2.2.13 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:**	Medium
	Warning Time:	Less than 6 hours	**Type of Hazard:**	Natural
	Probability:	Remote (Unlikely to occur in a year)	**Impact:**	Localized (Less than 10% of land are affected)
	Disaster Declarations:	DR-266-OH (1969) DR-738-OH (1985)		DR-1656-OH (2006) USDA FSA S4275 (2017)

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. 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; however, they can and have struck in many other areas.

Predicting exactly what parts of Ashtabula 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 2.2.13.1 below is a map illustrating tornado touchdown locations and paths within Ashtabula County.

Tornado Touchdowns

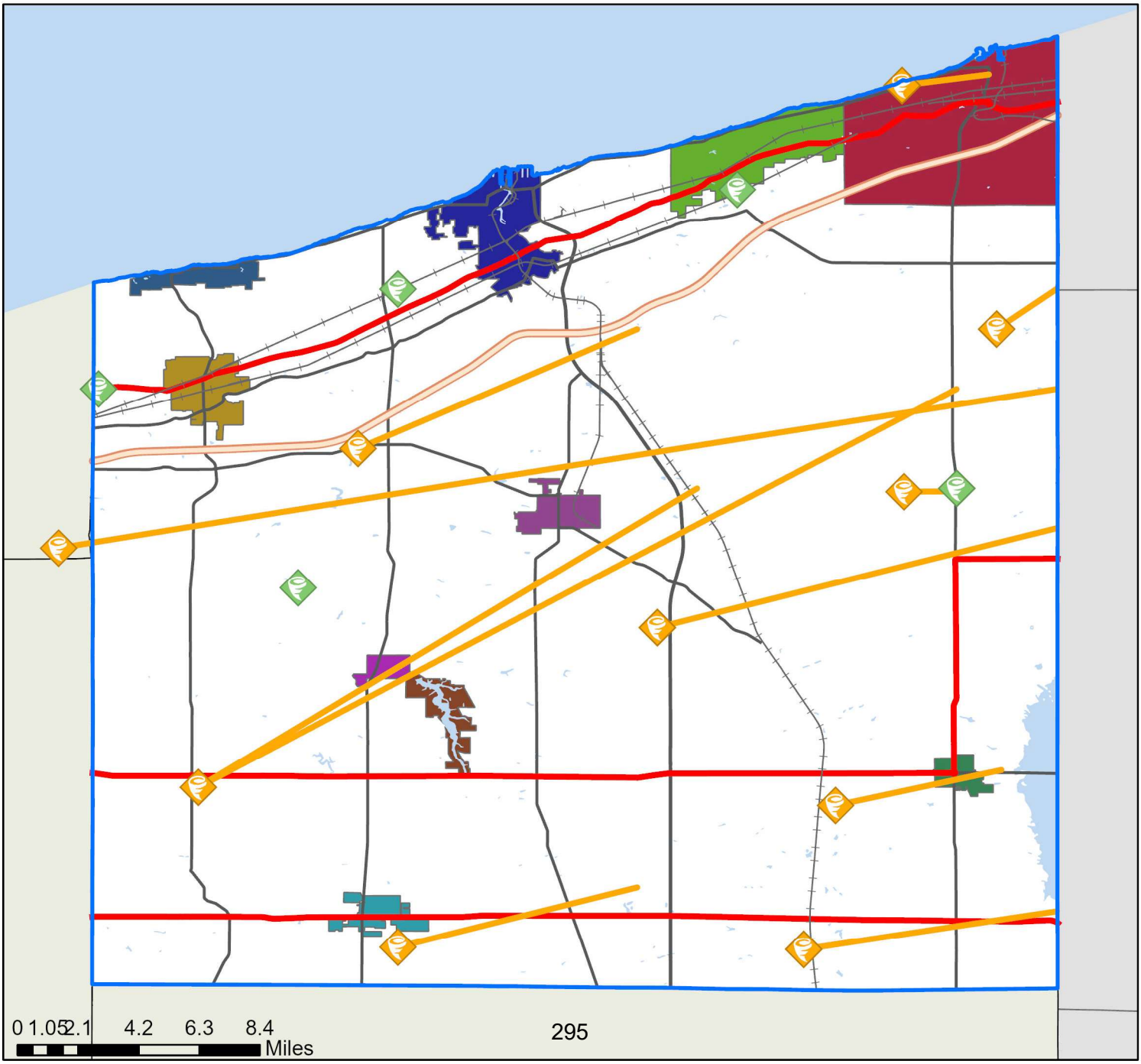
Tornado Paths

ASHTABULA COUNTY HAZARD MITIGATION PLAN

Figure 2.2.13.1: Tornado Touchdowns & Paths

Data Source(s): NOAA NCEI

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.



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. Tornadoes can also occur along a “dryline” which separates very warm, moist air to the east from hot, dry air to the west.

Another way that tornadoes form is when warm moist air flows upslope. Under the right temperature and moisture conditions, intense thunderstorms can produce tornadoes in higher terrain.

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 2.2.13.1 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 or the National Weather Service to re-evaluate the historical tornado data using the Enhanced scale.

Table 2.2.13.1

Enhanced Fujita (EF) Scale		
EF Rating	*3-second Gust Speed (mph)*	*Possible Damage*
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 the majority of documented tornadoes that have occurred in Ashtabula County were measured utilizing this scale.

Table 2.2.13.2

Fujita Tornado Scale		
Scale	*Wind Estimate (MPH)*	*Typical Damage*
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; cares 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. 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 Ashtabula County including; Crestlawn Village (Ashtabula City), Glenwood Village (Ashtabula City), Jefferson Mobile Estates (Jefferson Village), Mobile Acres Park (Edgewood), Mobile Grove (Conneaut City), Chestnut Hills (Conneaut City), Theil's (Conneaut City), Oakwood Mobile Homes (Edgewood), Saybrook Mobile Home Park (Saybrook Township), and Whispering Willow Mobile Home Community (Geneva City).

There are several large campgrounds in Ashtabula County including those located within the Geneva State Park, Pymatuning State Park, Holiday Camplands and Lake Village Campgrounds in Andover Township, the Grand River Valley KOA Holiday, and Sun Retreats in Geneva-on-the-Lake.

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 map below (Figure 2.2.13.2) depicts the distribution of mobile homes by Census tract.

% of Mobile Homes (Est.)

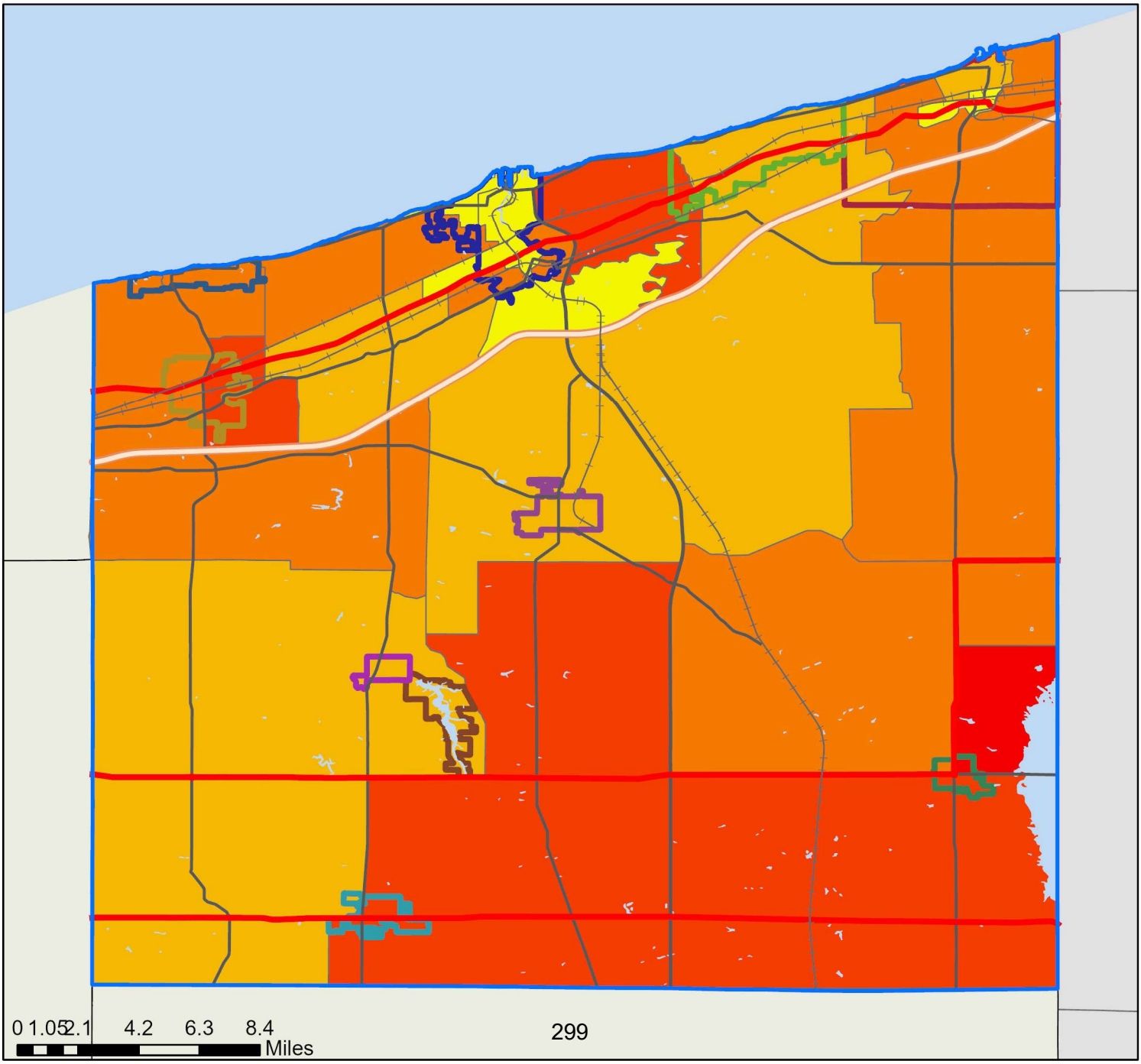
- 0.0 - 0.5
- 0.6 - 5.8
- 5.9 - 10.5
- 10.6 - 17.5
- 17.6 - 58.4

ASHTABULA COUNTY HAZARD MITIGATION PLAN

Figure 2.2.13.2: Mobile Homes by Tract

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

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.



Historical Occurrences

According to NOAAs National Centers for Environmental Information (NCEI) Storm Events Database, there has been 16 tornadoes in Ashtabula County since 1956, this suggests an occurrence rate of 0.24 tornados per year. These tornadoes resulting in 29 reported injuries, no reported fatalities, and approximately $9 million in reported property damage. The majority of the tornadoes that have occurred in Ashtabula County were rated F2, accounting for five of the 16 tornadoes. The month when the most tornadoes occurred was June, with four. The following table summarizes those incidents.

Table 2.2.13.3

Historical Tornadoes – Ashtabula County (1956 to 2024)						
Date	*Area Impacted*	*Scale*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
7/8/1956	Hartsgrove &	F2	0	0	$250,000	$0
4/29/1959	Pierpont	F0	0	0	$2,500	$0
4/16/1961	Austinburg & Plymouth	F1	0	0	$250,000	$0
4/19/1963	West of Geneva	F2	0	0	$25,000	$0
7/24/1967	Hartsgrove & Jefferson	F2	0	2	$250,000	$0
8/7/1972	North of Rock Creek	F1	0	0	$25,000	$0
5/31/1985	Monroe Center	F4	0	0	$250,000	$0
5/31/1985	South of Orwell & North of Colebrook	F3	0	10	$2,500,000	$0
5/31/1985	West of Dorest	F2	0	15	$2,500,000	$0
6/22/1985	East of South Madison	F2	0	2	$250,000	$0
6/10/1986	North of Saybrook	F1	0	0	$25,000	$0
7/25/1987	South of North Kingsville	F1	0	0	$25,000	$0
6/6/2010	Andover Village	EF1	0	0	$500,000	$0
6/27/2010	Amboy & Conneaut	EF1	0	0	$300,000	$0
5/26/2011	Pierpont	EF0	0	0	$200,000	$0
11/5/2017	Wick & Simons	EF2	0	0	$1,500,000	$0
	TOTALS		**0**	**29**	**$8,852,500**	**$0**

Source: NOAA – NCEI, Storm Events Database

Wayne Township EF2 Tornado – November 5, 2017

An EF0 tornado touched down in a field in rural Wayne Township near the southern border of Ashtabula County. The initial touchdown occurred along Hayes Road about halfway between U.S. Route 322 and the county line. A few trees fell in the area. The tornado continued east-northeast across farmland while quickly intensifying to EF1 intensity. The tornado eventually reached the Williamsfield area and crossed State Route 7 just south of its intersection with U.S. Route 322.

It then intensified to EF2 strength and roughly followed U.S. 322 for close to two miles. The tornado then turned northeast as it crossed Simons South Road and lifted just as it reached the Pennsylvania state line. The worst damage occurred along U.S. 322 east of State Route 7. The tornado affected approximately 20 properties and destroyed at least four homes with eight more sustaining major damage. The other homes along the damage path sustained lesser damage. The four destroyed homes were all within a third of mile from each other on U.S. 322. The storm also leveled a couple of garages along U.S. 322 and tree damage was extensive. The tornado scattered debris in fields across the area. The damage path was over six and a half miles in length and up to 200 yards in width. It took several days for power to be restored in the Williamsfield area.

Loss and Damages

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

Table 2.2.13.4

Ashtabula 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)*
39007000101	$965,550,693	4,653	$331,040	$50,372	$58,919	$3	$109,294
39007000102	$587,019,605	3,130	$0	$29,868	$39,328	$0	$69,197
39007000103	$781,775,010	3,527	$53	$39,778	$44,317	$0	$84,094
39007000200	$821,551,454	4,344	$719,500	$53,298	$63,608	$10	$116,916
39007000300	$1,170,998,835	2,093	$228,068	$79,665	$31,547	$3	$111,215
39007000400	$355,036,289	1,681	$62	$24,151	$25,336	$0	$49,488
39007000500	$785,413,231	4,082	$311	$53,428	$61,524	$0	$114,952
39007000601	$766,740,248	2,582	$124	$52,158	$38,916	$0	$91,074
39007000602	$430,650,007	3,294	$0	$29,295	$49,647	$0	$78,942
39007000603	$936,976,341	4,058	$279,328	$63,738	$61,162	$4	$124,904
39007000701	$655,457,629	3,036	$3,774	$44,588	$45,759	$0	$90,347
39007000702	$727,947,298	2,836	$984,267	$49,521	$42,745	$14	$92,279
39007000703	$574,938,746	3,631	$6,681	$39,110	$54,727	$0	$93,837
39007000704	$800,449,400	3,793	$431,894	$54,451	$57,168	$6	$111,625
39007000801	$602,774,693	1,346	$38,399	$41,004	$20,287	$1	$61,291
39007000802	$981,159,687	4,912	$217,507	$66,754	$74,034	$3	$140,791
39007000900	$978,569,872	4,473	$425,785	$66,569	$67,417	$6	$133,992
39007001001	$1,087,864,044	5,597	$4,573,905	$74,014	$84,359	$66	$158,439
39007001002	$944,294,311	3,397	$3,475,901	$64,255	$51,201	$49	$115,505
39007001101	$297,755,602	1,852	$4,603,043	$20,264	$27,914	$65	$48,243
39007001102	$1,309,514,375	6,133	$4,320,472	$89,102	$92,440	$61	$181,603
39007001201	$517,064,612	3,497	$5,940,413	$35,183	$52,708	$83	$87,975

Ashtabula 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)*
39007001202	$523,009,188	3,327	$6,686,645	$35,304	$49,895	$95	$85,293
39007001301	$716,258,778	3,622	$11,125,056	$48,399	$53,594	$158	$102,151
39007001303	$461,664,520	2,835	$8,209,829	$31,408	$42,730	$115	$74,253
39007001304	$361,745,758	979	$1,052,741	$24,634	$14,756	$15	$39,405
39007001401	$532,474,010	4,119	$3,962,437	$36,914	$62,390	$60	$99,365
39007001402	$885,882,483	4,689	$8,798,263	$60,440	$70,731	$124	$131,295
Grant Total	**$20,560,536,719**	**97,518**	**$66,415,498**	**$1,357,665**	**$1,439,158**	**$943**	**$2,797,765**

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

Future Occurrences

The historical data for tornadoes in Ashtabula County does not indicate an increasing frequency per se. between 1972 and 1987 (i.e., 15 years), there were seven tornadoes recorded in the NCEI database; between 2010 and 2017 (i.e., 17 years), there were four tornadoes recorded.

Risk Assessment

This section summarizes the vulnerability of Ashtabula County to tornadoes. The county conducted an online survey for the public to share its thoughts on the hazards listed in this plan. Table 2.2.13.5 presents the results of that survey, specifically regarding tornadoes.

Table 2.2.13.5

Public Sentiment, Tornado					
	Level of Concern				
Hazard	*Not at All*	*Somewhat*	*Concerned*	*Very*	*Total Responses*
TORNADO	18 (12.16%)	46 (31.08%)	52 (35.14%)	32 (21.62%)	148
In the past five years, do you remember this hazard occurring in your community?				60 (40.54%)	148
Have you noticed an increase in the occurrences or intensity of this hazard?				44 (29.73%)	148
Have you noticed a decrease in the occurrences or intensity of this hazard?				3 (2.03%)	148

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 2.2.13.6

Risk Ranking, Tornado			
Category	*Points*	*Description*	*Notes*
Frequency	2	Remote (Unlikely to occur in a year)	There have been 16 recorded tornadoes in Ashtabula County since 1956, this suggests an occurrence rate of 0.24 tornadoes per year.
Response	4	One month	The response to areas impacted by an EF2 tornado typically takes anywhere from days to weeks.
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	3	At least two weeks	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 16 recorded tornadoes have resulted in 29 reported injuries.
Property	1	Less than 10% of property affected	Though destructive, tornadoes are localized events. The 16 recorded tornadoes have resulted in approximately $9 million in reported property damage.
Totals	**19**	**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. Tornadoes are non-spatial hazards; therefore, it is difficult to profile tornadoes and determine exact risk areas. Thus, no jurisdiction is more or less at risk.

2.2.14 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  HIGHEST HIGH MEDIUM LOW LOWEST	**Period of Occurrence:**	At any time, typically during elevated temperature days	**Risk Ranking:**	Medium
	Warning Time:	None	**Type of Hazard:**	Technological
	Probability:	Probable (Likely to occur in a year)	**Impact:**	Limited (10-25% 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 the planning committee was most concerned with interruptions to electricity. 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.
- **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

Northeast Ohio, including Ashtabula County has experienced recent power outages including 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 8,000 (i.e., 21%) residents 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 of particular 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 committee members indicated that the county is experiencing more frequent non-storm related power outages. Recent non-storm related power outages have affected thousands of residents and a few businesses in Ashtabula County, especially during periods of elevated temperatures.

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, including customers in Ashtabula County.

Northeast Blackout of 2003

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. 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.

Northeast Ohio Blackout – July 2025

Portions of Northeast Ohio experienced multiple power outages, some without prior warning, exasperated by hot weather. Tree branches contacting power lines resulted in outages in several local substations. Thousands of customers were impacted, with some outages affective over 20,000 customers.

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, 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 he 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.

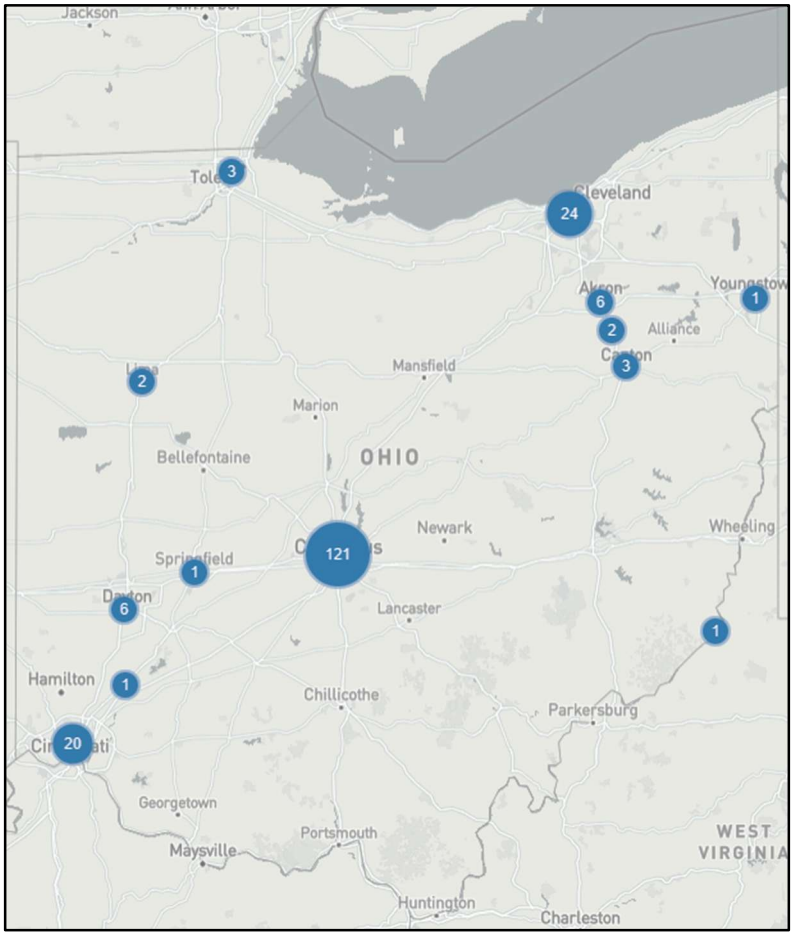
Future Occurrences

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.

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.

Figure 2.2.14.1

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 2.2.14.1, the nearby City of Cleveland is home to 24 of these data centers.

Risk Assessment

This section summarizes the vulnerability of Ashtabula County to 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 utility failures.

Table 2.2.14.1

Public Sentiment, Utility Failure					
	Level of Concern				
Hazard	*Not at All*	*Somewhat*	*Concerned*	*Very*	*Total Responses*
UTILITY FAILURE	21 (14.19%)	51 (34.46%)	53 (35.81%)	23 (15.54%)	148
In the past five years, do you remember this hazard occurring in your community?				59 (39.86%)	148
Have you noticed an increase in the occurrences or intensity of this hazard?				53 (35.81%)	148
Have you noticed a decrease in the occurrences or intensity of this hazard?				3 (2.03%)	148

Source: Online Public Survey Results

Table 2.2.14.2 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 2.2.14.2

Risk Ranking, Non-Storm Related Utility Failure			
Category	*Points*	*Description*	*Notes*
Frequency	4	Probable (Likely to occur in a year)	Non-storm related brownouts and blackouts are becoming a more frequent issue in Ashtabula County. 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	2	Limited (10-25% 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 Ashtabula County; no jurisdiction is more or less at risk. As such, there is no image identifying jurisdictional fluctuations.

2.2.15 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	**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:	None		

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 am to six pm 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. The northeastern corner of Ohio does contain varying topography when compared to the western portion of Ohio, which contributes to more complex wildfire behavior. 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 2.2.15.1. 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. On February 9, 2019, the Ohio Department of Natural Resources announced the expansion of the ODNR Division of Forestry's Forest Fire Protection Area which now includes the entirety of Ashtabula County.

Figure 2.2.15.1

ODNR Division of Forestry's Expanded Forest Fire Protection Area

Areas of concern for wildfires in Ashtabula County would be the 264,000 acres of forested, pasture, and open urban areas with recreational opportunities and other attractions in designated areas, such as campgrounds within Geneva State Park and Pymatuning State Park which include over 21,000 acres of largely open and wooded areas, or within the 1,088 acres of the Dorset Wildlife Area. Campfires, coupled with large numbers of visitors and a large proportion of trees, make wildfires a potential hazard for Ashtabula County. The map below (Figure 2.2.15.2) illustrates the areas in Ashtabula 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.

Deciduous Forest

Evergreen Forest

ASHTABULA COUNTY HAZARD MITIGATION PLAN

Figure 2.2.15.2: 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 1.05 2.1 4.2 6.3 8.4 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.

Impacts and Vulnerability

Ashtabula 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. Many municipalities within Ashtabula County border larger forested areas and are susceptible to Wildland-Urban Interfaces (WUI), the area where houses meet or intermingle with undeveloped wildland vegetation. In addition, the large number of tourist attractions to include parks, forests, and campgrounds, depending on the time of year, can increase the demographic effect as temporary population densities increase well within the forest boundaries. 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." All structures in the county are either within a wooded area containing potential fuel (as mapped above) or within the 2.4-kilometer buffer. The orange dots on Figure 2.2.15.3 below represent structures *not* within wooded areas with potential fuel, but solely within 2.4 kilometers of these areas. The map illustrates Radeloff et al.'s assertion that the WUI is a set of conditions rather than a place.

Areas w/ Potential Wildfire Fuel

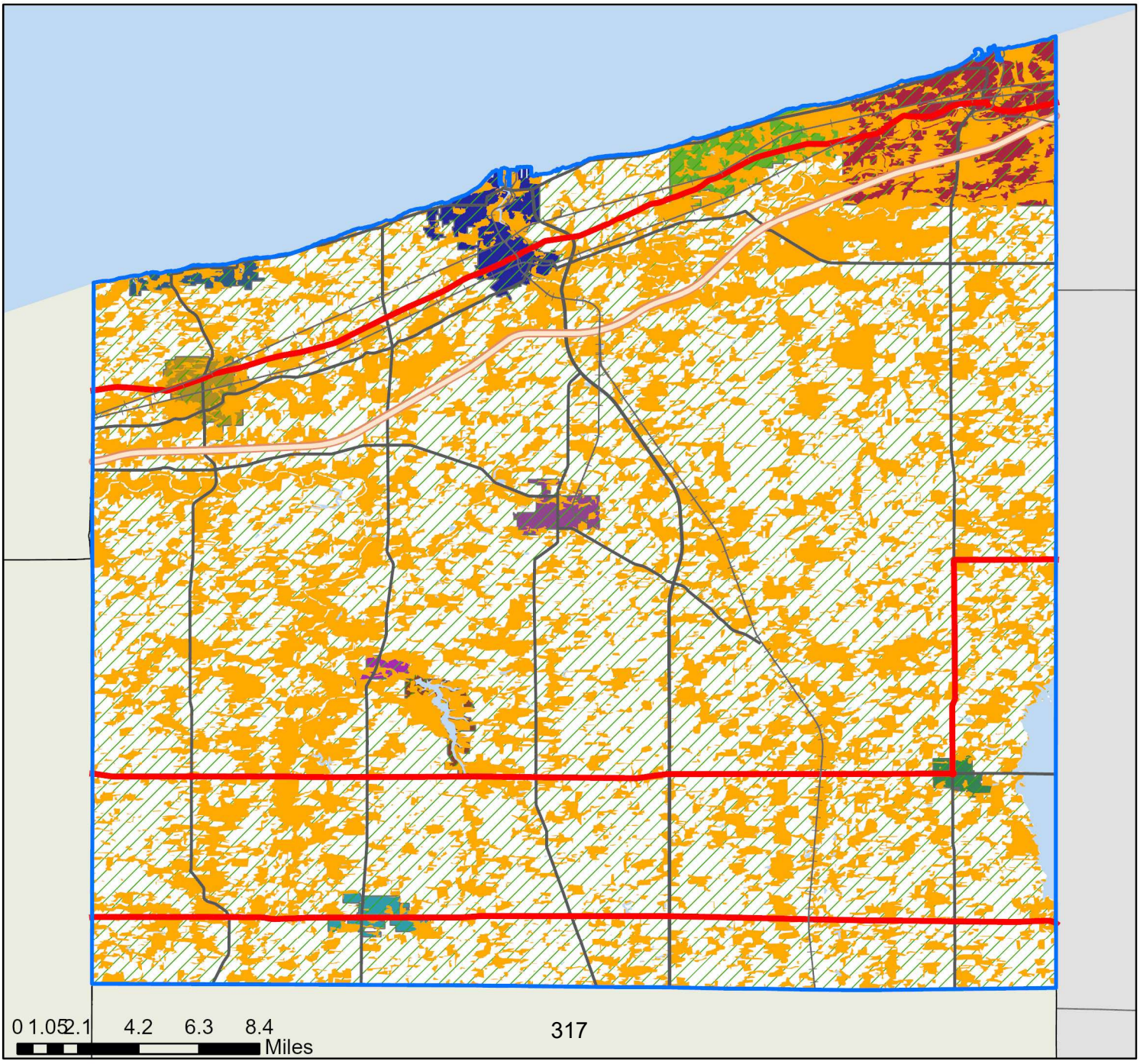
WUI (only) Areas

ASHTABULA COUNTY HAZARD MITIGATION PLAN

Figure 2.2.15.3: Approx. of Wildland-Urban Interface

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.



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), Ashtabula County had 72 wildfire events from 2018 through 2022; 374 acres burned in that time. These fires did not result in any injuries or fatalities, and no structures were threatened or destroyed.

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 Ashtabula County by the respective number of events recorded, resulting in an average of 4.05 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 Ashtabula County. Table 2.2.15.1 presents that data.

Table 2.2.15.1

Ashtabula 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)*
39007000101	$296,396,908	1,003	$165,460	$1,186	$70	$0.02	$1,256
39007000102	$73,247,107	372	$0	$293	$26	$0.00	$319
39007000103	$106,716,412	374	$0	$427	$26	$0.00	$453
39007000200	$348,559,148	1,855	$369,940	$1,394	$130	$0.05	$1,524
39007000300	$326,723,496	1,062	$146,423	$1,307	$74	$0.02	$1,381
39007000400	$93,962,590	527	$62	$376	$37	$0.00	$413
39007000500	$108,524,037	445	$248	$434	$31	$0.00	$465
39007000601	$94,098,221	177	$124	$376	$12	$0.00	$389
39007000602	$57,729,511	493	$0	$231	$35	$0.00	$265
39007000603	$284,307,796	1,470	$84,910	$1,137	$103	$0.01	$1,240
39007000701	$103,923,544	358	$1,613	$416	$25	$0.00	$441
39007000702	$305,281,941	1,284	$350,835	$1,221	$90	$0.05	$1,311
39007000703	$80,020,882	428	$805	$320	$30	$0.00	$350
39007000704	$92,240,329	529	$180,519	$369	$37	$0.02	$406
39007000801	$88,712,465	345	$11,493	$355	$24	$0.00	$379
39007000802	$333,706,120	1,420	$120,625	$1,335	$100	$0.02	$1,434
39007000900	$288,256,052	1,299	$165,176	$1,160	$92	$0.02	$1,252
39007001001	$421,947,534	2,313	$1,611,287	$1,688	$162	$0.22	$1,850
39007001002	$458,160,064	1,565	$1,215,920	$1,833	$110	$0.17	$1,942
39007001101	$122,099,237	803	$1,589,307	$488	$56	$0.22	$545
39007001102	$456,963,451	2,460	$1,312,879	$1,828	$172	$0.18	$2,000
39007001201	$243,808,831	1,678	$2,333,786	$975	$118	$0.32	$1,093
39007001202	$248,262,305	1,616	$2,531,545	$995	$114	$0.34	$1,109
39007001301	$196,878,641	1,118	$2,555,950	$788	$78	$0.35	$866
39007001303	$198,599,632	1,205	$2,805,679	$794	$84	$0.38	$879
39007001304	$65,882,904	323	$254,902	$264	$23	$0.03	$286
39007001401	$181,935,326	1,489	$1,073,329	$728	$104	$0.15	$832
39007001402	$236,588,537	1,428	$1,988,128	$953	$102	$0.27	$1,054
Grant Total	**$5,913,533,021**	**29,439**	**$20,870,946**	**$23,669**	**$2,066**	**$3**	**$25,738**

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

Future Occurrences

Seasons are changing in length and timing in Ashtabula 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

This section summarizes the vulnerability of Ashtabula 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 2.2.15.2

Public Sentiment, Wildfire					
	Level of Concern				
Hazard	*Not at All*	*Somewhat*	*Concerned*	*Very*	*Total Responses*
WILDFIRE	64 (43.24%)	57 (38.51%)	22 (14.86%)	5 (3.38%)	148
In the past five years, do you remember this hazard occurring in your community?				17 (11.49%)	148
Have you noticed an increase in the occurrences or intensity of this hazard?				29 (19.59%)	148
Have you noticed a decrease in the occurrences or intensity of this hazard?				3 (2.03%)	148

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.

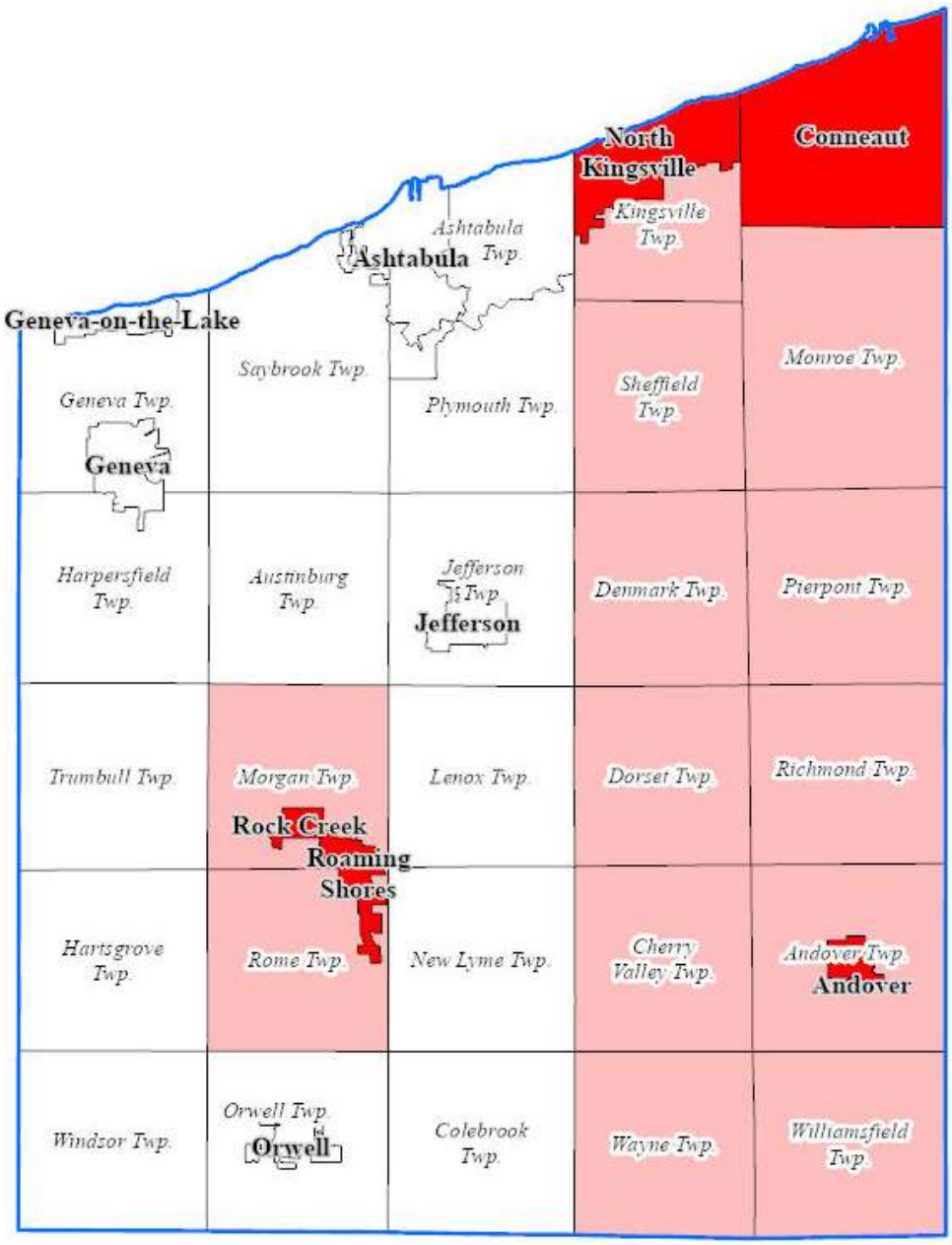
Table 2.2.15.3

Risk Ranking, Wildfire			
Category	*Points*	*Description*	*Notes*
Frequency	5	Frequent (Will occur during a year)	There were 72 fire events reported in Ashtabula County from 2018 to 2022, (for an average of 18 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 5.19 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	The average wildfire in Ashtabula County would burn 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. The following map identifies those multi-jurisdictional risks concerning wildfire. Those labels not underlaid by a shaded drop shadow are not more or less at risk of wildfire. Those with red drop shadows are more at risk.

Figure 2.2.15.4

Wildfire Multi-Jurisdictional Risk Map



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 Ashtabula 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 – Ashtabula County									
Hazard	*Risk Ranking*	*Frequency*	*Response*	*Onset*	*Magnitude*	*Business*	*Human*	*Property*	***Total***
Cyber Incident	**HIGH**	5	5	4	2	4	1	2	**23**
Severe Winter Weather	**HIGH**	5	3	1	5	2	3	3	**22**
Flooding	**HIGH**	5	4	3	4	1	3	1	**21**
Invasive Species	**MEDIUM**	5	5	1	3	4	2	2	**20**
Severe Thunderstorm Winds & Hail	**MEDIUM**	5	2	2	5	2	2	2	**20**
Utility Failure (Non-storm)	**MEDIUM**	4	2	5	2	2	3	2	**20**
Hazmat Release	**MEDIUM**	5	3	5	1	1	3	1	**19**
Tornado	**MEDIUM**	2	4	4	2	3	3	1	**19**
Health Related Emergencies	**MEDIUM**	3	5	1	4	2	2	1	**18**
Wildfire	**MEDIUM**	5	3	4	1	2	2	1	**18**
Dam & Levee Failure	**MEDIUM**	2	4	1	1	3	3	3	**17**
Earthquake	**MEDIUM**	5	2	5	1	1	1	1	**16**
Terrorism/Civil Disturbance	**LOW**	2	3	5	1	1	2	1	**15**
Coastal Erosion	**LOW**	4	5	1	1	1	1	1	**14**
Drought	**LOW**	2	2	1	4	1	1	2	**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

Ashtabula County's NRI scores[1] 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 Ashtabula County when compared to the rest of the United States.

Table 2.3.2

Ashtabula County Risk Index				
Jurisdiction	*Risk Index*	*Expected Annual Loss*	*Social Vulnerability*	*Community Resilience*
Ashtabula County	61.3 (Relatively Low)	59.1 (Relatively Low)	81.9 (Very High)	83.2 (Very 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					
Hazard	*Risk Index (Avg. of Scores)*	*Absolute NRI Ranking*	*Hazard Profile Vulnerability Assignment*	*Absolute Hazard Profile Ranking*	*Hazard Profile Absolute / Ranking Placement Difference*
Severe Winter Weather	85.3	1	High (22)	2	↓ 1
Tornado	77.8	2	Medium (19)	T 5	↓ 3
Flooding	68.2	3	High (21)	3	↔
Severe Thunderstorm	56.9	4	Medium (20)	T 4	↔
Earthquake	51.2	5	Medium (16)	8	↓ 3
Wildfire	45.1	6	Medium (18)	6	↔
Drought	No Rating	N/A	Low (13)	11	↔

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 second highest score among the hazards profiled in this hazard mitigation plan; however, it ranks one point below the technological hazard cyber incident, which was the highest scoring hazard profiled in this plan. If you take this technological hazard out of the rankings then this plan and the NRI both consider severe winter weather as the highest ranking natural hazard.
- The difference in the ranking of the tornado hazard between this plan and the NRI is also Influenced by the inclusion of two technological hazards considered in this plan that ranked above tornado. If you remove those technological hazards the ranking between this plan and the NRI would be nearly the same. This holds true for the earthquake hazard as well.

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 Ashtabula 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 Ashtabula 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 15 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 appear in the table 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).

The key for the tables below is as follows:

- Changes have resulted in an **Increase** in vulnerability for the jurisdiction (↑)
- Changes have resulted in a **Decrease** in vulnerability for the jurisdiction (↓)
- Changes have resulted in **No Change** in vulnerability for the jurisdiction (↔)

COASTAL EROSION

Ashtabula County is bordered by 28 miles of Lake Erie shoreline on the north. According to the Ohio Coastal Management Program (OCMP), approximately 95% of Ohio's Lake Erie shore is eroding with 43% of the shore now beachless. The bluffs along Ashtabula County's shoreline range from 15 feet to over 60 feet in height and are rich in clay and are prone to erosion, slumping and block falls from groundwater and runoff. Development further inland that channels untreated rainwater runoff directly into the lake can contribute to shoreline erosion.

Municipalities located along the shoreline of Lake Erie include; the cities of Ashtabula and Conneaut, the villages of Geneva-on-the-Lake and North Kingsville, as well as the townships of Ashtabula, Conneaut, Geneva, Kingsville, and Saybrook. The impacts of coastal erosion along a three-mile stretch east of Ashtabula towards North Kingsville is threatening segments of State Route 531 in multiple locations.

Table 2.4.1

Development Trends & Vulnerability Implications Summary					
		Change Type			
	Jurisdiction	*RD*	*PD*	*GT*	*Notes*
COASTAL EROSION	**Ashtabula County**	↔	↑	↔	Five townships contain Lake Erie shoreline and are susceptible to coastal erosion; Ashtabula, Conneaut, Geneva, Kingsville, and Saybrook. These areas have seen limited recent development along Lake Erie's shores; however, they are interested in potential future development along the shoreline. Ashtabula and Saybrook townships have been identified as Community Reinvestment Areas.
	Ashtabula	↔	↑	↓	There is a sizable commercial district located in Ashtabula Harbor, on the waterfront. The city has been identified as a Qualified Opportunity Zone. Recent development has not been targeted along the shoreline. Ashtabula City has experienced a population decrease of approximately 6% over the past decade.
	Conneaut	↑	↑	↓	There is a sizable commercial district located at the Conneaut Port, near the waterfront. The city is also a Qualified Opportunity Zone. Industrial development and revitalization efforts have been particularly focused on its waterfront and downtown area. Conneaut City has experienced a population decrease of approximately 4% over the past decade.
	Geneva	↔	↔	↓	Though the city has experienced several recent commercial developments they have not occurred along the shoreline. Geneva City has experienced a population decrease of nearly 5% over the past decade.
	Andover	N/A	N/A	N/A	Not susceptible to coastal erosion.
	GOTL	↔	↔	↓	Recent or potential development have affected no change to the hazard of coastal erosion. Geneva-on-the-Lake has experienced a population decrease of approximately 29% over the past decade.
	Jefferson	N/A	N/A	N/A	Not susceptible to coastal erosion.
	North Kingsville	↔	↔	↓	The village has experienced limited development over the past five years. Potential development along the shorelines is not anticipated. North Kingsville has experienced a population decrease of nearly 6% over the past decade.

Development Trends & Vulnerability Implications Summary					
	Jurisdiction	*Change Type*			*Notes*
		RD	*PD*	*GT*	
	Orwell	N/A	N/A	N/A	Not susceptible to coastal erosion.
	Roaming Shores	N/A	N/A	N/A	Not susceptible to coastal erosion.
	Rock Creek	N/A	N/A	N/A	Not susceptible to coastal erosion.

CYBER INCIDENT

Ashtabula County's steering committee 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. Committee members also recognized the interconnectedness of systems that could be disrupted by cyber incidents. As an example, a cyber incident impacting a water utility *also* impacts all critical facilities relying on service from that utility.

Additionally, committee members 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 2.4.2

Development Trends & Vulnerability Implications Summary					
		Change Type			
	Jurisdiction	*RD*	*PD*	*GT*	*Notes*
CYBER INCIDENT	**Ashtabula County**	↑	↑	↔	Of the three recorded cyberattacks since 2020, one impacted Ashtabula County Medical Center and the other affected the county recorder's office. Recent and potential development such as digitization and greater adoption of cloud-based technologies have increased the risk of cyber incidents.
	Ashtabula	↔	↑	↔	Ashtabula is the most populated municipality in the county. A large portion of the counties' commercial, industrial, and public services base is located in the City of Ashtabula. Recent development has not increased nor decreased the cities vulnerability to cyber incidents.
	Conneaut	↔	↑	↔	Second most populated municipality in the county. Recent development has not increased nor decreased the cities' vulnerability to cyber incidents.
	Geneva	↑	↑	↔	Of the three recorded cyberattacks since 2020, one impacted the City of Geneva's website and online data systems. Recent and potential development such as digitization and greater adoption of cloud-based technologies have increased the risk of cyber incidents.
	Andover	↑	↑	↔	The village has seen notable commercial developments in recent years centers around the Heritage Development. Limited future commercial and industrial growth is expected in the village, the number of systems exposed to cyber-threats would increase minimally.
	GOTL	↔	↑	↔	Recent development has not increased nor decreased the villages vulnerability to cyber incidents. Potential development such as digitization and greater adoption of cloud-based technologies have increased the risk of cyber incidents
	Jefferson	↔	↑	↑	The village of Jefferson serves as the county seat and operates networks that are tied to local and state governmental assets which could be targeted for cyberattacks. The village of Jefferson has experienced a population increase of 3.4% over the past decade.
	North Kingsville	↔	↑	↔	Potential development such as digitization and greater adoption of cloud-based technologies have increased the risk of cyber incidents.
	Orwell	↔	↑	↔	Potential development such as digitization and greater adoption of cloud-based technologies have increased the risk of cyber incidents.
	Roaming Shores	↔	↑	↑	Potential development such as digitization and greater adoption of cloud-based technologies have increased the risk of cyber incidents. The village of Roaming Shores has experienced a population increase of just over 5% over the past decade.
	Rock Creek	↔	↑	↑	Potential development such as digitization and greater adoption of cloud-based technologies have increased the risk of cyber incidents. The village of Rock Creek has experienced a population increase of 26% over the past decade.

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 29 dams throughout the county is 67 years. Approximate 55% of the dams in Ashtabula County received an assessment condition of "poor", while only 7% received a "satisfactory".

Table 2.4.3

Development Trends & Vulnerability Implications Summary					
		Change Type			
	Jurisdiction	*RD*	*PD*	*GT*	*Notes*
DAM & LEVEE FAILURE	**Ashtabula County**	↔	↑	↑	Most of the areas that would be inundated because of a dam failure are located outside of the municipalities. Austinburg Township contains the most Class I-III dams in the county with four.
	Ashtabula	↔	↔	↑	The southern portion of the city is located downstream of the Ashtabula County Outdoor Club Lake with is a Class I dam. The dam is 97 years old and was assigned an assessment condition of poor in late January of 2024.
	Conneaut	N/A	N/A	N/A	Not susceptible to dam failure.
	Geneva	N/A	N/A	N/A	Not susceptible to dam failure.
	Andover	↔	↔	↑	The Holiday Camplands Lake Dam is a Class I Dam and is located north of the Village of Andover. The dam is 50 years old and was assigned an assessment condition of fair in late September of 2022.
	GOTL	↔	↔	↑	The Palmetto Lake Dam is a Class II Dam located in the northern portion of the Village. The dam was assigned an assessment condition of poor in October of 2023
	Jefferson	N/A	N/A	N/A	Not susceptible to dam failure.
	North Kingsville	↔	↔	↑	The oldest dam in the county is the North Kingsville Route 20 Lake Dam which was constructed in 1900 (i.e., 124.5 years old). Other dams that could impact the village include the North Kingsville Lake Dam and the Pierce-Ruhland Pond Dam, all of which are Class II dams.
	Orwell	↔	↑	↑	There are two Class I dams that could impact the Village of Orwell during a significant failure of the dam structures, the Camp Whitewood Lake Dam, and the Naji Lake Dam. These dams are 58 and 62 years old respectively.
	Roaming Shores	N/A	N/A	N/A	Not susceptible to dam failure.
	Rock Creek	↓	↑	↑	Rock Creek is located downstream of the Roaming Rock Shores Lake Dam which is the largest dam in the county. The dam was assigned an assessment condition of poor in late October of 2021. Funding through the HHPD program has been obtained to conduct a rehabilitation project of the dam. Rock Creek Village experienced a population increase of just over 26% from 2010-2020.

DROUGHT

Neither recent nor potential developments within the participating jurisdictions have caused increases or decreases in vulnerability to drought. All jurisdictions within the county have experienced a population decrease over the past 10 years except for a 3.4% population increase in Jefferson Village, 5.17% increase in Roaming Shores Village, and a 26.09% increase in Rock Creek Village.

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 2.4.4

Development Trends & Vulnerability Implications Summary					
		Change Type			
	Jurisdiction	*RD*	*PD*	*GT*	*Notes*
DROUGHT	**Ashtabula County**	↔	↔	↔	Recent development throughout the county has been limited and has not taxed groundwater aquifers; thus, recent development has had no impact on the risk of drought. Potential development is not expected to be at a level that will tax existing groundwater aquifers.
	Ashtabula	↔	↔	↓	Recent development has been steady, but it has not yet taxed groundwater aquifers; thus, recent development has affected no change to risk. Potential development is not expected to be at a level that will tax existing groundwater aquifers. Ashtabula City has experienced a population decrease over the past decade.
	Conneaut	↔	↔	↓	Recent development has been steady, but it has not yet taxed groundwater aquifers; thus, recent development has affected no change to risk. Potential development is not expected to be at a level that will tax existing groundwater aquifers. Conneaut City has experienced a population decrease over the past decade.
	Geneva	↑	↑	↔	A significant drought could negatively impact the growing wine industry in the City of Geneva.
	Andover	↔	↔	↓	Recent nor potential development is anticipated to taxed groundwater aquifers; thus, development has affected no change to risk. Andover has experienced a population decrease over the past decade.
	GOTL	↑	↑	↔	A significant drought could negatively impact the growing wine industry in Geneva-on-the-Lake.
	Jefferson	↔	↔	↑	Jefferson Village was one of only three municipalities in the county that experienced population growth from 2010 to 2020. Recent nor potential development is anticipated to taxed groundwater aquifers; thus, development has affected no change to risk.
	North Kingsville	↔	↔	↓	Recent nor potential development is anticipated to taxed groundwater aquifers; thus, development has affected no change to risk. North Kingsville has experienced a population decrease over the past decade.
	Orwell	↔	↔	↓	Recent nor potential development is anticipated to taxed groundwater aquifers; thus, development has affected no change to risk. Orwell has experienced a population decrease over the past decade.
	Roaming Shores	↔	↔	↑	Roaming Shores Village was one of only three municipalities in the county that experienced population growth from 2010 to 2020. Recent nor potential development is anticipated to taxed groundwater aquifers; thus, development has affected no change to risk.
	Rock Creek	↔	↔	↑	Rock Creek Village experienced moderate population growth from 2010 to 2020, increasing by over 26%. Recent nor potential development is anticipated to taxed groundwater aquifers; thus, development has affected no change to risk.

EARTHQUAKE

Ashtabula County is located within the Southern Great Lakes Seismic Zone, which is an area of low to moderate earthquake activity around Lakes Erie and Ontario. The majority of the earthquakes that have occurred in the county were centered in or near Ashtabula City as well as Harpersfield and Trumbull Townships along the Ashtabula and Lake County border.

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 2.4.5

Development Trends & Vulnerability Implications Summary					
		Change Type			
	Jurisdiction	*RD*	*PD*	*GT*	*Notes*
EARTHQUAKE	**Ashtabula County**	↓	↓	↔	Several houses in the county (i.e., 35%) are between 55 and 66 years old, and 30% are 86 years old or older. These older structures may be more susceptible to damage from earthquakes. Recent and potential development have been conducted utilizing modern construction techniques and the use of modern materials. This has resulted in a decreased risk of earthquake damage.
	Ashtabula	↓	↓	↔	
	Conneaut	↓	↓	↔	
	Geneva	↓	↓	↔	
	Andover	↓	↓	↔	
	GOTL	↓	↓	↔	
	Jefferson	↓	↓	↔	
	North Kingsville	↓	↓	↔	
	Orwell	↓	↓	↔	
	Roaming Shores	↓	↓	↔	
	Rock Creek	↓	↓	↔	

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 30% of the housing units in the county being built in 1939 or before, with another 35% being built between 1950 and 1970. Figure 2.4.1 identifies, by tract, the percentage of residences constructed in 1970 or afterward.

% Res. Built 1970 or Later

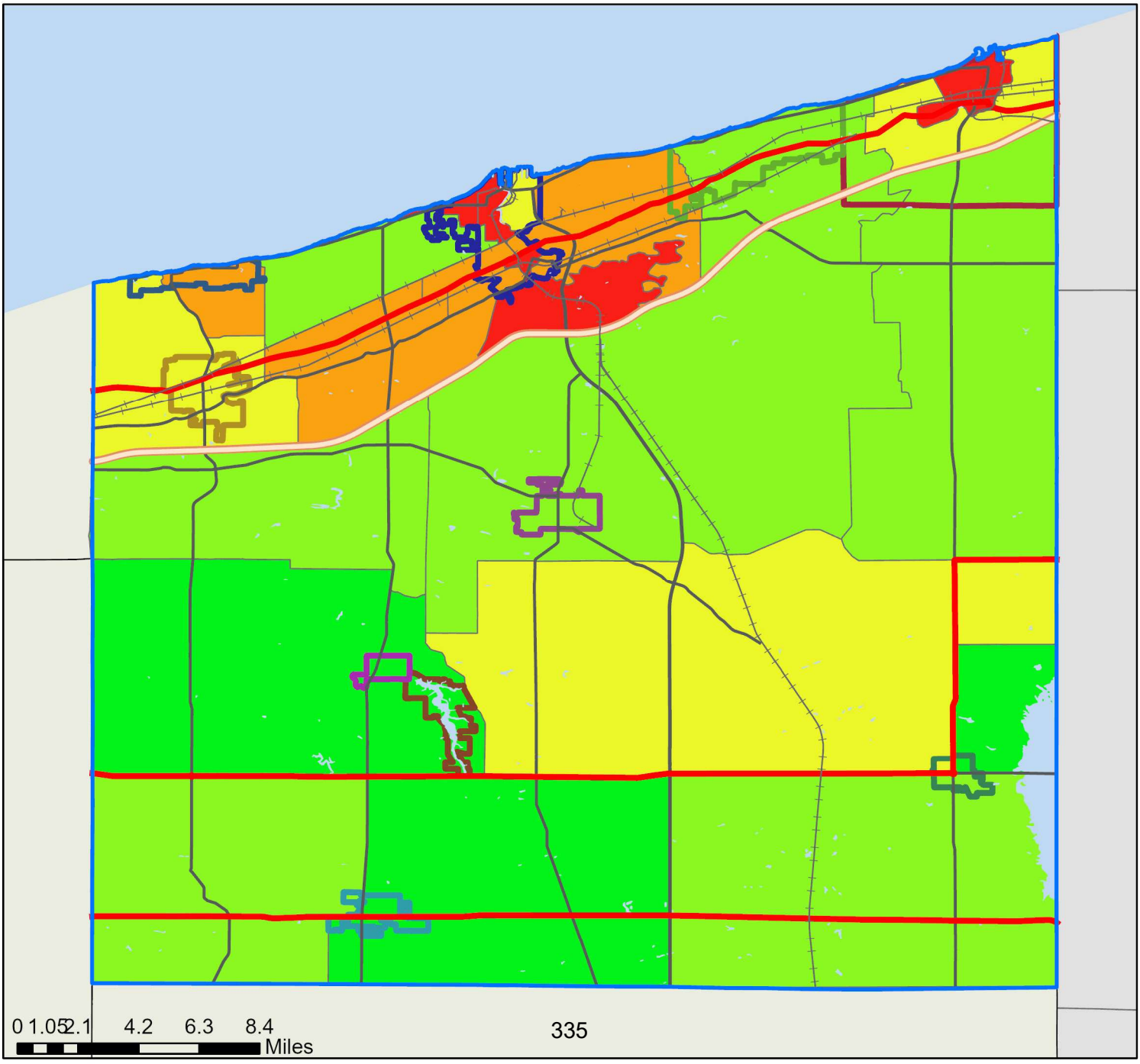
- 0.0 - 22.0
- 22.01 - 32.0
- 32.01 - 43.0
- 43.01 - 58.0
- 58.01 - 73.0

ASHTABULA COUNTY HAZARD MITIGATION PLAN

Figure 2.4.1: Residential Structures Built After 1970

Data Source(s):
U.S. Census ACS (2020)

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.



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 2.4.2 identifies the areas of Ashtabula 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 Ashtabula County are working to enhance stormwater management systems.

Table 2.4.6

Development Trends & Vulnerability Implications Summary					
		Change Type			
	Jurisdiction	*RD*	*PD*	*GT*	*Notes*
FLOODING	**Ashtabula County**	↔	↔	↓	There are 10 repetitive and two severe repetitive loss single family structures located within the county. Potential development along the Grand River has been limited.
	Ashtabula	↓	↔	↓	Neither recent nor potential developments within the Ashtabula River watershed have significantly changed the cities' vulnerability to flooding.
	Conneaut	↓	↔	↓	Neither recent nor potential developments within the Conneaut River watershed have significantly changed the cities' vulnerability to flooding. There is only one repetitive loss structure located within Conneaut.
	Geneva	↓	↔	↓	Neither recent nor potential developments have significantly changed the cities' vulnerability to flooding. There is only one repetitive loss structure located within Geneva.
	Andover	↓	↔	↓	Neither recent nor potential developments within the Pymatuning Creek watershed have significantly changed the villages' vulnerability to flooding.

Development Trends & Vulnerability Implications Summary					
		Change Type			
	Jurisdiction	*RD*	*PD*	*GT*	*Notes*
	GOTL	↓	↔	↓	Neither recent nor potential developments have significantly changed the villages' vulnerability to flooding.
	Jefferson	↓	↔	↔	Neither recent nor potential developments have significantly changed the villages' vulnerability to flooding. There is only one repetitive loss structure located within Jefferson.
	North Kingsville	↓	↔	↓	Neither recent nor potential developments have significantly changed the villages' vulnerability to flooding.
	Orwell	↓	↔	↓	Neither recent nor potential developments have significantly changed the villages' vulnerability to flooding.
	Roaming Shores	↓	↔	↔	Neither recent nor potential developments within the Rock Creek watershed have significantly changed the villages' vulnerability to flooding.
	Rock Creek	↑	↔	↑	Rock Creek Village experienced moderate population growth from 2010 to 2020, increasing by over 26% this could indicate the potential for a slight increase in vulnerability within the Rock Creek watershed.

ASHTABULA COUNTY HAZARD MITIGATION PLAN

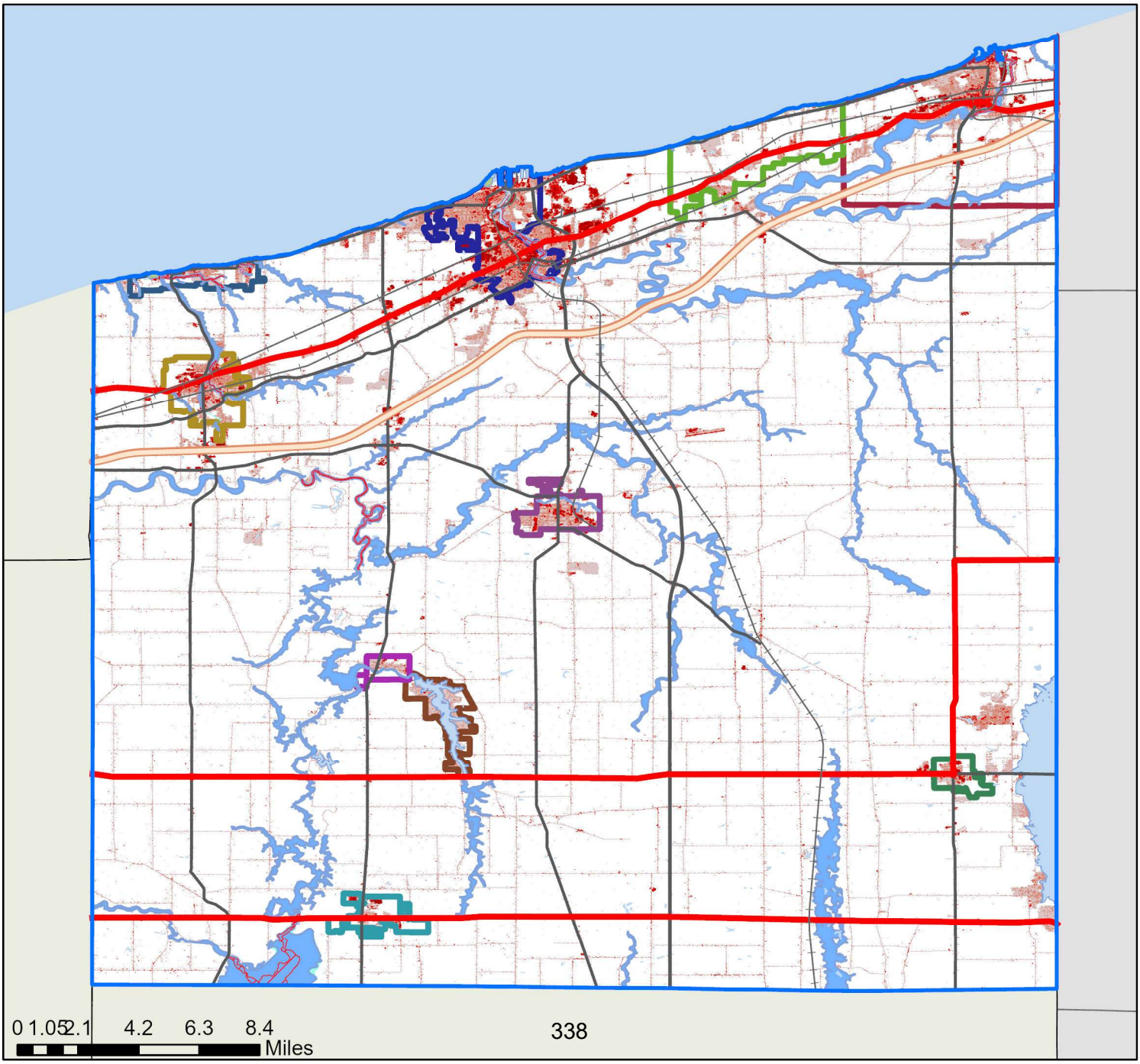
Figure 2.4.2: Impervious Surfaces & SFHA Overlay

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

Floodway
Coastal Floodplain
1% Annual Chance
0.2% Annual Chance (incl. Coastal Areas)

Land Cover
<20% Impervious
20-49% Impervious
50-79% Impervious
>80% Impervious

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.



HAZARDOUS MATERIALS RELEASE

Ashtabula County has a concentration of industrial companies several of which are located in or near the Village of Orwell. 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 Ashtabula 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.

Table 2.4.7

Development Trends & Vulnerability Implications Summary					
		Change Type			
	Jurisdiction	*RD*	*PD*	*GT*	*Notes*
HAZMAT RELEASE	**Ashtabula County**	↔	↔	↔	Development trends including recent and potential development have not caused any discernable increases or decreases in vulnerability to hazardous materials releases for any areas in Ashtabula County.
	Ashtabula	↑	↔	↔	Recent industrial development in the City of Ashtabula includes a proposed significant pig iron manufacturing facility by Petmin USA, and the expansion of Plastpro 2000 Inc. a fiberglass door manufacturer in 2024.
	Conneaut	↑	↔	↔	
	Geneva	↔	↔	↔	
	Andover	↔	↔	↔	
	GOTL	↔	↔	↔	The City of Conneaut has experienced limited commercial development activity in its harbor area.
	Jefferson	↔	↔	↔	
	North Kingsville	↔	↔	↔	
	Orwell	↔	↔	↔	
	Roaming Shores	↔	↔	↔	
	Rock Creek	↔	↔	↔	

HEALTH RELATED EMERGENCIES

Epidemic outbreaks are more probable in densely populated areas, such as the cities of Ashtabula, Conneaut, and Geneva (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; Andover, Geneva-on-the-Lake, Jefferson, and North Kingsville. This trend interacts with the access to healthcare variable. As the population ages, its needs for healthcare increase. The Ashtabula Regional Medical Center (ARMC) recently (i.e., June 2024) added a new 115,000 square foot Patient Care Tower which includes 55 private patient rooms, 10 Intensive Care Units (ICU), 24 Emergency Department (ED) rooms, five operating rooms, and a wound healing center. The project also includes the renovation of 16,500 square feet of the existing hospital and he relocation of the helipad. This recent development has helped to decrease the risk of health related emergencies.

In Ohio, including Ashtabula 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 Ashtabula County Coroner’s Office showed a significant drop from 41 in 2017 to 25 in 2018.

INVASIVE SPECIES

Lake Erie is particularly vulnerable to aquatic invasive species due to its shallow, warm, and biologically active ecosystems. Ballast water discharge from large vessels is a significant pathway for the introduction of non-native species, with over 180 aquatic non-native species already established in the Great Lakes basin. Development and associated activities in coastal areas can create opportunities for these species to spread into new areas within Ashtabula County. Changes in land use, such as development and agriculture, can increase the spread of invasive species by creating disturbed habitats where they can more easily establish themselves.

The implementation of invasive species management programs and regulations at the state level (like the Ohio Department of Agriculture's list of invasive plants) can help to prevent the introduction and spread of invasive species within Ashtabula County.

Table 2.4.8

Development Trends & Vulnerability Implications Summary					
		Change Type			
	Jurisdiction	*RD*	*PD*	*GT*	*Notes*
INVASIVE SPECIES	**Ashtabula County**	↑	↑	↔	The recent and potential increase in the development of the agricultural sector throughout the county could be negatively impacted by various invasive species.
	Ashtabula	↔	↑	↔	Increases in shipping active at the Ashtabula Harbor could increase vulnerability to aquatic invasive species, and other invasive species within the city.
	Conneaut	↔	↑	↔	Increases in shipping active at the Conneaut Harbor could increase vulnerability to aquatic invasive species, and other invasive species within the city.
	Geneva	↑	↑	↔	The recent and potential increase in development of the wine industry in the City of Geneva could be negatively impacted by an infestation of the spotted lanternfly.
	Andover	↔	↔	↔	Development trends including recent and potential have not caused any discernable increases or decreases in vulnerability to invasive species in the Village of Andover.
	GOTL	↑	↑	↔	The recent and potential increase in development of the wine industry in the City of Geneva could be negatively impacted by an infestation of the spotted lanternfly.
	Jefferson	↔	↔	↔	Development trends including recent and potential have not caused any discernable increases or decreases in vulnerability to invasive species in the Village of Jefferson.
	North Kingsville	↔	↔	↔	Development trends including recent and potential have not caused any discernable increases or decreases in vulnerability to invasive species in the Village of North Kingsville.
	Orwell	↔	↔	↔	Development trends including recent and potential have not caused any discernable increases or decreases in vulnerability to invasive species in the Village of Orwell.
	Roaming Shores	↔	↔	↔	Development trends including recent and potential have not caused any discernable increases or decreases in vulnerability to invasive species in the Village of Roaming Shores.
	Rock Creek	↔	↔	↔	Development trends including recent and potential have not caused any discernable increases or decreases in vulnerability to invasive species in the Village of Rock Creek.

SEVERE THUNDERSTORMS

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.

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.

TERRORISM

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 Jefferson 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.

NON-STORM RELATED UTILITY FAILURE

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 Ashtabula County.

Recent development, including the implementation of smart grid upgrades by Ohio Edison and The Illuminating Company including the installation of capacitor banks to regulate volage and automated equipment to minimize service disruptions may potentially decrease the risk. FirstEnergy has undertaken a multi-year grid modernization project in Ashtabula County, investing in new infrastructure and technology to improve reliability and reduce the duration of power outages.

Table 2.4.9

Development Trends & Vulnerability Implications Summary					
		Change Type			
	Jurisdiction	*RD*	*PD*	*GT*	*Notes*
NON-STORM RELATED UTILITY FAILURE	**Ashtabula County**	↓	↔	↔	Potential development trends have not caused any discernable increases or decreases in vulnerability to non-storm related utility failures in the unincorporated areas of the county.
	Ashtabula	↓	↑	↔	The city has experienced limited recent development; however, anticipates moderate commercial/industrial development in the future. The city has also experienced a population decrease of 6% from 2010-2020.
	Conneaut	↓	↑	↔	The city has experienced limited recent development; however, anticipates moderate commercial/industrial development in the future. The city has also experienced a population decrease of 4% from 2010-2020.
	Geneva	↓	↔	↔	The city has experienced limited recent development and anticipates limited commercial/industrial development in the future. The city has also experienced a population decrease of nearly 5% from 2010-2020.
	Andover	↓	↔	↓	The village has experienced limited recent development and anticipates limited commercial/industrial development in the future. The village has also experienced a population decrease of 15% from 2010-2020.
	GOTL	↓	↔	↓	The village has experienced limited recent development and anticipates limited commercial/industrial development in the future. The village has also experienced a population decrease of 29% from 2010-2020.
	Jefferson	↓	↔	↑	The village has experienced limited recent development and anticipates limited commercial/industrial development in the future. The village has experienced a population increase of 3.4% from 2010-2020.
	North Kingsville	↓	↔	↔	The village has experienced limited recent development and anticipates limited commercial/industrial development in the future. The village has also experienced a population decrease of 6% from 2010-2020.
	Orwell	↓	↔	↔	The village has experienced limited recent development and anticipates limited commercial/industrial development in the future. The village has also experienced a population decrease of 8% from 2010-2020.
	Roaming Shores	↓	↔	↑	The village has experienced limited recent development and anticipates limited commercial/industrial development in the future. The village has experienced a population increase of 5% from 2010-2020.

Development Trends & Vulnerability Implications Summary					
	Jurisdiction	*Change Type*			*Notes*
		RD	*PD*	*GT*	
	Rock Creek	↓	↔	↑	The village has experienced limited recent development and anticipates limited commercial/industrial development in the future. The village has experienced a population increase of 26% from 2010-2020.

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 Ashtabula 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 2.4.3) 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.

Areas w/ Potential Wildfire Fuel

Residential Land Uses

Commercial Land Uses

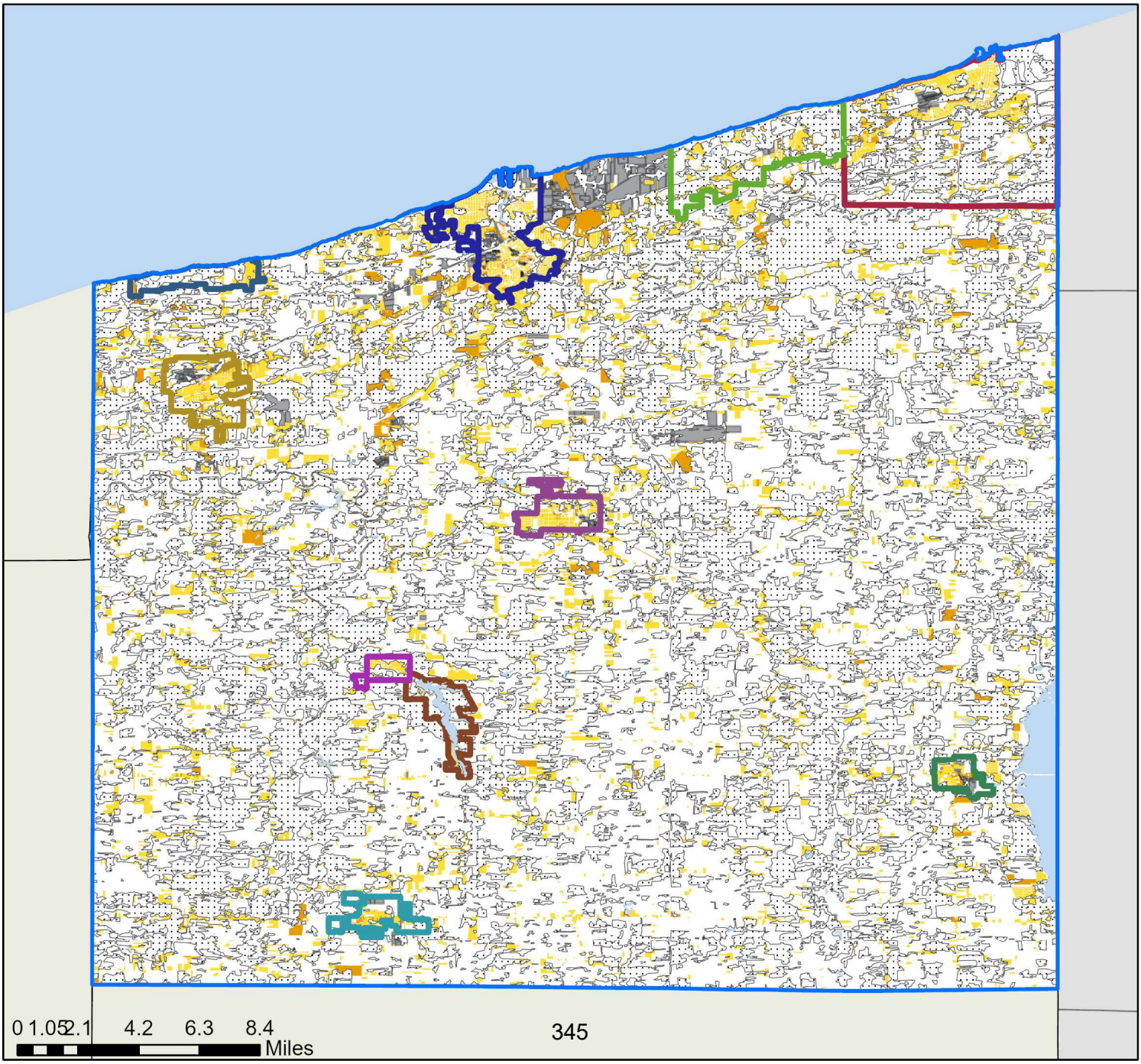
Industrial Land Uses

ASHTABULA COUNTY HAZARD MITIGATION PLAN

Figure 2.4.3: Developed Areas/ Wildfire Risk Overlay

Data Source(s): Ashtabula Co. Planning, 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.



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 2.4.10 offers a summary (non-exhaustive) of key points woven through the above narrative.

Table 2.4.10

Key Development Influences on Risk in Ashtabula County		
Development Trend	*Hazard Implication*	*Risk Direction*
Modern residential construction using reinforced materials	Earthquake, Wind, Winter Storm	↓ Decreased vulnerability
A rehabilitation project on the Roaming Rock Shores Lake Dam using HHPD funds	Dam Failure	↓ Decreased exposure
Acquisition, relocation, and elevation mitigation projects	Flash Flooding, Flooding	↓ Decreased vulnerability and exposure
Ashtabula Harbor dredging and wetland habitat creation project conducted by USACE, Buffalo District in May of 2025.	Flooding	↓ Decreased vulnerability
Implementation of smart grid upgrades	Non-Storm Related Utility Failures	↓ Decreased vulnerability
Maintenance project of the Ashtabula West Breakwater	Coastal Erosion	↓ Decreased vulnerability
Launch of CyberOhio initiative and Ohio Persistent Cyber Improvement (OPCI)	Cyber Incident	↓ Decreased vulnerability
Participation in the Ohio Firewise Program	Wildfire	↓ Decreased vulnerability
Expansion of impervious surfaces in urbanizing areas	Flash Flooding, Severe Storms	↑ Increased exposure
Increased development of the wine industry	Drought, Invasive Species	↑ Increased exposure
Aging transportation infrastructure	Hazmat (Rail, Highway), Flooding	↑ Increased vulnerability and exposure
Aging dam infrastructure, average age of dams in the county is 67 years.	Dam Failure	↑ Increased vulnerability
Aging electrical systems, grid, and infrastructure	Severe Thunderstorms, Winter Storms, Non-Storm Related Utility Failure	↑ Increased vulnerability
Persistent legacy housing stock (pre-1950)	Severe Thunderstorms, Winter Storms, Shelter-in-Place Hazmat	↑ Increased vulnerability
Growing usage of digital infrastructure and networks	Cyber, Non-Storm Related Utility Failures	↑ Increased complexity
Population centers experiencing the most development located along Lake Erie shoreline	Coastal Erosion	↑ Increased exposure
Increased global trade and shipping on the St. Lawrence Seaway and Lake Erie	Invasive Species	↑ Increased exposure
Development within the Wildland Urban Interface (WUI)	Wildfire	↑ Increased exposure
Aging population and pockets of poverty	Public Health, Terrorism	↑ Increased vulnerability