	60	Pierce	No



## 4 | HAZARD RISK ASSESSMENT

Class	Name	Stream	Owner Type	Drainage (Acres)	Township	EAP (as of 10/2018)
III	Ravines of Eastgate Dam	Unnamed Tributary to Shayler Run	Private, Assn.	512	Union	Approved 8/7/95
III	Clermont Northeastern Schools Lake Dam	Tributary to Brushy Fork	Public, Local	13	Stonelick	No
III	Hidden Hill Lake Dam	Twelvemile Creek	Private	787	Monroe	No
III	Zf Batavia Retention Basin Dam	Tributary to Fourmile Run	Industrial	237	Batavia	No
III	Owensville Lake Dam	Tributary to East Fork Little Miami River	Private	157	Stonelick	No
III	Bethel Upground Reservoir No. 1	Cloverlick Creek - Offstream	Public, Local	5.5	Tate	No
III	Rouster Lake Dam	Tributary to Lick Fork	Private	301	Stonelick	Approved 2/14/14
III	Wiemeyer Pond Dam	Tributary to Lick Fork	Private	27	Stonelick	No
III	Branjarzak Lake Dam	Tributary to Lick Fork	Private	58	Stonelick	No
IV	Clark Lake Dam	Tributary to Bear Creek	Private	25	Franklin	No
IV	Nickell Lake Dam	Tributary to Indian Creek	Private	25	Franklin	No
IV	Swope Lake Dam	Tributary to Bear Creek	Private	15	Franklin	No
IV	Hunter Lake Dam	Tributary to East Fork Little Miami River	Private	13	Williamsburg	No
IV	Williamsburg Reservoir	Offstream	Public, Local	6	Williamsburg	No

## 4 | HAZARD RISK ASSESSMENT

Class	Name	Stream	Owner Type	Drainage (Acres)	Township	EAP (as of 10/2018)
IV	Mims Lake Dam	Trimble Run	Private	70	Williamsburg	No
IV	Lake O' The Woods Dam	Tributary to Barnes Run	Private	50	Williamsburg	No
IV	Neal Lake Dam	Tributary to Todd Run	Private	24	Williamsburg	No
IV	Unknown	Tributary to East Fork Little Miami River	N/A	139	Miami	No
IV	Unknown	Tributary to Indian Creek	N/A	60	Franklin	No
IV	Damms Lake Dam	Tributary to East Fork Little Miami River	Private	172	Batavia	No
IV	Sprague Lake Dam	Tributary to Fourmile Run	Private	106	Batavia	No
IV	Sky Hill Lake Dam	Tributary to Lucy Run	Private	15	Batavia	No
IV	Trautmann Lake Dam	Tributary to East Fork Little Miami River	Private	50	Batavia	No
IV	Keeler Lake Dam	Tributary to Little Miami River	Private	12	Miami	No
IV	Bethel Low Head Dam	Cloverlick Creek	Public, Local	10440	Tate	No
IV	Kerr Lake Dam	Tributary to Twelvemile Creek	Private	79	Monroe	No
IV	Stevens Lake Dam	Tributary to North Fork	Private	17	Monroe	No
IV	Unknown	Tributary to Salt Run	N/A	20	Union	No

## 4 | HAZARD RISK ASSESSMENT

Class	Name	Stream	Owner Type	Drainage (Acres)	Township	EAP (as of 10/2018)
IV	Unknown	Tributary to Stonelick Creek	Private	155	Stonelick	No
IV	Koenig Lake Dam	Tributary to Bares Run	Private	25	Miami	No
IV	Edwards Lake Dam	Tributary to O'bannon Creek	Private	35	Goshen	No
IV	Unknown	Tributary to Stonelick Creek	N/A	90	Wayne	No
OTHER	Glassmeyer Lake Dam	Bear Creek	Private	16	Franklin	No
OTHER	Unknown	Tributary to Bear Creek	N/A	N/A	Franklin	No
OTHER	Galbraith Lake Dam	Tributary to Ohio River	Private	N/A	Franklin	No
OTHER	Equinus Golf Club Lake Dam	Tributary to Ninemile Creek	Private	13	Pierce	No
OTHER	Unknown	Tributary to Ninemile Creek	N/A	10	Pierce	No
OTHER	Taylor Lake Dam	Tributary to Guest Run	Private	83	Tate	No
OTHER	Hauserman Lake Dam	Tributary to Indian Creek	Private	16	Franklin	No
OTHER	Unknown	Tributary to Sugartree Creek	N/A	13	Tate	No
OTHER	Dela Palma Fishing Lake Dam	Tributary to East Fork Little Miami River	Private	64	Williamsburg	No

## 4 | HAZARD RISK ASSESSMENT

Class	Name	Stream	Owner Type	Drainage (Acres)	Township	EAP (as of 10/2018)
OTHER	Salter Lake Dam	Tributary to Slabcamp Run	Private	50	Batavia	No
OTHER	Unnamed Lake Dam	Tributary to East Fork Little Miami River	Public, Federal	8	Williamsburg	No
OTHER	Ohio Valley Egg Cooperative Lake Dam	Tributary to East Fork Little Miami River	Private	70	Williamsburg	No
OTHER	Retention Pond Dam	N/A	Public, Local	N/A	Cincinnati	No
OTHER	All Star Pond Dam	Tributary to Little Miami River	N/A	N/A	Williamsburg	No
OTHER	Red R Lake Dam	Tributary to Lick Fork	Private	30	Miami	No
OTHER	Belfast Fishing Lake No. 1 Dam	Tributary to Stonelick Creek	Private	72	Stonelick	No
OTHER	Brothers Lake Dam	Unnamed Trib Of Bear Creek	Private	45	Washington	No
OTHER	Unknown	Tributary to Poplar Creek	N/A	N/A	Tate	No
OTHER	Unknown	Tributary to Poplar Creek	N/A	N/A	Tate	No
OTHER	Unknown	Tributary to Indian Creek	N/A	45	Tate	No
OTHER	Unknown	Tributary to Indian Creek	N/A	20	Tate	No
OTHER	Berlier Lake Dam	Tributary to Sugartree Creek	Private	5	Tate	No

## 4 | HAZARD RISK ASSESSMENT

Class	Name	Stream	Owner Type	Drainage (Acres)	Township	EAP (as of 10/2018)
OTHER	Unknown	Tributary to Town Run	N/A	N/A	Tate	No
OTHER	Kluba Lake Dam	Tributary to Lucy Run	Private	30	Batavia	No
OTHER	Sunset Lake Dam	Tributary to Back Run	Private	48	Batavia	No
OTHER	Poe Lake Dam	Tributary to Bares Run	Private	12.5	Miami	No
OTHER	Halcyon Lake Dam	Tributary to Little Miami River	Private	70	Miami	No
OTHER	Mulberry Hills Pond Dam	Tributary to Horner Run	Private	30	Miami	No
OTHER	Frances Lake Dam	Tributary to Horner Run	Private	10	Miami	No
OTHER	Riebel Lake Dam	Tributary to Fagin Run	Private	10	Ohio	No
OTHER	Unknown	Tributary to Twelvemile Creek	N/A	N/A	Monroe	No
OTHER	Holscher Lake Dam	Tributary to Twelvemile Creek	Private	10	Monroe	No
OTHER	O'neil Pond Dam	N/A	Private	N/A	Ohio	No
OTHER	Batavia Water Supply Reservoir Dam	East Fork Little Miami River	Public, Local	N/A	Batavia	No
OTHER	Unknown	Tributary to Back Run	N/A	N/A	Batavia	No
OTHER	Unknown	Tributary to Back Run	N/A	N/A	Monroe	No
OTHER	Amelia Park Detention Basin	Tributary to Lucy Run	Private	N/A	Amelia Village	No

## 4 | HAZARD RISK ASSESSMENT

Class	Name	Stream	Owner Type	Drainage (Acres)	Township	EAP (as of 10/2018)
OTHER	Brewer Lake Dam	Tributary to Little Miami River	Private	13	Miami	No
OTHER	Grail Lake Dam	Tributary to Bares Run	Private	30	Miami	No
OTHER	Pringle Lake Dam	Tributary to Stonelick Creek	Private	8	Wayne	No
OTHER	Terra Aqua Lake Dam	Greenbush Creek	Private	1037	Wayne	No
OTHER	Littell Lake Dam	Tributary to O'bannon Creek	Private	35	Goshen	No
OTHER	Standring Lake Dam	Tributary to Patterson Run	Private	20	Jackson	No
OTHER	Captain Anthony Meldahl Locks and Dam	Ohio River	Public, Federal	N/A	N/A	No
OTHER	Cedar Lake Dam	Tributary to O'bannon Creek	Private	N/A	Goshen	No
OTHER	Belfast Fishing Lake No. 2 Dam	Tributary to Stonelick Creek	Private	90	Stonelick	No
OTHER	Mitchell Farm Pond Dam	Tributary to O'bannon Creek	Private	2509	Miami	No
OTHER	Unnamed Lake Dam	Tributary to Poplar Creek	Public, Federal	40	Tate	No
OTHER	Fish Hatchery Dam	Tributary to East Fork Little Miami River	Private	N/A	Batavia	No
OTHER	Sedimentation Pond No. 2 Dam	N/A	Utility	N/A	Washington	No



## 4 | HAZARD RISK ASSESSMENT

Class	Name	Stream	Owner Type	Drainage (Acres)	Township	EAP (as of 10/2018)
OTHER	Scott Lake Dam	Tributary to Indian Creek	Private	0	Franklin	No
OTHER	Hood Lake Dam	Tributary to Indian Creek	Private	40	Tate	No
OTHER	Unnamed Lake Dam	Tributary to Town Run	N/A	0	Tate	No
OTHER	Lake Allyn Dam	Tributary to Shayler Run	Private	492	Batavia	No
OTHER	Brashear Lake Dam	Tributary to Sugartree Creek	Private	175	Tate	No
OTHER	Wuerdeman Lakes Dam (Lower)	Tributary to Shayler Run	Private	189	Union	No
OTHER	Wuerdeman Lakes Dam (Upper)	Tributary to Shayler Run	Private	158	Union	No
OTHER	Heritage Lake Dam	Rocky Run	Private, Assn.	2150	Stonelick	No
OTHER	Unnamed Lake Dam	Tributary to O'bannon Creek	N/A	0	Goshen	No
OTHER	Lake Monterey Dam	Tributary to Brushy Fork	Private	466	Jackson	No
OTHER	Woodcreek Lake Dam	Tributary to Horner Run	Private, Assn.	28	Miami	No
OTHER	Bradley Pond Dam	Tributary to Stonelick Creek	Private	122	Stonelick	Approved 2/8/12
OTHER	Lake Cast-A-Line Dam	Tributary to Little Miami River	Private	17	Miami	No

In addition, based on drainage basin maps provided by the ODNR Department of Water Resources, there are 37 Class I dams located in surrounding counties that have the potential to create problems downstream in Clermont County in the event of dam failure. More specifically, **Table 4.8.2** includes details on the number of Class I dams located within nearby Counties that would drain into Clermont

County, according to the ODNR. Failure of these dams could create dangerous conditions within Clermont County.

**Table 4.8.2: Number of Class I Dams within Clermont County's Drainage Basin, by County**

County	Number of Dams in Drainage Basin
Hamilton	8
Butler	2
Warren	6
Green	3
Clinton	8
Brown	3
Adams	3
Scioto	4
<b>Total</b>	<b>37</b>

There is one levy located in Clermont County. This levy is currently decommissioned and will be completely decommissioned within three to five years. Failure of this levy could cause debris (coal ash) to slide onto US-52 or slide into the embankment toward the Ohio River. No structures would be impacted by a levy failure.

### 4.8.3 Extent

As previously mentioned, Class I dams have a total storage volume greater than 5,000 acre-feet or a height of greater than 60 feet. According to Chapter 1501:21-13 of the Ohio Revised Code, sudden failures of Class I dams would increase the probability that one of the following conditions would result:

- Loss of human life
- Structural collapse of at least one residence or one commercial or industrial business

Sudden failures of Class II dams would result in at least one of the following conditions:

- Disruption of a public water supply or wastewater treatment facility, release of health hazardous industrial or commercial waste, or other health hazards.
- Flooding of residential, commercial, industrial, or publicly owned structures. At the request of the dam owner, the chief may exempt dams from the criterion of this paragraph if the dam owner owns the potentially affected property.
- Flooding of high-value property. At the request of the dam owner, the chief may exempt dams from the criterion of this paragraph if the dam owner owns the potentially affected property.
- Damage or disruption to major roads including but not limited to interstate and state highways, and the only access to residential or other critical areas such as hospitals, nursing homes, or correction facilities as determined by the chief.
- Damage or disruption to railroads or public utilities.
- Damage to downstream class I, II, or III dams or levees, or other dams or levees of high value. Damage to dams or levees can include, but is not limited to, overtopping of the structure. At

the request of the dam owner, the chief may exempt dams from the criterion of this paragraph if the dam owner owns the potentials affected property.

Sudden failures of Class III dams would result in at least one of the following conditions:

- Property losses including but not limited to rural buildings not otherwise described the Ohio Administrative Cod Rule 1501:21-12-01 (2010), and class IV dams and levees not otherwise listed as high-value properties in this rule. At the request of the dam owner, the chief may exempt dams from the criterion of this paragraph if the dam owner owns the potentially affected property.
- Damage or disruption to local roads including but not limited to roads not otherwise listed as major roads.

Sudden failures of class IV dams would result in property losses restricted mainly to the dam and rural lands, and the loss of human life is not probable.

### 4.8.4 History

According to the ODNR, White Lake Dam experienced a piping failure (internal erosion caused by seepage) in 2000. This is the only known dam failure event in Clermont County. There are no other reported dam failures in Clermont County.

### 4.8.5 Probability

With only one recorded dam failure in Clermont County, the probability of dam failure for the County is less than one percent. Future dam failures are unlikely, but not impossible.

### 4.8.6 Vulnerability Assessment

#### *Infrastructure Impact*

Dam failures could lead to flooded roadways, including interstates and state routes. Access roads could also be flooded. In Class I and II dam failures, wastewater treatment facilities and the public water supply could be disrupted.

#### *Population Impact*

According to the American Community Survey's 2017 population estimates, the population of Clermont County is approximately 204,214. To minimize the impact to the population, residents should be prepared for a safety plan in the event of a dam failure. It is possible that Class I and II dam failures may cause disruption to the public water supply. Health hazards may also be released into the flood waters during a dam failure which may cause indirect harm to the local population.

#### *Property Damage*

There is potential risk to high-valued properties, residential properties, commercial properties, and industrial properties. as well as publicly owned properties. Properties that are owned by the dam owner may be exempt from property damage calculations.

#### *Loss of Life*

Class I dam failures include probable loss of life. Loss of life is not likely in dam failures from the remaining classes.

### ***Economic Losses***

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

Emergency Action Plans (EAPs) have been completed for some of the dams, as shown in **Table 4.8.2**; however, the data is subjected to agreements where it cannot be published publicly. The Ohio Department of Natural Resources holds record of these EAPs.

### **4.8.7 Land Use and Development Trends**

Development has likely occurred in areas that will flood after a dam failure. Land use plans can limit development in these areas. There are 1,413 more structures within the FEMA defined floodplain as compared to the 2014 All Hazards Mitigation Plan Update.

### 4.9 Harmful & Invasive Species

#### 4.9.1 Description

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

#### 4.9.2 Location

Harmful species have the potential to be a County-wide hazard in Clermont County, potentially affecting all areas and jurisdictions.

The Asian Longhorn Beetle is currently impacting Tate Township, East Fork State Park, and portions of Stonelick and Batavia Townships. There are quarantines in effect in these areas.

#### 4.9.3 Extent

Clermont County is currently impacted by the Asian Longhorn Beetle (ALB) and the Emerald Ash Borer (EAB), both invasive species. Other harmful species with the potential for negative impacts include harmful algae blooms, kudzu, brown marmorated stink bugs, gypsy moths, and feral swine.

The Asian Longhorn Beetle (**Figure 4.9.1.**) lays eggs under the bark of hardwood trees. The larva feeds on the living tissue of the tree, limiting new growth. Larva are also capable of burrowing deeper into the tree where it can feed and grow throughout the winter season. Adults will emerge from the tree and feed on the leaves and mate. ALB adults can fly up to 400 yards in search of new host trees and have been seen from April to December. Signs of an ALB infestation appears between two and four years, with tree death occurring between ten and fifteen years. The ALB impacts maple, horse chestnut, mimosa, birch, hackberry, katsura, ash, golden raintree, sycamore, poplar, willow, mountain ash, and elm trees.

**Figure 4.9.1: Asian Longhorn Beetle**



The Emerald Ash Borer (**Figure 4.9.2**) is an invasive species that targets natural occurring and landscaped North American ash trees. The EAB is capable of eliminating an entire tree species from forests or urban environments. Native ash borers typically target weakened ash trees, but the EAB can impact healthy trees of any age. Adults typically emerge from infested wood and trees between late May and early August, with peak emergence in July. Larva hatch on the exterior of the tree and burrow in, feeding through summer and early fall. Tree death from the EAB can occur within two to four years.

**Figure 4.9.2: Emerald Ash Borer**



Harmful algae blooms (HAB) are toxic blooms that can occur on Lake Harsha and the Ohio River. HAB can negatively impact recreational and athletic water events. They can also be toxic for pets, livestock,



and sometimes humans. While many HAB are native to Ohio, their growth can be impacted by human activity. Not all algae blooms are harmful, and there is a way to test waters for HAB.

Kudzu (**Figure 4.9.3**) is a species of plant that can grow up to 60 feet in a year. This plant is originally from Asia but was brought to North America in the 1870s as an ornamental plant. Kudzu plants typically invade the forest edge or open fields, overtaking other types of vegetation which may be more desirable. The kudzu plant also supports the kudzu bug (**Figure 4.9.3**), which feeds on the kudzu plant but also feeds on soybeans, wisteria, beans, and other plants. While the kudzu plant has been found in Ohio, there are no reports of the kudzu bug.

**Figure 4.9.3: Kudzu Plant (left) and Kudzu Bug (right)**



**Figure 4.9.4:  
Brown Marmorated Stink Bug**

The Brown Marmorated Stink Bug (**Figure 4.9.4**) consumes numerous breeds of specialty crops, which include fruit crops and vegetable crops. Kentucky, Indiana, and Ohio are rated by the USDA as having Brown Marmorated Stink Bug levels at 'agricultural and nuisance problems.' However, nearby states such as West Virginia and Pennsylvania have levels at 'severe agricultural and nuisance problems.'



**Figure 4.9.5: Gypsy Moth**

The Gypsy Moth (**Figure 4.9.5**) is an invasive species first discovered in the Greater Cincinnati Region in June 2014. The Gypsy Moth defoliates trees, and can impact oak, spruce, hecklock, and other trees, with oak trees being the preferred hosts. Main infestation areas have been found and are targeted for eradication. However, there may still be satellite infestations that have not been identified.



Feral swine refers to the Eurasian Wild Boar and neglected domestic swine. While feral swine have not been reported in Clermont County, they have been reported nearby and may find their way into the county. Feral swine have wide-ranging impacts that include the destruction of soybean and corn crops, damage to soil quality and root strength through rooting, degradation to water quality through wallowing (Figure 4.9.6) 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.

Figure 4.9.6: Feral Swine Wallows



### 4.9.4 History

There were four reports of Brown Marmorated Stink Bug in Clermont County, all in September of 2017.

The Asian Longhorn Beetle is currently impacting Tate Township, East Fork State Park, and portions of Stonelick and Batavia townships. There are quarantines in effect in these areas. The Asian Longhorn Beetle had previously affected Monroe Township, but the township has since been released from quarantine.

Harmful Algae Blooms appeared in the Ohio River in 2015. Lake Harsha in East Fork State Park has had two occurrences of Harmful Algae Blooms in June of 2014 and June of 2016.

### 4.9.5 Probability

Invasive and harmful species have already impacted the County, with other species moving closer to Clermont County. The probability for future invasive and harmful species events is high.

### 4.9.6 Vulnerability Assessment

#### *Infrastructure Impact*

Harmful algae blooms may impact waterways, and publicly-maintained trees may be destroyed or impacted by various invasive species. There are no other likely infrastructure impacts due to harmful and invasive species.

#### *Population Impact*

Water quality has the potential to be impacted by feral swine and harmful algae blooms. Feral swine can introduce harmful bacteria into the water system, while harmful algae blooms are sometimes toxic. Harmful algae blooms can impact aquatic sporting events and recreational activities. There are no other likely impacts to the local population.

#### *Property Damage*

Property damage from harmful and invasive species is likely to occur on crops and landscaping but is limited in effect otherwise.

#### *Loss of Life*

Harmful algae blooms are toxic to humans, and feral swine can impact drinking water. However, loss of life is unlikely as a result of the harmful and invasive species discussed here.

### ***Economic Losses***

Economic impacts can vary greatly depending on the target and of the invasive species and their impacts on those targets. Agricultural crops are greatly impacted by many of the harmful species that are already in Clermont County or that are nearby with the potential to migrate into the County. According to the Ohio Annual Bulletin produced by the USDA's National Agricultural Statistics Service in September 2017, Clermont County's top crops are corn and soybeans. According to the 2012 Census on Agriculture, these commodities generated 20,703,000 and 29,389,000 cash receipts, respectively. The successful production of these crops can be impacted by the presence of the harmful and invasive species. Trees in natural growth or landscaped areas are also greatly impacted by harmful species. If a large number of trees are severely damaged or killed by various invasive species, there may be additional indirect economic losses. Examples include increased heating and cooling costs, reduced property value, and reduction in viable lumber for construction.

### **4.9.7 Land Use and Development Trends**

There are no likely impacts on development and land use due to invasive species.

### 4.10 Terrorism

#### 4.10.1 Description

Terrorism is defined as “the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives” (28 CFR, Section 0.85). Tools used to conduct acts of terrorism include Weapons of Mass Destruction (WMD); biological, chemical, nuclear, and radiological weapons; arson; incendiary, explosives; armed attacks; industrial sabotage; intentional hazardous materials release; and cyberterrorism.

The Federal Bureau of Investigations (FBI) produces an annual terrorism report, which contains profiles and chronologies of terrorism incidents in the United States. Terrorism can be both International and Domestic, where International Terrorism is defined as acts “perpetrated by individuals and/or groups inspired by or associated with designated foreign terrorist organizations or nations (state-sponsored)” (Source: FBI). The second is Domestic Terrorism, defined as acts “perpetrated by individuals and/or groups inspired by or associated with primarily U.S.-based movements that espouse extremist ideologies of a political, religious, social, racial, or environmental nature” (Source: FBI).

Types of terrorism include Cyberterrorism, Agroterrorism, Terrorism (Biological), and Terrorism (Chemical). Stakeholders have also requested discussion on Active Aggressors as a hazard, and so an assessment of Active Aggressors has also been included in this section, as they have the potential to incite terror. These types of terrorism are defined below:

- **Cyberterrorism:** Cyberterrorism is an electronic attack using one computer system against another, and attacks can be directed towards computers, networks, or entire systems. A cyber-attack may last minutes to days. Homeland Security, the FBI, and the FCC DOJ are often involved in developing countermeasures that focus on reducing the threat, vulnerability, and likelihood of attack.
- **Agroterrorism:** 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.
- **Biological Terrorism:** Biological terrorism includes use of bacteria, viruses, or toxins to incite terror. This mode of terrorism can last minutes to months.
- **Chemical Terrorism:** Chemical terrorism includes 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:** An 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.

#### 4.10.2 Location

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

### 4.10.3 Extent

The extent of each of these modes of terrorism includes:

- **Cyberterrorism:** Typically, the built environment is unaffected by a cyber-attack. Inadequate security can facilitate access to critical computer systems, allowing them to be used to conduct attacks.
- **Agroterrorism:** The extent of the effects varies by type of incident. Inadequate security can facilitate the adulteration of food and introduction of pests and disease agents to crops and livestock.
- **Biological Terrorism:** A biological attack could cause illness and even kill hundreds of thousands of people, overwhelm public health capabilities, and create significant economic, societal and political consequences. Public health infrastructure must be prepared to prevent illness and injury that would result from biological terrorism.
- **Chemical Terrorism:** Most chemical agents are capable of causing serious injuries or death, and their often rapid course of action means there is very little time to act when an act of chemical terrorism occurs. Public health infrastructure must be prepared to prevent illness and injury that would result from chemical terrorism.
- **Active Aggressor:** Active Aggressor incidents often occur in areas where a number of people gather regularly. This may be a place of employment, a neighborhood gathering area (church, recreational center, school, etc.), or other location.

Terrorist threats may also occur among school districts within the County. Threats can last several hours or event days and cause multiple problems such as disturbing a school's order, causing traffic jams, and inducing civil panic. Individuals, groups, and institutions should be aware of, and understand how to react to, such potential threats immediately and appropriately.

### 4.10.4 History

One active shooter event and other various cyber attacks have occurred in Clermont County, as described below.

#### *Cyber Attacks, Various*

Clermont County faces cyber-attacks on the County firewall regularly. Phishing attempts, scareware threats, and denial of service attacks on the County network have also occurred.

#### *Active Shooter in Pierce Township on February 2, 2019*

An active shooter barricaded himself on the evening of Saturday, February 2, 2019. During a 12-hour standoff with local law enforcement, one sheriff's deputy was killed and another was injured.

### 4.10.5 Probability

Cyber attacks are likely to continue occurring. Because there has been only one recorded active shooter event in Clermont County, future events are unlikely (less than one percent chance) but possible.

### 4.10.6 Vulnerability Assessment

#### *Infrastructure Impact*

Above ground structures such as government buildings, churches, libraries, and schools, as well as below-ground infrastructure such as natural gas pipelines, are at risk for terrorism damage. Acts of cyberterrorism have the potential to target systems that may influence or control infrastructure.



### ***Population Impact***

The population of Clermont County is likely to be impacted should an act of terror occur. It is important that public health organizations are prepared to prevent illness and injury that may result from acts of terror.

### ***Property Damage***

Since terrorism acts can occur anywhere within the County, property damage is a possible outcome of such an event. Agroterrorism may result in damage to crops, and an active aggressor situation may result in minimal property damage.

### ***Loss of Life***

Acts of terror are likely to result in loss of life. It is important that public health and healthcare organizations are prepared to act quickly should an act of terror occur.

### ***Economic Losses***

Since the probability of terrorism happening in Clermont County is very low, and there is less than a one percent chance of this type of hazard occurring in any given year, local terrorism-related economic losses are estimated at zero. However, terror attacks occurring in other locations have the potential to have economic impacts in Clermont County. Transportation networks, such as air transportation, can be shut down as a result of terrorism, impeding profits and resulting in economic losses to organizations in Clermont County. Any act of terror, nationwide, that results in a temporary freeze of goods or services has the potential to limit or suspend economic activity in Clermont County.

### **4.10.7 Land Use and Development Trends**

Terrorism can occur anywhere. Non-residential land uses are more likely to be targeted for terror events or active shooters. New schools and government buildings should have active shooter plans in place.

### 4.11 Extreme Temperatures

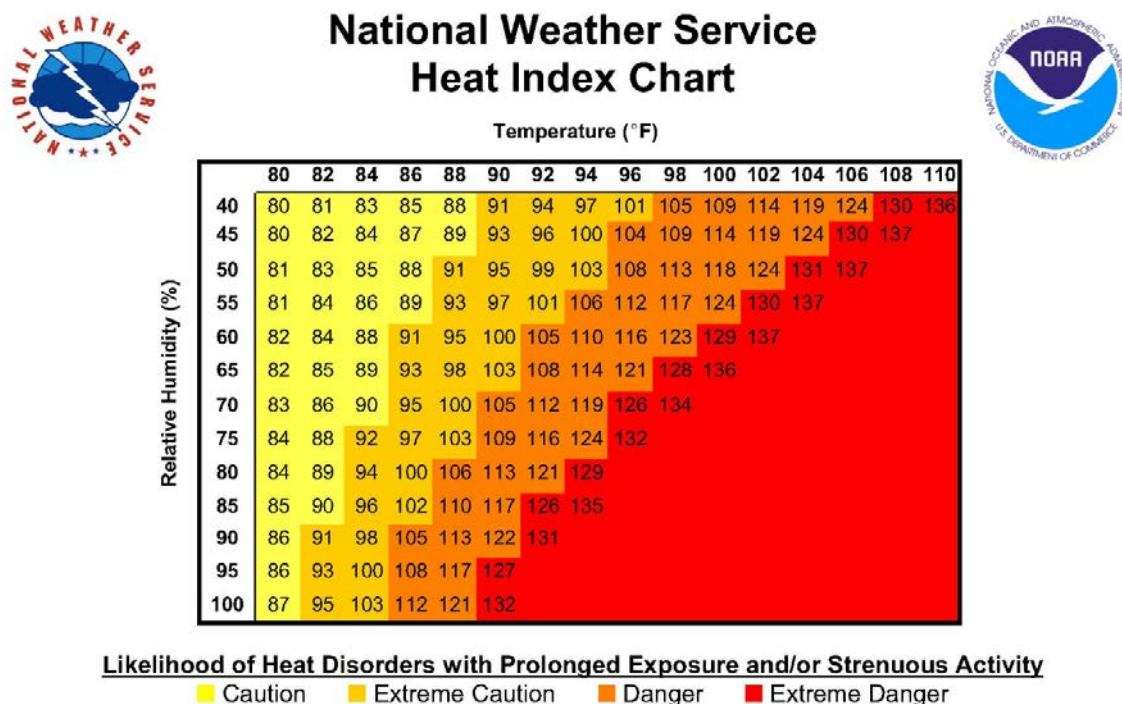
#### 4.11.1 Description

The extreme temperature hazard includes both extreme heat and extreme cold, both of which are often underestimated as hazards because other natural hazards occur more frequently or generate more damage (e.g. floods, tornadoes, etc.). The effects of extreme temperatures can vary based on other circumstances. Extreme heat and extreme cold can be defined as the following:

##### *Extreme Heat*

According to the Center for Disease Control, extreme heat occurs when summertime temperatures are higher or the air is more humid than normal. Extreme heat may also contribute to the formation of a drought if moisture and precipitation are lacking. Average temperatures for a location are taken into consideration when determining whether an extreme heat event has occurred. The National Weather Service's Heat Index Chart is provided in **Figure 4.11.1**, below.

Figure 4.11.1: Heat Index Chart (Source: NWS)



##### *Extreme Cold*

While there is no specific definition for extreme cold, the following is generally accepted by most states: Temperatures 10-15 degrees below average for an extended period of time.

Extended bouts of extreme cold during Ohio winters have the potential to lead to frostbite and even loss of life. Wind chill can dramatically affect the temperatures outside, causing frostbite in a matter of minutes. Wind chill is a calculation of how cold it feels outside when the effects of temperature and wind speed are combined. **Table 4.11.1** displays common terminology related to extreme cold.

**Table 4.11.1: Extreme Temperature Terminology**

Effect	Description
<b>Wind Chill</b>	Not the actual air temperature but rather how wind and cold feel on exposed skin. As the wind increases, heat is carried away from the body at an accelerated rate, driving down the body temperature. Animals are also affected by wind chill; however, cars, plants and other objects are not.
<b>Frostbite</b>	Damage to body tissue caused by extreme cold. A wind chill of -20 degrees Fahrenheit (°F) will cause frostbite in just 30 minutes. Frostbite causes a loss of feeling and a white or pale appearance in extremities, such as fingers, toes, ear lobes or the tip of the nose. If symptoms are detected, get medical help immediately! If you must wait for help, slowly re-warm affected areas. However, if the person is also showing signs of hypothermia, warm the body core before the extremities.
<b>Hypothermia</b>	A condition brought on when the body temperature drops to less than 95 degrees Fahrenheit (°F). It can kill. For those who survive, there are likely to be lasting kidney, liver and pancreas problems. Warning signs include uncontrollable shivering, memory loss, disorientation, incoherence, slurred speech, drowsiness, and apparent exhaustion.

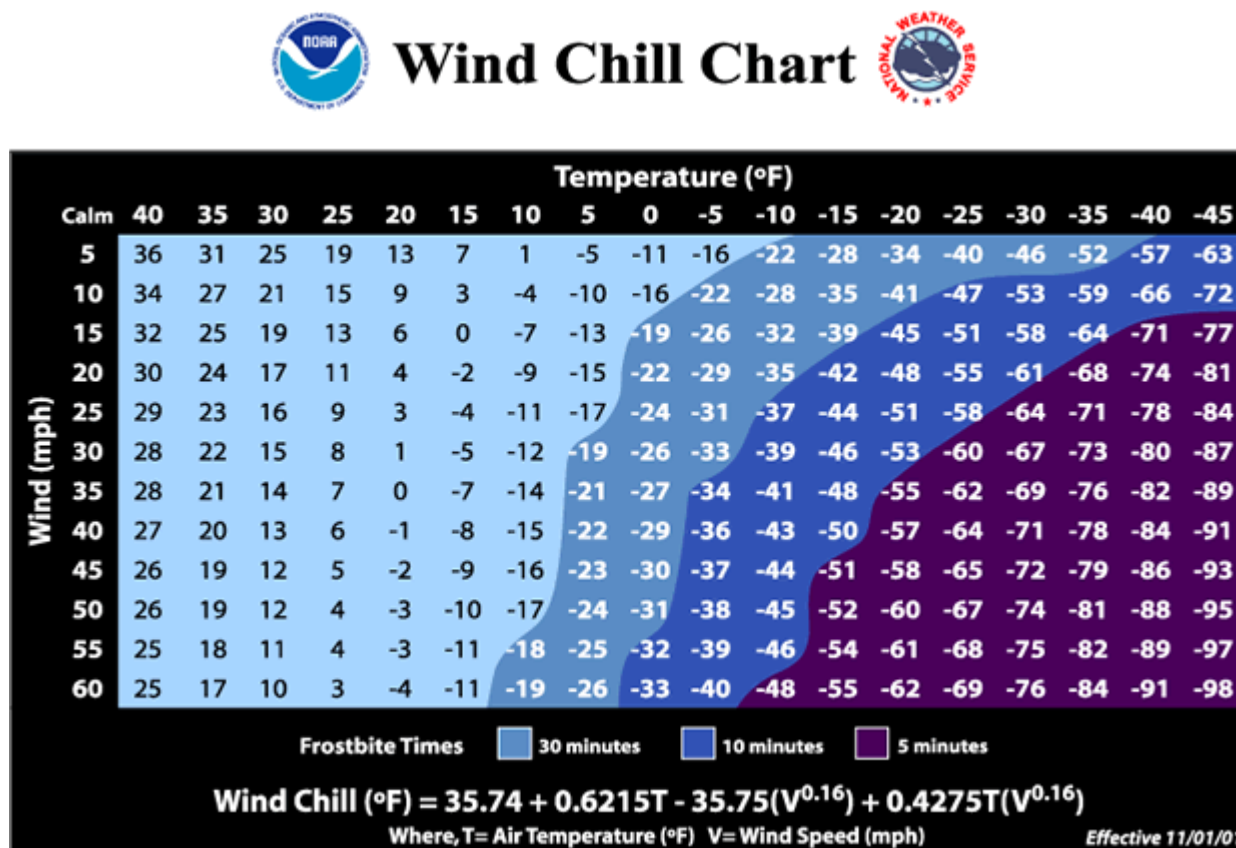
Source: NOAA

The National Weather Service can issue the following warnings related to wind chill:

- **Wind Chill Advisory:** Issued when the wind chill temperatures with the combination of the wind and cold air will be between -10°F to -24°F.
- **Wind Chill Factor:** Increased wind speeds accelerate heat loss from exposed skin. No specific rules exist for determining when wind chill becomes dangerous. As a general rule, the threshold for potentially dangerous wind chill conditions is about -20°F.
- **Wind Chill Warning:** A Wind Chill Warning is issued when the wind chill or feel like temperature with the combination of the wind and cold air will be -25°F or colder.

Figure 4.11.2 provides the National Weather Service's Wind Chill Chart.

Figure 4.11.2: Wind Chill Chart (Source: NWS)



### 4.11.2 Location

Extreme temperature is a county-wide hazard that can affect all areas and jurisdictions in Clermont County. Often, these events will often occur at a regional or even national scale. The hot season typically occurs from June to August. The cold season typically occurs from November to March, with average temperatures ranging from approximately 25°F to 30°F.

### 4.11.3 Extent

Due to the widespread nature of extreme temperature events, all structures, croplands, and infrastructure may experience impacts. All residents of the County may also be impacted, especially at-risk populations that are more susceptible. The elderly and infants are the most vulnerable populations for extreme temperatures. The most common symptoms caused by extreme heat, according to the Centers for Disease Control (CDC), include:

- **Heat Cramps:** Muscle spasms, often in the abdomen, arms, or calves, caused by a large loss of salt and water in the body. Heat cramps can occur from prolonged exposure to extreme heat combined with dehydration, and they commonly happen while participating in strenuous outdoor activities such as physical labor or sports.
- **Heat Exhaustion:** Severe illness requiring emergency medical treatment. It can occur from exposure to extreme heat over an extended period of time (usually several days), especially when combined with dehydration. Heat stroke is the most serious medical condition caused by extreme heat, requiring emergency treatment. Heat stroke (or hyperthermia) occurs when the body can no longer regulate its temperature, and its temperature rises rapidly—up to 106°F or higher.

- Heat Stroke:** Usually occurs as a progression from other heat-related illnesses, such as heat cramps or heat exhaustion. It can also strike suddenly without prior symptoms, however, and it can result in death without immediate medical attention. Extreme heat is especially dangerous because people might not recognize their symptoms as signs of a more serious condition. For example, symptoms like sweating or fatigue may just appear to be normal reactions to a hot day. People may be in more danger if they experience symptoms that alter their decision-making, limit their ability to care for themselves, or make them more prone to accidents. If untreated, heat-related illnesses can worsen and eventually lead to death. Heat can also contribute to premature death from health impacts other than those listed above. This is because extreme heat can worsen chronic conditions such as cardiovascular disease, respiratory disease, and diabetes.

According to the NWS, common symptoms of prolonged exposure to extreme cold include:

- Frostbite:** An injury to the body caused by freezing body tissue. Fingers, toes, ears, and tip of the nose are most vulnerable. Symptoms include white or pale appearance. The area affected should be slowly re-warmed. Immediate medical attention is needed. **Figure 4.11.2**, above, shows the onset time for frostbite at certain temperatures and wind chills.
- Hypothermia:** Hypothermia is abnormally low body temperature (below 95°F). Warning signs include uncontrollable shivering, memory loss, disorientation, incoherence, slurred speech, drowsiness, and apparent exhaustion. If these symptoms are being experienced, immediate medical attention is needed, and the body should be re-warmed slowly.

### 4.11.4 History

There have been at least seven reported extreme temperature events in Clermont County since 1996. There were no deaths or injuries associated with these events. Property damage totaled \$20,000. The history of extreme cold and extreme heat events is summarized in **Table 4.11.2** and full details on the events are included in **Appendix A**.

**Table 4.11.2: Summary of Extreme Temperature Events in Clermont County**

Date of Event	Type of Event	Deaths	Injuries	Property Damage	Crop Damage
2/1/1996	Extreme Cold	0	0	\$20,000*	\$0
8/7/2007	Extreme Heat	0	0	\$0	\$0
8/23/2007	Extreme Heat	0	0	\$0	\$0
6/9/2012	Extreme Heat	0	0	\$0	\$0
1/7/2014	Extreme Cold	0	0	\$0	\$0
1/2/2018	Extreme Cold	0	0	\$0	\$0
1/27/2019 – 1/30/2019	Extreme Cold	0	0	\$0	\$0
<b>Total</b>	<b>-</b>	<b>0</b>	<b>0</b>	<b>\$20,000</b>	<b>\$0</b>

*\*Property damage recorded for the extreme cold event on February 1, 1996 was due to freezing and bursting of water pipes and house fires caused by space heaters.*



### 4.11.5 Probability

With four extreme cold events on record since 1996, there is a 17 percent chance of an extreme cold event annually. Additionally, with three extreme heat events on record since 1996, there is a 13 percent chance of an extreme heat event annually. Only one extreme cold event was responsible for property damage, which averages to \$870 annually; no property damage was recorded for extreme heat events, so they are estimated to cost \$0 annually.

### 4.11.6 Vulnerability Assessment

#### *Infrastructure Impact*

Although extreme heat does not typically affect infrastructure, it does have the potential to create a power outage if the electric grid is overtaxed due to heavy use of air conditioning. Power outages during periods of extreme heat may also accompany severe weather. For example, on June 29, 2012, a widespread power outage occurred during an excessive heat warning due to Derecho winds. It lasted three days and left more than 30,000 Duke customers without power.

The primary impact of extreme cold on infrastructure is typically the freezing of exposed water pipes and systems, but extreme cold can have secondary impacts on infrastructure.

#### *Population Impact*

Although there is no history of population impact, extreme heat can have an impact on the population of the entire County. Groups that are particularly vulnerable to extreme heat include young children, older adults, and people with chronic health conditions, such as obesity, hypertension, cardiopulmonary or vascular disease. Residents should be aware of the dangers of extreme heat and how to recognize the symptoms of such conditions as heat cramps, heat exhaustion, and heat stroke.

The greatest vulnerability from extreme cold is humans and livestock. People should stay indoors during extreme cold events. If someone is outside during an extreme cold event, they should wear loose-fitting and warm clothing and cover all exposed skin. Efforts should be made to protect livestock, pets, and other animals during extreme cold events.

#### *Property Damage*

There is no reported history of structures being affected by extreme temperatures in Clermont County; however, a worst-case scenario of estimated losses was considered in **Table 4.11.3**, below. Due to the non-site-specific nature of this hazard, two worst-case scenarios at 0.05 percent damage and one percent damage were run for county-wide structures.

**Table 4.11.3: Structure Vulnerability due to Extreme Temperature (Source: Clermont County)**

Structure Type	Number	Total Value	Damage for 0.05% Scenario	Damage for 1% Scenario
Residential	79,609	\$3,528,287,800	\$1,764,143.90	\$35,282,878
Non-Residential	16,783	\$1,309,161,700	\$654,580.85	\$13,091,617
Critical Facilities	3,041	\$399,726,760	\$199,863.38	\$3,997,268.60
<b>Total</b>	<b>99,433</b>	<b>\$5,237,176,260</b>	<b>\$2,618,588.13</b>	<b>\$52,371,763.60</b>

### ***Loss of Life***

While Clermont County does not have any loss of life recorded due to extreme temperatures, death is possible when exposed to these hazards for prolonged periods of time.

### ***Economic Losses***

The County has recorded \$20,000 in economic losses due to extreme cold and no losses due to extreme heat. This averages to \$870 annually in economic losses due to extreme cold.

Extreme heat can have an economic impact by compromising crops and livestock, which are both vulnerable to extended heat events. Human productivity can also be adversely affected when working conditions become too hot. Extreme cold has the potential to cause more economic losses through the freezing of pipes and the loss of agricultural crops, especially if an extreme cold event occurs during a time outside of the traditionally coldest months of the year.

### **4.11.7 Land Use and Development Trends**

There are no likely impacts on development and land use from extreme temperatures.

### 4.12 Drought

#### 4.12.1 Description

A drought is a shortage in atmospheric moisture or precipitation over an extended period of time. Droughts are common throughout all climatic zones and can range in length from a couple weeks to multiple years or decades in some areas. According to the National Oceanic and Atmospheric Administration (NOAA), there are three common types of drought: Meteorological, Agricultural, and Hydrological.

Meteorological drought severity is calculated by the amount of the rainfall deficit (compared to annual averages) and the length of the dry period. Agricultural drought is based on the effects to agriculture by factors such as rainfall and soil water deficits, or diminished groundwater/reservoir levels needed for irrigation. Hydrological drought is based on the effects of rainfall shortages on the water supply, such as stream flow, reservoir and lake levels, and ground water table decline.

#### 4.12.2 Location

Droughts are regional events that have the potential to affect all areas and jurisdictions within Clermont County. They most commonly occur in Ohio from spring through autumn; however, they may occur at any time throughout the year.

To illustrate the locational distribution of a past drought event in Ohio as compared with present-day conditions, see **Figure 4.12.1**. This figure depicts the Drought Monitor for the State of Ohio for August 28, 2012 (a historic drought event discussed in the History section) compared to August 27, 2019 (present-day), as well as the statistics comparison for the percent areas of the State that experienced the drought conditions.

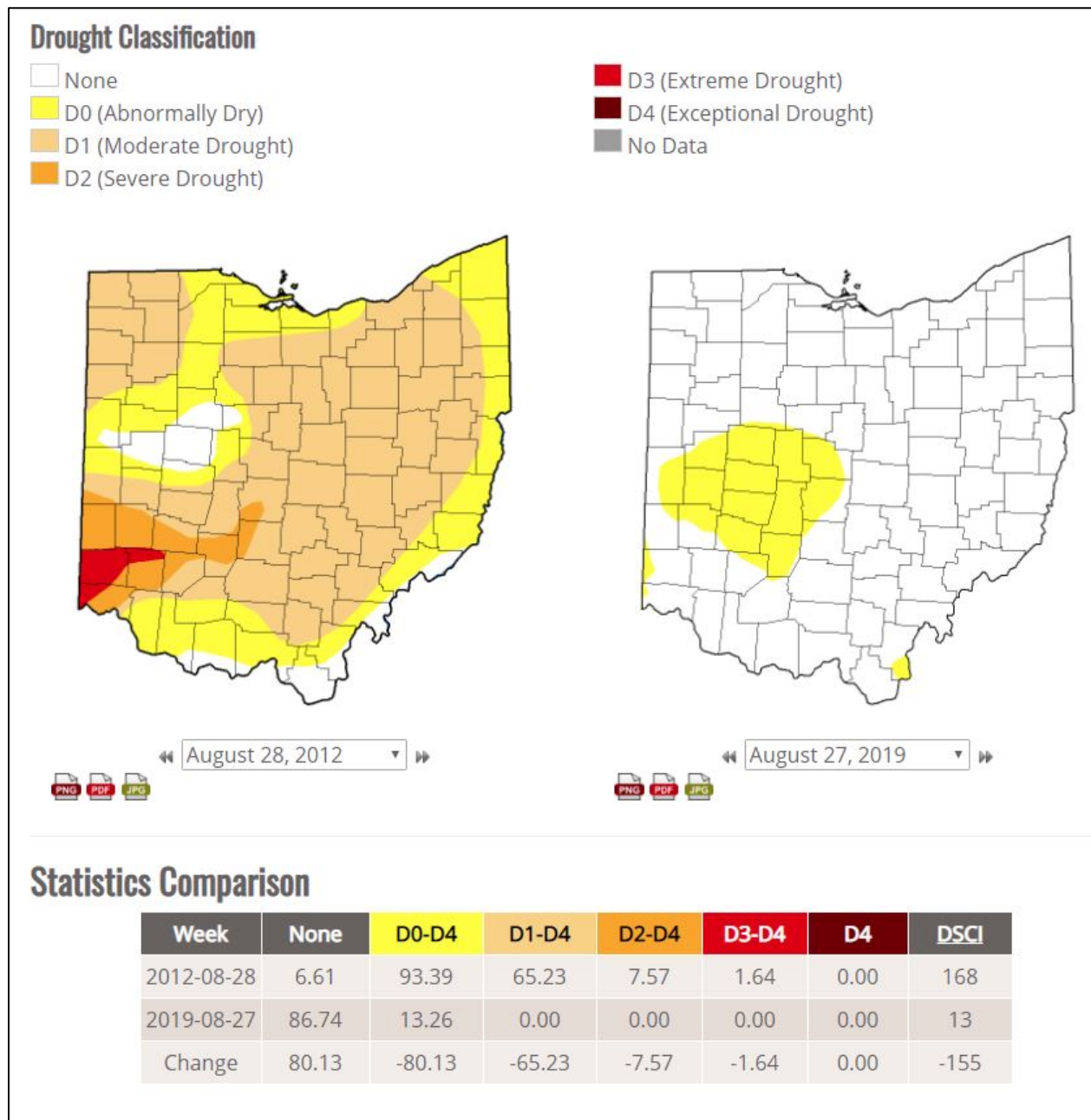
#### 4.12.3 Extent

Due to the regional nature of droughts, effects may be noticed throughout the County in the urbanized and rural areas. All jurisdictions with the County may be affected in a single drought event. In Clermont County, droughts are often linked to prolonged periods of above average temperatures and little to no precipitation.

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

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

Figure 4.12.1: Drought Monitor for the State of Ohio, August 2012 and August 2019



Note: The Statistics Comparison is calculated as a percent area in those drought conditions.

The PDSI is a standardized index with values typically falling between -4.00 and +4.00, although extreme conditions can be greater in value (**Table 4.12.1**). Negative values indicate drought conditions while positive values represent wet spell conditions. Values around zero represent near normal conditions.

**Table 4.12.1: Palmer Drought Severity Index Classifications**

Palmer Classifications	
4.0 or greater	Extremely Wet
3.0 to 3.99	Very Wet
2.0 to 2.99	Moderately Wet
1.0 to 1.99	Slightly Wet
0.5 to 0.99	Incipient Wet Spell
0.49 to -0.49	Near Normal
-0.5 to -0.99	Incipient Dry Spell
-1.0 to -1.99	Mild Drought
-2 to -2.99	Moderate Drought
-3.0 to -3.99	Severe Drought
-4.0 or less	Extreme Drought

### 4.12.4 History

Between 1895 (when climate records began) and 2017, there were 59 years that experienced below-average precipitation, many of which were reported monthly for droughts that were ongoing throughout the dry months. No injuries, deaths, property damage, or crop damage related to these droughts were recorded. The following historic drought events have been recorded for Clermont County. Episode narratives, if available, were provided by the NCDC.

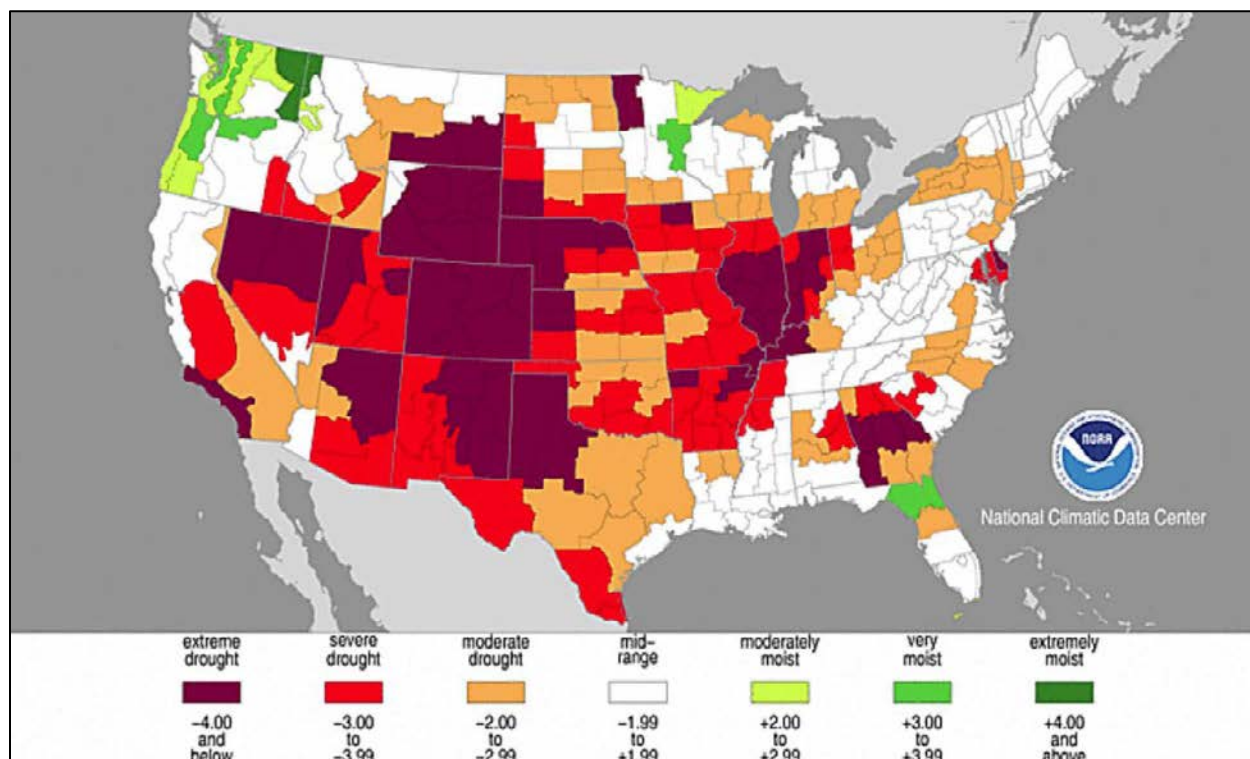
#### *July 2016*

According to the Ohio EMA's *Weekly Drought Report* from August 12, 2016, the U.S. Drought Monitor indicated that three-fourths of Ohio experienced drought conditions. This drought was classified as an Agricultural/Meteorological drought. According to the Drought Severity Indices that are contained in Ohio's Drought Incident Annex and the Palmer Drought Index, the Northwest, Southwest and South Central climate divisions were in a Moderate Drought state, including portions of Clermont County. No injuries, deaths, property damages, or crop damages were reported. (See **Appendix A** for the Ohio EMA's *Weekly Drought Report* from August 12, 2016.)

#### *Summer 2012*

Widespread drought occurred throughout the lower 48 states, including Ohio and Clermont County. The summer of 2012 was one of the worst recorded droughts on record for Clermont County. The Secretary of Agriculture made a disaster declaration for drought and excessive heat, which provided Small Business Administration Economic Injury Disaster loans to Ohio. No injuries, deaths, property, or crop damages were reported as a result of this drought. **Figure 4.12.2** displays the PDSI of July 2012 for the continental United States.

Figure 4.12.2: Palmer Drought Severity Index for the United States in July 2012



### *July 2007*

After weeks without significant rainfall, Clermont County entered a severe drought. There were no known injuries, deaths, property damage, or crop damage.

### *July-August 1999*

A significant drought was recorded in Clermont County. No injuries, deaths, property damage, or crop damage were reported.

### 4.12.5 Probability

Clermont County had 59 droughts in the past, which averaged to one drought every two years; the potential exists for the County to experience more droughts in the future. No property damage or crop damage was recorded for these events. With a growing population, according to 2017 U.S. Census estimates, Clermont County may likely face increased hardship when faced with drought conditions, as the residential, agricultural, and industrial demand for water resources will be greater.

### 4.12.6 Vulnerability Assessment

Based on current climate reports:

- Drought projections suggest that some regions of the U.S. will become drier and that most will have more extreme variations in precipitation.
- Even if current drought patterns remained unchanged, warmer temperatures will amplify drought effects.
- Drought and warmer temperatures may increase risks of large-scale insect outbreaks and wildfires.



## 4 | HAZARD RISK ASSESSMENT

- Drought and warmer temperature may accelerate tree and shrub death, changing habitats and ecosystems in favor of drought-tolerant species.
- Forest-based products and values – such as timber, water, habitat and recreation opportunities – may be negatively impacted.
- Forest and rangeland managers can mitigate some of these impacts and build resiliency in forests through appropriate management actions.

Drought does not have a significant impact on infrastructure or structures. The greatest impacts of drought are on agricultural interests, as crops may fail and livestock may not have sufficient water resources. Economic losses are the greatest threat from droughts to Clermont County. According to the 2012 Census of Agriculture developed by the United States Department of Agriculture (USDA), top crop items based on acreage for Clermont County include soybeans and corn. Commodity Loss Statistics for these crops are included in **Table 4.12.2** and compare a non-drought year (2011) with the production and harvest of crops in a drought year (2012).

**Table 4.12.2: Commodity Loss Statistics between 2011 and 2012 (Source: USDA)**

Commodity	Units	Non-Drought Year 2011 (acres)	Drought Year 2012 (acres)	Change	Amount
Soybeans-planted	Acres	37,600	34,400	Down	-3,200
Soybeans-harvested	Acres	37,400	34,100	Down	-3,300
Yield	%	99.47%	99.13%	Down	-0.34%
Soybeans-production	Bushels	1,841,000	1,539,000	Down	-302,000
Yield	Bushels/acre harvested	49	45	Down	-4
Corn, planted	acres	15,400	18,700	Up	3,300
Corn, grain-harvested	acres	15,100	18,300	Up	3,200
Yield	%	98.05%	97.86%	Down	-0.19%
Corn, grain-production	Bushels	2,460,000	2,108,000	Down	-352,000
Yield	Bushels/acre harvested	163	115	Down	-48

Based on this USDA data, Clermont County's soybean and corn planted versus harvested yield percentages decreased by 0.34 percent and 0.19 percent, respectively. Additionally, the total number of bushels per acre harvested decreased for both soybeans (8.2 percent) and corn (29.4 percent). These declines in crop harvest that are likely related to the 2012 drought translate directly to economic losses for Clermont County.

### 4.12.7 Land Use and Development Trends

Drought is most likely to impact agriculture land uses and land uses that house or serve vulnerable populations, such as schools, daycares, hospitals, and nursing homes.

### 4.13 Wildfire

#### 4.13.1 Description

A wildfire is a fire in an area of combustible vegetation that occurs in the countryside or rural area. The Ohio Department of Natural Resources (ODNR) identifies Ohio's wildfire seasons as occurring 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. Each year an average of 1,000 wildfires burn 4,000 to 6,000 acres of forest and grassland within Ohio's forest fire protection district, which corresponds mostly to the state's unglaciated hill country.

#### 4.13.2 Location

According to the State of Ohio Enhanced Hazard Mitigation Plan (2019), Clermont County has not been identified as a county within the ODNR Division of Forestry's Wildfire Protection Area. Additionally, no communities within Clermont County have been classified as a community at risk of wildfires. All areas of Clermont County are identified as having a low wildfire hazard level. However, the County is located in ODNR Division of Forestry Region 3, which represents areas of highest wildfire risk and hazard in Ohio (see **Figure 4.13.1**). In addition, on February 6, 2019, ODNR expanded Ohio's Wildfire Protection Area in order to increase wildfire protection efforts into more communities. ODNR now includes Clermont County in Ohio's Wildfire Protection Area, but due to the timing of the 2019 version of the State of Ohio Enhanced Hazard Mitigation Plan update, ODNR's newly expanded Wildfire Protection Area has not yet been assessed by the Ohio EMA.

#### 4.13.3 Extent

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

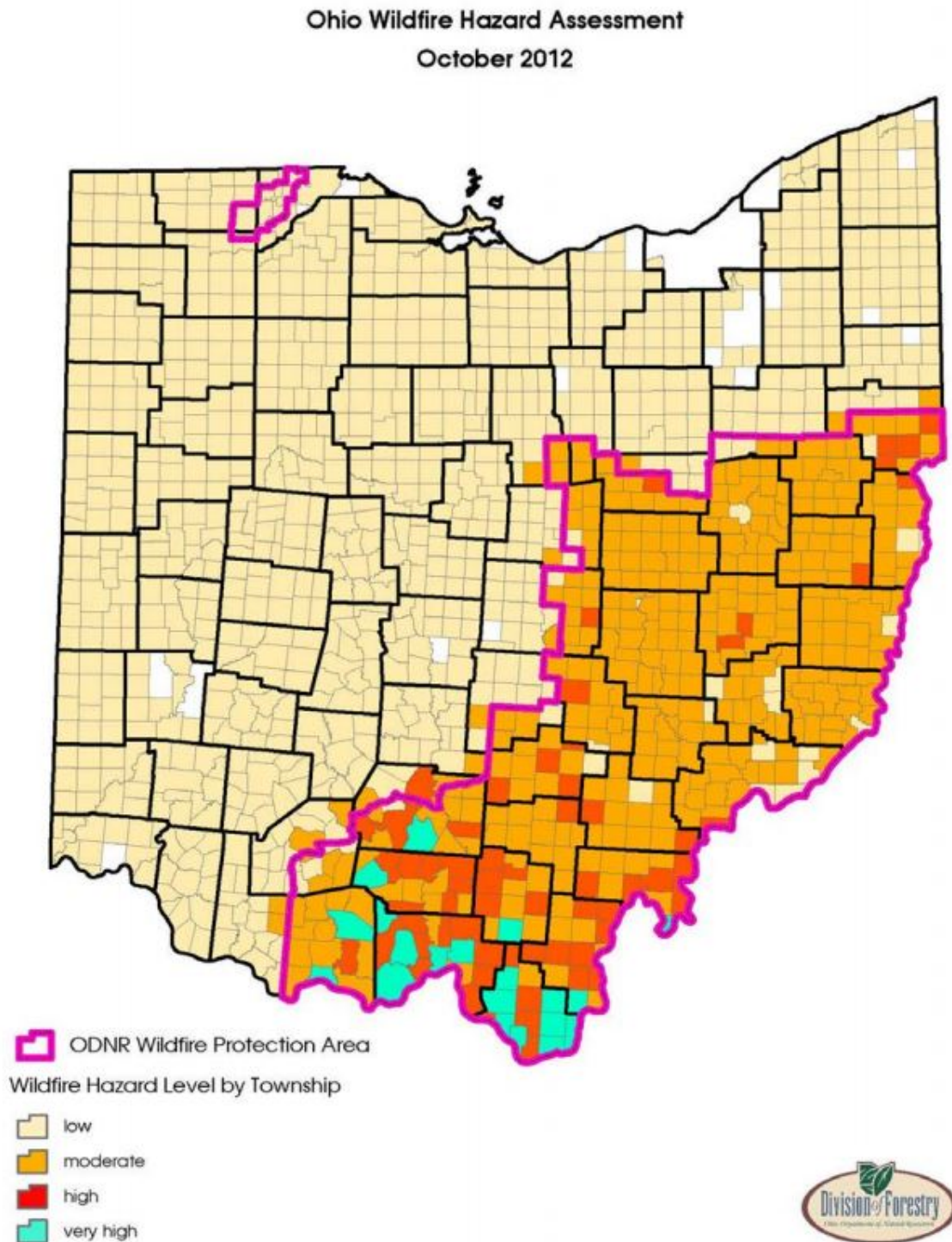
#### 4.13.4 History

According to the State of Ohio Enhanced Hazard Mitigation Plan (2019), Clermont County has experienced at least 81 wildfire events from January 2007 to December 2017. These fires have burned a total of 373 acres of land, with each event burning 4.60 acres on average. Of these fires, 71 burned less than 10 acres of land, while 10 burned between ten and 99.99 acres of land. No fires burned more than 100 acres of land.

#### 4.13.5 Probability

The State of Ohio Enhanced Hazard Mitigation Plan (2019) predicts an estimated seven wildfire events in Clermont County each year, which is calculated based on the number of historic fire events between January 2007 and December 2017. Additionally, the State of Ohio Enhanced Hazard Mitigation Plan indicates that based on historic events there is a 100 percent probability that a wildfire will occur within any County in any given year.

Figure 4.13.1: ODNR Division of Forestry Wildfire Risk Level by Township



### 4.13.6 Vulnerability Assessment

#### *Infrastructure Impact*

If a wildfire event occurred, the event could interfere with access and usage of roads in addition to affecting above-ground utilities. However, Clermont County is categorized as having a low risk level for wildfires, so it is currently estimated that the County will have low risk of impacts to infrastructure from wildfires.

#### *Population Impact*

According to the American Community Survey's 2017 population estimates, the population of Clermont County is approximately 204,214. If wildfire occurred in Clermont County, the population could be impacted by loss of homes and crops and short-term air pollution. However, Clermont County is categorized as having a low risk level for wildfires, so it is currently estimated that the County will have low risk of impacts to its population from wildfires.

#### *Property Damage*

According to the Ohio EMA, high valued personal property, including homes, machinery, agricultural crops, and tree plantations in areas of moderate wildfire risk are more vulnerable to damage by wildfire. Fire engines belonging to local fire departments are also occasionally damaged while suppressing wildfires. Wildfire suppression has resulted in a great amount of personal property being saved by fire departments. Due to the non-site-specific nature of this hazard, **Table 4.13.1** lists all structures within Clermont County as having potential impacts from Wildfires. It also provides values for two worst-case scenarios valued at one percent damage and five percent damage. Specifically for State-owned/leased critical facilities, the Ohio EMA has identified 93 facilities in Clermont County. All of these facilities are categorized as having a low exposure level to wildfires.

#### *Loss of Life*

Clermont County has not experienced loss of life as a result of wildfire events, although there is potential for loss of life were a wildfire to occur. Advanced evacuation warnings can reduce the likelihood of death as a result of wildfire.

#### *Economic Losses*

Although Clermont County is categorized as low risk, wildfires have the potential to damage agricultural crops, tree plantations, and structures, which can result in economic losses. Potential economic losses and damages associated with Clermont County structures and potential worst-case scenarios (one and five percent) are shown in **Table 4.13.1**.

**Table 4.13.1: Structure Vulnerability due to Wildfire (Source: Clermont County)**

Structure Type	Number	Total Value of Structures	Damage for 1% Scenario	Damage for 5% Scenario
Residential	79,609	\$3,528,287,800	\$35,282,878.00	\$176,414,390
Non-Residential	16,783	\$1,309,161,700	\$13,091,617.00	\$65,458,085
Critical Facilities	3,041	\$399,726,760	\$3,997,267.60	\$19,986,338
<b>Total</b>	<b>99,433</b>	<b>\$5,237,176,260</b>	<b>\$52,371,762.60</b>	<b>\$261,858,813</b>

### 4.13.7 Land Use and Development Trends

Although risk to these properties is low, there are 16,920 more residential properties and 3,062 more non-residential properties across the County as compared to the 2014 All Hazards Plan Update.

## 4.14 Earthquakes

### 4.14.1 Description

An earthquake is a sudden movement of the Earth's crust caused by the abrupt rupture and rebound of accumulated stress along geologic faults. These movements vary in length and may last from a few seconds to several minutes.

The seismicity, or seismic activity, of an area refers to the frequency, type and size of earthquakes experienced over a period of time. Earthquakes are measured using observations from seismometers. The moment magnitude scale, developed in the 1970s, is the most common scale on which earthquakes larger than approximately 5.0 are reported for the entire world. The more numerous earthquakes smaller than magnitude 5.0, reported by national seismological observatories, are measured mostly on the local magnitude scale; also referred to as the Richter scale. These two scales are numerically similar over their range of validity. Magnitude 3.0 or lower earthquakes are mostly almost imperceptible or weak, while magnitude 7.0 and over earthquakes can potentially cause serious damage over larger areas. Damage from an earthquake also depends on the earthquake's depth in the earth's crust. The shallower an earthquake's epicenter, the more damage to structures it will cause, if all other factors are equal.

An earthquake can also be measured by its intensity. The Modified Mercalli Intensity Scale (MMI) ranges in value in roman numeral I to XII (**Table 4.14.1**).

**Table 4.14.1: Modified Mercalli Intensity Scale (Source: ODNR)**

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



Major earthquakes are low probability, high consequence events. Most major earthquakes in the U.S. have occurred in California and other western states. There have been recorded earthquakes throughout the U.S., and the Ohio River Valley has experienced earthquakes exceeding the 3.0 magnitude within the last 25 years.

### 4.14.2 Location

Earthquakes are county-wide hazards and can affect all areas and jurisdictions within Clermont County. According to the Ohio Department of Natural Resources (ODNR), Ohio is located on the periphery of the New Madrid Seismic Zone, an area in and around Missouri that was the site of the largest earthquake sequence to occur in the country. Additionally, Clermont County is located within the Granite-Rhyolite Province and East Continent Rift Basin and is just west of the Grenville Front Tectonic Zone (see **Figure 4.14.1**).

### 4.14.3 Extent

Earthquakes pose a risk to life and property, depending on the severity. To monitor earthquakes, the State of Ohio has deployed several seismometers to record any earthquakes (**Figure 4.14.2**). Seismic station SLSO (Stonelick State Park Ohio) is situated in northeastern Clermont County. The station was installed in July 2018. The station sits atop stiff clay soils above Ordovician-age bedrock, 25 miles northeast of Cincinnati. This station will give geologists an understanding of Ohio's basement geology and earthquakes occurring in southwestern Ohio and northern Kentucky. The station also fills in a gap in the network and provides important seismic monitoring and coverage in this part of the state. SLSO is a cooperative effort between the Ohio Geological Survey and Ohio State Parks. Data is transmitted in real time back to the Ohio Earthquake Information Center (OEIC) at Alum Creek State Park.

### 4.14.4 History

Ohio has had damaging earthquakes historically, though there are no damaging events recorded in Clermont County. The Ohio Department of Natural Resources (ODNR) has record of three small, non-instrumental earthquakes of size 2.0 to 2.9 in the 1800s occurring in Clermont County – these events were recorded in 1804, 1859, and 1864 (see **Figure 4.14.3**). Earthquakes have also been felt by residents of Clermont County, with epicenters east and south of the County.

The State of Ohio has experienced more than 120 earthquakes since 1776, 14 of which have caused minor to moderate damage. The largest historic earthquake in Ohio was centered in Shelby County in 1937. This event, estimated to have had a magnitude of 5.4 on the Richter scale, caused considerable damage in Anna and several other western Ohio communities, where at least 40 earthquakes have been felt since 1875.

Southern Ohio has experienced more than 30 earthquakes. Clermont County could be impacted by two separate geologic fault systems that cause earthquakes. The Cincinnati Arch is one such zone and last contributed to an earthquake felt in Clermont County in 1875. This event caused structural damage in western Ohio and affected a total area estimated at over 40,000 square miles. The second major fault system is the New Madrid Fault. A branch of the New Madrid fault line is called the Wabash Valley Seismic Zone. This zone has had multiple earthquakes, but the tectonics of this region is still unknown. Additional seismic research has led to the discovery of several other, smaller faults throughout the region. The tectonics of these faults is not well understood, and an earthquake along any of the nearby faults may pose additional risks to Clermont County.



**Figure 4.14.1: Map of Deep Structures in Ohio (Source: ODNR)**

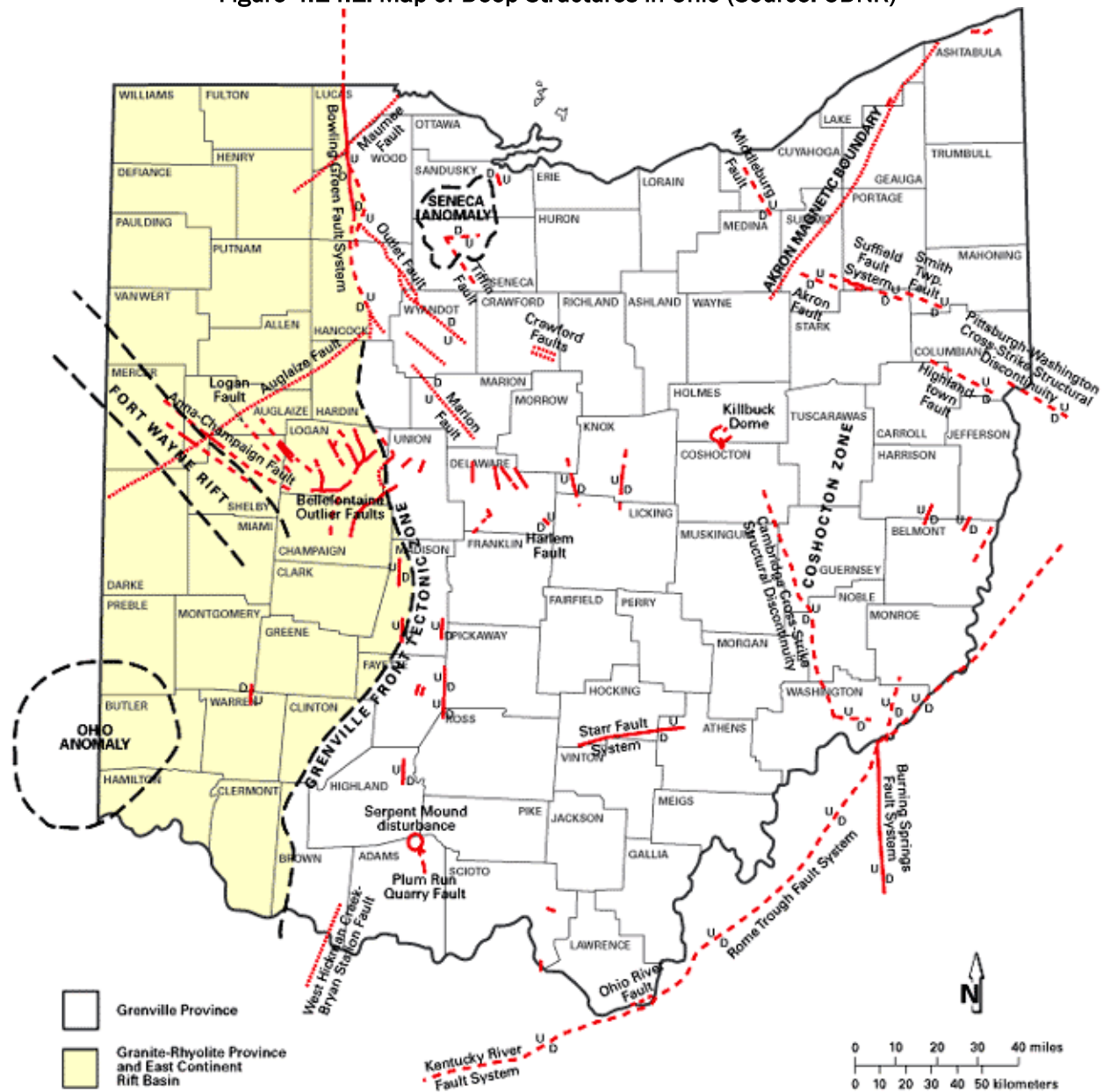


Figure 4.14.2: Location of Seismometers in Ohio (Source: ODNR)

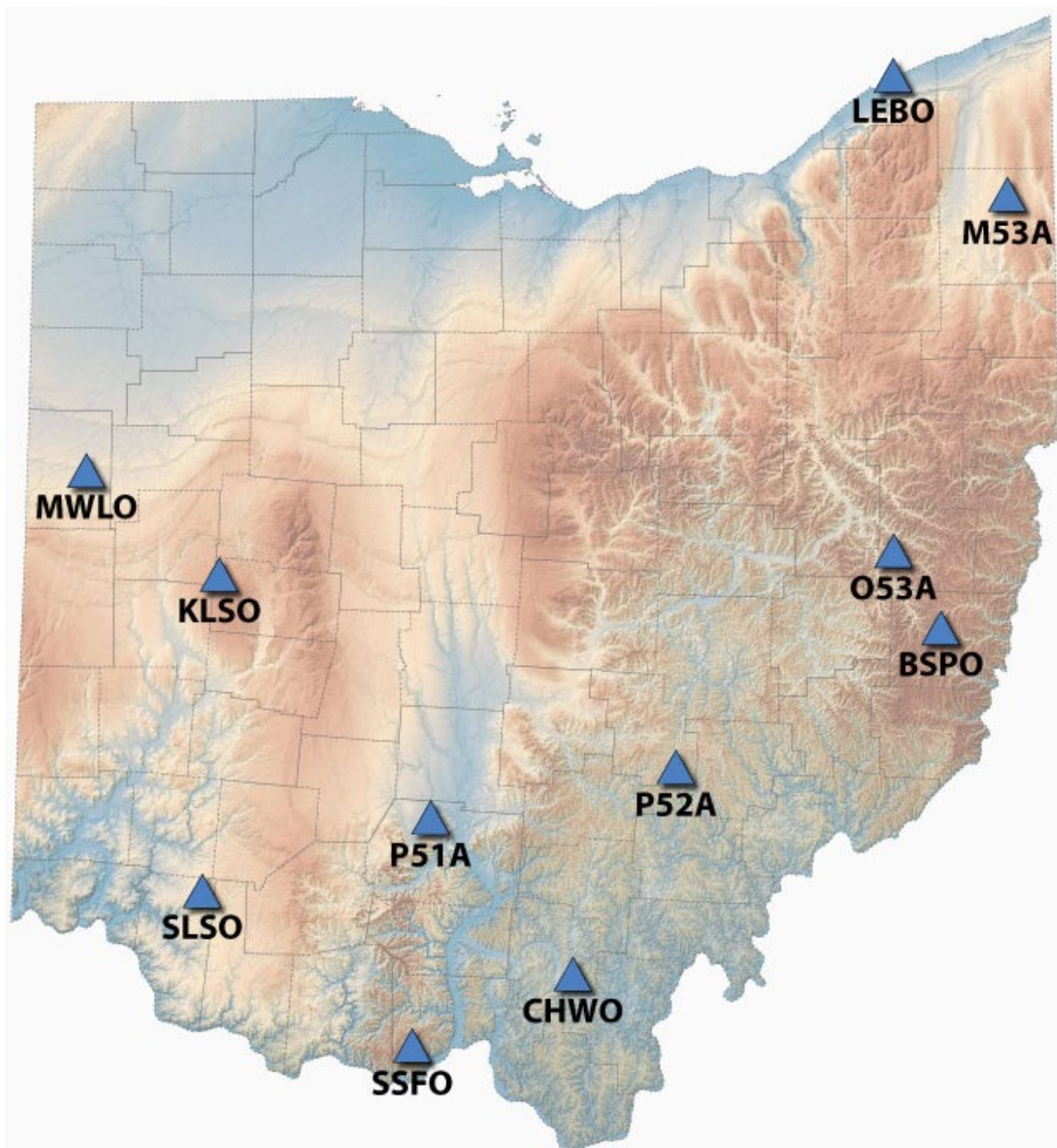
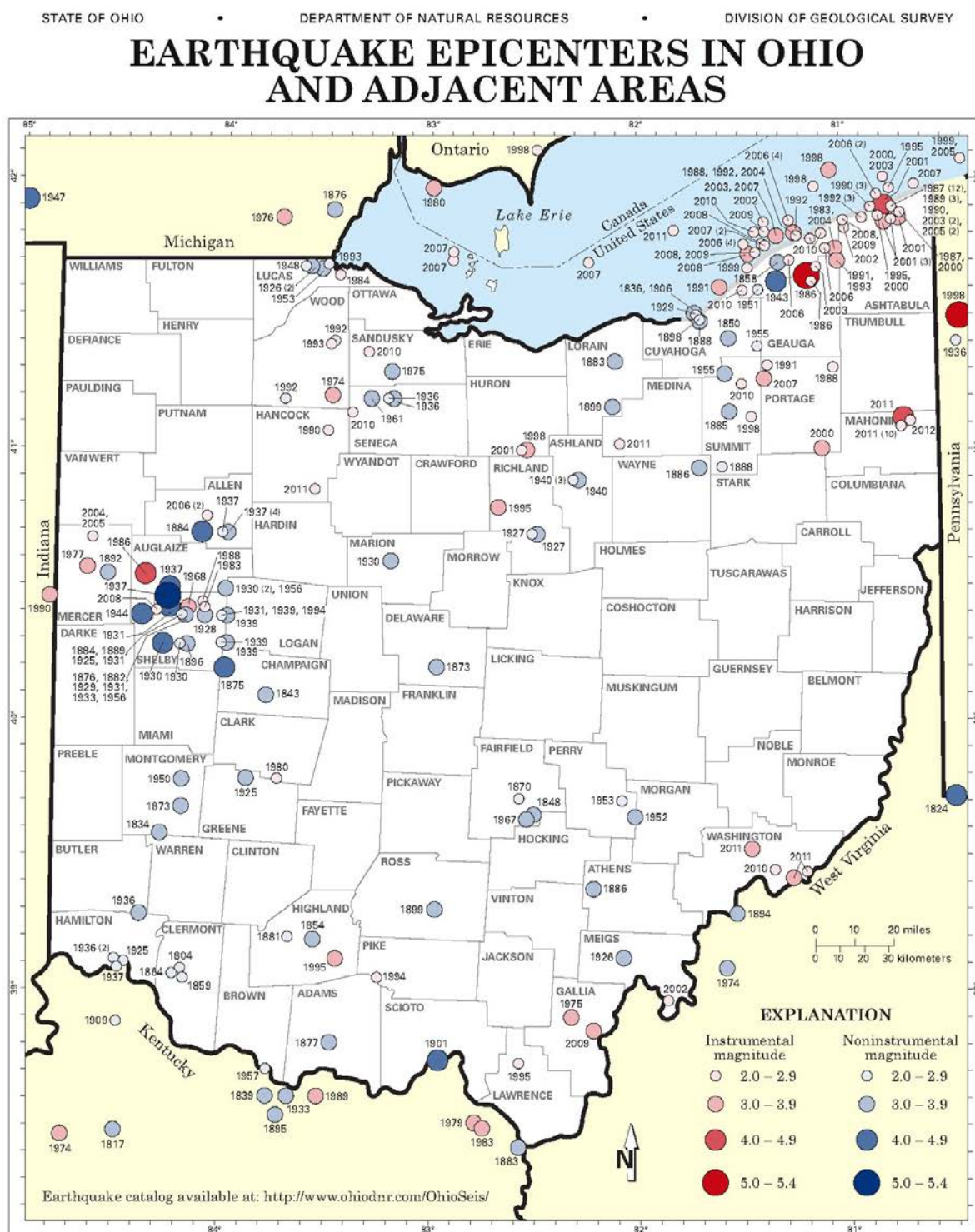


Figure 4.14.3: Earthquake Epicenters in Ohio (Source: ODNR)



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

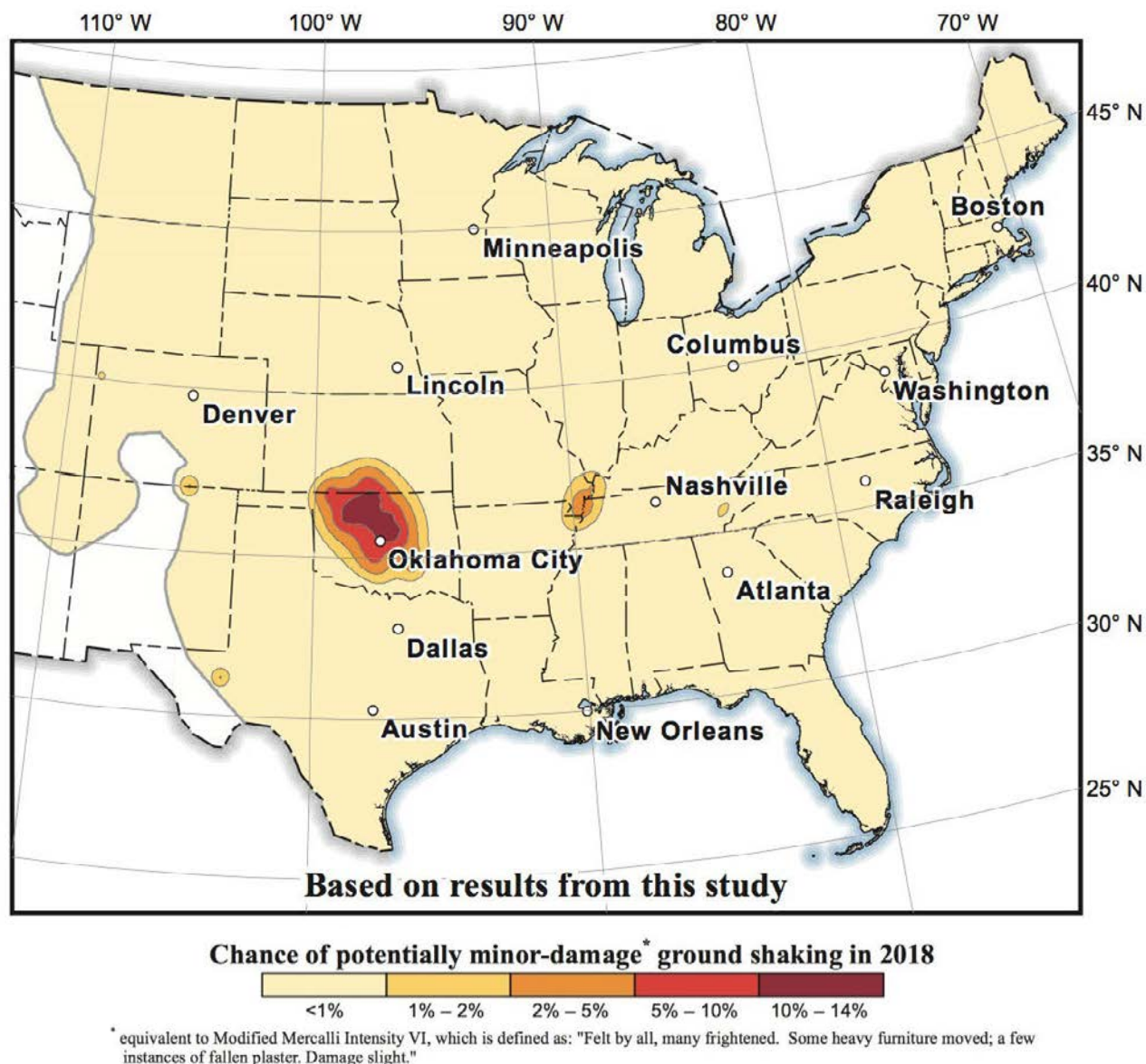




### 4.14.5 Probability

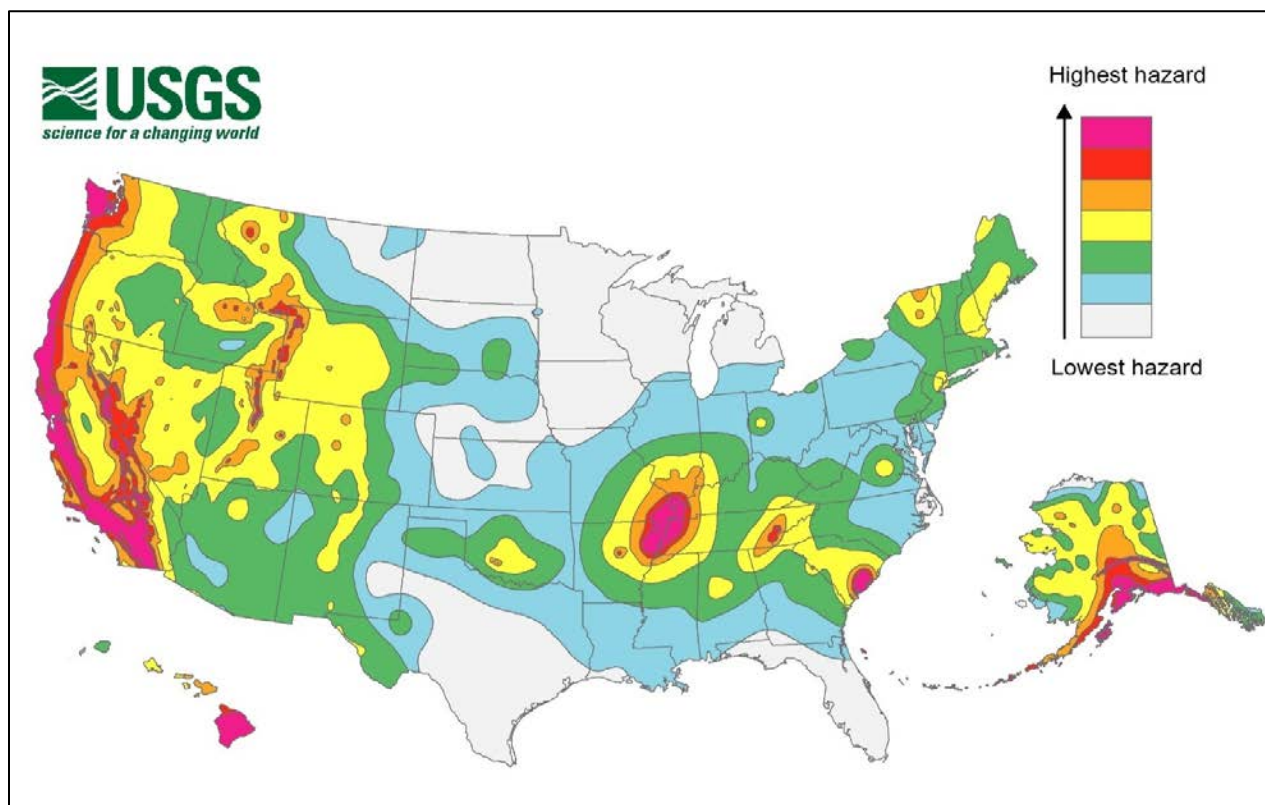
The U.S. Geological Survey (USGS) has both long-term and short-term probabilistic seismic hazard forecasts. In the 2018 one-year probabilistic seismic hazard forecast, the USGS estimated that there was a less than one percent chance of potentially minor-damage ground shaking in 2018 for Clermont County (Figure 4.14.4).

Figure 4.14.4: Chance of Potentially Minor-Damage Ground Shaking in 2018 (Source: USGS)



The USGS also determined the long-term hazard of earthquakes for the United States (Figure 4.14.5). This map identifies that most of Clermont County and surrounding areas in Ohio have the second to lowest hazard ranking for the nation. There are some communities along the very southern part of the state, and potentially in southern Clermont County, that have the third to lowest hazard ranking. These communities would be at a slightly greater risk for earthquakes than the rest of Clermont County.

Figure 4.14.5: Probability of Earthquakes in the United States (Source: USGS)



### 4.14.6 Vulnerability Assessment

Past incidents of earthquakes have not resulted in any recorded infrastructure or population impacts, property damage, economic losses, or loss of life, although each of these are possibilities if an earthquake would occur. Because earthquakes are a county-wide hazard, it has the potential to impact all property and critical facilities in the County.

Due to the non-site-specific nature of this hazard, **Table 4.14.2** lists all structures within Clermont County as having potential impacts from earthquakes.

Table 4.14.2: Structure Vulnerability due to Earthquakes (Source: Clermont County)

Structure Type	Number	Value of Vulnerable Structures (\$)		
		Building	Land	Total
Residential	79,609	2,672,123,490	856,164,310	3,528,287,800
Non-Residential	16,783	932,290,820	376,870,880	1,309,161,700
Critical Facilities	3,041	299,480,190	100,246,570	399,726,760
<b>Total</b>	<b>99,433</b>	<b>3,903,894,500</b>	<b>1,333,281,760</b>	<b>5,237,176,260</b>

### **4.13.7 Land Use and Development Trends**

As an earthquake is unlikely, there are no likely impacts on development and land use. However, to mitigate any potential damage that may result from an earthquake in the future, structures should be built to absorb the impact from earthquakes as best as possible.

There are 16,920 more residential properties and 3,062 more non-residential properties across the County as compared to the 2014 All Hazards Plan Update. All properties may be exposed to an earthquake, however unlikely.



# 5 | Hazard Mitigation

### 5.1 Hazard Mitigation Strategy

Each potential hazard, including both natural, geological, and man-made hazards, were rated by representatives of the participating jurisdictions on a scale of zero to five, with zero indicating the hazard should not be studied and five indicating the most significant threat to the representative's community. **Table 5.1** displays the average of representatives' ratings as a Priority Score for each hazard. The hazard that scored the highest (Severe Storms, 4.3939), was given a Hazard Rank of one. The mitigation goals follow the ranking of hazards as established by the participating jurisdictions of Clermont County.

**Table 5.1: Hazard Priorities**

Hazard Identification	Priority Score	Hazard Rank
Severe Storms	4.3939	1
Tornadoes	4.1250	2
Flooding	4.0606	3
Utility Failure	3.4848	4
Hazardous Materials	3.3333	5
Winter Storms	3.3030	6
Landslides	2.4783	7
Dam Failure	2.3636	8
Invasive Species	2.3030	9
Terrorism	2.2813	10
Extreme Temperatures	2.0152	11
Drought	1.9394	12
Wildfire	1.6970	13
Earthquakes	1.6061	14
Hurricanes/Tropical Storms	1.2121	Included in Severe Storms
Mine Subsidence	0.5625	Not Assessed

Severe Storms became the top ranked hazard priority. Three new hazards were included in this 2019 All-Hazards Mitigation Plan, including terrorism, extreme temperatures, and wildfire. Because representatives did not believe Mine Subsidence to be a significant threat, with a corresponding priority score less than one, it was not assessed for this Plan. Based on stakeholder feedback, Hurricanes and Tropical Storms were assessed in the Severe Storm assessment.

Mitigation projects will only be implemented if the benefits outweigh the associated cost of the proposed project. As part of the planning process, the Planning Team, with input from the local municipalities and the public, performed a general assessment of each mitigation action that would

require FEMA funding. Once the County or its jurisdictions are ready to implement a proposed mitigation action, it may be beneficial to perform a detailed cost-benefit analysis in order to determine the economic feasibility of that action. Actions will also be evaluated for feasibility based on social and environmental impacts, technical feasibility, and any other criteria that evaluate project effectiveness. This evaluation process for each project will be performed during the pre-application phase of a grant request. Project implementation and funding will be subject to the availability of FEMA grants and other funding sources, as well as local resources.

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

### 5.2 Hazard Mitigation Goals

The Clermont County Core Planning Committee assessed several goals and actions to mitigate the hazards identified in the hazard mitigation planning process. These mitigation actions were developed based on best practices and projects thought to be the most feasible and the most beneficial to reducing the impact of each of the hazards. The mitigation actions were generated in accordance with the following types of mitigation strategies, in no particular order: 1) prevention; 2) protection of property; 3) protection of natural resources; 4) structural projects; 5) emergency services; and, 6) public education and awareness.

The mitigation goals identified by the Core Planning Committee, are as follows:

- Reduce loss of life and injury from hazard events.
- Reduce environmental damage from hazard events and protect natural resources.
- Minimize damage to personal and public property.
- Provide public awareness of potential hazards and mitigation efforts.
- Update critical facility locations and identify new critical facilities to prevent disruption during and after an event.
- Identify areas of greatest impact from hazards (e.g. High-water marks, repetitive loss, etc.).
- Coordinate mitigation efforts through communication and collaboration between jurisdictions and all departments.
- Increase awareness of jurisdictional leaders on how to recuperate costs pre- and post-disasters.
- Develop and implement plans and programs to identify and reduce a hazard's risk (e.g. Emergency action plans, Power Restoration Plans, Post-Hazard Evaluation and Action Plan, etc.).
- Complete a hazardous materials commodity flow study which includes roads, air, and water transportation.
- Provide public awareness on the National Flood Insurance Program (NFIP), grant programs, and safe rooms.
- Promote communication and collaboration to all communities to assist in accurate data collection.

All respondent surveys are available for review in **Appendix F: Meeting Documentation**.

### 5.3 Hazard Mitigation Action Priority

The goals listed above, as well as the hazards assessed for this Plan, informed the development of actions that the County and participating jurisdictions can take to mitigate the impacts of each of the hazards. Members of the Core Planning Committee completed a Previous Mitigation Action Status survey, which indicated the status of mitigation actions included in the previous Hazard Mitigation Plan. This survey asked representatives to indicate whether the mitigation action from the previous plan was completed, deleted, deferred, unchanged, or ongoing. It also asked the representative if the action should be included in the Updated Plan.

Once all mitigation actions from the previous plan were reviewed and their status indicated, all mitigation actions for the 2019 Clermont County All-Hazards Hazard Mitigation Plan were reviewed and rated on a scale of one to five by members of the Core Planning Committee based on the several criteria, including whether the action was cost-effective, technically feasible, environmentally sound, needed immediately, and the action's total risk reduction.

The surveys collected at each of the Core Planning Committee and Public Meetings were tabulated to develop a score for each individual mitigation action. These scores are indicated in the Hazard Mitigation Action Priority Table on the following pages.

The score was determined by two factors:

1. The ranking of the hazard, as determined by the Hazard Priority Survey (**Table 5.1, above**).
2. The ratings received from the Core Planning Committee and the public on the mitigation actions.

The raw scores were then ranked and each mitigation action was assigned a number to indicate the priority of that specific action, according to the survey responses.

Hazard Mitigation Action Priorities are organized by hazard (see **Table 5.2**). The information used to develop the priorities that can be found in the Matrix Scoring Spreadsheet, which is located in **Appendix B**.

**Appendix B** also includes the status of all mitigation actions developed and included in the 2014 Clermont County All Hazards Mitigation Plan Update in a separate table. This table also includes comments from the jurisdictions responsible for each action. The completed surveys that were used to make this table can be found in **Appendix F**.

It should be noted that some of the mitigation actions in **Table 5.2** has a Lead Agency listed as "Local Jurisdictions." This designation indicates that a mitigation action applies to all of the local jurisdictions in Marion County. Also of note, for some of the mitigation actions, the local jurisdictions should be able to implement them without coordinating with other communities; however, inter-jurisdictional coordination, especially on similar hazards, is encouraged.

Table 5.2: Hazard Mitigation Actions and Priorities by Hazard

Hazard Mitigation Actions - Priorities Table, by Hazard								
#	Mitigation Action	Community	Action Score	Action Priority	Lead Agency	Funding Source	Start/End	Status
All Hazards								
1	Installation of Emergency Generators for the PUB WTP and PUB Well Fields.	County-wide,	1515.00	15	Clermont County Water Resources	To be identified through existing budget or grants	11/1/19-12/31/24	Deferred; Priorities with limited funding.
2	Tornado/Storm Shelters.	Pierce Township,	1511.00	19	Administrator of Pierce Twp	Existing Budget	11/1/19-12/31/24	Deferred; logistics and legalities of personnel.
3	Currently using County EOP. We are in process of developing our township specific EOP.	All Jurisdictions, Pierce Township,	1513.00	18	Administrator of Pierce Twp	Existing Budget	11/1/19-12/31/24	Deferred
4	Public education through whatever medium(s) on how to prepare and protect their interests (web, seminars).	All Jurisdictions, Pierce Township,	1520.00	5	Administrator of Pierce Twp	Existing Budget	11/1/19-12/31/24	Ongoing; use website, availability of education materials.
5	Green Address Signs for all residential homes.	Washington Township,	1517.00	14	Administrator of Washington Twp	Existing Budget	11/1/19-12/31/24	Ongoing; 90% complete
6	Develop/update back-up power generation capabilities at critical government facilities (e.g. temporary storm safe locations, community EOCs).	County-wide, All Jurisdictions,	1517.18	13	Clermont County, Mayors/Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New
7	Develop/update Continuity of Operations Plan.	County-wide, All Jurisdictions,	1518.94	11	Clermont County, Mayors/Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New

Hazard Mitigation Actions - Priorities Table, by Hazard								
#	Mitigation Action	Community	Action Score	Action Priority	Lead Agency	Funding Source	Start/End	Status
8	Provide public education and outreach on disaster preparedness including websites, newsletters, social media, Preparedness Month events, etc.	County-wide, All Jurisdictions,	1519.33	9	Clermont County EMA, Mayors/ Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New
9	Develop or update Emergency Operations Plans.	County-wide, All Jurisdictions,	1519.35	8	Clermont County EMA, Mayors/ Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New
10	Maintain an all-hazard outdoor warning siren system, including repairing, replacing, and upgrading.	County-wide, All Jurisdictions,	1518.89	12	Mayors/ Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New
11	Continue fire code, building code, zoning, and floodplain management enforcement activities.	County-wide, All Jurisdictions,	1520.89	4	Clermont County Building Dept., Mayors/ Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New
12	Schedule and participate in Table Top exercises of COOP & DR plans.	Wayne Township,	1515.00	15	Administrator of Wayne Twp	Existing Budget	11/1/19-12/31/24	New
13	Add preparedness month activities to public calendar.	Wayne Township,	1519.00	10	Administrator of Wayne Twp	Existing Budget	11/1/19-12/31/24	New
14	Implement public education via new township website, becoming viewer, mobile-friendly, and informative of hazard mitigation, disaster preparedness, safe locations, township policies, etc.	Wayne Township,	1520.00	5	Administrator of Wayne Twp	Existing Budget	11/1/19-12/31/24	New



## 5 | HAZARD MITIGATION

Hazard Mitigation Actions - Priorities Table, by Hazard								
#	Mitigation Action	Community	Action Score	Action Priority	Lead Agency	Funding Source	Start/End	Status
15	Establish safe locations within the township for residents seeking help during/after hazardous conditions.	Wayne Township,	1525.00	1	Administrator of Wayne Twp	Existing Budget	11/1/19-12/31/24	New
16	Purchase cots for designated shelters to be stored at sites.	Wayne Township,	1520.00	5	Administrator of Wayne Twp	Existing Budget	11/1/19-12/31/24	New
17	Purchase generator for community center.	Wayne Township,	1521.00	3	Administrator of Wayne Twp	Existing Budget	11/1/19-12/31/24	New
18	Review cooperative agreements with county/gas companies/Sheriffs' Department regarding DR plans.	Wayne Township,	1523.00	2	Administrator of Wayne Twp	Existing Budget	11/1/19-12/31/24	New
19	Promote the installation of community safe rooms.	County-wide,	1514.00	17	Clermont County EMA	Ohio EMA grant	11/1/19-12/31/24	New
Severe Storms								
20	Purchase weather radios for residents (Monroe Twp).	Monroe Township,	1419.00	25	Administrator of Monroe Twp	Existing Budget	11/1/19-12/31/24	Deferred; Applied for grant (unsuccessful). Have changed plan to a notification system like Nixel or Code Red.
21	Build a new Town Hall to include a Storm Shelter (Amelia Village).	Amelia Village,	1418.00	27	Mayor/Administrator of Amelia	Existing Budget	11/1/19-12/31/24	Unchanged
22	Purchase back-up generator for current Village Hall (Amelia Village).	Amelia Village,	1419.00	25	Mayor/Administrator of Amelia	Existing Budget, possible grants (PDM Grant)	11/1/19-12/31/24	Unchanged

Hazard Mitigation Actions - Priorities Table, by Hazard								
#	Mitigation Action	Community	Action Score	Action Priority	Lead Agency	Funding Source	Start/End	Status
23	A public education campaign on having multiple means to receive severe weather notifications, such as weather radios, smart phone apps, social media feeds, and/or registration for mass notification systems.	County-wide, All Jurisdictions,	1420.05	23	Clermont County EMA	Existing Budget	11/1/19-12/31/24	New
24	Create a Standard Operating Guideline for the timely clearing of roads from debris caused by severe storms.	County-wide, All Jurisdictions,	1419.21	24	Clermont County Engineer, Local Road/Service Depts.	Existing Budget	11/1/19-12/31/24	New
25	Maintain StormReady Certification.	County-wide, All Jurisdictions,	1420.44	22	Clermont County EMA	Existing Budget	11/1/19-12/31/24	New
26	Identify safe locations for residents to seek shelter during tornado events through mutual cooperation with local municipalities and organizations.	Wayne Township,	1421.00	21	Administrator of Wayne Twp	Existing Budget	11/1/19-12/31/24	New
27	Start discussions with neighboring townships regarding dead, fallen tree responsibilities at cemeteries.	Wayne Township,	1425.00	20	Administrator of Wayne Twp	Existing Budget	11/1/19-12/31/24	New
Tornadoes								
28	Shelter for Tornadoes and Cold Weather (Monroe Twp).	Monroe Township,	1323.00	28	Administrator of Monroe Twp	To be identified through grants or existing budget.	11/1/19-12/31/24	Ongoing; grants so far unsuccessful; looking for funding.
29	Install additional tornado sirens.	Pierce Township,	1315.00	31	Administrator of Pierce Twp	Existing Budget	11/1/19-12/31/24	Ongoing: 8 existing sirens; adding 5 more.

Hazard Mitigation Actions - Priorities Table, by Hazard								
#	Mitigation Action	Community	Action Score	Action Priority	Lead Agency	Funding Source	Start/End	Status
30	Promote the Ohio Safe Room Rebate Program for the construction and installation of residential safe rooms.	County-wide, All Jurisdictions,	1315.85	30	Clermont County EMA, Mayors/ Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New
31	Identify tornado safe locations for residents to seek shelter during tornadoes/high wind events, through coordination with local municipalities.	County-wide, All Jurisdictions,	1320.17	29	Mayors/ Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New
Flooding								
32	Replace or correct culvert pipes along SR-222 in Nicholasville to control flooding (Monroe Twp).	Monroe Township,	1216.00	41	Administrator of Monroe Twp	Existing Budget	11/1/19-12/31/24	Ongoing; 90% complete; culvert has been replaced. ODOT still works on ditching in this area.
33	Ditching/Culvert Upgrades of Washington Township roads.	Washington Township,	1214.00	42	Administrator of Washington Twp	Existing Budget	11/1/19-12/31/24	Ongoing, 90% complete.
34	Improve stormwater management system.	County-wide, All Jurisdictions,	1217.40	39	Clermont County Soil & Water Conservation District, Mayors/ Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New
35	Identify and study poor draining areas to control flooding.	County-wide, All Jurisdictions,	1218.63	35	Clermont County Engineer, Soil & Water Conservation District, Mayors/ Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New

Hazard Mitigation Actions - Priorities Table, by Hazard								
#	Mitigation Action	Community	Action Score	Action Priority	Lead Agency	Funding Source	Start/End	Status
36	Repair or replace ditching and culverts to control flooding.	County-wide, All Jurisdictions,	1217.50	37	Clermont County Engineer, Soil & Water Conservation District, Mayors/ Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New
37	Continue to identify and study riverbank stabilization opportunities.	County-wide, All Jurisdictions,	1216.25	40	Clermont County Engineer, Soil & Water Conservation District, Mayors/ Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New
38	Provide mitigation option guidance to property owners of flood-prone structures, such as acquisition, relocation, elevation, dry flood proofing, and wet flood proofing. Guidance may include applying for federal mitigation dollars when possible.	County-wide, All Jurisdictions,	1217.42	38	Clermont County EMA, Mayors/ Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New
39	Encourage residents in flood-prone areas to purchase flood insurance.	County-wide, All Jurisdictions,	1218.15	36	Clermont County EMA, Mayors/ Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New
40	Identify vulnerabilities, deteriorations of ditches and culverts on township roads.	Wayne Township,	1223.00	33	Administrator of Wayne Twp	Existing Budget	11/1/19-12/31/24	New
41	Start ditching & culvert upgrades of township roads.	Wayne Township,	1222.00	34	Administrator of Wayne Twp	Existing Budget	11/1/19-12/31/24	New

Hazard Mitigation Actions - Priorities Table, by Hazard								
#	Mitigation Action	Community	Action Score	Action Priority	Lead Agency	Funding Source	Start/End	Status
42	Stormwater management in Newtonsville - identify, document issues.	Wayne Township,	1225.00	32	Administrator of Wayne Twp	Existing Budget	11/1/19-12/31/24	New
Utility Failure								
43	Tree trimming of township roads in right of ways along utility lines.	County-wide, All Jurisdictions,	1118.00	46	Utility Providers	Existing Budget	11/1/19-12/31/24	New
44	Identify vulnerabilities on township roads with power lines.	Wayne Township,	1122.00	43	Administrator of Wayne Twp	Existing Budget	11/1/19-12/31/24	New
45	Tree trimming of township roads.	Wayne Township,	1117.00	48	Administrator of Wayne Twp	Existing Budget	11/1/19-12/31/24	New
46	Implement zoning regarding location of, planting of trees near power lines.	Wayne Township,	1119.00	45	Administrator of Wayne Twp	Existing Budget	11/1/19-12/31/24	New
47	Implementation of Source Water Protection Plans and Drinking Water Contingency Plans.	County-wide, All Jurisdictions,	1120.00	44	Clermont County Water Resources, Drinking Water Utilities	Existing Budget	11/1/19-12/31/24	New
48	Implement actions necessary for the proper closure and management of the former Beckjord facility and associated coal ash ponds.	County-wide, All Jurisdictions,	1118.00	46	Clermont County Water Resources, Administrator of Pierce Twp	Existing Budget	11/1/19-12/31/24	New
Hazardous Materials								
49	Develop/Update Wellhead Protection Plan	County-wide, All Jurisdictions,	1019.50	49	Clermont County Water Resources, Drinking Water Utilities	Existing Budget	11/1/19-12/31/24	New
50	Organize an annual drill to prepare for a disaster involving hazardous materials.	County-wide, All Jurisdictions,	1015.45	52	Clermont County EMA, Mayors/ Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New

Hazard Mitigation Actions - Priorities Table, by Hazard								
#	Mitigation Action	Community	Action Score	Action Priority	Lead Agency	Funding Source	Start/End	Status
51	Report what hazardous materials are being handled on-site and amounts according to regulation.	County-wide, All Jurisdictions,	1018.17	50	Clermont County EMA, Mayors/ Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New
52	Update commodity flow study to identify types and volume of hazardous materials transported via river, pipeline, truck, rail, and plane.	County-wide, All Jurisdictions,	1016.00	51	Clermont County EMA, Mayors/ Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New
53	Public outreach regarding disposal of household hazardous waste.	County-wide, All Jurisdictions,	1015.00	53	Adams-Clermont Solid Waste District	Existing Budget	11/1/19-12/31/24	New
Winter Storms								
54	Provide public education and outreach on winter weather safety, which may include family and traveler emergency preparedness, driver safety, and animal protection.	County-wide, All Jurisdictions,	917.64	54	Clermont County EMA	Existing Budget	11/1/19-12/31/24	New
Landslides								
55	Develop a map of landslide prone areas.	County-wide, All Jurisdictions,	815.75	56	Clermont County GIS, Engineer, Mayors/ Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New
56	Enforce slide-prone area ordinance to limit fill or dumping and address drainage or other landslide related problems.	County-wide, All Jurisdictions,	814.33	62	Clermont County Engineer, Mayors/ Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New



Hazard Mitigation Actions - Priorities Table, by Hazard								
#	Mitigation Action	Community	Action Score	Action Priority	Lead Agency	Funding Source	Start/End	Status
57	Enforce drainage control regulations to reduce risk of landslides resulting from saturated soils.	County-wide, All Jurisdictions,	815.00	58	Clermont County Building Dept, Engineer, Mayors/ Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New
58	Develop grading ordinances which require developers and landowners to obtain permits prior to filling or regrading.	County-wide, All Jurisdictions,	815.75	56	Clermont County Building Dept, Mayors/ Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New
59	Implement Sanitary System Codes to reduce the effect of drainage on landslides by limiting the type and location of sanitary systems.	County-wide, All Jurisdictions,	814.50	61	Clermont County Public Health, Mayors/ Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New
60	Provide mitigation option guidance to property owners on site stabilization, energy dissipation, and flow control measures.	County-wide, All Jurisdictions,	816.67	55	Clermont County Soil & Water Conservation District, Building Dept., Mayors/ Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New
61	Implement Restraining Structures to hold soil in place.	County-wide, All Jurisdictions,	814.75	60	Clermont County Soil & Water Conservation District, Engineer, Mayors/ Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New

Hazard Mitigation Actions - Priorities Table, by Hazard								
#	Mitigation Action	Community	Action Score	Action Priority	Lead Agency	Funding Source	Start/End	Status
62	Implement Debris-Flow Measures, such as stabilization, energy dissipation, and flow control measures, to reduce damage in sloping areas.	County-wide, All Jurisdictions,	813.33	64	Clermont County Soil & Water Conservation District, Engineer, Mayors/ Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New
63	Implement grading to increase slope stability.	County-wide, All Jurisdictions,	813.67	63	Clermont County Soil & Water Conservation District, Engineer, Mayors/ Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New
64	Consider Vegetation Placement and Management Plans to increase soil stability.	County-wide, All Jurisdictions,	815.00	58	Clermont County Soil & Water Conservation District, Engineer, Mayors/ Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New
65	Consider placement of utilities. (Placing utilities outside of landslide areas decreases the risk of service disruption.)	County-wide, All Jurisdictions,	813.25	65	Utility Providers	Existing Budget	11/1/19-12/31/24	New
Dam Failure								
66	Coordinate with ODNR to implement Dam Safety Program.	County-wide, All Jurisdictions,	716.55	71	Clermont County EMA, ODNR	Existing Budget	11/1/19-12/31/24	New
67	Encourage dam owners develop/update their dam safety plans.	County-wide, All Jurisdictions,	717.33	68	Clermont County EMA, ODNR	Existing Budget	11/1/19-12/31/24	New

Hazard Mitigation Actions - Priorities Table, by Hazard								
#	Mitigation Action	Community	Action Score	Action Priority	Lead Agency	Funding Source	Start/End	Status
68	Encourage dam owners to be prepared to respond should their dam fail, including a notification plan for the appropriate response agencies.	County-wide, All Jurisdictions,	717.88	67	Clermont County EMA, ODNR	Existing Budget	11/1/19-12/31/24	New
69	Identify downstream risk should dam failure occur.	County-wide, All Jurisdictions,	716.64	70	Clermont County EMA, ODNR	Existing Budget	11/1/19-12/31/24	New
70	Coordinate with local communities to ensure they understand risk to dam failures and the impact it would have on their community.	County-wide, All Jurisdictions,	717.00	69	Clermont County EMA, ODNR	Existing Budget	11/1/19-12/31/24	New
71	Review Disaster Recovery Plan	Wayne Township,	720.00	66	Administrator of Wayne Twp	Existing Budget	11/1/19-12/31/24	New
72	Add to Continuity of Operations Plan.	Wayne Township,	712.00	73	Administrator of Wayne Twp	Existing Budget	11/1/19-12/31/24	New
73	Coordinate with dam owners/operators to rehabilitate high hazard dams that have the potential for failure	County-wide,	714.00	72	Clermont County EMA	Existing Budget	11/1/19-12/31/24	New
Harmful & Invasive Species								
74	Implement an invasive species education program that covers associated hazards, identification, behavior, and quarantine procedures.	County-wide, All Jurisdictions,	617.36	76	OSU Extension Office, USDA, Clermont County Public Health	Existing Budget	11/1/19-12/31/24	New
75	Share information with the public that explains the importance of not importing or exporting firewood.	County-wide, All Jurisdictions,	617.50	75	OSU Extension Office, USDA, Mayors/Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New

Hazard Mitigation Actions - Priorities Table, by Hazard								
#	Mitigation Action	Community	Action Score	Action Priority	Lead Agency	Funding Source	Start/End	Status
76	Work with agricultural producers to monitor and minimize nutrient runoff in order to prevent Harmful Algal Blooms.	County-wide, All Jurisdictions,	616.13	77	Clermont County Public Health, Water Resources, Soil and Water Conservation District	Existing Budget	11/1/19-12/31/24	New
77	Public education on property owner responsibility for the removal of dead/dying vegetation affected by invasive species.	County-wide, All Jurisdictions,	616.00	78	OSU Extension	Existing Budget	11/1/19-12/31/24	New
78	Increase protection efforts for public infrastructure that may be affected by dead/dying vegetation due to invasive species (e.g. tree removal).	County-wide, All Jurisdictions,	610.00	79	Clermont County, Mayors/Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New
79	Identify and establish policy and procedure to deal with falling dead ash trees within the township.	Wayne Township,	622.00	74	Administrator of Wayne Twp	Existing Budget	11/1/19-12/31/24	New
Terrorism								
80	Encourage critical infrastructure to implement protective measures at their facilities.	County-wide, All Jurisdictions,	516.56	82	Clermont County EMA, Sheriff and Police Depts	Existing Budget	11/1/19-12/31/24	New
81	Coordinate with local law enforcement to ensure the safety of large public gathering events.	County-wide, All Jurisdictions,	520.22	80	Clermont County Sheriff, Local Police Departments	Existing Budget	11/1/19-12/31/24	New

Hazard Mitigation Actions - Priorities Table, by Hazard								
#	Mitigation Action	Community	Action Score	Action Priority	Lead Agency	Funding Source	Start/End	Status
82	Provide guidance to schools, churches, government agencies, health care facilities, and other critical facilities on improving protection, preparedness, response, and recovery activities to an active aggressor threat.	County-wide, All Jurisdictions,	519.35	81	Clermont County Sheriff, Local Police Departments, EMA	Existing Budget	11/1/19-12/31/24	New
Extreme Temperatures								
83	Provide guidance and resources for vulnerable populations during extreme temperature events.	County-wide, All Jurisdictions,	415.40	83	Clermont County Public Health, Mayors/ Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New
84	Provide guidance and resources on utility assistance programs.	County-wide, All Jurisdictions,	415.20	84	Clermont County Community Services	Existing Budget	11/1/19-12/31/24	New
Drought								
85	Encourage all property owners to prepare for droughts by installing equipment that reduces the use of water.	County-wide, All Jurisdictions,	315.00	85	Clermont County Water Resources, Drinking Water Utilities	Existing Budget	11/1/19-12/31/24	New
86	Develop water storage plans, water use ordinances, contingency plans, and water delivery systems in water utility operating plans.	County-wide, All Jurisdictions,	314.67	86	Clermont County Water Resources, Drinking Water Utilities	Existing Budget	11/1/19-12/31/24	New
87	Encourage farmers to purchase crop insurance and drought insurance.	County-wide, All Jurisdictions,	312.00	88	OSU Extension, Mayors/ Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New

Hazard Mitigation Actions - Priorities Table, by Hazard								
#	Mitigation Action	Community	Action Score	Action Priority	Lead Agency	Funding Source	Start/End	Status
88	Develop map of sensitive areas, population, wildfire possibilities. Look into Dry Hydrants.	Wayne Township,	313.00	87	Administrator of Wayne Twp	Existing Budget	11/1/19-12/31/24	New
Wildfire								
89	Promote public education on smoking hazards and the risks of recreational fires.	County-wide, All Jurisdictions,	217.63	90	Local Fire/EMS Departments	Existing Budget	11/1/19-12/31/24	New
90	Provide public education on extreme fire danger and red flag warnings, including what it means and what actions to take when it is issued.	County-wide, All Jurisdictions,	218.33	89	Local Fire/EMS Departments	Existing Budget	11/1/19-12/31/24	New
Earthquakes								
91	Use community outreach activities to foster an awareness of earthquake mitigation activities in homes, schools, and businesses.	County-wide, All Jurisdictions,	114.62	91	Clermont County EMA, Mayors/Administrators of Local Jurisdictions	Existing Budget	11/1/19-12/31/24	New
92	Work with insurance industry representatives to increase public awareness of the importance of earthquake insurance for home owners and other building owners.	County-wide, All Jurisdictions,	111.80	92	Clermont County EMA	Existing Budget	11/1/19-12/31/24	New



# 6 | Schedule and Maintenance

### 6.1 Participation Overview

The Clermont County All-Hazards Mitigation Plan will be adopted by all jurisdictions that chose to participate: Clermont County, City of Milford, and the Villages of Amelia, Batavia, Bethel, Chilo, Felicity, Moscow, Neville, New Richmond, Newtonsville, Owensville, and Williamsburg. Additional entities, including townships, may also choose to adopt the plan. As mentioned in the Introduction, the City of Loveland is located in Clermont, Hamilton, and Warren Counties and selected to participate in the 2018 Hamilton County Multi-Hazard Mitigation Plan. After the jurisdictions have adopted the plan, their signed resolutions or ordinances will be added to the plan as an Appendix.

### 6.2 Continued Public Involvement

The public will continue to be able to provide feedback on the Plan, as the Plan will be available through the Clermont County EMA and Ohio EMA websites. The Clermont County EMA will provide access to the plan to all County, municipality, and township offices, and will make the Plan available in hardcopy and electronic format to the public as appropriate. The Clermont County EMA Director will post notices of any meetings for updating and evaluating the Plan, using the usual methods for posting meeting announcements in the County to invite the public to participate. All meetings will be open to the general public. The Clermont County EMA will publicly announce updates to the Plan as part of the review process.

### 6.3 Plan Integration & Annual Review

Local government plays a major role in the execution and implementation of mitigation strategies. This happens in large part during the daily operations that guide the development of various communities in the County. As such, each community will be responsible for monitoring which items they are accountable for implementing. The Core Planning Committee will meet annually in order to monitor and evaluate the Clermont County All-Hazards Mitigation Plan. All participating jurisdictions will be encouraged to attend this yearly plan update meeting. The meeting will be held so that it coincides with the budget process so that future funding sources can be determined and set aside for actions slated for that particular year. This meeting will also be available to the public.

### 6.4 Updating the Plan

The Plan must be updated within five years and re-adopted by the County and all participating jurisdictions in order to maintain compliance with federal regulations and ensure eligibility for certain federal mitigation grant funds. The Clermont County EMA will identify any necessary modifications to the Plan, including changes in mitigation goals and actions that should be incorporated into the next update. The Clermont County EMA Director and the County Commissioners will initiate the process of updating the plan in accordance with federal guidelines in sufficient time to meet state and federal deadlines.