

2.0 HAZARD IDENTIFICATION AND RISK ASSESSMENT

The purpose of the Hazard Identification and Risk Assessment (HIRA) is to identify the number and frequency of disasters in Seneca County and the risk to people, property, and structures resulting from those hazards. This process allows officials and residents to better prepare for incidents when they occur. The HIRA is addressed in four sections. The County Profile (2.1) provides demographic and descriptive information on Seneca County and its jurisdictions. The Hazard Identification (2.2) describes hazards that pose a threat to Seneca County and provides a brief history of significant occurrences. The Vulnerability Assessment (2.3) examines the vulnerability of each individual jurisdiction, and the Risk Analysis (2.4) evaluates and ranks the risks Seneca County must address through its mitigation efforts.

This plan section will identify and describe specific hazards for each of the municipalities in the county, describe their specific vulnerabilities, and address their local ability to respond to a variety of incidents. The social, financial, and physical vulnerability of each community and the county will be discussed. The local capacity to address core capabilities associated with response will be examined and analyzed, and gap areas where capabilities are not sufficient for worst-case scenarios will be addressed. Seneca County's ability to manage all eight community lifelines will be examined and gap areas will be described, including where and how the county would compensate for and backfill those needs based upon past significant events and community history.

Various demographic and statistical online tools have been used to research and address social vulnerability and community resilience, factors that will provide the foundation for mitigation strategies formulated to meet the unique and individualized needs of Seneca County's small communities. As a rural county with less population than many of Ohio's metropolitan areas, Seneca County is unlikely to receive significant federal assistance in a widespread disaster. Most assistance from outside the immediate region would likely come from Toledo, Columbus or Lima. To realistically discuss these theoretical situations, stakeholders have diligently worked to identify gaps in capabilities and resources, potential areas of response compromise, and the special needs of various populations within the county. This section will address non-English speaking communities, disabled and disadvantaged persons, and transient populations that are common to the county as well as the more typical populations like elderly, rurally isolated, and those without local familial connections.

To meet the current mitigation planning requirements for social vulnerability and community resilience information, sections have been added to the plan. The demographics include information about minority populations and their needs, as well as age-based and disability-based data that includes both the traditional multi-generational residents of Seneca County and the new residents who have limited family support, are making lifestyle changes, or other temporary and permanent considerations.

Discussions examined and analyzed community capabilities to respond in a significant disaster as well as a long-term incident, and to identify where additional help would be found in an incident that reached past the limitations of local capabilities. As a small county, Seneca County officials recognize the likelihood of receiving measurable state and federal resources in a widespread incident is highly unlikely; therefore, it is the county's burden to identify alternate and non-traditional resources to meet those potential needs as a way to minimize long-term negative effects on residents, their families and their property.

Goals included the identification of ways to ensure that every person in Seneca County has a similar opportunity to survive a disaster in a similar manner, and has the ability to recover to the same degree as other residents. Realizing that most of the residents would require more resources and services to make that happen, discussions included the identification of those probable groups of people and discussion about how that process might work to enable them to survive the worst of days.

Indicators of changing weather patterns have been discussed and deliberated. Situated some distance from any metropolitan area in Ohio, Seneca County is not significantly affected by new massive manufacturing plants or excessive traffic flow across federal highways. Some of the very negative environmental and social impacts felt in the major metropolitan areas like Columbus, Cincinnati, and Cleveland are not present in Seneca County. Little urban sprawl occurs in the area, but what occurs is residential as new people fill jobs in the Greater Toledo Metropolitan area, but choose to live in Seneca County. As this plan was developed, the influx of warehousing and logistics was felt to be in early stages, and professionals expect Seneca County to grow in the near future due to these business additions.

In Seneca County, people all tend to know one another and take their neighbor in when disaster strikes because outside resources are limited. Many families have lived in Seneca County for generations. Communities of only a few hundred or so residents have few resources, but many neighbors are willing to share their homes, supplies and help. They cite the infrequency with which disaster strike, although they realize the possibilities. While they may be limited in equipment or other goods, they are filled with the desire and willingness to help one another. They have the ability to improvise, adapt and overcome.

Needs after a severe storm may be addressed differently, and perhaps anecdotally, in these communities because they do not have access to fully certified shelters, commercially provided food supplies, and sufficient response personnel to meet post-disaster needs for help. Residents will identify a need, and develop a solution to solve it. Seneca County residents assume they will need to help themselves, if only for the first few days in the worst situations. These characteristics unique to small rural communities change little over the years. However, changes in storm characteristics and other natural phenomenon are noted, and discussions included these potential effects of worsening storms that hit much harder and faster.

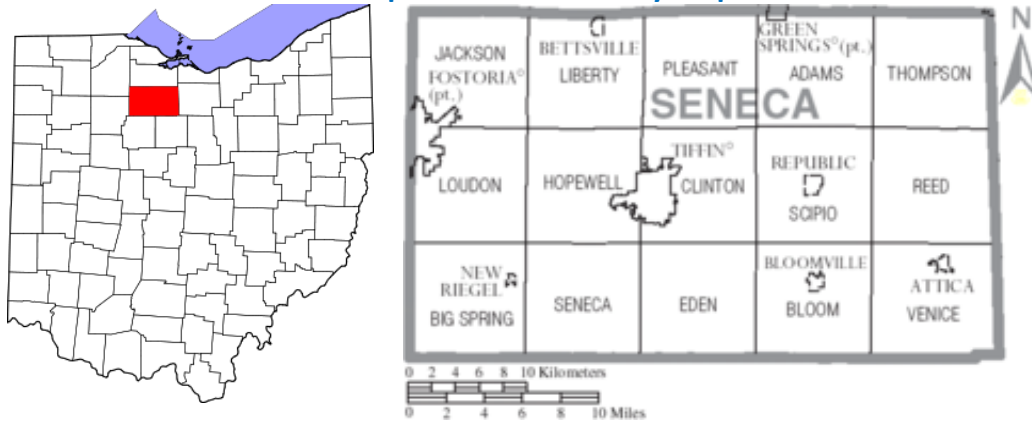
This plan, through application of the information in this Hazard Identification and Risk Analysis section, intends to then develop mitigation strategies that will equitably and inclusively provide potential solutions for disaster outcomes likely in Seneca County. Stakeholders worked to

identify, characterize and understand how each group of its local society will react and respond to disasters of catastrophic or serious magnitude, and developed solutions to ensure that all populations, all communities, and all parts of this small county can survive and recover from a disaster successfully and become as whole as possible after the incident.

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



Seneca County is located in northwest Ohio south of Toledo by about 55 miles. Lima lies to the southwest about 60 miles away, and Columbus to the south about 90 miles away. The county is an agricultural county with several mid-size industrial and manufacturing companies. Of the county's 54,527 residents, 57.59 percent live inside municipalities defined as cities, and 5.83% live inside municipalities defined as villages. That leaves 36.58% of the county's residents to live in unincorporated areas across the county. and forty-five percent live inside municipalities. Seneca County ranks #47 in population amid Ohio's 88 counties.

The US Census in 2020 shows a total population of 54,527; when the mitigation planning took place in 2019, the population was listed at 55,207. According to the World Population Review website, Seneca county population has decreased less than one percent since the 2020 United States Census was completed. The same source lists statewide growth in Ohio for the same time period as 0.067%, comparing to the 0.097% for Seneca County.

Seneca County consists of 550.6 square miles. There are no major inland lakes or shorelines, but the Sandusky River flows through the county. Adjacent counties include Sandusky, Huron, Crawford, Wyandot, Hancock and Wood counties. The closest major city is Toledo, approximately 55 miles to the northwest. Lima is 61 miles to the south, and Columbus is 89 miles to the south-southeast.

The Seneca County Board of County Commissioners and other elected and appointed officials provide leadership, support, and service to the county. In addition to the commissioners, elected officials include the county Engineer, Auditor, Treasurer, Clerk of Courts, Prosecutor and Sheriff, all of whom were instrumental in mitigation planning activities. Appointed officials particularly involved included the chief elected and appointed officials, floodplain managers, community development coordinators, social assistance departments, agricultural industry leaders, conservation and natural resources employees, and many others. Many officials in Seneca County fill multiple roles in the community, crossing local levels of government and combining responsibilities in a non-traditional way that allows the available staffing to fill all critical roles.

2.1.1 Demographics

According to US Census data, the estimated 2023 population in Seneca County is 54,527. 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: Seneca County Population Statistics

Statistic	Figure
Population Density	99.9 persons/sq. mile
Population	54,527
Female Population	49.7%
Male Population	50.3%
Median Age	40.6 years
Population under 18	21.2%
Population under 5	5.4%
Population over 65 and over	19.8%
White	93.1%
Hispanic or Latino	5.8%
African-American	2.8%
Two or More races	2.9%
Households	21,910
Average Household Size	2.38 persons
Median Household Income	\$62,476
Persons in Poverty	12.0%
Percent w/o health insurance	6.3%
Persons <65 y/o with a disability	10.3%
Owner-occupied Residential structures	72.0%
Language spoken other than English	3.2%
Veterans	3,140
Households with no vehicle or access	5.7%

Households with Internet/broadband	85.3%
Households with a computer	91.5%
Total Housing Units	24,048
Building Permits Issued 2023	39
High School Graduates >25 y/o	93.4%

Seneca County has 23,934 housing units according to the 2020 United States Census. The owner-occupied housing rate is 72.0%; median value of owner-occupied units is \$128,100. The median monthly cost for a home with a mortgage is \$1,125. Data updates by Headwaters Economics cites 21,910 housing units in the county in 2022, with 28% being rental units and 825 being mobile homes.

Multi-unit housing structures such as apartment buildings account for 14.7% of all housing units. There are 17 mobile home parks in Seneca County, and most are near or inside either Tiffin or Fostoria. Most (11) can accommodate less than fifty mobile homes; only three have the capacity to accommodate over one hundred homes. Three can have between 51 and 100 mobile homes. One of the facilities is listed as “closed”. There are 825 mobile homes throughout the county, most of which are located in mobile home parks. The median gross rent for all types of rental properties is \$789 per month. Seneca County Metropolitan Housing Authority provide 243 Housing Choice Vouchers for residential subsidies for county residents.

Roughly 91.5% of households have a computer; 85.3% of households have access to broadband internet.

Multiple special residential housing facilities are present across the county. As of 2024, the types of facilities and statistics for each type are as follows:

Table 2-2: Special Residential Facilities

Facility Type	Number	Beds
Nursing Home Facilities	6	408
Assisted Living Facilities	5	253
Jails and confinement	2	216
Residential college students	2	1882
Other Residential Facilities	3	109

2.1.2 Incorporated Jurisdictions

Seneca County incorporated jurisdictions include two cities and five villages. The village of Green Springs is partially located in Seneca County, but joins with Sandusky County for mitigation purposes. The City of Fostoria is partially located in each of three counties, but joins with Seneca County for the purpose of hazard mitigation. There can be some discrepancy in

population numbers as this fluctuation affects specific numbers, and sub-sets of municipal or township statistics cannot be isolated.

The City of Tiffin is the largest municipality and serves as the county seat. It is the hub of most business and government activity in the county, and most of the population lives in this area. Healthcare, retail centers, government services, and other commercial businesses are primarily located in Tiffin.

The City of Fostoria provides many commercial, healthcare, and retail resources, and has a fully staffed city government. Fostoria sits on the juncture of Seneca, Hancock and Wood counties, and thus has multiple counties from which to pull resources when needed.

The villages include Attica, Bettsville, Bloomville, New Riegel, and Republic. Greens Springs sits on the Sandusky County line, and utilizes Sandusky County for most resources because it is only a few miles from Fremont, the county seat of Sandusky County. Seneca County's villages are all under a thousand residents and have limited capabilities and resources.

Attica

This village is the largest of the villages in Seneca County, and lies on a major route to the state's capital and other metropolitan areas. With significant traffic flowing through the village on two state highways, they serve as a stop in-between for many travelers. Attica is a stable village with many families living there for generations.

Table 2-3: Attica Demographics

Statistic	Figure
Population, 2020	873
White	95.9%
Hispanic or Latino	2.3%
Households	318
Median Income	\$71,563
Persons in Poverty	9.4%
Owner-Occupied Homes	75.8%
Disabled Population	16.5%
Without Health Insurance	6.4%
Language other than English	0.0%
Elderly >65 y/o	18.7%
Veterans	10.4%
Households with Internet	n/a

Bettsville

Bettsville is located on the north central border with Sandusky County, and is home to many families who have lived in the village for generations. With an agricultural base, the village lies

on a major state highway and experiences a great deal of traffic as goods move from one village to another in the area. The population of Bettsville is extremely stable.

Table 2-4: Bettsville Demographics

Statistics	Figure
Population, 2020 US Census	595
White	91.1%
Hispanic or Latino	8.6%
Households	266
Median Income	\$61,250
Persons in Poverty	11.2%
Owner-Occupied Homes	77.1%
Disabled Population	11.4%
Without Health Insurance	0.0%
Language other than English	2.9%
Elderly >65 y/o	9.2%
Veterans	3.9%
Households with Internet	

Bloomville

Bloomville lies in the central Seneca County area, and is on a main state highway where trucks carry goods from one village to another, and where larger shipments cross as they travel from one city to another. The population is stable and many residents have lived in the village for generations.

Table 2-5: Bloomville Demographics

Statistic	Figure
Population, 2020	867
White	93.5%
Hispanic or Latino	2.9%
Households	303
Median Income	\$61,118
Persons in Poverty	10.9%
Owner-Occupied Homes	72.9%
Disabled Population	14.9%
Without Health Insurance	7.0%
Language other than English	1.1%
Elderly >65 y/o	11.6%
Veterans	7.1%
Households with Internet	n/a

Fostoria

As the second-largest population in Seneca County, Fostoria lies on the northwestern corner of Seneca County, and geographically lies in Seneca, Wood and Hancock Counties. For the purposes of mitigation, the city participates in the Seneca County efforts. Of the 13,441 residents that live within the city incorporation limits, 9,471 of them live within the Seneca

County borders. For the purpose of this plan, all Fostoria residents and properties are considered part of this plan, including multiple upground reservoirs that lay in Hancock County but are owned by the City of Fostoria.

Table 2-6: Fostoria Demographics

Statistic	Figure
Population, 2020	13,047
White	82.2%
Hispanic or Latino	13.5%
Households	5,092
Median Income	\$53,145
Persons in Poverty	21.0%
Owner-Occupied Homes	65.7%
Disabled Population >65 y/o	14.8%
Without Health Insurance	8.2%
Language other than English	7.5%
Elderly > 65 y/o	16.4%
Veterans	7.2%
Households with Internet	84.1%

New Riegel

This small, agriculturally based village is home to many families that have lived in the area for generations. There is little business or industry in the village, and residents enjoy to quiet and peaceful atmosphere of such a small village.

Table 2-7: New Riegel Demographics

Statistic	Figure
Population, 2020	286
White	94.4%
Hispanic or Latino	3.4%
Households	110
Median Income	\$57,500
Persons in Poverty	14.0%
Owner-Occupied Homes	61.8%
Disabled Population	11.6%
Without Health Insurance	3.7%
Language other than English	3.4%
Elderly >65 y/o	14.3%
Veterans	12.4%
Households with Internet	n/a

Republic

Republic is located where several state highways intersect, and experiences a large amount of traffic on any given day. The community has numerous small businesses, and residents have for the most part lived there for a long time.

Table 2-8: Republic Demographics

Statistics	Figure
Population, 2020	556
White	91.9%
Hispanic or Latino	4.3%
Households	217
Median Income	\$77,188
Persons in Poverty	6.7%
Owner-Occupied Homes	74.7%
Disabled Population	9.2%
Without Health Insurance	6.6%
Language other than English	1.6%
Elderly >65 y/o	8.9%
Veterans	2.0%
Households with Internet	n/a

Tiffin

Tiffin is the county seat and the largest municipality in Seneca County. It serves as the primary hub for goods and services, and is located almost in the very middle of the county geographically. Tiffin's population is very stable and has fluctuated by only slightly over four hundred people since 2010.

Table 2-9: Tiffin Demographics

Statistics	Figure
Population, 2020	17,963
White	90.8%
Hispanic or Latino	3.6%
Households	7,543
Median Income	\$62,476
Persons in Poverty	12.4%
Owner-Occupied Homes	60.3%
Disabled Population < 65 y/o	10.5%
Without Health Insurance	3.8%
Language other than English	3.7%
Elderly > 65 y/o	19.4%
Veterans	5.1%
Households with Internet	87.1%

2.1.3 Townships and Unincorporated Communities

Seneca County is divided into fifteen townships. Each is governed by three trustees and a fiscal officer elected by the voters. They meet monthly and are responsible for the health, safety, and welfare of township residents. Approximately 57.59% of county residents live in the two cities, and 5.83% live in the small villages. The remaining 36.58% live in rural areas in the townships. Townships are not required to adopt the mitigation plan; Seneca County acts on their behalf for mitigation actions and projects.

Table 2-10: Township Population Statistics

Township	Population 2020	2010 Comparison
Adams	1,247	1,320
Big Spring	1,683	1,520
Bloom	1,624	843
Clinton	4,105	4,109
Eden	2,042	2,188
Hopewell	2,672	2,774
Jackson	1,401	1,512
Liberty	2,029	1,374
Loudon	2,246	2,140
Pleasant	1,477	1,635
Reed	738	848
Scipio	1,674	1,180
Seneca	1,444	1,622
Thompson	1,370	1,443
Venice	1,683	859

Unincorporated Communities and Neighborhoods

Seneca County has seven census-designated areas and twenty-four unincorporated areas. They do not have formal government, and do not function as a jurisdiction, but are well-known areas to local residents.

Census designated areas include the following:

- Bascom
- Flat Rock
- Old Fort
- Fort Seneca
- Kansas
- McCutchenville
- Melmore

The unincorporated areas include the following:

- Adrian
- Alvada
- Amsden
- Angus
- Berwick
- Caroline
- Carrothers
- Cooper
- Cromers
- Fireside
- Frenchtown
- Iler
- Lowell
- Maple Grove
- Omar
- Reedtown
- Rehoboth
- Rockaway
- Saint Stephens
- Siam
- Springville
- Swander
- Watson
- West Lodi

2.1.4 Institutions and Special Facilities

Seneca County residents have access to multiple educational and healthcare resources in the county. Access to these services improves the quality of life for residents and contributes to the successful development of the economy and workforce.

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 2-11: 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 408 total beds and 5 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.

2.1.5 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 multi-lane highways in Seneca County. A complete list of federal and state highways in the county is provided in table 2-7 below.

Table 2-12: 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 road 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. These are maintained contractually, directly or in collaboration with another jurisdiction.

Rail

Rail is a 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. Several communities, including Bettsville, Tiffin and Fostoria experience long rail crossing delays due to long trains and in-transit stoppages as they enter the North Baltimore yard for loading and unloading, or as they are switched in and out of North Baltimore or Toledo area rail yards.

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). Seneca County Airport is the most active and is open to the public. It is owned by Seneca County and is operated through the County Commissioners office. Tiffin Aire is the operator-manager of the airport. Andrew Newman is the airport manager. There are two asphalt runways.

Utilities

The majority of homes in Seneca County, approximately 50.4%, are heated with natural gas, but 15.8% use bottled, tank or LP gas. An additional 25.8% 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 2-13: 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 Assoc., Inc.
Toledo Edison	Consumers Gas Cooperative

The remaining structures in the county utilize alternate heat sources.

- Coal, coke or wood 4.9%
- Fuel oil, kerosene 2.3%
- Solar energy or other fuel 0.8%
- No fuel used 0.2%

Water collection, treatment and distribution, as well as wastewater collection and treatment are handled differently by each jurisdiction. There is no countywide system. Tiffin contracts with AQUA Ohio for potable water collection, treatment and distribution. They handle wastewater collection and treatment for the city. Fostoria does both, maintaining six upground reservoirs to collect water, operating a treatment plant and distribution lines. They also collect and treat wastewater. Republic and Bloomville work together to manage water and wastewater. Bettsville and Attica both manage and provide both water and wastewater services to their residents. Attica maintains an upground reservoir as a water source. Most townships and rural homes are served through individual wells for drinking water and septic systems for sanitation.

Telecom is provided by AT&T, Frontier North and Brightspeed. All cellular providers typical to the general area are available in Seneca County.

2.1.6 Topography and Climate

Topography

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.

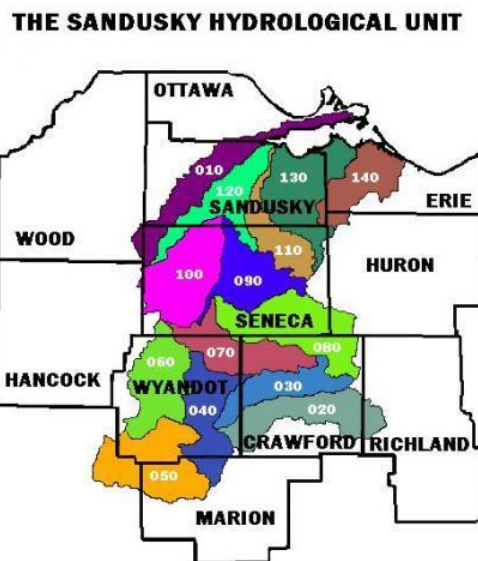
Climate

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.

2.1.7 Waterways and Watershed

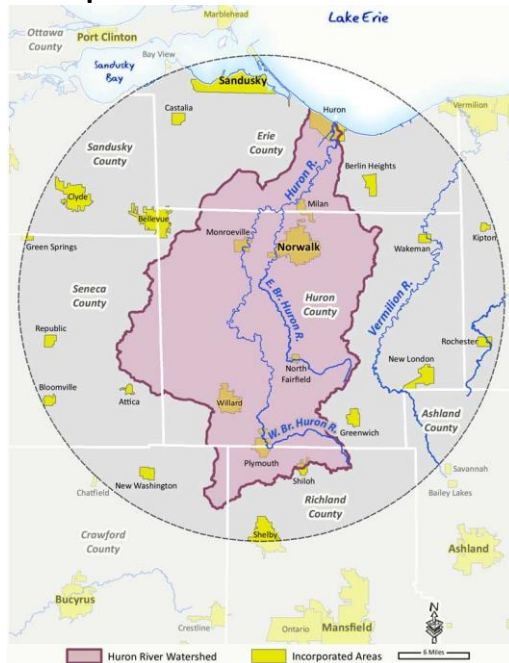
Seneca County is part of three distinct watersheds: Sandusky River, Huron River, and Blanchard River. The majority of the county falls in the Sandusky River watershed. Small areas on the east and west borders of the county are located in the Huron River (east) and Blanchard River (west) watersheds. The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

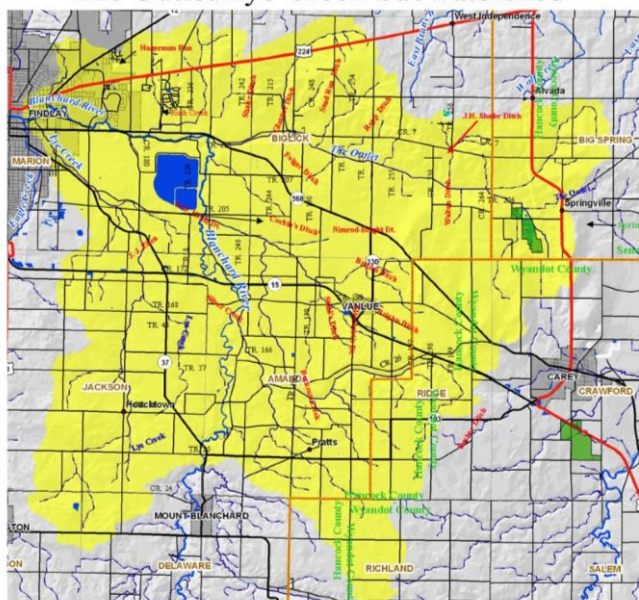
Map 2-3: Huron River Watershed



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

The Outlet/Lye Creek Subwatershed



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.

2.1.8 Land Use

Agriculture is the primary land use in Seneca County. Nearly 80% of the land is used for cultivated crops. Another almost 2% is dedicated to pasture. Corn, soybeans, wheat, oats and hay are the primary crops grown throughout the county. Specialty crops, including tomatoes, 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 8.61% 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.

There have been no significant changes in land use over the past five years. Changes have been slight adjustments or mathematical interpretations.

Table 2-14: Seneca County Land Use

Use Category	2024 Percentage	2019 Percentage
Cultivated Crops	79.05%	79.99%
Forest	8.61%	8.60%
Developed, Lower Intensity	6.58%	6.76%
Pasture/Hay	1.94%	2.06%
Developed, Higher Intensity	2.13%	0.99%
Wetlands	0.64%	0.51%
Open Water	0.38%	0.41%
Barren (strip mines, gravel pits, etc.)	0.40%	0.35%
Shrub/Scrub and Grasslands	0.28%	0.32%

2.1.9 Regulation and Community Development Planning

Building regulations in Seneca County vary from jurisdiction to jurisdiction. Zoning is optional, and must be voted into effect by the residents of the jurisdiction. Seven of fifteen townships, and two of five villages are zoned; both cities are zoned. Floodplain regulations are administered by the Seneca County Soil and Water Conservation District, in conjunction with floodplain managers from specific jurisdictions that belong to NFIP and/or have floodplain area. The Seneca County Parks District and the cities of Tiffin and Fostoria develop land use and comprehensive plans for the county. The Tiffin-Seneca Economic Partnership provides transportation, housing, and economic development planning. TSEP also manages grant programs, subdivision regulations, and administration of several financial incentive programs.

Zoning regulations provide overall guidance in the use of specific areas for specific purposes. Areas are designated, or zoned, for agricultural, residential, or commercial use. Regulations guide lot splits, setbacks, and parking capacity. Curb cuts and entrances are governed by highway and street departments, ranging from ODOT to a village. Each zoned jurisdiction maintains a zoning Board of Appeals and Zoning Rules as guidance, and is responsible for updates the guidance on a regular basis.

Table 2-15: Seneca County Zoning Status

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

Local building code enforcement for commercial development, provided through a contractual agreement with SAFEBuilt, works with new and existing business owners to create well-designed, code-compliant business properties. This includes all commercial property, such as manufacturing, industry, retail, institutions, or other public buildings. Commercial construction or renovation begins with zoning permit application, as well as application for permits to cover HVAC/mechanical, electrical and general building permits. This triggers work with SAFEBuilt, the local zoning officer, the fire chief, public health, and floodplain managers.

Local fire chiefs are notified by zoning officers when applications for new or expanding facilities are filed, and they lead the initial effort to work through code compliance and appropriate channels for construction approvals. Plumbing and septic construction must have public health approval. Commercial development begins with an application for construction, required by commercial building codes, and is driven through the process by the commercial inspectors from SAFEBuilt.

All municipalities and townships are covered commercially by the Ohio Basic Building Code and the International Fire Codes. There are no residential construction codes except for plumbing and septic permits that are issued, under a contractual agreement, by the Erie County Health District on behalf of Seneca County Health Department. All contractors, commercial or residential, must be registered with the Seneca County Building Department.

The NFIP requires that participating communities develop and maintain floodplain regulations, and appoint a floodplain manager. Participating NFIP communities are eligible to purchase flood insurance through FEMA. The following table shows which jurisdictions participate in the

NFIP and lists their designated floodplain manager. Floodplain regulations determine if and how construction can occur in a designated floodplain, and what mitigation measures must be engaged in order to build in a flood-vulnerable location. Generally speaking, any financial assistance or incentive program, and any mortgage on the property, requires a property in a floodplain to carry federally-supported flood insurance through FEMA.

Table 2-16: Floodplain Managers

Jurisdiction	Floodplain Manager
Seneca County	Bret Margraf, Nutrient Technician
Village of Bettsville	Gary Harrison, Mayor
City of Fostoria	Sandra Coleman, Zoning Inspector
City of Tiffin	Matt Watson, Engineer

The Village of Republic is sanctioned by NFIP as of 05/03/2012. Attica, Bloomville and New Riegel have never applied for participation in NFIP because they have no area designated as a floodplain.

Jurisdictional Capability for Mitigation

The capability to implement mitigation strategies and to manage mitigation projects varies across Seneca County. Seneca County is fully capable of developing, executing and administering a complex mitigation project, as are both the City of Fostoria and the City of Tiffin. All three jurisdictions have full capabilities for designing, administering, executing, managing, and completing a significantly complex mitigation project using either full time staff or contracted staff. They have adequate engineering staff for technical design and implementation work, and administrative staff to develop project applications and manage the deliverables. They may require assistance from contracted personnel for special projects, but it would be reasonably anticipated for them to have full capabilities to initiate and manage mitigation projects. It is likely these three jurisdictions would have the financial ability to meet the local match required unless the projects were extensive infrastructure projects with an extremely high cost. Fostoria is considered disadvantaged in census areas 39147962800 and 39147963000 due to, in part, low income and deep poverty; Tiffin is considered disadvantaged in census area 39147963200, partly due to low income.

On the other hand, none of the five villages would be able to develop, execute and administer a complex mitigation project. They have limited access to individuals who would design, administer or execute a project, and would have to either hire a contractor to do this work, or forego the option of funding due to a lack of resources. With populations under 1,000 residents, they are not afforded the benefit of paid, designated employees or officials to manage special projects, and most village work is performed by elected officials as volunteers. Some have employees who assist with administrative work, manage a utility or maintain streets, but some villages do not have any employees. Villages would only have the capacity to conduct projects if they could include project management costs for hired staff in a grant, and they were able to meet the required match at a reduced amount. If villages were allowed to work through Seneca County to conduct projects, there may be additional feasibility.

The townships would work through the Seneca County Commissioners for mitigation projects. They lack the personnel to manage complex projects but have a working relationship with the county to address their needs. Townships would rely upon Seneca County for administration and implementation of a significant project. They would generally require a reduced local share to be able to meet match requirements.

Table 2-17: Jurisdictional Capabilities

Jurisdiction	Planning Commission	Comprehensive Plan	Commercial Building Codes	Zoning Ordinances	Floodplain Regulations	Capital Budget Mitigation	Capital Budget PW Mitigation
Seneca County	No*	Yes	Yes	n/a	Yes	Yes	Yes
Village of Attica	No*	No*	Yes	Yes	No	No	No
Village of Bettsville	No*	No*	Yes	No	Yes	No	No
Village of Bloomville	No*	No*	Yes	Yes	No	No	No
City of Fostoria	No*	Yes	Yes	Yes	Yes	Yes	Yes
Village of New Riegel	No*	No*	Yes	No	No	No	No
Village of Republic	No*	No*	Yes	No	No	No	No
City of Tiffin	No*	Yes	Yes	Yes	Yes	Yes	Yes
Adams Township	No*	No*	Yes	Yes	Yes	No	No
Big Spring	No*	No*	Yes	No	Yes	No	No
Bloom Township	No*	No*	Yes	No	Yes	No	No
Clinton Township	No*	No*	Yes	Yes	Yes	No	No
Eden Township	No*	No*	Yes	Yes	Yes	No	No
Hopewell Township	No*	No*	Yes	Yes	Yes	No	No
Jackson Township	No*	No*	Yes	Yes	Yes	No	No
Liberty Township	No*	No*	Yes	No	Yes	No	No
Loudon Township	No*	No*	Yes	No	Yes	No	No
Pleasant Township	No*	No*	Yes	Yes	Yes	No	No
Reed Township	No*	No*	Yes	No	Yes	No	No
Scipio Township	No*	No*	Yes	Yes	Yes	No	No
Seneca Township	No*	No*	Yes	No	Yes	No	No
Thompson Township	No*	No*	Yes	No	Yes	No	No
Venice Township	No*	No*	Yes	No	Yes	No	No

*Tiffin-Seneca Economic Partnership and Fostoria Community Development Corporation act on behalf of jurisdictions for economic and community development as well as land use planning and regulation development. Seneca Regional Planning was recently disbanded. Tiffin-Seneca Economic Partnership acts in place of it.

2.1.10 Economy and Business

Manufacturing is the largest employment sector in the county followed by trade, healthcare and social assistance, retail, hospitality, education and construction according to the Tiffin Seneca County Economic Partnership 2024 Success Report.

During the period between 2019 and 2023, according to the TESP report, the number of manufacturing jobs rose by 0.97%, and healthcare and social assistance job numbers grew in

similar numbers. However, retail, hospitality, education, and construction job numbers fell by similar numbers. There are approximately 530 fewer jobs in Seneca County in 2023 than there were in 2019, according to TSEP. Comparatively, per capita income raised from \$34,595 to \$35,384 and median household income rose from \$61,425 to \$64,994. The poverty level fell from 13.31% to 12.53% in that same timeframe.

The Ohio County Profile, developed by the Ohio Office of Research, tells a similar story. According to that resource, there are 616 fewer jobs in Seneca County than there were in 2019. The “employment by industry” table below shows the data according to the county profile.

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 the Ohio County Profile 2024 indicate that there are 233,145 acres in farms, but according to the Ohio Agricultural Statistics 2023-2024 Annual Bulletin, compiled by USDA, only 209,141 acres are in cropland, and 198,635 acres are actually harvested. There are 1,080 individual farms. The average farm size is 216 acres. The total case receipts for crops and livestock are \$212,644,000, for an average per-farm gross receipt of \$196,892.

Tables 2-11 and 2-12 list the major employers and industries in Seneca County according to the Seneca County Ohio Census Profile 2024.

Table 2-18: Major Employers

Employer	Sector
American Fine Sinter	Manufacturing
Dorel Industries/Ameriwood Industries	Manufacturing
Fostoria City Schools	Government
Heidelberg College	Service
Mercy Health – Tiffin Hospital	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 2-19: Employment by Industry

Employment Sector	Average Employment 2024	Average Employment 2019
Manufacturing	4,511	4,241
Trade, Transportation and Utilities	3,521	3,653
Education and Health Services	2,906	3,502
Local Government	2,162	2,235
Leisure and Hospitality	2,125	2,062
Construction	848	929
Professional and Business Services	902	832

Other services	603	614
Financial Services	460	486
State Government	240	272
Information	149	211
Natural Resources and Mining	207	202
Federal Government	113	124

Agriculture

The U.S. Department of Agriculture defines prime farmland as “land best suited to grow, feed, forage, fiber, and oilseed crops.” This type of land produces the highest crop yields with the least amount of energy and economic resources. According to this definition, much of the acreage in Seneca County is prime farmland, making agriculture a major economic contributor.

The Ohio Department of Development shows Seneca County has 1,080 farms with an average acreage of 216 acres. The major crops grown include corn, soybeans and wheat with some small amounts of vegetables, fruit and berries, and nursery/greenhouse products. There are also cattle and calves, dairy cows, hogs and pigs, sheep, and goats, as well as some egg-producing poultry in the county.

Table 2-20: Farmland Data

Crops	Acres	Livestock	Head
Land Area	352,655	Cattle and Calves	5,500
Land in Farms	233,145	Milk Cows	200
Cropland	209,141	Hogs & Pigs	n/d
Harvested Cropland	198,635	Sheep & Goats	n/d
Pastureland	3,580	Layers & Pullets	n/d
Woodland	13,479		
Gross Receipts	\$172,144,000		\$40,500,000

2.1.11 Community Growth and Development Trends

Trends in employment include decreases in some sectors and increases in others. Manufacturing, leisure and hospitality, professional and business services, and natural resources and mining have experienced slight increases. Other categories of employment experienced slight losses. Overall, jobs decreased by 530 (TSEP) to 616 (Ohio Office of Research). Most stakeholders who participated in mitigation meetings were very optimistic about the coming years, but recognized that growth has been stagnant to slight losses.

The Seneca County workforce, like many other counties, has experienced ups and downs since the 2020 pandemic. Prior to the public health disaster, Seneca County’s growth was very conservative with increases of the workforce in hundreds per year. A drop in 2018 brought them backward for a short time. The highest workforce numbers were in 2019, just before the COVID-19 Pandemic struck. The workforce numbers fell from 2019 through 2021, plummeting by almost 10% in 2021 as people stayed home and gave up second jobs to a low of just over twenty-five thousand. 2022 brought an increase of over a thousand, and 2023 continued very modest growth. The local workforce has not yet recovered from those losses. Unemployment

hit its highest in 2020, but is now at 3.6%, well below the county's five-year average of 5.0%. The overall workforce numbers impact the unemployment percentage, not telling the total Seneca County job trends story when viewed as a single statistic.

Table 2-21: Total Employment Statistics*

	2023	2022	2021	2020	2019	2018	2017	2016	2015
Civilian Labor Force	26,461	26,291	25,255	27,114	27,683	27,100	27,400	27,200	27,100
Employed	25,512	25,195	26,528	24,917	26,529	25,900	26,100	25,800	25,800
Unemployed	949	1,096	1,273	2,197	1,154	1,200	1,200	1,300	1,300
Unemployment Rate	3.6%	4.2%	4.8%	8.1%	4.2%	4.4%	4.7%	4.9%	4.8%

*2024 Ohio County Profile for Seneca County used for data

Residential development has improved since the late 2000s but has not returned to former pro-development levels. It has not kept pace with residential growth state-wide. Between 2007 and 2013, 192 new home construction permits were issued, an average of 27 per year, as evidenced in previous mitigation plans. From 2013 through 2017, the average was 26.4 per year, as shown in the table below. From 2019 through 2023, an average of thirty single family homes have been constructed annually.

Housing costs have rocketed in the past five years, pushed upward by the pandemic and supply-demand issues with building materials. The average construction cost has increased. From 2013 through 2019, the average single-family home built in Seneca cost \$159,400. The average cost increased to \$177,400 from 2019 through 2023. The number of homes built increased from 26 per year in the previous years to 31 more recently.

The cost of new housing, as well as the cost of renovation of existing housing is a concern for community development officials. They cite an extreme adequate housing shortage as a significant barrier to economic growth. Costs of construction that have raised significantly have caused the overall maintenance of existing homes to fall, and therefore the housing for new employees is limited. As a result, their housing study has resulted in the goal to develop 65-85 new homes per year in order to support economic growth and job creation.

Table 2-22: Single Family Home Construction Permits

	2023	2022	2021	2020	2019	2017	2016	2015	2014	2013
Total Permits	31	34	41	23	24	28	24	31	27	22
Avg. Construction Cost	\$215.6K	\$227.2K	\$145.7K	\$152.7K	\$145.7K	\$198.5K	\$162K	\$144.6K	\$121.8K	\$170.2K

Note: 2019 statistics were unavailable

Economic Development

Community growth and development in Seneca County is the outcome of multiple organizations and jurisdictions working together to meet community needs and improve the

local business environment and economy. Sometimes the communication is formal, and other times it is informal, but the various levels of government engage in active collaboration to improve and grow the county's economy.

In previous years, Seneca Regional Planning was the hub of community and economic development in Seneca County. In July 2024, Seneca Regional Planning was disbanded and Seneca-Tiffin Economic Partnership assumed all responsibilities of the regional planning function. Seneca Regional Planning had been organized in committees that dealt with specific functions, such as lot splits and transportation improvement. They handled economic development, zoning, land use planning, subdivision planning, and comprehensive planning. They participated in mitigation planning, and provided a mitigation link into community and economic development activities. They created an Active Transportation Plan, a Building Management Plan and a Bus Transit Plan as well.

Major players in this development collaboration are the Tiffin-Seneca Economic Partnership, the Fostoria Economic Development Corporation, the Seneca Regional Chamber of Commerce, and the individual county, city, village and township representatives. The zoning and compliance officers from zoned and regulated jurisdictions and the floodplain managers from across the county are involved in applicable projects and activities. Since the last mitigation plan was adopted, the Seneca Regional Planning office has been merged into the Tiffin-Seneca Economic Partnership for efficiency and effectiveness. They now are responsible for all work with the Fostoria Economic Development Corporation, county villages, and townships to enhance the business environment in Seneca County.

The Tiffin-Seneca Economic Partnership and the Fostoria Economic Development Corporation both work to identify, recruit, and secure new businesses, expansion of existing businesses, and transfer of existing businesses to new owners when appropriate. They work with businesses in areas of land use, regulations, and mitigation, helping them locate in an area that will best suit their needs and serve the local community. Both organizations help with finances, be that through commercial lending or special finance programs, incentives, or grant programs. They work with employers to find the right employees, and they advocate for and assist with career technical and job training needs assessment locally as a way to ensure that employers have an adequate workforce to staff their companies.

The Tiffin-Seneca Economic Partnership constitutes the planning commission for county jurisdictions. Although it is a separate nonprofit classified as a 501-c-3 nonprofit organization, the city and county delegate planning efforts to them. Tiffin's city administrator works with the TSEP, as does the county administrator on behalf of the county commissioners. The township trustees and villages in the county are connected to these efforts through a representative on the TSEP committees. Members include entities like the OSS Solid Waste District and Tiffin City Schools. Partners listed include the City of Tiffin and Seneca County. (Seneca County representatives include township and village representatives as well as county representatives.)

Tiffin-Seneca Economic Partnership lists economic development (commercial, downtown, industrial, rural, small business, workforce, and other), community development (parks and facilities), beautification and revitalization, crisis assistance, capacity building, and project management among their activities. They also manage downtown façade grants, Community Development Block Grants, enterprise zones, community reinvestment areas, tax increment financing districts, new jobs programs, the Sandusky-Seneca-Tiffin Port Authority and Tiffin-Seneca CARES Grant program. They work regularly in conjunction with Great Lakes Community Action Partnership, North Central Area Transit, the Mental Health and Recovery Services Board, Tiffin Community Health Center, United Way of North Central Ohio and First Call for Help.

The Fostoria Economic Development Corporation works in the City of Fostoria in the same ways. As a community that lies in three counties (Hancock, Wood and Seneca), they join hands with parties from all around. They work to promote greater Fostoria for new and existing business, helping with additional services, expansions, and renovations. They manage programs that provide incentives and means to build structures, find new customers, train employees, and support the community. They lead efforts to showcase available properties, and find suitable tenants or owners. Their efforts are made in collaboration with local and county government, business partners, and lending institutions and programs.

Seneca Regional Chamber of Commerce is a full-fledged partner in countywide development. Led by a board that includes local business leaders, elected and appointed officials, and all forms of local business owners, this group is the promoter and advocacy agent for all of Seneca County. They provide full information about jobs in Seneca County, activities and events that take place across the county, and advantages enjoyed by the local businesses and workforce. They support what the previously described organizations do by organizing and inspiring the business leaders in the community to make Seneca County an attractive and fun place to live and work. Their membership includes hundreds of businesses, nonprofit agencies, government offices, educational institutions, and professionals.

Several written documents were consulted in the mitigation planning project to determine the status of community growth and development trends, and how they might affect, or be affected by, disasters. As written evidence of what kind of growth and development has occurred, these recent documents were examined for trends and outcomes. Each document listed below showcases projects and/or outcomes led by staff and volunteers. The documents are listed with a summary of the information included in each document:

- ❖ The Tiffin Seneca Economic Partnership (TSEP) **2023 Success Report** outlines \$109M invested in various community development projects that led to the creation of 213 jobs in 2023. It lists specific economic development projects by Aldridge Electric, IPC Food Service, Heavenly Pizza and Webster Industries, all completed in 2023. It listed Tiffin's Community Kitchen groundbreaking and Brownfield evaluation and remediation of the former Rainbow Muffler site in Tiffin. Tavern 19 opened in Bloomville and a Flowerland franchise owner chose Fostoria as its newest location. The City of Tiffin boasted of ten new businesses, three relocations, one expansion and two ownership transfers. Several

design projects made the county a more attractive business zone, and several volunteer groups offered up their assistance to the TSEP. They listed their members, consisting of over sixty businesses, institutions and public entities across the county.

- ❖ The ***Seneca County Rural Housing Market Analysis*** (2019) provides very specific analysis of current housing conditions, and combines projected housing goals with economic development considerations for the coming years. Although the home values and rent levels identified are no longer accurate, this document defines an aging stock of homes, sometimes in disrepair with little hope of renovation, that does not meet the needs of a potential workforce of the near future. Although the Seneca County Land Bank has been effective in demolishing numerous properties that were in severe disrepair, the findings are still accurate, generally speaking. In contrast to a bright outlook, the report illustrates the current housing market conditions, occupancy levels and condition of existing older homes, and new home creation for every municipality and township in Seneca County. The housing development goals of Seneca County include the addition of 65 to 85 newly constructed homes each year for the coming several years, as well as additional improvements to or demolition of existing vacant homes, based upon the condition of the individual home. It closes by linking new housing and upgraded existing housing to economic development, citing the importance of adequate and desirable housing as criteria for successful economic growth. Again, it should be noted that significant changes in housing costs and availability have taken place since this document was written, and current conditions are likely worse than in 2019.
- ❖ The ***Seneca County Multijurisdictional Plan for the Next Generation*** was written in June 2020 by Seneca County and the Cities of Tiffin and Fostoria, and serves as a comprehensive economic development strategy for the county and its municipalities. Villages and townships participated with city and county departments as the steering committee. They created visions for Seneca County, including villages and townships; Seneca County Park District, the City of Tiffin and the City of Fostoria. The integrated goals in this document include creation of a prosperous and resilient economy; maintenance of an attractive, desirable and livable place; ensuring quality community facilities and services; engaging in environmental stewardship through valuing natural resources, providing enhanced mobility, accessibility and public utilities; and strengthening a strong community character and image. This plan purposely focused on countywide collaborative efforts to enable cooperation and success.
- ❖ The ***Seneca County Active Transportation Plan*** (2018) defined the needs of mobility, ingress and egress, and logistics across the county and its jurisdictions. This plan dealt with mobility by not only motorized vehicle, but also by bicycle, wheelchair, scooter, and other devices as residents travel for work, errands and social events. They considered the development of walking and biking trails, pedestrian traffic and safety, and mobility for people with disabilities.

In analyzing these documents, specific conclusions were reached in the mitigation planning process. First, Seneca County is experiencing slow to moderate economic growth, but is actively pursuing avenues to increase that activity. Additions to the business community are often small to very small ventures, focusing on light manufacturing, services and retail. There is an emphasis upon restoration of historical structures and use of those structures, when possible, but replacing them when renovation is not affordable or feasible. Most of the development is located within either the City of Tiffin or the City of Fostoria. Most of the small villages are rural bedroom communities that provide quiet, rural settings for homes. The residents in these villages intend to maintain the environment as it is, and do not intend to attract large businesses or heavy manufacturing. Their goal is to support the families who live there, and to preserve and maintain the surrounding farmland for agricultural purposes.

While the Seneca County EMA is not officially part of the economic development committees or regulation-developing bodies, planning participants continually cited example of how the negative consequences of disasters and mitigation efforts to prevent future damages are, in fact, included in all activities.

The new structure of the economic partnership is not fully implemented, and due to its recency, details and implementation steps are still being refined. Ensuring that all the appropriate partners are involved, and all the future considerations from various areas of interest are included in and considered during development activities is intended. How the financial and infrastructure planning and implementation by municipalities and townships will be integrated into economic development remains to be established. Current culture in the county indicates that the rural communities are not focused on growth, but instead on improving the quality of life in the communities for those who live there. None of them spoke about plans to develop new subdivisions or multi-family housing units, but they did speak openly about preserving the rural atmosphere and the solitude of a small community.

Where rural village life in Seneca County goes in the future remains to be seen. Villages, in general, struggle with improvement and maintenance of utilities and infrastructure. If changing weather patterns bring additional rain, or heavier rain, those needs may become more difficult to manage. As the elderly in the communities pass on, it may become difficult to maintain resident numbers, leaving even more homes abandoned and reaching toward disrepair. The county is already experiencing the disadvantages of having older-than-average homes that are disproportionately expensive to update, making them less desirable for younger owners. Population growth is happening in the cities and adjacent townships, and that may continue at an accelerated pace in the future. This, in itself, could exacerbate the difficulty in maintaining and upgrading infrastructure in the villages and townships. The TSEP and FCIC will be challenged to keep these concerns at the forefront, ensuring that the currently-desired rural residents are able to live comfortably and efficiently in the coming years.

Yet to be developed is how the TSEP and FCIC will handle subdivision rules, housing development construction codes and regulations, interface with floodplain regulations, and enforce or advocate for zoning regulations. Comprehensive planning was recently led by the

Parks & Recreation Department, but will likely transition to TSEP in the future. How budgetary planning for utility improvements and regulation updates remains to be worked out. Land use planning, considering that the county is primarily used for agriculture, will require refinement. These issues have all been worked out in other counties, and Seneca County may follow suit.

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. Twelve hazards were identified as relevant to Seneca County, as listed below.

- Dam Failure
- Drought/extreme heat
- Earthquake
- Flood
- Hazardous materials
- Infrastructure failure (utility systems, water/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 2-23: 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.

Climate change was not listed as a specific hazard, but was incorporated into the discussions about all hazards, and applied as it relates to Seneca County. Strategies were considered in the

context of how changing weather patterns and presentations would affect the incidence, circumstances, and outcomes of a particular impact. For example, as rain falls faster and more intensely, flooding was expanded to include surface runoff, flash flooding, and surface flooding. Consideration for how increased rainfall, and resulting increased runoff, would affect Seneca County was given. The effects of hard, pounding rain and pooling on surfaces causes additional rapid surface drainage which worsens surface stress and topsoil erosion. All of these kinds of effects were considered in the context of what is happening now, and the plan has been modified to include those changes. Therefore, climate change is an implied part of every hazard, and will be continually assessed as this plan is implemented and later updated. In developing this assessment, the Seneca County Hazard Mitigation Planning Team analyzed the hazards and risks present throughout the county. Because of the impact on residents, they discussed all hazards, not just natural hazards.

Table 2-24: 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
DR-4507-OH	January 20, 2020	Ohio COVID-19 Pandemic

To understand the risk posed by natural hazards in Seneca County, it is important to examine the characteristics of each hazard and evaluate local occurrences. Historical information was obtained from the National Oceanic and Atmospheric Administration's National Climatic Data Center (NCDC) and supplemented with information from local officials. This section defines each hazard and describes Seneca County's history with each.

2.2.1 Climate and Weather

To meet the requirements of mitigation planning and make the topic relevant and applicable to the local community, the potential effects of climate change are discussed in each of the hazards to which it applies. The Climate Mapping for Resilience and Adaptation website information was discussed as part of the stakeholder meetings, and the reactions are appropriate to that data and other data that was anecdotally included by participants.

How storms occur and the impact on the community is changing. Stakeholders reported various differences in thunderstorms, windstorms, and precipitation in general. Most participants felt that rain falls in more intense storms now and with greater amounts at one time, rather than gentle rains that came frequently in past years. They felt that the wind is stronger than it used to be, and blows more consistently than they remember in the past. In general, stakeholders felt that winters are less harsh, not as cold, and have less snowfall. The

say little change in drought, although they said periods between rainfall episodes are longer than they used to be, and at the time of meetings, the county was experiencing an extremely dry period.

Data suggests that there is also a change in temperatures, although local stakeholders did not feel this change is remarkable in Seneca County. They did report that cool weather lasts longer into May now than it used to, and that the warm-up to summer-like temperatures often does not happen until June. There are still cool spells in June, but there are warmer days in between the cooler ones, whereas May is generally consistently cooler than in the past. They remarked that falls seem to be warmer, and the warm weather commonly stretches into November.

Seneca County stakeholders felt that climate change will have less of an effect locally than in more metropolitan areas. Located in the midst of northwest Ohio where there are no major cities very close by, and few carbon-dissipating industries with robust operations, they feel climate change will impact them in a slower and less profound manner than metropolitan areas closer to Toledo, Columbus and Cincinnati. With a total county population lower than many major cities, the county's contributions to pollution and environmental causative activities are far less than in a Franklin or Cuyahoga County. Therefore, climate change was considered a less imminent threat than in many other counties. While it does affect the various meteorological events, the change is not profound.

Stakeholders did recognize changes in storm patterns and the specific outcomes of major weather fronts. Almost all participants felt there is a marked increase in tornado activity this year, even considering that detection and monitoring has increased in capability to detect funnel clouds, rotation and debris fields. Those changes are discussed within each hazard described in the following section. Many of their comments were consistent with climate projections, only to a lesser degree with fewer drastic changes.

Data is according to the Climate Mapping for Resilience and Adaptation (CMRA) website. This tool is consistent with the USGS and NOAA datasets. Projections can be expressed in tracts similar to the Economic Justice Screening Tool and Building Code Adoption Tracking, but the following table is a countywide projection.

In general, this tool indicates that ambient temperatures are rising, and higher emissions caused a greater increase. Days between rains might increase, and the consecutive dry days will likely increase. Total rainfall will change minimally, but storms may result in more rainfall. These projections are consistent with stakeholder conversations.

Table 2-25: Climate Projections per CMRA – Seneca County OH

Category of Climate Condition	1976-2005 Low	2015-2044 Low	2015-2044 High	2035-2064 Low	2035-2064 High	2070-2099 Low	2070-2099 High
EXTREME HEAT							
Annual Days max temperature > 90	+16.0	27.9	30.8	38.4	47.9	49.5	81.6
Annual days with max temperature >95	+6.0	7.6	9.4	13.1	19.3	20.2	47.3
Annual day max temp >100	+1.2	1.3	1.8	3.3	5.6	6.1	21.3
Annual single highest max temperature >105	+0.1	0.1	0.2	0.4	1.2	1.1	8.2
Annual single highest temperature	+3.6	98.8	99.3	100.4	102.1	102.0	107.3
Annual highest max. temp avg. over 5 days	+3.4	93.9	94.5	95.7	97.3	97.5	102.5
Cooling degree days	+339.2	1152.4	1198.6	1350.2	1521.7	1551.8	2233.1
DROUGHT							
Average annual total precipitation	+1.2	38.1	39.6	37.8	38.3	38.1	39.6
Days/year with precipitation	-2.5	197.1	193.4	197.8	196.9	197.1	193.4
Day/year with no precipitation	+2.5	168.0	171.7	167.4	168.3	168.0	171.7
Max # consecutive dry days	+0.4	11.8	12.5	11.4	11.6	11.8	12.5
Annual day max. temp. >90	+16.0	49.5	81.6	38.4	47.9	49.5	81.6
Annual days max. temp >100	+1.2	6.1	21.3	3.3	5.6	6.1	21.3
WILDFIRE							
Days/year no precipitation	+2.5	166.3	167.0	167.4	168.3	168.0	171.7
Max. # consecutive dry days	+0.4	11.2	11.4	11.4	11.6	11.8	12.5
Days/year with precipitation	-2.5	198.8	198.2	197.8	196.9	197.1	193.4
Annual days max temp >90	+16.0	27.9	30.8	38.4	47.9	49.5	81.6
Annual days max temp >100	+1.2	1.3	1.8	3.3	5.6	6.1	21.3
FLOODING							
Average total precipitation	+1.2	37.3	37.5	37.8	38.3	38.1	39.6
Days per year with precipitation	-2.5	198.8	198.2	197.8	196.9	197.1	193.4
Max number of consecutive wet days	n/c	12.9	12.8	12.8	12.9	12.9	12.9
Annual days with precipitation >1 inch	+0.4	2.5	2.6	2.7	3.0	2.9	3.6
Annual days with precipitation >2 inches	n/c	0.1	0.1	0.1	0.1	0.1	0.2
Annual days with precipitation >3 inches	n/c	0.0	0.0	0.0	0.0	0.0	0.0
Annual days > 99 th percentile precipitation	+0.6	4.8	5.1	5.1	5.7	5.4	6.7
Days with max temp <32	-10.5	27.8	26.8	23.6	20.8	19.9	11.1

2.2.2 Dam/Levee Failure

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 flood control purposes or to store water for irrigation, water supply, or energy generation. Dams can also be created for recreational purposes. They can be composed of earth, rock, concrete, masonry, timber, or a combination of materials. Dams are classified according to an assessment of hazard potential, specifically

low, significant or high hazard. Low hazard dams that fail would likely cause no loss of life, few economic or environmental losses, and damage would likely be confined to the owner's property. Significant hazard dams may cause economic or environmental damage, disruption of lifeline facilities, or impact other entities. High-hazard dams, upon failure, are expected to cause a loss of human life, in addition to economic and environmental damage, and disruption to lifeline services.

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.

A failure of these structures is defined as the uncontrolled release of the water held back by the dam in a lake or reservoir. The majority of dams have a small enough storage volume that a breach or failure will have limited impact on the surrounding community, and many are classified as low-hazard dams. A large number of dams are classified as significant hazard, and some are considered high-hazard. Failure of a large, high hazard dam can cause substantial flooding downstream and lead to significant loss of life and property.

There are many causes of dam failure, including:

- Sub-standard construction
- Geological instability
- Spillway design error
- Poor maintenance
- Internal erosion
- Extreme inflow
- Earthquake

Should the amount of rain that falls, or ice melt after significant winters, increase, dams could be at increased risk of failure. Holding back an increased amount of water, especially when upstream melting or drainage is taking place, puts more stress on the structure and increases the chances of failure. Over-topping of the structure could occur under conditions of long-lasting heavy precipitation with saturated soils and waterways already full of draining water. Repeated additional stress through ongoing waves of heavy rainfall places extra wear and tear on structures, and could potentially decrease the lifespan of a structure, or require additional maintenance and repairs. Earthen dams could deteriorate faster due to the erosive nature of gravitational drainage. The engineering requirements for dams that hold water back within a waterway could increase as stress on those structures. This hazard could be impacted by upstream communities; however, the watershed is made up of mostly farmland. This effect is not anticipated by Seneca County officials to be remarkable. In fact, because the dams in Seneca County are all upground reservoirs, there is no expectation that follow-on dam failure would occur under any reasonably anticipated catastrophic conditions.

Extreme drought could negatively impact a wastewater lagoon through excessive evaporation and causing natural imbalances and chemical changes. More evaporation would be reasonable to expect, further depleting the water content. Algal bloom is more robust in hot weather, and the presence of phosphates and other contaminants could cause treatment problems. Seneca County currently has two wastewater lagoons. One is owned by the Village of Attica and the other by the Village of Republic.

The National Inventory of Dams (NID) identifies the dams across the United States. The NID Data Dictionary (2021) defines critical verbiage associated with that resource. Each dam has an identification number and name. The owner, dam condition, and filing of an Emergency Action Plan (EAP) is described. Other information utilized include the dam classification (high-hazard, significant hazard, etc.) and the inspection date and condition of the dam. The dam is described in the context of size and capacity, and the river or stream that feeds the structure is identified. The nearest municipality is identified. While significant detail about the dam is included on this site, for the purpose of this mitigation plan, the basic information is used.

Dams are classified by the potential magnitude of a breach. “High Hazard” indicates that failure of that particular structure would probably cause the loss of human life. Economic, environmental, and lifeline losses are probable as well, although the loss of human life probability is the only required indicator for high-hazard classification. “Significant” indicates that the loss of life is not anticipated, but there would be economic, environmental, and lifeline losses should a breach occur. “Low” hazard indicates the losses would likely be limited to those of the dam owner.

The National Levee Database identifies the same information for levees in all states. There are no levees identified in Seneca County. There are eight dams listed in Seneca County, but there are also six dams just into Hancock County that are owned by the City of Fostoria. These dams are also considered as part of this mitigation plan because the City of Fostoria has chosen to align with Seneca County for mitigation purposes. Fostoria is partly located in three counties, of which Seneca is one.

High Hazard Dams

There are eight high hazard dams that may affect Seneca County. Of those, seven are included in the hazard assessment and mitigation strategy components of this plan. One is considered a vulnerability to Seneca County, but because the owner and entity responsible for the dam is located in Sandusky County, vulnerability has been considered but mitigation strategies will be part of the Sandusky County Hazard Mitigation Plan.

Beaver Creek Upground Reservoir

Beaver Creek Upground Reservoir is located in Adams Township, and is owed and managed by the City of Clyde in Sandusky County. It is a high hazard dam used for the purpose of collecting water for the city’s water treatment system. It is located off stream from Beaver Creek and has a maximum storage capacity of 2,900 acre-feet. The water capacity is 500,000 cubic yards. It was constructed in 1971, and was designed by Floyd G. Browne & Associates from Marion,

Ohio. It is currently inspected by ODNR and found to be in fair condition. It has a current EAP that was written by GGJ, Inc. of Willoughby, Ohio.

The EAP identifies the signs and indicators of a developing problem with the reservoir, and calls for specific actions for particular indicators. It talks about notification and work within the city workforce to evaluate, obtain consultation from ODNR and professional engineering services, and others as appropriate. The plan assigns roles and responsibilities to city employees, and identifies other community parties who would play a role in managing an emergency. It discusses complicating and compounding circumstances such as weather, emergencies during non-working hours, and redundant communication systems. The inundation maps predict that flooding could and probably would affect multiple homes and would be five feet in depth or less. The prediction does not change based upon current weather because it is anticipated that the floodwater will split into three watercourses that provide drainage to the Beaver Creek Reservoir. The breach analysis program that was used to develop the plan was the National Weather Service Simplified Dam-Break program.

The EAP for Beaver Creek Reservoir calls for City of Clyde personnel to take specific and definitive action upon identification of a significant threat. Twenty-five Adams Township residences will be evacuated. The Water Plant Superintendent is responsible for the emergency operations, assisted by the Clyde City Manager and Ohio Department of Natural Resources, as available. Sandusky County EMA, Seneca County EMA, and Norfolk Southern Railway are notified immediately, followed shortly by law enforcement, fire services and other relevant parties. The EMA offices will partner in the evacuation process, and will ensure the sheltering and service to evacuees. The railroad is notified because a section of track will likely be affected that will necessitate emergency action on their part. The overall operation will be commanded by the City Manager and the Water Treatment Plant Superintendent, prioritized into three goals. The first goal is to implement the evacuation, then complete notifications of others, and then to make necessary repairs to resolve the problem. This plan was originally developed in December 2000; it was revised in March 2023. The plan follows the FEMA-recommended format and content for an EAP.

The mitigation planners met with the Clyde city administrator and the water treatment superintendent, and had several conversations about the Beaver Creek Reservoir as indicated above.

Attica Upground Reservoir #2

Attica's upground reservoir was constructed in 2006 by Makeever and Associates and is owned and managed by the Village of Attica. The structure is owned and operated by the Village of Attica. This upground reservoir is considered a high hazard dam. It is used for water supply and is off stream from Honey Creek. It holds 140,000 cubic yards of water and has maximum storage of 162 acre-feet. It was inspected by ODNR on May 22, 2018 and is considered to be in fair condition. The EAP was written in 2008.

The upground reservoir sits in Venice Township on the north side of a census-designated area called Caroline. It is bound by Honey Creek on the north, State Route 4 on the west, East Street and Trail 1057 on the south, and the Norfolk Southern railroad on the east. It is a 49-million-gallon reservoir operating in conjunction with another 15-million-gallon reservoir. The structure has a system of pump stations to fill and control the water levels, and an overflow and drain structure with piping. According to the EAP, the top of the reservoir is 944' and the maximum water surface elevation is 939'. The bottom of the reservoir is at 915'.

The EAP defines various emergency situations and conditions. It cites specific actions to be taken for a list of problems or potential problems, and includes notification of the public and evacuation as appropriate actions for some circumstances. It very specifically lists a variety of situations that are indicative of structural or functional problems with the reservoir, and directs the actions to be taken for each issue.

Another section of the plan delineates responsibilities to specific individuals during "watch" or "warning" events. This include both village representatives as well as others outside the scope of the village, like the EMA Director. It identifies specific protective actions to take, such as blocking off roads by law enforcement and activation of evacuation orders. It very clearly lists a variety of situations in which the owner (Village of Attica) is required to obtain engineering assistance, emergency management help, or other structural work. The plan directs the appointment of an "EAP Coordinator" to monitor, update and enforce the plan's stipulations.

The plan establishes a regular maintenance and monitoring schedule for the structure. It lists resources necessary to take action to correct problems, and sets standards for initiation of repair and remediation. The plan also sets for training, exercising, updating and posting of the EAP, as well as general provisions regarding the responsibilities outlined in the plan.

The plan annexes provide documents for use in recording any unusual events or actions taken. There are flow charts that designate decision trees and the sequence of critical actions to be taken. Phone numbers are listed alongside responsible parties and action plan players. Appendices include a reservoir vicinity map, a map designating the roadblocks that would be necessary in an emergency event, and an inundation map. The inundation map simply identifies a zone where flooding is likely to occur but does not give times of inundation for any demographics about the area.

The inundation zone, when compared with a map on Google Earth, appears to include less than 20 homes, of which some plots appear to be farmsteads with outbuildings and silos. It appears that the plan author does not anticipate the floodwaters to travel south to the Caroline area, but instead expects the water to flow north into the southern side of Attica. This would involve at least one small business, a church and a fire department. The flood water is not anticipated to travel further north than South Woodwind Drive, and therefore would not affect most of the village proper. It appears possible that State Route 4 could become water-covered and impassable for a period of time.

The mayor and village administrator from the Village of Attica met with mitigation planners, the EMA director, and others to discuss infrastructure. This is reflected in Section 01: The Planning Process and the participation worksheet.

Fostoria Upground Reservoirs #1 - #6.

The City of Fostoria owns and operates several upground reservoirs for the purpose of supplying their water system. All of these upground reservoirs are included in this plan. That has not always been the case.

Within the incorporation limits of the city, there are three different counties, including Seneca, Hancock and Wood. The City of Fostoria has chosen to work with Seneca County regarding Hazard Mitigation Planning for several mitigation planning cycles now, and continues to choose to be included in the Seneca County Hazard Mitigation Plan.

In past mitigation plans, it was assumed the reservoirs would be included in the Hancock County Hazard Mitigation Plan because they are physically located in Hancock County. After both county plans were written and approved in approximately 2019, it was discovered that the upground reservoirs owned by the City of Fostoria were not included in the Hancock County plan. They were mentioned and discussed in the 2019 Seneca County Hazard Mitigation Plan. Therefore, the decision was made to include a full dam risk and vulnerability assessment and mitigation strategies in the 2025 Seneca County Hazard Mitigation Plan. They are owned, operated, controlled, and improved by the City of Fostoria. Hancock County and Washington Township are not responsible for the structures, the operation of the system, or any improvements to the system. Whole and complete responsibility and authority for them rests with the City of Fostoria.

For ease of discussion, following is a table that includes each reservoir and its detailed location. Some are located within the Fostoria city limits, in the part of the city that is located in Hancock County; others are located outside the city limits in Washington Township and Hancock County, but still owned and maintained by the City of Fostoria.

Table 2-26: Fostoria Upground Reservoir List

Dam Name	Geographic Location	Owner	Classification	Condition	Federal I.D.
Lake Daugherty Upground Reservoir #1	City of Fostoria, Hancock County,	City of Fostoria	Significant Hazard	Poor	OH 00786
Lake Mottram Upground Reservoir #2	City of Fostoria, Hancock County	City of Fostoria	High Hazard	Fair	OH 00787
Lake Lamberjack Upground Reservoir #3	City of Fostoria, Hancock County,	City of Fostoria	High Hazard	Poor	OH 00785
Lake Mosier Upground Reservoir #4	City of Fostoria, Hancock County	City of Fostoria	High Hazard	Poor	OH 00784
Lake LaComte Upground Reservoir #5	Hancock County, Washington Twp.	City of Fostoria	High Hazard	Fair	OH 00788
Veterans Memorial Reservoir	Hancock County, Washington Twp.	City of Fostoria	High Hazard	Fair	OH 02730

City of Fostoria Upground Reservoirs #1 through #6

Lake Daugherty Upground Reservoir #1 (Significant Risk Dam) provides water for the Fostoria public drinking water system. It is the smallest and shallowest of the six reservoirs, and the primary purpose is to receive drawdown from UR#4 Mosier, and send it to the raw water transmission lines. The capability to pump directly into this reservoir from the river exists, but requires constant monitoring while taking plan. The water supply to this reservoir is the East Branch of the Portage River and Lake Mosier Upground Reservoir #4.

Lake Mottram Upground Reservoir #2 (High Hazard Dam) is not utilized for day-to-day operations. It receives drawdown water from UR #4 Mosier by gravity through the raw water transmission line when being used for storage capacity. It is equipped with an automatic overflow structure on the northwest corner to prevent overtopping under normal operations.

Lake Lamberjack Upground Reservoir #3 (High Hazard Dam) is not utilized for day-to-day operations. It receives drawdown water from Reservoir No. 4 Mosier and #5 LaComte by gravity through the raw water transmission line when used, and is used for overall storage capacity. It is equipped with an automatic overflow structure on the northeast corner to prevent overtopping under normal operations.

Lake Mosier Unground Reservoir #4 (High Hazard Dam) is not used for day-to-day operations. Its primary purpose is to pump water directly from the East Branch of the Portage River into the reservoir for storage. The water here is used only during drought conditions. It is equipped with an automatic overflow structure on the north embankment to prevent overtopping under normal operating conditions.

Lake LaComte Upground Reservoir #5 (High Hazard Dam) is used for day-to-day operations and storage capability. It receives water pumped directly from the East Branch of the Portage River. The raw water pumping facility at the same location is used for pumping operations directly into Reservoir #6 or directly to the water treatment facility.

Fostoria Reservoir #6, (High Hazard Dam) also known as Veteran's Memorial Reservoir is used for water supply and recreation. It is off stream of the East Branch of the Portage River, and is 3.8 miles from Fostoria. It was designed by Floyd Browne Associates, Inc. The structure is an earthen dam constructed in 1992. It holds 1,250,000 cubic yards of water and has a maximum storage capacity of 4,834 acre-feet. The surface area is 160.8 acres, and the dam is 12,249 feet in length and 32 feet high. This dam was last inspected on June 24, 2021 and rated in fair condition. It is considered a high hazard dam. There is no EAP and no inundation maps entered on the National Inventory of Dams website.

Google Earth shows the Veterans Memorial Reservoir located on the south side of State Route 12 as it leaves Fostoria on the southwest side and heads toward Findlay. There are several businesses, some that appear to be of significant size, across the highway from the reservoir. An electrical substation is across the highway on the north side. Several homes, some part of a farmstead, lay to the southwest along the highway. Fostoria Country Club is to the north.

Fostoria's Reservoir #5 Lake LaComte Reservoir, Reservoir #4 Lake Mosier Reservoir, and Reservoir #3 Lake Lamberjack Reservoir lie to the northeast of Veteran's Memorial Reservoir.

There is no emergency action plan for this dam.

Emergency Action Plans for Fostoria Upground Reservoirs

All Emergency Action Plans were developed by Peterman Associates, Inc. from Findlay, Ohio. Those five plans are organized in the same format and contain very similar information, and an EAP has been created for each of five dams. There is no EAP for Veterans Memorial Reservoir. All current plans were reviewed and revised in July 2006, and again in August 2008.

Each EAP clearly identifies each dam with both state and federal identification numbers as well as street locations and owner information. The purpose of each structure, as described above, is listed in each plan. The recreational activities are indicated as permitted or not permitted. Some reservoirs allow boating with small boats (10 hp and 26' length limitations) and fishing with an appropriate license. Some provide walking paths and hiking trails, and picnic areas.

Inundation zones and projections in each one of the plans were developed through utilization of the USACE HEC-RAS system to model the East Branch of the Portage River. Maximum flood elevations were calculated, and timing was developed back upon flows and cross sections entered. A simplified hydrograph was created to determine peak breach discharge rates as well as taper factors for the flood water. This resulted in the plan's inundation zones displaying flow in the shortest time possible for a worst-case scenario plan. Factors like each reservoir below grade water storage capacity being included in the flow numbers made the scenario show additional magnitude. With the East Branch of the Portage being dry for a large part of each year, it further stated worst case indications.

Bridges and culverts, and other local structures that may affect flow were not taken into consideration. Some tributaries off the river, such as Wolf Creek, were not considered in the calculations. Flood water would flow into those waterways, further decreasing the magnitude of the incident as the water separated and flowed in less concentration. By the same token, if pre-failure river conditions were extremely full and flowing, the magnitude could, under the most catastrophic conditions, increase.

Each EAP Section of the manual identifies warning and notification procedures, and designates the specific person who is responsible for conducting specific actions. These designations include the identification of a potential or definitive emergency, and defines the events as Type C Non-Emergency Condition, Type B Potential Failure Situation Developing, and Type A Failure Imminent or Occurred. Based upon the type event, notifications are described and specific contacts are given in the form of a call-down list. There are primary parties for notification, and secondary parties. This includes individuals from local and state agencies as well as the general public affected by the incident.

Response and mitigation measures are identified and directed through the plan's step-by-step format. Resources that may be needed are identified and sourced. Assignments for specific responders are listed, include the dam owner, their personnel, and other local and state officials and appointees. Protective actions such as evacuation, rescue, and signage placement and traffic management are defined and described.

A plan to train personnel inside and external to the City of Fostoria, to exercise the EAP, to revise and distribute the plan are described and assigned. There is defined coordination of upstream and downstream affected parties.

The pre-amble for each EAP includes a schedule of regular maintenance for the reservoir. The daily, monthly, annual and periodic check points are identified, and documentation forms are provided to keep track of maintenance. If a problem is found, a clear channel of reporting is identified to prevent the problem from causing an event. Personnel are clearly assigned maintenance and repair duties.

Several appendices are included to aid in workers' ability to prevent events and to manage situations that may lead to an event in a standardized and appropriate manner. They attached ODNR Fact Sheets for the following areas of interest to the EAP:

- Lake Drains
- Rodent Control
- Trees and Brush
- Class of Structures
- Earth Dam Failures
- Seepage at Earth Dams
- Concrete Repair Techniques
- Inspection of Concrete Structures
- Probable Maximum Floods
- Design & Maintenance of Trashracks
- Open Channel Spillways
- Outlet Erosion Control Strategies
- Upstream Slope Protection
- Embankment Instability
- Ground Cover
- Spillway Conduit System Problems
- Critical Flood Design Criteria
- Remediation Alternatives

Inundation maps are included in each plan, and indicate the timing of floodwater through the inundation zone. Also listed are the roads, streets and highways that would potentially be affected, and what the dam failure effect would be on each roadway section. Preparedness information in this section talks about access to the sites, responding during inclement weather and adverse conditions, and surveillance of the events as a preventive measure.

Significant or Low Hazard Dams

Lake Daugherty Upground Reservoir #5 is described with the other high hazard dams owned by the City of Fostoria for ease of discussion, but it is a significant hazard dam.

Mohawk Lake Dam is owned by Mohawk Country Club and is located in Eden Township to the southeast of the City of Tiffin. Mohawk Lake is a recreational area build in 1913 on VanMeter Creek. It is considered a significant hazard dam. There is an EAP that was last revised in 2019, and the 2018 inspection by ODNR rendered a satisfactory condition rating.

The Attica Wastewater Treatment Loagoon is considered a significant hazard structure, and has an EAP that was revised in 2016. It was engineered by Makeever and Associates, Inc. for the purpose of wastewater collection. It was inspected in 2017 b ODNR and found to be in satisfactory condition.

The Attica Upground Reservoir was built in 1955, engineered by Floyd G. Browne & Associates of Marion, Ohio. It is off stream of Honey Creek, and collects water for treatment. This significant hazard dam was inspected by ODNR in 2018 and found to be in poor condition. There is no EAP.

The Republic Wastewater Lagoon is a significant hazard dam owned by the Village of Republic. It was designed by Poggemeyer Design Group and built in 2003. It was inspected by ODNR in 2018 and found to be in satisfactory condition. The EAP was written in 2003 and has not been revised.

The Ella Street Low Head Dam is owned by Aqua Ohio – Tiffin Division. It is a concrete low head dam used for water supply collection. There is no design firm listed, but it was built on the Sandusky River on the southwest side of Tiffin. ODNR inspection in 2018 gave it a satisfactory condition rating. There is no EAP.

Bacon Low Head Dam is owned by Frank L. Bacon, and was constructed in 1922. Privately owned and located on the Sandusky River, it is used for water supply. There is no design firm listed. It is a masonry structure last inspected in 2013 with no condition listed. It is considered a low hazard dam. There is no EAP.

ODNR Dam Listing

According to ODNR Division of Water Resources, there are 21 dams in Seneca County. This duplicates some of the NID listing. Class IV and Other-classified dams do not appear on the National Inventory of Dams; that resource generally includes dams categorized as Class I through Class III only. This also includes the afore-mentioned upground reservoirs in Hancock County that are owned by and the responsibility of the City of Fostoria.

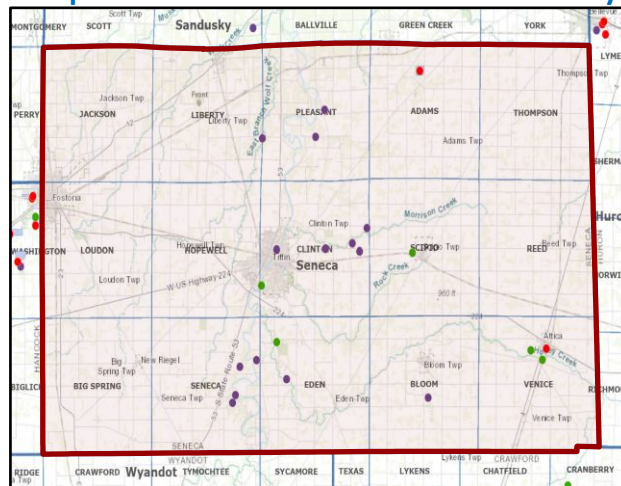
Table 2-27: ODNR-Listed Seneca County Dams

Name	Class	Owner	Location
Attica Upground Reservoir #2	I	Village of Attica	Venice Township
Beaver Creek Upground Reservoir	I	City of Clyde (Sandusky Co.)	Adams Township
Attica Upground Reservoir	II	Village of Attica	Venice Township
Attica Wastewater Treatment Lagoon	II	Village of Attica	Venice Township
Ella Street Low Head Dam	II	Aqua Ohio – Utility	Tiffin
Mohawk Lake Dam	II	Privately Owned	Eden Township
Republic WWT Lagoon	II	Village of Republic	Scipio Township
Bacon Low Head Dam	IV	Privately Owned	Tiffin
Buchman Lake Dam	IV	Privately Owned	Seneca Township

Estep Lake Dame	IV	Privately Owned	Clinton Township
Funk’s Lake Dam	IV	Privately Owned	Clinton Township
Honey Creek Diversion Levee	IV	Unknown	Eden Township
Jacobs Pond Dam	IV	Privately Owned	Clinton Township
Marsh Lake	IV	Privately Owned	Bloom Township
Nye Lake Dam	IV	Privately Owned	Seneca Township
Schoen Lake Dam	IV	Privately Owned	Scipio Township
Shults Lake Dam	IV	Privately Owned	Liberty Township
St. John’s Dam	IV	ODNR	Seneca Township
Welter Lake Dam	IV	Privately Owned	Seneca Township
Wilbert Lake Dam	IV	Privately Owned	Pleasant Township
Wise Lake Dam	IV	Privately Owned	Pleasant Township
Dams owned by City of Fostoria in Hancock County			
Lake Mottram Unground Reservoir #2	I	City of Fostoria	Washington Township
Lake Lamberjack Upground Reservoir #3	I	City of Fostoria	Washington Township
Lake Mosier Upground Reservoir #4	I	City of Fostoria	Washington Township
Veterans Memorial Reservoir #6	I	City of Fostoria	Washington Township
Fostoria Upground Reservoir #5	I	City of Fostoria	Washington Township
Lake Daugherty Upground Reservoir #1	II	City of Fostoria	Washington Township

Note: Honey Creek Diversion Levee is not shown as a levee on the National Levee Database.

Map 2-5: Ohio Dam Locator – Seneca County



Local Dam Failure History

According to records from Association of State Dam Safety Officials website, Fostoria Upground Reservoir No. 5 (Lake LaComte) experienced a slope instability issue on June 26, 2012. There was a shallow slide on a downstream slope that caused the Emergency Action Plan to be activated. No structures were flooded and there were no evacuations.

2.2.3 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 standard amount of time required for an extended dry period to be considered a drought. It is considered a drought when the dry period lasts long enough to impact the environment and economy of a region, typically a period of months or years.

There are four common types of droughts:

Type	Description
Meteorological	Based on the degree of dryness (rainfall deficit) and length of dry period
Hydrological	Based on impact of rainfall deficits on water supply such as stream flow, reservoir and lake levels and water table decline
Agricultural	Based on impacts to agriculture by rainfall deficits, soil water deficits, reduced ground water, and reservoir levels needed for irrigation
Socio-economic	Based on the impact of drought conditions on supply and demand of some economic goods

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 length of time 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 rises. Between injuries, fatalities, and crop/property damage, these disasters can significantly impact the economy of a region.

Heat waves can occur in Seneca County and but the incidence is rare and the duration typically short. Extreme temperatures are considered anything above 90 degrees Fahrenheit. In the humid climate of western Ohio, these temperatures are often accompanied by high humidity. Temperatures rarely exceed the mid-90s, although the region does occasionally experience higher temperatures. 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 2-28: Average Temperatures and Rainfall

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High	34°	37°	47°	61°	72°	82°	85°	83°	77°	64°	51°	39°
Avg. Low	21°	22°	29°	39°	50°	60°	64°	62°	56°	44°	34°	26°
Avg. Precip.	2.56"	2.28"	2.81"	3.54"	4.15"	4.37"	4.03"	3.66"	3.19"	2.93"	2.6"	2.69"

Drought/Extreme Heat Risk Assessment

Drought is not generally severe in Seneca County, but many years include abnormally dry periods and even moderate drought. Dry spells can last for several weeks but most months have sufficient rainfall to support crop growth and human sustenance. Drought conditions, when they do occur, have a significant impact on the agriculture industry that prevails in the county. According to the US Drought Monitor historical information, Seneca County has experienced abnormally dry conditions at some time during the year in nineteen of the past twenty-five years, and moderate drought conditions in nine of twenty-five years. There were four severe drought incidents recorded since 2000, including the worst in the fall of 2024.

Drought and extreme heat are countywide hazards and can affect all areas and jurisdictions.

The long-term effects of drought and heat wave according to climate change “high” level projections could increase the average minimum temperature by as much as 3.5 (F) and the average maximum temperature by 2.6 (F). While those temperatures are not within what is considered “extreme” levels, one must keep in mind these are averages created by mathematical manipulation, and therefore, there will be days that reach far above those temperatures and days that fall far below. With average highs in the low 80’s in July and August, this will likely bump those temperatures to the high 80’s, and will perhaps increase the number of 90 (F) plus days as well. Evaporation will increase as temperatures rise, worsening drought when rainfall becomes minimal. Those days place stress on electrical systems to fuel environmental systems, and stress the water supply to feed vegetation and crops, as well as providing additional potable water for people and animals. To the contrary, the growing season is anticipated to increase by up to fifteen days, enabling higher production and opening the door to crops that used to need more time to grow than Ohio weather permitted. The stress on the electrical grid as demands grow could be significant, causing outages and interruptions in service. Should high degree days occur simultaneously while a period of no precipitation accompanies it, there would be stress on crops, reducing yields, and livestock that could

potentially cause loss of animals. Pestilence may increase as might infestations of nuisance weeds because insects and weeds tend to thrive in hot, humid weather. Hot and humid weather is difficult for people with medical issues, especially respiratory or cardiac issues; therefore, this potential increase may negatively affect the elderly and medically-dependent part of the community, as well as others with economic disadvantages. When wheat and other grains and forages are growing, or are cut and drying before baling, the risk of field fires increases in hot, dry weather. Sparks from trains are more likely to cause a field fire under those conditions. Participants did not see significant changes in this area of vulnerability.

Changes in the last five years relevant to drought and extreme heat are somewhat subtle. Vulnerability to drought and extreme heat changes affect an aging population as stated in the demographics section of the Hazard Identification and Risk Analysis, with much of the population living in rural areas being elderly. While in general the population in the small villages is decreasing, all of the villages have experienced increases in the average age of the population, which makes a higher percentage of the population susceptible to heat injury when temperatures rise, especially if combined with a power outage. The concentration of drought statistics is not severe for any of the last twenty-five years, but there is more regularity and repetition of measurable drought since 2016 than there was prior to that from 2004 until 2015. Within that time period, only 2012 held significant drought.

The increasing likelihood of drought through a changing environment could potentially affect the water supply, endangering the elderly (and others) when considering potable water sufficiency; however, the major water source is the Sandusky River that is fairly robust, and carries large amounts of water. Tributaries of the Sandusky River are used for water supply as well. Those who live in service areas for distributed water have less risk than those who obtain their water from private wells. This might be off-set by the fact that as people in the small villages pass away or move into long-term facilities, the number of people at risk decreases. Younger people are not moving into the villages in any significant number, so there has not been and is not expected to be an increase in population in the villages in Seneca County.

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 NDCD 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 2-29: Seneca County Drought/Extreme Heat History

Hazard	Incidents	Property Loss	Crop Loss	Deaths	Injuries
Drought	5	0	\$18.00M	0	0
Extreme Heat	0	0	0	0	0

Seneca County has been affected by several droughts in recent decades. The 1988-1989 North American Drought followed a milder drought in the Southeastern United States and California the year before. This drought spread from the Mid-Atlantic, Southeast, Midwest, Northern Great Plains, and Western United States. It was widespread, unusually intense, and accompanied by heat waves that killed 4,800 to 17,000 people nationwide and substantial numbers of livestock. One particular reason this drought became very damaging was that farmers likely farmed on land that was marginally arable. Another reason was the pumping of groundwater near the depletion mark. The Drought of 1989 destroyed crops almost nationwide. Lawns went brown and many cities and jurisdictions enacted water restrictions. This catastrophic drought continued to impact the Midwest and Northern Plains states during 1989. The drought was not declared over until 1990. According to the planning team, this drought did affect Seneca County, but not to the extent that it did other areas.

In June, July and August of 1999, little rain fell from May through June. Water restrictions were enacted in several communities, but crops were not adequately hydrated in the early stages of the growing season. Dry soils persisted through July and August when much of the needed rainfall missed fields in Seneca County. Crop yields were believed to suffer a 30% reduction, but there was no determination of actual dollar amounts of loss.

The second most recent drought to affect Seneca County occurred in the summer of 2012. This incident, referred to as the 2012 North American Drought, 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. Along with many other counties, Seneca County was designated with moderate drought conditions by mid-June of 2012. This lasted for two months. This drought has been compared to similar droughts in the 1930s and 1950s but was not in place 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.

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.

At the time this plan was being developed, Seneca County was designated as having “severe drought” conditions, but no declarations were in effect. The designation was the result of generally low amounts of rain for several months, and a drier than normal fall.

2.2.4 Earthquake

An earthquake occurs when two blocks of earth, called 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 the following 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.

According to the Ohio Seismic Network, seismic risk in Ohio is difficult to evaluate because significant earthquakes are infrequent. The recurrence interval is generally very long, sometimes spanning hundreds or thousands of years. In geologic terms, this classifies Ohio's historic record as an instant. Another factor in earthquake risk is the nature of the geologic materials upon which a structure is built. ODNR states "ground motion from seismic waves tends to be magnified by unconsolidated sediments such as thick deposits of clay or sand and gravel."

The Ohio Seismic Network lists 26 earthquakes in Ohio between January 1, 2024 and March 10, 2024. None of these occurred in Seneca County. The strongest one was a magnitude of 2.2 in Lake County. Most of these were in the far northeast part of Ohio.

Ohio has experienced more than 800 earthquakes since 1776. While only fourteen of these events have caused damage, there is a greater risk for earthquakes in Ohio than most people realize. The far northeast corner of Ohio has the most earthquakes, with Lake County showing 163 earthquakes of record in the Ohio Earthquake Database. In the past five years, there have been three earthquakes greater than 4.0 in Lake County. One occurred in 2023, one in 2022, and one in 2019.

To the southwest of Seneca County, Shelby County has the strongest history of earthquake with 39 on record, as long ago as 1876 and as recent as 2020. Logan County has had four earthquakes (1931-1994), and Clark County has had one (1980); Miami, Madison and Union Counties have no earthquakes on record. None of these areas are adjacent or closely located to Seneca County.

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.

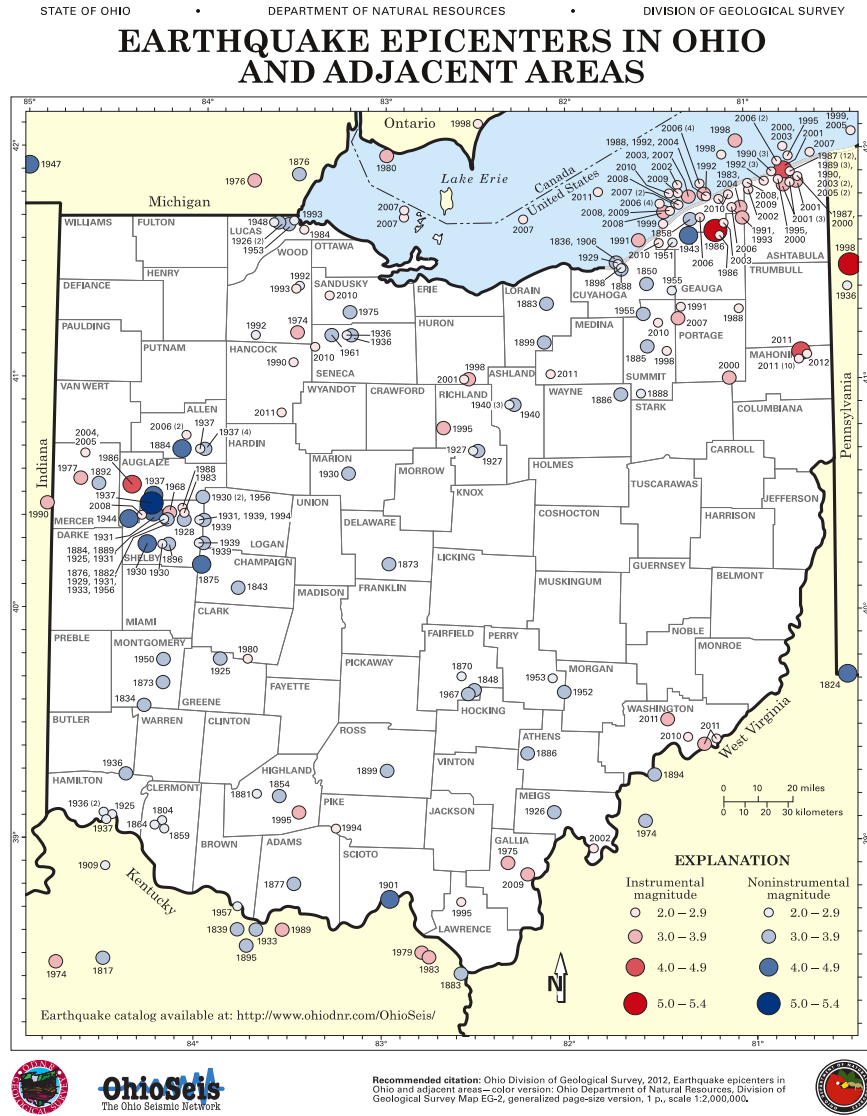
There is no documented evidence of structural damage in the county from any of these incidents. There are several documented earthquake epicenters in the adjacent counties of Sandusky, Wood, and Hancock. These incidents are all similar in magnitude to the Seneca County events and caused no known structural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

Table 2-30: 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 2-6: Earthquake Epicenters in Ohio and Adjacent Areas



2.2.5 Flood

A flood is defined as any high flow, overflow, or inundation of water over typically dry land that causes or threatens damage. Floods occur subsequent to meteorological events such as substantial precipitation, thunderstorms with heavy rainfall, rapid snowmelt, or extreme wind events along coastal waterways. In some areas, seismic activity can trigger floods.

Riverine flooding occurs when a river or stream rises to an elevation that causes the river to overflow its banks. The rising water threatens or causes damage to roadways, homes, buildings, and occupied spaces near the overflowing waterway. Lower levels of a watershed are more susceptible to this type of flooding because these waterways receive all the water from the upper levels and are responsible for carrying a much higher volume of water than the

tributaries. Water that lays on the surface and is not absorbed into the soils is considered surface flooding; this can occur on concrete or other impervious surfaces, roads and streets, parking lots, or other large areas. Water that ponds and takes an extended period of time to drain even though it is laying on top of soil is considered areal flooding.

Flash floods are defined as the rapid and extreme flow of high water into a normally dry area; a flash flood can also occur when there is a rapid rise in the water level of a stream or creek and the water rises above a pre-determined flood level within six hours of a precipitation event. This type of flooding occurs 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.

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.

Worldwide, flooding is the most common and costly disaster, resulting in significant loss of life and property every year. Floods have a substantial impact on the infrastructure. Common effects include roadway breeches, bridge washouts, roadway wash away, and water-covered roadways. As floodwater moves rapidly and forcefully, it washes away the surface and subsurface of roads, causing holes, ruts, and other problems for vehicles. Floodwater that is one foot deep is strong enough to carry vehicles away, often with occupants inside. Rescuers are powerless against rapid, rising water because they are unable to exert enough strength to counteract the physics of moving water.

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 only serve as a temporary stopgap measure; 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 and dangerous as the initial incident. Cleanup is often a long, protracted activity with its own set of hazards. Sewer systems can become inundated with floodwater and cease to function properly. Standing water becomes 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 initial recovery phase of the disaster.

Flood Risk Assessment

Historically, flooding has been a mild to moderate risk for Seneca County. The county's flood risk is largely attributed to the flat terrain that makes drainage difficult, and the presence of ditches, streams and rivers that flow throughout many parts of the county. Seneca County is where the water drains for thousands of acres of land, and as the runoff flows toward the Sandusky River, it converges on the center of Seneca County. The Sandusky River is wide, in some places deep, and very capable of draining a huge amount of water, but if the precipitation comes fast and hard, the water sometimes causes flooding along the way. Roads and highways can also flash flood as the precipitation or snow melt is unable to drain as fast as it arrives.

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.

The soil in Seneca County is highly susceptible to surface drainage. Many fields are tilled 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. Soils contribute to surface flooding in Seneca County.

Areal flooding is also an outcome of the soil types, the terrain, and the watersheds in Seneca County. This is a type flood characterized by ponding, and generally ends up more of a nuisance than a long-term problem for farmers trying to farm fields where sections remain underwater or extremely wet for a longer period of time than other adjacent areas. If it happens during planting in the spring, sections of fields may end up not producing a crop because seeds are drowned before they germinate. Later in the season, the standing water can flood out small plants with little resistance to flood water. Later on, areal flooding can prevent harvest, spoil the fruits of the plants, or kill the crops by not draining adequately.

Flash flooding is as much of a risk as riverine flooding because rapid or heavy rainfall amounts have difficulty in draining as fast as precipitation falls. During heavy rainfall events, the flat terrain or poorly absorbing soils prevent water from draining quickly, increasing the potential for flash floods. Some areas can have flooded streets and roads, houses might have water in basements or yards, and businesses are surrounded by water-filled parking areas and spaces. Parks and other recreational areas can flood, and some bridges and culverts are water-covered for a short period of time. The presence of flash flooding is totally dependent upon the amount of rainfall within a given time period, whether the ground is frozen or thawed, and how well saturated the ground was prior to the rainfall. The storm that causes a flash flood in the wet,

rainy spring when snow is melting is totally different than the storm that causes flash flooding on a dry, hot, late August afternoon.

Local Flood History

Data from NCDC indicates that Seneca County has been impacted by 28 flood/flash flood events since 1950. Collectively, these events have caused \$5.390M in property damage, and \$1.292M in crop damage. Because of the number of rivers, creeks, and streams, flooding is a countywide hazard and can affect nearly all jurisdictions, but the area along the Sandusky River and major tributaries like Honey Creek ditch and Wolfe Creek are at higher risk. The entire county is vulnerable to flash flooding.

Republic and New Riegel are not close to floodplain areas, and do not have waterways that traverse the jurisdiction. Attica, Bettsville and Bloomville have waterways that pass close to the jurisdiction, but not through it. They will experience areal and surface flooding in heavy rain situations, or when rain continues for a long period of time. Fostoria has waterways that go around the city but not through it. Tiffin, however, has the Sandusky River that crosses the entire north to south length of the city, and winds through neighborhoods and business districts as it collects runoff. While it has a significant capacity as it flows through Tiffin, the river can flood if water comes rapidly or the rainfall is heavy. Ice jams can cause some water back-up and then rapid release when the ice jam breaks.

Roadways are vulnerable to flooding when rain comes quickly in Seneca County. The slightly rolling terrain provides pockets and low spots where precipitation can collect. Road ditches to assist with drainage in an almost flat terrain also fill with water and overflow. It is not common for this flooding to last a long time; it is usually in the midst of heavy rainfall and dissipates quickly once the rain stops.

Two reported flooding incidents have occurred within the past five years. One was in Fostoria and the other in Tiffin. The Fostoria event resulted in \$250K damages after over three inches of rain in an hour. Underpasses were impassable, basements were flooded, and vehicles were stranded in standing water.

Table 31: Seneca County Flood/Flash Flood History

Hazard	Total Incidents	Total Property Loss	Total Crop Loss	Total Deaths	Total Injuries	Average Loss/Incident
Flood	9	\$2.080M	\$2.00K	1	0	\$231.33K
Flash Flood	22	\$3.310M	\$1.290	1	0	\$209.09K

Flood damage in Seneca County could include damage and destruction of physical buildings, 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, offices, schools, and special facilities like garages and maintenance buildings, and the capital contents of those structures. 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.

Participants in the planning process stated that precipitation averages may not have changed much over the past decade, but some stakeholders felt that rain falls harder, faster, and more intensely in some of the more recent storms. This causes flash and surface flooding to increase because drainage systems are not able to carry the water away as fast as it falls. Areal flooding increases for the same reason, but is displayed by standing water in fields when streams are full and flowing. As the upper levels cool during the colder months, freezing rain and sleet can be more damaging than just rain. In other months, hail can do more damage than pelting rain, and should the hail amounts increase, damages could surge. Plants can be shredded, roofs ruined, and cars damaged, as a few examples of expanding hail potential. All stakeholders said the flooding – no matter the type – does not last for a long time.

Projections for future rainfall estimate a rise in annual precipitation by two to four inches per year. If this increased rain comes gradually, the effects might be minimal. Additional nuisance weeds and more robust plant growth may be the most observed effects. If it comes gradually, there will be time to increase stormwater management systems as they are replaced and repaired. Should this come abruptly, flooding could worsen slightly. In an area where the land is almost completely flat, drainage could be more difficult and farmers may choose to tile more fields. Having a comprehensive tiling plan in place would manage this well. There is more debris washed into waterways with heavy, rapid downfall, and since crop debris already poses a problem, this could worsen it. This could necessitate more frequent cleaning of waterways, and the need for increased bridge spans and dry dams. Cleaning culverts and storm basins could be more necessary than ever. Because this is likely to occur gradually, participants felt that engineering standards would change as conditions change, and floodplain regulations would be modified along the way.

In the past five years, there have been no significant changes in flooding in Seneca County; there have actually been very few incidents of flooding at all. The only change, based upon input from stakeholders, is that rain falls faster and harder, and makes surface flooding more profound for a short period of time. The growth in agriculture may have had an effect on agricultural runoff, and is likely the reason for an increase in the amount of crop debris making its way into ditches, streams, and catch basins. There are remaining effects of Emerald Ash Borer as dead and diseased trees continue to fall during storms, creating excess debris for jurisdictions to clean up.

There have been no changes to major roadways or streets in Seneca County over the past five years, so there is no increased flooding due to infrastructure improvements; however, ODOT has recently released information several improvement programs. Upcoming projects include improvements to SR 18 near and east of Fostoria to US 224 in Tiffin. There will be resurfacing and bridge repairs through fall. State Route 100 between Tiffin and SR 231 will be closed for watermain replacement through October. Various state routes will be closed or restricted for repaving and berm work across the county.

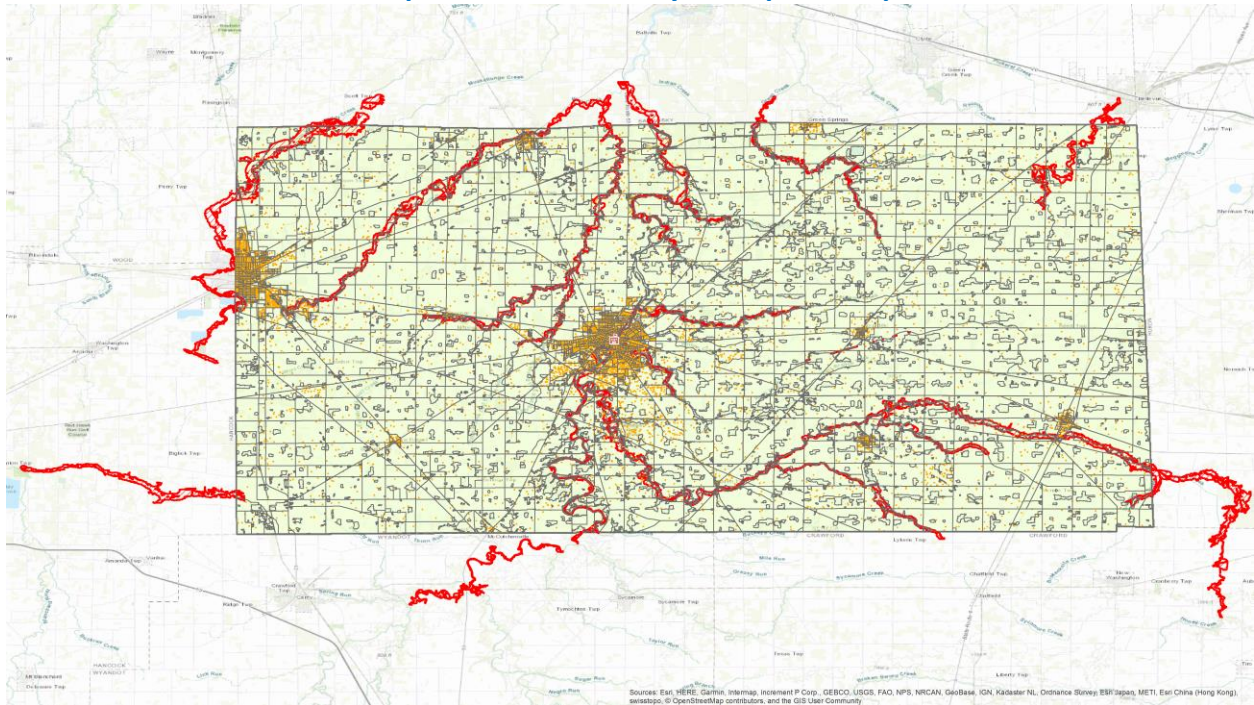
No major construction changes to roads or major properties have occurred over the past five years; therefore, the flood risk remains very similar to the past in that regard. The scheduled construction projects do not affect flood management negatively. No new subdivisions, commercial retail centers, big box stores, or manufacturing plants have been added.

Grain farmers have installed some field tile, and plans have been shared through Soil and Water Conservation District. Tile installation is done considering watersheds and sub-watershed, but can change the natural drainage slightly in some cases. Because of that, tiling plans are communicated to the Soil and Water Conservation District and submitted for plan approval. The county's SWCD staff indicated there are no major concerns about tiling plans, and they feel that the installation of field tile helps with effective drainage and prevents some flooding. They did not have any concerns about manure management on livestock farms, and did not believe flooding or drainage issues were complicated by livestock operations at all.

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 5/2/2011 for the entire county except Fostoria. Those maps were approved on 6/1/2011. There is no modernization schedule established at this time.

Map 2-7: Seneca County Floodplain Map



According to First street, an established provider of climate risk data, there are 5,221 properties at risk for flooding today in Seneca County. In thirty years, First Street projects there will be 5,466 properties at risk. Today, that constitutes 22.3% of all properties. This flood risk is attributed to riverine and flash flooding. They estimate that a property has a 26% chance of experiencing flooding over the course of a 30-year mortgage period.

The table below provides information National Flood Insurance Program participation for communities in Seneca County according to the FEMA Community Status Book Report for Ohio.

Table 2-32: National Flood Insurance Program Participation

Community	Init FHBM Identified	Init FIRM Identified	Curr EFF Map Date	Reg-Emer Date
Seneca County	02/01/74	05/17/90	05/03/11	05/17/90
City of Fostoria	04/12/74	07/01/87	06/02/11	07/01/87
City of Tiffin	03/01/74	07/03/86	05/03/11	07/03/86
Village of Attica		Not a Participant in NFIP		
Village of Bettsville	01/23/76	09/30/88	05/03/11 (M)	09/30/88
Village of Bloomville		Not a Participant in NFIP		
Village of New Riegel		Not a Participant in NFIP		
Village of Republic	n/a	05/03/11	05/03/11	Sanction 05/03/12

All jurisdictions that participate in NFIP have floodplain within their jurisdiction in Seneca County, and have an appointed floodplain manager. The Seneca County Soil & Water Conservations District is available to assist other jurisdictions with floodplain regulations, updates, assessments of effectiveness and regulation changes and improvements. Below is a list of those individuals, by jurisdiction.

Table 2-33: Seneca County Floodplain Managers

Jurisdiction	Name/Position	Address	Post Office
Seneca County	Bret Margraf, SWCD Nutrient Tech.	3140 S. SR 100	Tiffin OH 44883
City of Fostoria	Sandra Coleman, Zoning Inspector	213 S. Main St.	Fostoria OH 44830
City of Tiffin	Matt Watson, City Engineer	51 E. Market St.	Tiffin OH 44883
Village of Attica	No Designated Floodplain Manager – No Floodplain		
Village of Bettsville	Gary Harrison, Mayor	PO Box 241	Bettsville OH 44815
Village of Bloomville	No Designated Floodplain Manager – No Floodplain		
Village of New Riegel	No Designated Floodplain Manager – No Floodplain		
Village of Republic	No Designated Floodplain Manager – No Floodplain		

Communities that are participating in the National Flood Insurance Program (NFIP) are required to adopt and enforce regulations and codes that apply to new development in Special Flood Hazard Areas (SFHAs). These local floodplain management regulations must contain, at a minimum, NFIP requirements and standards that apply not only to new structures, but also to existing structures which are Substantially Improved (SI), or Substantially Damaged (SD) from any cause, whether natural or human-induced hazards.

According to 44 CFR 59.1, Substantial improvement means any reconstruction, rehabilitation, addition or other improvement to a structure, the total cost of which equals or exceeds 50 percent of the market value of the structure before the start of construction of the improvement. Likewise, substantial damage means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred. SI/SD requirements are also triggered when any combination of costs to repair and improvements to a structure in an SFHA equals or exceeds 50 percent of the structure's market value (excluding land value).

$$\frac{(Cost\ to\ Repair) + (Cost\ of\ Improvements)}{Market\ Value\ of\ Structure} \geq 50\ Percent$$

Enforcing the SI/SD requirements is a very important part of a community's floodplain management responsibilities. The purpose of the SI/SD requirements is to protect the property owner's investment and safety, and, over time, to reduce the total number of buildings that are exposed to flood damage, thus reducing the burden on taxpayers through the payment of disaster assistance. SD/SI requirements are enforced by the local floodplain administrator and monitored by the Ohio Department of Natural Resources (ODNR) Floodplain Management Program during Community Assistance Visits. If a local floodplain administrator is overwhelmed by the number of SD/SI inspections after a large event, ODNR has developed a network of

building code officials that are trained in conducting SD/SI field determinations. Help with SD/SI inspections can be requested through the county emergency management agency director.

For more information regarding Substantial Improvement and Substantial Damage, county officials can refer to [FEMA's Substantial Improvement/ Substantial Damage Desk Reference, P-758](#) or contact the [ODNR Floodplain Management Program](#).

The current flood map is illustrated on Page 52 of this document as Map 2-7 Seneca County Floodplain.

Repetitive and Severe Repetitive Loss Structures

Seventeen properties have been identified as repetitive loss or severe repetitive loss property across Seneca County. In Tiffin, seven are single family homes and one is a multi-family home. The other property is a commercial property. In other parts of the county, there are seven single-family homes and one non-residential property with flood history. While almost all properties have had more than one loss incident on record, there is only one single-family residential property that is considered a severe repetitive loss structure. The others are all considered repetitive loss structures, as indicated in the table below.

Table 2-34: Repetitive & Severe Repetitive Loss Properties

Seneca County Rep Loss and Severe Rep Loss Structures (Unmitigated)					
JURISDICTION Occupancy	Total RL/SRL Structures	RL Structures	SRL Structures	Total Losses	Total Paid
TIFFIN, CITY OF	9	9	0	20	\$798,719
Multi-Family Residential	1	1	0	2	\$10,620
Single Family Residential	7	7	0	16	\$221,131
Business Non-Residential	1	1	0	2	\$566,968
SENECA COUNTY (UNINCORPORATED)	8	7	1	19	\$215,157
Other Non-Residential	1	1	0	2	\$25,155
Single Family Residential	7	6	1	17	\$190,002
Countywide Total	17	16	1	39	\$1,013,877

Additional repetitive loss and/or severe repetitive loss structures may exist in Seneca County and not have been available or known at the time this was researched.

2.2.6 Hazardous Materials Incidents

A hazardous materials spill or release occurs when a hazardous substance breaches its container. Releases can occur within facilities that store and use hazardous materials and during the transport of these substances. Hazardous materials 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 hazard to the immediate area or greater community because of the small quantity that is released. A release that requires action by first responders or agencies outside of the spiller's facility is considered an emergency response.

Every hazardous material is unique and can be toxic, flammable, explosive, or corrosive, as well as any combination of those threats. 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. To protect the community, evacuation from the facility or area surrounding the spill may be necessary.

Dangerous chemicals can be hauled in a variety of ways, involving different types of containers and haulers. State and federal regulations provide guidance and regulation in the transportation of chemicals in a quantity sufficient to pose a hazard. These regulations are enforced by law enforcement and transportation officials. The majority of chemicals are transported by highway and rail, but on occasion there are chemicals flown on cargo planes. Counties generally do periodic commodity studies to determine what is hauled through and inside their county; refer to the Seneca County LEPC for specific details. The most recent commodity study was completed in 2023 and is on record at the Seneca County EMA.

Accidents on highways and roadways can cause the vehicles carrying substances to overturn, collide with other vehicles, or to ignite and burn. The runoff as liquid spreads, the vapors as a chemical dissipates, or the flash point and burning of a substance can expose those nearby to extreme danger from both traumatic injury and chemical absorption. These vehicle 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 thrown into the atmosphere, waterways or soils.

Rail incidents are a growing concern as major derailments have occurred elsewhere in Ohio and other states. The hauling of highly flammable and toxic materials on the railroads is increasing. The trains that move through the county are up to three miles long, and are staffed with minimal personnel. Crossings can be blocked for long periods, and there is no responsiveness to local lack of access by the railroads. Communities cannot open crossings for emergency needs, let alone other necessary traffic access. As Seneca County is located near terminals and ports in Ohio's rail network, there are approximately 261 railroad crossings in the county. At least 58 are in Tiffin and 48 in Fostoria; others are spread across the entire county. Over eight in ten crossings are at grade, and the remainder are overpasses. Most crossings and tracks are owned by either Norfolk Southern Railroad or CSX Transportation.

The Ohio Rail Development Commission illustrates in their Rail Crossing Community Impact Index that Seneca County ranks at a 2.24 on a 1.5 scale in likely delays to road users due to blocked rail crossings, or drivers have a 25% chance of experiencing a rail-block delay when traveling. Fostoria is more likely to have traffic delays due to crossing blockages than Tiffin.

Industrial and residential exposure to hazardous substances can also involve both trauma and exposure. Most incidents involve the breach of a container or the undesirable combination of chemicals that results in a lethal substance. These spills and leaks can occur in businesses, homes, and industries or anywhere else that hazardous substances exist.

No infallible reporting system for hazardous materials incidents exists. Many times, incidents of non-lethal exposure are not recognized as an emergency. For example, old thermometers are dropped and mercury is spilled, swept up, and thrown in garbage unless individuals know of the risks. They do not always know, and thus those kinds of incidents go totally unreported.

Industrial reporting is gauged by regulation. Spills involving reportable quantities are documented according to regulation. Smaller less significant spills often go undocumented unless someone is hurt and requires medical attention. Large industrial spills and leaks are investigated by local hazardous materials teams, regulators, and government responders. There are no major distribution centers, shipping terminals or warehouses in Seneca County, which helps to limit the unknown industrial spills that are cleaned up by on-site personnel and not reported to the LEPC.

Table 2-35: Hazardous Material Classifications

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

Seneca County has risk for hazardous materials incidents. The county is home to some manufacturing and industrial sites that manufacture or utilize hazardous substances. These substances are transported across the county on many state, and local roadways and rail lines. The majority of these transportation routes pass through municipalities and populated areas in Seneca County, increase the population's risk for exposure. The areas inside villages and the city where multiple state routes intersect, or where railroad tracks cross streets are vulnerable areas. As units hauling hazardous substances navigate their way through the municipalities the opportunity to make a wrong turn, not see a small vehicle, or catch a low-lying wire or pole is present.

All state highways in Seneca County are two-lane roads. In some areas, farm implements and other heavy equipment use the highways but travel at slow speeds. Passing on two-lane highways in slightly rolling terrain leads to crashes, and this is probably the highest risk of a hazardous materials spill locally. There are numerous locations where several state highways intersect, and the junctions are not always straight ninety-degree intersections. Angled roadways and confusing stop signs sometimes make one intersection more dangerous than another, and fueling locations with large fuel storage tanks make uncontrolled vehicles very concerning.

Seneca County is also vulnerable to farm chemical accidents, including anhydrous ammonia, fertilizers, pesticides, and other chemicals used on farms like petroleum products, heating gases, and lubricants and cleaning compounds. Additional risk includes the type vehicle used in transportation, including but not limited to farm equipment, small trucks, pickup trucks, and wagons.

Pipelines also present a hazardous materials risk in Seneca 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, and relationships between pipeline operators and first responders are maintained to facilitate the exchange of information and training.

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 the Pipeline and Hazardous Materials Safety Administration (PHMSA), Seneca County has experienced 2 hazardous materials spills or releases on highways or rail between 01/01/2019 and 09/30/2024. One incident was in Old Fort on SR 53 northbound toward Fremont. A truck carrying an elevated temperature liquid, not otherwise specified, experienced a tank split and spilled 10,760 pounds of the hot substance. A cleanup company remediated the scene with no lasting effects. Another incident occurred in Fostoria when a truck driver was unloading 25% sodium chlorite at a refinery when a connection failed and a very small amount of the substance leaked onto the ground. This was cleaned up by the shipper without incident. There were no deaths or injuries associated with the PHMSA data.

Between 01/01/2000 and 12/31/2018, there were nine hazardous materials spills recorded with PHMSA. Two incidents involved five gondola cars in a CSX train in Fostoria that leaked hazardous waste when tarps failed in windy weather and allowed product to blow out. The other incidents involved trucks on highways in either vehicular accidents or equipment failure. One vehicle accident resulted in the burning of thousands of gallons of gasoline and the operator died at the scene. Another resulted in what was considered a serious release, but there was no evacuation order. Most incidents were cleaned up by contractors, monitored by local fire officials.

According to Ohio EPA records, Seneca County has 83 hazardous materials responses between 2019 and 2024. Liquid spills, which accounts for most of them, range in size from one quart of diesel fuel to 5,000 gallons of liquid nitrogen. Incident types include traffic incidents, industrial spills, shipping incidents, and others that are undescribed. There is no time of year or time of day that spills seem to occur more or less. The hazard is applicable to the entire county, including both rural and urban areas.

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.

Hazardous materials incidents are a countywide hazard and can affect all areas and jurisdictions. The populated jurisdictions along highways are particularly vulnerable to this hazard because of their proximity to the major roadways on which these substances are transported. Communities where railroad tracks and crossings are present have an even more enhanced risk due to rail presence. Where railroad tracks, highways, and bodies of water are in close proximity to one another, the threat of a hazardous materials spill is enhanced. Should a derailment occur, the spillage could contaminate waterways. An incident nearby a school, hospital, or other institution could be catastrophic.

2.2.7 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. Electrical Power Outage

An electrical power outage is a short-term or long-term loss of electric power to a particular area. Power failures can be caused by natural events, such as damage to transmission lines caused by high winds, or non-natural events. Electro-magnetic pulses caused by severe solar storms can interfere with power transmission if the energy from flares on the sun reach local earth surfaces. Non-natural contributors to power system failures can include equipment failure, transformer failure, animals, vandalism, or intentional damage. Systems failures can range from a temporary outage of less than a few hours to long-term, multi-day outages. Short-term outages are inconvenient but generally not a significant risk to the community. Outages that last for several days, to months or more, however, can cause major disruption and harm to a community as compensatory capabilities are stretched beyond resources. Fuel sources for generators, the ability for generators to carry out all power-based critical services, and the stress of being power-deficient cause human suffering and extreme inconvenience that closes businesses and inhibits daily life activities.

While electrical system failures can occur because of a weather event or human-caused problem, breakdown of this critical utility can also occur independent of another hazard. When this happens, it is often the result of system overload or lack of improvements, updates, and maintenance to the system's infrastructure. Residents and businesses rely on electricity to support basic daily functions. When the system fails or service is interrupted, the effects are felt immediately. Populations with special needs, including children, the elderly, and those with serious medical conditions, suffer the most during electrical system failures.

Power failures do not generally cause significant structural damage, but power-based equipment and electronics can be damaged or ruined, depending upon how the outage occurred. The greatest risk for physical damage is from broken distribution lines, poles, and substations. The most significant impact is the hardship for the people and businesses affected by the outage, including the potential economic impact. If businesses are unable to operate for several days or longer until power is restored, the negative effect would quickly ripple across the community. Individual losses are generally limited to the loss of food that must be refrigerated, and perhaps medicines stored at home that require cooling. The loss of air conditioning for people with respiratory conditions can be life-threatening, and without a long-term capability to operate medical equipment, those with serious medical needs are at risk of dying.

A long-term outage, lasting months, potentially due to major disruption or destruction of the power grid, could be devastating. The activities of daily living are dependent upon electricity for most people, and only those able to survive in the most austere conditions would come through a long-term outage successfully.

People and businesses rely on electrical systems to support essential services and basic daily functions. Without power, telecommunications, utilities, public works, and other critical systems are non-functional. If backup power generation is available, some systems may be maintained, at least on a partial basis.

Power outages are a countywide hazard and can affect all areas and jurisdictions.

Power providers are listed in Table 2-13 on page 2-13, and are again discussed in “Energy Lifeline” starting on page 2-87. Generally speaking, as stated in the lifeline section, outages are short in duration in Seneca County. An unquantified number of residents have generators, and although some public generators need repairs and replacement due to age, there is a basic capability to provide essential services through generator power. Extended outages provide the greatest vulnerability because there would be difficulty in providing long-term, widespread shelters or warming/cooling stations across the county. Most shelters identified by Red Cross are not generator-equipped. Most of the public schools have some generator capacity, but tend to be more critical-component capable than overall total facility capable.

Vulnerability to a lack of power could increase with climate change as more demand is placed upon the power grid, and outages cause more discomfort. If temperatures rise in the summer to above 90 (F), especially in a heat wave of several days or weeks, people with medical problems will require air conditioning at an increasing rate. This will be a widespread issue, placing regions at risk for power failure or the need to “brown-out” power for conservation of generation capabilities. More severe storms may place more debris on power lines, interrupting service more unless additional measure to mitigation pole damages is implemented. Power companies may have to use damage-resistant poles, transformers and sub-stations at all locations should a significant change in storm characteristics take place. Buried power lines may be required in more places, adding cost to home and business construction.

Development could have an effect on power outages as the demand for electricity increases. With an already-burdened power grid, the overall demand for more power could be detrimental unless there are regional plans to increase the capacity of the power grid. Charging electric vehicles, powering additional layers of technology, and providing power for an increasing number of homes and businesses could overwhelm the capacity to create energy.

Local Power Failure History

Seneca County has experienced some extended power outages but there were no indications that this is confined to a specific area of the county. While power was generally described as “highly dependable”, an equipment or weather event could change that reliability. Most recounts of power outages were incidental, and stakeholders reported due to an equipment failure, temporary emergency situation, or a weather event.

While more jurisdictions have generators than five years ago, there is still a significant vulnerability to power outages. Many elderly and people who are dependent upon durable medical equipment do not have the financial ability to have a generator. Many jurisdictions need to at least add to their generator pool to be able to function well during an extended outage. Many generators are old, outdated or too small. Plans to have fuel for generators must be developed because some jurisdictions don’t have this done, putting them at risk for not being able to use generators as needed.

Some areas in Seneca County require the use of sump pumps to move storm water so it does not flood homes, businesses, and industrial areas. Some jurisdictions have enough of a need for significant power generation that a portable generating system is needed.

There is no official comprehensive history of power outages in Seneca County. The history is based upon the anecdotal contributions of stakeholders and the news history available digitally.

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.

Stakeholders discussed the effect rising temperatures might have amid an out-of-shape electrical grid, and the burden that increased demand for electricity puts on the generation and distribution systems. Populations in Seneca County are more dependent than ever on electricity to not only meet their comfort and health needs, but also to be able to connect with caregivers, financial institutions, suppliers, and family members through digital resources and communication systems. Without functioning power, as a power grid failure or extended outage is considered, could be devastating. This is in deep contrast to just several years ago when financial transactions were done more in person than online, and when accounts were managed through paper systems instead of electronic transfers. With an aging population that

has more vulnerability to heat injury, dehydration, and malnutrition, the extended loss of electricity or alternate heating and cooling systems could be very damaging.

B. Water and Sewer Utility Systems

Utilities include the systems that provide basic amenities and services to the public, such as water, wastewater, storm water, 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 serve significant regions in Seneca County. 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 water and wastewater utility systems, many 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 built 40 years ago are undersized to handle the amount of precipitation communities now receive. All of this is true in Seneca County. Infrastructure failure, specifically water, wastewater, and storm sewer systems, rated as one of the most concerning hazards 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.

The impact of drought and a decreasing water supply is of concern to Seneca County residents. Most of the water systems use rivers and major streams to supply reservoirs, water tanks, and towers with potable water. If through drought, these waterways cannot supply adequate raw water, the county will be forced to rely on groundwater from the aquifers below. With the karst substructure, this can be difficult to find, and aquifers may not be adequate to meet the need. If rainfall amounts decrease or become sporadic, that could mean trouble to Seneca County water collection and treatment providers.

B. 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. As more and more commercial traffic traverses Seneca County, the more that heavy trucks and haulers are using county and township roads to avoid road construction, closures and backups. This creates extensive and unusual wear on roads not intended or designed to carry that kind of weight. The cost to the local community to repair and replace these roads is increasing, and may end up unaffordable. Without grants programs to support these needs, Seneca County will experience the deterioration of its transportation routes. 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.

2.2.8 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 smaller rivers, lakes, and streams. Invasive insects and diseases are small organisms that can negatively impact plants, forests, and the health of wildlife. Table 2-32 identifies the invasive species across these categories that have the greatest impact in Ohio.

Table 2-36: Invasive Species in Ohio

Aquatic	Insects and Diseases	Plants, Weeds & Shrubs	Terrestrial Wildlife
Asian Carp	Asian Longhorned Beetle	Japanese Honeysuckle	Feral Pig
Curlyleaf Pondweed	Emerald Ash Borer	Japanese Knotweed	Unwanted/Exotic Pets
Hydrillia	Gypsy Moth	Autumn Olive	
Round Goby	Hemlock Woolly Adelgid	Buckthorns	
Ruffe	(HWA)	Purple Loosestrife	
Red Swamp Crayfish	Walnut Twig Beetle	Common Reed or Phragmites	
Sea Lamprey	Spotted Lanternfly	Reed Canary Grass	
White Perch		Garlic Mustard	
Zebra Mussel		Multiflora Rose	
		Bush Honeysuckles	
		Japanese Stiltgrass	
		Kudzu	
		Japanese Barberry	
		Callery Pear	
		Oriental Bittersweet	
		Apple of Peru	
		Canada Thistle	
		Cressleaf Groundsel	
		Giant Hogweed	
		Grapevines	
		Johnsongrass	

Kochia
 Marestalk
 Mile-a-Minute
 Musk Thistle
 Oxeye Daisy
 Palmer Amaranth
 Poison Hemlock
 Russian Thistle
 Shattercane
 Wild Carrot
 Wild Parsnip
 Poison Ivy

Invasive Species Risk Assessment

Seneca County has many wooded areas and large numbers of trees along with rolling and flat terrain. These wooded areas are vulnerable to damage from invasive species. The flat terrain contributes to high winds that can easily down dead or diseased trees that have been impacted by an invasive species. These fallen trees become storm debris, and fall onto homes, cars and trucks, businesses, and anything else in the way. They also fall into rivers and streams, further impeding drainage and clogging waterways with excessive debris.

While ash trees have been affected by disease in recent years, Ohio is rich with all kinds of trees that could be affected by another invasive species in the future. Forested areas and waterways could also be impacted by invasive plant and animal species. Any infestation would cause extreme damage to the county. Invasive species is a countywide hazard that can affect all areas and jurisdictions.

Damage from invasive species difficult to quantify because it does not generally affect buildings or other structures. The cost comes from the cleanup phase, including removal and disposal of diseased trees and vegetation, repair of property where fallen trees cause damage; cleaning and dredging of waterways that are filled with debris; cleaning of bodies of water; and repair of infrastructure damaged by the infestation. These are expensive tasks and, when done by government providers or large contractors who respond to emergent needs for service, the cost can be extremely high, costing jurisdictions hundreds of thousands of dollars.

Climate change could significantly affect this hazard. Invasive species, according to various experts, may increase if temperatures become warmer and precipitation amounts increase. Insects and plants generally thrive in hot, humid, wet weather. Some plant diseases also thrive in hot weather. Dependent upon the specific species, changing climate conditions could facilitate tree disease which increases debris after storms and property damage due to falling trees. It could also decrease farm yields, increase livestock pestilence, and endanger vegetation. Warmer waters promote unwanted results like algal bloom and invasive water species. Algal bloom in rivers is sometimes a problem, and an increase would worsen that situation and perhaps negate some of the efforts farmers and ecologists have taken over the past few years to improve water quality and protect the rivers.

There is no known effect that the past five years' development activities have had on invasive species, and no known effect that future development may have on invasive species. There was some conversation that increased housing development may force nuisance wildlife out of certain areas, but would also push them into other less-densely populated areas. This could potentially have a negative effect on rural areas, further forcing people out of the country and into the cities. That said, Seneca County does still have significant wooded and natural areas outside the organized communities.

Local Invasive Species History

The most recent invasive species to impact locally is 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. Since that time, the Ohio Department of Agriculture and partner agencies have worked to protect the state's 3.8 billion ash trees. Wood County and northwest Ohio were ground zero in the EAB infestation; EAB was initially identified in northwest Ohio before spreading across the entire state. Map 2-7 identifies EAB infestation areas in Ohio. According to natural resources officials, the worst of the EAB infestation has passed; the Ohio Department of Agriculture lifted the quarantine on movement of ash wood in 2011. The infestation is no longer spreading but there are thousands of dead and diseased trees that must still be removed. The process to remove these trees will take years and be a significant expense for land owners, including government agencies and municipalities. From a disaster perspective, the massive numbers of dead trees create an increased risk for property damage from high wind events. Dead and diseased trees are weak and more susceptible to wind damage than healthy trees. Along waterways, diseased trees also increase flood risk as they fall into and block streams, impeding water flow.

Other invasive species that are currently under quarantine in parts of Ohio include the Gypsy Moth, Walnut Twig Beetle, Asian Longhorned Beetle and the Spotted Lanternfly. Seneca County is not currently a Spotted Lanternfly quarantined county.

Some stakeholders discussed potential pine tree disease, elephant weed, garden crest, water crest, marestail, foxtail barley, and phragmites. They reported army worms killing lawns and grass in multiple areas. The general opinion was that some insects are coming in rail cars from other parts of the United States, transplanting new species when the cars sit waiting to be unloaded, or the infested cargo is shipped to receiving parties.

All county jurisdictions have experienced significant effects from the EAB infestation. As diseased trees along rivers and streams have died, they have fallen into waterways, impacting drainage and the flow of water. Although many of these have been removed, many remain and continue to cause impediments to waterflow. Diseased trees along the public right-of-way have also impacted infrastructure, as they are more likely to fall during a storm or high wind event. County and municipal street and road departments have aggressively removed diseased trees along the public right-of-way. This has been effective at reducing the impact on utility lines and other 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.

Nuisance wildlife is problematic in some areas. Coyotes are a concern because they feed on any prey they can find, endangering family pets, small livestock and children. Some streams are blocked by beaver dams. This causes debris to collect above the dams and obstruct the flow of water through the waterway. Deer have become so prevalent and so conditioned to humans that they are present in yards, parks and other recreational areas in numbers never seen before. They do significant damage to farm crops such as soybeans and corn, and they damage young evergreens and trees as they rub their antlers on the seedlings. They often destroy yards, landscaping and shrubs by running through it and tramping it down. Geese are increasing in number, and they are aggressive and dirty. Their droppings, believed to be toxic, cover sidewalks and recreational areas across the county. Wild turkeys are growing in number, and again, interfere with recreational and personal property use. Feral cats are present in most areas, and multiply by the hundreds every few months.

As the climate changes, if temperatures rise, humidity increases and rainfall hits new highs, insects and other invasive species may become more of a problem than they are now. Insects tend to thrive in hot weather, and weeds grow in the same. These changes exacerbate invasive species problems. If the food supply for nuisance wildlife is limited, their presence in residential and recreational lands will increase. It will become harder for them to find food, and the danger to pets and other small animals will grow. Insects and animals not indigenous to Ohio may migrate into the area, adding to this problem in an area that is developing and growing considerably. This could become more serious as areas are created for recreation.

Invasive species are present in most counties, but become noticed when a product of value, a natural resource, or human-utilized areas are impacted. Incidents are noticed when plants or trees begin to die, crops are negatively affected, or residential areas are infested. At that point, identification of the invasive species is made and treatment programs begin to control or eradicate the pest or plant.

Residents use lawn care chemicals to control weeds and pests in lawns, landscaping and gardens. Farmers use spraying systems to eliminate weeds and pests that negatively impact crops. Homeowners use chemicals to eliminate pests. These chemicals are often controlled substances. Farmers become certified to use pesticides and herbicides, homeowners have to sign for certain chemicals or hire a licensed applicator to use them, and businesses are not allowed to use chemicals that would negatively affect customers and products for sale.

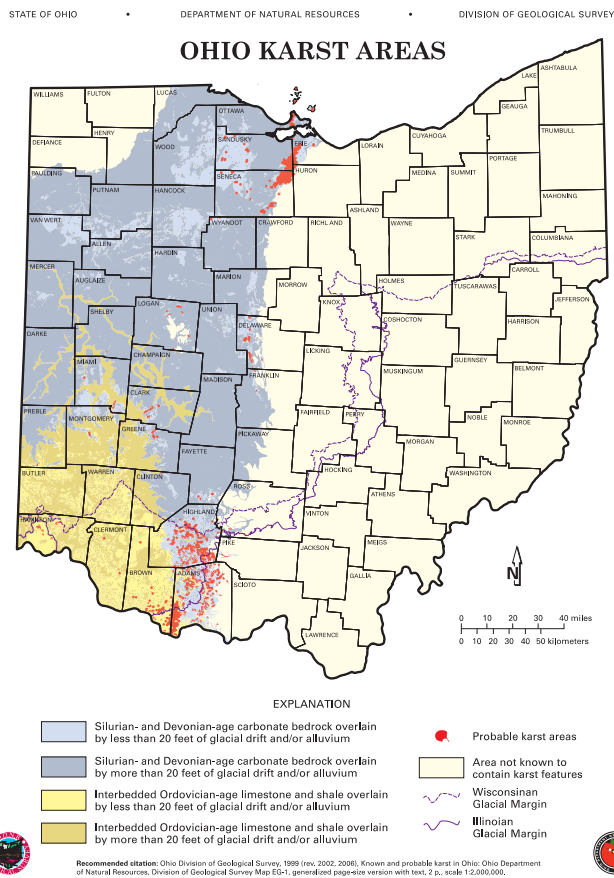
Sometimes the history of an event is marked by the compensating actions taken. For example, the management of mayflies along lake shorelines is to turn off the lights that draw the mayflies to land during their mating season, when they come onshore. At other times, the evidence of infestation is after a storm when debris has to be cleaned up. Increased debris is often the consequence of an infestation, as it was during the EAB incident in Ohio.

2.2.9 Land Subsidence

Land subsidence is the gradual or sudden sinking of the Earth’s surface caused by subsurface movement 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.

Karst is a specific type of topography that can contribute to land subsidence issues and is 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.

Landslide is also indicative of land subsidence. According to the Ohio Landslide Incident and Susceptibility map, Seneca County is at low incidence levels for landslide vulnerability.

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.

2.2.10 Severe Thunderstorm

A thunderstorm is a local storm produced by a cumulonimbus cloud accompanied by thunder, lightning, and/or hail. Lightning is a brief, naturally occurring electrical discharge that occurs between a cloud and another cloud or 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.

Seneca County experiences numerous thunderstorm events each year. The majority are mild or moderate in severity and include a combination of heavy precipitation, wind, and thunder. Hail and lightning are possible, but occur much less frequently than wind and heavy precipitation. Thunderstorms that include hail and lightning are much less frequent but are generally more severe. Thunderstorms are a countywide hazard and can affect all areas and jurisdictions. Lightning damages can occur countywide and have been recorded in the weather events data. There can be casualties due to lightning, especially if the storm hits suddenly and with little warning, or if the lightning is an isolated lone-standing weather event. These storms range from minor to severe, although the most are minor or moderate. Thunderstorms are relatively frequent but generally result in limited property damage.

It is not believed that development activities have had any effect on the countywide vulnerability to severe storms and thunderstorms, including rain, hail, lightning and wind. Minor improvements in storm drains and other infrastructure may have resolved some issues in specific locations. Otherwise, there has been no significant change for any village or the county as a whole. If rain becomes heavier due to climate changes, the damages from hail, lightning and heavy rain may increase as a result. Many of these kinds of damages are covered by private insurance, so it is believed that the damages numbers are under-expressed.

Local Severe Thunderstorm History

According to NCDC records dating back to 1950 Seneca County has experienced 175 thunderstorm events with 111 days reporting property damage. There are seven events that included hail for the same time frame, with over \$5.5M in cumulative damages. There are two recorded incidents for lightning, and 14 that included heavy rain. The marked difference between the individual components of severe thunderstorms is that when hail is included, the losses are considerably higher and include crop damages to a significant degree.

Table 2-37: Seneca County Severe Thunderstorm History

Hazard	Total Incidents	Total Property Loss	Total Crop Loss	Total Deaths	Total Injuries	Average Loss/Incident
Thunderstorm/Wind	175	\$6.251M	\$12.0K	0	2	\$35.79K
Hail	93	\$578.80K	\$5.05M	0	0	\$60.524K
Lightning	2	\$75.0K	0	0	1	\$37.5K
Heavy Rain	14	0	\$34.48K	0	0	\$2.46K

During the past five years, hail has occurred seven times, but no damages, deaths or injuries were reported due to the hail. There has been no reported heavy rain or lightning for that time frame, but there were 23 thunderstorm/wind events that caused have caused \$285.30K in property damages.

2.2.11 Tornado

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.

A tornado's life progresses through several stages: dust-whirl, organizing, mature, shrinking, and decay. Once in the mature stage, the tornado generally stays in contact with the ground for the duration of its life cycle. When a single storm system produces more than one distinct funnel clouds, it is referred to as a tornado family or outbreak.

Tornado magnitude is measured using the Enhanced Fujita scale, abbreviated as EF. The rankings range from EF-0 to EF-5 and are based on damages caused by the tornado. Prior to 2012, the Fujita scale was used to measure tornado damage and was abbreviated F-1 to F-2, depending on the level of impact.

The following chart was taken from FEMA’s website, and indicates the type of damages per Enhanced Fujita Scale tornado classification. Tornadoes in Seneca County have historically been an EF-2 or lower.

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.

Tornadoes are the most damaging of all atmospheric phenomena. While their frequency is low, the probability of significant damage is high. Because tornadoes occur as part of a storm system, they do not strike as independent incidents. Emerging out of a storm front or super cell, the tornado, especially when accompanied by heavy rain, straight-line wind, lightning, and hail, can be extremely damaging. Effects of a tornado include uprooted trees, damaged or destroyed buildings, and smashed vehicles. Twisting and flying debris turns into projectile weapons, which can cause injuries and fatalities.

Tornadoes in Seneca County are generally narrow, and do not grow to the width of the mega-tornadoes in the plain states. They are generally 25-500 yards wide and stay on the ground for a few miles. While tornadoes do not occur frequently in Seneca County, they can cause

moderate to severe damage. Tornadoes are a countywide hazard and can affect all areas and jurisdictions.

Should weather events become stronger under the premise of climate change, tornadoes in Ohio are anticipated to come in clusters and increase in speeds, according to input from plan participants. What has typically been an EF-0 or EF-1, could easily rise by one or two categories. The formation of multiple funnels in one general front can strike multiple parts of the county simultaneously, challenging the capacity to respond and significantly increasing the damages to property, loss of property and even loss of life. The need to begin using wind-resistant building materials would help property on the periphery of the primarily damaged area, but would not save property that is directly hit. Local tornadoes come with rain, hail, lightning, and straight-line winds, so it would be reasonable to assume all of those damages may increase as well. That would result in more damage to trees, endangering green space and destroying vegetation that would take decades to replace. In a county with little change in elevation, there would be less likelihood of inconsistent damages within neighborhoods, resulting in simply more damage over the entire county.

Stakeholders do not believe that vulnerability to tornadoes has changed in the past five years, nor has any development activity or goal changed the risk of the villages or the whole county to tornado damage.

Local Tornado History

Seneca County has experienced occasional tornadic activity. With 21 events between 1960 and 2024, tornadoes are not frequent. The worst tornadoes have been an F-3 prior to modification to the Fujita Scale, and an EF-3 after. The most damaging tornado was in May 2008 when Fostoria sustained damage to at least thirty homes, and had extensive damage to wooded areas and vegetations. Ironically, that tornado was rated an EF-1. The only tornado activity in the last five years was an unknown magnitude tornado, detected on radar, that touched down in the Alvada area south of Fostoria and west of New Riegel. No damage was identified. The tornadoes in Seneca County have ranged from and EF-0 to an EF-3, and one that was radar-detected only and considered an EF-U.

Table 2-38: Seneca County Tornado History

Hazard	Total Incidents	Total Property Loss	Total Crop Loss	Total Deaths	Total Injuries	Average Loss/Incident
Tornado	21	\$19.413M	0	60	32	\$924.428K

Ohio ranks among the top states in injuries, fatalities, and property damage from tornado events. At the time this plan is being developed, Ohio is one of the states with the most frequent, highest numbers of tornadoes in 2024. While it is believed that new and more effective detection is responsible for some increase in the number of recorded tornadoes, it is believed that there are significantly more tornadoes in 2024. There have also been more incidents with multiple tornadoes and funnel clouds in a given area that in years past.

According to the NOAA Storm Prediction Center, as of June 15, 2024, there were 71 tornadoes in Ohio in 2024 as of that date. There was one tornado recorded in Seneca County, near Alvada, on March 14, 2024 when other devastating tornadoes hit areas in Ohio like Indian Lake in Logan County. Reports of one to three-inch hail that night were reported in Tiffin and Bloomville. There was no damage recorded in Seneca County, but the outbreak became a declared event in Ohio due to its severity elsewhere.

2.2.12 Water Quality

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 by algal bloom, aquifer threats, and groundwater contamination as well as areas of insufficient groundwater during drought. 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 the 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 continually underway to determine the root cause of the increase in toxic algal blooms and identify actions that can be taken to reduce their occurrence. There is constant effort to reduce nitrogen and phosphorus runoff from agricultural production, landscaping treatments, and manufacturing waste. There is ongoing activity to identify and replace lead pipes that cause lead particulates to disburse into the drinking water through distribution. Reservoirs have become susceptible to contamination by algal bloom and other contaminants, and are continually monitored for corrective treatment. Compromise to the water tables through ground contamination of karst openings and aquifer exposure to road salts and other chemicals is maintained as much as possible, but unknown releases can cause exposure to harmful substances in spite of these efforts.

2.2.13 Windstorm

A windstorm is a weather event with very strong winds but little to no precipitation. Wind speed in this type of event typically reaches at least 34 mph but can be any speed that causes light or greater damage to trees and buildings. Damage can be caused by gusts, which are short bursts of high-speed wind, or longer periods of sustained wind.

A derecho is a specific type of windstorm that is widespread and fast moving. These storms can produce damaging straight-line winds over extremely large areas, sometimes spanning hundreds of miles long and more than 100 miles wide. To be defined as a derecho, the storm must produce damage over at least 240 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 from a tornado. However, the damage from this type of storm generally occurs in one direction along a straight path.

Erosion is an outcome of wind hazards in Ohio in the areas with essentially flat terrain like Seneca County. Because the soils provide fertile farmland, efforts have been sustained to use available acre of land for crop production. Land that was once wooded and lush with vegetation has been cleared and windbreaks have been removed to increase the amount of land available for productive; therefore, when winds cross the wide expanse of farm fields, the topsoil blows away. Much Seneca County farmland is vulnerable to wind-caused erosion. Because the extremely flat topography cannot be changed, and because the winds cannot be stopped, the mitigating action to save the soil is to plant windbreaks, use sod strip farming techniques, and to create vegetative buffer lines where possible.

Seneca County flat topography makes it vulnerable to damage from high winds unaccompanied by any kind of precipitation, making windstorms a countywide hazard. All areas and jurisdictions can be affected by severe wind. There is limited change in elevation or extensive wooded cover area to break up the effects of strong windstorms. Although winds in excess of 50 miles per hour can occur independently, this is uncommon. Most of the time, severe winds are part of a larger storm system. The wind occurs as precipitation and unstable air moves into the area. High winds are frequently accompanied by heavy rain, hail, ice, snow, or thunderstorms. In Seneca County, wind-only incidents are rare. NCDC has few recorded wind-only events since 1950.

Although participants in the plan update felt that winds have increased noticeably in frequency and consistency, the climate change predictions do not support that opinion. Overall, climate change predictions do not anticipate much change in winds. Participants felt there was more damage done by straight-line winds today than in years past. They felt the average wind is stronger than in the past. Stakeholders felt that windstorms are more common now, and that wind speeds of 35 to 50 miles per hour are frequent. Those are not necessarily tracked by the weather service because they are not considered a "storm". Stakeholders said there is almost no damage from windstorms for the most part.

Nothing in the past five years related to land use, development trends, infrastructure improvements, or regulation has changed the countywide or village vulnerability to windstorm damages. Stakeholders felt that tree-trimming was the most effective preventive action they could take.

Local Windstorm History

Although infrequent, high wind events can occur independent of other hazards. One of the most significant windstorms in Ohio occurred on September 14, 2008 when the remnants of Hurricane Ike moved across Ohio. Damage across Ohio exceeded \$500,000,000 but there is no recorded damage history in Seneca County. A derecho in June 2013 ripped across the southern and far western parts of Ohio, leaving communities in southeast and southern Ohio without power for weeks, and without the conveniences of electricity amid heavy debris and structural damages.

There were 2 high wind events listed in the NOAA database since 2019, where winds gusted to 50 knots in February and were sustained at 51 knots in November. There were no strong wind events. Most losses were limited to tree damage. In February, wet soil conditions facilitated the uprooting of trees in soaked and thawing soils. Damages were at \$52.00K for the year.

Table 2-39: Seneca County Windstorm History

Hazard	Total Incidents	Total Property Loss	Total Crop Loss	Total Deaths	Total Injuries	Average Loss/Incident
Strong Winds	4	\$60.00K	0	0	0	\$15.00K
High Wind	34	\$5.609M	\$1.100M	0	1	\$397.324K

2.2.14 Winter Storm

A winter storm is a weather event that includes several winter weather hazards, such as extremely cold temperatures, wind, snowfall, sleet, ice, or freezing rain. These storms can develop anytime between late fall and early spring.

An ice storm is a specific type of winter weather event. An ice storm occurs when temperatures fluctuate as precipitation falls and rainfall becomes freezing rain or sleet as temperatures drop. This can cause ice to form on trees, utility lines, roadways, and other surfaces and lead to power outages, downed trees, and hazardous road conditions.

A blizzard is the most serious type of winter storm; it is 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 for the event to be considered a blizzard.

Extremely cold temperatures can also be a winter weather hazard, with or without the presence of snowfall, ice, or other hazards. While there is no exact definition for 'extreme cold', these incidents are characterized by extended, multi-day periods of air temperatures or wind chills well below freezing. In Seneca County, the coldest month, January, has an average low temperature of 20 degrees Fahrenheit and an average high of 35 degrees Fahrenheit. An extreme cold event would be temperatures at or below this level for an extended period of time.

Severe winter storms are frequent in Ohio, and the specific components of each storm is dependent upon 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 season may include several fluctuations between cold and warm spells, or a winter may be relatively constant.

A non-blizzard winter storm event often begins with warmer air followed by very cold temperatures and heavy precipitation. Because weather systems move into Ohio from the south and west, initially warm air can cause temperatures to hover at the freezing mark, causing $\frac{1}{4}$ "to $\frac{1}{2}$ " ice (or more) to form on roads, trees, electrical lines, gutters and roofs, and vegetation as precipitation starts out as freezing rain and/or sleet. As the temperatures drop, precipitation becomes snow that adheres to the ice and forms heavy clumps of wet snow that brings power lines, trees, vegetation, and roof gutters down. As fronts move through and winds kick up, while temperatures drop, the heavy falling snow drifts across roads, ice damages trees and buildings, and travel is seriously difficult. This type storm drops 4-6 inches of heavy, wet snow over the county.

An alternate version of an Ohio severe winter storm 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. This kind of storm can easily dump a foot or more of snow on Seneca County and disrupt daily activities for several days. Because the ice is not part of this kind of storm, damages are generally less as power lines are not destroyed and structural damage is not severe. However, the amount of snow is challenging in light of the extreme low temperatures. The snow tends to be fluffy and creates deep snow drifts and blocks roads.

The greatest risk associated with winter storms is the loss of utilities. The elderly and young children are most at risk. When medications, health equipment, and food supplies cannot reach destinations, these populations endure the greatest hardship. Winter storms of this magnitude are relatively rare. Most winter storms are a temporary inconvenience that makes residents uncomfortable. It is extremely rare for casualties to occur, with the exception of traffic accidents that result from dangerous road conditions.

For the few the livestock operations in Seneca County, blizzards and winter storms that close county roads and make ingress and egress impossible for more than a few hours can be costly. Due to industry regulations, dairy farms are unable to store milk for extended periods of time and they are not at all able to process the milk given its very short shelf life. Other livestock, such as beef cattle, pigs, and poultry, require feed to be delivered to the farms frequently. Closed roads and inaccessible barns can cause animals to die for lack of fresh food. Utility outages stop automatic feeders and other electrical equipment on the farms, further extending the damages related to blizzards. Livestock can freeze to death, die of dehydration when water supplies are frozen, and starve when food isn't accessible.

Severe winter weather is a risk across Ohio. All areas of the state are susceptible to winter storms that bring heavy snow, high winds, and/or ice. These storms range from short, mild bursts of snow and ice to cold snaps with significant snowfall that last several days. In Seneca County, winter storms are a countywide hazard and can affect all areas and jurisdictions. The most common winter storms include a combination of multiple winter weather hazards, such as ice and snowfall. The ice begins to accumulate as temperatures fall before turning to snow, creating a layer of ice under the snowfall. Sleet and ice make roadways slick and dangerous, increasing the potential for vehicular accidents. Road crews are challenged to clear snow and ice from roadways and maintain safe transportation routes for residents.

Ice storms can occur independent of other winter weather hazards but this is not common. If temperatures hover near the freezing point, precipitation can freeze and accumulate on trees and power lines. This can lead to power outages when the branches and lines can break. Extremely cold temperatures can occur without other accompanying winter weather hazards but this is relatively rare. When it does occur, the incident is generally of a short duration and is an inconvenience to residents and businesses. Little physical damage generally occurs to buildings or infrastructure.

Seneca County typically experiences multiple winter weather events every year, although stakeholders felt that the frequency and severity of winter storms is diminishing. These incidents are rarely severe enough to cause property damage.

Seneca County has experienced 41 winter events since 1950, per NCDRC records, that include blizzard, cold/wind chill, extreme cold or wind chill, ice storm, heavy snow, sleet, winter storm or winter weather. Collectively, these incidents have caused \$12.879M in property damage. Only one of these incidents has been considered an ice storm, but ten were classified as cold or extreme cold events; none were categorized as a blizzard.

Because climate change predictions call for warmer temperatures, Ohio is anticipating less snow and ice. The diminishing severity of winter would potentially affect the growing season, extending it slightly before and after traditional times. The warmer, wetter winters may initially result in higher farm yields and new crops to northwest Ohio, but eventual increases in temperatures beyond comfort zones may negate that effect. The hibernation habits of some wildlife may lead to changes in those populations and a negative impact on nuisance damages they cause or their unwelcome presence in communities when fewer and fewer die during long, hard winters.

The past five years' vulnerability to winter storms and blizzards has not changed. Considering any development, land use changes, regulations or infrastructure changes, none have affected the likelihood or degree of damages experienced due to winter storms.

Local Winter Storm History

Twenty-nine of forty-one winter weather events recorded by NCDRC caused property damage in Seneca County. Most winter events in Seneca County cause heavy snowfall but when combined with winds, results in blowing and drifting snow. Plowing roads keeps crews busy all

day and night long, and most injuries are associated with plowing, blowing or shoveling snow to clear sidewalks and private properties. On occasion there may be a flat roof that is damaged by snow load, especially when the storm occurs in warmer winter conditions.

For much of Ohio, the most significant historical winter weather event is the Blizzard of 1978. Seneca County was impacted by this storm. On January 26, 1978, two low-pressure systems combined over Ohio to produce record-breaking snowfall, winds of up to 70 mph, and extremely low temperatures. In the Dayton area, slightly over a foot of snow fell on top of the twelve inches already on the ground from a previous snowfall. The high winds caused blowing and drifting so severe that roads were impassable and buildings were buried. Roads were impassable for almost a week, forcing businesses and schools to close until roads could be cleared. Throughout the region, residents opened their homes to stranded motorists and neighbors helped one another dig out from the blizzard. To date, this remains the worst winter weather event on record in Ohio, resulting in 51 deaths across the state and the call-out of 5,000 Ohio National Guardsmen to assist communities.

The Blizzard of ‘78 does not appear in the NOAA Storm events Database.

There were 42 winter weather events listed in the NOAA weather database since the beginning of 2019. None of these caused any recorded damages and there were no casualties. There were four recorded winter storms, twice there were extremely cold temperatures and low wind chill, and one ice storm. Twenty-two times the event was listed simply as winter weather without any quantifying description.

Table 2-40: Seneca County Winter Storm History

Hazard	Total Incidents	Total Property Loss	Total Crop Loss	Total Deaths	Total Injuries	Average Loss/Incident
Winter Storm	25	\$4.914M	0	0	2	\$196.560K
Winter Weather	2	\$250K	0	0	2	\$125.0K
Blizzard	0	0	0	0	0	0
Heavy Snow	4	\$590K	0	0	0	\$147.5K
Extreme Cold	6	0	0	0	0	0
Ice Storm	1	\$7.1M	0	0	0	\$7.100M
Cold/Wind Chill	4	\$25.00K	0	0	0	\$6.25K
Sleet	0	0	0	0	0	0

2.3 VULNERABILITY ASSESSMENT

While the committee developed a countywide prioritization that includes hazard consequences in the unincorporated areas of the county (townships and neighborhoods) as well as the including the municipalities in their conclusions, the municipalities took into account only their individual jurisdictional perspective on each hazard. Therefore, county mitigation strategies were based on the vulnerabilities of the entire county as well as those associated with the

unincorporated areas like townships and rural neighborhoods. The municipal strategies were based upon the municipality only.

Seneca County is susceptible to social losses and resiliency challenges. Identification of those who need extra help in the wake of disasters can be difficult in rural communities because of resistance to asking for help, strong desires for independence, and less obvious external signs of need. Many people simply do not want to ask for help, even if they need it badly. Those who endure residential instability or borderline homelessness, a lack of dependable transportation, or the need for extensive healthcare and treatment are often silent populations in Seneca County. With an aging population common to most rural areas in the state, and underserved and disabled populations who would need extra help, Seneca County social services and advocacy groups could be overwhelmed by a large-scale incident in spite of the fact that people across the county willingly step up and help one another. Because the county has a smaller population than some other counties, some social programs and public services are delivered by joint agencies like NAMI Northwest Ohio that serves Seneca, Sandusky, Wyandot and Ottawa counties, or the Sandusky-Seneca-Ottawa- Wyandot Alcohol and Mental Health Services Board. Ohio Agency on Aging, Inc. serves Seneca County from offices in Ontario, Ohio. This makes delivery of services, maintenance of local volunteers, and access to assistance for those without vehicles slightly harder.

Although the culture of rural populations is one of significant self-reliance and self-sufficiency, Seneca County lacks the extensive public services like extensive mass transit options, large food distribution programs, extensive behavioral health resources, and services for children and elderly in high demand situations. If a large portion of the population is negatively affected by a widespread disaster, there will be a shortage of volunteers to staff the response, and organizations like Red Cross may set up shelters and services in centralized areas instead of in individual communities. Service centers would most likely be established in Tiffin, again requiring transportation for intake and services, something local residents may struggle to do under extreme circumstances. Fostoria, as part of three different counties, may be diverted to Bowling Green or Findlay, which are both further away than Tiffin.

Seneca County is likely to experience resource gaps in any large-scale disaster, just as any other rural county would experience. As a small county with significant rural population, first responders are partly volunteers who have limited availability and equipment. Depending upon the time of day when a disaster strikes, many of these volunteers may not be available because they are at their fulltime jobs, perhaps outside Seneca County. While many volunteer firefighters, EMTs and other responders work inside the county, their daytime obligation is to their employer. They sometimes wear emergency response hats at that full-time employer's location, and therefore cannot, even with special laws supporting volunteerism in Ohio, leave their jobs to respond. Special response resources and additional crews accessed through mutual aid may not be close by when needed, or may be tied up responding to other areas. Unless an incident is limited in impact to Seneca County, they are unlikely to command a remarkable response from higher levels of government. They could easily find the county alone in serving its own catastrophic needs.

Seneca County and the various bodies of local government are filled with community-minded active individuals who often wear multiple hats. The church volunteer may also be the township trustee who also works for the county highway department. The village fire chief or mayor may also work out of town, and when home, fill various roles as school volunteer, church leader, and be the parent of several children with a spouse who also works out of the county. This places an extreme burden on volunteer capacity, first responder capacity, and overall ability to be self-sufficient in times of need.

The vulnerabilities in Seneca County are nearly the same today as in past years. There have been few changes in comprehensive planning, land use planning or regulation that affect the individual or collective risk analysis. The county is decreasing slightly in population, and although there are a few new businesses, those often use structures that housed a business that ceased to operate. The development trends and goals are not ones that will likely increase vulnerability. Creating affordable housing, increasing broadband access, identifying sustainable agricultural practices, improving infrastructure, filling transportation gaps, and improving regulations are actions that will lessen vulnerability and improve resiliency.

All this taken into account, Seneca County is highly resilient. Their work ethic and self-sufficiency are significant, and they are generally highly participatory in meeting their own needs. They have a strong tendency to take care of their neighbors. Their farm community is resourceful and willing to help neighbors, as are populations in the municipalities. They have the ability and desire to make the most of the resources they have, and to provide the leadership and inspiration for their own recovery.

2.3.1 Underserved Populations and Social Vulnerability Considerations

According to Data USA (<https://datausa.io/profile/geo/seneca-county-oh>), Seneca County median value of housing is valued at \$128,100 which is smaller than the national average value. When housing markets were sometimes doubling in value in 2019 and 2020 elsewhere in the United States, Seneca County homeowners saw the value of their property rise by 13.4%, taking the average value of a home from just \$112,960 to the current value. The home ownership rate in Seneca County is 72.0%, compared to a national average of 64.8%. Of the percentage who own their home, 66.2% have a mortgage on that property, making them vulnerable to inflation, rising property taxes, and loss of financial stability.

The percentage of residents living below the poverty line is 11.6%, below the national average of 12.5%. Females age 18-24 are the largest group living in poverty, followed by females between 25 and 34 years old. The most common ethnic group affected by poverty in Seneca County is White, followed by Black and Hispanic residents.

Approximately 4.93% of the county's residents have no health insurance; 50.5% have employer-provided coverage and the rest obtain coverage from Medicare, Medicaid, military benefits, or non-group health insurance policies.

Discussions included identification of services that assist persons with emotional, mental and addiction needs. The Mental Health & Recovery Services Board of Seneca, Ottawa, Sandusky and Wyandot Counties provides funding and support to the independent providers of behavioral services in Seneca County. There are crisis counseling and service providers, therapists for behavioral, mental and emotional conditions, and addiction services. There are multiple support groups for various situations. Many services are provided within Seneca County, but others are delivered online or at locations in one of the other counties.

The Seneca County Senior Services provides services for the elderly in the county. They provide various services to help seniors remain safely in their homes, and assist those who are part of congregate living communities. They serve meals, provide nutritional support, provide areas for social activities, and coordinate transportation services. They also build ramps for seniors to use, allowing some to remain in their homes for a longer period of time.

The Seneca County Board of Developmental Disabilities provides assistance for children and adults with disabilities. These include early intervention, autism and sensory resources, community education and outreach, and service and support assistance. They provide a full scope of services that includes academic, vocational, social, physical, and emotional support.

2.3.2 Demographic Risk Assessment Tools

Recently created by the federal government, various tools exist online to assist in assessment of risks and vulnerabilities in the United States. Tools that were used for information include the National Risk Index, the Justice40 Initiative Screening Tool, and a Neighborhoods at Risk developed by Headwaters Economics, among others.

Census Tract to Political Jurisdiction Comparison

Many online assessment tools utilize census tracts rather than political jurisdictions because statistics are collected by the US Census Bureau and categorized into census tracts. While census tracts sometimes include an entire township or municipality, most times they are not consistent with those boundaries. To aid in understanding of vulnerability information and to apply it to the mitigation strategies created in this planning activity, the following chart gives and understanding of what political jurisdictions are included in specific census tracts.

Unincorporated area names and census area names have been included in the description to help understand the neighborhoods that are grouped together. The National Risk Index overall ratings are included to create a quick visual assessment of relative vulnerability throughout the county, and to further understanding of comparative analysis of a countywide perspective.

There are fourteen census tracts in Seneca County and with the exception of what appears to be a few houses, they follow county boundaries, but not municipal or township boundaries. There are some slight variations across the county in statistical representation of Seneca County because of areas, mostly in Fostoria, that are part of Hancock and Wood Counties but lie within the city's incorporation area.

Table 2-41: Seneca County Census Tracts & NRI Overview

Census Tract Number	Included Political Jurisdictions	Risk Index Score	Ex. Annual Loss	Social Vulnerability	Community Resilience
39147962500	East central part of rural area; includes Reedtown, West Lodi, Republic, Omar, Attica Junction	18.61	Very Low	Relatively Low	Very High
39147962600	Includes northern-east side bounded by FR 18 and west of SR 53; includes Fort Seneca, Lowell, Watson, Old Fort	25.06	Relatively Low	Relatively Low	Very High
39147962700	Northwest section of county to about SR 53; Bettsville, Amsden, Maple Grove, Cromers, Angus, Rehoboth, Longley, Kansas, Mt. Gilead	20.91	Very Low	Relatively Low	Very High
39147962800	Rural area NE of Fostoria, including area between WTR 84, NTR 17, CR 60, and US 23.	24.17	Very Low	Relatively Moderate	Very High
39147962900	Fostoria, SR 23/299 to Spruce St, and Jackson to E. Clark St.	30.38	Very Low	Relatively High	Very High
39147963000	Fostoria from E. Fremont St. to Center Rd.	28.80	Very Low	Very High	Very High
39147963100	SW section, including New Riegel, Frenchtown, Springville, Adrian, Berwick, and McCutchenville	30.32	Relatively Low	Very Low	Very High
39147963200	SW side of Tiffin, bordered by Sandusky River, W CR 90, CR 47, CR 14, S TR 109, and SR 18	45.02	Relatively Low	Relatively High	Very High
39147963300	NW side of Tiffin bounded by SR 18, N TR 109, W CR 38, and N TR 135	33.48	Relatively Low	Relatively Low	Very High
39147963400	Rural area NE of Tiffin bounded by Swander Rod, N. TR 165, E CR 38, and N TR 135	38.22	Relatively Low	Relatively Moderate	Very High
39147963500	NE side of Tiffin bordered by SR 18, Jackson Street, and Huss Street	32.74	Relatively Low	Relatively Moderate	Very High
39147963600	SE side of Tiffin, bordered by E CR 50, Swander Rd. US 224 and SR 100; includes Swander	26.95	Relatively Low	Relatively Low	Very High
39147963700	South side of Tiffin east of Sandusky River; bordered by SR 100, US 224, Swander Rd. and the river.	36.48	Relatively Low	Relatively Low	Very High
39147963800	Far SE corner of the county; includes Attica, Caroline, Carrothers, Bloomville and Melmore; between US 224 and Crawford-Seneca County Line	21.00	Relatively Low	Very Low	Very High

National Risk Index

The National Risk Index (NRI) was released in 2021. It can be found online at <https://hazards.fema.gov/nri> and a report was created for fourteen census tracts in Seneca County. Note that census tracts do not align with political jurisdictions, so the relationship

between the county, municipalities and townships in this plan is not consistent with the individual areas identified as census tracts.

This geospatial tool assesses risks and vulnerability for all counties across the USA. The NRI estimates the likelihood that a given hazard may strike a specific area, and then estimates the value of property, daily activities, or lives lost in a worst-case scenario. It also views losses in the context of social vulnerability, taking into account factors like economic status, disabilities, or other special needs. The NRI then assesses the community resilience based upon community characteristics and threat levels. The extensions then can be combined to draw estimates and conclusions about how a specific community may fare, and what needs may be, after a disaster occurs. The NRI is an overall, comprehensive assessment and does not always interface perfectly with local input obtained from stakeholders in mitigation planning meetings. The NRI is useful for property and social vulnerabilities in a monetized manner.

This tool did not include avalanche, coastal flooding, tsunami, or volcanic activity in the risks for Seneca County's census tracts. It did include cold wave, drought, earthquake, hail, heat wave, hurricane, ice storm, landslide, lightning, riverine flooding, strong wind, tornado, wildfire, and winter weather as applicable hazards. The stakeholders disagreed that hurricane and landslide are relevant to Seneca County. They argued that should the remnants of a hurricane reach Seneca County, it has neither the magnitude nor the severity it has when classified as a hurricane or a tropical depression, and therefore becomes heavy rain, high winds, or thunderstorms when it reaches Ohio. Landslide was rejected by the committee because there are no areas with adequate elevation to be considered landslide; in Seneca County, a similar situation might be referred to as land subsidence or erosion.

The census tracts in Seneca County were assessed on the NRI as "Relatively Low" and "Very Low" risk with reference to vulnerability to natural hazards. This data is expressed in the national context, comparing the local community to the national averages. Additionally, compared to the rest of the country, Seneca County's anticipated annual loss is relatively to very low, social vulnerability is rated at relatively moderate to very low, and community resilience is rated as relatively high to very high. While this data gives a very broad picture of how Seneca County compares to other counties, there were disagreements with some of the overall conclusions. The NRI assessment of social vulnerability was seen as understated and community resilience as overstated. This is likely due to the low population in Seneca County as compared to greater metropolitan areas and highly concentrated populated areas in the national perspective.

Speaking in the context of the county and its management of disaster consequences, stakeholders felt that their localized perspectives were more accurate, and more in sync with local capabilities to respond and serve survivors. However, the exposure and expected annual loss numbers were evaluated to be accurate and relevant. A summary of countywide data is expressed in the following table, taken from the NRI. Specific details of this, by census area, is included as O6 National Hazard Index Appendix and discussed in the vulnerability to each specific hazard.

Table 2-42: NRI Hazard types, expected annual loss and exposure values

Hazard	Exposure (Population)	Exposure (Buildings)	Exposure (Agriculture)	Estimated Annual Loss (Total)
Cold wave	55,063	\$11,329,882,437	\$161,581,658	\$28,545
Drought	n/a	n/a	n/a	n/a
Earthquake	55,069	\$11,329,727,000	\$148,902	\$183,111
Hail	55,063	\$11,329,882,913	\$161,581,658	\$95,381
Heat Wave	55,063	\$11,329,882,437	\$161,581,658	\$76,362
Hurricane	n/a	n/a	n/a	n/a
Ice Storm	55,063	\$11,329,882,437	\$538,525	\$538,885
Landslide	872	\$308,986,882	\$4,500	\$21,900
Lightning	55,063	\$11,329,882,913	n/r	\$3,128
Riverine Flooding	1,348	\$254,877,154	\$6,071,147	\$422,731
Strong Wind	55,063	\$11,329,882,913	\$161,581,658	\$499,080
Tornado	55,063	\$11,329,882,913	\$161,581,658	\$1,564,645
Wildfire	1,555	\$353,534,717	\$3,811,994	\$2,149
Winter Weather	55,063	\$11,329,882,437	\$161,581,658	\$460,074

Climate and Economic Justice Screening Tool (CEJST)

This tool, developed in 2021, identifies indicators of underserved and over-burdened populations. It uses eight categories, including climate change, energy, health, housing, legacy pollution, transportation, water and wastewater, and workforce development. Those communities that are designated by this tool are given advantages in the receipt of Justice40 Initiatives that address climate, clean energy and related areas.

Most areas of Seneca County are not considered “disadvantaged”. Of fourteen census areas, only three are considered such. Tract #39147962800, the northern side of Fostoria and tract #39147963000 on the southern side of Fostoria are disadvantaged, as well as tract #39147963200 which is the southwest side of Tiffin. All are designated as low income, having a lack of green space. Included in rankings for one or more of those census tracts is high diabetes and heart disease rates, poverty significantly above federal poverty levels, lack of indoor plumbing, high energy costs and education less than a high school diploma.

The census tract that includes the northwest quadrant of Urbana, and parts of Salem, Mad River and Concord townships is the only area considered disadvantaged. This area was designated as low income, and found to have high energy costs, a lack of green space for residents and eleven percent of the residents having less than a high school diploma or an equivalent. These factors all indicate higher than average rates of disadvantaged and underserved populations.

All other census tracts in Seneca County are not considered disadvantaged.

Neighborhoods at Risk by Headwaters Economics

This tool provides census tract information about vulnerable people and neighborhoods, and provides projections regarding climate change. This will allow identification of underserved

populations and persons with special or extra needs by census tract within the county. Significant and applicable findings that cause groups to be more vulnerable to disaster loss are shown in the following table.

Table 2-43: Special Populations

Characteristic	Population
People in Poverty	6,063
Families in Poverty	746
People in “deep” poverty	2,547
People in poverty and over 65 y/o	675
Families with Children in poverty	1,013
Single mother families in poverty	698
Households receiving assistance	5,027
Occupied Rental Homes	6,131
Occupied Mobile Homes	825
Hispanics	3,028
Lack English speaking fluency	133
Over 65 years old	10,064
Over 80 years old	1,247
Under 5 years old	2,961
No High School Diploma	3,634
Over 65 y/o living alone	7,048
Single female + children	4,130
No Car households	1,258
Persons with disabilities	7,808
Persons without health insurance	2,934

Resilience Analysis and Planning Tool (RAPT)

This portal allows the user to obtain detailed resource information about the community, and to identify places and services that would be helpful after a disaster. Users can obtain specific information, like addresses, of the identified resources. It provides the following information as part of the Seneca County, Ohio data.

Table 2-44: RAPT Analysis of Population

Resource or Facility	Number
Fire Stations	14
Law Enforcement Stations	10
Mobile Home Parks	15
Public & Private School Buildings	17
Colleges & Universities	3
SNAP Authorized Retailers	36
Hospitals (General)	2
Long Term Care Facilities	17
Pharmacies	8
Wastewater Treatment Plants	10

This tool will allow emergency managers to instantly spot resources and identify the address of various important sites. The demographic data will enable decision-makers to determine the methods of warnings and notifications, shelters, and other special services for underserved populations.

Summary

These various pieces of data are mostly consistent from one tool to another, and most find their foundational information in the 2020 US Census. There was some discussion about the accuracy of the conclusions, mostly as it related to the actual vulnerability and resilience of the areas. While overall information has been listed in this section, specific community-based data will appear in each community's vulnerability statement because every community is slightly different. Overall, these tools provide a solid method for Seneca County to identify likely locations of urgent need based upon demographic information, and can quickly identify underserved populations that need extra effort and critical resources rapidly when a serious incident occurs.

2.3.3 Comprehensive Social Vulnerability and Capability Assessment

Social vulnerability was rated as "very low" to "relatively low" for most of Seneca County. Two census areas and one in Tiffin were rated as "very high". These three areas are also considered disadvantaged for reasons of poverty, deep poverty, health conditions, low education levels, and low availability of green space. The lack of residential, financial and family stability appears to contribute to social vulnerability in Seneca County. This would require a higher level of social services and supports to be provided during and after any significant disaster event. It would require support of the lifelines that provide food, water, and shelter as well as household items and personal items. The health and medical lifeline would probably need to provide additional services, including both physical and behavioral health resources. As is true in any impoverished neighborhood, the repairs and replacement of structures and equipment after a destructive event would be significant. The structures in these areas would likely be more vulnerable to fire, wind, and water damage, rendering the structures uninhabitable to a greater degree than other locations.

Sheltering for residents when displaced from their homes is a significant vulnerability for all of Seneca County, not only for the high vulnerability zones mentioned above. For those families that live in mobile homes, and due to a generalized widespread shortage of adequate housing, it would be difficult to house great numbers of residents. Finding long-term housing solutions would be a challenge, and building new structures would likely take too much time. Without an array of temporary housing options, Seneca County could easily struggle to maintain the shelter lifeline in a catastrophic event.

Historically Red Cross has provided sheltering capabilities using local churches and other public facilities. However, churches across the state are at risk of closing because church participation has decreased over recent years, and those facilities without air conditioning and generators may not be able to be used. Historically, churches have also fed the masses, and they have funded utility bills and rent deposits and provided other financial and household support for

disaster victims. With many residents likely to not have a strong church affiliation, that reduces the connection between disaster survivors and church resources. Red Cross is suffering from a lack of volunteers, just like other organizations, and they are sometimes hard pressed to operate shelters in rural communities. The void in capability includes not only a lack of facilities that are suitable, with shower, feeding and sleeping areas as well as generator power, but also includes the supplies and volunteers to operate shelters. There are schools that are well-equipped and likely to be available, but there are no supplies or trained volunteers to run them.

Stakeholders discussed non-English speaking workers who are located many Ohio counties through various employment programs. Seneca County is not highly populated by temporary or permanent foreign workers, or by migrant laborers who reside permanently in other states. Although communication with some truckers can be challenging because they come from a base far away from Seneca County, the stakeholders did not feel language provides much of a barrier in Seneca County.

Local schools and county Job and Family Services work with homeless and economically disadvantaged residents. All schools have a designated person who works with homeless students and children. All have intervention specialists who work with students that have special needs or social vulnerability.

Group homes that house individuals with disabilities are not easily identified and located; they are individual homes with a 24/7 caregiver, and they provide housing for a few individuals at a time. There was no estimated number of these homes shared in meetings. Recovery houses are sponsored and serviced by licensed organizations, and are more easily located, when necessary, through the local mental health board and the disabilities board. Relocation for the individuals is problematic due to individual needs as well as a lack of transportation. In spite of providing robust senior services and assistance programs, elder abuse and neglect numbers are on the rise, and this is another situation that would not be improved or lessened in the wake of a disaster.

Stakeholders summarized populations at most risk as first, the elderly. All agencies that serve the elderly reported an increase in services provided and requests for even more services. While these agencies meet regularly and network on a daily basis, it is impossible to meet all needs and service requests. They see consistently increasing isolation and hardship in elderly individuals, couples and families. While an informal network of residents looks out for each other in a farm community, and younger ones check in on older ones, keeping up is getting harder every day. In a disaster, this could be overwhelming. Although Seneca County is a very resilient area because neighbors help neighbors, the egress of younger generations is negatively impacting this at a rate slower than neighboring counties. Some homes and farmsteads are being purchased or rented by people moving in from other areas who are not as friendly and familiar as they used to be.

Children, especially those with special needs, fill the second group of special concerns because finding the services to help them is difficult and sometimes dependent upon agencies based

outside the county. Healthcare stakeholders reported that the number of grandparents raising small children is extremely high, and this is increasing every day. Many families with children do not own their own home, and the high rental numbers make those residents at risk for deteriorating and deficient housing, adding to their disadvantage. The health department provides vaccinations for all children and provides local clinics in many communities to help, but there are many other areas of need for the children in the county. Abuse and neglect statistics are on the rise, and this will only get worse in a disaster.

The economically impoverished have challenges in obtaining necessary life-sustaining services too. Just over 5% of the population has no healthcare coverage and are expected to self-pay for care. These are often those who can least afford to do that, so they go without healthcare. Social services staff reported that more and more families are giving up health insurance to be able to pay for necessities. Reduced benefits for behavioral healthcare impacts this as well, and prevents many people with emotional and mental health problems or addictions from requesting and obtaining care. None of those issues improve under the stress of disasters, and stakeholders anticipate this being a problem area should there be a large-scale incident.

In summary, stakeholders reported that social needs are on an upward trajectory in Seneca County. While providers felt they are “keeping up”, they said that federal funding for underserved and disadvantaged populations needs to keep increasing for them to continue adequate services. In the event of a disaster, these needs will all be amplified, and they doubt that current funding will begin to meet the actual needs.

Disaster sheltering is a concern should there be a widespread, regional need for overnight shelter operations. Red Cross is far less active in Seneca County than in years past, and has very limited numbers of local volunteers. A regional disaster would be difficult for them to staff. Should a widespread incident like a power outage cause mass evacuations and sheltering, Seneca County would have to rely upon churches and schools to provide neighborhood shelter locations, but the equipment for shelters would be a challenge without enough Red Cross resources. Collaboration between ARC and the EMA would be critical.

Some of the fire and EMS service in Seneca County is provided by volunteer departments. The City of Tiffin Fire Department and Fostoria Fire Department are the only full-time 24-hour staffed fire departments in the county. The average age of the volunteers is ever-increasing, and is probably an average of 55-60 years old now. Younger people are not joining fire departments for a variety of reasons, and when they do, it is hard to keep young firefighters in Seneca County. Volunteerism is at an all-time low in fire service in Seneca County, just as it is across the entire State of Ohio. Retention of fire officers is incredibly difficult. People work out of the county, they work long hours, their jobs do not accommodate leaving to fight a fire or respond to a disaster. Daytimes when volunteers are working are exceptionally difficult to staff, and it may take five different departments to fight a house fire nowadays.

Providing special rescue services is difficult, but Tiffin Fire Department and Fostoria Fire do have specialized capabilities. While their personnel are full-time paid employees, they also have a

hard time retaining workers. Training younger and newer individuals is getting harder because younger workers are not inclined to volunteer to gain experience, or to work for low wages before they come to a city like Tiffin or Fostoria. With this shortage in the availability of workers, it is even more difficult to find adequate numbers to train in hazardous materials response, technical rescue, or specialty areas because of the extensive training, personal commitment, and cost of outfitting an individual for specialized work. With the miles and miles of rail that cross Seneca County, and that provide for high numbers of crossings within the two cities, there is ample concern over providing, maintaining and supporting workers who are capable of hazardous materials response.

EMS services are difficult to provide, but Seneca County EMS provides several squads around the county, and provides advanced capability staff to those squads that are sometimes supplemented with part-time and volunteer personnel. Retention of current workers difficult. Many new workers demand wages higher than can be paid, and thus they move on to larger cities and metropolitan areas outside the local community.

Because two house fires or multiple EMS calls at one time could overwhelm county resources, they have aggressively developed and utilized mutual aid agreements with surrounding counties. They use the statewide mutual aid programs as well, and rely upon regional specialty resources for unique or high-tech needs. They use the structural rescue teams from Toledo and Lima. Local departments work together well, and joint operations are generally smooth and effective.

There are basic commercial building regulations in Seneca County consistent with those required by the State of Ohio. Aggressive codes have not been adopted for residential development, but commercial development is enforced by SAFEBuilt, a third-party provider of building code enforcement services. All commercial property is required to meet State of Ohio building codes, and those codes are enforced. The county does not, however, have a comprehensive and progressive set of building codes to guide post-disaster clean up and rebuilding.

Located close to Findlay and Toledo, Seneca County has many resources for supplies in disasters. Locally there is access to several building supply distributors that could provide adequately for the county. There are multiple distribution centers for major retailers in Toledo, and those are utilized to provide life-sustaining supplies and equipment. Two major home improvement companies have warehouses in Findlay, and there are multi-product warehouses and distributors in the general area with tremendous stock of life-sustaining supplies. Columbus, Perrysburg, Bowling Green, Findlay, Lima, and Cleveland are other locations where critical resources can be found.

Medical resources for resilience come mostly from the Toledo area, and perhaps from Findlay or Lima. Medical helicopters come from Toledo and Lima to serve the county. Findlay, Fremont, Bowling Green, and other near-by network hospitals can back up Seneca County Mercy Hospital – Tiffin and ProMedica – Fostoria as needed. Ground transport services are in

place to assist with patient movement. Multiple providers of durable medical equipment and medical supplies are available, and many in proximity to Seneca County, making service during disasters feasible.

The county has multiple generators on hand for extended power outages, but some are perhaps worn enough that stressful use may cause them to fail. The number of generators is adequate so long as they operate without repairs or replacement so long as everything works when plugged in. Amateur radio volunteers can assist with communications when towers are down, or when power is out. Local fuel supplies are fairly redundant, but often limited to gasoline. The county keeps its own supply of fuel for emergencies. Replacement and repair of old generators is a concern.

To summarize, Seneca County is most capable of maintaining Health and Medical and Communication Lifelines through existing resources and regular external providers. Energy Lifelines may be impeded by forces beyond Seneca County's control if power generation fails or if distribution lines are destroyed in mass. While providing food and water would likely be handled by the county, having the staff to provide organized shelters to a large portion of county residents would significantly tax the county's ability to meet needs, but Red Cross is a potential resource for them to do this. Extensive demands on fire service and emergency medical services would be extremely difficult for the county. They have suffered from a lack of volunteers to staff fire and EMS companies, just like most other Ohio counties. Transportation Lifelines could be unmet unless the schools were able to step up and fill the void even though there is significant capability within the county's transit program. Therefore, Safety and Security, Transportation, and Food, Water and Shelter Lifelines may cause some difficulty. An extensive hazardous materials incident would require Urbana Fire to fully mobilize quickly, and to obtain assistance from other county departments. Seneca County could call in outside resources very readily, making the Hazardous Materials Lifeline less difficult to maintain. All in all, Seneca County is robust in their intent to take care of themselves, and in spite of limited resources, they are rated as highly resilient and self-sufficient. This characteristic will serve them well in any significant disaster.

2.3.4 Seneca 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 trees 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.

Climate change could have a profound effect on flooding as rain, snow and ice can develop faster, and hit communities more intensely in a shorter period of time. If warning and notification systems are not effective, then the damages can be far worse because residents do not take protective actions. More rain faster leads to more surface flooding, more erosion of topsoil and cover plants, and more washout of berms, roads, and tiles.

All of Seneca County is vulnerable to tornado and wind damage, ranked second, and severe thunderstorm 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. Generally speaking, tornadoes, straight-line winds, and thunderstorms all come at the same time. 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.

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.

Work with the railroad companies has met inconsistent results. In general, the ditches along the tracks and the side rail locations are not well maintained, and cause the negative effects of flooding to get worse. Efforts to cooperate on overpass, underpass and other structural improvements have not been met with cooperation. Communication about hazardous materials hauled is sometimes good, and other times not. The incident in East Palestine has caused all local officials to see Seneca County's vulnerability in a brighter light, and to consider it a much higher risk than previously.

Land subsidence is a recent development, and continues to gain importance and priority. 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. Where hazardous materials storage intersects an area with unexplained collapse, officials are more concerned than ever.

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 Ohio watersheds under scrutiny for runoff and chemicals, ones that have been declared an impaired watershed due to ongoing water quality issues. A breach 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.

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.

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.

Winter storms are 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 than rebuilding or repairing structures.

The townships and unincorporated areas identified infrastructure failure as a lower concern, which includes road, street and highway deterioration; bridge and culvert failure; power and gas outages; and water, wastewater and storm water system failure. 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 are difficult due to bridge and 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. 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 include 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.

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. At this time, the farmers are reporting damage to livestock and crops from black vultures, and other rural stakeholders report nuisance animals like coyotes, raccoons, and possum populations on the rise. Coyotes are a threat to small livestock like chickens, as well as family pets. Ground-creeping noxious weeds were reported in some places, and these not only choke out ornamental plants and landscaping, they also absorb water and take it away from growing crops.

Earthquake was considered a remote likelihood, and not prioritized high on the hazard list. Vulnerability would include any utilities buried underground or above ground on poles, and a severe earthquake could be very destructive. Response and recovery would take a long time. However, there is no history of this happening, and the risk was considered extremely low.

Table 2-45: Township/Unincorporated Area Hazard Rank

Rank	Hazard
1	Flood
2	Tornado or Windstorm
3	Severe Thunderstorms
4	Hazardous Materials Incident

5	Land Subsidence
6	Water Quality
7	Drought & Extreme Heat
8	Dam/Levee Failure
9	Winter Storm
10	Infrastructure Failure
11	Invasive Species
12	Earthquake

2.3.5 Jurisdiction Vulnerability

Seneca County has many common factors across the county, but each municipality considered its own unique vulnerabilities based upon the characteristics of the jurisdiction. Most villages are a combination of residential, commercial and occasionally industrial properties. While the townships are primarily agriculturally based, the villages have other small industries, retail and distribution, and professional services within their limits. The following section describes how each community ranked each hazard, with “1” being the most disruptive and concerning. The symbol “n/a” means that particular hazard is not applicable to that particular community.

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 for 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 significant 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 to make this improvement. The reservoir that collects water for the village's water treatment plants 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. They are, however, concerned about maintaining the village's high-hazard dam/reservoir because as it ages, the costs could increase beyond their ability to improve. While dam failure ranked in the moderate to low level of concern, this has the potential to be a problem in coming years. They are considering an agreement with the City of Willard to tap into their water supply for redundancy because it pulls water from Honey Creek as well, and has greater capacity to treat and distribute water. This would provide, at the same time, an alternative to reservoir supplies.

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 continually monitors trees on public property and trims or removes them as necessary. Severe storms bring the possibility of extensive amounts of debris, and therefore invasive species is a low concern. The weak and dead trees fall easier and create tons of debris that must be managed. This is a rare occurrence in Attica.

Earthquake was the lowest of all concerns. With limited underground utilities and very few buildings, the village does not see this as a huge concern. There is no history of earthquake, although it is possible. The stakeholders determined that earthquake was not a worrisome prospect.

Winter storms are only considered a slight risk, and that would be under conditions of extremely cold temperatures and high wind at the same time. Even so, unless this would carry on for an extended period of time, residents were not concerned. The water system is supplied by Honey Creek and officials do not anticipate a situation where that supply would not be adequate.

Although they did note an occasional rainfall that is more intense, and once in a while the dry spells are slightly longer in duration than before, Attica did not note many weather changes over the past few years. They did not feel that the effects of climate change are profound.

The Village of Attica ranked hazards and threats as follows:

**Table 2-46
Attica Hazard Rank**

Rank	Hazard
n/a	Drought & Extreme Heat
n/a	Land Subsidence
1	Tornado or Windstorm
2	Flood
3	Infrastructure Failure
4	Water Quality
5	Hazardous Materials Incident
6	Severe Thunderstorms
7	Dam/Levee Failure
8	Invasive Species
9	Winter Storm
10	Earthquake

Bettsville

Infrastructure failure is the highest 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. Stakeholders reported that the quarry

activity is currently being expanded to both wider and deeper blasting. MGQ Quarry has purchased additional property for expansion on CR 133. Officials are concerned this expansion will extend and worsen the effects of quarrying activities on the village.

Flooding is also 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 buildup of debris, ice and crop fodder. As these structures currently exist, debris collects and worsens the flooding. The village has relocated some ditch area and installed tile in 2023 to help reduce 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. The effect flooding has on infrastructure makes the two hazards a combination that causes disruption and expense both to the village and the residents.

The quarry 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 Bettsville'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.

Bettsville officials are moderately concerned about damage from tornadoes, wind and severe thunderstorms. Tornado and high winds are more concerning than severe thunderstorms, but they usually strike Bettsville as one front. Tornadoes and high wind cause significant damage to 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. The recent frequency of tornadoes in Ohio, much higher than in the past, has officials concerned.

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. The abandoned quarry site has a pile of soil that is contaminated with mercury, and while this is in remediation, officials realize that mercury is extremely dangerous.

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.

Land subsidence, and the movement of earth is something village officials constantly monitor. Quarrying activities combined with karst below the surface make the village susceptible to various outcomes. The karst substructure is part of the limestone deposits that feed the quarry rock. 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.

Earthquake is unlikely in Bettsville, and there is no history of any kind of earthquake. 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.

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. They did not feel that drought and extreme heat are a threat to Bettsville.

Bettsville is not vulnerable to dam failure because there are no structures near the village.

Table 2-47: Bettsville Hazard Rank

Rank	Hazard
n/a	Drought and Extreme Heat
n/a	Dam or Levee Failure
1	Infrastructure Failure
2	Flood
3	Tornado or Windstorm
4	Water Quality
5	Hazardous Materials Incident
6	Severe Thunderstorm
7	Severe Winter Storm

8	Land Subsidence
9	Invasive Species
10	Earthquake

Bloomville

Tornadoes and windstorms 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. Recent storms have included hail and caused limbs and trees to come down. With recently increasing numbers of tornadoes during the past two years, officials are concerned this trend will continue, putting the village at higher risk than before.

Bloomville officials are 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.

Water quality is a concern. While they have a robust emergency plan for their water treatment facility, the continual testing that has to happen, and the aging distribution infrastructure is concerning. They have wastewater system infrastructure concerns as well, associated with aging systems and increasing weather extremes. They are fearful that the increasing cost of maintaining and upgrading these systems will become difficult for the small village.

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. Heavy snow and ice are expensive due to insufficient and inadequate snow equipment, but stakeholders felt storms under six inches in volume are manageable; greater snowfall is an extreme challenge to the resources of the community.

The village is moderately concerned with hazardous materials spills and releases due to the truck traffic through the village and 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 leaking tanks or loss of control accidents would be the highest likelihood.

Officials are less concerned about drought and extreme heat because power outages are infrequent and water supplies are strong. Should power fail, it would leave an increasing elderly population without air conditioning, and that can easily cause problems for people with underlying health conditions. They feel their water supply is adequate even in low-precipitation times.

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. They feel that more investigation needs to occur to more correctly map karst areas.

Invasive species is only a worry in the context of debris management, and the increased number of trees that fall when diseased and weakened. However, if temperatures get hotter and insects are able to survive in a varied climate, there could be additional nuisance or health issues associated with invasive species that don't normally exist in northwest Ohio.

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. If rains become heavier and more intense, the flash flooding could become worse and cause more damage.

Earthquake is not assessed to be a high risk, but infrastructure would be heavily damaged if it did occur. There is no history of earthquake in Bloomville. The unknown karst substructure would likely cause secondary voids and sink holes should an earthquake occur, and that could make the damages to infrastructure and structures much worse than it would be otherwise.

There are no dams or levees in the village so they are not vulnerable to dam failure.

Table 2-48: Bloomville Hazard Rank

Rank	Hazard
n/a	Dam or Levee Failure
1	Tornado or Windstorm

2	Severe Thunderstorm
3	Infrastructure Failure
4	Water Quality
5	Severe Winter Storm/Blizzard
6	Hazardous Materials Incident
7	Drought and Extreme Heat
8	Land Subsidence
9	Invasive Species
10	Flood
11	Earthquake

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 six reservoirs, five of which are classified as high hazard dams. Lake Daugherty Upground Reservoir #1, Lake Mottram Upground Reservoir #2, Lake Lamberjack Upground Reservoir #3, Lake Mosier Upground Reservoir #4, LaComte Upground Reservoir #5, and Veteran's Memorial Reservoir #6 are all situated inside city limits but in Hancock County along the East Branch of the Portage River. They are, however, the sole responsibility of the City of Fostoria, and the City has the authority to manage them as the sole owner. The Ohio EPA has determined that Lake Mosier Dam is unstable. LaComte Reservoir #5 and Veterans Memorial Reservoir are in need of significant work to strengthen the dams. At the last inspections, Lake Daugherty #1, Lake Lamberjack #3, and Lake Mosier #4 were rated in "poor" condition. The others were rated as "fair".

The City of Fostoria has plans to decommission Lake Daugherty #1 and Lake Mosier #4, and turn the area into wetlands. The river side of one of the dams will be lowered to create a public fishing pond. The city is in the process of studying what repairs and upgrades are necessary for the remaining four reservoirs. They are finding costs to far exceed their financial capabilities, especially when combine with other federal and state infrastructure mandates.

All dams have emergency plans in place except Veterans Memorial Reservoir, for which an EAP should be created. The five current plans need to be updated because they are out of date. 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 may not include 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. Fostoria is under a federal consent decree to address overflow, sewer separation and cross connection issues in the storm and sanitary sewer systems. Correction of these items will occur over a long period of time due to the extensive cost. 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.

Along similar lines, water quality is a high concern due to the vulnerability and condition of the entire water system. The city has only one raw water feed line to the water plant. An additional line is needed to insure continuous flow to the treatment plant. Reservoir failure

could also adversely affect water quality by endangering the raw water supply. The city struggles to keep up with new testing requirements because of the cost and drain on resources.

Tornadoes and windstorms, along with 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. If the concentration of elderly without substantial family support continues to increase, and the severity of storms also increases, there will be a higher dependency on city public safety services than ever before. In a time when they are struggling to maintain those departments at recommended staffing levels, this could be extremely problematic.

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 standstill. 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.

Fostoria officials are concerned about flooding. All four quadrants of the city have areas that 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 in the outskirts of the city limits. 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.

Hazardous materials spills and releases are a high concern because of the multiple state highways and railroad tracks that cross the city. Approximately two hundred trains travel through the city on a regular day, and the trains are now up to three miles long, travel as fast as 50 mph, and have minimal staffing. They carry ethanol and other dangerous chemicals that could easily cause explosions and fire, as well as air and water contamination if they derail. The particular chemicals on these trains are highly volatile and difficult to manage in emergency conditions. 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.

Drought and extreme heat would be problematic for Fostoria. With a high number of rental properties and mobile homes, there is little structural resistance to heat issues. Without electricity, elderly and medically dependent individuals would suffer. There are few facilities that can be used as shelters or cooling/warming stations, so many of these people would have to remain in their homes. While this is not a high concern based upon actual probability, this could be serious if there were an extended hot spell. The water supply is ample, and it is unlikely the city would be unable to operate its water system.

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.

Table 2-49: Fostoria Hazard Rank

Rank	Hazard
1	Dam or Levee Failure
2	Infrastructure Failure
3	Water Quality
4	Tornado and Windstorm
5	Severe Thunderstorm

6	Severe Winter Storm
7	Flood
8	Hazardous Materials Incident
9	Drought and Extreme Heat
10	Earthquake
11	Invasive Species
12	Land Subsidence

New Riegel

Tornado and windstorm are the highest threat in New Riegel. With increasing numbers of tornadoes, and higher instances of high winds and wind damage, the village is on the lookout for developing conditions that lead to tornado formation. They are out in the middle of an open space with nothing to protect them. They do have one outdoor warning siren, but it is old and due to be replaced. Their small budget makes replacement difficult. With an elderly population that frequently does not use computers or cellular phones, warning is critical to the village.

Thunderstorms and associated hazards are also high on the list of concerns. Hail, lightning and wind gusts are commonly part of storm systems. 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.

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. These storms are an extensive drain on village resources, and in many cases, there is not sufficient services to help residents. The high elderly population is frequently unable to help themselves and rely upon neighbors and family, sometimes who do not live nearby, to assist them.

Water quality worries New Riegel officials. They depend upon wells and if the aquifer or water source were contaminated by chemicals or dried up through drought, it would be difficult to provide water to families and individuals. They are concerned about keeping up with testing options and making sure the water supply is safe.

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.

New Riegel officials identified flash flooding as a minor 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. Curb replacement is something they want to do, but lack the funds to complete this kind of project.

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.

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.

New Riegel does not have any known history of land subsidence or sink holes. There are no dams, reservoirs or lagoons in the village.

Table 2-50: New Riegel Hazard Rank

Rank	Hazard
n/a	Dam or Levee Failure
n/a	Land Subsidence
1	Tornado or Windstorm
2	Severe Winter Storm
3	Severe Thunderstorm
4	Water Quality
5	Hazardous Materials
6	Infrastructure Failure
7	Invasive Species
8	Land Subsidence
9	Flood

10	Drought and Extreme Heat
11	Earthquake

Republic

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.

Severe storms are damaging for Republic. Some of the cause is that warning systems are not adequate to reach all the residents. With older residents, many of whom do not comfortably use a computer and who do not have cell phones with warning apps, it is difficult to give them fair warning of impending heavy rain, hail, lightning and wind. Some are homebound and do not see the weather changing, making them totally dependent upon warning systems. They also incur damages to homes and private property when hail damages their homes or heavy rain floods their basements.

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.

Riverine and flash flooding is a significant 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.

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. A newly constructed fuel site in the middle of the village has residents on edge. The 18,000-gallon LP tank sits close to a state highway and a three-way intersection. Officials feel that this tank increases the village vulnerability to a fire, explosion or release of chemical significantly, and they question how first responders would be able to reach an incident and manage it quick enough to save lives.

Water quality is a moderate concern. They have a reservoir that is not classified as a high hazard structure, but it draws water from area waterways. If a hazardous spill were to

contaminate the waterway, or the treatment facility were to fail or falter, it could have a negative impact upon village residents. It could also be costly to repair, and the village would be challenged to afford the emergency expenditures.

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.

Drought and extreme heat would be problematic if combined with a power outage or a water supply problem. 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. Invasive species infestation could be problematic if hotter weather facilitated the growth of insects and other pestilence, and if drought were to facilitate the growth of nuisance ground covers that would suck water from agricultural crops.

Land subsidence could be a developing problem; the extent of karst formations is unknown, and therefore the question of vulnerability cannot be completely answered. 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. In 2022, a sink hole emergency near the gas station in an intersection. No reason was ever found for the problem, and officials suspect there is karst substructure. 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.

Table 2-51: Republic Hazard Rank

Rank	Hazard
1	Infrastructure Failure
2	Severe Thunderstorm
3	Tornado or Windstorm
4	Flood
5	Hazardous Materials Incident
6	Water Quality
7	Severe Winter Storm
8	Drought and Extreme Heat

9	Land Subsidence
10	Invasive Species
11	Dam or Levee Failure
12	Earthquake

Tiffin

Failure of critical infrastructure is the city's greatest concern, including failure of water treatment and wastewater management systems, utilities, and other critical services. In Tiffin, these necessities are provided by a combination of government services and private industry. Tiffin officials are actively engaged in a long-term plan to combat infrastructure failure, and their efforts are expected to continue for many years. 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. They provide assistance to homeowners to improve their water and wastewater connections when faulty systems are identified. 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 experience occasional 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 an extended utility outage. Generators to provide alternate power sources are always a necessity and officials are constantly trying to find ways to provide more of them.

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. Flooding impacts households and residents across Tiffin. Basement infrastructure such as 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 cleanup 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.

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 cleanup 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.

City residents and businesses are vulnerable to wind and severe storm damage. Tornado and high winds are more concerning than severe thunderstorms because they are more intense and strike specific spots, damaging whatever is there. 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. As they reported that storms are more intense, and sometimes even more frequent when it comes to severe thunderstorms and wind events, they are more of a concern. Ohio’s tornado count for the past two years has risen significantly, and this concerns officials about the damage that could be done by multiple tornadoes in one strike.

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. Both colleges have maintenance buildings beside railroad tracks, and dormitories very nearby. A school is located very close to tracks as they run through the city. This proximity makes 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. The fire department does have robust plans to respond around obstacles like blocked railroad crossings, but in a small city with the traffic congestion Tiffin has, this presents challenges.

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. The city owns most of the riverbank, so they are able to monitor it continually for any changes or problems. 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.

City officials recognize that runoff high in phosphorus and crop nutrients could endanger their water supply, and this is concerning to them. 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.

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. The two dams in the city could be negatively impacted because they are made of concrete with no flexibility. While this would not be devastating from a life-loss perspective, it would create expensive and lengthy cleanup efforts.

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. Officials report that cold spells boast of lower temperatures now, but they last for fewer days and seem to be less frequent. It does seem to officials that cold spells are more intense in spite of being shorter in duration.

Invasive species is a slight concern because Tiffin has so much tree cover and landscaping of homes and institutions. An infestation could be extremely damaging, not only to the ecological well being of the city, but also to the aesthetic qualities of the entire area. Managing the debris from weakened and dead vegetation and trees becomes difficult, so this would worsen the effects of severe storms and wind events as well. They attempt to remain diligent in identifying threats, and work with natural resource experts in doing so, but a widespread invasion of something could be serious. They also deal with rodents and nuisance animals inside the city. This might include a dangerous predator animal like a coyote, or less threatening but damaging raccoons, or docile possums on public and private property. They have no animal control officer, so employees deal with these issues on a case-by-case basis and help the best they can.

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.

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. They see providing alternate power sources as a key mitigation measure, and intend to equip potential shelters and institutions with generators to combat this threat.

Table 2-52: Tiffin Hazard Rank

Rank	Hazard
1	Infrastructure Failure
2	Flood
3	Tornado or Windstorm
4	Hazardous Materials Incident
5	Land Subsidence
6	Water Quality
7	Severe Thunderstorms
8	Earthquake
9	Severe Winter Storm
10	Invasive Species
11	Dam or Levee Failure
12	Drought and Extreme Heat

All-hazard Approach to Vulnerability

All hazards were averaged to arrive at a county-wide vulnerability ranking. Hazard rating totals were added and divided by the number of jurisdictions that listed the hazard as valid. There was no effort to adjust the ratings according to population counts or property values. This was

a rating intended to simply give the elected and appointed officials an indication of what hazards could be addressed collaboratively and how important each might be when looking at the entire county.

For information and a perspective of longevity, the 2020 Hazard Mitigation Plan rankings were identified at the top of the chart. This allowed stakeholders to visualize changes over a five-year period, and take into account the long-term mitigation approach as opposed to varying and short-term five-year periods.

This approach and information will also facilitate cooperation between communities as they can, from this plan, identify those hazards that are particularly relevant to their community, but they can also see what is relevant to the entire county, joining forces in some cases to address a hazard collaboratively.

Table 2-53: Countywide Overall Average Vulnerability Prioritization

	Dam Failure	Drought/Ext. Heat	Earthquake	Flood	Hazardous Materials	Infrastructure Failure	Invasive Species	Land Subsidence	Severe Storms	Tornado & Wind	Water Quality	Winter Storms
2019 Hazard Mitigation Plan	N/I	10	8	2	4	1	11	5	7	3	6	9
2025 Hazard Mitigation Plan												
Seneca County 2025 Rank	8	7	12	1	4	10	11	5	3	2	6	9
Fostoria 2025 Rank	1	9	10	7	8	2	11	12	5	4	3	6
Tiffin 2025 Rank	11	12	8	2	4	1	10	5	7	3	6	9
Attica 2025 Rank	7	n/a	10	2	5	3	8	--	6	1	4	9
Bettsville 2025 Rank	n/a	n/a	10	2	5	1	9	8	6	3	4	7
Bloomville 2025 Rank	n/a	7	11	10	6	3	9	8	2	1	4	5
New Riegel 2025 Rank	n/a	10	11	9	5	6	7	8	3	1	4	2
Republic 2025 Rank	11	8	12	4	5	1	10	9	2	3	6	7
TOTAL SCORE	38	53	84	37	42	27	75	55	34	18	37	54
# Jurisdictions considering a risk	5	6	8	8	8	8	8	7	8	8	8	8
Adjusted Score	7.60	8.83	10.50	4.62	5.25	3.37	9.37	7.85	4.25	2.25	4.62	6.75
COUNTYWIDE RANK	8	10	12	4	6	2	11	9	3	1	5	7

2.3.7 National Risk Index Vulnerability Assessment

The National Risk Index compares the ten census tracts in the county by hazard and establishes a vulnerability assessment for each area.

The following information is taken from the National Risk Assessment tool. This assessment establishes the county's vulnerability by census tract and broken into individual hazard categories. It includes the exposures as well as expected annual losses for various hazards.

The following tables describe exposures and expected annual losses for various components of the community. These tables link to the vulnerability narratives that follow.

SENECA COUNTY EXPOSURE & ESTIMATED LOSS TABLES PER HAZARD

Seneca County Coldwave Estimated Annual Loss							
Census Tract	Exposure (Buildings)	Exposure (Population)	Exposure (Agriculture)	EAL (Buildings)	EAL (Pop Equiv)	EAL (Agriculture)	EAL (Total)
39147963700	\$952,935,151	4,949	\$5,864,656	\$282	\$2,201	\$26	\$2,508
39147963100	\$999,768,407	4,378	\$28,727,940	\$295	\$1,947	\$126	\$2,368
39147963400	\$936,080,188	4,253	\$5,243,390	\$277	\$1,892	\$23	\$2,191
39147963200	\$957,094,295	4,187	\$4,789,660	\$283	\$1,862	\$21	\$2,166
39147963300	\$1,081,880,805	4,055	\$3,930,879	\$320	\$1,803	\$17	\$2,140
39147963600	\$691,785,228	4,206	\$2,303,732	\$204	\$1,871	\$10	\$2,085
39147963800	\$889,458,916	3,825	\$27,089,872	\$263	\$1,701	\$119	\$2,083
39147962600	\$777,765,072	3,861	\$24,468,840	\$230	\$1,717	\$107	\$2,054
39147962500	\$718,789,951	3,724	\$34,240,370	\$212	\$1,656	\$150	\$2,019
39147962900	\$716,351,068	3,890	\$0	\$212	\$1,730	\$0	\$1,942
39147962700	\$655,846,654	3,439	\$21,597,736	\$194	\$1,530	\$95	\$1,818
39147963500	\$625,075,663	3,638	\$942	\$185	\$1,618	\$0	\$1,803
39147962800	\$761,866,725	3,444	\$1,225,877	\$225	\$1,532	\$5	\$1,762
39147963000	\$565,184,314	3,214	\$2,097,764	\$167	\$1,429	\$9	\$1,606
Grand Total	\$11,329,882,437	55,063	\$161,581,658	\$3,349	\$24,489	\$707	\$28,545

Seneca County Earthquake Estimated Annual Loss					
Census Tract	Exposure (Buildings)	Exposure (Population)	EAL (Buildings)	EAL (Pop Equiv)	EAL (Total)
39147963300	\$1,081,871,000	4,055	\$17,794	\$3,562	\$21,356
39147963200	\$957,080,000	4,187	\$14,599	\$2,601	\$17,200
39147963100	\$999,759,000	4,378	\$13,376	\$3,030	\$16,406
39147962800	\$761,855,000	3,444	\$12,145	\$2,202	\$14,347
39147962900	\$716,340,000	3,890	\$11,466	\$2,490	\$13,956
39147963700	\$952,924,000	4,949	\$10,406	\$3,465	\$13,871
39147963400	\$936,066,000	4,253	\$11,502	\$1,965	\$13,468
39147963800	\$889,448,000	3,825	\$9,937	\$2,431	\$12,368
39147963600	\$691,773,000	4,206	\$8,932	\$2,759	\$11,691
39147963500	\$625,063,000	3,638	\$8,063	\$2,272	\$10,334
39147962700	\$655,836,000	3,439	\$8,046	\$2,037	\$10,083
39147962600	\$777,756,000	3,867	\$7,906	\$1,948	\$9,854
39147963000	\$565,176,000	3,214	\$7,889	\$1,760	\$9,649
39147962500	\$718,780,000	3,724	\$6,842	\$1,685	\$8,527
Grand Total	\$11,329,727,000	55,069	\$148,902	\$34,208	\$183,111

Seneca County Hail Estimated Annual Loss							
Census Tract	Exposure (Buildings)	Exposure (Population)	Exposure (Agriculture)	EAL (Buildings)	EAL (Pop Equiv)	EAL (Agriculture)	EAL (Total)
39147963100	\$ 999,768,407	4,378	\$ 28,727,940	\$ 7,092	\$ 597	\$ 1,059	\$ 8,748
39147963800	\$ 889,458,916	3,825	\$ 27,089,872	\$ 6,937	\$ 573	\$ 1,083	\$ 8,593
39147963300	\$ 1,081,880,805	4,055	\$ 3,930,879	\$ 7,675	\$ 553	\$ 145	\$ 8,372
39147963700	\$ 952,935,151	4,949	\$ 5,864,656	\$ 6,760	\$ 674	\$ 216	\$ 7,651
39147963200	\$ 957,094,295	4,187	\$ 4,789,660	\$ 6,790	\$ 571	\$ 177	\$ 7,537
39147962500	\$ 718,789,951	3,724	\$ 34,240,370	\$ 5,563	\$ 552	\$ 1,381	\$ 7,496
39147963400	\$ 936,080,188	4,253	\$ 5,243,390	\$ 6,641	\$ 580	\$ 193	\$ 7,413
39147962600	\$ 777,765,072	3,861	\$ 24,468,840	\$ 5,634	\$ 538	\$ 931	\$ 7,102
39147962800	\$ 761,866,725	3,444	\$ 1,225,877	\$ 5,405	\$ 469	\$ 45	\$ 5,919
39147962700	\$ 655,846,723	3,439	\$ 21,597,736	\$ 4,653	\$ 469	\$ 796	\$ 5,917
39147962900	\$ 716,351,475	3,890	\$ 0	\$ 5,082	\$ 530	\$ 0	\$ 5,612
39147963600	\$ 691,785,228	4,206	\$ 2,303,732	\$ 4,907	\$ 573	\$ 85	\$ 5,566
39147963500	\$ 625,075,663	3,638	\$ 942	\$ 4,434	\$ 496	\$ 0	\$ 4,930
39147963000	\$ 565,184,314	3,214	\$ 2,097,764	\$ 4,009	\$ 438	\$ 77	\$ 4,525
Grand Total	\$ 11,329,882,913	55,063	\$ 161,581,658	\$ 81,581	\$ 7,612	\$ 6,188	\$ 95,381

Seneca County Heatwave Estimated Annual Loss							
Census Tract	Exposure (Buildings)	Exposure (Population)	Exposure (Agriculture)	EAL (Buildings)	EAL (Pop Equiv)	EAL (Agriculture)	EAL (Total)
39147963100	\$999,768,407	4,378	\$28,727,940	\$84	\$5,557	\$982	\$6,623
39147963700	\$952,935,151	4,949	\$5,864,656	\$80	\$6,282	\$201	\$6,562
39147962500	\$718,789,951	3,724	\$34,240,370	\$60	\$4,727	\$1,171	\$5,958
39147963800	\$889,458,916	3,825	\$27,089,872	\$74	\$4,855	\$926	\$5,856
39147962600	\$777,765,072	3,861	\$24,468,840	\$65	\$4,901	\$837	\$5,802
39147963400	\$936,080,188	4,253	\$5,243,390	\$78	\$5,398	\$179	\$5,656
39147963200	\$957,094,295	4,187	\$4,789,660	\$80	\$5,314	\$164	\$5,558
39147963600	\$691,785,228	4,206	\$2,303,732	\$58	\$5,338	\$79	\$5,475
39147963300	\$1,081,880,805	4,055	\$3,930,879	\$91	\$5,147	\$134	\$5,372
39147962700	\$655,846,654	3,439	\$21,597,736	\$55	\$4,365	\$738	\$5,158
39147962900	\$716,351,068	3,890	\$0	\$60	\$4,937	\$0	\$4,997
39147963500	\$625,075,663	3,638	\$942	\$52	\$4,618	\$0	\$4,670
39147962800	\$761,866,725	3,444	\$1,225,877	\$64	\$4,371	\$42	\$4,477
39147963000	\$565,184,314	3,214	\$2,097,764	\$47	\$4,079	\$72	\$4,198
Grand Total	\$11,329,882,437	55,063	\$161,581,658	\$949	\$69,889	\$5,525	\$76,362

Seneca Ice Storm Estimated Annual Loss					
Census Tract	Exposure (Buildings)	Exposure (Population)	EAL (Buildings)	EAL (Pop Equiv)	EAL (Total)
39147963300	\$1,081,880,805	4,055	\$54,059	\$28	\$54,086
39147963100	\$999,768,407	4,378	\$49,956	\$30	\$49,986
39147963200	\$957,094,295	4,187	\$47,823	\$29	\$47,852
39147963700	\$952,935,151	4,949	\$47,616	\$34	\$47,650
39147963400	\$936,080,188	4,253	\$46,773	\$29	\$46,803
39147962800	\$761,866,725	3,444	\$38,068	\$24	\$38,092
39147962600	\$777,765,072	3,861	\$36,202	\$25	\$36,227
39147962900	\$716,351,068	3,890	\$35,794	\$27	\$35,821
39147963600	\$691,785,228	4,206	\$34,567	\$29	\$34,595
39147962700	\$655,846,654	3,439	\$32,771	\$24	\$32,794
39147963500	\$625,075,663	3,638	\$31,233	\$25	\$31,258
39147963800	\$889,458,916	3,825	\$30,109	\$18	\$30,127
39147963000	\$565,184,314	3,214	\$28,241	\$22	\$28,263
39147962500	\$718,789,951	3,724	\$25,312	\$18	\$25,331
Grand Total	\$11,329,882,437	55,063	\$538,525	\$360	\$538,885

Seneca Landslide Estimated Annual Loss					
Census Tract	Exposure (Buildings)	Exposure (Population)	EAL (Buildings)	EAL (Pop Equiv)	EAL (Total)
39147963100	\$93,438,938	327	\$1,361	\$6,529	\$7,889
39147962600	\$59,185,938	236	\$862	\$4,699	\$5,561
39147963700	\$34,302,053	166	\$500	\$3,317	\$3,817
39147962700	\$66,871,810	48	\$974	\$950	\$1,924
39147963800	\$38,618,574	52	\$562	\$1,045	\$1,607
39147962500	\$12,112,950	19	\$176	\$369	\$545
39147963300	\$1,893,886	13	\$28	\$268	\$296
39147963200	\$2,030,729	7	\$30	\$139	\$169
39147963400	\$532,003	4	\$8	\$83	\$91
39147962800	\$0	0	\$0	\$0	\$0
39147963600	\$0	0	\$0	\$0	\$0
39147962900	\$0	0	\$0	\$0	\$0
39147963000	\$0	0	\$0	\$0	\$0
39147963500	\$0	0	\$0	\$0	\$0
Grand Total	\$308,986,882	872	\$4,500	\$17,400	\$21,900

Seneca Lightning Estimated Annual Loss					
Census Tract	Exposure (Buildings)	Exposure (Population)	EAL (Buildings)	EAL (Pop Equiv)	EAL (Total)
39147963700	\$952,935,151	4,949	\$701	\$4,599	\$5,300
39147963400	\$936,080,188	4,253	\$747	\$4,243	\$4,990
39147963300	\$1,081,880,805	4,055	\$805	\$3,842	\$4,646
39147963100	\$999,768,407	4,378	\$707	\$3,917	\$4,623
39147963200	\$957,094,295	4,187	\$697	\$3,862	\$4,558
39147963600	\$691,785,228	4,206	\$524	\$4,020	\$4,543
39147963800	\$889,458,916	3,825	\$629	\$3,424	\$4,053
39147962600	\$777,765,072	3,861	\$559	\$3,492	\$4,051
39147962500	\$718,789,951	3,724	\$526	\$3,472	\$3,998
39147963500	\$625,075,663	3,638	\$469	\$3,481	\$3,950
39147962900	\$716,351,475	3,890	\$500	\$3,415	\$3,915
39147962800	\$761,866,725	3,444	\$541	\$3,089	\$3,630
39147962700	\$655,846,723	3,439	\$473	\$3,144	\$3,617
39147963000	\$565,184,314	3,214	\$383	\$2,745	\$3,128
Grand Total	\$11,329,882,913	55,063	\$8,258	\$50,745	\$59,003

Seneca Riverine Flooding Estimated Annual Loss								
Census Tract	Exposure (Sq. Mi)	Exposure (Buildings)	Exposure (Population)	Exposure (Agriculture)	EAL (Buildings)	EAL (Pop Equiv)	EAL (Agriculture)	EAL (Total)
39147963600	0.1092	\$53,306,081	242	\$44,692	\$36,546	\$33,522	\$452	\$70,520
39147963700	1.3774	\$44,696,545	223	\$647,419	\$30,643	\$30,852	\$6,544	\$68,040
39147963500	0.0443	\$45,120,703	259	\$0	\$30,934	\$35,887	\$0	\$66,821
39147963200	0.9680	\$39,413,449	208	\$347,565	\$27,021	\$28,852	\$3,513	\$59,387
39147963800	3.2273	\$12,421,035	65	\$1,235,123	\$8,516	\$9,015	\$12,485	\$30,016
39147962600	3.3888	\$10,523,033	63	\$1,153,995	\$7,214	\$8,713	\$11,665	\$27,592
39147962700	2.4459	\$9,473,287	73	\$764,145	\$6,495	\$10,140	\$7,724	\$24,359
39147963100	1.7443	\$13,560,671	48	\$743,196	\$9,297	\$6,605	\$7,512	\$23,415
39147963400	0.3219	\$13,497,184	91	\$143,499	\$9,254	\$12,552	\$1,451	\$23,256
39147962500	1.6619	\$6,107,778	39	\$703,709	\$4,187	\$5,330	\$7,113	\$16,630
39147963000	0.1432	\$4,616,382	26	\$85,515	\$3,165	\$3,542	\$864	\$7,572
39147963300	0.5151	\$2,141,006	12	\$202,290	\$1,468	\$1,611	\$2,045	\$5,123
39147962800	0.0000	\$0	0	\$0	\$0	\$0	\$0	\$0
39147962900	0.0000	\$0	0	\$0	\$0	\$0	\$0	\$0
Grand Total	15.9473	\$254,877,154	1,348	\$6,071,147	\$174,741	\$186,622	\$61,368	\$422,731

Seneca County Strong Winds Estimated Annual Loss

Census Tract	Exposure (Buildings)	Exposure (Population)	Exposure (Agriculture)	EAL (Buildings)	EAL (Pop Equiv)	EAL (Agriculture)	EAL (Total)
39147963100	\$999,768,407	4,378	\$28,727,940	\$40,650	\$2,054	\$5,532	\$48,235
39147963300	\$1,081,880,805	4,055	\$3,930,879	\$43,988	\$1,902	\$757	\$46,648
39147963700	\$952,935,151	4,949	\$5,864,656	\$38,745	\$2,322	\$1,129	\$42,197
39147963200	\$957,094,295	4,187	\$4,789,660	\$38,915	\$1,964	\$922	\$41,801
39147963400	\$936,080,188	4,253	\$5,243,390	\$38,060	\$1,995	\$1,010	\$41,065
39147962600	\$777,765,072	3,861	\$24,468,840	\$30,170	\$1,725	\$4,381	\$36,276
39147963800	\$889,458,916	3,825	\$27,089,872	\$28,336	\$1,407	\$4,256	\$34,000
39147962800	\$761,866,725	3,444	\$1,225,877	\$30,977	\$1,616	\$236	\$32,829
39147962700	\$655,846,723	3,439	\$21,597,736	\$26,666	\$1,613	\$4,159	\$32,438
39147962900	\$716,351,475	3,890	\$0	\$29,126	\$1,825	\$0	\$30,951
39147963600	\$691,785,228	4,206	\$2,303,732	\$28,127	\$1,973	\$444	\$30,544
39147962500	\$718,789,951	3,724	\$34,240,370	\$23,434	\$1,412	\$5,236	\$30,082
39147963500	\$625,075,663	3,638	\$942	\$25,415	\$1,707	\$0	\$27,122
39147963000	\$565,184,314	3,214	\$2,097,764	\$22,980	\$1,508	\$404	\$24,892
Grand Total	\$11,329,882,913	55,063	\$161,581,658	\$445,590	\$25,023	\$28,467	\$499,080

Seneca Tornado Estimated Annual Loss

Census Tract	Exposure (Buildings)	Exposure (Population)	Exposure (Agriculture)	EAL (Buildings)	EAL (Pop Equiv)	EAL (Agriculture)	EAL (Total)
39147963300	\$1,081,880,805	4,055	\$3,930,879	\$101,875	\$41,219	\$25	\$143,119
39147963700	\$952,935,151	4,949	\$5,864,656	\$89,743	\$50,307	\$40	\$140,089
39147963100	\$999,768,407	4,378	\$28,727,940	\$94,152	\$44,502	\$193	\$138,847
39147963200	\$957,094,295	4,187	\$4,789,660	\$90,125	\$42,560	\$32	\$132,718
39147963400	\$936,080,188	4,253	\$5,243,390	\$88,147	\$43,231	\$36	\$131,414
39147963600	\$691,785,228	4,206	\$2,303,732	\$65,142	\$42,754	\$16	\$107,911
39147962900	\$716,351,475	3,890	\$0	\$67,455	\$39,541	\$0	\$106,997
39147962800	\$761,866,725	3,444	\$1,225,877	\$71,741	\$35,008	\$8	\$106,757
39147962600	\$777,765,072	3,861	\$24,468,840	\$69,990	\$36,131	\$159	\$106,280
39147962700	\$655,846,723	3,439	\$21,597,736	\$61,770	\$34,957	\$142	\$96,869
39147963500	\$625,075,663	3,638	\$942	\$58,860	\$36,980	\$0	\$95,840
39147963800	\$889,458,916	3,825	\$27,089,872	\$66,190	\$24,904	\$165	\$91,259
39147963000	\$565,184,314	3,214	\$2,097,764	\$53,221	\$32,670	\$14	\$85,904
39147962500	\$718,789,951	3,724	\$34,240,370	\$54,691	\$25,746	\$202	\$80,640
Grand Total	\$11,329,882,913	55,063	\$161,581,658	\$1,033,103	\$530,511	\$1,031	\$1,564,645

Seneca County Wildfire Estimated Annual Loss								
Census Tract	Exposure (Sq. Mi)	Exposure (Buildings)	Exposure (Population)	Exposure (Agriculture)	EAL (Buildings)	EAL (Pop. Equiv)	EAL (Agriculture)	EAL (Total)
39147963100	1.0849	\$32,553,014	139	\$398,673	\$401	\$15	\$0	\$417
39147963200	0.3679	\$62,740,025	181	\$120,733	\$251	\$13	\$0	\$264
39147963700	0.3701	\$18,418,367	91	\$145,530	\$193	\$20	\$0	\$213
39147962500	2.5507	\$43,926,259	181	\$931,803	\$191	\$14	\$0	\$204
39147962600	1.9575	\$42,360,933	212	\$725,655	\$169	\$15	\$0	\$184
39147962800	0.1512	\$39,095,768	126	\$31,069	\$156	\$9	\$0	\$165
39147963000	0.0659	\$6,141,848	44	\$36,590	\$136	\$17	\$0	\$153
39147963800	1.0817	\$26,773,192	142	\$459,689	\$134	\$13	\$0	\$147
39147963600	0.3218	\$31,632,517	138	\$104,276	\$135	\$10	\$0	\$146
39147962700	1.9816	\$20,744,325	148	\$707,008	\$111	\$14	\$0	\$124
39147963300	0.2260	\$17,753,072	25	\$76,552	\$75	\$2	\$0	\$77
39147963500	0.0205	\$9,114,301	113	\$942	\$36	\$8	\$0	\$44
39147963400	0.1864	\$2,281,096	14	\$73,474	\$9	\$1	\$0	\$10
39147962900	0.0000	\$0	0	\$0	\$0	\$0	\$0	\$0
Grand Total	10.3661	\$353,534,717	1,555	\$3,811,994	\$1,999	\$150	\$1	\$2,149

Seneca County Winter Weather Estimated Annual Loss							
Census Tract	Exposure (Buildings)	Exposure (Population)	Exposure (Agriculture)	EAL (Buildings)	EAL (Pop Equiv)	EAL (Agriculture)	EAL (Total)
39147963300	\$1,081,880,805	4,055	\$3,930,879	\$39,219	\$3,604	\$10	\$42,833
39147963100	\$999,768,407	4,378	\$28,727,940	\$36,242	\$3,892	\$74	\$40,208
39147963700	\$952,935,151	4,949	\$5,864,656	\$34,544	\$4,399	\$15	\$38,958
39147963200	\$957,094,295	4,187	\$4,789,660	\$34,695	\$3,722	\$12	\$38,429
39147963400	\$936,080,188	4,253	\$5,243,390	\$33,933	\$3,780	\$14	\$37,727
39147963800	\$889,458,916	3,825	\$27,089,872	\$32,243	\$3,400	\$70	\$35,713
39147962600	\$777,765,072	3,861	\$24,468,840	\$28,194	\$3,432	\$63	\$31,689
39147962800	\$761,866,725	3,444	\$1,225,877	\$27,618	\$3,061	\$3	\$30,682
39147962500	\$718,789,951	3,724	\$34,240,370	\$26,056	\$3,310	\$88	\$29,455
39147962900	\$716,351,068	3,890	\$0	\$25,968	\$3,458	\$0	\$29,426
39147963600	\$691,785,228	4,206	\$2,303,732	\$25,077	\$3,739	\$6	\$28,822
39147962700	\$655,846,654	3,439	\$21,597,736	\$23,775	\$3,057	\$56	\$26,887
39147963500	\$625,075,663	3,638	\$942	\$22,659	\$3,234	\$0	\$25,893
39147963000	\$565,184,314	3,214	\$2,097,764	\$20,488	\$2,857	\$5	\$23,350
Grand Total	\$11,329,882,437	55,063	\$161,581,658	\$410,713	\$48,944	\$417	\$460,074

2.4 RISK ANALYSIS

To estimate disaster losses, a damage profile that considers the potential impact and loss from each hazard is developed. In this section, loss estimates from floods, earthquakes, winter storms, tornadoes, thunderstorms, windstorms, and drought are examined. While the losses from these incidents are often more of a temporary and inconvenient nature, significant disruption to business, some property damage, and loss of life is possible under extreme or unusual circumstances. This information was used to determine Seneca County's risk for each specific hazard.

2.4.1 Dam/Levee Failure Damage Profile

There are several high-hazard dams in Seneca County, and there are several lower-hazard dams. The high hazard dams are all publicly owned by municipalities. The condition of the dams ranges from satisfactory to poor, and they have some indication of threat of failure at this time. There is an emergency action plan on file with ODNR and the Seneca County EMA for all but one of these structures. The owners all work closely with the Seneca County EMA to establish notification processes and to obtain assistance if a dam were ever to fail. There are regular inspections of these facilities. All professional design and management are considered adequate, and there is no failure anticipated. The inundation zones around the dams include nice homes, small businesses, roadways and industries. The losses would reasonably be expected to include the loss of life and significant property damage if any of the high hazard dams were to fail.

There are multiple other dams located across the county. Some are reservoirs owned by villages that hold water for treatment and distribution, and there are wastewater lagoons that hold treated wastewater.

There are several other Class IV/Other dams in the county. None of these are expected to cause any damages if they were to fail except for minor damage to the owner's property. These dams appear on the ODNR dam locator but do not appear on the National Inventory of Dams. All of these dams are described thoroughly earlier in this section, and within the jurisdiction having authority sections.

2.4.2 Drought/Extreme Heat Damage Profile

Seneca County can experience slight drought and occasionally experiences periods of decreased precipitation during the agriculture-growing season. The climate is moderate and does not turn arid at any time. There is not any significant history of an extended drought that would cause casualties or property damage more significant than a reduction in crop yields for a single growing season nor is there any history of extensive crop losses in excess of a single crop year. Precipitation patterns can contribute to a series of years with higher or lower average yields due to slight dryness and late planting or harvest because of excessive rainfall.

Climate change could have a significant effect on Seneca County, especially for agriculture and the elderly or disadvantaged populations in the county. The ClimRR tool indicates temperatures could easily rise several degrees by the middle of the century, which puts elderly

and medically challenged individuals at higher risk, and makes incidents involving power loss or storm damage more serious.

The detail of those heat projections includes the number of days with a heat index that is problematic. In general, the days of higher temperatures in the summer months will likely become more plentiful, with runs of days above ninety degrees becoming longer, and periods between rain events longer as well. This will make the vulnerable even more so.

Because Seneca County has some livestock producers, including beef cattle, dairy cattle, poultry, swine and sheep, the effects of high temperatures could be devastating to those individual farms. There is limited ability to control the environment in livestock barns. Death, dehydration, and illness will be far more prevalent when temperatures soar for longer periods of time and to higher levels. If increasing temperatures are combined with less rainfall, or even longer periods of time during episodes of rainfall, the limited availability of water for animals will be difficult for farmers to manage. Most livestock water is provided by wells; if wells become dry, alternate sources of water will be through commercial providers. Livestock require hydration; the absence of adequate hydration negatively impacts growth, milk production, reproduction, and the health of the animals. The negative economic impact will be significant.

Farm crop production may be negatively impacted by higher temperatures and changes in rainfall. If rain is scant after planting or during pollination seasons, germination and maturation will not occur. If rain is extremely light or heavy, yields will be negatively impacted. If rain is excessive during either planting or harvest season, the crops cannot get planted, they don't grow when they wash away, weeds grow profusely in wet, soggy ground, and plant disease thrives on very dry or very wet conditions.

Farmsteads, as well as some rural homes, depend upon wells for water in many cases. As rainfall becomes inconsistent, wells dry up or cisterns overflow. For those water systems that pull from the ground water supply or local waterway, less rainfall up the entire watershed would result in less available water for treatment and distribution. While the average rainfall may not change much, the way in which it falls and the spread of amounts over the year will have a huge impact on household use of water. Should high temperatures occur, many rural homes are not air conditioned, and farmers who work outside don't have the ability to control an outdoors environment. The power grid would be stressed to handle such temperatures and heat index levels. Those who live with economic difficulties could find themselves unable to afford electricity at these levels. Older county residents with medical conditions may suffer due to these circumstances. Underserved and disadvantaged people may suffer more because they have so few resources, and may eventually migrate to the cities for environmental amenities. The cascading economic downturn for the county could be damaging to all county residents and businesses.

In a rural county with open fields and some wooded area, grain crops, and homesteads, fire could become an issue. If water is not generously available to fight fires, the spread of field

fires across hundreds of acres in the hot, dry summer weather could be significant. Not only would those losses affect agriculture, but also would endanger the many small businesses, villages, residences and schools built out in the rural areas of Seneca County. The ClimRR wildfire projections support this prediction. Chances of field fires is already relatively high; the fire weather index will increase by mid-century.

For the purpose of loss estimates, only the major cash grain crops were considered because those crops constitute the majority of production in Seneca County. Production livestock can be sold in spite of drought; other cash crops such as cucumbers, tomatoes, and vegetables are heavily insured. While many farmers purchase crop insurance for all crops, including grain, data does not exist to determine the percentage of crops that are insured in Seneca County.

2.4.3 Earthquake Damage Profile

Earthquakes are geologically possible but very rare in Seneca County. The county has not directly experienced any earthquakes in the past. Several have occurred in the greater western Ohio region although they have all been very minor and have caused no known damage. As such, there is little data to support committing resources to earthquake-proofing structures.

Examination of the loss projections indicated that most damage would affect wood and unreinforced masonry structures, and a great majority of those would be residential or agricultural buildings. Single family homes would be more affected than other residential buildings. Of critical facilities, schools would experience most of the damage with a couple police stations. The county EOC is at risk of damage. Not much infrastructure is expected to be damaged except a couple bridges, and many electrical and water lines. Electrical lines would take the longest to repair and replace with no service to 1% of the homes at one month out.

Because of the low risk and high cost of implementing mitigation strategies related to earthquake risk, the planning team did not identify aggressive actions. As they arrived at this decision, they considered earthquake damage projections in Table 2-52.

2.4.4 Flood Damage Profile

Seneca County is vulnerable to minor to moderate flood damage, mostly from flash flooding. The areas most likely to sustain flood damage are those adjacent or in close proximity to waterways, including some low-lying roadways and areas close to storm sewers that may be undersized or inadequate to handle runoff from heavy precipitation events. Areas along the Sandusky River and major creeks across the county are prone to flooding. The river is wide and deep in some spots, but most flooding occurs along the and other waterways, especially in low lying areas.

In Seneca County, damaging flooding is generally preceded by several days of heavy precipitation, and perhaps exacerbated by sudden melting of snow and ice or over-saturation of the soils prior to the start of rainfall because they do sit at the relative top of the watersheds. If water is unable to drain away as fast as it comes due to frozen soils or saturation, flash flooding occurs in the streets, roadways, and some low-lying properties. Most residential

damage is limited to flooded basements and access issues in general. There are several repetitive loss properties in the county known to emergency managers.

Some residents feel that the rainfall is more intense and more frequent than it used to be. There is also concern that field fodder and debris from fallen trees, which has increased in the aftermath of the Emerald Ash Borer infestation, washes into storm drains and clogs the storm sewers in some of the villages and developed portions of townships where they have storm sewers. There is a general opinion that when culverts and bridges are replaced, the new structures should be larger and have greater capacity. Whatever the cause, flash flooding and the storm sewer capacity is more challenged than in the past, and this makes flash flooding more serious even though it is still a temporary condition.

Flood damage in Seneca County can include damage and destruction of physical buildings, infrastructure, crops, and livestock. With livestock in the county, pastured animals could easily be trapped away from food and shelter, causing a serious threat to their well-being. Residential structural damages could include damage to single- and multi-family homes, as well as mobile homes. Mobile homes are of particular concern to local officials. 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 for livestock, equipment storage, and commodity storage, as well as the contents of those buildings, which constitute business assets such as production animals, equipment, and machinery. The force of water could damage grain bins, transfer legs, and elevator systems very easily. Government, nonprofit, and educational institutions include critical structures like fire stations, police stations, hospitals, offices, schools, and special facilities like garages and maintenance buildings, and the capital contents of those structures.

Actual structural damage could include flooding in residential basements and ground floors, compromise of the foundations and utility systems, and destruction of the contents of those structures. People are at risk from floodwater because household and industrial chemicals substances can contaminate floodwater and result in hazardous chemical exposure for rescuers, responders, and victims. Livestock could be significantly threatened by contaminated flood water and have no way to escape or the ability to protect themselves. This damage would result in large amounts of debris to manage, including finish, structural, and foundation materials and animal carcasses and waste.

Roads can flood for short periods of time in Seneca County, potentially closing businesses and institutions and crippling commerce for short periods of time. This period of business shutdown generally is confined to the floodplain and flash flooding areas and lasts for only a day or two once the rain stops.

Within the county's villages, some areas exist where storm sewers are of insufficient size and capacity to handle rapid and heavy downfall. Depending on exactly where precipitation is heaviest, if the ground is frozen, saturated, or dry, and how full waterways are at the time of

the event, significant flooding can occur on roads, streets, bridges, and neighborhoods. These flood-prone areas are not highly populated with residential or commercial structures but significant inconvenience can result when businesses close, access is cut off, and drainage systems are overwhelmed. Stored farm chemicals are at risk of being absorbed into the floodwaters, distributed over flooded areas, or damaged and depositing hazardous runoff in floodwater. In some areas, livestock in pastures may be at risk, depending on which waterways flood, and can become stranded or being injured before the floodwater recedes. Agricultural land that is heavily tiled drains quickly, facilitating rapid and significant amounts of runoff in ditches, streams, and rivers. This contributes to downstream flooding as the waterways attempt to drain the county.

Countywide flooding in Seneca County would occur only under the most severe of circumstances. As the county has very logical floodplain area along the major waterways, the rainfall would have to come in catastrophic amounts to flood the entire county, and extenuating circumstances like rapid ice thaw amid heavy rainfall and snowmelt would be necessary. Specifically, a multiple-day heavy rain event of more than 10 inches is suspected to be capable of widespread flooding, especially if it comes early in the spring and is combined with snowmelt and ice melting.

It is unlikely that loss of life would be attributable primarily due to flooding. If fatalities did occur, it would likely be the result of two or more combined threats, including lightning, tornado, or driving into standing water. If any of the high-hazard upground reservoirs were to overtop and break due to catastrophic rainfall, there could be loss of life within that inundation zone. Power would likely be affected, but outages in most of the county would probably be short-lived and temporary.

The NRI flood exposure numbers indicate values due only to riverine flooding, but this vulnerability assessment narrative included not only riverine flooding, but also flash, surface and areal flooding. Local stakeholders felt that riverine flooding happens rarely, but the various types of pluvial flooding are far more common and frequent. With the recent downbursts and rain bombs attributed to climate change, they felt pluvial flooding was worthy of full assessment.

2.4.5 Severe Thunderstorm Damage Profile

Thunderstorms are relatively frequent but not severe in Seneca County. During summers when heat builds up in the afternoon, a muggy and hot day can easily end with thunderstorms that include hail, lightning and heavy rain, and/or wind. Microbursts often add strong straight-line winds that destroy standing crops ready for harvest. There has seemed to be an increase in night-time storms the past couple years, bringing heavy rain overnight. These storms can develop quickly, provide little advance warning to residents, and cause significant destruction and disruption.

Thunderstorms that include hail are generally spotty and inconsistent. The fluctuating temperatures in the atmosphere necessary for hail to form do not occur frequently in western Ohio. When hail falls, damage most frequently occurs to vehicles, roofs, and siding on

buildings, and depending upon the season and growth stage at the time, farm crops. Rarely is there a loss of life or significant bodily injury. Thunderstorm winds can damage standing crops and are most damaging when wheat, soybeans, and corn are ready for harvest. Wheat is harvested in July, but soybeans and corn are not harvested until early fall. Corn is frequently at the pollination stage in July; at any point after stalks mature, hail and wind can shred and tear the leaves, flatten the stalks, and destroy the ears that are in the formative stages. This situation drops crop production to drastically low levels, causing an extreme loss to farmers for that year's crop.

Thunderstorms are a frequent but low risk hazard in Seneca County. The combination of hail, lightning, precipitation, and wind caused by thunderstorms can inflict damage in any area of the county. Thunderstorms are somewhat common but are typically minor and cause more inconvenience than actual damage. Lightning that directly strikes structures or objects is possible but infrequent. Moderate to severe damage from hail, lightning, and thunderstorm wind, including loss of life and property, is possible but statistics indicate the frequency is extremely low.

When severe thunderstorms are accompanied by tornadoes, damage from the tornadoes is likely to be more significant than that caused by the thunderstorm. Straight-line winds, the result of downbursts and microbursts, can be as destructive as tornado and cause damages similar to those described in the tornado EF scale.

The NRI does not specifically list exposures for severe thunderstorms. It lists hail, lightning, and strong wind, all three of which are components of a strong thunderstorm. Therefore, they must be considered and added together to project an accurate estimation of loss.

2.4.6 Tornado Damage Profile

Seneca County is universally vulnerable to tornado damage. The county has generally flat terrain with little change in elevation that would cause a tornado to slow down or break apart. Although tornado warnings are issued several times each year, tornadoes do not occur frequently in the county. They are most common in the spring although they can develop throughout the summer and fall, and most recently in Ohio, during nighttime hours. Historically, the magnitude of tornadoes in Seneca County is between EF-0 and EF-1 with over eighty percent of the incidents on record involving an EF-0 or EF-1 tornado.

Seneca County does have several hundred mobile homes throughout the county. Most are lived in year-round. These structures are more vulnerable to wind damage because they are less secured to the ground than buildings with foundations, have no basement or sub-terrain level, and are lighter weight and made of less wind resistant material than traditionally constructed homes.

The majority of residential structures in the county are constructed from wood, concrete, brick, and stone. Many homes are older and were constructed using limestone and other masonry materials; these homes are built on traditional foundations with basements or crawl spaces.

Some newer homes are concrete slab construction without basements or crawl spaces. These homes are most prone to superficial damage, roof damage, and falling trees during tornadoes and severe windstorms.

Many farms have outbuildings that house business assets, including equipment, supplies and goods, and livestock. These buildings may be traditional stick-built wooden structures with tresses and heavy beams, or may be newer pole buildings with varying steel structure. Many of the newer buildings are large, single-story structures and are therefore very vulnerable to wind and tornado. Some of these buildings house livestock rather than equipment. Grain systems with steel bins, concrete block walls, and metal conveyor systems with multiple legs are found on large grain farms. These bins often contain very significant quantities of grain, with values in future delivery or as a commodity yet-to-sell.

Commercial buildings are constructed of concrete, brick, concrete block, stone, and wood. These structures are generally built on concrete slabs with structural support trusses and pitched roof construction to facilitate snow and ice melt and runoff. Flat roof buildings, such as shopping centers and big-box type retail stores, are susceptible to heavy snow in blizzard conditions; there is no identifiable history of roof collapse incidents due to snow or ice.

Property damage from tornadoes in Seneca County most frequently includes damaged roofs, gutters, downspouts, trees, and, occasionally, an entire building. Mobile homes are damaged or destroyed in the most serious incidents. Outbuildings, barns, and storage buildings can be damaged because these structures are less resistant to wind damage and are frequently built on concrete slabs or dirt foundations.

2.4.7 Wind Storm Damage Profile

Wind incidents are somewhat frequent across Ohio, including in Seneca County. The county has experienced some high wind events in recent years. While not as damaging in Seneca County as they have been in others, these events typically damage trees, which lead to obstructed roadways and downed power lines. Crop damage and destruction is also a concern. When high winds damage young and maturing crops, yields can be significantly reduced, which negatively impacts the county's economy. Structural damage to roofs, downspouts, and siding is not uncommon.

2.4.8 Winter Storm Damage Profile

Winter storm damages can potentially affect homes, businesses, and properties across Seneca County. No singular area is more or less vulnerable to snowfall or winter weather conditions than another. The flat terrain provides little landscape to interrupt or redirect precipitation. The consistent elevations allow drifting and blowing snow to create low visibility conditions on roadways across the county. Livestock operations in the county are particularly vulnerable to blizzards, ice, snow, and other winter weather hazards. Even in adverse weather conditions, the animals must be fed, cows must be milked, manure must be removed from barns, and operations must continue. This requires daily ingress and egress to these farms, bringing in

food and supplies, and hauling out raw product and waste. Winter storms threaten and restrict access to these properties, making winter weather a concern for this part of the economy.

Power outages can occur anywhere in the county during blizzards or snow storms that include significant ice, wind, or heavy amounts of snow. Residential electric lines are mostly above ground and vulnerable to wind and ice, although the power companies have improved the distribution systems in recent years. Few residential properties have buried electric lines. Major supply lines are above ground as they enter Seneca County from the generation plants; therefore, power to the substations is vulnerable to wind and heavy snow and ice even if the residential lines are not. Power outages are probable, frequent, and can be widespread. Farms with livestock operations are much more vulnerable to significant loss; the feeding systems, milking and collection systems, and other critical operations are all based upon an electrical supply to run mechanized equipment. Without electricity, animals are not fed, eggs are not collected, and dairy cows are not milked. Product goes to waste, animals get sick, and farms lose a lot of income.

The loss estimates for winter storms are relatively low in spite of the recent and memorable winter seasons. There is no identifiable history of property loss due to snow pack, ice, or other winter storm-related causes. Reasonably anticipated losses from winter storms would include content loss such as food and perishables due to power interruptions. Losses in anything but an unusual, unpredictable incident would not include structures or infrastructure.

2.4.9 Countywide Risk Analysis

Based on the available hazard and vulnerability information, Seneca County has risk for damage from a variety of disasters. To determine the county's overall level of risk, each hazard was evaluated and scored based on common criteria. The criteria included frequency, response duration, speed of onset, magnitude, and impact on businesses, people, and property. Table 2-70 describes the overall scale used to score each hazard. Table 2-71 provides details on the scale used to measure magnitude. The composite scores for each hazard and their respective rank are identified in table 2-72.

Table 2-54: Assessment Scale

Score	Frequency	Response Duration	Speed of Onset	Magnitude	Business Impact	Human Impact	Property Impact
1	None	< ½ Day	> 24 Hours	Localized	< 24 Hours	Minimum	< 10%
2	Low	< 1 Day	12-24 Hours	Limited	1 Week	Low	10-25%
3	Medium	< 1 Week	6-12 Hours	Critical	2 Weeks	Medium	25-50%
4	High	< 1 Month	< 6 Hours	Catastrophic	> 30 Days	High	> 50%
5	Excessive	> 1 Month					

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 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 warning a community has before impact occurs.

- 1 = More than 24 hours
- 2 = 12-24 hours
- 3 = 6-12 hours
- 4 = Less than 6 hours

Magnitude

Magnitude is rated using standard damage scales such as the Enhanced Fujita Scale, or through development of a local comparative scale that is comparable in damages at like levels using the established damage scales. Some scales from other geographic regions, such as the North East Snow Index Scale, were used as models to develop a comparative tool for local use.

Table 2-55: Magnitude Scale

Score	Tornado	Windstorm	Flood	Earthquake	Drought	Winter Storm
1	EF-0/1	<65 mph	Minor	<5.9	D-0 Very Dry D-1 Moderate	<8" snow
2	EF-2	65-75 mph	Moderate	6.0-6.9	D-2 Severe	8-12" snow
3	EF-3	76-85 mph	Significant	7.0-7.9	D-3 Extreme	12-16" snow
4	EF-4/5	>86 mph	Major	>8.0	D-4 Exceptional	>16" snow

Business Impact

Business impact refers to the economic impact a hazard event is likely to have on a community. The definition references the amount of time facilities are likely to be closed.

- 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 percentage of parcels potentially affected in a given event.

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

The factors identified above 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.

Each community evaluated their hazards and risks the same way, and results were developed and confirmed for each municipality. Some communities did not include all hazards. Those results are shown in each municipality section; those below are for the whole county.

Table 2-56: Comprehensive Countywide Risk Analysis

Hazard	Frequency	Response Duration	Speed of Onset	Magnitude	Business Impact	Human Impact	Property Impact	Score	Rank
Tornado	4	4	4	3	2	2	3	22	1
Infrastructure Failure	4	4	2	4	3	2	2	21	2
Severe Thunderstorm	5	4	4	2	1	2	2	20	3
Flood	2	4	3	2	2	1	3	17	4
Water Quality	2	3	1	2	3	3	2	16	5
Hazardous Materials Incident	2	3	3	2	2	1	2	15	6
Winter Storm	3	3	2	2	2	1	1	14	7
Dam/Levee Failure	1	4	2	1	1	3	1	13	8
Land Subsidence	1	3	2	1	2	1	2	12	9
Drought/Extreme Heat	1	2	1	1	2	2	2	11	10
Invasive Species	2	2	1	1	1	1	2	10	11
Earthquake	1	1	3	1	1	1	1	9	12