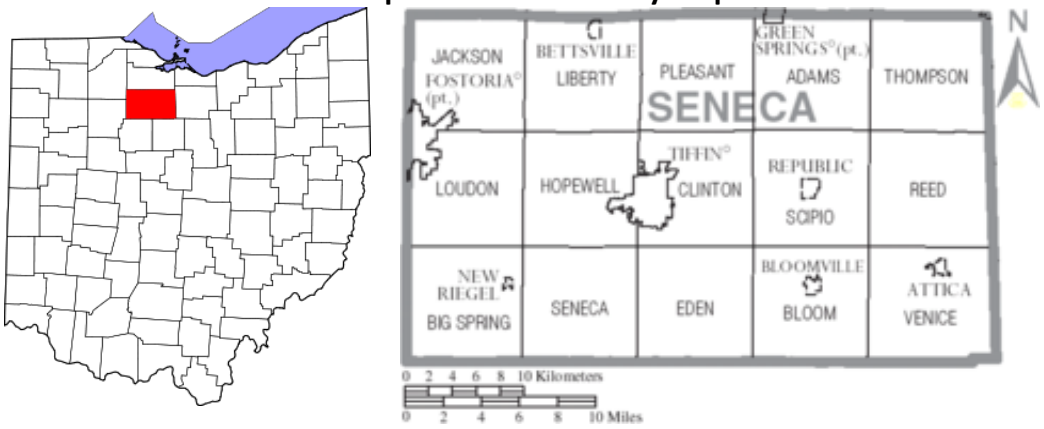
2.0 HAZARD IDENTIFICATION AND RISK ASSESSMENT

The Hazard Identification and Risk Assessment (HIRA) identifies the type and frequency of disasters that affect Seneca County and the risk to people and property created by those hazards. The HIRA is addressed in four sections. The County Profile provides general information about Seneca County and its jurisdictions. The Hazard Identification section describes hazards that threaten Seneca County and their history. The Vulnerability Assessment discusses each jurisdiction's vulnerability to the identified hazards. The Risk Analysis evaluates and ranks the hazards Seneca County must address through mitigation efforts.

2.1 COUNTY PROFILE

Seneca County is located in northwest Ohio; it is a rural county with a land area of 550.6 square miles. The county shares borders with Sandusky, Huron, Crawford, Wyandot, Hancock, and Wood counties. Toledo, which is approximately 55 miles to the northwest, is the closest major city.

Map 2-1: Seneca County Map



2.1.1 Demographics

According to US Census data, the estimated 2018 population in Seneca County is 55,207. The 2010 population was 56,745. The county is experiencing a slight downward trend in population; this is expected to continue for the next several decades. This slight decrease is common in Ohio's rural communities and represents an elderly population decrease through death and a challenging job environment for younger workers.

Table 2-1: County Population Statistics

Statistic	Figure
Population Density	103/sq. mile
Female Population	50.0%
Male Population	50.0%
Number of Households	21,507
Population under 18	21.9%
Population over 65	18.1%
White alone	89.4%
Hispanic or Latino	5.3%
Black or African American	2.7%
Two or more races	2.2%
Average Household Size	2.44 persons
Median Household Income	$49,153
Persons in Poverty	13.6%

Seneca County has 24,172 housing units. The owner-occupied housing rate is 72.2%; median value of owner-occupied units is $98,600. The median monthly cost for a home with a mortgage is $989.

Multi-unit housing structures such as apartment buildings account for 14.7% of all housing units. There are 1,064 mobile homes throughout the county, many of which are located in mobile home parks. The median gross rent for all types of rental properties is $672 per month.

Roughly 84.5% of households have a computer; 73.8% of households have access to broadband internet.

Multiple special residential housing facilities are present across the county. As of 2018, the types of facilities and statistics for each type are as follows:

Table 2-2: Special Residential Facilities

Facility	Facilities	Beds
Nursing Home Facilities	6	519
Residential Care Facilities	6	253
Jails and confinement	2	226
Residential college students	2	1384

2.1.3 Incorporated Jurisdictions

Seneca County has two cities and five villages. These municipalities all chose to participate in the county's 2020 mitigation planning efforts.

Cities

There are two cities in Seneca County: Tiffin and Fostoria. Tiffin is the county seat and largest municipality. It is the primary business and retail center of the county and home to Tiffin Mercy Hospital and two private universities, Heidelberg University and Tiffin University.

Fostoria is located on the border between Seneca and Wood counties. The majority of Fostoria falls within Seneca County's borders so the city falls under Seneca County for mitigation planning purposes. Fostoria is slightly smaller than Tiffin. It is home to multiple manufacturing and industrial businesses. The city also has one hospital, ProMedica Fostoria Community Hospital.

Table 2-3: City Population and Demographics

City	Population	Households	Median Income	Persons Below Poverty
Fostoria	13,251	5,502	$35,125	30.5%
Tiffin	17,546	6,633	$41,445	17.7%

Villages

There are five incorporated villages in Seneca County. By definition, a village in Ohio has fewer than 5,000 residents. Seneca County villages all have populations below 1,000.

Table 2-4: Village Population and Demographics

Village	Population	Housing Units	Median Income	Persons Below Poverty
Attica	899	478	$52,250	14.9%
Bettsville	661	310	$48,359	10.8%
Bloomville	956	427	$40,435	19.1%
New Riegel	249	121	$43,542	15.4%
Republic	549	284	$49,083	9.3%

The village of Green Springs is partially located in Seneca County. For mitigation planning purposes, they participate in the plan for Sandusky County and are not included in this plan.

2.1.4 Unincorporated Areas

Seneca County's unincorporated areas are divided into fifteen townships. In Ohio, townships are governed by an elected board of trustees. They meet monthly, at a minimum, and are responsible for the health, safety, and welfare of township residents. Townships also have elected Fiscal Officers who manage the township's finances. Because townships are unincorporated, they are considered part of the county for the purpose of hazard mitigation planning and activities.

Table 2-5: Township Population Statistics

Township	Population
Adams	1,320
Big Spring	1,769
Bloom	1,799
Clinton	4,109
Eden	2,188
Hopewell	2,774
Jackson	1,512
Liberty	2,035
Loudon	2,140
Pleasant	1,635
Reed	848
Scipio	1,729
Seneca	1,622
Thompson	1,443
Venice	1,758

Township trustees and fiscal officers manage the business affairs of the township, which consist mostly of maintaining the roads, cemeteries, and critical facilities, and clearing debris from township ditches. Some townships have their own fire department while others are part of a fire district or shared service agreement with another department in the area. For law enforcement purposes, rural townships are covered by the Seneca County Sheriff's Office.

Unincorporated Communities and Neighborhoods

Seneca County has 29 unincorporated communities and seven census-designated places. These small neighborhoods are not organized municipalities and do not have any official form of government; they function as part of the township in which they are located. Most of these locations have historical significance or were incorporated in the past but have a population that has decreased to the point that they are no longer considered a municipality.

2.1.5 Institutions and Special Facilities

Seneca County residents have access to abundant educational and healthcare resources. These services contribute to the quality of life for residents and the successful development of the local economy.

Education

Students in Seneca County are served by twelve public school districts and three private schools. Vocational education is provided by Vanguard Sentinel Career and Technology Center, located in Tiffin. Heidelberg University and Tiffin University are both located in Tiffin. Between the undergraduate and graduate programs, Heidelberg University has an enrollment of approximately 1,200 while Tiffin University's enrollment is roughly 3,000. These institutions

provide on-campus housing for some students while others live in off-campus housing or commute from elsewhere in the county and surrounding region.

Table 2-6: Seneca County Schools

Public School Districts	Private/Parochial Schools
Bellevue City School District	Bridges Community Academy
Bettsville Local School District	Calvert Catholic Schools
Buckeye Central Local School District	North Central Academy
Clyde-Green Springs Exempted Village School District	
Hopewell-Loudon Local School District	
Fostoria City School District	
Lakota Local School District	
Mohawk Local School District	
New Riegel Local School District	
Old Fort Local School District	
Seneca East Local School District	
Tiffin City School District	

Healthcare

Seneca County residents have access to healthcare services across the county. Mercy Health – Tiffin Hospital is located in Tiffin near the center of Seneca County. ProMedica Fostoria Community Hospital is located in Fostoria, although technically not in the Seneca County portion of the city. According to the Ohio Department of Development, Seneca County has 6 licensed nursing homes with 519 total beds and 6 licensed residential care facilities with 253 total beds. Residents also receive medical care at the many physician practices, clinics, and urgent care centers located in the county. Specialized facilities in the county include dialysis and oncology centers, among others.

2.1.6 Infrastructure

Infrastructure and utility systems provide access and critical services to residents, workers, and visitors. This section describes the county's road and rail infrastructure, airports, and utility systems.

Transportation Systems

Seneca County has a strong transportation system that includes more than 1,350 miles of roadways. Of these, 407 miles are federal and state routes. Across the county, the road system includes 108 bridges located on various federal, state and local roadways. All highways in the county are two-lane highways; there are no four or six lane highways in Seneca County. A complete list of federal and state highways in the county is provided in table 2-7 below.

Table 2-7: Seneca County Highways

Interstates	U.S. Highways	State Highways		
None	23	4	67	231
	224	12	100	587
		18	101	590
		19	162	635
		53	228	778

The Seneca County Engineer is responsible for maintaining and repairing 390 miles of county roads, 403 bridges, and 1,400 culverts as well as hundreds of miles of roadside tiles and ditches and thousands of road signs. In addition to the county roadways, there are hundreds of miles of township and municipal roadways that are maintained by the jurisdiction road/street departments.

Rail

Rail is another significant transportation system in Seneca County. Rail lines across the county are operated by CSX Transportation, Norfolk Southern Corporation, and the Northern Ohio and Western Railway. Lines run east-west and north-south throughout the county. These are all commercial rail lines transporting goods across the state. There is no passenger rail service in Seneca County.

Airports

There are four airports in Seneca County: Bandit Field Airdrome (Green Springs), Fostoria Metropolitan Airport (Fostoria), Seneca County Airport (Tiffin), and Weiker Airport (Green Springs).

Utilities

The majority of homes in Seneca County, approximately 51.7%, are heated with natural gas. An additional 23.2% utilize electric heat. These utilities are provided primarily by private providers; the village of Republic is the only municipal electric provider in the county. The Public Utilities Commission of Ohio regulates private companies that provide public utility services. These companies, along with municipal electric utilities, are identified in the table below.

Table 2-8: Seneca County Utility Providers

Electric Service	Natural Gas Service
AEP Ohio	Columbia Gas of Ohio
North Central Electric	KNG Energy Inc.
Ohio Edison	Swickard Gas Company
Republic (municipal provider)	Village Energy Cooperative Association, Inc.
Toledo Edison	

The remaining structures in the county utilize alternate heat sources.

- Bottled, tank, or LP gas 16.2%
- Coal, coke or wood 5.2%
- Fuel oil, kerosene 2.3%
- Solar energy or other fuel 0.7%
- No fuel used 0.7%

The majority of water and wastewater facilities in Seneca County are private systems. Municipal systems provide service within and slightly beyond the borders of the larger municipalities, including Tiffin, and Fostoria. Northern Ohio Rural Water, American Water, and individual wells provide water service in most other areas of the county. Outside of the municipalities, wastewater service is managed through individual septic systems.

2.1.7 Topography and Climate

Seneca County is located in a transition zone between the differing geological features of Central Ohio and Northwest Ohio. Central Ohio, which is southeast of Seneca County, is considered Till Plains. Till Plains feature flat to gently rolling plains and heavy till soils. The area northwest of Seneca County is considered Lake Plains. Glaciers formed this area, which features extremely flat lands scattered with ancient beach ridges.

This same transition zone impacts soil types in Seneca County. The soils in the southeastern part of the county, the Till Plains, are level, gently sloping, somewhat poorly drained and formed in fine textured glacial till. The soils in the Lake Plains area to the northwest are mostly level, well drained and formed in medium textured alluvium.

The terrain in Seneca County is mostly flat. The highest elevation in the county, 978 feet, is located near the village of Attica in the southeastern quarter of the county. The lowest elevation, 641 feet, is in the Sandusky River north of Tiffin. The difference between the highest and lowest points is only 337 feet. As the natural watershed falls north towards Lake Erie, the counties south and east of Seneca have higher elevations, and those to the north side are lower, facilitating drainage to Lake Erie.

Climate

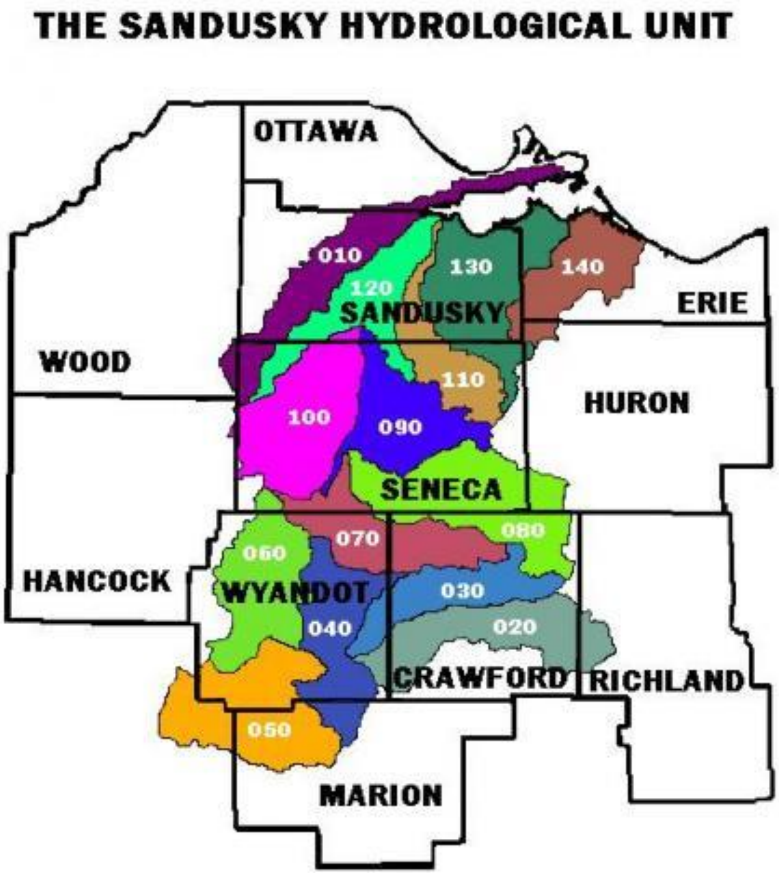
The climate of Seneca County is consistent with most of Ohio. The humid continental climate zone features cold winters and hot summers. The average annual high temperature is 60 F and the average annual low is 40.8 F. July is the warmest month with an average high of 84 F. January is the coldest month with an average low of 18 F. Average annual precipitation is 37.49 inches. The most precipitation falls in June, with an average of 4.06 inches. February is the driest month with an average precipitation of 2.17 inches.

2.1.8 Waterways and Watershed

Seneca County is part of three distinct watersheds: Sandusky River, Huron River, and Blanchard River. The majority of the county falls in the Sandusky River watershed. Small areas on the east and west borders of the county are located in the Huron River (east) and Blanchard River (west) watersheds.

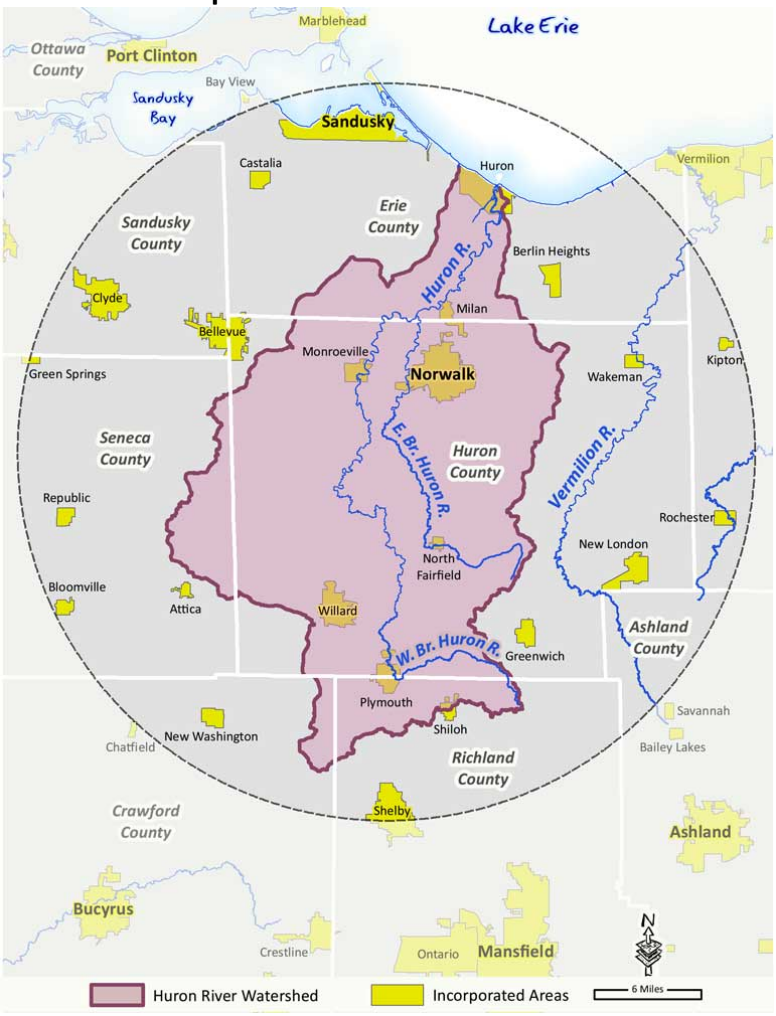
The Sandusky River Watershed encompasses portions of Seneca, Sandusky, Erie, Wyandot, Crawford and Marion counties. The Sandusky River is the primary waterway that flows through the county. It is 133 miles long and originates in Crawford County. The river flows north through central Seneca County and the city of Tiffin, continuing north into Sandusky County and flowing into Lake Erie through Sandusky Bay. Approximately 1,420 additional miles of ditch, stream, and river flow through the county and into the drainage basin. These tributaries include several significant streams that cross portions of Seneca County, including Honey Creek, Wolf Creek, and Rock Creek. Honey Creek crosses the southeast side of the county. Wolf Creek and the East Branch of Wolf Creek cross the eastern side and Rock Creek flows through the east central portion of the county.

Map 2-2: Sandusky River Watershed



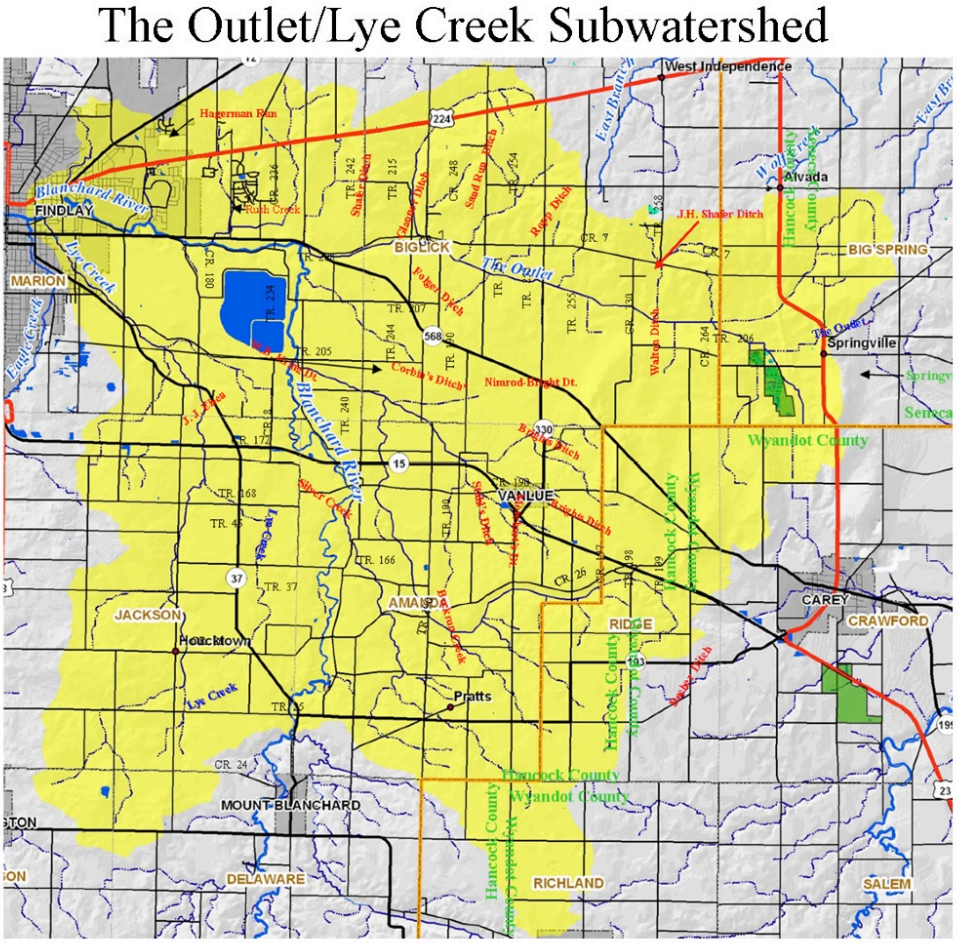
A small area on the western edge of the county drains into the Huron River. This area begins south of Bellevue and ends north of Attica. The Huron River itself does not cross into Seneca County at any point.

Map 2-3: Huron River Watershed



The extreme southwest corner of Seneca County is located in the Outlet/Lye Creed Sub-Watershed of the Blanchard River Watershed. This area is part of Big Spring Township.

Map 2-4: Outlet/Lye Creek Sub-Watershed



There are 239 acres of bodies of water in Seneca County. These include Garlo Lake, Greenwich Reservoir, Grassy Pond, Attica Upground Reservoir, Morrison Lake, and Mohawk Lake. There are 810 ponds, 366 linear miles of small streams, and 219 miles of county-maintained ditches. Privately maintained ditches have not been quantified.

2.1.9 Land Use

Agriculture is the primary land use in Seneca County. Nearly 80% of the land is used for cultivated crops. Another 2% is dedicated to pasture. Corn, soybeans, wheat, oats and hay are the primary crops grown throughout the county. Specialty crops, including tomatoes, sugar beets, cabbage and cucumbers are grown in some areas. Livestock includes dairy and beef cattle, swine, alpacas, sheep, goats, and poultry. These crops and livestock contribute significantly to Seneca County's economy.

Forested land accounts for 8.6% of Seneca County's land area. This includes 990 acres of state parks, forests, nature preserves and wildlife areas. Some of these areas are woodlands on steep

slopes, primarily along the Sandusky River and in un-drained areas where the soil is shallow over bedrock.

Table 2-9: Seneca County Land Use

Use Category	Percentage
Cultivated Crops	79.99%
Forest	8.60%
Developed, Lower Intensity	6.76%
Pasture/Hay	2.06%
Developed, Higher Intensity	0.99%
Wetlands	0.51%
Open Water	0.41%
Barren (strip mines, gravel pits, etc.)	0.35%
Shrub/Scrub and Grasslands	0.32%

2.1.10 Regulation

Zoning regulations and flood plains are administered by each individual jurisdiction. The Seneca Conservation District administers the county's floodplain regulations. Jurisdictions that have floodplain regulations administer floodplain regulations within their jurisdiction. The Seneca Regional Planning Commission is responsible for the county's land use planning, transportation planning, and the county sewer district. SRPC also administers subdivision regulations, manages the Community Development Block Grant program, supports economic development through administration of several funding programs.

Zoning regulations are in place in most municipalities and some townships in Seneca County. Regulations are adopted by each jurisdiction and enforced through their local zoning inspector and zoning board or commission. The zoning status for all jurisdictions in the county is listed in table 2-10 below.

Table 2-10: Seneca County Zoning Status

Zoned	Not Zoned
Adams Township	Big Spring Township
Attica	Bloom Township
Bettsville	Bloomville
Clinton Township	Liberty Township
Eden Township	Loudon Township
Fostoria	New Riegel
Hopewell Township	Republic
Jackson Township	Reed Township
Tiffin	Seneca Township
Pleasant Township	Thompson Township
Scipio Township	Venice Township

2.1.11 Economy

Manufacturing is the largest employment sector in the county followed by trade, transportation, and utilities and education and healthcare. Seven of the thirteen top employers in Seneca County represent manufacturing.

Education and healthcare account for a significant percentage of employment in the county. Mercy Hospital of Tiffin, Tiffin University, Tiffin City Schools, and Fostoria City Schools are all in the top thirteen employers in Seneca County.

Agriculture is a significant employer in Seneca County. Most farms are family farms that have been handed down from generation to generation. Census figures from 2012 indicate the presence of 37,033 acres of wheat; 460 acres of orchards; 69,441 acres of corn; 119,829 acres of soybeans; 1,161 acres of vegetables. The average family farm consists of 237 acres. Livestock production includes beef and dairy cattle, swine, poultry, alpacas, sheep, rabbits, and poultry.

Tables 2-11 and 2-12 list the major employers and industries in Seneca County.

Table 2-11: Major Employers

Employer	Sector
American Fine Sinter	Manufacturing
Dorel Industries/Ameriwood Ind.	Manufacturing
Fostoria City Schools	Government
FRAM Group Operations LLC	Manufacturing
Heidleberg College	Service
Mercy Hospital of Tiffin	Service
National Machinery LLC	Manufacturing
Roppe Corp	Manufacturing
State of Ohio	Government
Tiffin City Schools	Government
Tiffin University	Service
Toledo Molding & Die Inc	Manufacturing
Webster Industries	Manufacturing

Table 2-12: Employment by Industry

Employment Sector	Average Employment
Manufacturing	4,241
Trade, Transportation and Utilities	3,653
Education and Health Services	3,502
Local Government	2,235
Leisure and Hospitality	2,062
Construction	929
Professional and Business Services	832
Other services	614
Financial Services	486
State Government	272
Information	211
Natural Resources and Mining	202
Federal Government	124

2.1.12 Development Trends

Seneca County's economy, which was severely impacted by the recession in 2008, has improved significantly since that time. After reaching its highest unemployment statistics in 2009, Seneca County's unemployment has dropped steadily, as described in Table 2-13. As of August 2019, the rate had dropped to 4.0%.

Table 2-13: Employment Statistics

	2014	2015	2016	2017	2018
Total Labor Force	27,200	27,100	27,200	27,400	27,100
Employed	25,600	25,800	25,800	26,100	25,900
Unemployed	1,600	1,300	1,300	1,200	1,200
Unemployment Rate	5.8%	4.8%	4.9%	4.7%	4.4%

Since the county's previous mitigation plan was developed, Seneca County's economy has continued to grow. This growth includes retail and commercial development, primarily in Tiffin, and industrial and manufacturing growth across the county. Economic development partners, including the Tiffin-Seneca Economic Partnership and Fostoria Economic Development Corporation, promote economic development opportunities in the county and work with companies to identify available sites for new development or expansion of existing companies.

Residential development has improved since the late 2000s but has not returned to pre-recession levels nor has it kept pace with residential growth state-wide. Between 2007 and 2013, 192 new home construction permits were issued, an average of 27 per year. From 2013 through 2017, the average was 26.4 per year, as shown in the table below. The average construction cost has increased but the pace of construction remains stagnant. This is a concern for community development officials who cite a housing shortage as a significant barrier to economic growth.

Table 2-14: Single Family Home Construction Permits

Year	Permits	Average Construction Cost
2013	22	$170,200
2014	27	$121,800
2015	31	$144,600
2016	24	$162,000
2017	28	$198,500

2.2 HAZARD IDENTIFICATION

Seneca County has experienced many disasters in its history, ranging from floods and tornadoes to blizzards and windstorms. In this section, the hazards that can impact the county are defined and the risk for each hazard is assessed. As part of this process, the Hazard Mitigation Planning Team analyzed the hazards and risks present throughout the county. Eleven hazards were identified as relevant to Seneca County, as listed below.

- Drought/extreme heat
- Earthquake
- Flood
- Hazardous materials
- Infrastructure failure, including dams, utility systems, water and wastewater systems, and roads and bridges
- Invasive species
- Land subsidence
- Severe thunderstorm
- Tornado and windstorm
- Water quality
- Winter Storm

Some hazards were excluded from this plan because they pose no risk to Seneca County. The excluded hazards and the justification for the exclusion are identified in the table below.

Table 2-15: Excluded Hazards

Excluded Hazard	Justification
Coastal Erosion	The county has no open coastline.
Tsunami	Geographically impossible
Volcano	Geographically impossible
Wildfire	Insufficient forested area

Seneca County does not have a long history of federal disaster declarations or assistance. The county has been included in eight federal declarations. A comprehensive list of federal disaster declarations for Seneca County is provided in table 2-16.

Table 2-16: Federal Disaster Declaration History

DR/EM Number	Incident Date	Incident Type(s)
DR-90-OH	January 23, 1959	Flood
DR-1444-OH	November 10, 2002	Tornadoes, Severe Storms
DR-191-OH	April 14, 1965	Tornadoes, Severe Storm
DR-266-OH	July 15, 1969	Tornadoes, Severe Storm, Flood
EM-3055-OH	January 26, 1978	Winter Storm
DR-1580-OH	December 22, 2004	Flood, Winter Storm, Mudslide
EM-3198-OH	December 22, 2004	Winter Storm
EM-3250-OH	September 14, 2005	Hurricane Katrina Evacuation

To understand the local risk posed by these hazards, the following pages examine the characteristics and evaluate the local history of each hazard. Historical information was obtained from the National Oceanic and Atmospheric Administration's National Climatic Data Center (NCDC) and supplemented with information from local officials.

2.2.1 Drought and Extreme Heat

A drought is a deficiency of moisture that adversely impacts people, animals, and vegetation over an area of significant size. Because drought is a creeping phenomenon characterized by the absence of water, there is no defined beginning or end, nor is there a specific amount of time required for an extended dry period to be considered a drought. An event is considered a drought when the dry period lasts long enough to impact the environment and economy of a region, typically several months or years.

Drought severity is measured using the Palmer Drought Severity Index (PDSI). The PDSI measures dryness based on recent precipitation and temperature statistics. Drought classifications are identified in the chart below:

Measurement	Description
-4 or less	Extreme Drought
-4 to -3	Severe Drought
-3 to -2	Moderate Drought
-2 to -1	Mild Drought
-1 to -0.5	Incipient Dry Spell
-0.5 to 0.5	Near Normal
0.5 to 1	Incipient Wet Spell
1 to 2	Slightly Wet
2 to 3	Moderately Wet
3 to 4	Very Wet
4 or more	Extremely Wet

A heat wave is a period of abnormally hot and unusually humid weather, typically lasting for two or more days. This can be an extended period of time with higher than normal

temperatures or a shorter period of time with abnormally high temperatures. Regardless of the duration or exact temperatures, heat waves are a safety hazard to anyone exposed to the high heat. People are at risk for heat exhaustion and heat stroke, which can be fatal in the most serious cases. When heat waves are accompanied by drought conditions, the potential for a serious natural disaster increases. Between injuries, fatalities, and crop/property damage, these disasters can significantly impact the economy of a region.

Heat waves can occur anywhere in Ohio but are typically brief, lasting only a few days. Extreme temperatures are considered anything above 90 degrees Fahrenheit. In the humid climate of the Midwest, these temperatures are often accompanied by high humidity. Temperatures rarely exceed the mid-90s, although the region does occasionally experience temperatures in the upper 90s or slightly higher. These brief heat waves are not uncommon, but rarely last more than a few days. A heat wave lasting longer than a week is extremely rare.

Table 2-17: Average Temperatures and Rainfall

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High	33°	36°	47°	60°	71°	80°	84°	83°	76°	63°	50°	37°
Avg. Low	18°	20°	28°	39°	49°	59°	63°	61°	53°	42°	34°	23°
Avg. Precip.	2.32”	2.17”	2.48”	3.43”	4.02”	4.06”	3.54”	3.5”	3.35”	2.64”	3.11”	2.87”

Drought/Extreme Heat Risk Assessment

Although uncommon, drought and extreme heat are countywide hazards and can affect all areas and jurisdictions. Brief spells of abnormally dry conditions can last for several weeks but most months have sufficient rainfall to support crop growth. Drought conditions, when they do occur, have a significant impact on the county’s agriculture industry.

Seneca County does not have a history of extended drought that would cause casualties or property damage but can experience short periods of unusually dry conditions throughout the crop growing season. The most common drought-related loss is a reduction in crop yields for a single growing season and endangerment of any livestock that could not get water for survival.

Based on the U.S. Department of Agriculture’s 2012 Census of Agriculture, the market value of all agricultural products sold in Seneca County is $174,572,000. In a drought, the significant crop and livestock operations across the county would be exposed to loss. Table 2-18 identifies the quantities of the primary agricultural commodities in the county that could be impacted by drought-related loss. While many farmers purchase crop insurance, there is no way to know the exact portion of crops that are insured across the county. Insurance is also only a partial financial remedy in the event of severe drought.

Table 2-18: Drought Vulnerability Assessment

Top Commodities	Crop Acres/Livestock Inventory
Soybeans	126,506 acres
Corn	97,318 acres
Wheat	17,562 acres
Hogs/Pigs	48,960 count
Cattle	9,157 count
Poultry	3,002 count

Local Drought/Extreme Heat History

Drought and extreme heat have had some impact on Seneca County. Per official NDCD records, the Seneca County has experienced five official droughts and zero extreme heat events as indicated in table 2-19 below. The documented crop loss from these events is $18,000,000. Some drought events are documented in records from the United States Department of Agriculture rather than NCDC records. The USDA issues drought declarations and provides farmers and ranchers with disaster relief funding. According to USDA records, Seneca County has been included in several significant drought incidents.

Table 2-19: Seneca County Drought/Extreme Heat History

Hazard	Incidents	Property Loss	Crop Loss	Deaths	Injuries
Drought	5	0	18M	0	0
Extreme Heat	0	0	0	0	0

One of Ohio's more significant droughts was the 1988-1989 North American Drought. This event was preceded by droughts in the Southeastern United States and California the year before. The 1988 was widespread and intense. It included heat waves that killed thousands of people and substantial livestock nationwide. One of the underlying causes of the drought was the nationwide use of marginally arable land for agriculture production and continued pumping of groundwater near the depletion mark. This major drought was catastrophic for the agriculture industry, destroying crops across the country. Water use restrictions were put in place across many jurisdictions. The drought continued to impact the Midwest and Northern Plains states during 1989 and was not declared over until 1990.

In the summer of 2012, Ohio was impacted by another severe drought, the 2012 North American Drought. This incident was an expansion of the 2010-2012 United States drought that began in the spring of 2012. Lack of snowfall in the United States caused very little melt water to absorb into the soil. The drought included most of the United States and all of Ohio. This drought has been compared to similar droughts in the 1930s and 1950s but did not last as long. The drought caused catastrophic economic ramifications. According to most measures, this drought exceeded the 1988-1989 North American Drought, which is the most recent comparable drought. On September 5, 2012, the USDA issued a disaster declaration for all counties in Ohio affected by the drought.

The most recent drought to affect Ohio occurred in 2016. On January 6, 2017, the USDA issued a disaster declaration for drought conditions experienced from May through October 2016. The primary declaration was issued for five Ohio counties; ten contiguous counties were also included in the declaration. Seneca County was not identified as a primary or contiguous county in this declaration but the greater northwest and west central Ohio regions were impacted by abnormally dry conditions.

2.2.2 Earthquake

An earthquake occurs when two of earth's plates move past one another beneath earth's surface. The location where the plates meet is called a fault. The shifting of the plates causes movement along the fault line. This movement can often be felt in areas surrounding the earthquake's epicenter and can cause damage ranging from insignificant to devastating. Damage caused by an earthquake can include rattling foundations, falling debris, and, in the most severe cases, toppling buildings, bridges, and culverts. The severity of earthquake movement is measured using the Modified Mercalli Index scale as defined in this chart:

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

Earthquake Risk Assessment

In Seneca County, earthquakes are geologically possibly but extremely rare. Earthquake is a countywide hazard and can affect all areas and jurisdictions. Ohio has experienced more than 120 earthquakes since 1776. While only a few of these events have caused structural damage, Ohio does have some earthquake risk, more than many people realize. West central Ohio is the region of the state with the highest earthquake risk. Seneca County is north of this region but does have some earthquake risk.

Earthquake incidents in Seneca County have mostly occurred in the northwest quadrant of the county in an area identified as the Seneca Anomaly. The Seneca Anomaly is a depression in the surface almost 900 meters in diameter and 100 meters deep. It was discovered during an attempt to drill a well in 1998. Believed to be a "hole" created by a meteor hit at an unknown time, the anomaly is commonly known as "Liberty Crater" because its characteristics match those of known meteor hits on Mars. It is not believed to be a weather-related characteristic and is not believed to be associated with an earthquake although it is in an area of limestone where underground voids and caverns exist. This inconsistent density of the sub-terrain in this area may contribute to sinkholes and other depressions forming without apparent cause.

Because of the low risk and high cost of implementing earthquake mitigation strategies, the planning team did not identify any such actions. As they arrived at this decision, they considered historical earthquake damage data and HAZUS loss projections for a 5.0 magnitude earthquake with an epicenter in Tiffin. Table 2-20 is the vulnerability analysis based on HAZUS data.

Table 2-20: Earthquake Scenario Vulnerability Analysis

Building Type	Number of Buildings	Exposure
Residential	2,652	$968,497,041
Non-Residential	1,473	$416,567,831
Critical Facilities	71	$20,078,965
Totals	*4,196*	*$1,405,143,838*

Local Earthquake History

Records from the Ohio Department of Natural Resources indicate that Seneca County has experienced four earthquakes with epicenters in the county. These earthquakes were weak to moderate in magnitude, ranging between 2.5 and 3.7 on the Richter scale. Two of these incidents occurred on January 31, 1936. The most recent incident occurred in 2010.

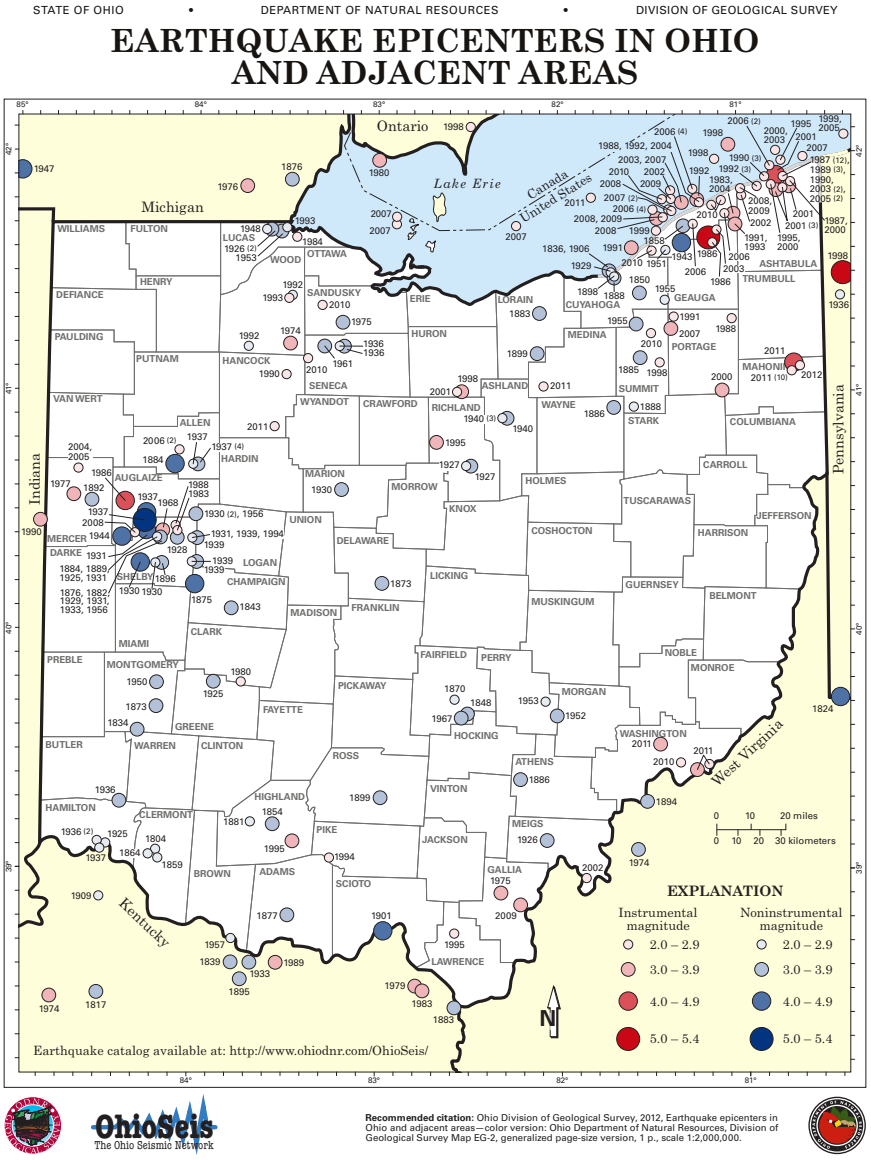
There is no documented evidence of structural damage in the county from any of these incidents. There are several documented earthquake epicenters in the adjacent counties of Sandusky, Wood, and Hancock. These incidents are all similar in magnitude to the Seneca County events and caused no known structural damage.

Table 2-21: Seneca County Earthquake History

Date	Location	Magnitude	Modified Mercalli
01/31/1936	Liberty Township	2.5	II
01/31/1936	Pleasant Township	3.1	IV
02/22/1961	Liberty Township	3.7	V
02/25/2010	Fostoria	2.9	III

The following map provides locations for the incidents in table 2-21.

Map 2-5: Earthquake Epicenters in Ohio and Adjacent Areas



2.2.3 Flood

According to the National Weather Service, a flood is defined as an overflow of water onto typically dry land. Riverine or flash flooding can cause the inundation of a normally dry area. Riverine flooding is caused by rising water from a nearby waterway, such as a river, stream, or drainage ditch. Flooding generally occurs subsequent to a meteorological event such as substantial precipitation, rapid snowmelt, or extreme wind events along coastal waterways. This type of flooding can last days or weeks.

A flash flood is caused by heavy or excessive rainfall over a short period of time, typically less than six hours. These events are often characterized by raging torrents after heavy rains impact riverbeds, streets, or low-lying areas and can occur within minutes or hours of excessive rainfall. Flash flooding can also occur when the ground is too saturated, impervious, or flat to drain rainfall into waterways through storm sewers, ditches, creeks, and streams at the same rate as the precipitation falls. In some flash flood events, storm and/or sanitary sewer infrastructure can become overwhelmed, leading to sewer backup inside of structures.

Karst flooding occurs when the drainage capacity of an underground sinkhole is not adequate enough to transfer storm water runoff to the subsurface and the excess water pushes to the surface. Unlike riverine and flash flooding, this type of flooding occurs in the days and weeks after heavy precipitation events as the rainfall is absorbed into the ground and fills subsurface karst voids. As these voids fill to capacity, the water pushes through to the surface, flooding basements, yards, driveways, and anything else in the way. This type of flooding can only occur in areas with subsurface karst formations.

Floods are the most common and costly disaster worldwide, resulting in significant loss of life and property. They have a substantial impact on infrastructure, including roadway breeches, bridge washouts, road wash away, and water-covered roadways. Fast-moving floodwater can wash away the surface and sub-surface of roads, creating holes, ruts, and other problems for vehicles. Floodwater that is one foot deep is strong enough to carry vehicles away, often with occupants inside.

Floodwaters seek the path of least resistance as they travel to lower ground and will seep into and occupy any structure in their path. Basements and lower levels of buildings can become inundated with floodwater. Installing sandbags along the exterior of a building can be a temporary stopgap measure but, if floodwaters do not recede quickly, the force of the water will move through the sandbags and enter the structure.

The aftereffects of flooding can be just as damaging as the flood itself. Cleanup is often a long, protracted activity with its own set of hazards. Standing flood water is often contaminated with household and industrial chemicals, fuel, and other materials that have leaked into the water. All floodwater is considered contaminated, either from germs and disease or hazardous materials. This creates a hazard for responders and residents throughout the cleanup phase.

Flood Risk Assessment

In Seneca County, flooding is considered a significant risk. The risk includes riverine, flash, and karst flooding. The county's flat terrain and the number of rivers, streams, creeks, and ditches contribute to the local flood risk. Seneca County is located in three different watersheds: Sandusky River, Huron River, and Blanchard River. Most of the county falls in the Sandusky River watershed. A small area on the eastern edge of the county between Bellevue and Attica falls in the Huron River watershed and the extreme southwest corner is located in the Blanchard River watershed. Flooding is a countywide hazard and can affect all jurisdictions.

The soil in Seneca County is highly susceptible to surface drainage. Many fields are tiled to reduce runoff and the accompanying soil erosion. Ditches are also used to route runoff water into creeks and streams. Ditches also help contain runoff from roads and other properties. When flooding events occur during the winter, floodwaters tend to be deeper and take longer to drain because the ground is already frozen and cannot absorb floodwater. After heavy precipitation events, some roads are vulnerable to flooding and may be closed for several hours or days until floodwater can drain away.

Local flood damage can include damage or destruction of physical structures, infrastructure, crops, and livestock. Residential structural damages could include single and multi-family homes, group living facilities, and multi-family housing complexes. Commercial and industrial structural damages could include buildings used for manufacturing, product handling, transportation, warehousing, retail, business, and industrial, and the capital equipment associated with those uses. Agricultural structures would include barns used for livestock, storage buildings, equipment, and machinery. Grain bins and elevator systems could be damaged very easily by the force of water. Government, nonprofit, and educational institutions include critical structures like fire stations, police stations, hospitals, schools, and maintenance buildings; damage could include the physical structure as well as the contents. This damage would result in large amounts of debris to manage, including finish, structural, and foundation materials. It is unlikely that loss of life would be attributed to flooding. If a death were to occur, it would likely be the result of two or more combined threats, such as lightning, tornado, or driving into standing water.

The vulnerability analysis in table 2-22 is based on HAZUS data simulating a 100-year flood in Seneca County.

Table 2-22: 100-Year Flood Scenario Vulnerability Analysis

Building Type	Number of Buildings	Exposure
Residential	5,390	$1,431,607,000
Non-Residential	1,177	$313,127,000
Critical Facilities	242	$63,046,000
Totals	*6,809*	*$1,807,780,000*

Floodplain Mapping and National Flood Insurance Program
Seneca County's floodplain maps were updated in 2011 as part of FEMA's Map Modernization Program. The current floodplain maps became effective 05/03/2011.

The tables below provide information on participation in the National Flood Insurance Program for Seneca County communities as identified in FEMA's Community Status Book for Ohio. The communities in table 2-23 participate in NFIP and are considered to be in good standing with the program. Only one community, as identified in table 2-24, is under sanction from NFIP.

The villages of Attica, Bloomville, and New Riegel do not currently participate in NFIP because there is no special flood hazard area identified within the village limits.

Table 2-23: NFIP Participating Communities

Community	Initial FHBM Identified	Initial FIRM Identified	Current Map Effective Date	Reg-Emer Date
Seneca County	06/09/1978	05/17/1990	05/03/2011	05/17/1990
Bettsville	04/23/1976	09/30/1988	05/03/2011	09/30/1988
Fostoria	04/12/1974	07/01/1987	06/02/2011	07/01/1987
Tiffin	03/01/1974	07/03/1986	05/03/2011	07/03/1986

Table 2-24: NFIP Sanctioned Communities

Community	Initial FHBM Identified	Initial FIRM Identified	Current Map Effective Date	Reg-Emer Date
Republic		05/03/2011	05/03/2011	05/03/2012

Repetitive and Severe Repetitive Loss Structures
Within Seneca County, there are fifteen known repetitive loss structure as of August 31, 2018. These structures are located in Tiffin and unincorporated areas of the county. Locations and recorded loss data are provided in the table below. One of the properties in the unincorporated areas of the county is considered a severe repetitive loss (SRL) property because of the number of losses.

Table 2-25: Repetitive/Severe Repetitive Loss Properties

Community	Occupancy	Losses	Building Payments	Contents Payments	Total Payments
Seneca County	Other Non-Residential	2	$25,155.46	0	$25,155,46
Seneca County*	Single Family	5	$83,345.99	$9,731.96	$93,077.05
Seneca County	Single Family	2	$10,769.18	0	$10,769.18
Seneca County	Single Family	2	$16,959.19	0	$16,959.19
Seneca County	Single Family	2	$10,656.60	0	$10,656.60
Seneca County	Single Family	2	$10,053.10	0	$10,053.10
Tiffin	2-4 Family	2	$9,208.89	$1,411.08	$10,619.97
Tiffin	Other Non-Residential	2	$519,760.17	$47,207.80	$566,967.97
Tiffin	Single Family	2	$16,834.39	0	$16,834.39
Tiffin	Single Family	3	$75,799.34	0	$75,799.34
Tiffin	Single Family	2	$18,256.96	0	$18,256.96
Tiffin	Single Family	2	$17,245.58	0	$17,245.58
Tiffin	Single Family	2	$2,893.34	$2,622.10	$5,515.44
Tiffin	Single Family	4	$22,916.72	0	$22,916.72
Tiffin	Single Family	3	$78,404.07	0	$78,404.07

* Indicates Severe Repetitive Loss Property

Local Flood History

Per NCDC records, Seneca County has experienced 8 floods and 20 flash floods since 1950. Property and crop damage from these incidents have been extensive, as identified in table 2-26.

Table 2-26: Seneca County Flood History

Hazard	Incidents	Property Loss	Crop Loss	Deaths	Injuries
Flood	8	2.080M	2K	1	0
Flash Flood	20	3.060M	1.29M	0	0

Seneca County has a history rich with flood incidents. One of the most damaging floods in the county's history occurred on March 23, 1913. During that event, 19 lives were lost; 6 bridges, 46 barns, 46 homes and 69 businesses were destroyed; 564 homes were damaged and 500 people were left homeless. The total 1913 loss of $1 million would equate to more than $23 million in today's dollars.

More recently, flooding events in 2007 and 2011 affected Tiffin and other isolated areas near Republic, Attica, Bettsville and Bloomville. In August 2007, moisture from the remnants of Tropical Storm Erin interacted with a stationary front to cause heavy rain-producing thunderstorms over northern Ohio. The thunderstorm moved across Wyandot, Hancock, Crawford, and Richland Counties in the early morning hours of August 21. Catastrophic flooding occurred in all of these counties. Seneca County was impacted by heavy thunderstorm precipitation on August 19-21. Widespread flooding occurred across the county with the worst conditions reported in northern Seneca County. A spotter in the northwest part of the county

reported 6.30 inches of rain between 8:00am on the 19th and 3:00pm on the 20th. Another observer in Tiffin reported a three-day total of 4.45 inches. Significant flooding occurred along all of the major rivers and streams in the county. The Sandusky River left its banks in Tiffin, flooding portions of 5th and 6th Avenues and damaging many homes. In Bettsville, Wolf Creek left its banks and caused significant damage. At least two homes had to be evacuated due to flooding. State Route 12 was closed because of floodwaters more than three feet deep. On August 21, a nursing home north of McCutchenville was partially evacuated due to rising floodwaters. During this event, one home was declared destroyed because of significant damage and seven others were declared uninhabitable. Hundreds of additional homes sustained lesser damage, primarily from basement flooding. Dozens of streets and highways were closed because of flooding. Erosion and standing water caused considerable damage in agricultural areas of the county. As result of this event, Seneca County received $5,421,576.31 in public assistance funds.

On July 22, 2011, the combination of a surface boundary and a surge of warm, moist air helped thunderstorms develop during the early afternoon hours; the storm persisted through the afternoon and early evening. The ground was already saturated from recent heavy rainfall, which set the stage for flash flooding. Some locations received as much as three to four inches of rainfall in less than 90 minutes. A second round of thunderstorms hit some locations, resulting in rapid runoff and more flash flooding. Overnight, more than six inches of rain fell in Tiffin, resulting in numerous road closures, abandoned cars, and the evacuation of the Clinton Estates mobile home park. The YMCA building was flooding with significant damage. Most roads around Tiffin were closed for several hours.

2.2.4 Hazardous Materials Incident

A hazardous materials spill or release occurs when a hazardous substance breaches its container. The release can occur during operations at a fixed facility or during transportation of the substance, which can occur via ground, rail, or pipeline transport. Hazardous substances are stored in numerous types of containers, including drums, cans, jars, pipes, and other vessels. Some releases are incidental and can be safely cleaned up by on-site facility personnel. An incidental release does not threaten the health or safety of the immediate area or community because the spill involves only a small quantity. If the release involves a quantity larger than what can be handled by facility personnel and requires action by first responders or agencies outside of the spiller's facility, the incident is considered an emergency response. To protect the community, evacuation from the facility or area surrounding the spill may be necessary.

Every hazardous substance is unique and can have toxic, flammable, explosive, and/or corrosive properties. Each material is assigned a class based on these properties; hazardous materials classifications are described below. When a hazardous substance is released into the environment, it can negatively impact the safety and health of the community by contaminating the air, water, and/or ground.

Class	Description
1	Explosives
2	Gases
3	Flammable liquids and combustible liquid
4	Flammable solid, spontaneously combustible, dangerous when wet
5	Oxidizer and organic peroxide
6	Poison (toxic) and poison inhalation hazard
7	Radioactive
8	Corrosive
9	Miscellaneous

Traffic accidents on roadways can cause the vehicles carrying hazardous substances to overturn, collide, or ignite and burn. The runoff caused by chemical spills, the vapors created as a chemical dissipates, or the burning of a substance can expose anyone in the immediate vicinity of the incident to extreme danger. Vehicular accidents compound the vulnerabilities of people and the environment to include both traumatic injury due to the crash or kinetics of the incident and the negative effects of absorbing the chemical that is released into the atmosphere.

Injuries from exposure to hazardous substances can occur from direct contact with the substance and traumatic injuries from explosions or fires. Most hazardous materials releases involve the breech of a container or an unintentional mixing of chemicals. These spills and leaks can occur in businesses, homes, and industries or anywhere else that hazardous substances exist.

There is no unified reporting system for hazardous materials incidents. Industrial spills involving reportable quantities are documented in accordance with state and federal regulations. Smaller spills often go undocumented unless someone is injured and requires medical attention. Large industrial spills and leaks are investigated by local hazardous materials teams, regulators, and government responders. Spills that occur on highways and railroads become known because local first responders and emergency management officials are involved in responding to the incident. Incidents of non-lethal exposure, such as a small chemical spill in a residence or a broken mercury thermometer, may not even be recognized as an emergency. Individuals do not always know the risks associates with these incidents so they clean up the spill as best they can without any additional reporting.

Hazardous Materials Incident Risk Assessment

Seneca County has a moderate risk for hazardous materials incidents. Numerous two-lane state highways and railroads cross the county; hazardous materials are continually transported through Seneca County on these transportation routes. There are also multiple facilities that manufacture, use, or store hazardous substances. Fertilizers, pesticides, and other chemicals used for agriculture purposes are also transported on roadways in the county. Universities and hospitals utilized chemicals in their operations, although typically in much smaller quantities

than industrial operations. Parks, recreation areas, golf courses, and individual properties also utilize lawn chemicals that can be dangerous in large quantities or when spilled.

Pipelines also present a hazardous materials risk in Seneca County. Map 2-6 identifies the most significant pipelines in the county. These pipelines carry natural gas, petroleum products, and other substances. While the pipelines are well maintained, there is always risk for an incident. First responders participate in training to prepare for these potential responses.

Because of the movement of hazardous materials on different types of transportation systems throughout the county, hazardous materials incidents are a countywide hazard and can affect all areas and jurisdictions.

Local Hazardous Materials Incident History
According to Ohio EPA records, Seneca County has 28 hazardous materials responses. The incident dates range from 2009 through 2014. Incident types range from moderate industrial spills that were cleaned up internally to broken mercury thermometers reported by the public. Seneca County Local Emergency Planning Committee (LEPC) data indicates that small hazardous materials spills and releases occur somewhat frequently, due in large part to the number of state highways and rail lines present in Seneca County. The majority of these incidents are safely addressed by industrial safety personnel and first responders.

2.2.5 Infrastructure Failure

Infrastructure is defined as the basic physical and organizational structures and facilities that are necessary for the operation of a society. It includes, but is not limited to, buildings, roads, power supplies, water/wastewater, and other utility systems. These essential services, structures, and systems are critical to the function of a community. For the purpose of hazard mitigation, this plan will address these types of infrastructure failure: utility systems; roads, bridges, and culverts; wastewater and storm sewers; water treatment and distribution; dams and levees.

A. Dam and Levee Systems
A dam is an artificial barrier built across flowing water. This barrier directs or slows the flow of water and often creates a lake or reservoir. A dam is considered hydrologically significant if it has a height of at least 25 feet from the natural streambed and a storage capacity of at least fifteen acre-feet or an impounding capacity of at least 50 acre-feet and is six feet or more above the natural streambed. Dams are constructed for different purposes, such as flood control or to water storage for irrigation, water supply, or energy generation. They can be composed of earth, rock, concrete, masonry, timber, or a combination of materials. A lowhead dam is a man-made obstruction that is built within a waterway and typically spanning from bank to bank. These dams have water flowing across the top of the dam and are typically one to fifteen feet tall. Most low head dams are designed to control upstream water levels; they do not typically provide any flood control function.

Levees are embankments constructed to prevent the overflow of a river and subsequent flooding of the surrounding land. They can be built using earth, rock, or other materials. Levees constructed from concrete or masonry materials are referred to as floodwalls.

Many of the structures classified as dams or levees in Ohio are part of municipal water or wastewater treatment systems. These structures are often referred to as upground reservoirs or lagoons. According to ODNR, an upground reservoir is defined as a reservoir formed by artificial barriers on two or more sides and which impounds water or liquefied material pumped or otherwise imported from an exterior source. Lagoons are considered upground reservoirs.

Dam failure is defined as the uncontrolled release of the water held back by the structure. Depending on the storage volume of the dam and the types of structures surrounding it, a breach or failure can have a significant or limited impact on the surrounding community. In the most significant dam failure incidents, there can be substantial flooding downstream, damage to property, and loss of life. Potential causes of dam failure include, but are not limited to, sub-standard construction, geological instability, spillway design error, poor maintenance, internal erosion, and/or extreme inflow.

The Ohio Department of Natural Resources (ODNR) is responsible for determining dam risk through their Dam Safety Program. ODNR classifies dams based on this scale:

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

Dam/Levee Failure Risk Assessment

According to the Ohio Department of Natural Resources. there are 21 dams in Seneca County. The county's dam inventory includes two Class I structures, five Class II structures, and 14 Class IV structures. Four dam structures are considered lowhead dams.

Three of the identified dams are considered upground reservoirs and two are wastewater treatment lagoons. Many of the Class IV structures function as water retention structures on agriculture ponds, small waterways that hold back a recreational water supply, or are privately-owned structures that affect the flow of runoff waters.

One dam on the county's inventory is considered a levee. Honey Creek is the primary water source for the eastern portion of the county. The Honey Creek Diversion Levee helps to ensure

an adequate water supply in Honey Creek. Additional levees, in the form of floodwalls, exist in along the Sandusky River in Tiffin. These structures are intended to protect the business and residential districts along the river from flood damage when the river rises.

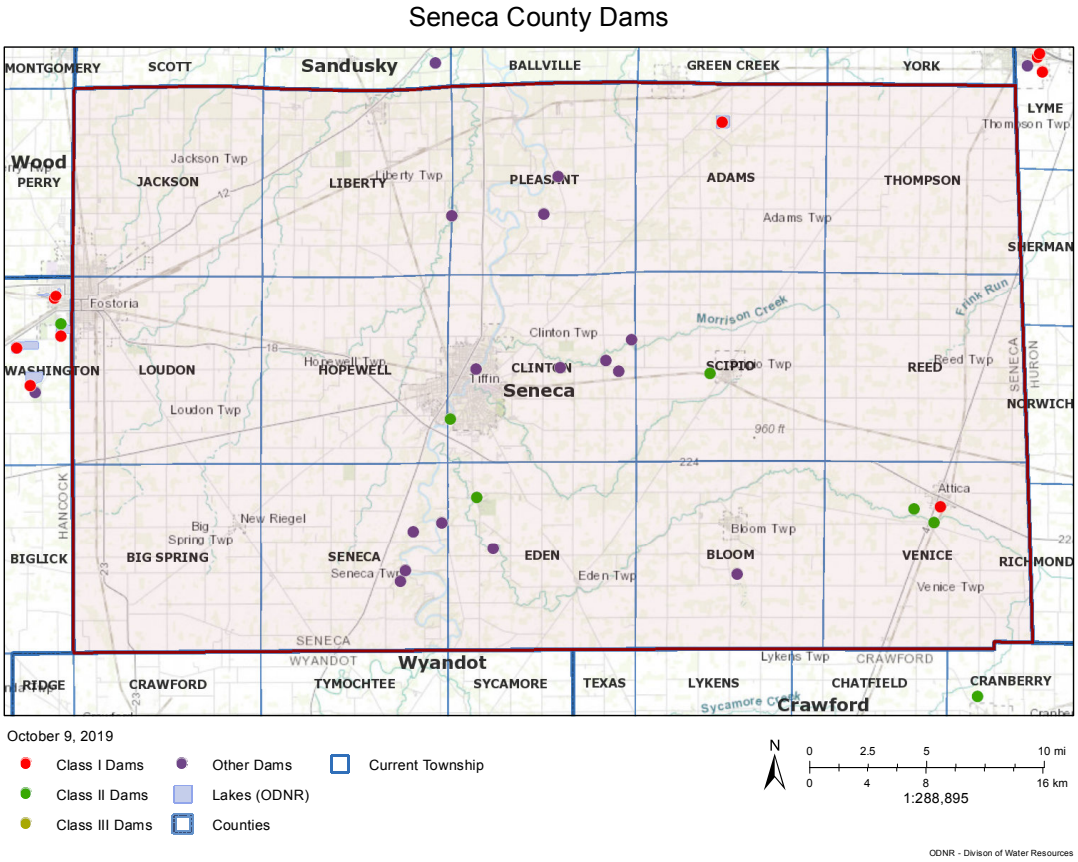
The complete list of dams and classifications for the county is identified in table 2-27.

Table 2-27: Seneca County Dams

Dam	Class	Location	Owner	EAP
Attica Upground Reservoir	II	Venice Township	Village of Attica/Public	Yes
Attica Upground Reservoir #2	I	Venice Township	Village of Attica/Public	Yes
Attica WWT Lagoon	II	Venice Township	Village of Attica/Public	Yes
Bacon Low Head Dam	IV	Tiffin	Private	Unknown
Beaver Creek Upground Reservoir	I	Adams Township	City of Clyde/Public	Yes
Buchman Lake Dam	IV	Seneca Township	Private	Unknown
Ella Street Low Head Dam	II	Tiffin	Aqua Ohio/Utility	Yes
Estep Lake Dam	IV	Clinton Township	Private	Unknown
Funk's Lake Dam	IV	Clinton Township	Private	Unknown
Honey Creek Diversion Levee	IV	Eden Township	Unknown	Unknown
Jacobs Pond Dam	IV	Clinton Township	Private	Unknown
Marsh Dike	IV	Bloom Township	Private	Unknown
Mohawk Lake Dam	II	Eden Township	Private	Unknown
Nye Lake Dam	IV	Seneca Township	Private	Unknown
Republic WWT Lagoon	II	Scipio Township	Village of Republic/Public	Yes
Schoen Lake Dam	IV	Clinton Township	Private	Unknown
Shults Lake Dam	IV	Liberty Township	Private	Unknown
St. John's Dam	IV	Seneca Township	ODNR/Public	Yes
Welter Lake Dam	IV	Seneca Township	Private	Unknown
Wilbert Lake Dam	IV	Pleasant Township	Private	Unknown
Wise Lake Dam	IV	Pleasant Township	Private	Unknown

Maps identifying the locations of all dams in table 2-27 are included on map 2-6, which is provided by ODNR.

Map 2-6: Seneca County Dam Locations



Local Dam Failure History

There is no known local dam failure history.

B. Utility Systems

Utilities include the systems that provide basic amenities and services to the public, such as water, wastewater, storm water, electricity, and natural gas systems. These systems can be maintained by a public entity, usually a jurisdiction or cooperative agency, or by private companies. Water, wastewater, and storm water utilities are generally operated by public entities, although privately owned water systems do exist. Electricity in many jurisdictions is provided by private providers but some municipalities do own and operate their own municipal electric system. In rural areas, many homes receive these basic utilities through individual septic systems and water wells. Regardless of the type of delivery, utility systems provide critical services to the community. These systems are vulnerable to failure caused by disaster conditions or independent from any hazard or storm.

Utility System Risk Assessment

Utility infrastructure is vulnerable to failure caused by aging system components, general system failure, overuse, and/or poor maintenance. All utility systems, even those that are well maintained can fail. These systems are incredibly expensive to maintain and must be upgraded

or replaced as time goes on. As communities grow and develop, systems must be expanded to meet increasing demand. Changes in regulations also require systems to be upgraded or modified. All of this is very costly. These costs are initially the responsibility of the jurisdiction or entity that manages the system but is eventually passed on to the user through fees.

Because of the overwhelming expense of maintaining and upgrading utility systems, many utility systems are not in good repair. Water lines are old and undersized. Wastewater and storm water systems that were combined when the system was originally built have not been fully separated in spite of regulations requiring this separation. Stormwater systems that were adequate when build 40 years ago are undersized to handle the amount of precipitation communities now receive. Electric and natural gas distribution systems have not been upgraded to keep pace with community growth. All of this is true in Seneca County. Infrastructure failure, specifically water, wastewater, and storm sewer systems, rated as the most concerning hazard across Seneca County. Communities recognize how critical these systems are to the public and are working diligently to identify funding to upgrade and maintain their systems. These efforts include borrowing funds, applying for grants, and increasing user fees and any other funding opportunities they can identify. Because every community relies on utility infrastructure for critical services, infrastructure failure is a countywide hazard that can affect all jurisdictions and unincorporated areas of Seneca County.

Local Energy Utility Failure History

Utility system failures can be caused by storms or natural hazards. On January 5, 2005, Seneca County and central Ohio was impacted by a severe ice storm. Thousands of trees and utility poles across the area were covered in ice. Electricity was out in some areas for ten days. Business operations came to a halt and people were forced to find shelter somewhere with electricity for several days. This storm caused more than $7,000,000 in damage in Seneca county alone. Just three years later, in September 2008, Seneca County was impacted by another major power outage. As the sub-tropical remnants of Hurricane Ike traveled north from the Gulf of Mexico, heavy winds affected significant portions of the Midwest. In Ohio, the sustained 75 mph winds caused an estimated 2.6 million power outages. While some outages were brief, more than 300,000 people were without power for more than a week. Businesses were shut down, leading to significant economic loss.

One notable utility failure that was completely independent of a storm event was the Northeast Blackout on August 14, 2003. This widespread power outage affected nearly 45 million people in eight U.S. states plus 10 million people in Canada. The outage was caused by a system failure. In Ohio, more than 500,000 people were without power. Businesses were forced to close and people with special medical needs were unable to meet those needs without access to electricity.

C. Roads and Bridges

Transportation infrastructure is a critical part of any community. The roads, bridges, and associated system components that allow people to travel throughout the community are critical to commerce and daily life. Maintenance of roads and bridges is the responsibility of

various government entities. State and federal highways are maintained by the Ohio Department of Transportation. County roads are the responsibility of the Seneca County Engineer. Municipalities maintain their own city, village, or township roads and streets. In some cases, the county engineer may have an agreement in place with townships or smaller municipalities to maintain roadways in that jurisdiction. This is often the case if the jurisdiction does not have the funds to own and operate snow plows and other similar equipment.

Road and Bridge Failure Risk Assessment

Like utility systems, roads and bridges require continual maintenance and repair. These resources are used heavily by the public and are extremely vulnerable to damage. Weather conditions, standing water, continual freezing and thawing, and the salt and chemicals used to treat roads in winter weather can cause damage. As communities grow and transportation needs change, roads and bridges must be upgraded to meet changing traffic patterns. Communities in Seneca County work diligently to maintain these critical transportation assets. In most cases, road repair and maintenance accounts for a significant portion of each jurisdiction's annual budget. Local officials do everything within their power to maintain safe transportation routes for residents and businesses. Even with these efforts, Seneca County has roadways that are in need to repair and/or replacement.

Local Road and Bridge Failure History

Road maintenance is an ongoing issue in Seneca County. Every jurisdiction has a list of roads and bridges that need to be repaved, repaired, or completely replaced. They address these projects as aggressively as possible, depending on funds. When grants and outside funding sources are available, jurisdictions pursue those programs to continue this work.

2.2.6 Invasive Species

An invasive species is a plant or animal species that is not native to the local ecosystem and whose introduction is likely to cause economic or environmental harm or harm to human life. Across the United States, more than 5,000 species are recognized as invasive. Invasive species are classified as terrestrial plants, terrestrial wildlife, insects and diseases, and aquatic species.

Invasive terrestrial plants can displace native species, impact the wildlife that rely on native species as a source of food or shelter, or form monoculture plant communities that reduce biodiversity. While more than 25% of the plant species in Ohio originate from other areas, most are not invasive; fewer than 100 species are actually considered invasive.

Invasive terrestrial wildlife is much less common than other types of invasive species but can still cause significant damage to natural habitats. Aquatic invasive species are plants and animals that impact the quality of waterways. These can affect large bodies of water, such as Lake Erie and the Ohio River, and much smaller rivers, lakes, and streams. Invasive insects and diseases are insects, fungus, and other small organisms that can negatively impact plants, forests, and the health of wildlife. Table 2-28 identifies the invasive species across these categories that have the greatest impact in Ohio.

Table 2-28: Invasive Species in Ohio

Species	Type
Asian Carp	Aquatic
Curlyleaf Pondweed	Aquatic
Hydrilla	Aquatic
Round Goby	Aquatic
Ruffe	Aquatic
Red Swamp Crayfish	Aquatic
Sea Lamprey	Aquatic
White Perch	Aquatic
Zebra Mussel	Aquatic
Asian Longhorned Beetle	Insects & Diseases
Emerald Ash Borer	Insects & Diseases
Gypsy Moth	Insects & Diseases
Hemlock Wooly Adelgid (HWA)	Insects & Diseases
Walnut Twig Beetle	Insects & Diseases
Japanese Honeysuckle	Terrestrial Plant
Japanese Knotweed	Terrestrial Plant
Autumn-Olive	Terrestrial Plant
Buckthorns	Terrestrial Plant
Purple Loosestrife	Terrestrial Plant
Common Reed or Phragmites	Terrestrial Plant
Reed Canary Grass	Terrestrial Plant
Garlic Mustard	Terrestrial Plant
Multiflora Rose	Terrestrial Plant
Bush Honeysuckles	Terrestrial Plant
Feral Pig	Terrestrial Wildlife

Invasive Species Risk Assessment

Like most areas of Ohio, Seneca County's landscape is rich with trees and wooded areas, all of which are vulnerable to damage from invasive species. When trees that are dead or weakened from invasive species fall, they become storm debris and can damage homes, buildings, vehicles, and anything else in their path. Diseases trees also fall into rivers, creeks, and streams, clogging the waterways and impeding drainage and increasing the county's vulnerability to flooding.

The most recent widespread invasive species incident in Ohio was the Emerald Ash Borer. Seneca County is also vulnerable to damage from other tree-infecting insects. Waterways could also be impacted by invasive plant and animal species. An infestation of any type would cause damage across the county, making invasive species a countywide hazard that can affect all areas and jurisdictions.

The cost to a community from invasive species is difficult to quantify because it comes from the long-term effects and cleanup costs rather than direct property damage. The costs associated

with invasive species include actions such as removing diseased trees and vegetation, repairing damage caused by falling trees, cleaning and dredging debris-filled waterways, and repairing infrastructure damaged as a result of the infestation. These tasks are extremely costly, often resulting in tens of thousands of dollars in expense for a jurisdiction.

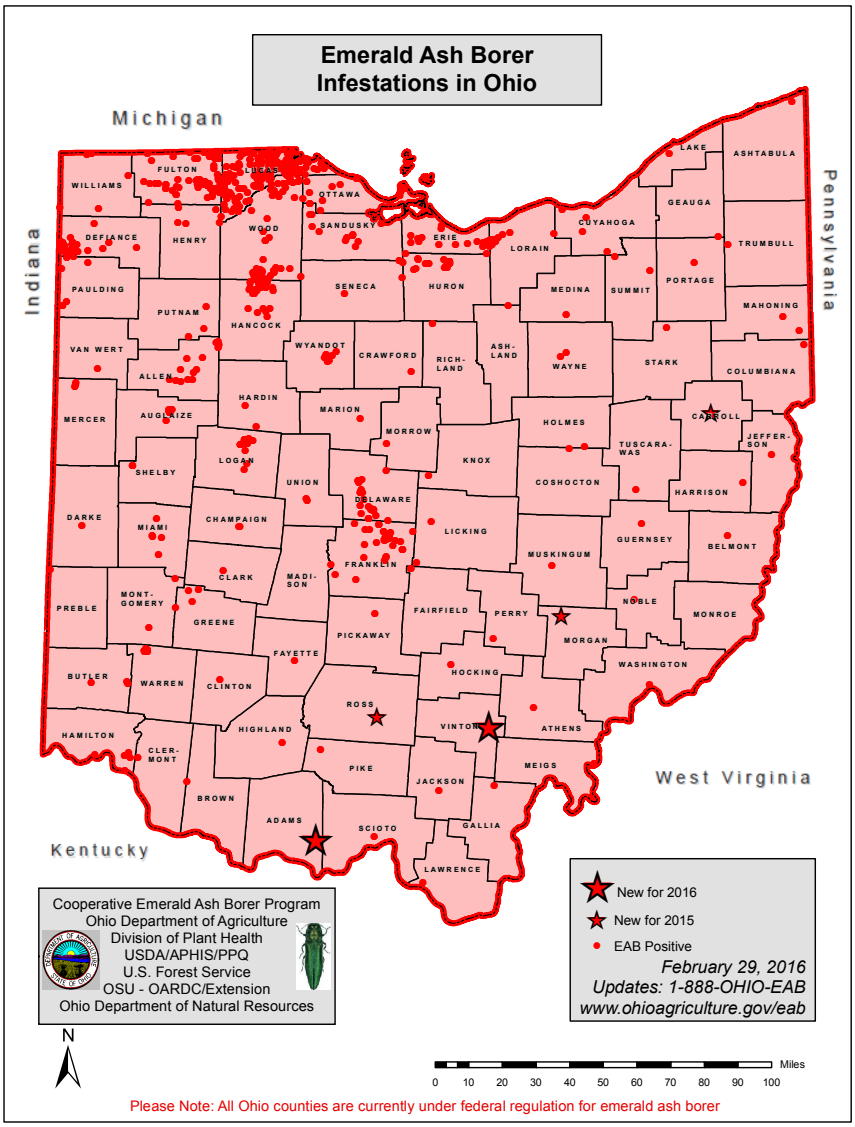
Local Invasive Species History

The most recent invasive species to significantly impact Ohio was the Emerald Ash Borer (EAB). EAB is an ash-tree killing insect native to Asia that kills trees within three to five years of infestation. It was first discovered in Ohio in 2003. To mitigate EAB impact, the Ohio Department of Agriculture and partner agencies worked to protect the state's 3.8 billion ash trees. Map 2-7 identifies EAB infestation areas in Ohio. Seneca County was not one of the most heavily affected areas of the state but was impacted by the infestation and statewide quarantine on ash wood. The quarantine was lifted in 2011, indicating that the worst of the infestation has passed. While the infestation threat has passed, many communities are still dealing with the after effects of this incident. In some areas, hundreds of dead and diseased trees have not been removed and pose a significant risk to their community. Removal is cost prohibitive for some communities and individual property owners. Most jurisdictions are removing dead trees as they have the funds but it will take years and significant funding to remove all of them. From a disaster perspective, the dead and diseased trees increase a community's risk for property damage from high wind events because the trees are far more susceptible to wind damage. Along waterways, diseased trees also increase flood risk as they fall into streams and impeded drainage.

Other invasive species that are currently under quarantine in parts of Ohio include the Gypsy Moth, Walnut Twig Beetle, and Asian Longhorned Beetle.

In Seneca County, all jurisdictions have been affected by the EAB infestation. Diseased trees along rivers and streams have fallen into waterways, impacting drainage and the flow of water. Trees also fall on roadways and utility lines during storms and high wind events. The county engineer and municipal street and road departments have aggressively removed diseased trees along the public right-of-way to reduce this risk. This has been effective at reducing the impact on utility lines and infrastructure but has been a significant financial burden for jurisdictions. Public agencies are also not able to remove trees from private property. Individual landowners are responsible for removing dead and diseased trees from their personal property. Because this does not always occur, there are still hundreds of dead and diseased trees that will continue to cause problems across the county in the coming years.

Map 2-7: Emerald Ash Borer Infestation Map



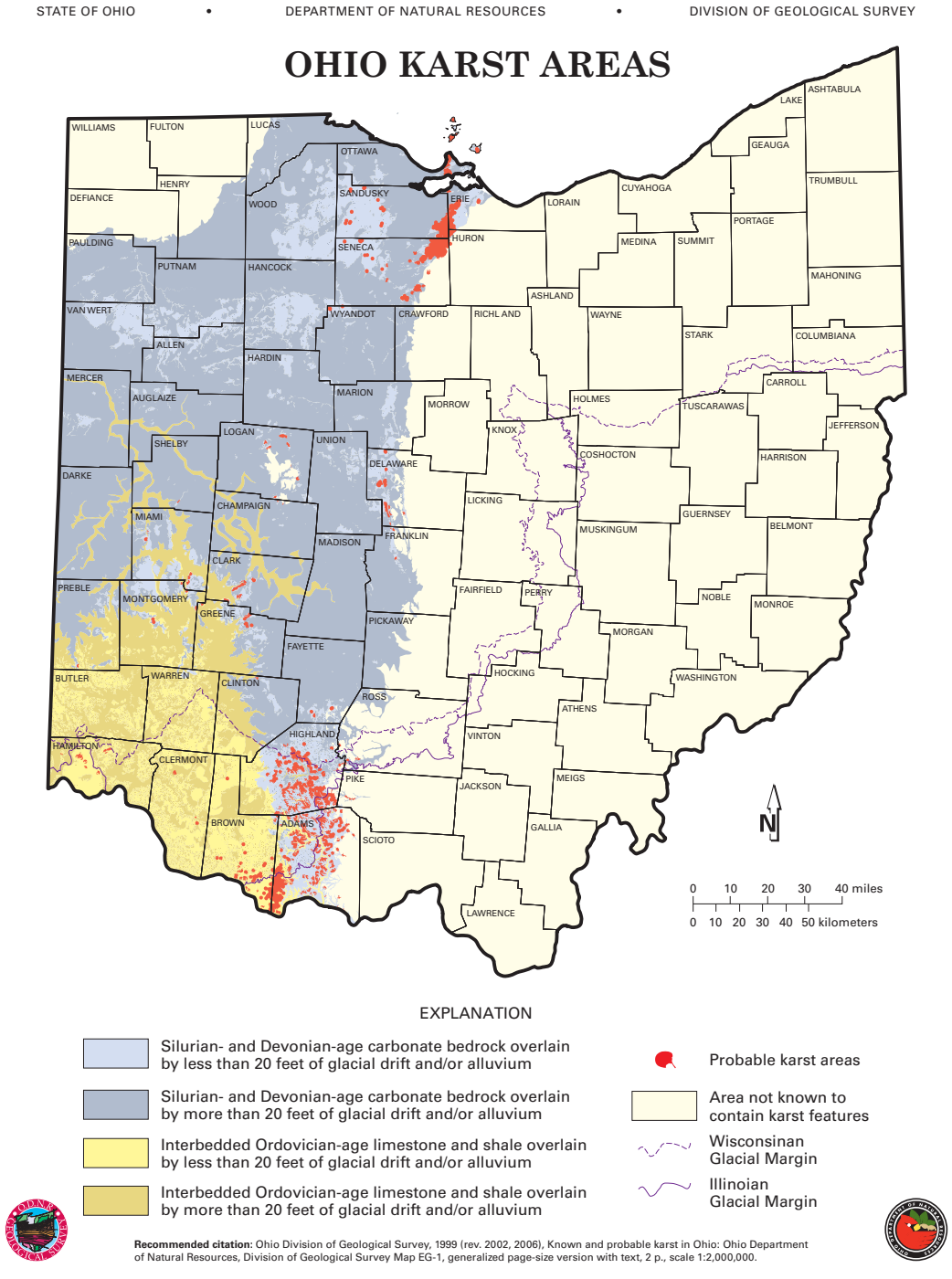
2.2.7 Land Subsidence

Land subsidence is the gradual or sudden sinking of the Earth's surface caused by subsurface movement of earth materials. Subsidence is an issue that develops over time. The primary causes are aquifer-system compaction, underground mining, drainage of organic soils, natural compaction, sinkholes, and thawing permafrost. Land subsidence affects more than 17,000 square miles across the United States, an area equivalent to the size of New Hampshire and Vermont. For more than 80% of this area, subsidence is the result of groundwater exploitation and overuse.

Karst is a specific type of topography that can contribute to land subsidence issues. Karst is a landscape shaped by the dissolution of limestone or dolomite layers of bedrock. Surface water percolates through these layers, slowly dissolving the limestone or dolomite and creating voids.

The voids may be visible or invisible, depending on their depth. Visible voids can allow surface water to flow directly into the water table. Deeper voids are not visible at the surface. Over time, the water table can change, potentially destabilizing the deeper voids. A significant area of karst is located on northeast Seneca County, as identified on map 2-8.

Map 2-8: Ohio Karst Areas



Land Subsidence Risk Assessment

Seneca County is located in an area of Ohio identified as having significant karst topography. According to the map from the Ohio Department of Natural Resources, a concentrated area of karst topography is located in the northeast corner of Seneca County. Additional known areas of karst are located throughout the central section of the county. The sinkholes and karst voids in these areas are susceptible to collapse. The surrounding areas are vulnerable to flooding when the voids fill with excess groundwater that eventually pushed to the surface. Because this type of floodwater rises from underground rather than the overflow of a waterway, this flooding is difficult to manage. The flooding is typically only alleviated when the groundwater levels drop and the floodwater can drain into the surface. Depending on the specific groundwater levels and soil saturation, this process can take weeks or months.

Local Land Subsidence History

The most significant local land subsidence incident occurred in 2008 when karst flooding impacted an area near the city of Bellevue in southeast Sandusky County and southwest Erie County. This area is slightly north of Seneca County. This incident was precipitated by the highest groundwater levels in more than 30 years. As groundwater levels increased, the karst substructure and sinkholes filled with water. This water eventually pushed to the surface, causing extensive flooding that included residential structures and roadways. State Route 269, a major roadway in the area, was closed for a period of time and affected residents suffered extensive damage to their properties. While this incident did not occur within Seneca County's borders, the affected area is just north of the Seneca County line and the county has the same geologic features and risk within its borders.

2.2.8 Severe Thunderstorm

A thunderstorm is a local storm produced by a cumulonimbus cloud accompanied by a combination of thunder, lightning, and hail. Lightning is a brief, naturally occurring electrical discharge that occurs between a cloud and the ground. Hail is frozen rain pellets that can damage buildings, vehicles, and other structures as they fall. Hail forms in the higher clouds and accumulates size as it falls as precipitation. If temperatures close to the ground are warm, the hail can partially melt or become freezing rain. Most thunderstorms include heavy precipitation and wind. These storms can produce hail, lightning, flash floods, tornadoes, and damaging winds that pose significant risk to people and property in the area. A thunderstorm that produces a tornado, winds of 58 mph or greater, and/or hail with a diameter of at least 1", is considered a severe thunderstorm. These storms typically develop as part of a larger storm front and are preceded and followed by regular thunderstorms.

Severe Thunderstorm Risk Assessment

Thunderstorms are a frequent occurrence in Seneca County. They are most likely to occur during the spring and summer months but can occur at any time of the year. In the spring and summer, atmospheric conditions allow heat to build during the day and produce thunderstorms that include hail, lightning, heavy rain, and/or wind in the late afternoon and early evening. Microbursts often include strong straight-line winds that can damage or destroy standing crops

and develop quickly with little warning. Most thunderstorms include heavy precipitation, wind, and thunder. Hail and lightning are possible but less frequent. Thunderstorms are a countywide hazard and can affect all areas and jurisdictions.

Thunderstorms are relatively frequent but generally result in little or no property damage. The most severe incidents can damage buildings and infrastructure. Hail can damage vehicles, roofs, and siding. Injuries or loss of life during a thunderstorm are rare. Thunderstorm winds can damage standing crops; in the most serious events, this damage can permanently damage the crops and drastically reduce crop yields. When this occurs, it has a significant economic impact on the producer and community.

Table 2-29 describes the overall vulnerability of countywide property to worst-case severe thunderstorm damage, including hail, wind, heavy precipitation and lightning. Vulnerability estimates were calculated at 25% of the county's property as a worst-plausible case scenario for widespread severe thunderstorm damage. This figure was based on input from the planning team and loss statistics from a variety of past incidents.

Table 2-29: Thunderstorm Scenario Vulnerability Analysis

Building Type	Number of Buildings	Exposure
Residential	4,532	$1,203,660,000
Non-Residential	1,290	$342,889,000
Critical Facilities	268	$69,889,000
Totals	*6,089*	*$1,616,438,000*

Local Severe Thunderstorm History

Thunderstorms are a frequent hazard in Seneca County but are generally not severe. According to NCDC records, the county has experienced 204 thunderstorm wind incidents, 146 hail events, and 2 lightning occurrences since 1950. While most of these events are minor and cause little or no damage, a few have caused considerable property damage. Collectively, thunderstorm incidents have caused nearly $6,500,00 in property damage and $5,000,000 in crop damage.

Table 2-30: Seneca County Severe Thunderstorm History

Hazard	Incidents	Property Loss	Crop Loss	Deaths	Injuries
Thunderstorm Wind	204	5.9M	12K	0	2
Hail	146	579K	5M	0	0
Lightning	2	75K	0	0	1

Several of the more damaging thunderstorm events in Seneca County have occurred in the past decade. On May 25, 2011, a warm front moved across Tennessee, Kentucky, and Ohio, dropping significant rainfall across the region. Much of Seneca County received heavy amounts of hail and high winds. Nickel size hail was reported in Fostoria and Bettsville. In Tiffin and Alvada, weather spotters and residents reported pea and golf ball size hail, which caused

damage to a number of vehicles and buildings. In all, the county suffered $350,000 in damage from hail alone.

Another significant incident occurred in July 2013 when pollinating corn stalks were flattened during a severe thunderstorm in Huron and Erie counties, which are adjacent to Seneca County. Straight-line winds can cause severe damage to roofs, siding, and trees. Another similar thunderstorm impacted the county a few months later on October 31, 2013 when a line of strong storms moved across the region late in the evening. Weather spotters reported wind gusts as high as 60 mph. Damage was most severe in the Tiffin area where at least one mobile home was knocked off the foundation. Several utility poles and trees were downed leading to significant power outages.

2.2.10 Tornado/Windstorm

Windstorms can include rotational or straight-line winds and can occur within a larger weather system of thunderstorms or as an independent hazard. Rotational wind events are classified as tornadoes or funnel clouds while straight-line wind events are generally identified as windstorms.

A tornado is an intense, rotating column of air that protrudes from a cumulonimbus cloud in the shape of a funnel or rope whose circulation is present on the ground. If the column of air does not touch the ground, it is referred to as a funnel cloud. This column of air circulates around an area of intense low pressure, almost always in a counterclockwise direction. Tornadoes usually range from 300 to 2,000 feet wide and form ahead of advancing cold fronts. They tend to move from southwest to northeast because they are most often driven by southwest winds. When a single storm system produces more than one distinct tornado or funnel cloud, it is referred to as a tornado outbreak.

Tornado magnitude is measured using the Enhanced Fujita scale, abbreviated as EF. The ratings range from EF-0 to EF-5 and are based on wind speeds and related damage. The Enhanced Fujita Scale has been used as the official tornado rating scale since 2007. Prior to 2007, tornado severity was rated using the Fujuta scale (abbreviated as F-0 through F-5), an earlier version of the Enhanced Fujita scale. The difference between these two rating scales is that the Enhanced Fujita scale bases the rating on wind speed while the earlier Fujita scale is based on the amount of destruction caused by the tornado.

The following table is provided by FEMA and indicates the wind speeds and type of damages for each rating on the Enhanced Fujita Scale.

EF-Scale	Wind Speed	Typical Damage
0	65 – 85 mph	Light damage. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over,
1	86 – 110 mph	Moderate damage. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
2	111 – 135 mph	Considerable damage. Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground
3	136 – 165 mph	Severe damage. Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
4	166 – 200 mph	Devastating damage. Whole frame and well-constructed houses completely leveled; cars thrown and small missiles generated.
5	>200 mph	Incredible damage. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters; high-rise buildings have significant structural damage; incredible phenomena will occur
No rating		Inconceivable damage. Should a tornado with the maximum wind speed in excess of EF-5 occur, the extent and types of damage may not be conceived. A number of missiles such as iceboxes, water heaters, storage tanks, automobiles, etc. Will create serious secondary damage on structures.

A windstorm is a weather event with very strong winds but little to no precipitation. Sustained wind speeds in a windstorm can reach at least 34 mph with gusts significantly higher. Regardless of wind speed, any wind event that causes property damage can be considered a windstorm.

A derecho is a widespread, long-lived windstorm. It is often associated with bands of rapidly moving thunderstorms. This type of storm can produce damaging straight-line winds over extremely large areas, sometimes spanning hundreds of miles. To be classified as a derecho, the storm must produce damage over at least 250 miles, have wind gusts of at least 58 mph across most of the storm's length, and multiple gusts of 75 mph or greater. The destruction produced by a derecho can be very similar to that of a tornado but generally occurs in one direction along a straight path.

Tornado/Windstorm Risk Assessment

In Ohio, tornadoes are generally narrow and do not reach width of the mega-tornadoes that occur in the Great Plains and southern states. Locally, tornadoes are typically 25-500 yards wide and stay on the ground for a few miles. Ohio ranks among the top twenty states in injuries,

fatalities, and property damage from tornado events. Tornadoes are not a frequent occurrence in Seneca County but their severity and impact can be substantial. The magnitude of past tornadoes has ranged from F/EF0 to F/EF3. Tornadoes are a countywide hazard and can affect all areas and jurisdictions.

The flat topography of northwest Ohio is also vulnerable to damage from high wind incidents, making windstorms are a countywide hazard that can affect all areas and jurisdictions. Most severe wind events are part of larger storm systems that typically include heavy rain, hail, ice, snow, or thunderstorms. Extreme winds can also occur independent of other hazards.

Property damage from tornadoes and windstorms can include damaged roofs, gutters, downspouts, and trees. Outbuildings, barns, and storage buildings are at risk for damage because these structures are less resistant to wind damage and are frequently built on concrete slabs or dirt foundations. Damage to agriculture industry during the growing season when fields are planted is also a risk. High winds can damage crops and reduce yields, which has a negative effect on the county's economy.

Most residential buildings in the county are constructed from wood, concrete, brick, and stone. Older homes are typically constructed using limestone and other masonry materials and built on traditional foundations with basements or crawl spaces. Newer residential construction is frequently built on concrete slabs without basements or crawl spaces. These homes are most prone to superficial damage, roof damage, and falling trees during tornadoes and severe windstorms. Mobile homes are more vulnerable to wind damage because they are less secured to the ground than buildings with foundations, are lighter weight, and constructed of less wind-resistant material than traditionally built homes.

Table 2-31 describes the overall vulnerability of countywide property to worst-case tornado and wind damage. Vulnerability estimates were calculated at 10% of the county's property as a worst-plausible case scenario for widespread tornado or windstorm damage. This number was based on input from the planning team and loss statistics from a variety of past incidents.

Table 2-31: Tornado/Windstorm Scenario Vulnerability Analysis

Building Type	Number of Buildings	Exposure
Residential	2,719	$722,196,000
Non-Residential	774	$205,734,000
Critical Facilities	161	$41,934,000
Totals	*3,654*	*$969,864,000*

Local Tornado/Windstorm History

Seneca County has experienced22 tornadoes and 38 wind incidents according to NCDC records. Table 2-32 summarizes the tornado and wind incidents in Seneca County's history.

Table 2-32: Seneca County Tornado/Windstorm History

Hazard	Incidents	Property Loss	Crop Loss	Deaths	Injuries
Tornado	22	19.4M	0	6	32
High Wind	34	5.6M	1.1M	0	1
Strong Wind	4	60K	0	0	0

The map below identifies the location of tornado incidents in Seneca County.

Map 2-9: Tornado/Windstorm History

Numerous tornado and wind events in Seneca County have caused significant damage to property or agricultural assets. One of the most damaging wind events occurred on November 10, 2002 when two strong tornadoes impacted the county on the same day. In Tiffin, an F3 tornado caused more than $12,000,000 in damage while an F1 tornado impacted Fostoria, also causing significant damage. Total property damage in the county $13,900,000.

Another damaging windstorm occurred on September 14, 2008 when the remnants of Hurricane Ike moved across Ohio. This event was unusual because it was a straight-line wind event with little to no precipitation. The storm caused damage across most of western and central Ohio; statewide property damages exceeded $500,000,000. In Seneca County, high sustained winds and gusts caused significant damage to tree and utility poles and widespread power outages. Because the incident during fall harvest, agricultural losses were significant. In Seneca County property loss was estimated to be $6,100,000 and agricultural losses were an additional $550,000.

2.2.10 Water Quality Emergency

Water quality refers to the chemical, physical, biological, and radiological characteristics of water. It is a measure of the water relative to the requirements of one or more biotic species and human need or purpose. A water quality emergency occurs when the quality of water available for human consumption is compromised. In recent years, water quality has become a growing concern in northwest Ohio as Lake Erie and its associated rivers and streams have been affected. Other areas of the state have also experienced water quality issues in inland lakes and reservoirs, making water quality a growing concern statewide. Algal blooms are one of the more common causes of water quality issues. These occur when colonies of algae produce toxic harmful effects on people and animals. In Lake Erie, high phosphorous levels caused by runoff are considered a contributing factor to these harmful algal blooms. Some algal blooms produce microcystin, which is a poisonous bacterium that can sicken or kill people, fish, birds, and other animals. When microcystin or other toxins infiltrate a public water supply, the water becomes contaminated and unsafe for consumption. These incidents can have a drastic human and economic toll on the affected area.

In addition to harmful algal bloom risk, water treatment and distribution systems are susceptible to infrastructure failure. This can include anything from long-term lack of repair, maintenance and/or upgrade to contamination from lead pipes and other substances.

Water Quality Emergency Risk Assessment

Because a water quality emergency can occur in any source body of water or water treatment facility, water quality is a countywide hazard that can affect all areas and jurisdictions. When water quality is compromised, risks to the community include public health and the economy. From a public health perspective, contaminated water can cause serious illness when consumed. Persons with special medical needs, compromised immune systems, the elderly, and children are most susceptible to this. Animals are also susceptible to illness from contaminated water. If the water supply is contaminated, residents lose access to drinking water in their homes and restaurants, grocery stores, and businesses that use water in their regular operations are forced to close until water service is restored. The loss of revenue, even if only for a short duration, can have a significant economic impact. Any compromise in the water supply also affects the public's trust of government officials. If the public is concerned about the safety of the water supply and believes local officials are not fully communicating about the issue, they may question the information provided by local officials.

To protect the community's water supply, jurisdictions must continually monitor, repair, and upgrade water treatment infrastructure. Because this is costly, jurisdictions must plan and budget for it. If the infrastructure is not well maintained and emergency work must be completed when an incident occurs, the economic cost is higher than completing work through ongoing maintenance and upgrades. In addition to the direct economic loss resulting from the emergency, the jurisdiction must immediately identify funds to make the repairs. These costs are often recouped through increases in the fees charged to consumers, ultimately costing residents more money through increases to water rates, user fees, and local taxes.

Local Water Quality Emergency History

The most significant water quality emergency in Ohio occurred on August 3, 2014. Seneca County was not directly impacted by this event but it did bring significant attention to water quality issues in the region. On August 3, microcystin from a toxic algal bloom was detected in the water supply in Toledo, Ohio, causing the water to be declared unsafe to drink. The Toledo water system supplies municipal water to approximately 400,000 people in the northwest Ohio region. Local emergency management and government officials scrambled to provide drinking water to the affected communities. Within hours, stores across the region sold out of bottled water as residents rushed to purchase critical water supplies. Restaurants and food service businesses were forced to close until safe water could be provided and hospitals experienced a surge of patients who believed they were ill from consuming contaminated water. Within three days, Toledo's water was declared safe to drink but the economic and political ramifications lasted much longer. In the years since, the city is still working to upgrade infrastructure and coordinating with adjacent communities who rely on Toledo for their water supply.

Seneca County has not experienced a water crisis like the Toledo incident but communities are concerned with protecting their water supply. Inland lakes and reservoirs in other areas of the state have experienced toxic algal blooms and other water quality issues. Across Ohio, research is underway to determine the root cause of the increase in toxic algal blooms and identify actions that can be taken to reduce their occurrence.

2.2.11 Winter Storm

A winter storm is a weather event that includes one or more winter weather hazards, including extremely cold temperatures, wind, snowfall, sleet, ice, rain, or freezing rain, and can develop anytime between late fall and early spring. These winter weather events are frequent in Ohio but the specific components of each event depend on the weather conditions at the time. Winter temperatures can be mild and relatively warm (above freezing) or they can fall below zero and stay there for several days. A winter season may include several fluctuations between cold and warm spells or be relatively constant.

A blizzard is a specific type of winter storm characterized by sustained winds or frequent gusts of 35 mph or greater and falling or blowing snow that reduces visibility to less than ¼ mile; both of these conditions must be present for at least three hours to be considered a blizzard.

The non-blizzard version of a severe winter storm often begins with warmer air followed by very cold temperatures and heavy precipitation. An initial blast of warm air can cause temperatures to hover at the freezing point as precipitation falls, causing ¼ "to ½" ice (or more) to form on roads, trees, electrical lines, gutters and roofs. The precipitation begins as freezing rain and/or sleet and, as temperatures drop, turns to snow that adheres to the ice and forms heavy clumps that bring down power lines and trees. As the storm system moves through and winds kick up, temperatures drop and the heavy falling snow drifts across roads, ice damages trees and buildings, and road conditions becomes treacherous. This type of storm can drop several inches of heavy, wet snow across the county.

Another type of severe winter storm that can affect northwest Ohio begins with extremely cold weather (below 10 degrees Fahrenheit) and heavy snowfall, high winds, and extreme cold. A severe storm of this nature would likely pack sustained winds of 15-25 miles per hour, over ten inches of snow, and temperatures below ten degrees Fahrenheit for more than 24 hours. When this type of storm occurs, it can disrupt daily activities (work, school, commerce) for several days. Because the ice is not part of this kind of storm, property damage is generally limited because power lines are not destroyed and buildings are rarely damaged. The amount of snow, however, is challenging because of the extreme low temperatures.

Ice storms are another type of winter storm event that can impact the area. An ice storm occurs when damaging ice accumulations occur, typically when temperatures fluctuate above and below the freezing point and precipitation falls in the form of rain, freezing rain, sleet, and ice. This causes ice to accumulate on trees and utility lines, often resulting in loss of utilities and communications systems. As ice accumulates on roadways, travel also becomes dangerous. A significant ice accumulation is considered anything ¼ “or more.

Winter Storm Risk Assessment
Severe winter weather is a risk across all of Ohio. Winter storms range from short, mild bursts of snow and ice to multi-day events incidents with significant snowfall. In Seneca County, winter storms are a countywide hazard and can affect all areas and jurisdictions.

Winter storms often include multiple hazards, such as ice and snow. Ice accumulates as temperatures fall then turns to snow, creating a dangerous layer of snow-covered ice, increasing the potential for vehicular accidents. Road crews work continuously to clear roadways. Occasionally, ice storms occur independent of other winter weather hazards. Although rare, when this occurs it can have a significant negative effect on the community. Power outages are a frequent outcome of ice storms when precipitation accumulates on trees and power lines causing them to break. Extremely cold temperatures can also occur without other accompanying winter weather hazards, although this is infrequent. These incidents are typically very short, lasting only a day or two, and are an inconvenience to residents and businesses more than the direct cause of property loss.

The greatest risk from winter storms is the loss of utilities. Power outages can occur during ice storms or winter storms that include significant wind or snowfall. Because most electric lines are above ground, they are vulnerable to damage from wind and ice. While many electric providers have improved their distribution systems in recent years and new construction generally includes underground utilities, the main transmission lines are still above ground and vulnerable to weather-related damage. In spite of this, power outages are infrequent and generally not widespread outside of an extreme ice event.

Anticipated losses from winter storms include food and perishables due to power interruptions and minor economic loss due to short-term business closures. Except for the rare blizzard, damage to structures or infrastructure is not expected. Most winter storms are a brief

inconvenience, lasting no more than a few days. Casualties are extremely rare, with the exception of traffic accidents resulting from dangerous road conditions.

Table 2-33 describes the overall vulnerability of countywide property to worst case scenario winter storm damage. Vulnerability estimates were calculated at 2% of the county's property as a worst-plausible case scenario for widespread winter storm damage. This number was based on input from the planning team and loss statistics from a variety of past incidents.

Table 2-33: Winter Storm Scenario Vulnerability Analysis

Building Type	Number of Buildings	Exposure
Residential	363	$96,293,000
Non-Residential	103	$27,431,000
Critical Facilities	21	$5,591,000
Totals	*487*	*$129,315,000*

Local Winter Storm History

Seneca County has experienced 28 winter storm-related incidents since 1950, according to NCDC records. These incidents caused limited property damage and no loss of life.

Table 2-34: Seneca County Winter Storm History

Hazard	Incidents	Property Loss	Crop Loss	Deaths	Injuries
Blizzard	0	0	0	0	0
Extreme Cold/Wind Chill	5	0	0	0	0
Ice Storm	1	7.1M	0	0	0
Winter Storm	22	4.9M	0	0	2

The most significant winter weather event in Seneca County's history occurred in 1978. On January 27, 1978 the "Blizzard of '78" dropped more than eighteen inches of snow, high winds, and plummeting temperatures on Seneca County and much of northwest Ohio. Businesses closed for multiple days, some up to a week, and opening roads to maintain transportation was a major challenge. The National Guard was deployed to assist with clearing roads from the heavy snowfall and delivering critical supplies, such as heating fuel, food and medicine. At the time, local media reported at least nine fatalities. These occurred primarily when individuals attempted to walk to shelters and were overcome by cold. One resident was found severely frostbitten in his unheated home. While this storm occurred more than 40 years ago, it remains the most significant blizzard event in the county's history.

The county was also impacted by a major ice storm on January 5, 2005. Just two weeks prior, on December 22, the region was affected by a serious snowstorm that included ice and ten inches of snow. On January 5, freezing rain caused significant ice accumulation on top of the snowfall. Most of central Ohio, including the southern portions of Seneca County, was impacted. Major power outages occurred as lines and poles snapped from the weight of ice. Nearly 80% of electric customers lost power over a nine-county region, some lasting 10 days. Between these two storms, property damages in Seneca County alone were nearly $10,000,000.

2.3 VULNERABILITY ASSESSMENT

Although jurisdictions in Seneca County share many characteristics, each individual jurisdiction is somewhat unique in how it is affected by the identified hazards. This section describes how each jurisdiction prioritized hazards and describes their impact.

2.3.1 Seneca County

The top vulnerability in Seneca County was identified as infrastructure failure, which includes dam failure; road, street and highway deterioration; bridge and culvert failure; power and gas outages; and water, wastewater and storm water system failure.

The county has several dams, including the Class I Attica Upground Reservoir #2 and Class II Attica Upground Reservoir (#1) and Attica Wastewater Treatment Lagoon, all located in Venice Township. These structures lie south of Attica in the Honey Creek loop around the edge of the village. Both reservoirs could inundate sections of State Route 4 and natural habitat around Honey Creek if both totally failed; the wastewater lagoon is further away from the village and is located in an area that is primarily creek bottom and farmland and poses little risk to residential or commercial structures. Other Class I dams include the Beaver Creek Upground Reservoir in Adams Township, owned by the City of Clyde. This is located in rural land that is farmed but there are no structures in the inundation zone. Under the worst of conditions, North Township Road 196 and County Road 34 could experience some flooding for a brief period. In a full failure, North Township Road 34 to the west could be covered briefly. Republic owns a Class II wastewater treatment lagoon in Scipio Township but there are no residences in the primary inundation zone. A railroad track lies to the south but due to elevations and drop, water would flow away from the track. Mohawk Lake Dam in Eden Township is on a private country club; a breach would push water onto the golf course but not into residential areas. Countywide, vulnerability to dam failure is low because the potential inundation zones of these dams do not include residential or high population areas.

The county's risk for road, street and highway deterioration is high. Between movement of industrial products and grain and livestock farms, the roadways are filled with heavy trucks that transport goods in and out of Seneca County. In many areas, there is concern that trucks exceed the load limits for the pavements, bridges and culverts. There are no four-lane state highways in Seneca County so diverting heavy truck traffic to that type of roadway is not possible. The two-lane state highways in the county are relatively narrow roads with limited passing zones. This increases the risk for vehicular accidents and wear and tear on berms and shoulders. Many roads are vulnerable to flooding and flash flooding, as the terrain is rolling. Low spots flood and, because the flooded area is small, the state highway department does not close the roadway. Detours for are difficult due to bridge land roadway weight limits and detours can be lengthy and inconvenient. Drivers often create their own detours using township and county roads that far exceed load limitations, further damaging roadways.

Power outages are infrequent but can be lengthy. When they do occur, they are typically caused by failure of distribution lines or substation failure and generation problems. In extreme

weather events, poles can fall due to the impact of wind, ice, or snowfall. These outages can lead to the temporary closure of businesses, churches, and schools and disruption to food service, health care, and other critical operations. Persons with medical equipment needs, young children, and the elderly suffer the most when power is compromised. Households lose food supplies, restaurants and grocery stores lose inventory, and industrial facilities and agricultural producers lose raw and processed product. Without appropriate backup power sources, utility systems are unable to treat raw water, process wastewater, pump drainage and empty flooded areas. Critical public safety services lose communication system components and struggle to communicate with one another during response to emergency calls. As more people rely on cell phones and the Internet for communication, residents are impacted when they cellular towers are non-functional and there is no power source available to charge devices. In an extended power outage, access to financial institutions and credit card systems will be a significant challenge for individuals and businesses.

Many older homes have outdated or ill-maintained septic systems while other rural homes have systems that can become inundated with floodwater during heavy precipitation events. Most rural areas do not have sanitary sewers so residents must install and maintain individual septic systems. Soils are limited in suitability for septic disposal so maintenance of these systems can be a challenge. Rural homes also utilize private wells for water as public water systems do not extend very far outside incorporated jurisdictions.

Fuel shortages or distribution system failure can also impact the population. Heating systems, vehicles, and other equipment that rely on natural gas, propane, gasoline, or diesel fuel will cease to function when fuel runs out or is not available. In a long term outage or shortage, this can impact an entire community if businesses are forced to close because fuel is not available.

Hazardous materials spills and releases were identified as a concern in Seneca County due to the number of highways and rail lines in the county. The state highways that cross Seneca County are all two lanes; there are no four lane highways. Because these roads are heavily traveled and somewhat narrow, passing vehicles can lead to accidents. This is especially true when passenger vehicles attempt to pass slower moving commercial and agriculture vehicles. The county is also experiencing an increase in commercial traffic on smaller county and township roads as those vehicles seek alternate paths across the county. These roadways are not designed for heavy commercial traffic and are generally narrow with limited berm or shoulder. Commercial vehicles, especially those carrying hazardous materials, are more vulnerable to accidents on these roads as drivers navigate roadways not designed for large vehicles. Seneca County also has numerous railroad tracks, many of which pass through cities, villages, and incorporated areas. Hazardous materials are continually moving across the county on trains. Any significant incident involving hazardous materials could require evacuation of residents and impact water or air quality in the county.

Flooding, including riverine, flash, karst and storm sewer back up, was identified as the second highest concern for Seneca County. The county's flat terrain changes by slightly over two hundred feet from south to north, driving drainage toward Lake Erie as it crosses the county.

The Sandusky River is a large waterway that varies between deep and shallow. In many areas it has a rock bottom, so the mature river is unable to increase its capacity by developing additional depth and instead pushes out of its banks to hold additional water from upstream. Major ditches like Honey Creek, Rock Creek, Morrison Creek, Wolf Creek, and others fill higher and higher as the precipitation amounts increase and eventually push out of their banks just like the river, flooding the homes, farms, and businesses in their path. As rainfall amounts increase and storms become more robust, the ditch banks and fields deteriorate with soil eroding away filling the streams with sediment and tree or crop debris. In areas of karst structure, sink holes develop as the water amounts change the voids and spaces below the surface, creating areas that cannot be used for anything and destroying any structures built on that land.

Flash flooding inundates paved areas such as streets, roads, driveways, access roads and lanes back into fields and businesses, which can restrict access to residential and commercial property. Livestock can become isolated and farmers have no way to move them to a safer location. Bridges on rural roads are closed and often not re-opened for a week or two; bridge abutments and culverts are damaged by the water and must be replaced. Pavement and berms are washed out, ditches lose part of the bank, and field tiles are overwhelmed and break under the pressure of water, all requiring repair.

Heavy precipitation can also cause tree to weaken and fall, sometimes into waterways or across roads. Debris and fodder washes into the ditches, moves upstream and clogs waterways, culverts, and bridges. Ice clings to the debris and causes more jams in the winter months. The jams cause deterioration of bridges and bridge supporting structures, weakening the bridge. A buildup of waterway debris kills filter strips used for agricultural conservation and contributes to topsoil erosion. While no-till crops are more ecologically friendly in some ways, the fodder and debris from those crops contributes to the debris that clogs waterways. Trees grow along rivers and streams and drop leaves and limbs into the water, further contributing to the debris problem. The Sandusky River is also used for recreational purposes, which can lead to additional pollution when users leave trash and debris behind. Because the Sandusky River is designated as a scenic river by the Ohio Department of Natural Resources, any cleaning of the waterway must be done within very strict rules and requirements. Collaborative on these efforts must include conservancy districts, state agencies, and the US Army Corps of Engineers.

Storm sewer back up, flash flooding, and road flooding cause damage to residential structures across Seneca County. Damage includes basements filled with water that destroying appliances, furnaces, and water heaters. Some homes experience repetitive flooding and residents are unable to live in the home repeatedly due to flood damage in the living spaces.

Like flash flooding, karst flooding prevents farmers from planting fields and harvesting crops. Whether floodwaters are caused by heavy precipitation or karst water rising from underground voids, farmers cannot work the fields that have standing water. In karst areas, sinkholes develop as the underground voids and holes change. Farmers are losing productive acreage, and losing land to use as pasture for livestock. This negatively affects their income and costs

tremendous amounts of money to repair equipment damaged by hitting the unanticipated sinkhole.

All of Seneca County is vulnerable to wind damage. This wind can come in the form of a tornado or straight-line winds and occur independently or as part of a storm system. Barns, farm outbuildings, homes, and businesses are vulnerable to roof damage and destruction, including ripping the entire roof off, denting and removing siding, and damaging the main structure of the building. Hail destroys everything in its path, including cars, buildings, and people. Tall trees often fall onto structures, destroying the structure and contents. Debris blocks roads and driveways. Tractors, combines, and other farm equipment can also be destroyed. Livestock in pastures and barns are injured or lost, stranded amid debris, or isolated by standing water or damaged barns they cannot get into. Residential homes and non-agricultural businesses are damaged in much the same way. Debris removal, one of the most challenging stages of disaster recovery, must be addressed before rebuilding can begin. Unless the debris can be collected, hauled, and disposed of, often at an extremely high cost to the jurisdiction and property owner, the process recovery cannot even begin. There is a huge concern over sheltering the public in tornadoes and severe storms. Without adequate shelters, basements, and other places of refuge, county residents would be left in danger during storms. Mobile home owners, residents in homes without basements, group living facilities and multifamily units are all without shelters.

Land subsidence is a recent development. With heavier rains and more water in the rivers and streams, outer curves are undercutting the banks, creating unstable areas above that make up yards, fields, roads and streets, and recreational areas. As the undercutting continues, the land above falls away. This is dangerous to people and destructive to property. The karst substructure is changing and land is falling into sinkholes in some areas in north central Seneca County. What was a field one day becomes a ditch bank the next, and then it transitions into being part of the ditch bottom. Areas near the quarries in the north central part of the county are perceived as unstable and there is concern that the land will collapse or change due to constant blasting.

Water quality and groundwater compromise is a concern because it would negatively impact public water systems and private wells across Seneca County. Contamination of the groundwater is possible due in part to runoff from chemicals used by farmers, businesses, and homeowners. The runoff is high in phosphorus and nitrogen, which is a primary contributor to water quality issues. Seneca County is part of the Maumee River Watershed, which has been declared an impaired watershed due to ongoing water quality issues. A breech of the water supply would cause life threatening difficulty for those who need ongoing medical care, for food services and restaurants, and for institutions like schools, churches, and hospitals. Providing bottled water to the community would be incredibly costly while a bulk water distribution would be difficult. There is also concern that the quarrying operations in the county will open up an aquifer, making it unusable for a water supply.

While earthquakes are not of high concern, Seneca County is not unfamiliar with mild earthquakes. Many tremors have been felt over the years but none has caused significant damage. A stronger quake could, however, damage underground utility lines, pipes and tiles, and structures that have sub-surface floors. Other damage could potentially included roads and streets, bridges, culverts, and power lines. Building could be damaged, some seriously, although there are very few buildings more than four stories tall. Travel on damaged roadways and business operation without power and other utilities would be difficult. Farm assets could be lost or damaged, including equipment and livestock. In the most extreme incident, injuries and fatalities could occur.

Winter storms a primarily an inconvenience. The greatest cost to the community is increased personnel and equipment costs for road maintenance. In the most extreme winter weather events, power lines can fall and debris can block roadways. More often, ice on roadways requires application of road salt, brine, or grit and the snow requires plowing and moving. The expense to jurisdictions is high, especially when these events occur multiple times during a winter season. Sometimes businesses and institutions have to close, especially if ice, snow, and wind have caused power outages. The cost to the community in these situations is economic in the form of lost wages and production rather that rebuilding or repairing structures.

Drought and extreme heat are only dangerous when power is out. If air conditioning is available, most people can endure a few days of extreme heat. Should power be interrupted, the need for shelters would be high. Most Seneca County townships do not have a shelter that is available and almost none have one that is generator powered. The need for generators is significant.

If another invasive species like Emerald Ash Borer were to hit Seneca County, the damage to trees and the amount of debris after storms would be astronomical. For the most part, the EAB infestation has been handled and the affected trees removed. However, the cost of removal and disposal and impact of damage from trees that fell during storms was very high, including damage to buildings, vehicles, equipment, and residences. Regardless of the particular species, an infestation of a tree-destroying agent would be incredibly difficult and expensive.

2.3.2 Attica

Windstorms, straight-line winds and tornadoes, are the primary concern in Attica. The damage caused by the wind directly and from falling trees and debris can be extensive. Falling trees can block streets, which become a challenge fro the village to clear with a small staff and limited resources. The cost of debris disposal is high and can become a financial burden on the village. Structures and the surrounding properties incur damage to roofs, siding, and trees; this becomes an expense for property owners. Vehicles are sometimes damaged by water, hail, or flying debris. When the racetrack is in operation and visitors are present, the village's population can be four times greater than normal. Lack of storm shelters for visitors during severe weather events is a concern; there are some designated safe areas for spectators but it

is not known if these spaces are adequate. Other festivals and community events pose the same vulnerability.

Flooding is another concern in Attica. With Honey Creek flowing to the south and its tributaries draining into it from the north, the village is prone to riverine and flash flooding. The creek can come out of its banks when more than two inches of rain falls in a day; this water can drain slowly, leaving floodwater in the village for several days. State Route 4, which runs through the center of Attica, does not usually flood but the water comes close on the south side of the village and just outside the corporation limits. Streets inside the village flood but typically drain within six to twelve hours. While flooding in the living space of residential structures is rare, it is common for basements to flood with a few inches of water. With the worst storms, residents can suffer loss of furnaces, hot water heaters, and household appliances in basements. Some storm sewers can become overwhelmed, leading to small areas of water back up in basements. A few areas of the village are designated flood hazard areas, which are a concern to village officials.

Aging infrastructure is a concern for the village because of the cost of improvements. Maintenance of storm water and wastewater systems is costly, especially for small municipalities like Attica. Street maintenance is also expensive, especially as heavy rain and rapid drainage cause continual damage to berms and pavement. Some streets do not have berms or curbs because the cost is too high for the village. The reservoir that collects water for the village's water treatment plans is located outside village limits but maintenance of this facility is the responsibility of the village. The required emergency plans are in place for this structure; there are no residential or commercial structures in the identified inundation zone. Electric service is provided by private providers; these companies have completed system improvements in recent years but the electrical system will always be vulnerable to damage from wind and severe storms. The village completed major upgrades to the water treatment plant in recent years, at significant expense to the village and residents.

Water quality was identified as Attica's fourth concern. This is primarily because of the risk for contamination from algal bloom, phosphorus and nitrogen and the constant testing required to maintain a safe water supply. While drought and extreme heat exacerbate a water shortage, and algae thrives in hot weather, the village has little concern over drought.

Hazardous materials are of moderate concern. Because State Routes 4 and 224 run through the village, the number of vehicles hauling hazardous chemicals is high. There are no major turns to navigate on these roadways so the chance of accidents is low. The proximity of Honey Creek to these routes, however, is a concern. A major spill could contaminate the creek and the reservoir that supplies water to the village.

Village officials were less concerned with severe thunderstorms unless the storms are accompanied by high winds or tornadoes. In the most severe thunderstorms, damage can occur to homes and streets may flood. This type of damage is uncommon. Winter storms are primarily an inconvenience to residents. State Routes 4 and 224 are maintained by ODOT so the

village is responsible for maintaining residential streets. The most common impact of a winter storm is short-term business closures and schools closing for a day or two. An invasive species could destroy trees and damage structures as diseased trees fall, increasing the village's vulnerability to wind damage. The village continual monitors trees on public property and trims or removes them as necessary.

Drought and extreme heat are not considered high risks for the village. Unless electricity is compromised for an extended period of time, the village can withstand this type of incident. The water system is supplied by Honey Creek and officials do not anticipate a situation where that supply would not be adequate. Earthquake is also considered a very low risk. While this hazard is possible, there is no known history of earthquakes nor are does the village have multi-story buildings that would be at risk.

2.3.3 Bettsville

Flooding is the incident most likely to cause damage in Bettsville, especially precipitation events that include long-lasting rainfall or that occur during the winter months when the ground is frozen. The village is susceptible to riverine and flash flooding when more than an inch of rain falls in a 24-hour period. Residential and commercial areas in the vicinity of Wolf Creek, northwest of SR 12, and Perry Lynch Ditch experience flooding. This area includes the village administration building and any homes on the southeast side of SR 12. Gravitational drop facilitates flooding here as water drains toward Wolf Creek. Natural turns in Wolf Creek and Perry Lynch Ditch are prone to ice jams and debris clogs, backing water up into property. The flooding is significant enough that many streets and SR 12 are covered within the village. The highway is rarely closed for this type of flooding so semi-trucks and large vehicles drive through the standing water. This disrupts the downtown and adjacent residential areas by creating wave-action that damages pavement, curbs, storm drains, and sidewalks. Some neighborhoods need larger culverts and bridge spans to help prevent build up of debris, ice and crop fodder. As these structures currently exist, debris collects and worsens the flooding. Water reaches additional property and can affect living quarters as well as basements. Homes experience living space inundation and damage to furnaces, water heaters, and other household appliances. The storm sewers are overwhelmed, buildings and homes are isolated, and berms, curbs and sidewalks are damaged by water washing them away.

Infrastructure failure is also a high concern for the village. With quarries to the immediate southeast that frequently blast for stone and other raw products, there is concern about the stress placed on underground utilities due to the subsurface movement. Water and wastewater lines that are constantly being jarred, old gas regulators in homes that have not yet been replaced, and the nearby groundwater source are all vulnerable to blast damages. Houses are located on bedrock without basements and the continual movement can create unusual wear and tear on the structures. The blasting, if it expands to deeper-held types of rock, could seriously stress any solid structures below or slightly above the surface. Also related to the quarry business, village officials are concerned about road and street wear and tear due to

heavy and constant truck traffic. When combined with heavy rain and high soil saturation, there is concern of serious roadway deterioration and failure.

The quarry also presents some risk to the water supply, including public fear that the groundwater will be negatively impacted and that the water collection, treatment, and distribution system will fail. While the groundwater source used for Beltsville's wells is sufficient, there is concern that future mining will open the aquifer and drain it, rendering the wells insufficient and eventually dry. While minimum buffer zones around the wells are maintained, officials are concerned that those zones are not sufficient and will eventually fail to protect the water source. Because some residents have individual wells and the village's public water utility depends on wells, this is a high concern.

The karst substructure that is part of the limestone deposits that feed the quarry is also a concern in Bettsville. The extent of the karst substructure is not fully known so village officials continually monitor the development of sinkholes, ditch bank deterioration, or water table changes. Karst flooding occurs in a paroxysmal manner, rising after most flooding has resolved. Karst mapping is not always detailed enough to earmark vulnerable parcels so village officials feel they must constantly monitor any of these possibilities. Karst flooding can inundate homes, destroy roads and sidewalks, and heave parking lots. Large trees can fall inexplicably, and sinkholes can open without warning.

Bettsville officials are moderately concerned about damage from tornadoes, wind and severe thunderstorms. Any of these events can cause significant wind to damage roofs, siding, vehicles and other equipment. Trees and utility lines are blown down and mobile homes can be destroyed or heavily damaged. Disposing of debris after these incidents is very expensive for the village, including the cost for personnel, equipment, and disposal fees.

Bettsville is concerned about the hazardous materials moving through and around the village. Farms surround the village. During the agriculture season, farm chemicals are continually transported through the village. The state highway is narrow within the village and left turns, slow-turning vehicles and pedestrians all increase the risk of an accident that leads to a spill or release.

Drought and extreme heat are fairly common, but other than causing water supply difficulty for firefighters, the water supply is not very affected. As long as the power stays on, elderly residents are able to withstand the heat and it is primarily an inconvenience.

Winter storms can increase the jurisdiction's expense due to increased personnel costs and additional wear and tear on equipment. There is rarely any physical damage to buildings or property. Some businesses may be forced to close temporarily, causing loss to employees and owners, and schools close for the day. Aside from winter weather events that include ice and power outages, the actual damage from winter storms is low.

Earthquake is unlikely in Bettsville. If this did occur, damages could include underground infrastructure, roadways and bridges, culverts, and sidewalks. Stone and masonry homes would be cracked and need significant repair. The likelihood of a strong quake is very low.

2.3.4 Bloomville

Bloomville officials are most concerned with infrastructure failure, specifically with the village's water, wastewater, and storm sewer systems. The wastewater system is gravity fed to a lift station at the treatment plant and a generator is in place to kick in if power is out. If the pump or generator were to fail, however, the effects would be disastrous. Developing redundancy for this system is a high priority. Electric service is provided by AEP; outages are infrequent but severe wind or ice could make pole replacement necessary. Because the village is small, Bloomville would likely be a low priority for service restoration. Power outages are problematic because the village does not have a generator for village hall or community center, which both serve as critical facilities during a disaster. The village has the physical space to shelter residents but communication and other important services would not be accessible without an alternate power source.

Winter storms that include ice, snow, and wind make it difficult for Bloomville to maintain the streets and roadways. State Route 19 passes through the village from north to south and is maintained by the Ohio Department of Transportation. Other streets in the village are the responsibility of the village; in severe winter weather events, this task can be very difficult for the village's small street department.

Windstorms and tornadoes are destructive. Most buildings in Bloomville are frame construction and highly vulnerable to rotational and straight-line wind damage. Shingle roofs are torn apart, siding is bent and damaged, and structures can be blown apart. The village has some history of high wind events and damage to homes, mobile homes, and pole buildings. Every year, the village creates an emergency fund to remove diseased and weakened trees to prevent or reduce wind damage. Retrofitting and strengthening of village facilities, however, has not been completed because funding is not available. Severe thunderstorms include wind as well as hail, freezing rain, and sleet that can damage power lines, roofs and homes, siding and vehicles. This is not uncommon in Bloomville although the damage does not always show in county statistics because much of it is covered by insurance.

Flooding is not a high concern in Bloomville because the village has a high elevation in comparison to the rest of Seneca County and Honey Creek, the nearest waterway, is a good distance away. Historically, flooding on Honey Creek has not reached the village. Bloomville does experience minor street flooding and some homes will get water in basements if there is excessive rain in a short period of time. As long as the storm sewer system is maintained and the pumps are powered, that flooding does not cause structural damage. Should the pumps or generator fail, that result would be extensive damage.

The village is moderately concerned with hazardous materials spills and releases due to the presence of farm chemicals in and around the village. Trucks that transport chemicals travel through Bloomville daily on State Route 19. There are no intersections to cause crashes so the concern is somewhat low.

There are some breaks in underground drainage tiles and officials are investigating any connection to karst substructure or instability. An earthquake could make this worse, and if tiles are old, fragile clay, it would not take much force to cause significant damage. As part of this issue, officials watch for sinkholes and/or ditch bank changes that indicate karst formation changes.

Officials are not highly concerned about drought and extreme heat because power outages are infrequent and water supplies are strong. There are no dams or levees in the village.

2.3.5 Fostoria

Fostoria officials are very concerned about flooding. All four quadrants of the city have areas than flood at various times. On the south side, the areas near the reservoirs as SR 12 heads toward Findlay all lie very low and standing water is common after heavy or extended rainfall. Flooding also occurs along the East Branch of the Portage River just into Hancock County. The water is deep enough to cover bridges and culverts and, in the most serious instances, can necessitate rescuing people from stranded vehicles. A residential area in the northwest quadrant of Fostoria also floods regularly. Homes and basements are impacted, damaging appliances, furnaces and water heaters as limiting use of the property for a short period. This area in the northwest includes the part of Fostoria located in Wood County along the East Branch of the Portage River. The residential area in the northeast sector of the city is along the South Branch of Muddy Creek. Homes in this neighborhood also flood, including basements and first floor living spaces. In all of these situations, streets flood, cars are stranded, basements are flooded, appliances and home systems are lost, and people sometimes have to evacuate. Streets are damaged when berms wash out and pavement crumbles and sidewalks are damaged by the saturation of the soils below. The city's many underpasses flood and traffic must be diverted; it is not uncommon for cars and other vehicles to become stranded in the flooded viaduct. The city's storm water system is inadequate to handle the amount of rain and the drainage; this can cause back up in homes and additional damage. Streets and bridges are impassable and businesses have to close. This flooding affects well over half of the city when rainfall is excessive or long lasting and is a major destructive event and a long-term disruption to business and transportation.

Fostoria officials are quick to identify crumbling infrastructure as a serious concern. Constant flooding contributes to damage on streets, highways, bridges, culvers, berms and sidewalks. The continual nature of the flooding allows for little repair to occur and, since it takes only a couple inches of rain for problems to begin, the situation with infrastructure is ongoing. Many of the sewers are still combined sanitary and storm sewers because the city has not been able to afford separation. They are engaged in ongoing work with the Ohio EPA to address sewer

plant insufficiency, pump failure, capacity and overflow into streets, basements, and other property. They have used various grant programs to help with the work but their need is high in the entire city and thus the expense is devastating for the small city. The wastewater treatment plant must be replaced and officials feel they will not meet the EPA 2024 deadline to complete that project due to funding deficiencies.

The city owns several dams. Lake Daugherty Upground Reservoir #1, Lake Mottram Upground Reservoir #2, Lake Lamberjack Upground Reservoir #3, Lake Mosier Upground Reservoir #4, Fostoria Upground Reservoir #5, and Veteran's Memorial Reservoir #6 are all in Hancock County along the East Branch of the Portage River. The Ohio EPA has determined that Lake Mosier Dam is unstable. Reservoir #5 and Veterans Memorial Reservoir are in need of significant work to strengthen the dams. All dams have emergency plans in place. The Lake Mottram and Lake Lamberjack dams have inundation areas that include residential areas. For those two dams, failure could result in the loss of life and destruction of all area property. For the others located south of SR 12, inundation zones do not include homes or other structures. The area would suffer field and land flooding, but there would be no loss of life.

Water lines in Fostoria are in bad condition, including lead content and some brick. The brick prevents proper pressurization of the lines. There is infiltration of soil and other particulates into the water being distributed. This can sometimes be detected by an earthy smell to the water, most commonly experienced in the fall. This is worse in dry spells when the pipes are less filled with water and the sediment is part of the water that reaches homes and businesses.

Alternate and backup power sources are a concern for Fostoria officials. Most communications equipment, utility systems, and critical city buildings do not have backup generators. When power fails, the city is hard pressed to continue services, especially if an outage lasts more than a day. Cell towers are insufficient for the load of phones dependent upon the transmission and making calls is difficult and not dependable. Other communications systems that need power are out of service, including two-way radio systems and other telecommunications.

Severe thunderstorms are a high concern because the city lacks the ability to shelter a large number of residents. Across Fostoria, there are hundreds of mobile homes and homes without basements. Many of these residents would need a safe haven in severe storms, evacuations, and other catastrophic events. The city does not currently have a strong sheltering plan in place. Some former shelters were in churches that have closed; others are no longer designated because they don't meet ADA rules or aren't accessible for other reasons. Other problems during severe storms include fires caused by lightning, huge amounts of debris from fallen trees, damage to homes and vehicles, and downed power lines. Ditches and waterways are blocked by crop fodder and yard debris, which slows drainage as storm basins are clogged. It isn't uncommon for streets to be closed due to fallen trees and debris. Tornado and wind have a similar impact. All of these storms cause wind damage to roofs, siding, home structures, and commercial buildings. Roofs are destroyed, siding is damaged, and some buildings are totally devastated.

Hazardous materials spills and releases are a high concern because of the multiple state highways and railroad tracks that cross the city. Fostoria also has numerous industrial facilities that utilize hazardous chemicals in their regular operations. A release could involve liquid, gas, or an explosion requiring evacuation. The city lacks adequate emergency shelters for this type of situation. Re-routing traffic, maintaining a safe environment for school children, continuing hospital operations, and evacuating residential and commercial areas are all high on the list of concerns for officials.

Water quality is a serious concern, mostly due to the city's deteriorating water treatment and distribution systems. Fostoria's water supply from the East Branch of the Portage River is adequate but the handling of raw water is cause for concern. There is concern in drought for field fires and loss of power, and thus loss of air conditioning for elderly and special needs populations. If generators and shelters were more available, those concerns would be diminished.

Winter storms are expensive because of the need for constant plowing and clearing of the snow. Winter weather events rarely cause structural damage to buildings but commerce and daily operations of schools, churches, and businesses can be brought to a stand still. People are unable to get medical care, visit retail centers, go to work or do other activities of daily life. Most of this is inconvenience rather than catastrophic damage.

An earthquake is unlikely but if it were to occur with any significant strength, underground utilities would be damaged or destroyed. This includes water, sewer, and gas lines. Sidewalks, streets, curbs and drainage tiles would also be impacted. Homes could be structurally compromised and many commercial buildings would have significant structural damage.

Invasive species seems to be the most manageable hazard to Fostoria officials. They have diligently dealt with Emerald Ash Borer and deterioration of ash trees over the past decade. They regularly trim and manage trees, and residents do the same. City officials feel they have the capacity to manage an infestation although a severe wind event at the onset of a new infestation would be incredibly expensive and demanding of personnel and equipment. Land subsidence was considered a very minor concern.

3.6 New Riegel

New Riegel officials identified flash flooding as their top concern for the village. Curbs are deteriorated or too low and water is able to collect on sidewalks and in yards after heavy rainfall. The two state highways that intersect inside the village are slightly elevated, draining storm water onto adjacent properties and sidewalks. Some homes get water in basements and streets can experience minor ponding of water. While there is not a large amount of flooding, there is some slight collection of crop fodder and leaf debris in storm sewers during and after heavy fall rain.

Transportation of hazardous materials through the village is a concern. Safety of residents, including children who attend school inside the village, are vulnerable to injury if a truck carrying chemicals were to be involved in an accident inside the village. An airborne or large amount of liquid substance could require evacuation of the school and residential neighborhoods.

Infrastructure failure in the form of power outages could cause damage. Many homes with basements have sump pumps to keep the rainwater out; if the power fails and the sump pumps cannot function, many basements will incur damage, including the loss of furnaces, water heaters, and household appliances. The village has one generator to power critical services. Because New Riegel contracts with the county wastewater treatment, the village is not directly responsible for the resilience of that system. Water is provided by individual wells and there is little perceived vulnerability to water problems. There are no dams, reservoirs or lagoons in the village.

Severe storm damage consists of tree debris and crop fodder. Constant attention to trimming trees and managing tree disease has helped minimize the effects of the Emerald Ash Borer on New Riegel. An infection of other hardwoods could pose a problem after severe storms if debris were extensive due to dead and weakened trees. Wind damage is common, most frequently in the form of roof and siding damage, hail damage to vehicles and siding, and downed trees, power lines, and utility outages. The village's outdoor warning siren is adequate to warn residents so long as the power is working and the siren is set off in a timely fashion. Sheltering after tornadoes or other severe storms is a concern. Some homes without basements and a few mobile homes do not have any individual shelter. The school could be used for a shelter but is not generator equipped.

Earthquakes were not considered a significant risk for the village. If an earthquake did occur, buildings would likely experience some light shaking. In a more serious event, underground pipes and other infrastructure could be damaged, including cracked and damaged pavement, broken curbs, downed poles, and damaged sewer lines.

Winter storms cause inconvenience and nuisance in New Riegel. It is difficult to keep streets and driveways open from drifting snow, but as long as the power stays on, damages are minimal.

The water supply for wells is strong and dependable and the risk of failure is low. Village officials did not perceive high temperatures and drought as a high risk and felt the village would be able to provide shelter, water, and protection to residents if those incidents did occur.

New Riegel does not have any known history of land subsidence or sink holes.

2.3.7 Republic

Riverine and flash flooding is the greatest risk for Republic. The village is situated between two major county streams, Rock Creek and Morrison Creek. Some streets, fields, yards and other property flood quite easily. State Routes 18, 19, 67 and 162 cross the village; because the highways are slightly raised to maintain use during heavy precipitation, the water from the highways drains onto adjacent property and causes flooding. Village officials believe that some tiles under the highways are broken and worsen this flooding. Most homes have basements that flood during these instances and residents can lose water heaters, furnaces, and other home appliances. Streets and residential areas on Jefferson Street, Broadway Street, Madison Street, and near the cemetery are easily flooded. While the streets are rarely covered with water to the point they are closed, the properties are impacted by floodwaters and use of and access to the property is severely impaired. There is ponding water due to elevation of highways and natural slow drainage that often affects homes on SR 18 to the north; across SR 18 west; on SR 19 as it enters the village on the north, between SR 162 and SR18 in the northeast quadrant, and south of Jefferson Street on the eastern side of the village along East Street between SR 162 and SR 19. At times, the flooding is made worse by crop and tree fodder clogging storm sewers and culverts. Some effects of the Emerald Ash Borer infestation remain in the form of weakened and dead trees that fall during times of extreme soil saturation. If another infestation of trees were to occur, weakened maples, oaks, and other deciduous trees would fall just like the ash trees, causing the same problem. The village operates its own storm sewer system; most components are in fair to moderate condition but some improvements are needed. This includes repairs to broken sections, replacement of tiles and culverts that are broken or in ill repair, and increased capacity to handle the water that drains off the elevated highways.

Infrastructure failure is a concern the village shares with other county jurisdictions. Republic does experience power failures, although less frequently now than in prior years. Fallen power poles and lines cause most outages. A new tree disease could make this worse if it caused more trees to fall on lines. The electric provider has made significant improvements over the past decade to harden electrical service. The village has four generators at critical facilities such as the water and wastewater treatment facilities, village hall and the police station and the fire and township house. The village owns its electrical distribution line but contracts with a private company for maintenance. Significant damage to this system could be costly to the village and/or the contracted company. Republic has three water wells and a tower with 100,000 gallons of stored water. While they could last two or three days without a water source, they are vulnerable to a groundwater contamination. A wastewater lagoon, classified as a Class II dam, is located outside village limits to the west. It is an earthfill upground reservoir; the inundation zone is far enough from homes that it is highly unlikely any failure would affect homes in the village. The village does have an emergency plan for the facility. Streets, sanitary and storm sewers, utility distribution lines, and the reservoir are expensive for the village to maintain and if they were to have a storm that damaged all of those, simultaneous repair would be nearly impossible for the small village.

Hazardous materials spills and releases are a significant concern for Republic. With four state highways crossing the village and the location amid densely farmed agricultural land, many chemicals are transported through the village every day. A railroad line crosses on the south end of the village, increasing the risk of a spill or release. Since homes and businesses are located equally close to multiple highways or rail lines, the chance of a plume exposure is high. A gas station sits at the juncture of SR 18 and 162, and the “stop” sign for SR 18 is often ignored, causing crashes at that site on a frequent basis. An out-of-control vehicle could easily damage the fuel pumps, causing a fire or explosion that would affect half the homes in the village. There is a grain elevator at the end two streets near the railroad; this facility could pose a danger in the form of a grain fire, explosion, or spill. Farm chemicals like anhydrous ammonia are transported through town every day during early growing season, and a collision between farm equipment and vehicles on the highway could be deadly and damaging.

Wind damage can be very damaging in Republic. There are many mobile homes and wood frame structures. Roof, chimney and siding damage are common; mobile homes can be swept off their foundations or destroyed much more easily than frame structures. One very high church steeple is a risk to nearby buildings if it were to collapse or be damaged during high wind events. The shelter location the village would use in a tornado or severe storm is a pole building structure used as a maintenance shop for village equipment. It would be vulnerable to wind damage and tornado, and has no underground area for safety. Many Republic residents do not have basements that are safe during storms because the basements will flood in heavy precipitation and there is no other wind-proof building used as a shelter. Others have no basement or other storm shelter.

Tornado damage in Republic could be devastating. Most homes and public structures are older frame constructed buildings with shingle roofs and traditional construction. These would all be highly vulnerable to complete damage by rotational winds or strong straight-line winds.

Winter storms, unless accompanied by ice and wind, are more of a nuisance than a disaster. While heavy snowfall accompanied by wind, sleet, freezing rain, and ice can interrupt utility lifelines and commerce, causing traffic accidents and loss of electricity, most storms are an inconvenience. Significant ice or wind can change that completely, however, and cause a much more serious incident. Because of the state highways, the village is rarely without ingress and egress but city streets can be hard to maintain when wind blows snow and streets are ice covered.

Republic sits on the edge of karst formations in Scipio, Thompson, Reed and Adams townships. While the village does not currently have any history of sinkholes or subsidence, officials are investigating the cause of what they believe to be drainage tile collapse that causes flooding. As more karst issues are discovered in the area to the northeast, the village intends to diligently monitor stream banks and areas that pond for evidence of karst characteristics.

Earthquake is unlikely to occur in Republic but mild tremors have been felt in Seneca County in the past. Should a significant quake occur, utility lines would likely be damaged. Power lines,

water lines, wastewater and storm sewers, and the wastewater treatment lagoon could all incur heavy damage.

The village does not perceive itself as vulnerable to drought and extreme heat. As long as power is available, there is adequate shelter for residents. The water supply is ample and while a contamination could negatively impact it, for most incidents the water supply would be sufficient.

2.3.8 Tiffin

The City of Tiffin has numerous problems due to flooding; these issues result from heavy precipitation, ice or debris jams, or storm sewer insufficiency in the context of heavy runoff. Because the Sandusky River flows through the city from the southwest to the northeast, these problems impact residential, commercial, and industrial areas alike. Tiffin is downstream from half of the Sandusky River Watershed area and the river is deep and full as it runs through the jurisdiction. Morrison, Willow, Rock, and Gibson Creeks feed the Sandusky River inside the city, full with water drained from thousands of acres to the south and east and are raging with runoff after heavy precipitation.

A railroad viaduct along the railroad tracks that cross the city frequently jams with ice or debris and prevents the river from flowing. This worsens flooding in the neighborhoods along the river and damages more property. Areas near Washington Street, which is a major city through street, frequently flood. At times, the log and ice jams have been so serious that the US Army Corps of Engineers has had to blast the jam to break it. Because Rock Creek feeds into the Sandusky River near the railroad viaduct, bringing runoff from as far away as Venice and Reed Townships, this is location an ongoing problem. This back up affects properties to the east, including Heidelberg University, and floods cars and parking lots, making buildings inaccessible, and preventing students from reaching their dormitories and classrooms. The debris and ice carried by the creek collects at the juncture of the creek, river and viaduct. This causes excessive flooding that impacts residential streets and structures, businesses, and government and private services and institutions. In addition to the university, residential areas can become inaccessible and basements often flood. When flooding occurs due to ice and debris jams, the city is at a distinct disadvantage as they are required to allow the Sandusky River Conservancy to manage the problem and are not allowed to take action to alleviate the flooding.

Some areas of Tiffin are prone to flooding because storm sewers, some still combined with sanitary lines, become overwhelmed and back up into homes and other buildings. The city is aggressively pursuing options for assistance with sewer separation and improvement and recently accepted a $13M interest free loan to begin improvements. These funds are not sufficient to complete all the necessary projects but provide a good starting point.

Water management in the form of retention, detention, elevation of structures, and channelization could effectively change the flow of water in some locations where floodwaters reach streets, homes, and businesses. A more robust building code with local enforcement

could assist in preventing some of the flood damage to parking lots, residential homes, and commercial structures. Enhanced zoning and development codes could help prevent more structures from being built in areas that flood or regularly incur damages. Residential code enhancement could help take structures out of areas that flood and require that flood-prone areas be used as natural habitat or for other purposes not vulnerable to flood damage.

City officials are concerned about the impact of flooding on public safety forces and their access to the city. During high water events, access to some of the critical facilities is limited and routes to potential emergency sites are blocked by floodwater. Some bridges and streets are flooded and inaccessible. Areas along the river, especially on the south and east banks, are especially vulnerable to this issue and can be difficult to reach in high water incidents.

Flooding impacts households and residents across Tiffin. Basement infrastructure such appliances, furnaces, and water heaters can be destroyed. In some homes, the primary living area can experience standing water, making the home uninhabitable. As a college town with two universities, basements in privately owned rental homes are often used as living areas for students. The loss of personal items can be devastating and costly and finding alternate housing is sometimes very difficult. Flash flooding takes a toll on streets, washing away berms and overwhelming storm basins and driveways and alleys or delivery docks are damaged. When roadways are flooded, vehicles often become stranded when people attempt to drive through high water. The clean up from flooding is extensive and costly; in the most serious incidents, properties and contents damaged by floodwater can breed mold and disease, creating a public health concern.

Tiffin officials are actively engaged in a long-term plan to combat infrastructure failure. Undersized sewers and insufficient wastewater treatment plant capacity make it difficult for the city to assure functional lifelines such as power, fuel, and sanitation to residents. Storm damage from wind, falling trees and debris accumulation, and the lack of back-flow prevention results in structural damage, power outages, power surges, and flooded living and business areas in buildings. While water treatment/distribution and electricity are provided by private entities, the city is concerned about hardened equipment and distribution lines and system redundancy should there be a widespread devastating storm in the region. They currently experienced frequent short-term power outages that interrupt business, make home medical equipment non-functional, and interrupt daily activities. Schools and universities have to shut down and the cost to food service, retail, industry, and manufacturing is significant. The city does not have sufficient generators to maintain lifelines in a extended utility outages.

Another type of infrastructure failure that is a concern in Tiffin is dam failure. The city has two dams, the Bacon Low Head Dam on Webster Street and the Ella Street Low Head Dam on the south end, that could fail or be overtopped by heavy river flow. If that were to occur, damage would be severe. Other factors would contribute to this situation but failure of the dam would place additional debris in the river and would increase the flow temporarily. Neither dam retains water into a reservoir area, but both are concrete structures that could place additional damaging concrete debris into the rapidly flowing water.

City officials recognize that runoff high in phosphorus and crop nutrients could endanger their water supply. Located in the middle of thousands of acres of productive farmland, the river and streams could experience algal blooms. Contaminated rivers could feed the water supply with toxins that would require expensive and extensive treatment. Worst-case scenarios could show contaminated ground water, impacting wells and non-waterway-based water supplies. The wells and reservoirs that supply the water system could be part of those affected sources.

City residents and businesses are vulnerable to wind damage. Touted by the windmill advocates as “the windiest area in Ohio”, buildings experience damaged roofs, siding, and broken glass after strong storms that involve wind. In recent years, the city has experienced tornadoes and straight-line winds strong enough to destroy homes and other buildings. Although trees are trimmed on a regular basis, the city has many old and large trees that are a hazard in high wind events. Oftentimes the storms in which these wind events are embedded also include hail, lightning, and heavy precipitation. The cost of debris management, including removal and disposal, is phenomenal and often devastating.

Tiffin officials do not feel they have sufficient emergency shelters for residents at risk of wind or flood damage. There is no large area designated as a shelter and no community structure exists to fill that capacity. Many government buildings are older structures that lack large open areas for a community shelter. The city has mobile homes, homes without basements, and a commercial/industrial sector that employs large numbers of people. Many of these individuals are vulnerable when there is nowhere to go during a significant wind or tornado event. Evacuation shelters and comfort stations are difficult to locate because few structures meet the criteria to serve in that capacity.

The potential for hazardous material spills was identified as a hazard in city. A railroad passes through the center of the city and exposes residential, industrial, commercial and manufacturing zones to a potential derailment or chemical release. This railroad intersects both universities in Tiffin, making staff and students vulnerable to a rail incident involving hazardous materials. Numerous state highways wind through the city; Tiffin also has numerous one-way streets and sharp turns that increase the potential for a hazardous materials spill. A spill could require residents to evacuate, damage property, and interrupt commerce and daily activities. Chemicals could leach into storm sewers and spread across the area. Access to medical care, education, and water supplies could be severely impaired. With the Sandusky River and multiple ditches passing near these highways and railway, a spill into a waterway could become incredibly serious and extending well beyond county lines. The numerous chemicals in use on both university campuses could also cause a hazardous materials incident. Crop dusters who fly out of the local airport could crash and cause significant death and destruction if loaded with agricultural chemicals.

Tiffin officials did identify drought or extreme heat as a significant concern. The local water supply is sufficient to maintain availability even during shortfalls. They do see vulnerability in not having community shelters to serve residents during power outages in extremely hot

weather and feel that grass fires and other non-structural fire risk is increased during hot and weather periods.

Earthquake was considered a low vulnerability because there are no extremely tall or high-rise buildings in the city and the risk of an earthquake is very low. That said, a moderate earthquake would damage underground utilities, power lines, water towers, and communication towers. Underground pipelines would easily be ruptured and explosion and fire would be almost for certain. Streets could crumble, parking lots be destroyed, and block or masonry buildings be cracked.

Officials felt that the risk for land subsidence is not currently a high concern but could increase over time. Natural changes to the river could lead to undercutting on outside curves and put riverbank property at risk. Sedimentation in the river and other streams could impact proper drainage. If ditches and streams are inundated with heavy runoff repeatedly, banks could erode and disappear. The presence of a new invasive species could destroy trees and worsen debris issues in waterways, further impeding drainage. If karst water levels surge, karst flooding could extend into areas in or near the city even though this has never happened. Sinkholes could develop on occupied land as well as in parks, fields, and natural habitat.

Winter storms are an inconvenience to the city but rarely cause property damage. Streets require extra attention and cost to maintain and businesses and schools close due to difficult travel and loss of utilities during ice and wind events. The combination of cold, ice, freezing rain, sleet, heavy snow, wind, and blowing and drifting snow is miserable for residents, dangerous for special needs populations and difficult to manage. If combined by a power outage, it can be deadly, especially if public safety forces are unable to reach callers.

2.3.9 Vulnerability Summary

The table below provides a summary of the hazard rank developed by each jurisdiction.

Table 2-35: Jurisdictional Vulnerability

Jurisdiction	Drought/ Extreme Heat	Earthquake	Flood	Hazardous Materials	Infrastructure Failure	Invasive Species	Land Subsidence	Severe Thunderstorm	Tornado/ Windstorm	Water Quality	Winter Storm
Seneca County	10	8	2	4	1	11	5	7	3	6	9
Attica	9	10	2	5	3	7	N/A	6	1	4	8
Bettsville	9	11	1	7	2	10	3	6	5	4	8
Bloomville	8	10	5	7	1	11	6	3	2	9	4
Fostoria	8	9	1	4	2	10	N/A	3	6	5	7
New Riegel	8	10	2	1	3	9	N/A	5	4	7	6
Republic	9	11	1	2	4	8	5	6	3	10	7
Tiffin	10	8	2	4	1	11	5	7	3	6	9

2.4 RISK ANALYSIS

To determine Seneca County's overall risk, each hazard was evaluated and scored based on common criteria: frequency, response duration, speed of onset, magnitude, and impact on businesses, people, and property. This section describes the rating scale used by the planning team.

Frequency

Hazard events that occur regularly are a higher risk than those that occur infrequently.

- 1 = None/Once in 100 years
- 2 = Low/Once in 50 years
- 3 = Medium/Once in 25 years
- 4 = High/Once in 1-3 years
- 5 = Excessive/More than annual

Response Duration

Response duration is defined as the amount time the response to a particular hazard is anticipated to last.

- 1 = Less than ½ day
- 2 = Less than 1 day
- 3 = Less than 1 week
- 4 = Less than 1 month
- 5 = More than 1 month

Speed of Onset
Speed of onset addresses the amount of advance warning before each hazard occurs.

- 1 = More than 24 hours
- 2 = 12-24 hours
- 3 = 6-12 hours
- 4 = Less than 6 hours
- 5 = No warning

Magnitude
Magnitude was evaluated based on the percentage of the population that would be affected by an incident.

- 1 = < 10% of population affected directly
- 2 = 11-25% of population affected directly
- 3 = 26-50% of population affected directly
- 4 = > 50% of population affected directly

Business Impact
Business impact refers to the potential economic impact a hazard event is likely to have on a community. The definition of each score refers to the amount of time critical facilities are likely to be shut down in the impacted community.

- 1 = Less than 24 hours
- 2 = 1 week
- 3 = At least 2 weeks
- 4 = More than 30 days

Human Impact
Human impact is defined as the number of lives potentially lost for a particular hazard.

- 1 = Minimum/Minor injuries
- 2 = Low/Some injuries
- 3 = Medium/Multiple severe injuries
- 4 = High/Multiple fatalities

Property Impact
Property impact is defined as the number amount of property potentially lost during a given hazard event.

- 1 = Less than 10% damaged
- 2 = 10-25% damaged
- 3 = 25-50% damaged
- 4 = More than 50% damaged

These factors were assigned values as described and rated against anecdotal analysis based upon history and past incidents. This scoring mechanism resulted in very similar assessment of

risks and vulnerabilities for the countywide vulnerability analysis. Table 2-36 provides the composite countywide risk analysis of these hazards.

Table 2-36: Risk Analysis

Hazard	Frequency	Response Duration	Speed of Onset	Magnitude	Business Impact	Human Impact	Property Impact	Score	Rank
Drought/Extreme Heat	1	1	1	1	1	1	1	7	10
Earthquake	1	2	5	1	2	1	1	13	8
Flood	4	3	3	3	2	2	3	20	2
Hazardous Materials	3	2	5	2	2	2	1	17	4
Infrastructure Failure	5	4	4	4	3	2	3	25	1
Invasive Species	1	1	1	1	1	1	1	7	11
Land Subsidence	2	3	2	2	1	2	2	14	5
Severe Thunderstorm	4	2	2	2	1	1	1	13	7
Tornado/Windstorm	4	3	4	2	2	2	2	19	3
Water Quality	1	3	2	2	3	1	1	13	6
Winter Storm	3	2	2	3	1	1	1	13	9