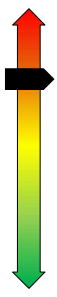


2.2.14 Tornado

Tornadoes are violently rotating columns of air that touch the ground and are usually attached to the base of an intense thunderstorm.				
 RISK HIGHEST HIGH MEDIUM LOW LOWEST	Period of Occurrence:	At any time, typically when warm and cold air masses are present together	Risk Ranking:	High
	Warning Time:	Less than 6 hours	Type of Hazard:	Natural
	Probability:	Occasional (May or may not occur in a year)	Impact:	Localized (Less than 10% of land are affected)
	Disaster Declarations:	DR-238-OH (1968) DR-870-OH (1990) OH-00032 (2012)		DR-4361-OH (2018) OH-00078 (2020)

Hazard Introduction and Overview

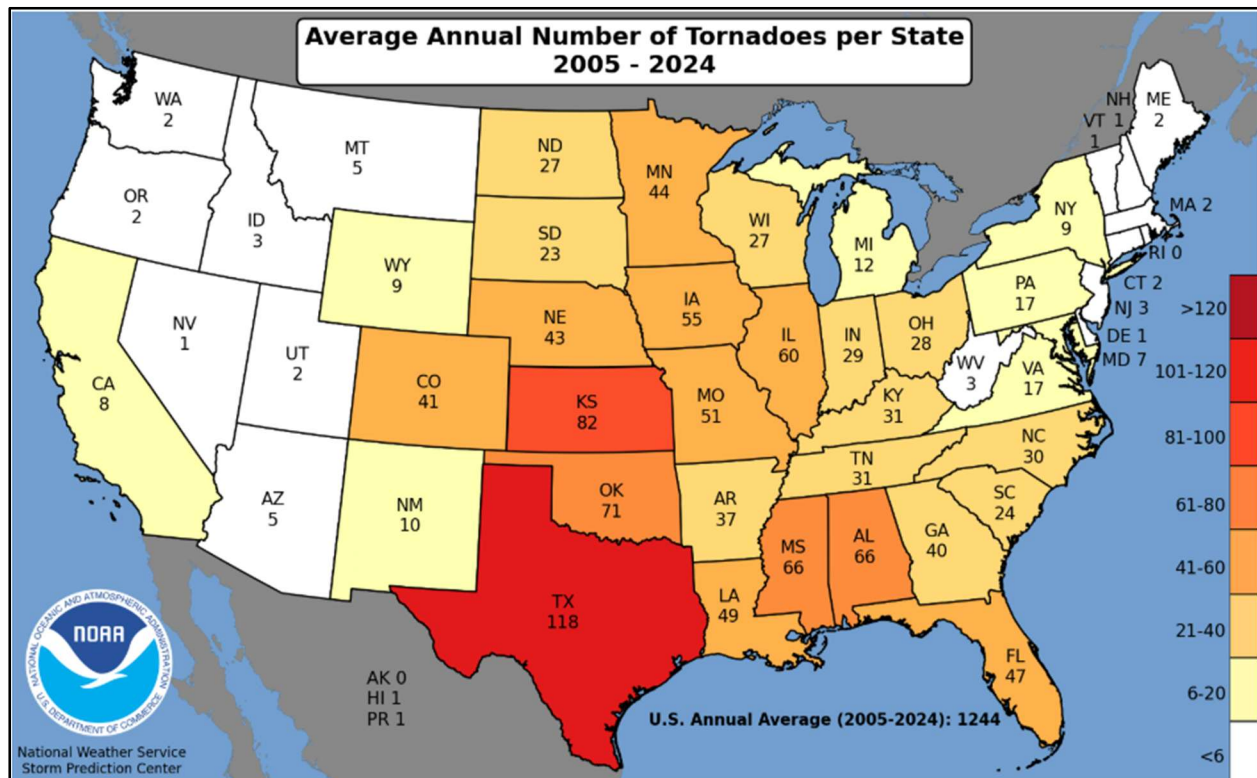
Tornadoes form when warm, humid air collides with cold, dry air. They are vertical funnels of rapidly spinning air that extend from a thunderstorm cloud to the ground. Tornadoes can have wind speeds up to 250 miles per hour and widths of approximately 660 feet. They occur in the U.S. more than anywhere else in the world, nationally there is an average of 800 tornadoes reported annually across the 50 states. Tornadoes originate from rotating thunderstorms called “supercells” or from Quasi-Linear Convective Systems (QLCS). Tornadoes are historically very difficult to predict. The storms that may produce a tornado can be forecasted, but not every storm with that potential will spawn a tornado and predicting where and when that will happen is incredibly difficult.

Location and Extent

Tornadoes are non-spatial hazards; therefore, it is often difficult to profile tornadoes and determine exact risk areas. Among the most unpredictable of weather phenomena, tornadoes can occur at any time of day, in any state in the union, and in any season. The nature of tornadoes is that they strike at random. Historical trends show that some areas of the country, such as the Midwest and plain states commonly referred to as tornado alley, have a higher probability of tornado occurrences due to the collision of moist, warm air moving north from the Gulf of America with colder fronts moving east from the Rocky Mountains; however, they can and have struck in many other areas.

According to information obtained from the National Oceanic and Atmospheric Administration (NOAA), see Figure 2.2.14.a below, between 2005 and 2024, Ohio averaged 28 tornadoes per year making it the state with the 20th most reported tornadoes per year (NOAA, NWS, 2024). The Ohio River Valley, which encompasses Clermont County, is a “preferred storm track” along which severe thunderstorms are likely to form (WOSU Public Media, 2025). This increases the possibility of tornadoes in this area.

Figure 2.2.14.a



Predicting exactly what parts of Clermont County have a greater chance of being struck by a tornado is not possible. The best predictor of future tornadoes is the occurrence of previous tornadoes. Figure 2.2.14.b below is a map illustrating tornado touchdown locations and paths within Clermont County.

CLERMONT COUNTY HAZARD MITIGATION PLAN

**Figure 2.2.14.b:
Tornado Touchdowns
& Paths (1953-2023)**

Data Source(s):
NOAA NCEI



Tornado Touchdowns



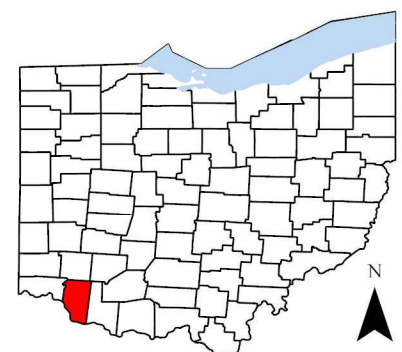
Tornado Paths

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.



CLERMONT
COUNTY OHIO

H
Consulting



0 0.93 1.85 3.7 5.55 7.4
Miles

As mentioned above, a tornado extends from the base of a thunderstorm to the ground. Normally, thunderstorms and associated tornadoes develop in warm, moist air in advance of strong eastward-moving cold fronts in late winter and early spring; however, they can occur any time of year. Tornadoes can also occur along a “dryline” which separates very warm, moist air to the east from hot, dry air to the west.

Tornadoes are measured by damage scale based on their winds, with greater damage equating to greater wind speed. The original Fujita-scale (F-scale) was developed without considering a structure’s integrity or condition as it relates to the wind speed necessary to damage it. The process of rating the damage was subjective with the original F-scale and arbitrary judgments were the norm. In order to reduce this subjectivity, the Enhanced F-scale (EF- scale) took effect February 1, 2007.

The Enhanced F-scale uses the original F-scale (i.e., F0-F5) developed by Dr. Theodor Fujita and classifies tornado damage across 28 different types of damage indicators, which mostly involve building/structure type, and these are assessed at eight damage levels (1-8). Therefore, construction types and their 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 the tornado. Table 2.2.14.1 below lists the classifications under the EF scale. It should be noted the wind speeds listed are estimates based on damage rather than measurements. Also, there are no plans by National Oceanic Atmospheric Administration (NOAA) or the National Weather Service (NWS) to re-evaluate the historical tornado data using the Enhanced scale.

Table 2.2.14.1

Enhanced Fujita (EF) Scale		
<i>EF Rating</i>	<i>3-second Gust Speed (mph)</i>	<i>Possible Damage</i>
0	65-85	Light Damage. Some damage to chimneys; break branches off trees; push over shallow-rooted trees; damage to signboards.
1	86-110	Moderate Damage. Surface peeled off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off roads.
2	111-135	Considerable Damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
3	136-165	Severe Damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; cars lifted off the ground and thrown.
4	166-200	Devastating Damage. Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
5	201+	Incredible Damage. Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobile sized missiles fly through the air more than 100-yards; trees debarked; incredible phenomena will occur.

The original Fujita Scale is provided below as 56% of the documented tornadoes that have occurred in Clermont County were measured utilizing this scale.

Table 2.2.14.2

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

Impacts and Vulnerability

While tornadoes are typically short-lived in duration, they are intensely focused and destructive. Tornadoes are the most violent of all atmospheric storms. Damage from tornadoes comes from the strong winds they contain. Wind speed in tornadoes can reach 300 miles per hour; winds at that speed can destroy homes, uproot trees, cause automobiles to become airborne, and turn glass and debris into high-velocity projectiles. All above-ground utilities are at risk for damage by tornadoes. Secondary and tertiary impacts from tornadoes include damage to roofs and other home finishing's. Additionally, fallen trees can interrupt power service or block transportation access.

Populations residing in mobile home parks and campgrounds should take particular care to seek adequate shelter with approaching severe weather. There are several mobile home parks in Clermont County, they are listed by jurisdiction and size in the table below.

Table 2.2.14.3

Clermont County Mobile Home Parks			
<i>Mobile Home Park Name</i>	<i>Jurisdiction</i>	<i>Size (Acres)</i>	<i>Size (No. Structures)</i>
East Fork Crossing	Batavia Twp	70.0	Large 100+
Greenbriar Estates	Batavia Twp	80.4	Large 100+
Bullocks	Franklin Twp	5.1	Small <50
Country View	Franklin Twp	10.0	Small <50
Felicity Estates	Franklin Twp	7.9	Small <50
Happy Acre	Franklin Twp	1.1	Small <50
L&S	Franklin Twp	1.0	Small <50
Limings MHP 2	Franklin Twp	2.6	Small <50
Limings MHP 3	Franklin Twp	2.7	Small <50
Deerfield Estate	Goshen Twp	9.9	Medium 51-100
Fay Gardens	Goshen Twp	30.3	Large 100+
Green Acres	Goshen Twp	38.0	Large 100+
Lakeshore Estates	Goshen Twp	49.2	Large 100+
Woodville Gardens	Goshen Twp	54.1	Large 100+
Colonial Estates	Miami Twp	13.0	Small <50
Orchard Lake	Miami Twp	24.2	Large 100+
Pleasant Hill	Miami Twp	20.2	Medium 51-100
Royal Hills Village	Miami Twp	24.1	Large 100+
Vista Woods	Miami Twp	15.5	Medium 51-100
Theilman's	Milford City	26.0	Medium 51-100
Amelia Estates FKA Holly Towne	Monroe Twp	23.0	Large 100+
Apple Creek Mfg. Home Community	Monroe Twp	58.9	Large 100+
Forest Creek	Monroe Twp	33.9	Medium 51-100
Hi-View Estates	Monroe Twp	21.5	Medium 51-100
Lakeside Estates	Monroe Twp	24.2	Medium 51-100

Clermont County Mobile Home Parks			
<i>Mobile Home Park Name</i>	<i>Jurisdiction</i>	<i>Size (Acres)</i>	<i>Size (No. Structures)</i>
Tall Timbers	Monroe Twp	47.0	Large 100+
Bowling	Ohio Twp	4.0	Small <50
Chestnut Lane	Ohio Twp	5.0	Small <50
Richmond Estates	Ohio Twp	122.1	Large 100+
Riverfront RV Park	Ohio Twp	53.3	Seasonal
Tradewinds	Ohio Twp	31.9	Large 100+
Eastgate Village	Pierce Twp	17.9	Large 100+

There are several large campgrounds in Clermont County including those located within the East Fork State Park, Stonelick State Park, Lake Cozy-Dale Campground, the Landing at Bear Creek RV Park and Campground, River Days Campground and River Pines RV Resort.

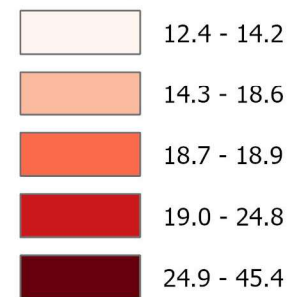
A factor that is somewhat related to income and housing is the presence of mobile homes. Mobile homes are affordable options for many residents, not only for those with lower incomes, but also for the elderly. While the quality of mobile home construction has improved in recent decades, data from numerous disasters (e.g., hurricanes, tornadoes, and high winds) generally suggests that they do not hold up as well to the elements as traditional stick-built homes. The National Weather Service (NWS) suggests that mobile home residents are 15 to 20 times more likely to be killed by a tornado that strikes the home in comparison to those in stick-built structures. “On average, a total of 72 percent of all tornado-related fatalities are in homes and 54 percent of those fatalities are in mobile homes” (NWS, n.d.). EF-1 tornadoes (as well as high-end severe thunderstorm winds) can severely damage or destroy mobile homes. The EF3 tornado that occurred on March 2, 2012 resulted in three fatalities. Two of those fatalities involved occupants in mobile homes and one involved a flood mitigated property (i.e., elevated structure collapse). The map below (Figure 2.2.14.c) depicts the distribution of mobile homes by Census tract.

CLERMONT COUNTY HAZARD MITIGATION PLAN

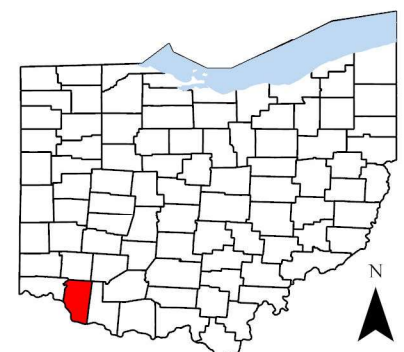
**Figure 2.2.14.c:
Mobile Homes by
Census Tract**

Data Source(s):
CDC ATSDR SVI (2020)

>10%, Mobile Homes



DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.



0 0.9 3.85 3.7 5.55 7.4
Miles

Historical Occurrences

According to NOAA's National Centers for Environmental Information (NCEI) Storm Events Database, there has been 23 tornadoes in Clermont County since 1953, this suggests an occurrence rate of 0.31 tornadoes per year. These tornadoes resulted in 53 reported injuries, four reported fatalities, approximately \$15.3 million in reported property damage and \$2,000 in reported crop damage. The majority of the tornadoes that have occurred in Clermont County were rated EF0, F0, and F1, accounting for 15 of the 23 tornadoes. The areas of the county that have experienced the most tornadoes are Goshen and Moscow. The months when the most tornadoes occurred were March, April, and July, with four each. The following table summarizes those incidents.

Table 2.2.14.4

Historical Tornadoes – Clermont County (1953 to 2024)						
Date	Areas Impacted	Scale	Deaths	Injuries	Property Damage	Crop Damage
4/15/1953	Wiltsee	F1	0	0	\$25,000	\$0
4/23/1968	Willowville & Fayetteville	F4	1	29	\$2,500,000	\$0
8/09/1969	Milford & Owensville	F3	0	7	\$250,000	\$0
6/24/1976	Goshen	F0	0	0	\$250,000	\$0
6/12/1978	Miamiville & Williamsburg	F1	0	0	\$50,000	\$0
4/08/1980	Neville	F1	0	2	\$250,000	\$0
6/02/1990	Northeast of Moscow	F2	0	0	\$250,000	\$0
8/05/1995	Neville & Chilo	F1	0	0	\$30,000	\$0
5/08/1996	Neville	F0	0	0	\$30,000	\$0
7/02/1997	Moscow & Felicity	F3	0	0	\$2,000,000	\$0
8/24/1999	Loveland & Goshen	F0	0	0	\$25,000	\$0
7/11/2006	Milford & Goshen	F1	0	0	\$100,000	\$2,000
5/30/2009	Bethel	EF0	0	0	\$1,000	\$0
5/23/2011	Moores Fork	EF0	0	0	\$30,000	\$0
3/02/2012	Moscow & Wiggonsville	EF3	3	13	\$5,660,000	\$0
9/07/2012	Williams Corners	EF0	0	0	\$40,000	\$0
3/01/2017	Locust Lake area of Pierce Township	EF1	0	0	\$400,000	\$0
3/26/2017	West of William H. Harsha Lake	EF1	0	0	\$30,000	\$0
2/25/2018	Moscow & Felicity	EF1	0	0	\$85,000	\$0
4/08/2020	Newtonsville & Edenton	EF0	0	0	\$50,000	\$0
7/06/2022	Branch Hill & Epworth Heights	EF1	0	0	\$100,000	\$0
7/06/2022	Goshen	EF2	0	2	\$3,000,000	\$0
3/03/2023	Tate & Williamsburg Townships	EF0	0	0	\$100,000	\$0
TOTALS			4	53	\$15,256,000	\$2,000

Source: NOAA – NCEI, Storm Events Database

Willowville & Fayetteville F4 Tornado – April 23, 1968 (DR-238-OH)

At approximately 1:00 p.m., an F4 tornado touched down near the community of Willowville. The 100 yard wide tornado remained on the ground for nearly 16 miles traveling northeast, crossing U.S. Route 50 prior to lifting west of Fayetteville. This is the longest track tornado recorded in Clermont County. This tornado resulted in one fatality, 29 reported injuries, and \$2.5 million in reported property damage.

Moscow EF3 Tornado – March 2, 2012 (OH-00032)

Thunderstorms developed during the afternoon in a high wind shear environment ahead of a strengthening low pressure system. Many of these storms became severe, with large hail, damaging thunderstorm winds, and tornadoes all being the main threats.

At approximately 4:46 p.m., an EF3 tornado approximately 440 yards wide moved into Clermont County from Pendleton County, Kentucky, directly impacting the Village of Moscow. The tornado continued on the ground for approximately 11.04 miles passing through Washington, Franklin, and Tate Townships prior to crossing into Brown County and 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 miles per hour in Clermont County, and 100 miles per hour in Brown County.

This tornado resulted in three fatalities and 13 injuries. Property damages were estimated at \$5,660,000 making this the costliest tornado in Clermont County's history. A State Disaster Declaration was issued 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.

Goshen EF2 Tornado – July 6, 2022

Thunderstorms developed ahead of a frontal boundary moving into a warm and humid airmass that was in place across the Ohio Valley. At approximately 2:00 p.m., an EF2 tornado touched down along Blue Sky Drive where several barns were damaged and multiple trees were uprooted and snapped. Additional damage consisting of dozens of snapped and uprooted trees occurred just southeast of the Huntley Road and Goshen Road intersection. As the tornado

approached Goshen, it rapidly strengthened and grew to around 500 yards in width. The tornado crossed Main Street, just to the west of State Route 28, causing significant damage to a couple of businesses. An insurance agency

completely lost its roof and several of the exterior walls collapsed. A woman inside the business was transported to the hospital with non-life threatening injuries. The large and strong tornado then crossed State Route 28, significantly damaging a fire station and causing complete roof loss to a brick business next door. Most of the exterior walls on the business also collapsed. A firefighter at the fire station also suffered minor injuries. This was the strongest point in the tornado life cycle with winds estimated around 130 mph.

Figure 2.2.14.d



Damage sustained to Fire Department Facility

The tornado continued moving southeast along Goshen Road, snapping hundreds of trees, and causing at least six

more homes to completely lose their roofs. A couple of additional homes also had some failure of exterior walls. The tornado struck both the middle and high schools causing some roof and siding damage. The tornado continued moving to the southeast crossing Woodville Pike near its intersection with

Figure 2.2.14.e



Tornado Damage – Goshen Township

Manila Road. The tornado then crossed Moler Road where it completely destroyed a barn and downed dozens of trees. Based on aerial footage, the tornado likely lifted somewhere between Moler Road and Cedarville Road. The tornado was on the ground for approximately 4.8 miles and resulted in two injuries and an estimated \$3,000,000 in property damages

Loss and Damages

Information obtained from FEMA's National Risk Index (NRI) was utilized to assess tornado impacts for each participating jurisdiction.

Table 2.2.14.5

Clermont County Tornado NRI Exposure / Expected Annual Loss Estimates							
Census Tract	Exposure (Buildings)	Exposure (Pop)	Exposure (Ag)	EAL (Buildings)	EAL (Pop Equivalence)	EAL (Ag)	EAL (Total)
39025040101	\$565,964,912	5,071	\$11,863,729	\$47,340	\$53,358	\$88	\$100,785
39025040102	\$296,093,220	2,648	\$1,640,799	\$24,769	\$27,844	\$13	\$52,625
39025040202	\$332,271,724	2,215	\$1,802,394	\$27,773	\$23,363	\$15	\$51,151
39025040203	\$1,022,070,560	6,230	\$732,952	\$85,468	\$65,715	\$7	\$151,190
39025040205	\$341,676,114	3,192	\$26,858	\$28,582	\$33,547	\$0	\$62,130
39025040206	\$894,653,283	4,463	\$852,559	\$74,795	\$46,997	\$8	\$121,801
39025040301	\$889,865,533	3,979	\$8,845	\$74,371	\$41,972	\$0	\$116,343
39025040302	\$950,572,549	3,900	\$85,348	\$79,528	\$41,155	\$1	\$120,684
39025040303	\$1,429,187,632	7,628	\$41,135	\$119,500	\$80,315	\$0	\$199,816
39025040401	\$968,154,343	3,349	\$16,266	\$81,133	\$35,243	\$0	\$116,376
39025040403	\$499,144,737	2,786	\$1,421	\$41,756	\$29,278	\$0	\$71,034
39025040404	\$988,884,593	3,974	\$3,570	\$82,723	\$41,774	\$0	\$124,497
39025040405	\$549,076,131	3,101	\$5,525	\$45,891	\$32,708	\$0	\$78,599
39025040500	\$1,064,910,314	5,082	\$8,913	\$89,085	\$53,407	\$0	\$142,492
39025040600	\$1,669,457,750	7,439	\$119,637	\$139,674	\$78,180	\$1	\$217,854
39025040702	\$565,211,242	4,351	\$48,809	\$47,285	\$45,726	\$1	\$93,012
39025040703	\$538,186,019	3,479	\$152	\$45,025	\$36,562	\$0	\$81,587
39025040704	\$624,067,866	3,949	\$1,000	\$52,206	\$41,500	\$0	\$93,707
39025040800	\$959,839,371	5,663	\$1,864,725	\$80,301	\$59,515	\$20	\$139,837
39025040900	\$1,041,851,226	5,682	\$3,329,092	\$87,161	\$59,714	\$28	\$146,903
39025041001	\$970,109,996	5,861	\$761,073	\$81,157	\$61,594	\$7	\$142,758
39025041002	\$894,322,825	3,092	\$669,277	\$74,815	\$32,494	\$6	\$107,315
39025041101	\$613,673,503	3,411	\$86,377	\$51,337	\$35,846	\$2	\$87,185
39025041102	\$957,999,896	5,352	\$134,546	\$80,142	\$56,244	\$1	\$136,387
39025041104	\$710,098,998	3,822	\$4,882	\$59,403	\$40,165	\$0	\$99,569
39025041105	\$610,093,661	6,110	\$42,215	\$51,037	\$64,210	\$0	\$115,248
39025041201	\$525,625,929	4,125	\$2,223	\$43,971	\$43,350	\$0	\$87,321
39025041202	\$1,271,849,462	5,024	\$27,920	\$106,397	\$52,797	\$0	\$159,194
39025041303	\$704,821,673	5,036	\$5,454	\$58,962	\$52,923	\$0	\$111,885
39025041304	\$26,506,533	23	\$1,446	\$2,217	\$242	\$0	\$2,459
39025041305	\$815,199,374	5,269	\$2,303	\$68,196	\$55,372	\$0	\$123,568
39025041306	\$1,086,996,949	5,438	\$35,432	\$90,933	\$57,148	\$0	\$148,081
39025041307	\$948,021,715	4,896	\$335,035	\$79,316	\$51,455	\$3	\$130,774
39025041403	\$704,717,021	4,378	\$3,140	\$58,953	\$46,008	\$0	\$104,962
39025041404	\$648,431,113	4,834	\$349	\$54,245	\$50,801	\$0	\$105,045
39025041405	\$611,782,206	5,384	\$4,874	\$51,197	\$56,592	\$0	\$107,789
39025041406	\$1,115,877,913	5,230	\$20,319	\$93,364	\$54,967	\$0	\$148,331

Clermont County Tornado NRI Exposure / Expected Annual Loss Estimates							
Census Tract	Exposure (Buildings)	Exposure (Pop)	Exposure (Ag)	EAL (Buildings)	EAL (Pop Equivalence)	EAL (Ag)	EAL (Total)
39025041503	\$597,864,510	4,730	\$68,123	\$50,014	\$49,708	\$1	\$99,723
39025041504	\$724,979,932	3,958	\$38,036	\$60,648	\$41,595	\$0	\$102,243
39025041505	\$677,709,159	3,600	\$38,988	\$56,694	\$37,832	\$0	\$94,527
39025041506	\$533,329,739	2,794	\$78,225	\$44,620	\$29,364	\$1	\$73,984
39025041600	\$825,972,684	5,533	\$167,793	\$69,097	\$58,146	\$2	\$127,245
39025041701	\$483,864,900	4,308	\$774,370	\$40,480	\$45,274	\$7	\$85,761
39025041702	\$474,675,733	3,223	\$1,066,047	\$39,714	\$33,874	\$10	\$73,598
39025041800	\$556,003,358	3,637	\$231,955	\$46,512	\$38,221	\$2	\$84,736
39025041900	\$791,512,363	5,525	\$4,780,435	\$66,220	\$58,064	\$42	\$124,326
39025042001	\$505,801,751	3,401	\$2,639,954	\$42,315	\$35,742	\$25	\$78,083
39025042002	\$499,144,852	2,352	\$1,968,343	\$41,757	\$24,718	\$18	\$66,493
Grand Total	\$36,078,126,867	208,527	\$36,442,863	\$3,018,083	\$2,192,618	\$310	\$5,211,011

Source: USDHS/FEMA – The National Risk Index, Version 1.19

Future Occurrences

It is not possible to describe or predict future tornadoes in Clermont County, or any other location. A review of historical tornado data for Clermont County does indicate an increasing frequency of tornadoes. Between 1953 and 1999 (i.e., 46 years), there were 11 tornadoes recorded in the NCEI database; between 2000 and 2024 (i.e., 24 years), there were 12 tornadoes recorded.

Scientific studies suggest that the traditional “Tornado Alley” in the Great Plains is shifting eastward, with increased tornado activity occurring in the Ohio Valley and southeast.

Risk Assessment

This section summarizes the vulnerability of Clermont County to tornadoes. The county conducted an online survey for the public to share its thoughts on the hazards listed in this plan. Table 2.2.14.6 presents the results of that survey, specifically regarding tornadoes.

Table 2.2.14.6

Public Sentiment, Tornado					
Hazard	Level of Concern				Total Responses
	Not at All	Somewhat	Concerned	Very	
TORNADO	3 (5.77%)	17 (32.69%)	17 (32.69%)	15 (28.85%)	52
In the past five years, do you remember this hazard occurring in your community?				17 (32.69%)	52
Have you noticed an increase in the occurrences or intensity of this hazard?				29 (55.77%)	52
Have you noticed a decrease in the occurrences or intensity of this hazard?				2 (3.85%)	52

Source: Online Public Survey Results

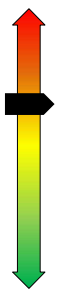
The following table assigns point totals based on the methodology identified in Section 2.2: Describe Hazards above. The categories in the table appear in Ohio EMA's Mitigation Information Portal (MIP) tool.

Table 2.2.14.7

Risk Ranking, Tornado			
Category	Points	Description	Notes
Frequency	3	Occasional (May or may not occur in a year)	There have been 23 recorded tornadoes in Clermont County since 1953, this suggests an occurrence rate of 0.31 tornadoes per year.
Response	5	More than a month	The response to areas impacted by an EF3 tornado typically takes anywhere from weeks to months.
Onset	4	Less than 6 hours	Tornado touchdowns can occur within warning.
Magnitude	2	Limited (10-25% of land area affected)	Tornadoes are intensely focused and destructive; they are the most violent of all atmospheric storms.
Business	4	More than 30 days	Widespread business impacts could reach one week given damage to electrical infrastructure. A business directly impacted by a tornado would likely be impacted for several weeks.
Human	3	Medium (Multiple severe injuries)	The 23 recorded tornadoes have resulted in four fatalities and 53 reported injuries.
Property	1	Less than 10% of property affected	Though destructive, tornadoes are localized events. The 23 recorded tornadoes have resulted in approximately \$15.3 million in reported property damage.
Totals	22	HIGH	

FEMA's *Local Mitigation Planning Handbook* (2023c) directs entities compiling multi-jurisdictional plans to identify any jurisdictions within the planning area for which the identified risks are more or less prevalent as compared to the rest of the planning area. "Tornadoes are non-spatial, unpredictable hazards that can affect various locations" (OEMA, 2024, p.2-39). All areas within Clermont County are at risk, as location, frequency, and impacts cannot be accurately predicted for specific, small geographic points. As such, there is no image identifying jurisdictional fluctuation.

2.2.15 Utility Failure (Non-Storm Related)

Non-storm related utility failures refer to any interruptions or losses of service caused by factors other than weather events.				
	RISK	Period of Occurrence:	At any time, typically during elevated temperature days	Risk Ranking: Medium
		Warning Time:	None	Type of Hazard: Technological
		Probability:	Occasional (May or may not occur in a year)	Impact: Critical (25-50% of land area affected)
		Disaster Declarations:	None	

Hazard Introduction and Overview

Public utilities are essential services provided to the public, generally by government or regulated private entities. Common types of utilities include water, electricity, natural gas, sewage, and telecommunications (i.e., phone, internet, cable). These networks and systems are part of the built environment and provide services that are often considered necessities and are subject to government oversight to ensure reliability and affordability. This hazard profile will focus specifically on non-storm related impacts to electricity as several of the other utilities are dependent on electrical power, and planning stakeholders was most concerned with interruptions to electricity. There are two primary electricity providers in Clermont County, Duke Energy, and the Ohio Valley Electric Corporation. The prolonged loss of electricity can disrupt water and wastewater treatment plants, traffic signals, gas station pumps, and phone service.

Electrical utility systems can experience a range of failures due to non-storm related factors. Common causes of non-storm-related failures include but are not limited to the following:

- **Equipment Failure:** This includes malfunctions of transformers, circuit breakers, generators, or aging infrastructure that cannot handle current demands or weather extremes.
- **Human Error:** Mistakes during maintenance, construction, or operation of power systems can trigger outages. This also includes incidents like accidentally digging into underground cables during excavation (i.e., line strikes).
- **High Energy Demand/Grid Overload:** When demand for electricity exceeds the grid's capacity, utilities might initiate planned outages (rolling blackouts) to prevent a system-wide failure.

- **Environmental Factors:** Trees or branches growing too close to power lines, even in the absence of storms, can cause short circuits, fires, and outages. Water, especially when mixed with certain snowmelt chemicals, can corrode underground utilities leading to failures.
- **Wildlife Interference:** Animals, such as squirrels, chewing on power lines or causing short circuits by building nests, can disrupt service.
- **Planned Outages:** Utility companies may intentionally schedule outages for maintenance, upgrades, or to ensure worker safety during infrastructure work.
- **Cyberattacks:** Malicious attacks targeting power grids and utility companies can disrupt control systems and cause outages.

Many parts of the United States electrical grid are decades old, and aging equipment and infrastructure is more prone to breakdowns. High demand during peak seasons can place excessive strain on the power grid, potentially leading to brownouts or blackouts. A brownout is a temporary reduction in voltage or power supply, often used to manage demand on the power grid during peak usage. This is different from a blackout, which is a complete loss of power.

Location and Extent

Southwest Ohio has been impacted by power outages resulting from storms; however, there are no documented instances of those described as “brownouts” or rolling blackouts. These interruptions can take place anywhere in the county and can range from localized events to countywide events. The extent of power interruptions and outages often depends on the cause, location, and the time of year they occur. The location and spatial extent of a power outages directly influence the number of people affected. The time of year these outages occur is also critical, individuals that utilize electricity to heat and cool their homes would experience far greater impact during periods of extreme heat or extreme cold. According to U.S. Energy Information Administration data from 2020, approximately 94% of all homes in Ohio use air conditioning. According to the Ohio Department of Development approximately 39,600 (i.e., 48%) residents of Clermont County utilize electricity to heat their homes.

A prolonged power outage can result in several different impacts, including personnel health, safety, and to critical infrastructure. Prolonged power outages can lead to carbon monoxide poisoning from improper ventilation of portable generators, temperature-related illnesses, food spoilage, and disruptions to essential services like water, traffic signals, and communication systems. Brownouts and rolling blackouts are a concern in rural areas of the

county where the use of water well are more prevalent, as electrical power is required to pump water from the wells.

Impacts and Vulnerability

Power outages are becoming a recurring issue, with areas reporting multiple disruptions over the summer months. Heat waves often exacerbate the problem as there is an increased demand for air conditioning which strains and overloads the capability of the existing power grid.

The loss of electrical power is often considered a nuisance event; however, prolonged interruptions can become life-threatening situations. A portion of the population may have increased medical needs, which can be exacerbated due to overheating, heatstroke, or hyperthermia (Klinenberg, 2015). Power failure leading to loss of heating and cooling in homes could exacerbate these health risks.

Thousands of people in the U.S. rely on electrically powered Durable Medical Equipment (DME). During power outages, these DMEs, including medical grade oxygen generators, power mobility devices, hospital beds, patient lifts, etc., require either a continuous alternate source of energy, such as a backup generator, or to be recharged after extended use. Without a way to keep these devices operational, a long-duration power outage can become deadly. Communities have begun to create registries for those who rely on devices and to assist in addressing their needs, so hospitals do not become overwhelmed during a power outage (Disaster Safety Strategies, 2014).

Interruptions may not result in immediate property damage beyond the owner of the system impacted but can result in financial losses, such as lost wages, operational shutdown costs, and associated clean-up costs. Infrastructure interruptions can cause schools, businesses, and governmental facilities to temporarily shut down until services can be restored. There have been a few instances where businesses were forced to close due to the loss of electrical power over a prolonged period.

Historical Occurrences

Planning stakeholders indicated that there is a growing concern regarding non-storm related power outages. The only reported non-storm related utility failure to occur in Clermont County involved a prolonged loss of landline telephone service from January 1st through the 19th of 2018. During this event, the county lost telephone service to Administration, Heritage, Corcoran, and Carriage House buildings.

The Great Blackout, Northeastern United States & Canada – August 14-17, 2003

On August 14, 2003, much of the northeastern United States and parts of Canada were plunged into darkness after a massive cascade electrical failure. The power outage affected both major cities and small towns, leaving millions of customers without electricity for up to four days.

The blackout originated in northern Ohio, where a simple fault resulted in a widespread cascade failure that affected a large portion of the power grid across the Northeast. The initial fault was the result of a high-voltage power line coming into contact with some overgrown trees. The line had softened and sagged from the intense heat caused by the electricity flowing through it. The contact with trees resulted in the power line being automatically shut down, as per normal safety protocols. In order to compensate for the now-inoperative power line, other high-voltage power lines began to take on increased power loads.

Northeast Blackout of 2003



Three of these lines also began to sag and brushed into trees, leading to more faults. As the remaining operating lines attempted to shoulder the extra burden, the system quickly became overtaxed.

The blackout left approximately fifty million people without power. While most customers had their power restored within two days, some were left in the dark for up to four days. The incident also resulted in close to \$6 billion worth of damage and led to eleven deaths.

After a task force found that the blackout was caused by a combination of human error and equipment failures, Congress adopted the Energy Policy Act of 2005, which granted the Federal Energy Regulatory Commission (FERC) the authority to approve and enforce

reliability standards. As of 2008, FERC had approved ninety-six such standards, some of which directly address the factors that led to the 2003 blackout, such as overgrown trees, inadequate training, and power grid fault survivability.

Electrical Utility Outage – January 31, 2023

“A large fire at the Markley electrical substation in Anderson Township in neighboring Hamilton County was visible for miles, the fire was reportedly caused by wildlife damaging a transformer. The fire knocked out power to an estimated 2,200 homes in Anderson. (WKRC, February 1, 2023)”. “Strobing pulses of green, blue, and yellow light against the overcast sky could be seen in Mariemont, Indian Hill, downtown Cincinnati and Clermont County (Fox 19, Planalp, February 1, 2023).”

Loss and Damages

There are limited resources that provides historical losses resulting from power outages or brownouts, these interruptions are generally considered in such terms as the number of customers without power. The *Great Blackout of 2003* which impacted the northeastern U.S. and portions of Canada left approximately fifty million people without power and resulted in nearly \$6 billion in property damage and 11 fatalities.

Calculating losses resulting from power outages, including brownouts and blackouts is complex, as they can include both direct (quantifiable) and indirect (harder to quantify) variables. Examples of direct losses include lost revenue, equipment damage and replacement costs due to low voltage supply, labor costs, spoiled inventory, and recovery costs. Examples of indirect costs include lost productivity, data loss, reputation damage, safety and security concerns, and health and medical risks.

The Value of Lost Load (VoLL) is a standard approach to estimate direct power-related losses, representing the value of one unit of electricity (e.g., kWh) that is lost due to a power outage. VoLL estimates typically vary based on factors like the sector involved, customer type (residential, commercial, industrial) and the duration of the outage. Losses might be estimated at \$0.12 to \$0.34 per kWh for residential customers and potentially higher for industries.

Businesses that are unable to operate due to the loss of electrical power would experience significant revenue losses. Multiple sources, including E Source Market Research, suggest that a four-hour power disruption can cost businesses between \$10,000 and \$20,000 in lost revenue, while a three-day outage can cost upwards of \$50,000. These costs can vary significantly based on the type and size of the business impacted.

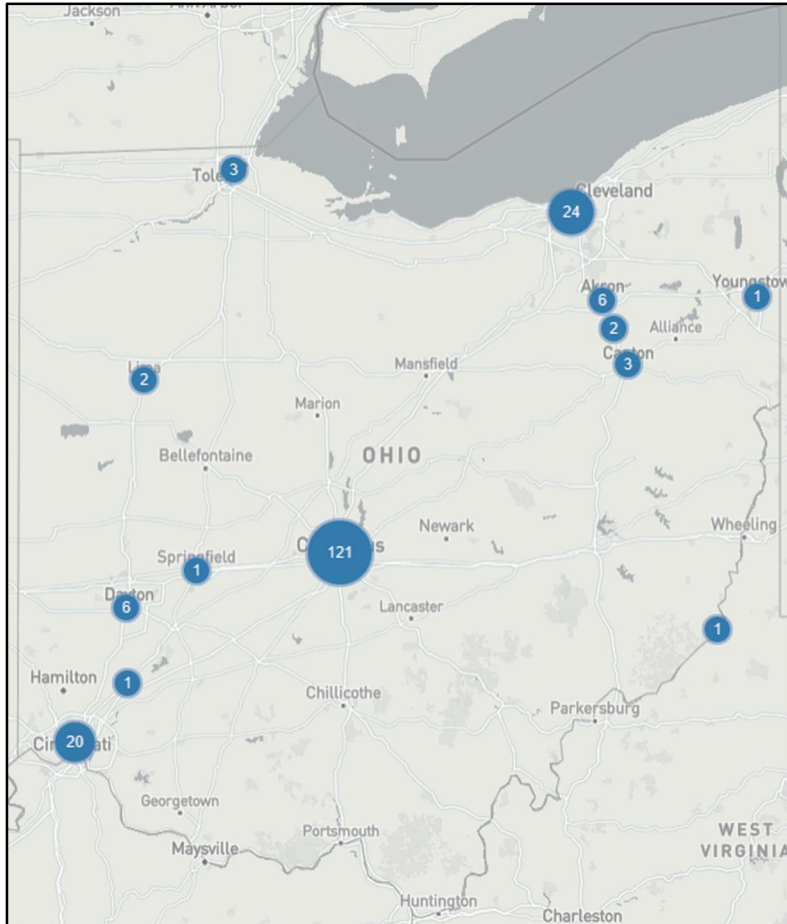
Future Occurrences

While trends pertaining to non-storm related power outages are difficult to establish comprehensively and explain conclusively, factors such as aging electrical systems and infrastructure beyond its intended lifespan, increasing interdependence, and growing societal dependence on electrical infrastructure suggest that the overall risk of impacts from power interruptions will continue to rise.

Figure 2.2.15.a

Artificial Intelligence (AI) data centers and overall growing technological demands are significantly impacting local power grids due to their high energy consumption, potentially leading to increased electricity costs for residents and businesses, and requiring upgrades to grid infrastructure. For example, in Ohio, some households are already seeing electricity bill increases of at least \$15 per month. These impacts are prompting discussions about how to ensure a reliable and sustainable energy supply for both data centers and the broader community.

Ohio Data Centers



The energy consumption of a single hyperscale AI data center can rival that of a large city, placing considerable strain on local power grids (Institute for Energy Research, 2025). According to information obtained from DataCenterMap.com, Ohio is ranked fourth in the country for its volume of data centers, trailing only Virginia, Texas, and California. As illustrated in Figure 2.2.15.a, the nearby City of Cincinnati is home to 20 of these data centers.

Risk Assessment

This section summarizes the vulnerability of Clermont County to non-storm related utility failures. The county conducted an online survey for the public to share its thoughts on the hazards listed in this plan. The following table presents the results of that survey, specifically regarding non-storm related utility failures.

Table 2.2.15.1

Public Sentiment, Non-Storm Related Utility Failure					
Hazard	Level of Concern				Total Responses
	Not at All	Somewhat	Concerned	Very	
NON-STORM UTILITY FAILURE	12 (23.08%)	20 (38.46%)	16 (30.77%)	4 (7.69%)	52
In the past five years, do you remember this hazard occurring in your community?				9 (17.31%)	52
Have you noticed an increase in the occurrences or intensity of this hazard?				12 (23.08%)	52
Have you noticed a decrease in the occurrences or intensity of this hazard?				1 (1.92%)	52

Source: Online Public Survey Results

Table 2.2.15.2 assigns point totals based on the methodology identified in Section 2.2: Describe Hazards above. The categories in the table appear in Ohio EMA's Mitigation Information Portal (MIP) tool.

Table 2.2.15.2

Risk Ranking, Non-Storm Related Utility Failure			
Category	Points	Description	Notes
Frequency	3	Occasional (May or may not occur in a year)	Non-storm related brownouts and blackouts are becoming a more frequent issue across Ohio. Several factors (i.e., aging infrastructure, increased energy demand) suggest that the risk will continue to rise.
Response	2	One day	Most responses to non-storm related electrical interruptions are completed or resolved within 24-hours.
Onset	5	None	Most of the time there is no warning prior to the occurrence of a non-storm related power outage.
Magnitude	3	Critical (25-50% land area affected)	Non-storm related power interruptions can range from localized to countywide events, lasting a few hours to multiple days.
Business	2	One week	Prolonged power outages may result in the temporary shutdown of businesses, resulting in lost wages, shutdown costs, food spoilage, and clean-up costs.
Human	3	Medium (Multiple severe injuries)	Prolonged power outages can become life-threatening situations, including carbon monoxide poisoning from improper ventilation of portable generators, heat related illnesses, loss of electrically powered Durable Medical Equipment (i.e., medical grade oxygen generators).
Property	2	10-25% property affected	Prolonged power outages can result in burst pipes due to freezing, water damage from failed sump pumps, damage to appliances due to inadequate voltage during brownouts and power surges when electricity is restored.
Totals	20	MEDIUM	

FEMA's *Local Mitigation Planning Handbook* (2023c) directs entities compiling multi-jurisdictional plans to identify any jurisdictions within the planning area for which the identified risks are more or less prevalent as compared to the rest of the planning area. The probability and severity of a non-storm related utility failure is equal across the entirety of Clermont County; no jurisdiction is more or less at risk. As such, there is no image identifying jurisdictional fluctuations.

2.2.16 Wildfire

Uncontrolled fires that spread rapidly through vegetative fuels (i.e., forests, grasslands, and prairies), exposing and possibly consuming structures. These dangerous fires can devastate not only wildlife and natural areas, but also communities.				
 RISK HIGHEST HIGH MEDIUM LOW LOWEST	Period of Occurrence:	Most common in spring and fall. Prolonged dry, hot spells.	Risk Ranking:	Medium
	Warning Time:	Less than 6 hours	Type of Hazard:	Natural
	Probability:	Frequent (Will occur during a year)	Impact:	Less than 10% of land area affected
	Disaster Declarations:	USDA FSA S3344 (2012)		

Hazard Introduction and Overview

A wildfire is an unplanned, uncontrolled, fire that spreads rapidly through vegetative fuels (i.e., forests, grasslands, and prairies), exposing and possibly consuming structures. Wildfires often begin unnoticed and can spread quickly, creating dense smoke that is visible for miles. Wildfires can occur at any time of the year but mostly happen during prolonged, dry, hot spells. Any small fire in a wooded area, if not quickly detected and suppressed, can get out of control. Human carelessness, negligence, and ignorance cause most wildfires (i.e., debris burning, equipment fires, arson, etc.). In some instances, downed powerlines can precipitate combustion. ODNR Division of Forestry estimates that more than 15,000 wildfire and natural fuel fires occur in any given year throughout Ohio, caused mainly by people carelessly burning debris.

Ohio's wildfire seasons occur primarily in the spring (i.e., March, April, and May) before vegetation has matured and greened, and the fall (i.e., October and November) when leaf drop occurs. During these times and especially when weather conditions are warm, windy, and with low humidity, vegetation is particularly susceptible to burning.

Open burning is regulated by state laws and local burning ordinances (§1301:7-7). Outside municipal limits, burning is prohibited from six a.m. to six p.m. during the months of March, April, May, October, and November. "Wildland fire can be a friend and a foe. In the right place at the right time, wildland fire can create many environmental benefits, such as reducing grass, brush, and trees that can fuel large and severe wildfires and improving wildlife habitat. In the wrong place at the wrong time, wildfires can wreak havoc, threatening lives, homes, communities, and natural and cultural resources" (U.S. Forest Service).

Location and Extent

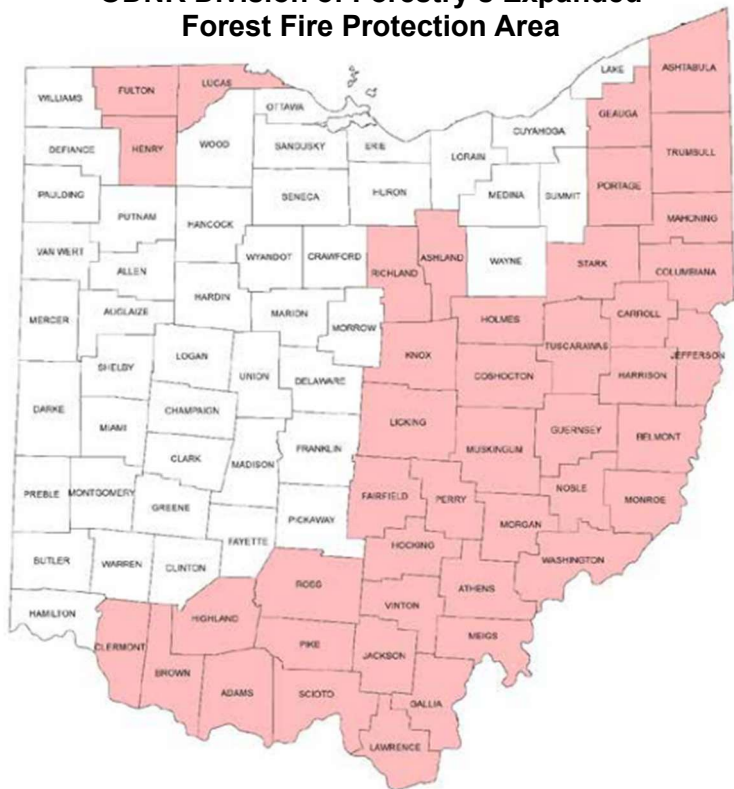
Wildfires in Ohio occur most frequently in the southern, southeastern, and eastern parts of the state. Each year in Ohio, an average of 450 wildfires burn 1,500 acres of forest and grassland within ODNR Division of Forestry's Wildfire Protection Area, see Figure 2.2.16.a. The protection district includes all 200,000+ acres of Ohio's 24 State Forests, as well as all privately owned lands within the district boundaries. The forest fire protection district corresponds mostly to the state's unglaciated hill country (southern and eastern Ohio).

On February 9, 2019, the ODNR announced the expansion of the ODNR Division of Forestry's Forest Fire Protection Area which now includes Clermont County

Areas of concern for wildfires in Clermont County would be the 176,500 acres of forested, pasture, and open urban areas with recreational opportunities and other attractions in designated areas, such as campgrounds within East Fork State Park, Stonelick State Park, and the Cincinnati Nature Center, which combine to include over 8,758 acres of largely open and wooded areas. Campfires, coupled with large numbers of visitors and a large proportion of trees, make wildfires a potential hazard for Clermont County. The map below (Figure 2.2.16.b) illustrates the areas in Clermont County that could be susceptible to wildfire conditions. It shows areas with potential fuels (i.e., deciduous forest, evergreen forest, herbaceous wetlands, urban/recreational grasses, and woody wetlands) that can help wildland fires to spread.

Figure 2.2.16.a

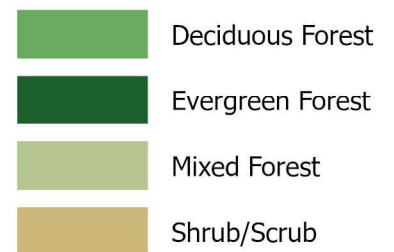
ODNR Division of Forestry's Expanded Forest Fire Protection Area



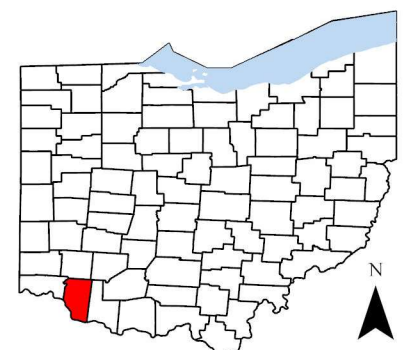
CLERMONT COUNTY HAZARD MITIGATION PLAN

**Figure 2.2.16.b:
Potential Wildfire Fuels**

Data Source(s):
USGS NLCD (2021)



DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.



0 0.9 3.8 5.5 7.4
Miles

Wildland Urban Interface (WUI) conditions may create a serious issue of concern in Ohio. The WUI is defined as the situation where homes, residences, and structures are in close proximity to forested lands and grasslands prone to wildfire. This creates a situation where, in the event of a wildfire, personal and property safety are put in jeopardy. As building development expands, homes and businesses may encroach areas susceptible to wildfires. Additionally, WUI situations force fire departments to shift focus from fire suppression to structure protection, consequently increasing exposure time and risk. WUI situations are most effectively addressed prior to wildfire occurrence by individual homeowners. The western portion of the county contains significant areas where WUI conditions exists.

Impacts and Vulnerability

Clermont County experiences several small fires each year, most of which are easily controlled by local fire departments and do not reach the threshold for inclusion as a “wildfire.” Like all other fires, wildfires require four conditions to start: an available fuel source (including dried leaves or grass), dry conditions (including low relative humidity), an ignition source, and a chemical reaction to sustain combustion. The first two conditions typically occur in Ohio in the spring and fall, when trees are bare, and sunlight can warm the ground and dry surface fuels.

The National Fire Danger Rating System is a system that allows fire officials to estimate current fire danger for a given area based on available fuels, weather, topography, and risks.

- **Low:** When the fire danger is “low,” fuels do not ignite easily, and a more intense heat source is needed to start fires. Dry grasslands may burn quickly, but wood fires will spread slowly, and control of these fires is typically not difficult.
- **Moderate:** When the fire danger is “moderate,” fires can start from accidental causes, but the number of fire starts is generally low. If a fire does start on open, dry grassland, it can spread quickly on windy days. Most wood fires spread slowly or moderately. The average fire intensity will be moderate, except in heavy concentrations of fuel. Fires are still not likely to become severe and are typically easy to control.
- **High:** When the fire danger is “high,” fires can start easily from most fuel sources. Unattended campfires and brush fires are likely to escape and can spread quickly. Fires can become serious and difficult to control unless extinguished when they are still small.
- **Very High:** When the fire danger is “very high,” fires will start easily from most fuel sources, spread rapidly, and quickly increase in intensity following ignition. These fires can be challenging to control and will often become much more extensive and longer lasting than fires in lower categories.

- **Extreme:** When the fire danger reaches “extreme,” fires of all types can start quickly and burn intensely. All fires are potentially dangerous and can spread rapidly with intense burning. Small fires become larger much faster than at the “very high” level. Long-distance fire spotting is likely. These fires can become dangerous and often last for several days.

A major cause of forest fires in Ohio is debris burning. These fires typically start small but spread by wind to dead grass and leaves bordering woodlands. The number and severity of wildfires depend on external factors such as drought, human activity, wind activity, and the amount of available fuel. Wildfires can burn less than one acre up to thousands of acres of land in a short period of time. These fires can completely destroy recreational areas, community infrastructure, cultural and economic resources, timber, forage, wildlife habitats, scenic vistas, and watersheds. Secondary effects of wildfires include erosion, increased landslide potential, the introduction of invasive species, and changes in air and water quality.

The demographic effects of a wildfire can be high depending on the location of the fire. Several jurisdictions within western Clermont County contain dense residential areas that are bordered by larger forested areas and are susceptible to Wildland-Urban Interfaces (WUI), the area where houses and other structures meet or intermingle with undeveloped wildland vegetation.

The fiscal effects can be large due to the disruption of infrastructure (i.e., roads, rails, and bridges) or loss of commercial and industrial facilities. A wildfire could also have a devastating effect on the timber and forest product industries.

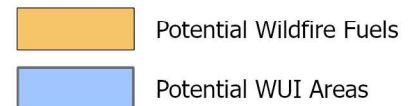
Critically, the WUI does not recognize an area where wildfires are more or less prone to occur. Instead, it identifies areas that can expect higher wildfire-related damages should an incident occur. It is difficult to understand that the WUI is not a place, per se, but conditions that exist. Thus, the WUI can be a rural subdivision in a wooded or vegetative area or three to four homes on an open range (USFA, 2022).

Radeloff and colleagues’ research further asserts that structures within 2.4 kilometers (1.49129 miles) of a woodland fuel source be considered “in the WUI area.” According to data from Clermont County GIS, there are 88,900 address points in the county. All the address points in the county are either within a wooded area containing potential fuel (as per above) or within the 2.4-kilometer buffer. The blue areas on Figure 2.2.16.c below represent areas *not* within wooded areas with potential fuel, but solely within 2.4 kilometers of these areas.

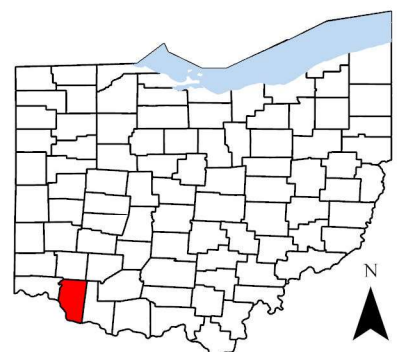
CLERMONT COUNTY HAZARD MITIGATION PLAN

**Figure 2.2.16.c:
Approximation of WUI**

Data Source(s):
Clermont County GIS



DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.



0 0.9 3.85 3.7 5.55 7.4
Miles

A wildfire may result in several structure fires. Structure fires may involve the destruction of plastics, foams, fabrics, carpets, wood, and asbestos-containing materials. Soot in smoke usually contains what is burned and may also contain byproducts of items burned (i.e., hydrogen cyanide is a byproduct of burning wool). The Phoenix Fire Department studied the exposure of soot on firefighters after extinguishment. Their findings indicated that chlorinated products become attached to soot and can enter the lungs (Bolstad-Johnson, 2010). Breathing in this soot can cause acute issues such as coronary artery disease, asthma, bronchitis, and many other respiratory illnesses (Keefe, 2013).

Historical Occurrences

Weather is the primary factor that determines the severity of fall and spring wildfire seasons in Ohio. Drought conditions, combined with windy days create red flag, or extremely high fire danger. Weather conditions leading up to and in 1930 resulted in the worst year to date for wildfires in Ohio, as 15,400 acres were recorded as burning over the course of the year. The extreme drought in 1950 that continued for the next several years provided for very active wildfire seasons as well. March 27, 1950, is considered the worst fire control day in Ohio’s history, as 65 fires burned a total of 5,900 acres. A total of 680 wildfires burned 22,445 acres in the fall of 1952.

According to the *State of Ohio Hazard Mitigation Plan* (OEMA, 2024), Clermont County had 55 wildfire events from 2018 through 2022; 29 acres burned in that time. These fires did not result in any injuries or fatalities, a total of three structures were threatened and one was destroyed. The following data was obtained from the Wilmington, Ohio National Weather Service (NWS), it provides the number of red flag warnings issued for Clermont County from 2020 to 2025.

Table 2.2.16.1

Clermont County Red Flag Warning (2020 – 2025)						
Red Flag Warnings	2020	2021	2022	2023	2024	2025
	1	0	1	1	0	0

Source: National Weather Service – Wilmington, OH

Goshen, Monroe, Pierce Townships Brush Fires – November 9, 2022

Prolonged drought conditions aided in the occurrence of multiple brush fires across several jurisdictions in late November. “Local fire departments responded to four large brush fires in Monroe Township. One of the fires was on Franklin Laurel Road, this fire damaged a barn and

woodpile. Brush fires were also reported on Cole Road in Pierce Township as well as in Goshen Township and Williamsburg. A local fire chief said there has been a noticeable increase in brush fires over the last few days, in part due to the Tri-State's moderate drought status. The majority of the brush fires were started as controlled burns that quickly get out of control" (WKRC, Jones, Nov. 10, 2022).

Loss and Damages

Estimating monetary losses to wildfire is difficult as the vast majority of wildfires in Ohio occur in open land or fields and monetary losses are not often recorded. This lack of data may result in inconsistencies if an analysis was based on reported monetary loss. However, from an exposure assumption, the greater the number of people and property in an area, and the greater variables for wildfire severity of that area, the greater the potential loss. The data that is more consistently available is the number of acres burned per event. For this estimate, planners divided the total number of acres burned from January 1, 2018, to December 31, 2022, in Clermont County by the respective number of events recorded, resulting in an average of 0.53 acres burned per event. Further, according to the National Fire Protection Association (NFPA), the average per-incident loss attributed to wildfire data captured in a ten-year period of large-loss fire was \$195,729,342.

Planners also used information obtained from FEMA's National Risk Index (2023) to estimate potential wildfire impacts for each census tract in Clermont County. Table 2.2.16.1 presents that data.

Table 2.2.16.2

Clermont County Wildfire NRI Exposure / Expected Annual Loss Estimates							
Census Tract	Exposure (Buildings)	Exposure (Pop)	Exposure (Ag)	EAL (Buildings)	EAL (Pop Equivalence)	EAL (Ag)	EAL (Total)
39025040101	\$73,047,963	590	\$588,306	\$2,099	\$538	\$0	\$2,637
39025040102	\$26,757,377	237	\$68,842	\$688	\$220	\$0	\$908
39025040202	\$143,390,704	738	\$270,242	\$657	\$130	\$0	\$787
39025040203	\$184,028,547	1,315	\$93,385	\$865	\$208	\$0	\$1,074
39025040205	\$52,671,887	535	\$3,726	\$344	\$118	\$0	\$462
39025040206	\$223,956,309	1,113	\$132,453	\$904	\$159	\$0	\$1,063
39025040301	\$484,364,183	2,097	\$4,314	\$1,937	\$295	\$0	\$2,233
39025040302	\$396,581,483	1,752	\$23,289	\$1,586	\$246	\$0	\$1,833
39025040303	\$555,961,046	2,984	\$20,112	\$2,361	\$436	\$0	\$2,797
39025040401	\$480,477,243	1,777	\$9,429	\$1,922	\$250	\$0	\$2,172
39025040403	\$169,890,697	1,189	\$1,117	\$680	\$167	\$0	\$847

Clermont County Wildfire NRI Exposure / Expected Annual Loss Estimates							
Census Tract	Exposure (Buildings)	Exposure (Pop)	Exposure (Ag)	EAL (Buildings)	EAL (Pop Equivalence)	EAL (Ag)	EAL (Total)
39025040404	\$307,814,794	1,373	\$1,631	\$1,231	\$193	\$0	\$1,424
39025040405	\$216,624,286	1,368	\$2,492	\$866	\$192	\$0	\$1,059
39025040500	\$167,021,368	685	\$3,294	\$668	\$96	\$0	\$764
39025040600	\$444,075,362	1,848	\$18,367	\$2,075	\$310	\$0	\$2,385
39025040702	\$152,575,873	1,065	\$9,955	\$713	\$196	\$0	\$909
39025040703	\$136,383,170	913	\$133	\$546	\$129	\$0	\$674
39025040704	\$290,998,303	1,917	\$384	\$1,164	\$270	\$0	\$1,434
39025040800	\$70,955,825	496	\$146,455	\$1,094	\$276	\$0	\$1,370
39025040900	\$104,041,215	812	\$304,787	\$7,866	\$2,173	\$1	\$10,040
39025041001	\$61,746,324	411	\$42,897	\$2,369	\$549	\$0	\$2,918
39025041002	\$103,641,032	503	\$21,858	\$1,327	\$223	\$0	\$1,550
39025041101	\$18,809,995	139	\$3,071	\$268	\$67	\$0	\$335
39025041102	\$94,887,367	264	\$6,611	\$3,214	\$283	\$0	\$3,497
39025041104	\$7,673,873	11	\$209	\$31	\$2	\$0	\$32
39025041105	\$22,664,431	277	\$557	\$552	\$231	\$0	\$783
39025041201	\$108,265,106	897	\$1,027	\$522	\$144	\$0	\$666
39025041202	\$108,278,473	500	\$1,473	\$472	\$73	\$0	\$546
39025041303	\$44,303,261	352	\$57	\$177	\$50	\$0	\$227
39025041304	\$13,670,418	2	\$729	\$55	\$0	\$0	\$55
39025041305	\$85,218,707	437	\$386	\$1,080	\$210	\$0	\$1,290
39025041306	\$19,164,684	243	\$35	\$118	\$51	\$0	\$169
39025041307	\$128,941,735	865	\$84,735	\$516	\$122	\$0	\$638
39025041403	\$81,457,931	555	\$252	\$648	\$151	\$0	\$799
39025041404	\$102,040,474	843	\$135	\$408	\$119	\$0	\$527
39025041405	\$107,799,506	964	\$2,069	\$431	\$136	\$0	\$567
39025041406	\$161,282,762	853	\$4,807	\$645	\$120	\$0	\$765
39025041503	\$29,312,539	203	\$11,706	\$549	\$83	\$0	\$631
39025041504	\$120,786,127	668	\$6,449	\$580	\$108	\$0	\$688
39025041505	\$93,034,827	453	\$3,485	\$798	\$114	\$0	\$912
39025041506	\$238,896,538	1,144	\$39,841	\$1,769	\$312	\$0	\$2,081
39025041600	\$259,506,845	1,850	\$52,141	\$2,384	\$608	\$0	\$2,992
39025041701	\$52,156,280	455	\$63,979	\$1,906	\$536	\$0	\$2,442
39025041702	\$141,681,806	840	\$108,248	\$2,685	\$695	\$0	\$3,380
39025041800	\$110,858,480	640	\$39,897	\$7,118	\$1,599	\$0	\$8,717
39025041900	\$183,332,246	1,299	\$606,191	\$17,783	\$4,461	\$2	\$22,246
39025042001	\$86,525,681	566	\$423,141	\$6,044	\$2,153	\$1	\$8,199
39025042002	\$146,715,409	780	\$445,394	\$3,046	\$738	\$1	\$3,786
Grand Total	\$7,414,270,496	41,816	\$3,674,092	\$87,762	\$20,543	\$6	\$108,310

Source: USDHS/FEMA – The National Risk Index, Version 1.19

Future Occurrences

Seasons are changing in length and timing in Clermont County, with earlier springs, delayed falls, and shorter winters. This seasonal shift could lengthen the fire season. Warmer temperatures mean higher evaporation rates, and thus, things dry out more quickly. Drier vegetation is more likely to burn if something sparks a flame.

Weather conditions, including extreme heat and drought, can increase the likelihood of fires escalating to the level of “wildfire.” Any fire left unattended or mismanaged has the potential to become a wildfire; however, the likelihood of a fire attaining a significant size and intensity is unpredictable and varies based on environmental conditions.

The Ohio Department of Natural Resources-Division of Forestry suggests that 63% of Ohio wildfires between 1997 and 2007 with a known cause were human-caused in some way (the cause of 36% of these wildfires were reported as other or unknown). As outdoor recreation opportunities develop, human behaviors may ignite more fires that have the potential to escalate into larger wildfires. Additionally, the discussion on the WUI is relative for future considerations. If subdivisions continue to be built on the fringe of more urbanized areas, they may be more susceptible to wildland fires.

Risk Assessment

The following table identifies 47 assets within Clermont County that are located within areas containing high potential wildfire fuels. The majority of the assets within high potential wildfire fuel areas are located in the Village of Batavia, the City of Milford and Miami, Stonelick and Union Townships. Approximately 49% of these assets are classified as vulnerable populations.

Table 2.2.16.3

Clermont County Assets Located in Wildfire Fuel Areas			
Asset	Address	Jurisdiction	Asset Type
Arbors of Milford	5900 Meadow Creek Dr	Milford	Vulnerable Pop
Bethel Methodist Church	3297 Ellick Rd	Bethel	Culture, Historical
Bethel-Tate Local School District	675 W. Plane St	Bethel	Special Consideration
Bethel-Tate Middle School	649 W. Plane St	Bethel	Vulnerable Pop
Boyd E. Smith Elementary School	1052 Jer Les St	Miami Twp	Vulnerable Pop
Charles L Seipelt Elementary School	900 SR 131	Miami Twp	Vulnerable Pop
Cincinnati Nature Center-Rowe Woods	4949 Tealtown Rd	Union Twp	Special Consideration
Clermont County Educational Service Ctr	2400 Clermont Center Dr	Batavia	Special Consideration
Clermont County Public Health	2400 Clermont Center Dr	Batavia	Medical

Clermont County Assets Located in Wildfire Fuel Areas			
Asset	Address	Jurisdiction	Asset Type
Clermont Northeastern Early Childhood Ed	2792 U.S. Route 50	Stonelick Twp	Vulnerable Pop
Clermont Northeastern Elem. School	5347 Hutchinson Rd	Stonelick Twp	Vulnerable Pop
Clermont Northeastern High School	5327 Hutchinson Rd	Stonelick Twp	Vulnerable Pop
Clermont Northeastern Middle School	2792 U.S. Route 50	Stonelick Twp	Vulnerable Pop
Clough Pike Elementary School	808 Clough Pike	Union Twp	Vulnerable Pop
DaVita Clermont County Dialysis	5901 Montclair Blvd	Miami Twp	Medical
Duke Energy Bethel-Batavia Pipeline	Old SR 32	Batavia	Utility, Infrastructure
Epilepsy Alliance of Ohio-Arborview	5405 Fomorin Rd	Williamsburg	Vulnerable Pop
Epilepsy Alliance of Ohio-Cedar Ck	5411 Fomorin Rd	Williamsburg	Vulnerable Pop
Fresenius Kidney Care	5890 Meadow Creek	Miami Twp	Medical
Gene Holland Park	128 Water St	Moscow	Special Consideration
Harmony Hill Dairy House	299 3rd St	Williamsburg	Culture, Historical
Laurels of Milford	934 SR 28	Milford	Vulnerable Pop
Little Miami Scenic Park	400 SR 126	Loveland	Special Consideration
Lytle Trace	299 Lytle Ave	Williamsburg	Vulnerable Pop
Magnolia Springs	767 Loveland-Miamiville Rd	Miami Twp	Vulnerable Pop
Marge Schott Lake Dam	39.21361 -81.2806	Miami Twp	High Potential Loss
McCormick Elementary School	751 Loveland-Miamiville Rd	Miami Twp	Vulnerable Pop
Meadowview Elementary School	5556 Mt. Zion Rd	Miami Twp	Vulnerable Pop
Moscow Water Tower	1839 U.S. Route 52	Moscow	Utility, Infrastructure
Pattison Park	2228 U.S. Route 50	Batavia	Special Consideration
Peirce Township Fire Dept. St 45	2877 Mount Pisgah Rd	New Richmond	Emergency Services
Provision Living at West Clermont	4299 Bach Buxton Rd	Union Twp	Vulnerable Pop
Siemens PLM Software	2000 Eastman Dr	Milford	High Potential Loss
Springvale Christian Academy	1700 Clark Dr	Goshen Twp	Vulnerable Pop
St. Mark's Lutheran School	5849 Buckwheat Rd	Miami Twp	Vulnerable Pop
Steamboat Trails	1221 Bethel-New Richmond Rd	New Richmond	Vulnerable Pop
Tata Consultancy Services	1000 Summit Dr	Milford	High Potential Loss
The Otterbein	6405 Small House Circle	Miami Twp	Vulnerable Pop
Total Quality Logistics	1701 Edison Dr	Milford	High Potential Loss
Ulysses S. Grant Birthplace	1551 SR 232	Moscow	Culture, Historical
Union Township Fire Dept. St 52	3873 Back Buxton Rd	Union Twp	Emergency Services
Union Township Fire Dept. St 53	5149 Beechwood Rd	Milford	Emergency Services
Union Township Police Department	4312 Glen-Este-Withamsville Rd	Union Twp	Emergency Services
Wayne Township Fire Dept. St 55	797 Wright St	Wayne Twp	Emergency Services
West Clermont Local School District	4350 Alcholtz Rd	Batavia	Special Consideration
West Clermont Middle School	1340 Clough Pike	Batavia	Vulnerable Pop
Withamsville-Tobasco Elementary School	3950 Britton Blvd	Union Twp	Vulnerable Pop

This section summarizes the vulnerability of Clermont County to wildfire. The county conducted an online survey for the public to share its thoughts on the hazards listed in this plan. The following table presents the results of that survey, specifically regarding wildfire.

Table 2.2.16.3

Public Sentiment, Wildfire					
Hazard	Level of Concern				Total Responses
	Not at All	Somewhat	Concerned	Very	
WILDFIRE	32 (61.54%)	13 (25.0%)	3 (5.77%)	4 (7.69%)	52
In the past five years, do you remember this hazard occurring in your community?				1 (1.92%)	52
Have you noticed an increase in the occurrences or intensity of this hazard?				12 (23.08%)	52
Have you noticed a decrease in the occurrences or intensity of this hazard?				2 (3.85%)	52

Source: Online Public Survey Results

The following table assigns point totals based on the methodology identified in Section 2.2: Describe Hazards above. The categories in the table appear in Ohio EMA's Mitigation Information Portal (MIP) tool.

Table 2.2.16.4

Risk Ranking, Wildfire			
Category	Points	Description	Notes
Frequency	5	Frequent (Will occur during a year)	There were 55 fire events reported in Clermont County from 2018 to 2022, (for an average of 13.8 incidents per annum).
Response	3	One week	Wildfires in the region are typically small and easily contained; however, may still require a small-scale response for up to a week.
Onset	4	Less than 6 hours	Officials can easily predict wildfire conditions but fires themselves occur with no notice.
Magnitude	1	Localized (< 10% of land area affected)	The average wildfire has burned 0.5 acres, which is substantially less than 10% of the county's land area.
Business	2	One week	Most wildfires in the county are small; however, there is the possibility of some businesses being impacted for up to one week.
Human	2	Low (Some injuries)	Generally, the risk of injury or death due to wildfire is low. First responders to the event may experience adverse health effects.
Property	1	Less than 10% of property affected	Historical wildfires in Clermont County have burned less than 10% of the county's land area. By proxy, wildfires would impact less than 10% of the property in the county.
Totals	18	MEDIUM	

FEMA's *Local Mitigation Planning Handbook* (2023c) directs entities compiling multi-jurisdictional plans to identify any jurisdictions within the planning area for which the identified risks are more or less prevalent as compared to the rest of the planning area. According to information obtained from U.S. Geological Survey's National Land Cover Database potential wildfire fuels are present throughout the county (see Figure 2.2.16.b above). Information illustrated in Figure 2.2.16.c above indicates that Wildland Urban Interface (WUI) areas are also present countywide. All areas of Clermont County are at risk of wildfire either by having potential fuels in their jurisdictions or locations with minimal potential fuel in WUI areas.

2.0 RISK ASSESSMENT

2.3 Summarize Vulnerability

Section 2.2: Describe Hazards, outlines a means for describing the probability and severity of the hazard effects on Clermont County. The individual profiles in Section 2.2 calculate the probability and severity of the hazard in question. The following table summarizes that data and presents a ranked list of anticipated hazard impacts. (NOTE: In the event of tie scores, planners alphabetized the hazards.)

Table 2.3.1

Summary of Hazard Rankings – Clermont County									
<i>Hazard</i>	<i>Risk Ranking</i>	<i>Frequency</i>	<i>Response</i>	<i>Onset</i>	<i>Magnitude</i>	<i>Business</i>	<i>Human</i>	<i>Property</i>	<i>Total</i>
Cyber Incident	HIGH	5	5	4	2	4	1	2	23
Tornado	HIGH	3	5	4	2	4	3	1	22
Flooding	MEDIUM	5	4	3	2	2	3	1	20
Severe Summer Weather	MEDIUM	5	2	2	5	2	2	2	20
Utility Failure (Non-storm)	MEDIUM	3	2	5	3	2	3	2	20
Hazmat Release	MEDIUM	5	3	5	1	1	3	1	19
Invasive Species	MEDIUM	5	5	1	3	1	1	2	18
Public Health Emergencies	MEDIUM	3	5	1	4	2	2	1	18
Severe Winter Weather	MEDIUM	5	2	1	3	1	3	3	18
Wildfire	MEDIUM	5	3	4	1	2	2	1	18
Dam & Levee Failure	MEDIUM	2	4	1	1	3	3	3	17
Landslide	MEDIUM	5	2	3	3	1	2	1	17
Terrorism/Civil Disturbance	LOW	2	3	5	1	1	2	1	15
Extreme Temperatures	LOW	3	2	1	4	1	2	1	14
Drought	LOW	2	2	1	3	2	1	2	13
Earthquake	LOW	2	2	5	1	1	1	1	13

The Federal Emergency Management Agency (FEMA) created the National Risk Index (NRI) in 2021 to illustrate risk in the communities of the United States from a dataset of 18 natural hazards. The tool is an interactive online map ranking risk variables such as expected annual loss, social vulnerability, and community resilience (which produce an aggregated risk score). For the hazards that appear in both this plan and the NRI, a comparison with the rankings in the preceding table can validate the findings of this risk assessment. The hazards in both the NRI and this plan are as follows.

- Cold wave (as “severe winter weather”)
- Drought
- Earthquake
- Hail (as “severe summer weather”)
- Heat wave (as “severe summer weather”)
- Ice storm (as “severe winter weather”)
- Lightning (as “severe summer weather”)
- Riverine flooding (as “flooding”)
- Strong wind (as “severe summer weather”)
- Tornado
- Wildfire
- Winter weather

Clermont County’s NRI scores¹ for overall risk, expected annual loss, social vulnerability, and community resilience appear below. Scoring is on a scale of 0 to 100. Per the NRI, lower risk is driven by lower loss, lower social vulnerability, and higher community resilience. The overall risk index rating is relatively low for Clermont County when compared to the rest of the United States.

Table 2.3.2

Clermont County National Risk Index				
<i>Jurisdiction</i>	<i>Risk Index</i>	<i>Expected Annual Loss</i>	<i>Social Vulnerability</i>	<i>Community Resilience</i>
Clermont County	67.0 (Relatively Low)	69.5 (Relatively Low)	15.1 (Very Low)	68.7 (Relatively High)

Table 2.3.3 compares the risk index scores for the hazards in this plan and the NRI and ranks them from highest to lowest. The far-right column describes the variance from the overall hazard rankings table above (derived from the hazard profile analysis).

¹ To ensure that hazard categories aligned, for this table, planners averaged the NRI scores for “heat wave,” “hail,” “lightning,” and “strong wind” into a score for “severe summer weather,” as well as the scores for “cold wave,” “ice storm” and “winter weather” into a “severe winter weather” category.

Table 2.3.3

NRI & Hazard Profile Rankings Comparison					
<i>Hazard</i>	<i>Risk Index (Avg. of Scores)</i>	<i>Absolute NRI Ranking</i>	<i>Hazard Profile Vulnerability Assignment</i>	<i>Absolute Hazard Profile Ranking</i>	<i>Hazard Profile Absolute / Ranking Placement Difference</i>
Severe Winter Weather	85.3	1	Medium (18)	T 5	↓ 4
Tornado	77.8	2	High (22)	2	↔
Flooding	68.2	3	Medium (20)	T 3	↔
Severe Thunderstorm	56.9	4	Medium (20)	4	↔
Earthquake	51.2	5	Low (13)	T 15	↓ 10
Wildfire	45.1	6	Medium (18)	T 5	↑ 1
Drought	No Rating	N/A	Low (13)	T 15	↔

When comparing these data, the first acknowledgment should be that this mitigation plan and the NRI considered different variables. Thus, comparisons are for planning purposes only.

There appears to be variance between the sources, but a closer look is necessary. The NRI only considers natural hazards, while this mitigation plan considers technological and human-caused hazards. In this mitigation plan, each hazard (i.e., natural, technological, and human-caused) received a risk ranking, which planners ultimately ranked in absolute order. By removing the technological and human-caused hazards from the mitigation plan ranking, the variance from the NRI comes more into focus. The reconciliation explained below renders the rankings of natural hazards between this plan and the NRI mostly consistent.

- Severe winter weather received the fifth highest score among the hazards profiled in this hazard mitigation plan; however, there are three technological hazards (i.e., cyber incident, non-storm utility failure, and hazmat release), ranked ahead of severe winter storm. If you take these technological hazards out of the rankings there would only be a difference of one.
- The difference in the ranking of the earthquake hazard between this plan and the NRI is also influenced by the inclusion of four technological or human-caused hazards (i.e., cyber incident, non-storm utility failure, hazmat release, and terrorism) considered in this plan that ranked above earthquake. If you take these hazards out of the rankings there would only be a difference of six.

2.0 RISK ASSESSMENT

2.4 Analyze Impacts

§ 201.6(d)(3)

Revisions to reflect changes in development. Describe the changes in development that have occurred in hazard-prone areas that have increased or decreased each community's vulnerability since the previous plan was approved.

This section of the risk assessment serves to connect the dots drawn throughout the identification and description of the hazards impacting Clermont County to form a better understanding of the potential impacts of those hazards. Section 1.2.4 – Development Trends above presents information about development trends in Clermont County by land use type. This section revisits those trends and assesses and describes how changes in development over the past five years within known hazard-prone areas have increased, decreased, or had no effect on each community's vulnerability to the hazards identified.

Local officials must realize that while the profiles in Section 2.2 present an in-depth overview of the hazards in question *at this moment in time*, the county has evolved over the last five years (since the previous adoption of the plan). This section discusses general trends that could influence vulnerability for each hazard.

The mapping in the “Development Trends” Section calls out “proposed land uses”, which indicate growth areas, and the narrative explains that local officials target these areas for commercial and industrial development as well as large-scale residential development. The county and municipal jurisdictions value their rurality, as do residents (based on sentiments shared via the public survey). The use of growth areas and the intentional down-zoning of the non-growth areas (allowing for much less dense single-family residential development and the preservation of open space) preserves much of this character. From the perspective of risk reduction, it maintains areas throughout the county for naturalized mitigation (e.g., green space that can absorb water from heavy precipitation, naturalized streams, etc.).

Proactive mitigation considerations for the growth areas will likely be necessary. Construction and development can change natural drainage paths and create or increase flood risks. Timbering processes may alter natural drainage paths or change the vegetation available to absorb rainwater. Though most of the growth areas lie outside of Special Flood Hazard Areas (SFHAs) related to riverine flooding, flash floods from runoff during heavy precipitation events may be a concern, particularly as new commercial and industrial developments pave more and more of the land in growth areas with impervious surfaces. New buildings, parking lots, and roads

(i.e., impervious surfaces) mean less land to absorb excess precipitation, forcing water into places it previously would not reach.

The answer is not always to limit development, and this narrative does not advocate restricting development within growth areas. Instead, the governmental bodies for the municipal areas (and the county governments for the unincorporated areas) within the designated growth areas may encourage (or consider requiring) mitigation measures like on-site storm water management through retention basins and other green infrastructure solutions as part of future development projects. Many of the existing storm water management regulations that are in place already encourage these measures. Their necessity may become more evident in the future.

Vulnerability Implications

Direct, measurable consequences of disasters can include fatalities and injuries, to humans, animals, or damage to property. Disasters do not end there; there are several indirect effects, tangible and intangible, associated with them. Some examples of these include loss of livelihood and income, loss of community and population, mental and psychosocial impacts, costs of rebuilding, repair or replacement, loss of inventory, wages, and tax revenue, etc. (Bullock, Haddow, & Coppola, 2017). All these also have a cost associated with them, but it is much more challenging to assign a specific dollar value and quantify them accurately. Often, disasters exacerbate risks already in a community (Comfort et al., 1999; Raker, Arcaya, Lowe, Zacher, Rhodes, & Waters, 2020). For instance, in areas where poverty is a concern, a disaster makes the challenges faced by those living in poverty much more difficult. In areas where access to public services is a concern, disasters may highlight how segments of the population cannot access assistance. Local leaders in areas where public trust in governmental systems is low may have difficulty rallying residents to follow the community's response strategy.

Countless instances of the hazards identified in Section 2.2 could disrupt critical infrastructure systems throughout the county. Loosely related variables, often considered *cascading hazards*, can complicate some events. For example, high winds may cause sporadic damage but usually do not become a significant county-wide concern until a large number of residents are without power. In addition to weather-related power outages, cascading hazards in the county could include (but not be limited to) the following:

- Damage to infrastructure (i.e., roads, bridges, pipelines, utility poles, etc.) and residences following flooding and severe weather events
- Flooding of downstream or protected areas in the event of a dam failure

- Drinking water supply shortages and contamination following severe and prolonged drought conditions or floods
- Power outages, ruptured gas lines, etc. following severe weather
- Public health concerns following flooding conditions
- Permanent or temporary population displacement before, during, or after an event

Hazard-Specific Considerations

This section considers how the definitions listed below impact (or are impacted by) the 16 hazards described in Section 2.2. The following tables and maps summarize these development trends for the jurisdictions participating in this plan. It utilizes the definition of “changes in development” from FEMA’s *Local Mitigation Planning Policy Guide* (2022c) and provides space for descriptions to briefly explain the reasoning for identified increases and decreases in vulnerability resulting from development. The policy guide definitions are as follows (2022c, p. 31).

- **Recent Development (RD):** For example, construction completed since the last plan was approved.
- **Potential Development (PD):** For example, development planned or under consideration by the jurisdiction.
- **General Trends (GT):** Conditions that may affect the risks and vulnerabilities of jurisdictions (for example, declining populations or projected increases in population, or foreclosures).

CYBER INCIDENT

Clermont County’s planning stakeholders added cyber incidents to the hazard list for the 2025 update. Members shared an awareness of greater connectivity between various commercial and industrial systems, as well as systems associated with critical infrastructure. The nature of cyber risk has evolved. Previously, risks surrounded the idea of stealing information; however, modern risk includes disrupting functions. For instance, recent attacks on healthcare facilities in Ohio put data at risk and also disrupted the operation of the facilities. As an example, a cyber incident impacting a water utility *also* impacts all critical facilities relying on service from that utility.

Additionally, planning stakeholders shared the assumption that cyber-attacks are on the rise. Data from Sentinel One (2025) confirms the presumption, reporting that ransomware attacks increased 84%, phishing attacks by 1,265%, and cloud intrusions by 75% over a one-year period, generally late 2023 through late 2024.

Finally, the so-called “digital divide” impacts cyber awareness and capability. The digital divide refers to unequal access to digital technology. For instance, internet connections in more rural areas may not be as robust as connections in urban (or urbanized) areas. As technology and access come online, a learning curve appears. Populations in rural areas or among older residents may have less cybersecurity awareness, creating soft targets for phishing or fraud.

Table 2.4.1

<u>Cyber Incidents Summary</u>	
Recent developments such as digitization and greater adoption of cloud-based technologies have increased the risk of cyber incidents.	Other conditions, such as a burgeoning awareness of the range of cyberattacks, potential systems impacted (and their interconnectedness), etc., have also increased risk of cyber incidents.

DAM & LEVEE FAILURE

An issue that could increase the risk of a dam failure is the aging of the infrastructure. The average age of the 33 dams throughout the county is 54 years. Approximate 42% of the dams in Clermont County received an assessment condition of “poor”, while only 27% received a “satisfactory”.

After more than two years of planning, the Village of Williamsburg, Clermont Soil and Water Conservation District and other project partners removed a low-head dam on the East Fork Little Miami River, restoring its natural system and opening up 85+ miles of free-flowing waterway.

Table 2.4.2

<u>Dam & Levee Failure Summary</u>	
Recent development has decreased the risk of dam and levee failure thanks to the removal of the low-head dam on the East Fork Little Miami River.	Missing EAPs, unregulated “other” structures, privately owned (HOA) dams, the potential for deferred maintenance combined with potential development may increase risk to dam and levee failure in the future.

DROUGHT

Neither recent nor potential developments within the participating jurisdictions have caused increases or decreases in vulnerability to drought. The county’s population has steadily increased over the past five decades, and four of the participating municipalities within the county have experienced a population increase over the past 10 years.

Though it has not been a problem to date, new development – agricultural, commercial, industrial, and residential – may place additional pressure on ground water sources, and significant new development may tax aquifers. As the communities seek to stabilize or grow their populations, they should remain cognizant of the use of source water and recharge capabilities.

Table 2.4.3

<u>Drought Summary</u>	
Recent development has been steady, but it has not yet taxed groundwater aquifers; thus, recent development has affected no change to risk.	Though climate projections (such as those from The Climate Explorer) show a potential for fewer days with at least one inch of rain, those projects suggest little to no change with respect to the drought risk.

EARTHQUAKE

While not commonly considered an earthquake-prone area, the southwest region of Ohio does experience seismic activity. The county’s is located on the periphery of the New Madrid Seismic Zone, an area in Missouri and adjacent states that was the site of the largest earthquake sequence to occur in historical times in the continental United States.

Building construction standards and materials can mitigate the negative effects of many of the moderate earthquakes typically of this seismic zone. In Ohio, codes such as the Residential Code of Ohio (Ohio Department of Commerce, 2019), have strengthened masonry construction through reinforcement requirements. These trends decrease potential earthquake risk.

Table 2.4.4

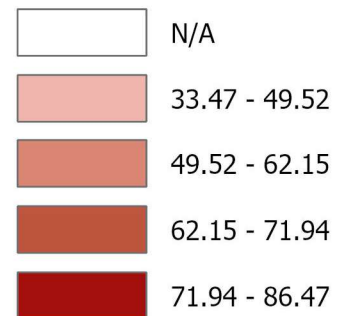
<u>Earthquake Summary</u>	
Recent development (through modern construction techniques and the use of modern materials) has resulted in a decreased risk of earthquake damage.	Societal variables, like a perceived low probability of earthquakes, contribute to risk, but those variables are generally unchanged. Thus, for the “other variables” category, there is no change to the earthquake risk.

The narrative above discusses earthquake risk with structures built with unreinforced masonry construction methods. Generally, these structures are those built pre-1950, and that cut-off is not only relevant for earthquakes. Modern construction methods and materials offer protection from earthquake damage. Census data (2024) indicates 6.8% of the housing units in the county being built in 1939 or before, with another 17.6% being built between 1950 and 1970. Figure 2.4.a identifies, by tract, the percentage of residences constructed in 1970 or afterward.

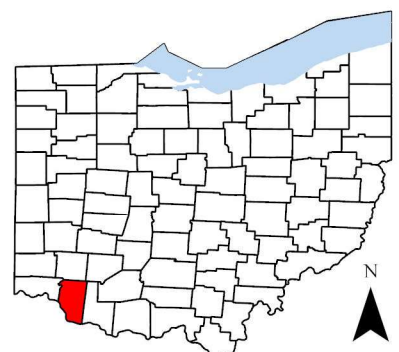
CLERMONT COUNTY HAZARD MITIGATION PLAN

**Figure 2.4.a:
% of Structures
Built After 1970**

Data Source(s):
U.S. Census (2000)



DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.



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EXTREME TEMPERATURES

While the overall exposure to extreme temperatures may not have changed significantly, the increasing proportion of older adults in the population heightens vulnerability. Reduced physiological tolerance, limited mobility, and higher utility costs, particularly for those on fixed incomes (Klinenberg, 2015), can increase the severity of impact during extreme heat or cold events. The percentage of Clermont County's population 65 and older rose from approximately 6.9% in 1970 (U.S. Census Bureau, 1970) to approximately 19% in 2020 (U.S. Census Bureau, 2020), an increase in the number of persons despite an overall decline in the county's population.

A lesser realized trend relevant to the extreme temperature discussion is the age of the housing stock. Older homes may not be adequately insulated, thereby offering less protection from extremely cold or hot temperatures. In the summer months, homes without air conditioning may put occupants at greater risk. Fortunately, over 80% of the county's housing stock has been built since 1950, with 23.6% of new housing construction occurring since 2000. On a wider scale, increased demand for electricity could put the larger grid at risk during long periods of extreme temperatures (especially heat).

Table 2.4.5

<u>Extreme Temperatures Summary</u>	
Recent development (through modern construction techniques and the use of modern materials) has resulted in a decreased risk of extreme temperature impacts, though at a much slower pace than other hazards (like the previous earthquake discussion).	Climate projections suggest that the number of days hotter or colder than the fifth percentile will remain reasonably steady (USEPA, 2021) for Clermont County and the wider region. However, climatological projects typically assume present-day infrastructure. As those factors evolve, particularly with an aging housing stock and population, the actual experience of extreme heat or cold may deviate from modeled expectations. This uncertainty in vulnerability possibilities supports the case for building flexible and anticipatory heat and cold response systems.

FLOODING

Though flooding is one of the more frequent and disruptive hazards for the county's participating jurisdictions, neither recent nor potential developments have significantly changed vulnerability. Many communities in the county have actively reduced repetitive loss risk through acquisition and relocation mitigation projects.

Anecdotal evidence suggests that development continues in low-lying areas, floodplain management has controlled new construction in special flood hazard areas (SFHAs), slowly

decreasing risk in those areas (particularly from riverine flooding) over time. Figure 2.4.b identifies the areas of Clermont County listed as “Developed, High Intensity,” with greater than 80% of the land area consisting of impervious surfaces, as well as “Developed, Medium Intensity,” which have between 50 and 79% of land areas covered with impervious surfaces. The intersections of these areas with special flood hazard areas (SFHAs) may provide local leaders with insights as to where to concentrate hazard mitigation efforts related to stormwater management and flash flooding. The figure also shows an overlay of the SFHAs in the developed areas.

Trends impacting the flood risk more readily have to do with heavy precipitation events. Local officials report intense bouts of rain, with significant quantities falling over relatively small geographic areas. This heavy precipitation can outpace existing stormwater infrastructure capacity, particularly in areas with older systems. Uncertainty around the timing, location, and magnitude of these events makes stormwater mitigation planning more urgent, not less. Fortunately, many communities in Clermont County are working to enhance stormwater management systems.

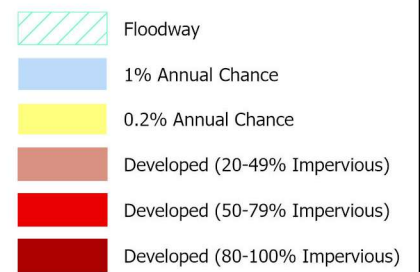
Table 2.4.6

<u>Flooding Summary</u>	
Recent development (through years of ongoing floodplain management) has resulted in a decreased risk of riverine flooding impacts.	Increased instances of intense precipitation often outpace stormwater utility systems. Additionally, development may pave over previously permeable surfaces, further increasing runoff during precipitation events. Though there is an emerging understanding of low-impact development and green infrastructure techniques, the combination of changing precipitation patterns and the built environment has resulted in an increased risk of flash flooding.

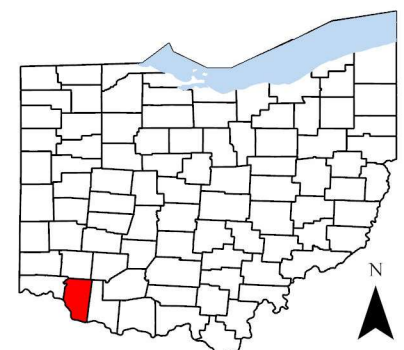
CLERMONT COUNTY HAZARD MITIGATION PLAN

Figure 2.4.b: Impervious Surfaces & SFHAs

Data Source(s):
FEMA, OEMA,
USGS NLCD (2021)



DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.



0 0.65 1.3 2.6 3.9 5.2
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HAZARDOUS MATERIALS RELEASE

Clermont County has a concentration of industrial companies several of which are located in northern portion of the county. The risk of hazardous materials incidents has been present for some time thanks to a robust legacy industrial base. As the nature of the county's industry has changed, so too has the nature of the hazardous material risk. Fewer industrial operators and decreased production at existing locations loosely equate to a lower risk of fixed facility incidents, and transport of hazardous materials to and from those facilities would also decrease, leading to a lower risk of transportation incidents. Yet, facilities in the county are not the only contributors to the risk.

Transport of materials to and from facilities throughout the region passes through Clermont County via highway, railway, pipeline, and waterway systems. In many cases, the central business districts of towns grew up along major intersections or rail infrastructure. Some long-term trends, like diverting major roadways away from densely built downtowns, have alleviated congestion as well as the starts, stops, and tight spaces that might contribute to accidents involving hazardous material (highway) shipments.

An aging transportation infrastructure may contribute to hazardous material risk. Roadways not designed for the quantities of heavy truck traffic seen today, railways not designed for the length and weight of modern freight trains, aging pipelines, etc., serve as examples.

Table 2.4.7

<u>Hazardous Materials Summary</u>	
Recent development has generally yielded no change to the overall hazardous materials risk.	Consideration of other variables is more nuanced. For example, as utility providers upgrade water treatment capabilities, many are moving away from chlorine-based treatment. Safety measures for transport and storage of materials are increasing and improving, as are materials used in the fabrication of containers. These variables suggest a decreased risk . Other variables, such as the aging transportation infrastructure and modern technologies allowing vehicles to transport higher quantities, heavier weights, etc., may combine to increase risks associated with transport in some areas. Still other variables, such as the ways in which the county's communities interact with transportation systems (through densely built downtowns) at least serve to sustain exposure to the hazardous material risk.

INVASIVE SPECIES

With the increase in global trade and travel, the probability of new and unexpected species arriving in Ohio and Clermont County will continue to grow. The importance of controlling the integrity of existing ecosystems will require ongoing state, national and international efforts to avoid unwanted infestations. To this end, the Ohio Administrative Code has been updated in 2023 to make the sale, propagation, distribution, and dissemination of 61 invasive species illegal.

Vessels on the Ohio River can contribute to the introduction of aquatic invasive species. Large vessels use ballast water to maintain stability. This water, taken on at one port, can contain a variety of aquatic organisms. When the ship discharges its ballast water, it can release these foreign species into the new environment. While ballast water is a primary concern, invasive species can also enter through other means, such as hitching rides on boat hulls, propellers, or other equipment.

According to the ODNR, Division of Forestry, one of the most invasive insect species in Ohio is the Emerald Ash Borer (EAB), which has greatly impacted all native ash trees found in Ohio. The infestation of the Asian Longhorned Beetle (ALB) led to the establishment of a federal quarantine area covering 44 square miles of Clermont County.

Table 2.4.8

<u>Invasive Species Summary</u>	
Potential development in the county to include increase in trade and travel could increase the risk .	Recent updates to the Ohio Administrative Code has made the sale, propagation, distribution, and dissemination of 61 invasive species illegal. Several mitigation efforts have been implemented by the Ohio Division of Forestry and Ohio Department of Agriculture to slow the spread of invasive species. These efforts have somewhat decreased the overall risk .

LANDSLIDE

Structures and other assets located near the edge of steep slopes increases the risk of landslides. Substantial development has largely steered clear of these areas. Changes in precipitation patterns to include more intense, localized rainfall events can increase slope instability, thereby increasing the risk of landslides.

Table 2.4.9

<u>Landslides Summary</u>	
Recent development has generally avoided landslide prone areas, resulting in no change to the overall risk of landslides.	Increased occurrences of intense rainfall can weaken slope stability, and there is evidence of more frequent occurrences of this type of precipitation event. As such, these variables may yield a slightly increased risk of landslides.

PUBLIC HEALTH EMERGENCIES

Epidemic outbreaks are more probable in densely populated areas, such as Union, Miami, Batavia, and Goshen Township, as well as the City of Milford (though other areas with a smaller population may have a higher population density), and especially at facilities containing large numbers of occupants (e.g., multi-unit residential developments, commercial and industrial sites at which a large workforce is employed, nursing homes, hospitals, schools, and large correctional institutions), regardless of location.

Older populations are more susceptible to various illnesses, including easily spread respiratory ailments, municipalities with aging populations include; Chilo, Moscow, and Neville. This trend interacts with the access to healthcare variable. As the population ages, its needs for healthcare increase.

In Ohio, including Clermont County, there is evidence suggesting a decrease in opioid use and its related harms. Ohio as a whole has seen a significant decrease in overdose deaths, outperforming the national average. Opioid Use Disorder (OUD) cases reported to the Clermont County Coroner's Office showed a significant drop from 71 in 2021 to 50 in 2022.

At the local level, the Clermont County Addiction and Recovery Partnership (CARP), formerly the Clermont County Opiate Task Force (OTF) has implemented multi-sector efforts to minimize substance misuse, distribution, addiction, and overdoses throughout the county.

Table 2.4.10

<u>Public Health Emergency Summary</u>	
Recent developments have had no change in the risk of potential public health emergencies.	Other variables have impacted public health emergency risk, though. The county's aging population increases vulnerability to illness, particularly during outbreaks of respiratory or heat-related health emergencies. Another development worth monitoring is the sustainability of smaller, more rural healthcare facilities. These variables combine to increase risk of public health emergencies.

SEVERE SUMMER WEATHER

Regarding severe thunderstorms, including hail and lightning, no developments or general trends in the county have influenced risk one way or another. Planners; however, note that this does not mean that the risk is not high. Roof integrity of older homes (i.e., unrenovated pre-1970 structures) is a vulnerability. In this sense, trends toward more modern construction reduce risk, but that trend has been slowly developing over time and does not suggest substantial risk reduction since the last plan update.

Table 2.4.11

<u>Severe Summer Weather Summary</u>	
Recent developments have had no change in the risk of severe summer weather.	Other trends may impact risk to this hazard. The aging population may have difficulty with affording full coverage insurance policies as it transitions to fixed incomes, which increases vulnerability to long-term financial hardship following storm-related damages. Similarly, residents living in poverty will have difficulty recovering from incidents, even small ones. As such, these variables slightly increase the risk. Additionally, as noted elsewhere in this section, intense precipitation accompanying thunderstorms can overwhelm stormwater management infrastructure. Though typically captured as “flash flooding,” the changes in precipitation increase risk of severe thunderstorms. Fortunately, though, the county and several municipalities are undertaking projects to enhance stormwater management systems. As more of these projects finish, this elevated risk may lessen.

SEVERE WINTER WEATHER

Neither recent nor potential developments, nor general trends in any of the participating jurisdictions have caused increases or decreases in vulnerability to severe winter weather. The communities in the county are aware of areas that may be isolated during severe winter weather and the potential impacts on those living in those areas.

Earlier discussions about the age of homes and the county’s aging population suggest increasing vulnerability to the effects of winter storms, particularly for households with limited financial resources or inadequate heating systems.

Table 2.4.12

<u>Severe Winter Weather Summary</u>	
Recent or future developments, nor general trends have changed the risk of severe winter weather.	Other trends may impact risk to this hazard. The most vulnerable structures to roof collapse and structure damage from heavy snow loads are those that are older and dilapidated. Approximately 6,000 residential structures in Clermont County were constructed in 1939 or earlier (ODSA, 2024). Ice accumulation can disrupt electrical power. Nearly 50% of the county's population utilizes electricity to heat their homes.

TERRORISM / CIVIL DISTURBANCE

Neither recent nor potential developments in any of the participating jurisdictions have caused increases or decreases in vulnerability to terrorism. Those communities in the county that house potential targets are fully aware and continue efforts to increase prevention and preparedness capabilities. The Village of Batavia as the county seat may be slightly more at risk of terrorism than other municipalities or the unincorporated areas of the county because they house local governmental bodies. Related to resource scarcity, sharp declines in employment can be correlated with increases in violence, ranging from high-profile incidents to more hidden occurrences (e.g., domestic violence).

TORNADO

Neither recent nor potential developments, nor general trends in any of the participating jurisdictions have caused increases or decreases in vulnerability to tornadoes. Variables such as the presence of mobile homes and manufactured housing (which are more vulnerable to wind-related damage) as well as low-income households unable to address wind-related damage remain present. Similarly, discussions about the increased resilience brought about by modern construction materials and methods apply to considerations of tornado risk.

Table 2.4.13

<u>Tornado Summary</u>	
Recent developments have had no change in the risk of tornadoes.	As noted under severe summer weather, the aging population may have difficulty with affording full coverage insurance policies as it transitions to fixed incomes, thus lessening resilience to address tornado damages. Similarly, residents living in poverty will have difficulty recovering from incidents, even small ones. These variables do not increase the likelihood or geographic extent of tornado events, but they increase the vulnerability of affected populations by reducing their capacity to rebuild or repair.

UTILITY FAILURE NON-STORM RELATED

Factors such as aging electrical systems and infrastructure beyond their intended lifespan, increasing interdependence, and growing societal dependence on electrical infrastructure suggest that the overall risk of impacts from non-storm related power interruptions will continue to rise.

Artificial Intelligence (AI) data centers and overall growing technological demands are impacting local power grids due to their high energy consumption, requiring upgrades to grid infrastructure. The energy consumption of a single hyperscale AI data center can rival that of a large city, placing considerable strain on local power grids. While several companies are targeting Ohio for data center development, there is no mention of that development occurring in Clermont County. However, several hubs and companies focused on AI are found in the nearby Greater Cincinnati area.

Table 2.4.14

<u>Non-Storm Related Utility Failure Summary</u>	
Overall growing technological demands are impacting local power grids due to their high energy consumption, requiring upgrades to grid infrastructure. Both recent and potential developments have increased the risk of non-storm related utility failures.	Factors such as aging electrical systems and infrastructure is also increasing the risk of non-storm related utility failures.

WILDFIRE

When people think of wildfire (or “wildland fire”), they often think of devastating incidents occurring in the western United States. Though the available fuels are different, wildfires (likely of a different scale) could happen in Clermont County and the wider region.

Recent developments have had no change to the risk of wildfire, though local officials should carefully consider how proposed developments may alter the fire risk. As residents build homes in dense wooded areas (or as residential developments encroach on these areas), risk increases as these structures could be impacted if a wildfire were to break out. Future development anywhere within the county or municipalities would increase the Wildland-Urban Interface (WUI) vulnerability.

The map below (Figure 2.4.c) illustrates areas that are targeted for future residential and commercial development in relationship to areas containing wildfire fuels. As depicted on the map several of these areas are either located within known Wildland-Urban Interface (WUI) or are on the fringes of WUI areas.

Table 2.4.15

<u>Wildfire Summary</u>	
Recent developments have had no change in the risk of wildfire, though local officials should carefully consider how proposed developments may alter the fire risk in an area.	Changing climatic conditions (e.g., earlier springs, delayed falls, and shorter winters [USGCRP, 2018]) may yield longer dry periods and increased evapotranspiration. These conditions do not directly increase risk , but they can create opportunity spaces for wildfires where they have been historically rare. Importantly, the spatial (i.e., geographical) and temporal (i.e., time-based) variability of these conditions adds a layer of uncertainty that complicates traditional fire risk forecasting.

CLERMONT COUNTY HAZARD MITIGATION PLAN

**Figure 2.4.c:
Developed Areas
& Wildfire Fuels**

Data Source(s):
USGS NLCD (2021)

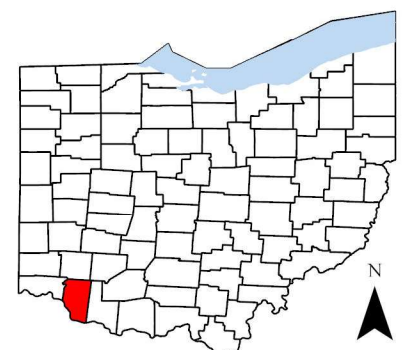


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The above narrative presents a substantial amount of information, and this information suggests that development patterns in the county since the last update have contributed to a rather mixed risk landscape. Therefore, Table 2.4.16 offers a summary (non-exhaustive) of key points woven through the above narrative.

Table 2.4.16

Key Development Influences on Risk in Clermont County		
<i>Development Trend</i>	<i>Hazard Implication</i>	<i>Risk Direction</i>
Launch of CyberOhio initiative and Ohio Persistent Cyber Improvement (OPCI).	Cyber Incident	↓ Decreased vulnerability
Removal of the low-head dam on the East Fork Little Miami River and Cloverlick Creek Dam. Regular inspections and maintenance by state and federal agencies.	Dam Failure	↓ Decreased exposure
Development and launch of the H2Ohio program which addresses water quality and resource issues.	Drought	↓ Decreased vulnerability
Modern residential construction using reinforced materials.	Earthquake, Tornado, Winter Storm	↓ Decreased vulnerability
The identification and communication of available heating and cooling centers throughout the county.	Extreme Temperatures	↓ Decreased vulnerability
Acquisition, relocation, and elevation mitigation projects.	Flash Flooding, Flooding	↓ Decreased vulnerability and exposure
Updates to the Ohio Administrative Code in 2023 to make the sale, propagation, distribution, and dissemination of 61 invasive species illegal. Several efforts taken by the Ohio Division of Forestry, Department of Agriculture, the Ohio River Foundation, and the Clermont Soil & Water Conservation District.	Invasive Species	↓ Decreased vulnerability
Decisions to steer future development away from known landslide prone areas.	Landslide	↓ Decreased vulnerability
Establishment of Clermont County Addiction & Recovery Partnership (CARP).	Public Health Emergency	↓ Decreased vulnerability
Development of the Ohio Statewide Terrorism Analysis and Crime Center (STACC), and the Intelligence Liaison Officer (ILO) Program.	Terrorism	↓ Decreased vulnerability
Participation in the annual statewide tornado drill during Severe Weather Awareness Week.	Tornado	↓ Decreased vulnerability
Implementation of smart grid upgrades to include substation and transmission line modernization.	Non-Storm Related Utility Failures	↓ Decreased vulnerability
ODNR's implementation of seasonal outdoor burning bans and enforcement of regulations on open burning during high-risk months.	Wildfire	↓ Decreased vulnerability
Growing usage of digital infrastructure and networks	Cyber, Non-Storm Related Utility Failures	↑ Increased complexity
Aging dam infrastructure, average age of dams in the county is 54 years.	Dam Failure	↑ Increased vulnerability

Key Development Influences on Risk in Clermont County		
<i>Development Trend</i>	<i>Hazard Implication</i>	<i>Risk Direction</i>
Continuing population growth in Clermont County and increased water consumption demand.	Drought	↑ Increased vulnerability
Expansion of impervious surfaces in urbanizing areas	Flash Flooding, Severe Storms	↑ Increased exposure
The county's location within the Ohio River watershed and surrounding natural areas. Increased shipping and travel in the nearby Cincinnati metropolitan area increase pathways for invasive species.	Invasive Species	↑ Increased exposure
Aging population and pockets of poverty	Public Health, Terrorism	↑ Increased vulnerability
Aging segments of electrical systems, grid, and infrastructure	Severe Summer Weather, Winter Storms, Non-Storm Related Utility Failure	↑ Increased vulnerability
Persistent legacy housing stock (pre-1950)	Severe Summer Weather, Winter Storms, Shelter-in-Place Hazmat	↑ Increased vulnerability
The high prevalence of mobile and manufactured homes in the county which are susceptible to wind damage and account for a disproportionately high rate of tornado fatalities.	Tornado	↑ Increased vulnerability
Development within the Wildland Urban Interface (WUI)	Wildfire	↑ Increased exposure