2.0 HAZARD IDENTIFICATION AND RISK ASSESSMENT

Wood County has experienced many disasters in the past century, ranging from natural storms including tornadoes to blizzards and technical or human-caused incidents. The purpose of the Hazard Identification and Risk Assessment (HIRA) is to identify the number and frequency of disasters in Wood County and the resulting risk to people, property, and structures from those hazards. This process allows officials and residents to better prepare for incidents when they occur. The first section of the HIRA, the County Profile, provides information about Wood County and its jurisdictions. In the Hazard Identification section, each hazard that poses a threat to the county will be discussed in detail. The final two sections, Vulnerability Analysis and Risk Assessment, will explain the risks and vulnerabilities Wood County must address to prepare for and mitigate the identified hazards.

This plan section will identify and describe specific hazards for the municipalities in the county, describe the specific vulnerabilities in each, and address the 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. Wood County's ability to manage all seven community lifelines will be examined and gap areas will be described, including where and how the county would compensate for and backfill those needs. Various tools have been used to address social vulnerability and community resilience, factors that will provide the foundation for mitigation strategies formulated to meet the unique and individualized needs of Wood County's diverse communities. With both sparsely and densely population areas, Wood County is may or may not receive significant outside assistance in a widespread disaster, and therefore, the stakeholders have diligently worked to identify gaps in local 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.

To meet the requirements in 2023 for additional social vulnerability and community resilience information, sections have been added to address those issues. The demographics now include additional 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 Wood County and the new residents who have come for jobs, small city life, or other considerations. Discussions have occurred to examine and analyze 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. Wood County officials recognize the likelihood of receiving measurable state and federal resources in a widespread incident is undetermined; 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 of discussion included the identification of ways to ensure every person in Wood 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 some populations 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 climate change have been discussed and deliberated. Wood County is near Toledo and the development that surrounds a large city, and is, in fact, part of that urban sprawl in the northern half of the county. At the same time, there is some of the richest and most productive farmland in the Maumee River watershed, combining farm and city life into one large county. Because in Wood County's small southern communities, people all tend to know one another and take their neighbor in when disaster strikes, resources are very different than in the northern, more metropolitan communities. Small towns of less than a thousand residents have few resources and structures. Needs after a severe storm may be addressed differently, and perhaps anecdotally, in these communities because they may not have access to fully certified shelters, commercially provided food supplies, and personnel in sufficient numbers to meet post-disaster needs for help. In many ways, these Wood County residents may have to help themselves. However, in the northern cities, where urban growth is significant and resources improve every day, there are full time first responders, plentiful social agencies and gathering locations, and services to help them respond and recover. Changes in storm characteristics and other natural phenomenon are noted, and discussions included these potential effects of climate change that may make the hazards strike harder and last longer regardless of the portion of Wood County that is affected.

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 Hardin 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 Hardin County can survive and recover from a disaster successfully and become as whole as possible after the incident.

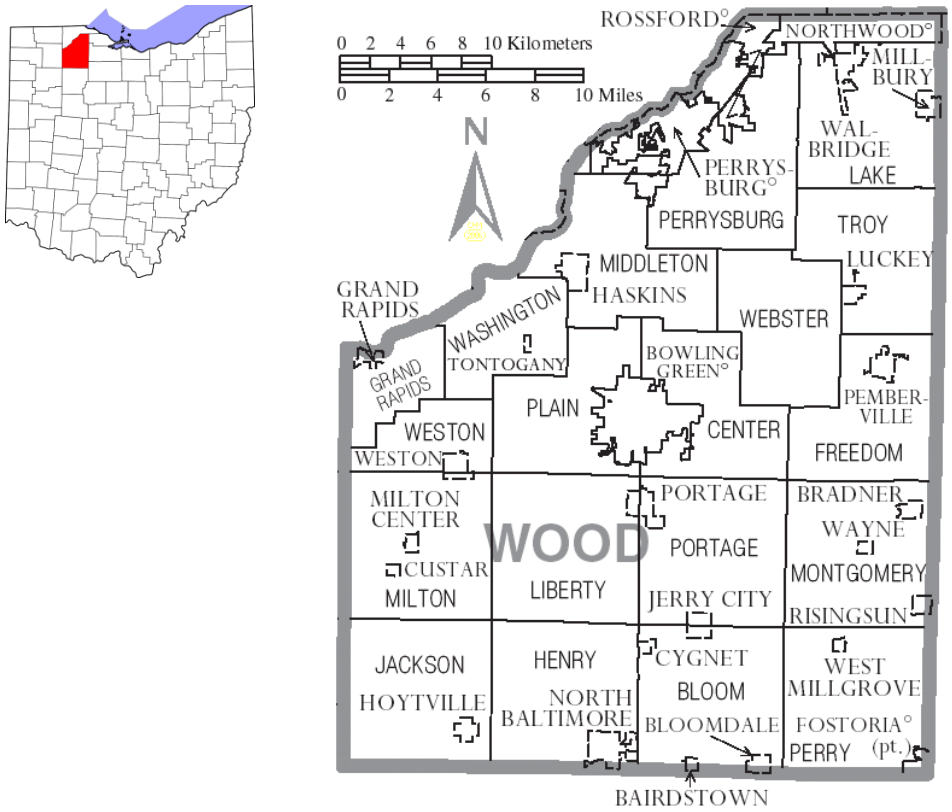
The Hazard Identification and Risk Assessment (HIRA) identifies the type and frequency of disasters that affect Wood County and the risk to people and property created by those hazards. The HIRA is addressed in four sections:

- County Profile – provides general information on Wood County and its jurisdictions.
- Hazard Identification– describes hazards that threaten Wood County and provides a brief history of significant past occurrences of each identified hazard. This also includes the identification of social hazards related to disaster impact upon people and climate change implications for each applicable hazard.
- Vulnerability Assessment – discusses each jurisdiction's vulnerability to specific hazards including the change in hazard impact when considering social factors and climate change. It addresses vulnerability when multiple hazards combine or when widespread effects are felt across the county.
- Risk Analysis – evaluates and ranks the hazards Wood County must address through mitigation efforts.

2.1 COUNTY PROFILE

Wood County is located in northwest Ohio. At 617.2 square miles, it is one of the larger counties in Ohio in terms of land area. The population of 132,248 resides in the county's four cities, twenty-one villages, and nineteen townships according to the 2020 US Census data. Lucas, Ottawa, Sandusky, Seneca, Hancock, Putnam, and Henry counties are all adjacent to Wood County. The closest major city is Toledo, located just north of the Wood-Lucas County border.

Map 2-1: Wood County Map



2.1.1 Demographics

Wood County's population is 131,592 according to 2022 US Census population estimates. The county's population increased significantly between 1970 and 1990, growing by nearly 25% in that timeframe. Population growth has seen moderate growth since 2000, a trend that is expected to continue for the next several decades.

Table 2-1: County Population Statistics

Statistic	Figure
Population Density	214.3/sq. mile
Female Population	50.4%
Male Population	49.6%
Median Age	34.8 years

Population under 18	20.1%
Population over 65	16.6%
White	92.5%
Black or African American	2.9%
Hispanic or Latino	6.3%
Average Household Size	2.37 persons
Median Household Income	$66,337
Persons in Poverty	10.9%

Wood County has 56,863 housing units. The owner-occupation rate is 64.2%; the median value of owner-occupied units is $177,000. Multi-unit housing structures such as apartment buildings account for 25% of all housing units. There are approximately 3,953 mobile homes across the county. The median gross rent for all types of rental properties is $845 per month while the median cost for homes with mortgages is $1,437 per month. There are 53,010 households in Wood County, with 18,970 being rental units and 3,127 mobile homes. Of all households, 89.7% have broadband internet and 95.2% have a computer. 11.82% do not have a smartphone. Persons without a religious affiliation stands at 46.85%.

Several special residential housing facilities, such as nursing homes and assisted living facilities, exist across the county. As of 2023, according to the Ohio Department of Health, the types of facilities and statistics for each type are as follows:

Table 2-2: Special Residential Facilities

Facility	Facilities	Beds
Nursing Home Facilities	10	746
Residential Care Facilities	7	838
Hospice Facilities	2	25

2.1.3 Special Populations, Underserved Populations, and Social Considerations

Wood County is one of Ohio's largest counties geographically. It is also one of the counties that combines small city life with rural life, has areas of high ethnic and cultural diversity, is home to many populations with special characteristics, and experiences a full spectrum of socio-economic diversity.

Like many other rural communities, Wood County finds itself in the midst of an aging population, especially in the more rural areas. The average age of farmers is over 55 years, and many are over 65 years old. Statistics show the elderly population at 15.2% of the population. Their children have chosen alternate professions and frequently have not continued to reside in Wood County. This leaves an elderly population with diminishing capability to perform the physical jobs associated with home or farmstead ownership, more medical needs and sometimes dependence upon medical equipment and multiple treatment plans to care for themselves without the benefit of daily assistance. It leaves farmland without a younger generation to assume the operations, and land must be sold, leased to other farmers, or sold

for urban development. Non-farm elderly find themselves unable to maintain their homes, drive in the often-extreme weather conditions, and carry on with adequate social activities or church participation like they have in the past. This leads to isolation, depression, and financial difficulties. As elderly begin to experience health crises, there is an increasing demand on emergency medical personnel and public safety forces to help them. Demand for long-term care rises, but only for those who can afford the cost of nursing homes and assisted living. Wood County experiences all of this. The bottom line is that they have a larger elderly population than ever, and those people need more help than they ever did in the past.

The elderly population are less able to use modern technology, and less likely to rely upon internet or wireless notifications for threat warnings. They are less reactive to protective action orders, and less likely to be able to transport themselves to a shelter in inclement weather. They are more vulnerable to environmental extremes, and they are more dependent upon utilities, especially electricity. They tend to have more complex and more numerous health conditions and disabilities.

As a county, there is a wide variety of medical care available. This allows people with many complex medical needs to live close by providers. Wood County has a high number of people who have multiple or serious underlying medical conditions that make them dependent upon medical equipment at home, and thus dependent upon power and other services. Statistics show 12% of the population is disabled, and according to the 2020 US Census, 8.8% of the disabled are under age 65. It also shows 4.3% of the population is without health insurance, many of whom may be the ones who need it most.

Populations with medical needs require special transportation at times, and frequently require caregivers and special shelters with medical capacity. They require mobility assistance and sometimes sensory perception assistance.

Wood County has 10.9% of its residents living in poverty according to the census data. Northwood and Bowling Green both have a population in poverty higher than the overall county percentage. Perrysburg, Northwood and Rossford have disability rates almost twice the county's overall percentage. However, for every veteran living in one of the four cities, two live elsewhere in Wood County. The highest percentages of ethnic diversity are in Perrysburg and Bowling Green.

Economically disadvantaged populations tend to be underserved and unrecognized. Their needs are often undefined, and they are not always open with others about their situation. They have few resources in reserve for recovery from a disaster, and most of the time live without planning ahead. They tend to be underinsured or uninsured, both from a property perspective and with health insurance. They often cannot afford the benefit of assistance devices, be that a hearing aid or eyeglasses, or a wheelchair for mobility. Homeless rates are high in this group, and often not in the traditional sense, but in the context of a life led through "couch surfing". Veterans often have medical needs, both physical and behavioral, that go unmet due to a lack of resources or a lack of timely services. They are especially vulnerable to

isolation. All of these groups of people are numerous, but can be hidden in plain sight within the community. Finding them is the first problem; serving them is the second.

The highest numbers of mobile homes, manufactured homes, and homes without basements are in the northeast quadrant of the county, which is also part of the most densely populated part of the county. Over one-third of the homes in Wood County are rental property that tends to be less cared for and underinsured, as well as less likely to be repaired after storm damage.

Some of the social difficulty in serving residents of Wood County has to do with the size of the county and the distance people live from social services. Over a dozen communities sit in the southern part of the county, south of US 6, several miles from another community. Most of them are without grocery stores and gas stations, and very few of them have any kind of medical services. Some have no building to be used as a shelter, and many of them have lots of properties that are by nature very susceptible to storm damage.

Providing the basics of village services is a challenge for many of them, let alone providing additional services after a disaster. To worsen the situation, there are only two of the villages (North Baltimore and Walbridge) that have over 2,000 residents; most others have less than 1,000 residents. Moving resources to serve a very small set of people is often very difficult to accomplish. Therefore, the southern half of Wood County is very difficult to serve.

The current challenges in having adequate numbers of trained personnel to staff volunteer fire and emergency medical services department makes this whole situation worse. These particular villages are far enough from the full-time paid departments that standard mutual aid is not a viable solution.

2.1.4 Risk Assessment Research Findings

Numerous online tools are in place to assist counties in the identification and characterization of hazards, and the community factors that make certain parts of the population more susceptible to injury or damage, or less likely to recover quickly. Generally, these tools all use the 2020 US Census to identify groups of people or characteristics of the population that make them especially vulnerable to the effects of disasters and widespread emergencies. The tools that were used to help Wood County assess its risks are listed and described in the following narrative.

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 can be created for Wood County, Ohio. 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 classifies Wood County as *relatively low risk*, in a general sense. Social vulnerability is rated as *very low*, and community resilience is *very high* according to this tool. This report states that "81.0% of counties in Ohio have a lower Risk Index".

According to this tool, Wood County relative hazard risk and expected annual loss ranking, as well as total exposure values are listed in the following table. The full report is attached as Appendix 2 NRI Wood County Report.

Table 2-3: NRI Hazard types, expected annual loss and exposure values

Hazard	Expected Annual Loss Rating	NRI Score	Total Exposure Value	Annualized Frequency	Expected Annual Loss
Cold wave	Relatively Low	53.9	$1,567,863,724,879	0.7/year	$65,682
Drought	No Expected Loss	0.0	n/a	0/year	$0
Earthquake	Relatively Low	73.3	$1,568,446,577,000	0.048% chance/year	$567,226
Hail	Relatively Moderate	82.4	$1,567,863,932,498	3.5/year	$521,343
Heat Wave	Relatively Low	68.9	$1,567,863,724,879	0.7/year	$212,273
Hurricane	Very Low	47.3	$1,553,674,823,728	0/year	$161,988
Ice Storm	Relatively Moderate	79.1	$1,567,277,535,392	1.3/year	$235,365
Landslide	Relatively Low	34.0	$66,014,986,753	0/year	$21,900
Lightning	Relatively Low	57.1	$1,567,681,308,616	56.8/year	$109,630
Riverine Flooding	Relatively Low	55.1	$26,174,413,767	1.3/year	$502,131
Strong Wind	Relatively High	89.5	$1,567,863,932,498	3.6/year	$1,495,665
Tornado	Relatively Moderate	90.0	$1,567,863,932,498	0.3/year	$6,167,364
Wildfire	Very Low	42.5	$251,789,096,310	0.001% chance/year	$24,068
Winter Weather	Relatively Moderate	76.1	$1,567,863,724,879	2.2/year	$144,701

Social vulnerability, the vulnerability of people rather than structures and property, is rated at 28.40; that means Wood County has a very low susceptibility to adverse impacts of disasters when compared to other areas in the United States. Only about 18% of the entire country has lower social vulnerability. In Ohio, only 28.4%% of the other 88 counties has lower social vulnerability.

Social vulnerability measures the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss or disruption of livelihood, according to the NRI narratives. Bowling Green experiences more social vulnerability and more cultural and ethnic diversity than other areas in the county, possibly due to international educational facilities within the city.

Wood County is rated as "very high" in community resilience. Compared to other counties across the United States, Hardin County is more resilient than approximately 95.67% of other counties, with only 4% being more resilient than Wood County. In Ohio, only 15% of other counties have a higher resilience rating, making Wood County one of the most resilient areas in Ohio. Nationally, Wood County is more resilient than 85.2% of other counties.

Community resilience measures, according to the NRI narrative, a community's ability to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions.

Resilience is based upon variables that include human social and cultural values like education levels, transportation access, disabilities, and health factors; economic issues like home ownership, livelihoods, income inequality, and institutional restoration potential; infrastructure and structural conditions, medical care availability, and access to internet; institutional access and governance capability; and environmental conditions.

Both social vulnerability and community resilience are measures using data published by the University of South Carolina's Hazards and Vulnerability Research Institute.

The Climate Explorer

The open access online tool provides climate projections under two separate assumptions. First, the assumption is made that efforts to reduce global emissions are robust, and the other where emissions continually increase throughout the 21st century. Respectively, these are referred to a RCP4.5 and RCP8.5.

This tool projects the following climatological conditions for Wood County, OH, USA by then end of this century:

Table 2-4: Climate Change Projections

Temperature	Annual	Spring	Summer	Fall	Winter
AVG. DAILY MAX TEMP					
1961-1990 Observed	59.9	59.6	84.4	63.7	32.1
2090 RCP4.5	66.3	66.7	92.2	70.6	36.9
2090 RCP8.5	71.0	69.0	98.0	74.0	43.0
PRECIPITATION					
1961-1990 Observed	33.4	3.29	3.51	2.41	2.02
2090 RCP4.5	36.4	3.64	3.26	2.75	2.48
2090 RCP8.5	28.0	5.00	4.00	3.00	3.00

Climate and Economic Justice Screening Tool (CEJST)

This open, online geospatial mapping tool for all communities in the United States assesses the status of disadvantaged communities by measuring marginalized, underserved, and overburdened conditions in relation to the ability to withstand the effects of climate change and to promote environmental justice. This program foundation is rooted in Executive Order 14008, signed by President Biden in January 2021.

Justice40 Initiatives consider climate change, clean energy, energy efficiency, clean transit, affordable and sustainable housing, training and workforce development, remediation and reduction of legacy pollution, and the development of critical clean water and wastewater infrastructure. Those communities that fall above the 90th percentile will receive, collectively, 40% of the programs associated with this initiative. Those programs include the Inflation Reduction Act, the Bipartisan Infrastructure Law, and the American Rescue Plan, among others as created and enacted. Programs include some of those from the Department of Homeland Security and FEMA, Department of Health and Human Services, the Environmental Protection Agency, and others.

Wood County is not considered a community at risk, as assessed by this tool, but the eastern side of Bowling Green that includes the university, and an area near West Millgrove are considered disadvantaged.

The area west of I-75, north of Wooster Street, south of Poe Road and east of Manville Avenue defines this area. Due to high energy and housing costs, low median incomes, high poverty, high unemployment, and low education levels, this area is one of concern.

To the southeast, an area bounded by SR 23 on the east, Emerson Road on the west, Jerry City Road on the north and Township Road 85 on the south is considered disadvantaged. This are, according to this tool, has a lock of green space, wastewater contamination of streams and waterways, and low income.

The tracts are generally described, and this assessment tool is available at this web address: https://screeningtool.geoplatform.gov/en/#11.89/40.66171/-83.61542. Findings in this plan were accessed on October 11, 2023.

Neighborhoods at Risk by Headwaters Economics

This social assessment tool is developed by Headwaters Economics Research, an independent, nonpartisan, nonprofit research group that works to improve community development and land management, and is commonly used to assess community challenges and strengths. Their data is found at http://www.headwaterseconomics.org/apps/neighborhoods-at-risk.

Headwaters Economics research findings indicate that Wood County has slightly less than the national average very young (< years) and very old (>65 years). There is a far lower proportion of the population made up of people of color, and language barriers are nearly non-existent. Households with no car amount to 4.4% of the county's units, and those with no health

insurance are almost the same number. However, 12% are people with disabilities, almost equal to the national average. Fewer families live in poverty in Wood County than across the country, and education levels are higher than national averages. However, the leading social issues for Wood County still are elderly living alone, single females with children living in poverty, people with disabilities, a lack of transportation options, and those with no health insurance.

The Climate Projections portion of Headwaters Economic research can identify changes in weather patterns that are in process or indicated from scientific data. For example, this research indicates that by 2048, Wood County will be warmer. Approximately 20 days more per year will reach 90 degrees Fahrenheit, 12 more days per year will see temperatures above 95 degrees Fahrenheit, and 100 degrees Fahrenheit will be reached 5 more times a year. The average annual temperature may increase from 53 degrees Fahrenheit to 55 degrees. These hot days will contribute to heat-associated injury and death, and chronic higher temperatures will facilitate drought conditions, more severe field fire probability, and warmer water temperatures in large bodies of water. The increased heat will also cause increased power usage for air conditioning, and will make the lack of tree canopy more noticeable and detrimental. Water shortages would be more critical in higher temperatures as drought would be more impactful with damage to crops and vegetation, and field fires would occur at a higher rate. Projections further into the future continue on the same trendline, with temperatures rising and precipitation increasing as time goes on.

Wood County is anticipated to have 0.4 more days per year of heavy precipitation, taking that anticipated number from 2.9 days to 3.2 days. Average annual precipitation is expected to increase from 35.3 inches to 36.0 inches by 2048. Faster, heavier rain leads to more riverine and flash flooding because the ground cannot absorb that much rain. The chances of sustained flooding are higher when general flooding incidents increase as events compound one another, or don't allow for complete drainage in between events. Areal flooding of fields in Wood County would have a detrimental effect on farm production, diminishing yields and agricultural economic conditions.

This research is one source that when combined with others, can give reliable projections for local communities to develop disaster expectations for future years.

Resilience Analysis and Planning Tool (RAPT)

This open-source online tool is another place to find relevant community data. It provides community date, infrastructure information, natural hazards, county indicators, census tract information, and options to map incidents to discover important characteristics to support response and recovery efforts. Some of the information is available in many other locations, but RAPT allows the users to find it in one easy-to-use location.

Wood County can use this tool to manage a response, likely enhancing capabilities in a more expedient manner because they can discover factual information that will help with methodology of a response mechanism.

Wood County has no Community Disaster Resilience zones.

Climate Risk and Resilience Portal (ClimRR)

This portal, developed by the Center for Climate Resilience and Decision Science at Argonne National Laboratory, in collaboration with AT&T and FEMA, helps address the specific changes that will be experienced as the climate changes. It allows local communities to simulate changes and identify the consequences, and then overlay those with a new picture of disasters and emergencies on the home front. This tool projects specific outcomes, with the RCP 4.5 projection being a conservative projection and the RCP 8.5 being a more dramatic outcome. Reports will show average annual and seasonal temperatures, minimum and maximum temperatures, precipitation, consecutive days without precipitation, degree days and wind speeds. This tool was used in this planning process to identify potential scenarios at approximately 2050 in consideration of climate change.

For Wood County, this tool indicates that mid-century average minimum temperatures will rise by as much as 2.66 degrees Fahrenheit, and average maximum temperatures by 2.32 degrees Fahrenheit. By the end of the century, these increases may be as much as 8.23 degrees Fahrenheit higher. Summer days with heat indices above 95F may increase by 23 days per year, and above 115F may raise by more than 4 days per year. Average wind speeds are projects to increase slightly, by approximately 0.36 miles per hour according to this tool. Average daily precipitation could increase from an annual average of 1.6515 inches to 1.7275 inches.

Summary

Information identified in this section can allow for correlation between characteristics. Examples of correlating characteristics expressed in the following table are likely to apply in Wood County.

Table 2-5: Characteristic and Risk Factor Correlation

Characteristic	Corelating Characteristic
Elderly	No smartphone Limited internet access Limited healthcare coverage Limited transportation Poverty
Low education levels	Poverty Limited healthcare coverage
Disabilities	Poverty and/or low income Risk of unemployment Limited access to healthcare Limited access to education No appropriate transportation Limited access to standard rental property
Limited English proficiency	Limited access to education Poverty Limited communication
No Health Insurance	Limited access to healthcare Poverty

No Vehicle	Poverty Limited access to healthcare Limited housing options
Single Parent Household	Poverty Limited access to education Limited access to healthcare High risk of unemployment Income inequality and disparity

All of this information from the various social assessment tools is most useful in a specific situation with defined areas of impact, and known resources. Wood County can use these tools to identify gap areas, compare with information they know in the EOC vs what the maps and tools illustrate, and then identify unknown or undiscovered areas of need. Each disaster is unique in who is impacted and what the specific needs are, so through research and thorough assessment, the Wood County Emergency Management Agency can attempt to learn who and where help is needed faster and more accurately.

2.1.4 Incorporated Jurisdictions

Wood County has many incorporated municipalities, ranging in size from large, suburban cities to small rural villages. In total, the county is home to four cities and twenty-one villages. A small portion of the city of Fostoria lies within the Wood County boundary but, for the purpose of hazard mitigation and other planning issues, is considered part of Seneca County and therefore not addressed in this plan.

Cities

Approximately half of Wood County's population lives in one of four cities in the county. The cities are the economic center of the county, attracting residents from Wood County and beyond for work, shopping, and services.

Bowling Green is the largest jurisdiction and the county seat. Located in the geographic center of the county, Bowling Green serves as a retail and business destination for the central and southern sections of the county. Bowling Green State University, one of Ohio's largest public universities, is located here. With approximately 19,000 students and more than 1,000 faculty and staff, the university is an important economic driver for Bowling Green and the surrounding area.

Northwood is located in the northeast corner of Wood County; it borders the city of Oregon in Lucas County on the north and Ottawa County on the east. The City of Toledo (Lucas County) is on the northern border. Until 1982, Northwood functioned as a village. Under the 1980 U.S. Census, the village reached an official population of more than 5,000, which allowed the jurisdiction to pursue city status and adopt a municipal charter. Since that time, the city's population has remained relatively steady, ranging between 5,000 and 5,500.

Perrysburg is located in northern Wood County along the Maumee River. It is a rapidly growing community and a major source of retail and business services for northern Wood County and

the surrounding region. The city's population has exploded since 1990, increasing from 12,551 to the current population of 21,592, making it the second largest jurisdiction in the county.

Rossford is located in northern Wood County at the intersection of Interstate 75 and the Ohio Turnpike. It shares borders with Perrysburg and Northwood; the city is home to many retail businesses that serve Wood County and the surrounding communities.

Table 2-6: City Population and Demographics

City	Population	Housing Units	Median Income	Persons Below Poverty
Bowling Green	30,808	11,865	$37,356	30.9%
Northwood	5,160	2,182	$72,434	12.4%
Perrysburg	25,041	10,520	$92,834	4.6%
Rossford	6,299	2,837	$75,811	9.1%

Villages

Wood County is home to twenty-one incorporated villages, the majority of which are small and rural. Two-thirds of the villages have a population of less than 1,000 residents.

Table 2-7: Village Population and Demographics

Village	Population	Housing Units	Median Income	Persons Below Poverty
Bairdstown	117	58	$48,750	4.7%
Bloomdale	665	281	$55,703	7.4%
Bradner	973	413	$43,920	8.8%
Custar	178	68	$48,750	11.9%
Cygnet	544	278	$51,563	12.8%
Grand Rapids	919	406	$55,234	17.1%
Haskins	1,246	508	$74,792	2.2%
Hoytville	222	118	$37,679	19.7%
Jerry City	455	211	$47,411	17.9%
Luckey	1,007	369	$59,750	6.1%
Millbury	1,193	542	$56,765	4.7%
Milton Center	135	75	$53,125	3.1%
North Baltimore	3,370	1,379	$46,458	15.3%
Pemberville	1,326	630	$56,438	11.4%
Portage	397	171	$53,158	16.9%
Risingsun	545	245	$37,857	19.1%
Tontogany	387	201	$69,464	6.9%
Walbridge	3,013	1,619	$39,826	8.4%
Wayne	842	436	$44,167	11.1%
West Millgrove	131	48	$31,429	15.4%
Weston	1,456	722	$42,560	17.4%

2.1.4 Unincorporated Areas

The unincorporated areas of Wood County are divided into townships. In Ohio, townships are governed by an elected board of trustees. They meet monthly, at a minimum, and are responsible for the health, safety, and welfare of the township residents. Townships also have elected Fiscal Officers who manage the township's finances. Because townships are unincorporated, they are considered part of the county for the purpose of hazard mitigation planning and activities. Wood County has nineteen townships. Most of these jurisdictions are rural and have a relatively small population. Several townships in Wood County, however, are considered developing townships and are experiencing rapid residential and business growth. Because of the diversity in Wood County's townships, they will be profiled in two sections: Developing Townships and Rural Townships.

Table 2-8: Township Population Statistics

Township	Population
Bloom	2,513
Center	1,140
Freedom	2,644
Grand Rapids	1,586
Henry	4,079
Jackson	702
Lake	11,160
Liberty	1,690
Middleton	5,611
Milton	929
Montgomery	4,157
Perry	1,568
Perrysburg	13,571
Plain	1,625
Portage	1,558
Troy	4,097
Washington	1,864
Webster	1,230
Weston	2,124

Developing Townships (Lake, Middleton, and Perrysburg Townships)

Lake, Middleton, and Perrysburg Townships are considered developing townships of Wood County. Located on the northern border of the county and adjacent to the cities of Northwood, Perrysburg, and Rossford, these townships have experienced significant residential and business growth in the last decade, a trend that is expected to continue in the coming years. With more than 10,000 residents each, Lake and Perrysburg Townships are the most highly populated townships in the county. Middleton Township is somewhat smaller, with approximately 4,500 residents, but is the third most populated township and is growing rapidly as urban sprawl from Perrysburg moves south. Because of the population and presence of business and industry in these townships, government in these three townships functions more

like that of a small city than a traditional township. These townships are still governed by an elected Board of Trustees and Fiscal Officer but have additional full and part-time staff to support services to the community. These positions include Township Administrators, Zoning Officers, law enforcement personnel, and firefighters.

Rural Townships (Bloom, Center, Freedom, Henry, Jackson, Grand Rapids, Liberty, Milton, Montgomery, Perry, Plain, Portage, Troy, Washington, Webster, and Weston Townships)
With the exception of the townships included in northern Wood County's suburban sprawl, townships in Wood County are rural. Most of the sixteen rural townships in Wood County have populations of less than 2,500. Townships fall under Wood County for the purpose of hazard mitigation planning and most grant administration. The elected township trustees and fiscal officers manage the business affairs of the township which consist mostly of maintaining the roads, cemeteries, and critical facilities, and clearing debris from township ditches. Some townships have their own fire department while others are part of a fire district or shared service agreement with another department in the area. For law enforcement, most rural townships are served by the Wood County Sheriff's Office.

Unincorporated Communities and Neighborhoods
Wood County has 34 unincorporated communities and 2 census-designated places. These small, informal neighborhoods function as part of the township in which they are located. In many instances, the locations have historical significance or were formerly incorporated but have ceased to have enough population to be considered a jurisdiction. Local residents generally still recognize the neighborhoods by their previous names.

2.1.5 Institutions and Special Facilities

Wood County has abundant educational and healthcare resources available for residents. Access to these services improves the quality of life for residents and contributes to the successful development of Wood County.

Education
Wood County provides many educational opportunities to residents. The county has thirteen public school districts that serve K-12 students and two post-secondary institutions.

Table 2-9: Wood County Schools

Public School Districts	Colleges/Universities
Anthony Wayne School District	Bowling Green State University
Bowling Green City	Owens Community College
Eastwood Local	
Elmwood Local	
Fostoria City	
Lake Local	
Lakota Local	
McComb Local	
North Baltimore Local	
Northwood Local	

Otsego Local
Patrick Henry Local
Penta County Career Center
Perrysburg Exempted Village
Rossford Exempted Village

Healthcare

Residents have ample access to healthcare services both in Wood County and in adjacent communities. Wood County Hospital is the primary hospital located within Wood County's border. Located in Bowling Green, this full-service hospital provides a comprehensive range of inpatient and outpatient healthcare services, including emergency services, intensive care, and diagnostic services. Wood County Hospital also operates an urgent care center at the Falcon Health Center on the campus of Bowling Green State University. Mercy Health operates a standalone emergency department in Perrysburg. Many additional healthcare options, including full-service hospitals, trauma centers, outpatient services, and primary care, are available in nearby Lucas County. Some residents in the southern areas of Wood County access healthcare in Hancock and Allen counties.

2.1.6 Infrastructure

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

Transportation Systems

Thousands of miles of roadway cross Wood County. This includes 55 miles of interstate, 62 miles of U.S. highway, 208 miles of state highway, and more than 1,600 miles of local roads.

The County Engineer is responsible for maintenance, repair, widening, resurfacing and striping 245 miles of county roads. The County Engineer also serves as an engineering advisor to the townships, which are responsible for maintaining 790 miles of township roads across the county. The County Engineer is responsible for maintaining bridges and culverts in the county. This responsibility extends to 443 bridges, 57 load limited bridges, and 2,500 culverts.

Table 2-10: Wood County Highways

Interstates	U.S. Highways	State Highways	
I-75	6	18	199
I-80/90	20	25	235
I-280	23	51	281
I-475		64	579
		65	582
		105	795

Rail

With 188 miles of railroad tracks, rail is prevalent across Wood County. CSX Transportation operates 175 miles of track and Norfolk Southern Corp. operates 12 miles. CSX also operates

several railyards and facilities in the county. This includes the Stanley Yard and Walbridge Yard in the northeast section of the county and the NW Ohio ICTF Intermodal Facility in North Baltimore.

Airports

Within Wood County, there are two primary airports. The largest of these is Toledo Executive Airport. Located in Lake Township, this airport primarily serves corporate and privately-owned aircraft. Wood County Regional Airport is located in Bowling Green and serves general aviation and corporate aircraft. Throughout the county, there are numerous private airstrips. Commercial air transportation is not available in Wood County. The closest commercial airports are Toledo Express and Detroit Metropolitan Airport.

Utilities

The majority of homes in Wood County, approximately 69.1%, are heated with natural gas. An additional 18.1% utilize electric heat. These utilities are provided by a variety of municipal and private entities. The Public Utilities Commission of Ohio regulates private companies that provide public utility services. These companies, along with municipal electric utilities, are identified in Table 2-15.

Table 2-11: Wood County Utility Service Providers

Electric Service	Natural Gas Service
AEP Ohio	Arlington Natural Gas Company
Hancock-Wood Electric	Columbia Gas of Ohio
Toledo Edison	KNG Energy, Inc.
Tri-County Rural Electric	Suburban Natural Gas Company
City of Bowling Green*	Waterville Gas and Oil Company
Village of Haskins*	
Village of Tontogany*	
Village of Pemberville*	
Village of Custar*	
Village of Bradner*	
Village of Cygnet*	
Village of Bloomdale	
**Municipal Electric Utilities*	

The remaining properties in the county are heated by other sources, including:

- Bottled, tank, or LP gas 8.9%
- Coal, coke or wood 1.5%
- Solar energy or other fuel 1.4%
- Fuel oil, kerosene 0.8%
- No fuel used 0.3%

Public Works

Public works services are provided by an array of entities across Wood County. Appendix J-1 in the Wood County Emergency Operations Plan provides information for each city, village and township regarding water treatment and distribution, wastewater collection and treatment, electricity generation and distribution, and natural gas distribution.

Of special interest in the mitigation and taken from the cited EOP appendix, potable water treatment providers include NWWSD, Bowling Green City Water Division, Toledo City Water Division and Oregon City Water Treatment Division. Bradner, Grand Rapids village, North Baltimore Water Department, the Village of Pemberville, Fostoria Water Treatment department, and the Village of Wayne also treat source water for distribution. Many jurisdictions independently distribute water to their residents. In Bloom, Freedom, Middleton, and Perry townships, water is provided through individual wells.

Wastewater treatment is provided by Bowling Green City Wastewater Treatment department, NWWSD, Oregon City Wastewater Treatment, Perrysburg City Public Utilities, Bradner Water Department, Grand Rapids Water Department, Haskins Water Department, North Baltimore Water Department, the Village of Pemberville, Toledo City Water Department, the Village of Wayne, and Fostoria Municipal Wastewater Treatment. Residents in Bairdstown, Bloom Township, Center Township, Freedom Township, Jackson Township, Middleton Township, Milton Township, and Perry Township, Plain Township, Portage Township, Washington Township, Webster Township and the Village of Weston rely upon mostly septic systems.

Please refer to the Wood County Emergency Operations Plan, Annex J Public Works, Appendix J-1 for detailed public works provider information.

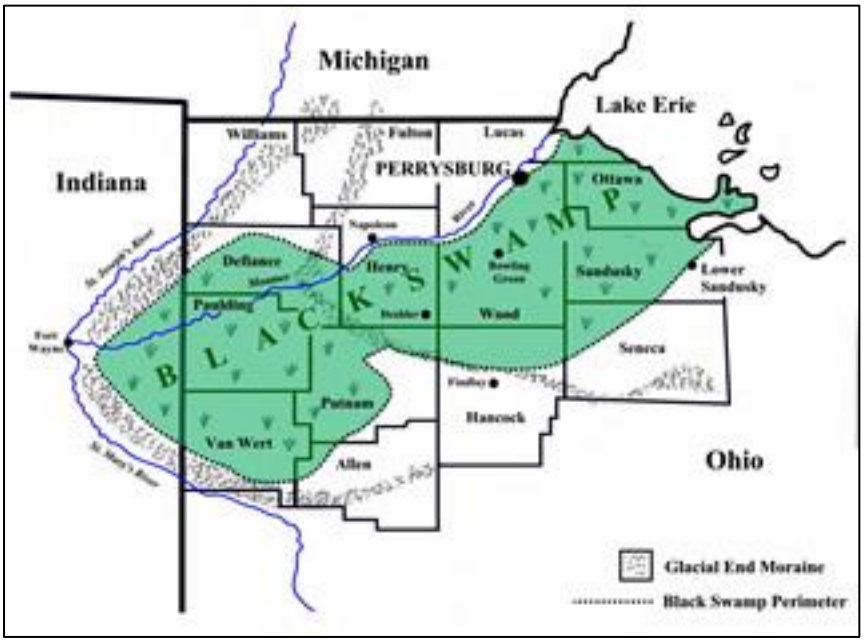
2.1.7 Topography and Climate

Wood County's terrain is exceptionally flat. Between the highest and lowest points, there is approximately 200 feet of difference. The county's highest point, located in Perry Township in the southeast corner of the county, is approximately 775 feet above sea level. The lowest elevation is 575 feet above sea level and is located in Rossford where the Maumee River enters Lucas County.

The county is located in an area of northwest Ohio that was originally known as the Great Black Swamp. The Black Swamp covered a 40-mile wide and 120-mile-long area, stretching from Fort Wayne, Indiana to Sandusky, Ohio, and was covered with dense forests, deep muck, and water. Beginning in the 1850s, the swamp was drained to create the rich agricultural area that exists in the region today. This long, painstaking process involved removal of the thick forest areas and installation of massive underground drainage systems and ditches to allow water to drain through the area. The development of this systematic drainage system, along with the construction of the many railroads that still exist in the area, supported the settlement and initial population growth of this area.

Construction of the drainage systems that eventually created useable agricultural land took decades. The first twenty years were spent clearing trees and deepening and widening natural drainage channels. Additional drainage ditches were also constructed across much of the county. These drainage channels, however, were not adequate to remove standing water from fields. Artificial underdrainage, also known as field tiling, was necessary to make fields useful for agricultural production. Drainage technology has improved greatly since its initial use in the county, transitioning from planks nailed together to create upside-down eave troughs in the 1800s and clay tile in the 1900s to today's use of lightweight, flexible plastic tile.

Map 2-2: Great Black Swamp



Soil Types

Wood County is covered by glacial deposits; these deposits range in thickness from one foot to more than 100 feet and are the parent material for most soils in the county. The majority of the soil in Wood County, approximately 60%, is classified under the Hoytville Association. These are very deep, level, and very poorly drained soils that form in wave-planed till and have a slope range of 0-1%. 14% of the county's soils are considered part of the Mermill-Aurand-Hoytville Association and 11% are part of the Hoytville-Ottokee-Rimer Association. These soils are very deep, level to gently sloping, and poorly to moderately drained.

Climate and Effects of Climate Change

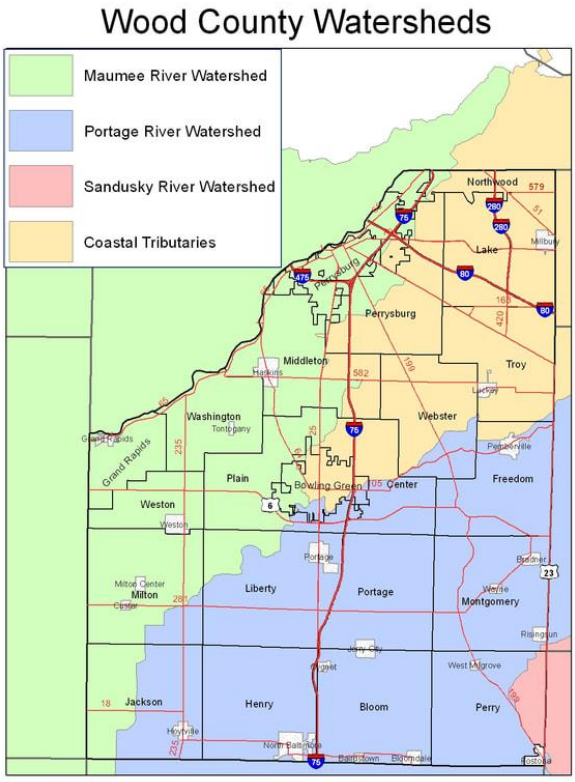
Wood County is located in a humid continental climate zone that features cold winters and hot summers. The average annual temperature is 49° F. July is the warmest month with an average high temperature of 84° F. January is the coldest month with an average low temperature of 15° F. Average annual rainfall is 33.14 inches. May and July are typically the wettest month with average precipitation of 3.58 inches of rain.

Anticipated changes in climatological characteristics for the coming century include the incidence of more temperature extremes, generally increasing temperatures, longer dry periods, heavier rain events, and more extreme weather in general. The consequences of these changes may cause additional areal and flash flooding, worsened erosion and topsoil deterioration, more nutrient depletion in fields that flood under heavy rain, more failure risk for high-hazard dams under the stress of heavy rainfall, accelerated deterioration of transportation infrastructure as roads and other structures are placed under additional wear and tear through increased precipitation and temperature variations, and elevated property damage as weather events increase in severity. These consequences will likely drive the cost of insurance, construction, replacement materials and labor up significantly as maintenance and replacement schedules change to accommodate increased risks.

2.1.8 Waterways and Watershed

Water in Wood County ultimately drains northeast to Lake Erie. The county is located primarily in three watersheds: the Maumee River, the Coastal Tributaries and the Portage River. A small area in the southeast corner of the county falls in the Sandusky River Watershed, but there are no major ditches there, and the amount of land is very small.

Map 2-3: Wood County Watersheds



Maumee River Watershed (Green)

The Maumee Main Stem and Select Tributaries include most of Plain Township, the southwest corner of Middleton Township, Washington Township, Grand Rapids Township, Weston Township, Milton Township except the far southwest corner, and the western third of Jackson

Township. This watershed includes the following waterways: Tontogany Creek, Sister Creek, Beaver Creek, Kettle Run, Little Beaver Creek, Sugar Creek, West Branch Tontogany Creek, Brush Creek, Yellow Creek, and Jackson Cutoff (a man-made ditch created when the Black Swamp was drained in the 1800's).

Portage River Watershed (Blue)
The Portage River Watershed includes the Toussaint River Watershed. The Toussaint River Watershed starts on the east side of Bowling Green where Toussaint Creek originates. It flows through Bowling Green into Webster and Troy Townships and exits Wood County into Sandusky County near State Route 23 and US 20. This watershed includes Packer (Two Root) Creek, and Martin Ditch. It drains the villages of Luckey and Pemberville. The Portage River Watershed includes the North, Middle, South, and East Branches of the Portage River. It includes drainage through Cuckle Creek, Foos Ditch, Cessna Ditch, Bull Creek, Eckert Ditch, Rocky Ford River, Hockenberry Run, Sugar Creek and Needles Creek. This watershed covers Center, Freedom, Liberty, Jackson, Portage, Henry, Bloom, Perry and Montgomery Townships.

Sandusky River Watershed (Pink)
The Sandusky River Watershed drains a small section of land in Montgomery Township. There are no major ditches or streams in Wood County that flow to the Sandusky River except for a ditch that flows northwest out of Fostoria and turns north at Hammer Road, and one ditch that flows to the south of Eagleville Road.

Coastal Tributaries Watershed (Yellow)
These waterways carry water into Ottawa County and it flows through the Toussaint River into Lake Erie. Much of the busiest area in Wood County is in this watershed, including the cities of Bowling Green and Northwood, Millbury, Lake and Perrysburg Townships, and the most highly developing part of Middleton Township. Part of the I-75 corridor, all of US 20, and the Ohio Turnpike run through this watershed. This watershed includes Turtle Creek, Crane Creek, Cedar Creek, Wolf Creek, Berger Ditch, Otter Creek, Henry Creek, Ayers Creek, Williams Ditch, Driftmeyer Ditch, Ambosch Ditch, Grassy Creek, Grassy Creek Diversion, Crooked Creek and Delaware Creek.

2.1.9 Land Use

Agriculture is the predominant land use in Wood County. Cultivated crops account for 76.6% of all land use in the county and 85% of the cash receipts for farms. Countywide, there are 1,091 farms with an average size of 246 acres.

The forested areas, grassland, and wetlands in Wood County includes twenty parks and nature preserves operated by the Wood County Park District as well as numerous parks, bike paths, and nature areas operated by other jurisdictions across Wood County.

Table 2-12: Wood County Land Use

Use Category	Percentage
Agricultural Use	76.6%
Residential Use	13.8%
Commercial Use	2.5%
Industrial Use	1.6%
Public & Institutional Use	1.8%
Parks & Open Space	0.4%
Roads & Railroads	2.8%
Other or Vacant	0.5%
Total	100.0%

As urban areas such as Toledo in neighboring Lucas County lose population, Wood County grows. Perrysburg and Bowling Green are two of the fastest growing small cities in America, and areas like Rossford and Northwood are not far behind. Wise use of the finite land resource is critical to managing the vulnerabilities of the future. As a strong agricultural community, the preservation of farmland and at the same time as the addition of commercial and industrial properties must be managed. Land use planning and development strategies to accomplish this are summarized in the Wood County Land Use Plan 2017. This plan discusses and addresses the following general topics:

- Sustainability for future generations to identify and protect natural and environmental resources through land use planning;
- Support of agricultural production through future land use planning and policies;
- Support and attraction of additional employment opportunities for the future;
- Protection of natural areas for recreational, historical and cultural preservation; and
- Promotion of redevelopment and reinvestment to wisely manage areas with the highest growth pressures.
-

Bowling Green has had a municipal comprehensive plan since 1963, and continues to update the plan on a regular basis. This plan promotes planned economic development activities, addresses both retention and recruitment of new business, strives to preserve the downtown area both historically and economically, establishes planning districts, addresses special districts like parks for preservation and expansion, and addresses local land use planning in a manner that is compatible with the countywide land use plan.

Perrysburg has developed the Perrysburg Tomorrow land use update plan in 2022. Their purpose was to establish a uniform vision for the city and to identify opportunities for programs that support future growth in a way that garnered public and private support and funding. Their plan cites best practices in the context of national trends. Future land us is considered in the context of rapid growth, moderate growth and low growth, and takes into account key gaps and barriers to growth, opportunities unique to Perrysburg, and future growth ideas. They consider changes in population, values, needs, and preferences. This plan takes into consideration Perrysburg's role in the countywide land use plan.

Rossford unveiled a master development plan in late 2022. This plan focuses on coordination of niche opportunities in clean energy, conservation, innovative mobility and transportation logistics as the nucleus for redevelopment and new development in the city. Sitting to the northeast of growth areas such as Perrysburg, amid major transportation routes like the Ohio Turnpike and I-75, the city wants to capitalize upon new opportunities to create a robust business and residential environment in the city. Again, this plan is done in consideration of the countywide plan with reference to land use goals and visions.

2.1.10 Regulation

The Wood County Planning Commission administers policy concerning land use, zoning regulations, and residential and commercial subdivisions. They administer several grant programs, such as Community Development Block Grants (CDBG) and Community Housing Improvement Program (CHIP). In 2022, the county used CHIP funds to improve low to moderate income housing across the county. They also used CHIP funds to help Bloomdale with storm water sewer projects and a sanitary sewer project in the Sugar Ridge area. The CDBG program was used to improve parking lots in public areas, maintain water towers, and provide sidewalks in Bloomdale, Bradner and Northwood.

The Wood County Planning Commission Director serves as the county's floodplain administrator and is charged with administering permits and regulating development within Special Flood Hazard Areas (SFHA). Section 3.0 of the county's floodplain regulations designates a Floodplain Administrator and specifies the duties of that office, which include updating regulations and enforcing such regulations under Section 6.0. Additionally, the Floodplain Administrator routinely monitors flood hazard areas to enforce regulations and provide community assistance, such as encouraging owners to maintain flood insurance policies.

The Wood County Planning Commission also provides leadership and expertise in establishing land use planning standards for the future. They address residential and commercial subdivisions, zoning regulations, parcel splits, rural address management, and floodplain development permits. The commission has two employees and a board of elected officials and appointed resident representatives. They regularly work with the Wood County Building Inspection Department, Health Department, EMA, Auditor, Economic Development Commission, Engineer, Recorder and the Ohio Lake Erie Commission, as well as the Wood County Township Association that represents the local townships.

The Wood County Building Inspection department is responsible for administering and enforcing all applicable building codes for residential and commercial construction. The department provides this service for Wood County properties as well as several adjacent counties and municipalities and has a staff of twelve. Staff positions include: Chief Building Inspector, Master Plans Examiner, Residential Plans Examiner, four clerical personnel, and seven Building Inspectors for structural, mechanical, electrical, and plumbing systems. Collectively, the staff work with customers to process building permit applications and payments, review and approve plans and specifications for construction, issue building permits with approved plans, provide ongoing inspection of projects through completion and

occupancy, and offer guidance to the public on completing a project. They administer the 2017 Ohio Building Code and the 2013 Residential Code of Ohio for One, Two & Three Family Dwellings, at this time.

The majority of jurisdictions in Wood County have zoning regulations in place. As identified in Table 2-10, only three villages and two townships do not have active zoning regulations. One township is partially zoned. Each zoned jurisdiction has a zoning inspector and local zoning board/planning commission. In the larger jurisdictions, the zoning inspector may be a full-time employee; in smaller jurisdictions, especially villages and townships, the position is often part-time. These entities are responsible for approving zoning permits at the jurisdiction level. In 2022, the Wood County Planning Commission helped Troy and Plain Townships update their zoning resolutions. Changes were also made in Perrysburg and Middleton Townships to improve wording in the regulations.

Table 2-13: Regulation and Code Status

Jurisdiction	Planning Commission	Comprehensive Plan	Commercial Bldg. Codes	Residential Bldg. Codes	Zoning Ordinances	Floodplain Regulations	NFIP Participation	Capital Budget for Mitigation	Public Works Budget for Mitigation
Wood County	Yes	Yes	Yes	Yes	n/a	Yes	Yes	Yes	Yes
Bowling Green	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Northwood	Yes	Yes	Yes	Yes	Yes	No	No*	Yes	Yes
Perrysburg	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rossford	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bairdstown	No	Yes	Yes	Yes	Yes	No	No	No	No
Bloomdale	No	Yes	Yes	Yes	Yes	No	No	No	No
Bradner	Yes	Yes	Yes	Yes	Yes	No	No*	No	No
Custar	No	Yes	Yes	Yes	Yes	No	No	No	No
Cygnet	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Grand Rapids	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Haskins	No	Yes	Yes	Yes	Yes	No	No	Some	Some
Hoytville	No	Yes	Yes	Yes	Yes	No	No*	No	No
Jerry City	No	Yes	Yes	Yes	Yes	No	No	No	No
Luckey	Yes	Yes	Yes	Yes	Yes	No	No*	Some	Some
Millbury	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Some	Some
Milton Center	No	Yes	Yes	Yes	No	No	No	No	No
North Baltimore	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pemberville	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Some	Some
Portage	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Risingsun	No	Yes	Yes	Yes	Yes	No	No	No	No
Tontogany	No	Yes	Yes	Yes	Yes	No	No	No	No
Walbridge	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wayne	No	Yes	Yes	Yes	No	No	No	No	No

West Millgrove	No	Yes	Yes	Yes	No	No	No*	No	No
Weston	Yes	Yes	Yes	Yes	Yes	No	No	Some	Some
Bloom Township	No	Yes	Yes	Yes	Yes				
Center Township	Yes	Yes	Yes	Yes	Yes				
Freedom Township	Yes	Yes	Yes	Yes	Yes				
Grand Rapids Township	Yes	Yes	Yes	Yes	Yes				
Henry Township	Yes	Yes	Yes	Yes	Yes				
Jackson Township	No	Yes	Yes	Yes	No				
Lake Township	Yes	Yes	Yes	Yes	Yes				
Liberty Township	Yes	Yes	Yes	Yes	Yes				
Middleton Township	Yes	Yes	Yes	Yes	Yes				
Milton Township	Yes	Yes	Yes	Yes	Yes				
Montgomery Township	No	Yes	Yes	Yes	No				
Perry Township	No	Yes	Yes	Yes	Yes				
Perrysburg Township	Yes	Yes	Yes	Yes	Yes No				
Plain Township	Yes	Yes	Yes	Yes	Yes				
Portage Township	Yes	Yes	Yes	Yes	Yes				
Troy Township	Yes	Yes	Yes	Yes	Yes				
Washington Township	Yes	Yes	Yes	Yes	Yes				
Webster Township	Yes	Yes	Yes	Yes	Yes				
Weston Township	No	Yes	Yes	Yes	Yes				
Bowling Green State University	Yes	Yes	Yes	Yes				Yes	Yes
Northwest Water/Sewer District	Yes	Yes	Yes	Yes				Yes	Yes

***Sanctioned by NFIP**

A greyed-out box indicates that particular regulation type is inapplicable to the corresponding jurisdiction, and/or is delegated to another entity.

The county and municipalities in Wood County have designated floodplain managers who implement and manage the floodplain regulations within their respective jurisdictions. Wood County provides assistance in the form of creation and update, implementation and improvement of floodplain regulations.

2.1.11 Economy and Development

Wood County's diverse economy includes production agriculture, small industry and manufacturing, retail and service industries, education, and government. The county has a blend of large and small businesses and rural and suburban areas. The county's robust transportation systems provide many routes to transport goods into and out of the county.

Business and Industry

Wood County has a generally strong and diverse economy that has benefitted from a healthy combination of agriculture, manufacturing, and service industries. Local agencies, such as Wood County Economic Development Commission, have worked diligently to foster business growth. Statistics show 16.0% of the workforce works in government, 67.9% privately, 2.3% self-employed, 10.1% non-profits and 3.5% in other forms of self-employment or unpaid work.

Employment in Wood County is attributed to multiple employment sectors. The percentage of the workforce employed in each sector, based on data available from the Ohio Department of Development, is listed in table 2-11. Table 2-12 identifies the county's major employers.

Table 2-14: Average Employment by Sector

Employment Sector	Percent Employed 2019*
Manufacturing	21.6%
Educational Services	11.3%
Health Care and Social Assistance	9.6%
Accommodations and Food Services	9.1%
Transportation and Warehousing	8.8%
Retail Trade	7.8%
Construction	6.8%
Wholesale Trade	5.4%
Administrative and Support Services	3.5%
Public Administration	2.8%
Information Services	1.6%
Management	1.5%
Finance and Insurance	1.2%
Real Estate Services	1.1%
Agriculture	0.6%
Mining and Oil/Gas Extraction	0.1%
Other	3.3%

- According to the Ohio Department of Job and Family Services Office of Workforce Development Economic Profile for Wood County.

Table 2-15: Major Employers

Employer	Sector	Employees
Bowling Green State University	Education	5,822
First Solar Inc.	Manufacturing	1,040
Magna International/Norplas Inc.	Manufacturing	N/A
Owens Community College	Education	1,415
Walgreen Co.	Logistics	1,029
Wood County Government	Government	N/A
Wood County Hospital Association	Bio-health	875
Amazon	Logistics	1,000
FedEx Ground	Logistics	552
Home Depot	Logistics	N/A
NSG Group	Manufacturing	N/A
Material Handling Services	Consulting Services	1,699
Continental Structural Plastics, Inc.	Automotive	1,238
Vehtek Systems Inc.	Automotive	811
Calphalon Corp.	Manufacturing	400
NAMSA	Information Service	400
Cooper-Standard Automotive Inc.	Automotive	316
Fresh Products LLC	Manufacturing	298
National Beef Ohio, LLC	Food Science/Ag	271
Oldcastle Buildingenvelope Inc.	Manufacturing	260
Betco Corp	Manufacturing	250
Industrial Power Systems Inc.	Manufacturing	250
Rosenborn Machine & Tool, Inc.	Manufacturing	250

In general, Wood County has very positive employment statistics. Unemployment has remained low in Wood County relative to many other counties in Ohio. The county did experience an increase in unemployment, along with the rest of the state, in the early 2000s. The highest unemployment was experienced in 2012 when the unemployment rate reached 7.0%. Since then, the rate has steadily decreased, falling to 4.1% in 2016. As of April 2018, Wood County has an unemployment rate of 3.5%, which is one of the lowest unemployment rates in Ohio.

Table 2-16: Employment Statistics

	2012	2013	2014	2015	2016
Employed	64,000	69,200	69,200	69,400	70,300
Unemployed	4,700	4,900	3,600	3,000	2,900
Unemployment Rate	6.9%	7.0%	5.2%	4.3%	4.1%

In 2022, according to the Wood County Commissioners Annual Report, the county building inspections officials inspected 5,726 residential improvement and construction projects, and 3,639 non-residential projects. Wood County added over 800 new jobs and saw private sector economic development investments reach of $1 Billion. These projects occurred in Perrysburg Township, Rossford, Henry Township, North Baltimore, and Bowling Green.

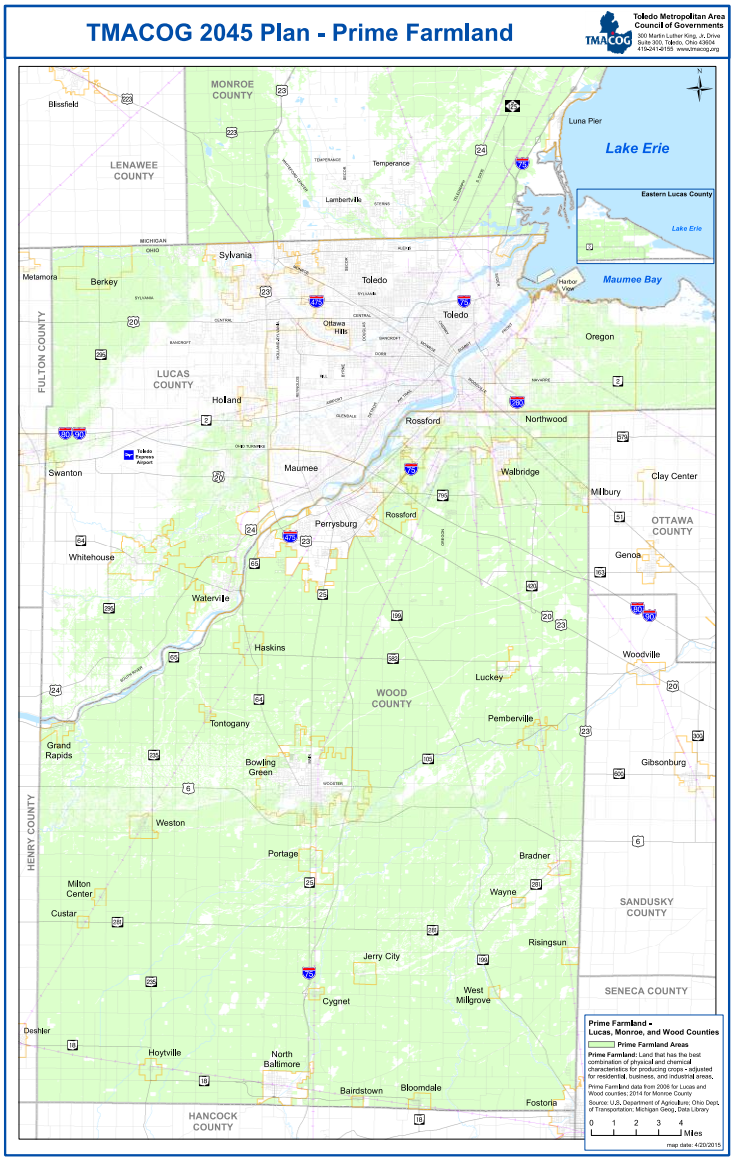
Agriculture

The U.S. Department of Agriculture defines prime farmland as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. This type of land produces the highest crop yields with the least amount of energy and economic resources. According to this definition, 89% of the available farmland in Wood County is considered prime. This amounts to approximately 354,000 acres. Therefore, agriculture is a major factor in Wood County's economy. Map 2-6 identifies land in the county that is classified as prime farmland.

Farm statistics for Wood County, according to the most recent USDA Census of Agriculture, are as follows: The market value of all products sold totaled $159,265,000. Of this, 79% was attributed to crop sales and 21% to livestock. The average farm received $148,895 from production sales, incurred $126,159 in costs of production, and realized $40,814 in net farm income. The county had 268,767 acres of land actively used for agricultural purposes. There are approximately 1,069 farms in the county with an average size per farm of 251 acres. Farms between 10 and 499 acres make up 72% of all county farms. There are 1,766 farmers in Wood County, of which nearly one-third are over the age of 65, and a quarter of all farmers are considered "new and beginning farmers" by the Ohio Department of Agriculture. Statewide, Wood County ranks tenth in sales of grain products (grains, oilseeds, dry beans, and dry peas), fourth in other crops and hay, and fifth overall in Ohio in the value of crops sold.

Corn, soybeans, and wheat are the most prevalent grain crops. Livestock production in the county includes cattle, hogs, and chickens. A small amount of land is used for production of fruits and vegetables.

Map 2-6: Prime Farmland Area



In 2022, over 62,600 acres of farmland in Wood County were covered by nutrient management plans that follow Tri-State Fertilizer Recommendations. Approximately 11,000 acres were seeded with overwintering cover crops, and fourteen drainage water management structures were designed and installed in 2022 as part of the H2Ohio Program, administered by Wood County Soil and Water Conservation. The Natural Resources Conservation Service help plan five new Environmental Quality Incentive Program contract on 705 acres in cost-share funding, including manure storage facilities, cover crops and nutrient management. The Conservation Stewardship Program provided funding to promote environmental conservation on 1,675 new acres, and 9,300 continuing acres.

2.1.11 Development Trends

Over the past decade, certain areas within Wood County have experienced significant metropolitan development. The City of Perrysburg has added housing, retail, and commercial

development. With a full set of construction standards in place, the city was quick to credit those regulations as the reason new development has not negatively impacted disaster vulnerability. They require storm water management measures that meet the needs of the community and allow for adequate storm water retention and have made the necessary infrastructure improvements to accommodate the new housing areas and additional businesses. Perrysburg officials believe that development has been managed well and losses due to disaster have not increased in the recent past.

Rossford and Northwood have utilized their regulations already in place to manage development but infrastructure in both cities is in need of repair before additional growth can occur. Development in recent years has exacerbated the need for infrastructure improvements. Flooding has worsened in the Crossroads area of Rossford where the most significant retail development has occurred. Water retention, street cleaning, de-icing, and snow drifting have been difficult to maintain under the worst conditions. Most of the challenges for Rossford and Northwood have been in commercial areas; the residential areas have been managed well as new residential development has occurred.

Bowling Green did not report any increased vulnerabilities as a result of development. The city has land use regulations in place to guide development; officials credit these well-considered regulations with prevention of increased damages. While they experience storm water management issues and potable water supply challenges, officials believe the city is prepared to maintain the safety of water across the city. Bowling Green has aggressively worked to upgrade and improve infrastructure to meet the demands of additional housing. There are areas in the northwest and south areas of the city that experience some storm water problems but these have not been worsened by development. Bowling Green State University has continued to make improvements to campus, in both housing units, educational facilities, and infrastructure. As they replace old dormitories with new structures that are safer and more efficient, vulnerability has been decreased.

The villages in Wood County have not experienced significant growth and their vulnerabilities have remained steady. Most small villages are experiencing a slight decrease in population over the past five years, and as a result, they are somewhat less vulnerable to disaster loss. The exception to this is the county's additional overall hazardous materials risk and increased concern over a safe and potable water supply. The variations brought about by a changing climate will impact all areas of Wood County, regardless of population, in many ways. Although many of these villages are not in areas considered floodplain, increased precipitation and more severe weather, combined with additional demand on utilities, power grids, and resources, will place them at higher risk in the coming years.

Across the county. there is concern over recent development and operation of large, converging rail systems. An intermodal yard was opened in North Baltimore just a few years ago; today it is utilized far below its maximum capacity status as CSX changes to how it transports goods across the rail. This intermodal yard is vulnerable to having containers of goods that are unmarked or improperly marked, and the release of hazardous materials as

these containers are transferred and trains are switched is high. The villages and residents in the southern part of the county are concerned about the presence of so much hazardous material on the trains that move in and about of that yard. In communities to the north, they are concerned about rail shipments into the Port of Toledo and the grain elevators in Lucas County, exposing Wood County residents to blocked crossings on a daily basis, as well as increasing the risk for derailments and traffic accidents at crossings. While the Stanley and Walbridge switching yards do not function as they did in years past, there are still high numbers of trains that pass through them, hauling a wide variety of products that include hazardous substances.

Rural Wood County areas are, naturally, concerned over urban sprawl. Officials and residents fear the loss of farmland to commercial purposes and are glad that county officials have shown dedication to maintaining agriculture as a mainstay of the county's economy. Many Wood County farmers are pro-active in managing nutrient runoff and actively participate in programs and research conducted by farm organizations and state government. They are front-runners in utilizing new practices to conserve the soil, prevent runoff, manage nutrient operations effectively, and sustain a safe and useable water supply.

Wood County adopted a Future Land Use plan in April 2017. According to that plan, people are moving from the highly urbanized cities in Lucas County, including Toledo, to Wood County for a more peaceful, less hectic lifestyle. Planners indicate they expect the uptick in Wood County population to continue through 2050 as Toledo's population continues to decline, a trend that began in the late 1970's. They anticipate residential, commercial, and industrial growth to continue for years to come. At the time the land use plan was adopted, Wood County Regional Planning indicated that rural population constituted 49.16% of Wood County and urbanized areas accounted for 50.84%. Planners anticipate that urban growth will far out-pace rural growth in the coming years.

Wood County is a rapidly developing county that appreciates new business and urban growth while also valuing and maintaining its dedication to agriculture and rural life. In the county, growth is intentional, planned, and managed; regulations are used to guide development, not stifle it. Communities work together as the urbanized areas join rural communities at the planning table to tackle needs and services jointly, recognizing that the varied parts of the community make Wood County one of the most desirable places to live in the United States.

As urban sprawl beckons Wood County, the I-75 corridor combined with the Ohio Turnpike provides easy and fast access to a large part of the Midwest and beyond. Continual steady growth is expected through 2050 will bring rise to more jobs, more services and more demands upon local government to support that growth. While growth is anticipated to follow the major transportation corridors, eventually it will encompass the small villages and rural townships. The county will be challenged in the coming years to create a vision for these rural areas that accommodates the growth patterns. Already utilities and infrastructure are being improved, but those plans will expand and grow as the center of population shifts into Wood County. Preservation of agricultural land will be a challenge. Managing storm water in the flat terrain

will place burdens on developers and designers to prevent endangerment of populated areas. Creation of affordable housing in the context of available services and easy access to work locations will have to be addressed. Incorporation of existing transportation hubs and infrastructure will provide a skeleton for development as the movement of goods into and out of Wood County becomes even more important than it is today.

Challenges will be exacerbated by climate change. With flat terrain and a complex network of ditches and streams, Wood County will be faced with providing storm water management for the entire county. The expansion of utility infrastructure will need to include the most rural areas, ones that have not seen that option to date. Protection of floodplains and controlled development in those areas will not always be in concert with existing access, highways, and other amenities. Encouragement of redevelopment of vacant and underutilized parcels will be important factors in retaining a high level of resiliency. Projections in the land use plan call for 1,420 additional acres of residential properties by the year 2050; most of this is expected to occur in rural areas outside incorporated areas. They also expect to need 590 acres for commercial and retail development, and over 200 acres for parks and green space. Whether this will come from urban areas already inside cities, or if it comes out of farmland that currently produces crops remains to be seen.

Bowling Green

The 2017 Community Vision for Bowling Green states: “The neighborhoods of Bowling Green will be attractive, walkable, and bikeable, with abundant green amenities. They will include safe and clean blocks that are inviting and livable for a vibrant mix of businesses, families, students, and professionals.” The city’s many goals, expressed by specific neighborhoods, are intended to be implemented through a system of development concepts. These concepts include preservation of historical assets and utilization of existing open and natural spaces as a way to create a resilient and sustainable community.

Bowling Green’s concise and streamlined plan released in May, 2022 calls for sustained economic growth, infrastructure and utility development, innovation and entrepreneurship, and an improved quality of life. Their efforts will include regular meetings with industry leaders to assess current situations and analysis of recruitment efforts. Zoning codes and other regulation will provide a basis for growth through increased partnerships that take advantage of opportunities for new ventures as well as redevelopment.

Bowling Green’s infrastructure plan identifies numerous improvements, all intended to improve the quality and increase the capacity of water service, storm water management, and sanitation. They intend to improve water treatment capabilities to serve their broad customer base, including the city and several other communities that buy water from them. They have also designated multiple areas that need improved water distribution, including outlying areas as well as the city proper, in an organized and prioritized manner.

Bowling Green State University

Bowling Green State University sits in the City of Bowling Green, but functions in many ways as an independent entity. The university is part of the State of Ohio. As a state university, BGSU enrollment exceeds 17,800 students in undergraduate and graduate programs, of which 5,000 live on campus. The population of the university is an exceptionally diverse group with ethnicity including White, Black, Hispanic, Bi-racial, and Asian students making up the majority of the student body. There is a significant international population. Faculty members number over 1,000. There are multiple dormitories and fraternities/sororities where residential students make BGSU their home while they are completing their post-secondary education. Many of these students are part of the local workforce, filling jobs both on and off campus. In addition to those students who live on campus, there are students who commute each day for classes on campus, and students who attend classes remotely.

BGSU is part of the City of Bowling Green as far as residential and commercial building codes, occupancy permits, fire service and EMS coverage, and other general government services. The university has a police force and an emergency operations center, and employs safety staff, maintenance and custodial workers, administrative workers, and others needed to operate their jurisdiction.

BGSU conducts and manages their own capital improvement and construction projects. They manage storm repair, cleanup, and mitigation efforts as a separate jurisdiction, subject to the occupancy and construction codes established in Wood County. For the purposes of property management, they are their own jurisdiction with their own budget and management organization. They would apply for, receive, and manage various forms of funding as an individual entity.

Northwestern Water and Sewer District

The Northwestern Water & Sewer District is a regional water and sewer district chartered under section 6119 of the Ohio Revised Code. The district was organized in 1994 to take over the water and sewer operations of the Wood County Sanitary Engineer and is specifically intended to meet identified goals within the service area. They establish a uniform water distribution and wastewater collection system; the create uniform and equitable rates for customers; they provide uniform service across the district; and the establish a uniform water distribution and wastewater collection system. They are overseen by a 10-member board of trustees who are appointed by county commissioners and/or elected by members of the district. The district includes all but one township in Henry County as well as a majority of Wood County.

NWWSD provides services in Perry, Bloom, Henry, Jackson, Milton, Liberty, Portage, Montgomery, Freedom, Center, Plain, Weston, Grand Rapids, Washington, Middleton, Webster, Perrysburg, Troy, and Lake Townships. They also serve West Millgrove, Risingsun, Jerry City, Cygnet, Bairdstown, Bloomdale, Portage, Hoytville, Custar, Milton Center, Weston, Tontogany, Luckey, Rossford and Millbury. Northwood, Walbridge, and Portage own their distribution systems, and Luckey is a member by contract.

The system has 20,000 customers and 74 full-time employees. Water services include 458 miles of water distribution pipe, 12 booster stations, 9 master metered public water systems, one water treatment plant, 10 water towers, 4 clearwells, 3,963 fire hydrants, 13 watersheds and 7 bulk water stations within their system. Sewer system services include 13 wastewater treatment facilities, 94 pumping stations, 365 miles of collection network, 60 submersible stations, 10 wet/dry well configurations, and 6,501 manholes.

NWWSD is responsible for its own budget and its own capital improvement projects. They manage storm damage and all operational functions on their own, and are considered a special district by election of the residents of Wood County.

Northwood

Northwood's long-term land use plan, adopted in 2004 and still in use, sets several development goals for the city. These include preservation of agricultural areas; specific designation of areas for residential, commercial and business use; focus on light industrial development; preservation of existing parks and open spaces; encouraged use of landscape buffers; creation of a central business district; co-location of specific manufactured homes and mobile homes in designated areas; creation of additional open space for recreational use; preservation of waterways, forests, wetlands, and flood plains; creation of a pedestrian friendly community; and development of annexation goals for the coming years. City officials also intend to create a mixed-use central business district, promote development standards for commercial projects, review impact fees, encourage a variety of housing types to be developed, and reduce curb cuts to improve safety.

Utility system goals include improvements to waterlines and storm sewers along Wales Road, East Broadway, Andrus Road, and Wynn Road. They called for improvements to connections to the City of Toledo water system.

Northwood has created a reinvestment area intended to provide tax incentives in promoting new development redevelopment. Tax abatements of up to 100% of the new value for up to ten years are part of their program to create and retain jobs. They have identified a revitalization district to attract restaurants and entertainment venues in areas of major travel, and to support the redevelopment project for the old Woodville Mall site. A site-specific renewal grant program furthers this cause, providing financial incentives to businesses that can expand and improve. The Zoning Committee and the Planning Commission work together to enable strong development guidance through updated and applicable regulations.
Other plans include the addition of affordable housing. As part of the old mall redevelopment, this housing provides outdoor spaces, ample utilities, and access to amenities to residents. A 26,000 square foot Community Center is part of this project. Housing units are designed to meet contemporary needs, such as charging stations in garages for recharging electric vehicles.

These goals were established in recognition of current and future needs for development regulation and for the betterment of providing services to community members. Northwood will continue to use these goals as guidelines to engage in smart development that creates a

sustainable community that is resilient to severe storms and other kinds of natural hazard impact.

Perrysburg

Perrysburg updated its development plan in 2022. Titled "Perrysburg Tomorrow", this plan sets a vision and strategy for opportunities in the coming years. They intend to guide development through establishment of land use designations, enhancement of the city's character through catalyst projects that create new city revenue, supported development through creative redevelopment and incentives, and use of state and federal financial programs. They have set environmental preservation and the creation of green space and open areas as a priority.

Perrysburg's 2008 plan, in place until 2022, was based upon the city's history of segregated land use, the overall goal of the plan was developing efficient use of land resources with strategic development and redevelopment, preserved natural areas, and strengthened downtown and waterfront areas. Perrysburg's goals include preservation of the small town character of the city; preservation of open space and protection of the rural character by developing residential neighborhoods around the periphery of the city in a strong neighborhood manner; development of mixed-use downtown areas; inclusion of green space in commercial development zones; development of a wide range of housing types in the city; street development that adequately handles the traffic; encouragement of walkability; wise use of the Maumee River space as recreational and open space; use of environmentally sensitive and sustainable practices in new development and redevelopment; and enhanced development along existing corridors to utilize existing infrastructure with managed access.

Rossford

The Rossford Business Association serves to develop new businesses and to retain the existing businesses in the city. They work with local businesses to promote and improve the local economy and to foster new development in the city. They work hand-in-hand with the Rossford Convention and Visitors Bureau and the City of Rossford. The City of Rossford has an Economic Development and Planning Commission that serves to promote and further develop the city. They have established entertainment zones to maximize the success of several commercial entertainment venues within the city, and assist others as needed to develop new business.

Countywide Development

Growth in Wood County occurs not only in the cities of Perrysburg, Northwood and Bowling Green but along the entire I-75 corridor that includes Lake Township, Perrysburg Township and Middleton Township. Residential growth in the cities and these developing townships is evidenced by the addition of subdivisions and single-family homes, condominiums, and multi-family housing units. Most housing is moderate to upscale and occupied by residents who work in skilled trades, professions, and business. Some low to moderate income housing exists as well. As younger generations move to the city and farms transition from family operations to corporate entities, the county's population is shifting away from the very small villages in southern Wood County to the suburban areas in the north.

Housing conditions have deteriorated in the small villages, which has contributed to the residential shift towards the cities. Failing water and wastewater infrastructure has negatively impacted the small rural villages in terms of residency while the presence of widespread water and sewer systems in the more populated areas has drawn people into the more developed areas. The overall effect is that population is on the increase in Wood County, growth is anticipated to continue for several decades, and most growth will occur in the cities and townships of northern Wood County.

The presence of plentiful logistics services by ground, air, and rail makes Wood County a prime area for industrial and commercial growth. The county's existing infrastructure allows for expansive growth. The Ohio Turnpike and Interstate 75 cross the county, along with many other major highways and access routes. Airports and rail terminals make shipping easy and accessible. This promotes the development of new industry and commerce.

While developers strive to respect and sustain the land dedicated to production agriculture on some of Ohio's richest soils, the competition from industry is strong. Multiple private gas transmission gas lines are being laid and put to use in the county. Formerly part of the Black Swamp that was drained in the 1800s, Wood County has a sophisticated system of ditches and waterways. These are integrated in the county's storm sewer and water management systems, resulting in a county that is primed for new growth.

Wood County land use planning efforts are based on several key concepts to guide development. Sustainability is critical to smart growth in the county and is critical to emergency managers who will address mitigation and disaster recovery in the coming decades. The land use plan states that the county supports the development of renewable energy and will encourage energy efficient growth through public private partnerships. Officials promise to encourage the use of environmentally sensitive storm water management through development of rain gardens, green roofs, pervious pavement and other eco-friendly products. They will discourage development inside floodplains and they intend to respect watershed and drainage systems that protect the county from flood damage.

Agriculture is considered a critical part of Wood County's economy. The county is committed to continued support and sustainment of production agriculture and will sustain partnerships that include Soil and Water Conservation Districts and Ohio State University Extension Service to promote best practices for agriculture. They are one of Ohio's most active counties in the H2Ohio Program. They pledge to continue to embrace agriculture as a fundament and essential component of the economy.

Wood County's growth plan frequently uses the word "managed." By using this word, the county intends to encourage flexible and responsive reactions to development pressures through the enforcement of regulations and requirements. Townships are encouraged to develop through a planned unit development process. The county intends to put underused and abandoned properties back to use in high-quality projects. Redevelopment of abandoned

or closed properties is critical to efficient use of county resources. Furthermore, officials promise to continually evaluate progress against plans, checking demands with availability before "new" is built and other property left to deteriorate.

Countywide building standards are used for all jurisdictions. Stormwater planning is accepted by and has involvement of all jurisdictions as well. They participate in the Toledo Metropolitan Area Council of Governments coalition on stormwater cooperation and coordination. Collaborative projects such as the Northwood construction of water retention for the Oregon wastewater treatment system that prevents overwhelming that utility are common. Almost all jurisdictions that have floodplain areas participate in NFIP. Bowling Green, Perrysburg, Wood County and Northwood have some form of historical preservation agency that works, oftentimes with others, to preserve the heritage and culture of Wood County.

By utilizing a comprehensive set of commercial and residential building codes to guide new construction and significant renovation of existing structures, Wood County officials provide strong guidance for new development. The county actively enforces floodplain regulations, zoning regulations, and building codes. The county's planning officials provide guidance and assistance to communities that actively participate or wish to join NFIP to ensure residents in these communities have access to flood insurance and other resources to reduce their vulnerability.

Wood County's land use planning efforts involve a wide variety of departments, individuals, and organizations. Led by the Chairman of the Wood County Planning Commission, county elected and appointed officials on the committee include the Wood County Engineer, Wood County EMA Director, Wood County Economic Development Director, Wood County Park District Director, Wood County Health District Commissioner, Wood County Committee on Aging, Wood County Soil and Water Conservation District, Northwest Water and Sewer District, Wood County Planning Commission, Bowling Green State University, a village representative (currently North Baltimore), a township representative (currently Middleton Township), and the Wood County Commissioners.

Past development efforts, as well as current efforts that will be evidenced by construction and new jobs in future months and years, are a community-wide effort in Wood County. They are attempting to prevent future disaster damages through smart development practices and wise management of the development of the past.

2.2 HAZARD IDENTIFICATION

Wood 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 Wood County are defined. The county's risk for each hazard and its history is also considered.

In developing this assessment, the Hazard Mitigation Planning Team analyzed the hazards and risks present throughout the county. Some hazards are relevant to only specific jurisdictions,

and others are a threat across the entire county. The thirteen hazards identified as relevant to at least a part of Wood County follow:

- Dam/levee failure
- Drought/extreme heat
- Earthquake
- Flood
- Hazardous materials incident
- Invasive species
- Landslide/mudslide
- Power failure
- Severe thunderstorm
- Tornado
- Water quality emergency
- Windstorm
- Winter Storm

Some hazards were excluded from this plan because they pose no risk to Wood County. The excluded hazards and the justification for the exclusion are identified in table 2-14.

Table 2-17: Excluded Hazards

Excluded Hazard	Justification
Avalanche	There is not sufficient elevation for this to occur.
Coastal Erosion	The county has no open coastline.
Hurricane	The county experiences only remnants of this in the form of heavy rainfall or high winds, covered as specific hazards.
Land Subsidence	Planning Team and hazard history did not identify as a concern
Tsunami	Geographically impossible
Volcano	Geographically impossible
Wildfire	Insufficient forested area

Wood County does not have a long history of federal disaster declarations or assistance. While the Ohio has a more extensive list of federal disaster assistance, Wood County has only been included in ten federal declarations. Wood County was included in the multi-year COVID-19 Pandemic declaration as well as and June 2012 excessive rainfall incident. Severe wind and storms in June 2012 affected Wood County. Longer ago, Wood County was included in a 2005 statewide disaster declaration that provided support for evacuation efforts following Hurricane Katrina. The most recent declaration for a disaster directly affecting Wood County occurred in November 2002. A comprehensive list of incidents in Wood County that resulted in federal disaster declarations are summarized in table 2-15. Overall, Wood County is not heavily hit with severe storms, and experiences relatively few widespread incidents, compared to other areas in the State of Ohio.

Table 2-18: Federal Disaster Declaration History

DR/EM Number	Incident Date	Incident Type(s)
DR-90-OH	January 23, 1959	Flooding, Severe Storm, Tornado
DR-266-OH	July 15, 1969	Flood, Severe Summer Storm, Tornado
EM-3055-OH	January 26, 1978	Winter Storm
DR-653-OH	March 12, 1982	Flood, Severe Summer Storm
DR-951-OH	August 4, 1992	Flood, Severe Storm, Tornado
DR-1444-OH	November 10, 2002	Severe Summer Storm, Tornado
EM-3250-OH	September 14, 2005	Hurricane Katrina Evacuation
EM 3346	June 29 – July 12, 2012	Severe storms, straight-line winds
USDA designation	October 2021	Excessive Rainfall – Agricultural only
DR 4507	Jan 20, 2020 – May 11, 2023	COVID-19 Pandemic

To understand the risk posed by these hazards in Wood County, it is important to examine the characteristics of each hazard and evaluate the local history of 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 Wood County's history with each.

2.2.1 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. They can be composed of earth, rock, concrete, masonry, timber, or a combination of materials.

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

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

Dam failure is defined as the uncontrolled release of the water held back by the structure. Depending on the storage volume of the dam and the types of structures surrounding it, a breach or failure can have a significant or limited impact on the surrounding community. In the

most significant dam failure incidents, there can be substantial flooding downstream, damage to property, and loss of life. Potential causes of dam failure include:

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

The National Inventory of Dams and the National Levee Database provide the most up-to-date information about water-retention structures in Wood County. According to these resources, there are no levees in Wood County, but there are eight dams of significance. All dams have an emergency action plan, and all are state regulated. None of the dams have hydropower.

Four dams are identified as high-hazard. A high-hazard dam is likely to cause both human and property losses should the structure fail. Significant hazard dams, such as another four in Wood County, would cause property damage upon failure, but probably no human loss would occur.

The four high-hazard dams include the North Baltimore Upground Reservoir #1 and 2, Bowling Green Upground Reservoir and Sludge Lagoons, Providence Dam and Grand Rapids Dam. Significant risk dams include Candlewood Lake Dam, East Candlewood Lake Dam, Cygnet Wastewater Lagoon, and Wayne Wastewater Lagoon.

The North Baltimore Upground Reservoir No. 1 & 2 is a used for water supply and recreation, and was last inspected in December 2019. It was found to be in satisfactory condition. Built in 1969, this dam has an Emergency Action Plan last revised in 2003. It is an off-stream structure designed by professional engineers. It sits just east of the Rocky Ford Creek one-tenth of a mile from the Village of North Baltimore just north of the Wood – Hancock County line. Deshler Road (SR 18) is north of the two reservoirs, and the entire residential area of the village is north of Deshler Road. The North Baltimore Water Works, Hancock-Wood Electric Cooperative, and North Baltimore Waste Water facilities are within one mile of the reservoirs. The drainage area is 65.6 square miles around the structure according to the inventory data.

The Bowling Green Upground Reservoir and Sludge Lagoons are located north of King Road, west of Forst Road, and east of SR 65, and serves the purpose of establishing a water supply for the Bowling Green water treatment plant. It was designed and built by the City of Bowling Green in 1989 off-stream of the Maumee River. It is approximately a mile from the city of Waterville in Lucas County, but the Maumee River is between the reservoir and the city, and would hold large quantities of water should the structure fail. There is an emergency action plan that was developed in 2018. The structure is state regulated, was inspected in 2022, and found to be in satisfactory condition. The inundation zone could include about fifteen houses to the southeast of the reservoir, along Township Road 100 and Township Road 235. These

nearby roads could flood over, as could a small section of SR 65. The Maumee River is less than 1,000 feet away, and would likely absorb most of the water under both catastrophic and non-catastrophic circumstances. Riverby Golf Course and numerous farm fields could be flooded to a minor degree. It is highly unlikely that any of the houses would experience severe flooding; most water would be surface flooding. With the Maumee River so close by, it is believed that any floodwaters would drain quickly.

Providence Dam is located on the Maumee River for recreational purposes. It is slightly to the north of Howard Island, a small piece of ground not developed or used for any purpose. The Village of Grand Rapids lies directly to the southeast of the dam, with Buttonwood and Howard Islands in between. Professionally engineered repairs were completed in 1996, but the dam was originally built in 1907. It is state-regulated. Last inspected in 2022, its condition is rated as fair. There is an emergency action plan in place. The inundation zone would likely include the Grand Rapids riverbank and park areas, and perhaps a section of SR 65. Conditions would have to be the greatest level of catastrophic for the Maumee River to not be able to quickly drain flooding if the dam were to break.

Grand Rapids Dam lies to the south side of Howard Island on the Maumee River, in closer proximity to the village than Providence Dam. Should this dam fail, the inundation zone would likely include the riverbank and a section of SR 65. The Maumee River would still, unless under extreme catastrophic circumstances, be able to drain the water quickly. Regulated by the state and repaired through professionally engineered assistance in 1996, this dam was also built in 1907. Inspection in 2022 resulted in a rating of “fair” for its condition. There is an emergency action plan in place that was updated in 2017.

Both Providence and Grand Rapids failing at the same time could more likely affect the Village of Grand Rapids, and negatively impact the SR 295 bridge that crosses the Maumee River, and connects the area to Lucas County. Under these conditions, it would take longer for the Maumee River to drain the area, assuming that the entire watershed would be in a fully saturated state. Local stakeholders did not believe that even this circumstance would flood homes in Grand Rapids, as the residential area is at a higher elevation and the river is extremely wide and deep at this point.

Widespread catastrophic rainfall over an extended period of time could cause Providence and Grand Rapids dams to break under the worst of conditions. The same circumstances could cause both the North Baltimore Upground Reservoirs and the Bowling Green Upground Reservoir to over-top with water. None of these structures are close to one another except for the Grand Rapids and Providence dams. The Bowling Green facility is over 16 miles from Grand Rapids, and North Baltimore is almost 20 miles from Grand Rapids, and over 23 miles from the Bowling Green facility.

Other dams include Candlewood Dam West and East Candlewood Dam, both on Sister Creek just south of Brillhart Road in Washington Township. Both are classified as significant risk and found to be in poor condition. Candlewood Dam developed an EAP in 2013, and East

Candlewood in 2022. Owned privately, they serve recreational purposes within a large residential area on Williamsburg Lake. Although very close to the Maumee River, extremely heavy long-term precipitation could theoretically cause them to fail. Several local roads within the housing development could experience surface flooding, affecting ingress and egress to the area. There are also farm fields in the area that could be impacted. Should the Maumee River significantly exceed flood stages, the river could rise out of its banks. These dams control the water on a lake that is fed by local ditches that experience the same high-risk runoff issues as other ditches in the Maumee River Watershed.

Catastrophic rainfall and rapid drainage, combined with ice jams, could cause the Maumee to rise out of its banks for the entire length, but this combination of factors is highly unlikely. Under these conditions, any property along SR 65 that follows the river could be flooded, and access to the area would be by emergency means only. There could be large numbers of swift water rescues in this area dependent upon how rapid the extensive rain came and how fast freezing temperatures rose.

The Cygnet Wastewater Lagoon (significant risk) is north of the village among farm fields. The village residential area is to the south, and Bonnie Plant Farm and Bates Recycling are to the north. A dairy farm is to the east. Should this facility breach, those residences and businesses could be affected by surface flooding. Overtopping in the case of catastrophic rain is the most likely cause of an event like this. This facility was inspected in 2019 and found to be in satisfactory condition. In 2020, an emergency action plan was developed.

The Wayne Wastewater Lagoon is considered “significant” risk, and is rated in satisfactory condition. It was last inspected in 2019, and has an emergency action plan that was developed in 1996. The lagoon sits to the southwest of the Village of Wayne, and northwest of a rural neighborhood on Wayne and Girton Roads. These homes are at a higher elevation than the lagoons, so flooding would likely drain to the north and west of the lagoons into farm fields. SR 281 could be impacted by flooding. Local leadership feels the risk to the villages is minimal.

While both Candlewood dams could add to impact levels for some area residents along the Maumee River in a catastrophic situation, the Cygnet and Wayne lagoons would like affect only the farmland around them, and the roads could flood for a short period of time. Few homes or businesses would likely be impacted even under the worst of conditions.

Stakeholders believe, based upon Wood County weather history, that it would take in excess of twelve inches of rain in less than twenty-four hours to cause the above-described catastrophic circumstances to occur.

Local Dam Failure History

According to records from Stanford University’s National Performance of Dams Program, there are no written reports of dam incidents, breaches, or failures in Wood County. There is a less than 1% probability of a dam incident. Local stakeholders had no recollection of dam failure anywhere in the county.

Stakeholders did not express overwhelming concern over any of the dams in Wood County. There was some concern about the Williamsburg Subdivision and Candlewood Dams as it relates to heavy rain and flooding. There was no concern of prominence, but stakeholders did express concern about maintaining privately owned dams. There was also a general concern voiced about a planned second one-million-gallon reservoir at the City of Bowling Green site. Concerns were expressed about cost of maintenance and actually performing the maintenance as needed.

According to the Association of State Dam Safety Officials, there have been seven dam failures in Ohio. Four were caused by flooding conditions from five or more inches of rain in several hours that resulting in overtopping. The other three were a result of structural deficiencies that lead to failure. None of these incidents were in Wood County, but all occurred between 2011 and 2019.

2.2.2 Drought and Extreme Heat

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

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

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

A heat wave is a period of abnormally hot and unusually humid weather, typically lasting for two or more days. This can be an extended period of time with higher-than-normal temperatures or a shorter period of time with abnormally high temperatures. Regardless of the 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 increases. Between injuries, fatalities, and crop/property damage, these disasters can significantly impact the economy of a region.

Heat waves can occur in Wood County but they are rare and typically brief, lasting only a day or two. Extreme temperatures are considered anything above 90 degrees Fahrenheit. In the humid climate of northwest Ohio, these temperatures are often accompanied by high humidity. Temperatures rarely exceed the mid-90s, although the region does occasionally experience temperatures of 100 degrees or slightly higher. These brief heat waves are not uncommon, but rarely last more than a few days. A heat wave lasting longer than a week is extremely rare.

Table 2-19: Average Temperatures and Rainfall

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High	31°	35°	46°	59°	71°	80°	84°	82°	75°	63°	49°	37°
Avg. Low	15°	18°	26°	36°	48°	58°	62°	59°	51°	40°	31°	21°
Avg. Precip.	1.73”	1.61”	2.36”	3.19”	3.58”	3.54”	3.58”	3.35”	2.68”	2.52”	2.64”	2.36”

Drought/Extreme Heat Risk Assessment

Drought and extreme heat. while not a common occurrence in Wood County, are countywide hazards and can affect all areas and jurisdictions. 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.

Wood County can experience slight drought conditions and does regularly experience short periods of decreased precipitation during the growing season for area farms. The climate is moderate and does not turn arid at any time. There is no 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 cause a series of years to have higher or lower average yields due to slight dryness, late planting due to excessive rainfall, or late harvest due to rainfall.

For the purpose of loss estimates, the top grain and livestock commodities were considered because they represent the majority of production in Wood County. 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 the county.

Based on the U.S. Department of Agriculture’s 2017 Census of Agriculture, Wood County’s agriculture industry has a total market value of $159,265,000. Of this total, $125,819,350 (79%) comes from crops and $33,445,650 (21%) comes from livestock. In a drought, these commodities would all be exposed to loss. Table 2-18 identifies the quantities of the primary agricultural commodities in the county that would be exposed to drought-related loss.

Table 2-20: Drought Vulnerability Assessment

Top Commodities	Crop Acres	Livestock Counts
Soybeans	132,719	
Corn (for grain)	79,619	
Wheat	19,673	
Forage-land (hay, silage, and green-chop)	8,254	
Cattle/Calves		8,092
Hogs/Pigs		973
Horses/Ponies		597

Climate changes in the future could significantly worsen this hazard.

Increasing average heat may change seasonal cycles, and modify the suitability of specific crops, trees, plants, and other vegetation that grows naturally in Wood County. Increases may alter the growing season by lengthening it, or by limiting the ability of heat-sensitive crops to produce typical yields when summer months are hotter for a longer time. Some insects, plant diseases and invasive species grow more in hot and/or humid environments, and the specific pestilence common to the area may change. Nuisance animals may be different based upon the temperatures the specific animals prefer, increasing some and decreasing numbers of others.

Drought combined with high temperatures places additional burden on existing utility systems. Air conditioning must run faster and longer, and has less low stress time during the overnight hours. This places the entire electrical grid under stress when extreme heat and humidity are regional in scope. The very young, the very old and those with compromising medical conditions are more susceptible to heat injury and illness, and therefore can place stress on EMS and medical care providers. Some concern was expressed about new multi-family or long-term housing facilities making sure there is adequate air conditioning for elderly or disabled residents in the future, but all participants felt that air conditioning is now much more widespread than in the past. They did express concerns about having adequate generator fuel supplies on hand should the electrical supply fail and air conditioners need to run on alternate power. Many stakeholders said they have generators now, but did not five years ago. Outdoor activities that promote health and wellness for the general population are compromised as people must stay inside to avoid heat injury. Water systems can endure some stress due to increased consumption of drinking water, irrigation of more crops, and watering of landscaping and other vegetation-rich areas.
It is projected by some global climate sources that drought conditions which cause a great deal more pumping of source water from aquifers can enhance the likelihood of earthquakes as pressure equilibrium underground changes when aquifers are diminished and fault lines adjust accordingly. The decreased pressure on fault lines when bodies of water shrink can also contribute to this phenomenon. (https://climate.nasa.gov/news/2926/can-climate-affect-earthquakes-or-are-the-connections-shaky/)

In areas of significant vegetation, whether composed of trees and underbrush, or farm crops and hay fields, fires are more likely in dry conditions, and fighting the fires becomes more difficult as water supplies are stressed.

Local Drought/Extreme Heat History

While drought is not common, Wood County has been impacted by several droughts in its history. According to NCDC records, five recorded droughts have caused $16,000,000 in crop loss.

Table 2-21: Wood County Drought/Extreme Heat History

Hazard	Incidents	Property Loss	Crop Loss	Deaths	Injuries
Drought	5	0	$16M	0	0
Extreme Heat	0	0	0	0	0

One of the more significant droughts to impact Wood County was the 1988-1989 North American Drought. This event followed a milder drought in the Southeastern United States and California the year before. The drought spread to Ohio 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. The nationwide use of marginally arable land for agriculture production and continued pumping of groundwater near the depletion mark are considered possible reasons this drought had such a significant impact on the agriculture industry. 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.

In the summer of 2012, Wood County was also impacted by a significant drought. This event, 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, Wood County was designated with moderate drought conditions by mid-June of 2012. 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. On September 5, 2012, the USDA issued a disaster declaration for all counties in Ohio affected by the drought; Wood County was included as a primary county.

The most recent drought to impact Wood County occurred in 2016. On January 5, 2017, the USDA issued a Secretarial Drought Designation for drought conditions experienced from May through October 2016. The primary declaration was issued for several Ohio counties; Wood County was considered one of the contiguous counties for which the declaration was issued

2.2.3 Earthquake

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

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

Earthquake Risk Assessment

Ohio has experienced more than 120 earthquakes since 1776. While only a few of these events have caused structural damage, Ohio has a greater risk for earthquakes than many people realize. West central Ohio is the area of Ohio at the highest risk for earthquakes; northeast Ohio is the second most active earthquake risk area. Wood County lies in the New Madrid Seismic Zone and has a 2-3% chance of an earthquake, rating the risk on industry scales as "low".

Earthquakes are geologically possibly but not common in Wood County. Earthquake is a countywide hazard and can affect all areas and jurisdictions in Wood County. The county does have exposure to a fault line and has experienced several very minor earthquakes in that past. None of these incidents have caused property damage. As such, there is little data to support committing extensive resources to earthquake-proofing buildings and other structures.

Conversation about earthquake in Wood County did not reveal overwhelming concerns. However, stakeholders did realize that underground infrastructure – water lines, sewer lines, fiber optic cable, communications lines, and pipelines would be the first property to be damaged, and an earthquake of lesser magnitude could cause damage. They also realized that bridges and culverts would be damaged, and may not visually reveal the extent of the damage and compromise. Water towers would be extremely vulnerable to damage and destruction. Because of the low incidence of earthquakes in Wood County, there are almost no structures built to resist those forces. The older kinds of pipe and tile would not be resistant to earthquake damage at all. Should a strong earthquake strike, which is not expected or predicted to anyone's knowledge, the debris management could be overwhelming.

Vulnerability to earthquake could increase because new development of multi-family residences are often three stories high or higher. These structures would be damaged in an earthquake. Some consideration may be given to whether or not these should be built to withstand the forces of an earthquake, realizing the risk is very low.

Because of the low risk and high cost of implementing mitigation strategies related to earthquake risk, the planning team did not identify significant mitigation actions.

Table 2-22: Earthquake Scenario Vulnerability Analysis

TOTAL	Building Value	Population Equivalency	Population	Agriculture Value
$1,568,446,577,000	$34,369,777,000	$1,534,076,800,000	132,248.00	n/a

Local Earthquake History

Records from the Ohio Department of Natural Resources indicate that Wood County has experienced six earthquakes with epicenters in the county. These earthquakes were minor in magnitude, ranging between 2.0 and 3.0 on the Richter scale. There is no documented evidence of structural damage in the county. Hancock, Sandusky, and Seneca Counties, which border Wood County on the east and south, have all reported some minor earthquake activity. Like the Wood County incidents, these occurrences have all been low in magnitude and caused no structural damage.

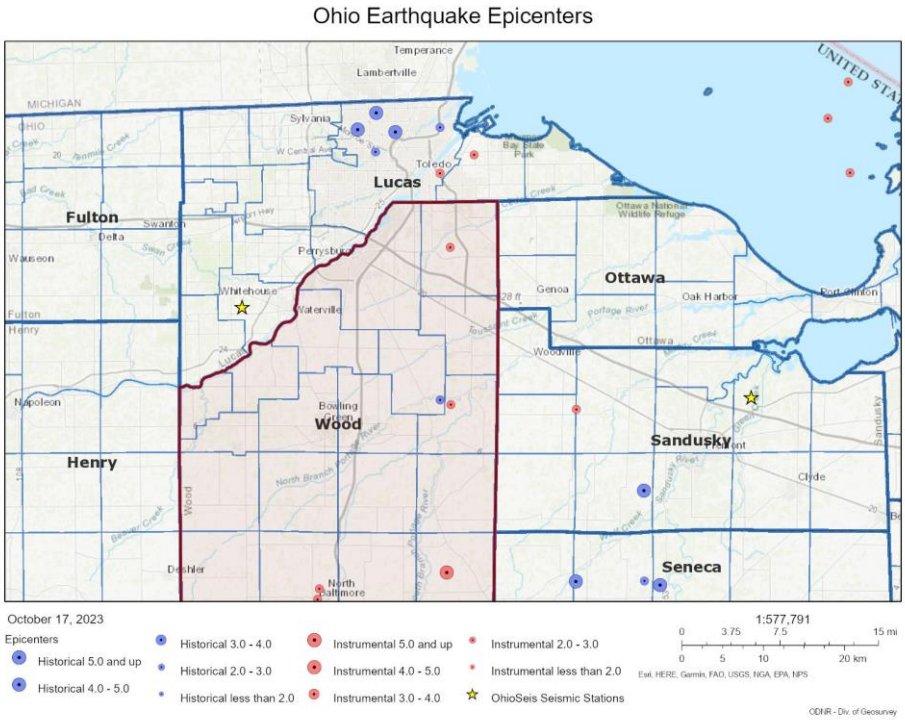
Table 2-23: Wood County Earthquake History

Date	Location	Magnitude	Modified Mercalli
09/29/1974	Perry Township	3.0	III
07/04/1992	Henry Township	2.0	III
07/14/1992	North Baltimore	2.0	III

10/04/1992	Webster Township	2.5	III
11/9/1993	Freedom Township	2.0	III
5/20/23	Walbridge	2.6	III

The following map provides locations for the incidents in table 2-21, according to ODNR records. Wood County is shaded in pink, and the red dot in the upper right corner indicates the Lake Township/Walbridge earthquake.

Map 2-9: Wood County Earthquake Epicenters



No damage was reported from the most recent Lake Township earthquake in May 2023. Wood County EMA staff actually felt the rumbling, but had no damage on their properties. Other participants agreed that there was no damage, and some did not feel the rumbling.

The strongest earthquake recorded in Ohio occurred in Shelby County, south of Wood County, in 1937 and was estimated to have a magnitude of 5.5 on the Richter Scale. This incident caused some damage in Anna and surrounding west central Ohio communities. The same area in Ohio also reported earthquake activity in 1875 and 1884. Residents in Anna also reported minor quakes in 1930 and 1931. The Pomeroy area, southeast of Columbus, experienced an earthquake in 1926. All of these earthquakes caused only minor damage, primarily shaking buildings, crumbling mortar with limited or no property damage. Impacts were only felt locally; no statewide damages were reported.

2.2.4 Flood

According to the National Weather Service, a flood is defined as an overflow of water onto typically dry land. The inundation of a normally dry area is caused by rising water from a nearby

waterway, such as a river, stream, or drainage ditch. Flooding generally occurs subsequent to a meteorological event such as substantial precipitation, rapid snowmelt, or extreme wind events along coastal waterways. This type of flooding, also known as riverine flooding can last days or weeks.

Pluvial (surface water) flooding is caused by over-saturated ground or overwhelmed drainage systems where the excess water has nowhere to go. It is caused by rapid or sustained rainfall. This can be surface flooding, flash flooding, or areal flooding.

Surface flooding occurs when rainfall is too fast or too intense for drainage systems to carry the water away as fast as it falls. The drainage system can be natural, gravitational fall to a waterway, or it can be made up of a system of pipes, catch basins, pumps and other components that route the water away from structures, homes, roads and so forth. In either case, the rain amount exceeds the system capacity, and water is unable to get away.

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

Areal flooding is similar to flash flooding, but occurs over a prolonged period of persistent continual rain, and occurs after several hours, not minutes, of the downpour. Areal flooding does not have the force behind it that flash flooding has. According to NOAA, areal flooding occurs more than six hours after rainfall. The ponding takes several hours to develop as water drains into low-lying flood prone areas. Areal flooding may cover a very large area, and might include fields, low-lying land along rivers or ditches, and other flood-prone areas. It may take days for areal flooding to subside. It comes gradually, and it leaves the same way.

Riverine flooding (also called fluvial flooding) happens when waterways are filled beyond capacity by rain and runoff from upstream land, and the waterway goes out of its banks to hold this water. The water generally runs very fast and rescues from this type flooding are very dangerous and deadly. This flooding takes debris, sediment, and objects with it as the force of water is at its fullest. Ice can begin to break up when temperatures thaw, and previously ice-covered waterways can jam, causing back flooding until the blockage suddenly releases. A heavy and powerful burst of water is sent downstream, turning debris into underwater projectiles and pulling objects into the deadly downstream gush.

As flooding dissipates and drains, low-lying areas of land will drain last. In a county like Wood where the terrain is almost completely flat, this later stage of standing water is common. Fields that are tiled with drainage systems will allow the water to percolate through the soils and reach the tiles that direct the water to ditches and streams. The tiles allow the water to drain

from the surface relatively quickly, but upon reaching the underground tiles, ditches and streams, is dependent upon the flow of the waterway to take the water away. Some tiling systems have valves that provide some control of the flow, and others are simply controlled through the pressure of draining water.

Another type of common flooding is associated with stormwater sewer systems. When constructed drainage systems are overwhelmed and cannot carry the load of rainwater away, sewer system/drainage system back-up flooding can occur. In these cases, water inside homes, in streets and yards, and in buildings stands still until the system catches up. In some cases, stormwater may back up into the homes because of flow within the drainage system and the inability to drain further downstream. Constructed drainage systems can back up for reasons not associated with drainage, and therefore, this kind of flooding can occur with or without rainfall.

Floods are the most common and costly disaster, resulting in significant loss of life and property. They have a substantial impact on infrastructure, including roadway breeches, bridge washouts, roadway wash away, and water-covered roadways. Fast-moving floodwater can wash away the surface and sub-surface of roads, creating holes, ruts, and other problems for vehicles. Floodwater that is one foot deep is strong enough to carry vehicles away, often with occupants inside. 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 be a temporary stopgap measure but, if floodwaters do not recede quickly, the force of the water will move through the sandbags and enter the structure.

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

Flood Risk Assessment

Historically, flooding has been a significant risk for Wood County. Because of the number of rivers, streams, and ditches that flow through flat, poorly drained terrain, flash and riverine flooding is a countywide hazard and can affect nearly all jurisdictions. Some of the small communities do not have storm sewer systems, so drainage is completely dependent upon gravitational water movement which is slow and ineffective, leaving ponded water and puddles for several days. The entire county is flat; therefore, farm fields naturally have standing water after rainfall that damages the crops and reduces yields. Many of the rural roads have road ditches where surface flooding drains, but those roads that do not have these are vulnerable to

flooding. All of the roads are vulnerable to berm damage and degradation of the pavement due to standing and rushing water.
Riverine flooding is a risk for the entire county. While there are only two major rivers, the Maumee and the Portage, there are many tributaries that include major ditches and streams. These ditches and streams can be of significant size and carry large amounts of water. There are also man-made road ditches that were created when the Great Black Swamp was drained and converted to productive farmland. These ditches receive runoff form both the fields and the roads, protecting crops and facilitating a usable road through the countryside. Road ditches tend to be deep with slightly steep banks. All of these waterways can reach capacity and flood the area around them, closing roads and making properties inaccessible.

There are highly traveled roadways along both the Portage and Maumee Rivers, as well as alongside many of the larger ditches. These roads do occasionally flood and some closures occur. Some secondary roads flood after heavy rain, limiting access to homes and farmsteads as well as businesses and institutions. Some of the state and federal highways will temporarily flood over after heavy rapid rain, and cause difficulty in vehicle control, and sometimes access problems.

Because the county is at the bottom of the Maumee Watershed, it receives runoff from many counties upstream. This will cause the waterways to leave their banks temporarily while the water drains. The Maumee River is very wide and very deep in Wood County, and has a huge expansion capacity. Major flooding is not common, and when flooding occurs, it drains quickly.

Farmland in Wood County is most often tiled because of the extremely flat terrain. Field tiling allows surface water to drain into the soils quickly because of two factors: first, the soils are loamy sandy soils that drain quickly; second, the tile creates an open space for the water and enables the water to percolate down through the soils into the tiles. Once in the tiles, the water moves through pressure of the standing water above it, and gravitational pull to the nearest waterways. If there is extensive water on the surface, the drainage flows faster. Some drainage tiles have valves to control the flow, but many do not. These drainage systems facilitate the flow of surface water off the fields and into the ditches and rivers.

Flash flooding is a risk for Wood County because the land is so flat and rapid or heavy precipitation often cannot drain as quickly as it falls. The flat terrain prevents water from draining quickly, increasing the potential for flash flooding when water collects in low-lying areas. In jurisdictions with storm sewers, these systems often cannot keep pace with rapid rainfall because of their sizing. Depending on the specific conditions at the time of the rain event, including 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. Storm water backup can occur in basements and homes. While this type of flooding is generally short in duration, it can be very damaging to property and infrastructure.

Flood damage in Wood 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.

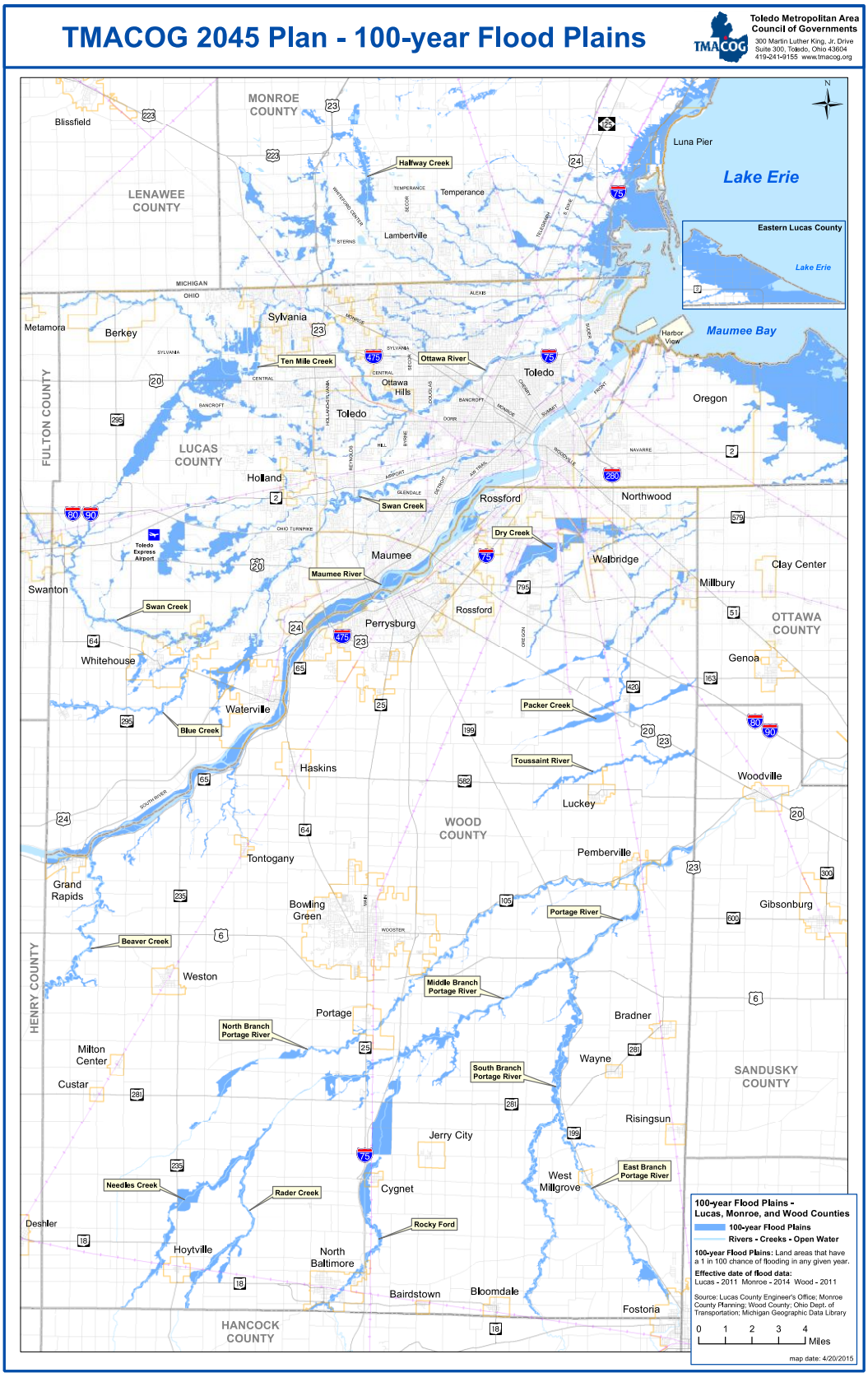
Table 2-24: NRI Riverine Flooding Exposure Values

TOTAL	Building Value	Population Equivalence	Population	Agriculture Value
$26,174,413,767	$545,810,789	$26,622,240,248	2,209	$6,362,731

Floodplain Mapping and National Flood Insurance Program

Wood County's flood maps were updated as part of the Map Modernization program beginning in Fiscal Year 2008. The initial scoping meeting was conducted on June 4, 2008. Revised maps became effective on September 2, 2011. Map 2-10 identifies the areas of Wood County that are included in the 100-year floodplain. There have been no changes in the past five years.

Map 2-10: Wood County Floodplain Areas



The table below provides information on participation in the National Flood Insurance Program for communities in Wood County according to the FEMA Community Status Book Report for Ohio. The communities in table 2-23 participate in NFIP and are considered to be in good standing with the program.

Table 2-25: NFIP Participating Communities

Community	Initial FHBM Identified	Initial FIRM Identified	Current Map Effective Date	Reg-Emer Date
Wood County	02/17/1978	01/05/1984	09/02/2011	01/05/1984
Bowling Green	08/15/1975	09/02/2011	09/02/2011	03/19/1984
Cygnet	05/10/1974	08/02/1982	09/02/2011	08/02/1982
Grand Rapids	03/01/1974	05/02/1983	09/02/2011	05/02/1983
Millbury	03/01/1974	05/02/1983	09/02/2011	05/02/1983
North Baltimore	02/08/1974	09/02/1982	09/02/2011	09/02/1982
Pemberville	10/18/1974	08/02/1982	09/02/2011	08/02/1982
Perrysburg	03/22/1974	05/02/1983	09/02/2011	05/02/1983
Portage	04/18/1975	04/04/1982	09/02/2011	04/15/1982
Rossford	03/10/1974	05/02/1983	09/02/2011	05/02/1983
Walbridge	12/13/1974	10/18/1983	09/02/2011	10/18/1983

The communities in table 2-24 do not participate in NFIP and are currently under sanction by the program.

Table 2-26: NFIP Sanctioned Communities

Community	Initial FHBM Identified	Initial FIRM Identified	Current Map Effective Date	Sanction Date
Luckey	--	09/02/2011	09/02/2011	09/02/2012
Hoytville	--	09/02/2011	09/02/2011	09/02/2012
Northwood	07/25/1975	09/02/2011	09/02/2011	09/02/1982
Tontogany	04/18/1975	09/02/2011	09/02/2011	04/18/1976
West Millgrove	--	09/02/2011	09/02/2011	09/02/2012

Because they do not have any identified flood hazard areas, the following communities do not currently participate in NFIP:

- Bairdstown
- Bloomdale
- Bradner
- Custar
- Haskins
- Jerry City
- Milton Center
- Risingsun
- Wayne
- Weston

Repetitive and Severe Repetitive Loss Structures

Within Wood County, some structures have suffered from repeated flood losses. These structures are identified as repetitive loss properties. Repetitive loss properties are insurable buildings for which two or more claims of at least $1,000 in loss were paid by the National Flood Insurance (NFIP) program during any rolling ten-year period. The table below identifies the jurisdictions that have known repetitive loss properties. There are no known severe repetitive loss structures in the county at this time.

Table 2-27: Repetitive Loss Properties

Community	Properties	Losses	Building Type	Average Payments	Total Payments	SRL
Wood County (unincorporated)	1	4	OTHER NONRES	$6,638.17	$26,552.67	No
Wood County (unincorporated)	5	12	SINGLE FMLY	$22,605.60	$59,697.37	No
Bowling Green	1	2	SINGLE FMLY	$9,112,76	$18,225.51	No
Grand Rapids	1	4	SINGLE FMLY	$7,534.82	$30,139.29	No
Grand Rapids	2	5	2-4 FMLY	$52,077.74	$142,162.08	No
Grand Rapids	2	5	BUSI-NONRES	$25,243.75	$56,114.01	No
Grand Rapids	5	11	OTHER NONRES	$8,636.82	$17,273.64	No
Millbury	1	2	SINGLE FMLY	$3,904.17	$17.273.64	No
Northwood	1	2	SINGLE FMLY	$6,147.50	$12,295.00	No
Pemberville	1	4	SINGLE FMLY	$24,743.46	$98,973.82	Yes
Pemberville	6	15	SINGLE FMLY	$72,754.09	$162,222,47	No
Grand Total	**26**	**66**			**$722,367.09**	

Additional repetitive loss and/or severe repetitive loss structures may still exist in Wood County. As floodplain maps are updated, new or currently unidentified structures may fall within updated floodplain boundaries in the future.

Local Risk Assessment

Flooding is a countywide risk. In some areas, development has enhanced and/or diminished the risk of property damage due to flooding. Several types of flooding occur, including riverine, flash, areal flooding, and sewer back up. Most stakeholders felt that rain is coming faster and in greater quantities now than the past, and that flooding is more of a risk now than it has been in the past. They recognized that when soils are saturated from prolonged or heavy rain, or from snowmelt in the spring, the risk of flooding increases. Areal flooding can render farmland untillable for some period of time, and can prevent use of public lands and private property until the water drains. When flooding occurs in heavy rain, the rapid runoff takes topsoil with it, causing flood-related erosion in many areas. Ditch banks are particularly vulnerable to surface runoff erosion. In some areas to the north, they felt that northeast winds that push the water back into the Portage River watershed feel those effects as far to the southwest as Wood County. Dumping of refuse into ditches is a problem that makes the ditches flow slower and less effectively, leading to flooding. Even though the municipalities have completed

improvements to their storm sewers, there are specific locations where rapid and heavy rainfall are still too much for the systems to handle, and water floods yards and lower floors of homes. They said that a constant power supply is important to run pumps to remove water from low-lying areas, or to fuel generators that keep sump pumps in basements running when power is interrupted.

Local Flood History

In Wood County's history, the county has experienced 21 floods and 15 flash floods since 1950., per NCDC records. Property damage from these incidents has totaled nearly $4,700,000 and crop loss has exceeded $95,000.

Table 2-28: Wood County Flood History

Hazard	Incidents	Property Loss	Crop Loss	Deaths	Injuries
Flood	21	$3.147M	$225K	0	0
Flash Flood	15	$1.645M	$20K	0	0

The most significant flood in Wood County's history occurred January 4, 2005. Heavy rain and snowmelt caused extensive flooding along the Maumee and Portage Rivers. In Grand Rapids, flood water damaged at least 21 businesses and dozens of homes. In Pemberville, rising water from the Portage River also caused extensive damages to residential and business properties. Hundreds of homes also experienced basement and nuisance type flooding, although the damage was not extensive enough to destroy the properties. Property losses for this event totaled $2,100,000.

On June 21, 2006, Wood County experienced a significant flash flood event when strong thunderstorms caused extremely heavy precipitation in the early evening. Wood County's northern townships and municipalities suffered the worst damage from this event. Haskins measured 4.0 inches of rainfall in a two-hour period; in Perrysburg and North Baltimore, totals were 2.5 inches for the same time period. Significant flooding of streets and low-lying areas was reported across the northern part of the county. In Bowling Green, basement and nuisance flooding was reported. Bowling Green State University reported at least three buildings with flood damage. Reported property damages for this event totaled $750,000.

In the past five years, the most significant event occurred on June 2, 2019 when heavy rain fell and the Latcha area in central eastern Wood County received over 4 inches of rain in one day. Some roads were closed and 10-15 homes in Pemberville were impacted. There was $75K in property damage, and $100K in crop damage.

2.2.5 Hazardous Materials Incident

A hazardous materials spill or release occurs when a hazardous substance breaches its container, such as a barrel or tank, or distribution device, such as a pipeline. The release can occur during operations at a fixed facility or during transportation of the substance, which can occur via ground or rail transport or through pipelines that are buried beneath the ground. Hazardous substances are stored in numerous types of containers, including drums, cans, jars,

pipes, and other vessels. Some releases are incidental and can be safely cleaned up by on-site facility personnel. An incidental release does not threaten the health or safety of the immediate area or community because the spill involves only a small quantity. If the release involves a larger quantity than can be handled by facility personnel and requires action by first responders or agencies outside of the spiller's facility, the incident is considered an emergency response. To protect the community, evacuation from the facility or area surrounding the spill may be necessary. In the case of pipeline emergencies, the owner of the pipeline must be involved in the response from the initial call to provide not only information about the substance, but also to manage the pipeline and equipment necessary to control the incident.

Hazardous materials incidents can also occur when a pipeline leaks, is breached, or is damaged due to any external force or material failure of the pipeline. The equipment used to distribute the liquid or gas through the pipeline, to release the substance into a holding tank of some sort for transfer to vehicles or other lines for distribution, or transfer areas where substances are maneuvered through pipelines all post a risk of accidental release. The substances inside the underground pipelines include natural gas, petroleum products, and other hazardous liquids. The substances that are carried through buried pipelines have the same range of characteristics as those carried in tankers, railroad cars, or airplanes.

Pipeline compressor stations can suffer "blowback" and release hazardous substances into the environment. Compressor stations compress the gas to a specified pressure and facilitate movement of the gas along the pipeline. Compressor stations include scrubbers, strainers, and filter separators to remove the liquids, dirt, particles and impurities from the natural gas. They may also have cooling systems or mufflers to decrease the sound emitted by the compressors. In a "blowdown", it has been reported that methane, benzene, toluene, sulfuric oxide, and formaldehyde can be released into the air. These compressor stations are monitored.

Every hazardous substance is unique and can have toxic, flammable, explosive, and/or corrosive properties. Each material is assigned a class based on these properties; hazardous materials classifications are described in table 2-27 below. When a hazardous substance is released into the environment, it can negatively impact the safety and health of the community by contaminating the air, water, and/or ground.

Table 2-29: 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

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

Injuries from exposure to hazardous substances can involve direct contact with the substance and traumatic injuries from explosions or fires. Most hazardous materials releases involve the breech of a container or the unintended combining 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.

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

Hazardous Materials Incident Risk Assessment

Wood County has significant risk for hazardous materials incidents. The county is home to approximately 150 facilities that manufacture, utilize, and/or store hazardous substances. These substances are transported on Wood County's diverse transportation system, which includes 188 miles of railroad tracks, multiple railyard facilities, and nearly 2,000 miles of roadways carrying thousands of rail cars and vehicles. Heavily populated jurisdictions along these highways and railroads are particularly vulnerable to hazardous materials incidents because of their proximity to the major transportation routes on which these substances are carried. Because of this, hazardous materials incidents are a countywide hazard and can affect all areas and jurisdictions.

Stakeholders reported that the number of placarded trucks seems to be increasing, especially on the secondary state highways. They noted in particular more tanker trucks. Some responders noted that many of the drivers do not speak English, and the wide variety of languages makes it very difficult to communicate effectively during an emergency. Many of the non-English speaking drivers seem to not understand the travel directions they have been given, and end up off-route more than before; this contributes to accidents and delayed containment of an incident. They felt this also contributes to drivers ending up in areas where their trucks are not supposed to travel, and a resulting violation of load limits and other travel

restrictions for hazardous materials. In general, they felt that the excessive amount of construction on state and federal highways and the multiple detours a driver encounters lead to the use of local roads for heavy hazmat trucks that is not appropriate or safe. They felt that GPS does not always route trucks properly and the drivers do not seem to question these directions like they should. The increased amount of manure hauling and application onto fields is a problem in the southern end of the county.

Educational institutions in the county reported feeling vulnerable to hazardous materials accidents and incidents. Penta County and several of the public schools are located in proximity to highways that have high numbers of hazardous materials shipments. Some are located nearby logistics and hauling companies, and see constant placarded traffic near their schools. Other districts have bus routes that include highways most frequently used by hazardous materials haulers. North Baltimore is very close to the intermodal rail yard where a multiplicity of substances passes through. They are vulnerable to the rail blockages that occur with trains converging on the rail yards in Walbridge, and recognize the possibility of a derailment that would involve hazmat near their school or their buses filled with students.

Hazardous materials vulnerability is making the need for well trained and capable firefighters, emergency medical technicians and hazmat personnel increase at the same time that personnel to staff these positions is at an all-time low. The need for adequately staffed, well trained and fully equipped responders has never been higher than it is now, significantly due to incidents that involve the release of hazardous materials. Some responders said there is also a lack of functional knowledge and application of incident command by responders at hazardous materials incidents, which leads to misunderstandings and effective scene management. As the distribution and hauling of dangerous substances increases, this problem will increase too.

Wood County LEPC completed a commodity study in 2020 to determine what chemicals were being hauled on the highways, rails and airports in the county with the purpose of using this information for first responder training and equipment purchases. The study, in general, found the highest number of trucks on I-75 and the Ohio Turnpike, but a significant presence of hazardous materials haulers on other highways as well. Ninety-nine chemicals were identified through observation, including all classifications of hazardous substances except Class 7 Radioactive. The top ten chemicals included flammable liquids and gases, cryogenic gases, corrosives, poisons and toxic liquids.

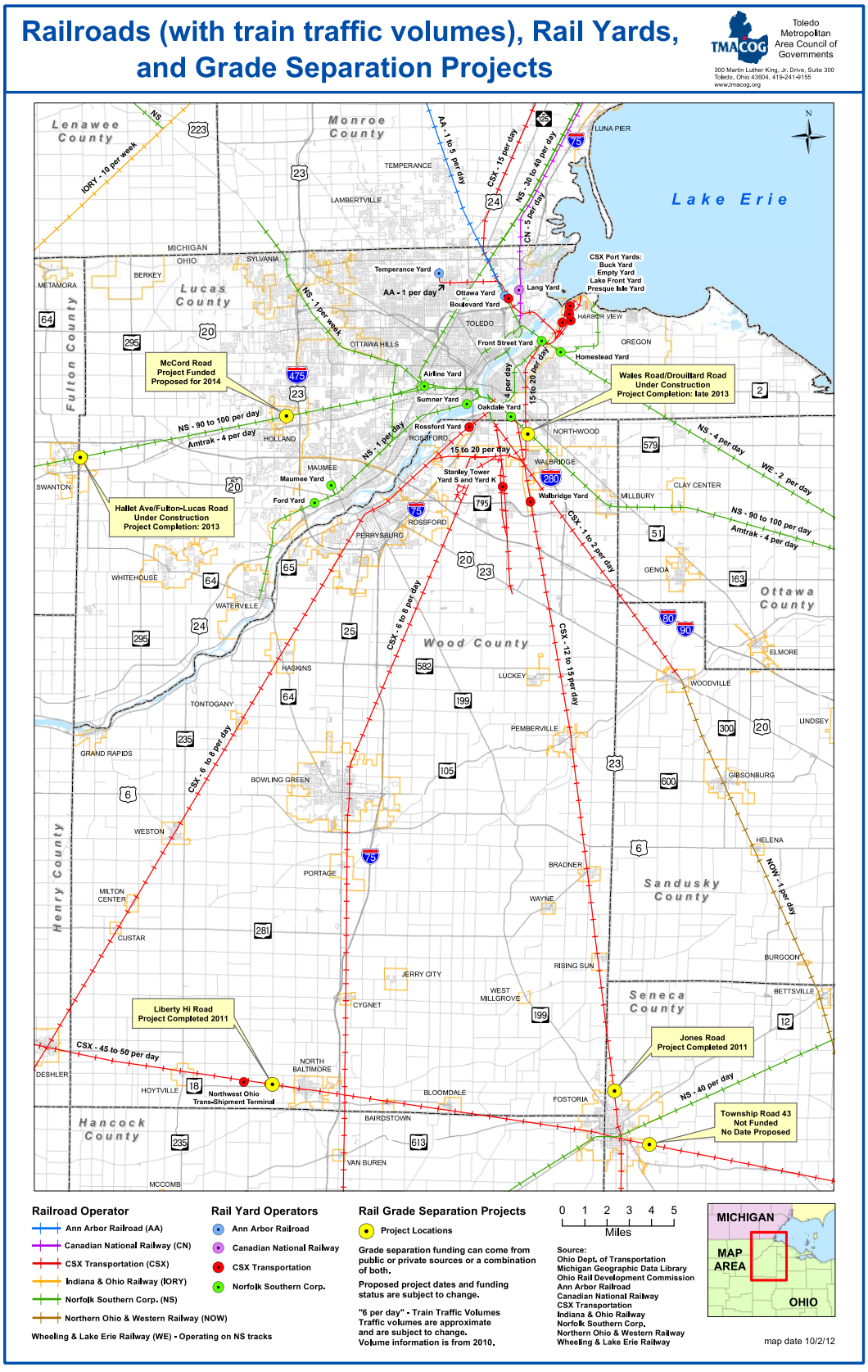
Various pipelines cross many areas of the county. Lines transmitting natural gas follow I74 on its east side from North Baltimore to Perrysburg; two other long gas lines cross the middle of the county east to west, Passing north of Pemberville into Perrysburg and another from SR 582 at SR 23 to the slight northwest into Perrysburg. Shorter lines cut through Risingsun, Wayne, and Bradner on the eastern border with Sandusky County. A gas line follows line south of Millbury to the northwest, and it transects Northwood. Yet another pipeline carries gas from east of West Millgrove to near Custar. Hazardous liquid lines go from North Baltimore to the northeast, passing through Northwood to refineries in Toledo. A line follows the eastern Wood County line and passes through Risingsun, Pemberville, past Luckey, through Millbury and on to

Lucas County refineries. A hazardous liquid line follows the south side of I-75 as it comes from Toledo refineries, and passes through Northwood, Walbridge, and Perrysburg Township. Another line transects the county from a point in Luckey to a point in Perrysburg

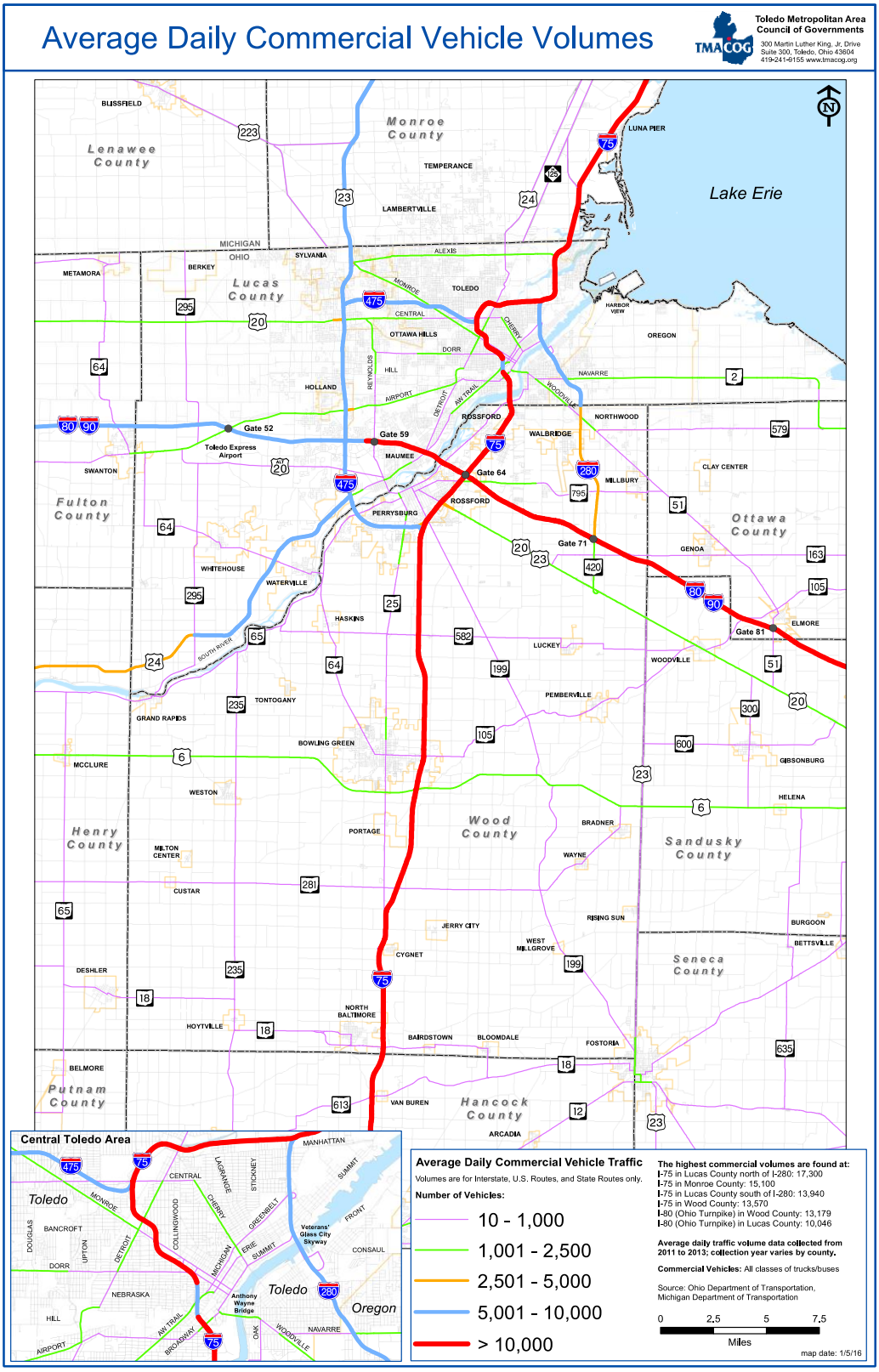
More pipelines are being buried in Wood County every day. The Rover Pipeline project is currently underway and a gas line is transecting the county north of SR 6 and south of US 20 is nearing completion. The Nexus pipeline is coming in on the far southeast corner of the county and moving northwest across the county through Milton Township, and is nearing completion as well.

Map 2-11: Wood County Pipelines

Map 2-12: Wood County Railroads



Map 2-13: Commercial Traffic on Wood County Highways



Local Hazardous Materials Incident History

According to records maintained by the Wood County Local Emergency Planning Committee, Wood County has experienced approximately 443 hazardous materials spills since 1999. These incidents involve vehicle accidents on the many roads or highways in the county, equipment failure in operation or during distribution of a chemical (such as agricultural application of chemicals), industrial spills during manufacturing, failure of containers to effectively hold the substance, or accidental mishandling of a hazardous substance.

Table 2-30: Wood County Haz-Mat Incident History

Year	Number of Incidents
Prior to 2003	103
2003 - 2007	51
2005	No Records
2008 - 2012	108
2013 - 2018	197
2019 - 2023	123

Wood County has experienced several significant hazardous materials incidents. One of the more notable incidents occurred on October 16, 2014. A tanker truck hauling ammonia collided with a truck and trailer on State Route 281. The tanker truck overturned, spilling ammonia into a nearby field and waterway. Response agencies included two fire departments, Wood County Highway Garage, Wood County EMA, Ohio Department of Transportation, Ohio EPA, and Ohio State Highway Patrol. The spill was cleaned up according to standard procedures and no long-term effects were noted.

On April 24, 2009, a major underground propane leak occurred. This incident involved response agencies from Middleton Township, Troy Township, and Wood County. Several residences were evacuated as a result of the leak; evacuees were housed in a local hotel for several days while the leak was repaired. In 2008, a pipeline carrying crude oil leaked into the Rocky Ford River.

The United States Pipeline and Hazardous Materials Safety Administration maintains a database of facility and highway hazardous materials incidents. This database is not necessarily consistent with the LEPC statistics because different criteria is used for reporting. The PHMSA database includes spills and releases that occur in shipping terminals, warehouses, and other facilities that handle hazardous materials. For most of these incidents, the spill is small and is managed by in-house materials handers, especially when the incident occurs in a warehouse, distribution center or shipping facility. It includes major incidents as well as minor ones where a gallon of paint was dropped and spilled, a forklift punctured a barrel, or a truck driver dropped a package and contents were released. The database includes car leaks that are discovered in rail switching yards as well as incidents in-transit.

The PHMSA reporting system lists 733 highway incidents for Wood County from 2013 through July 2023. A great majority of these occurred in Perrysburg, Bowling Green or Northwood at

logistics terminals. There were a few actual highway incidents that are reflected in Wood County LEPC data. One incident occurred in Custar, one in Walbridge and one in Bradner; these were highway incidents that involved tractor-trailer malfunction. There were four incidents where air-bound packages were dropped, punctured or registered incorrectly in Northwood at the shipping terminal. There were four incidents at CSX in Walbridge where rail cars were found to be leaking when being inspected in their switching yards.

In 2018 as the NEXUS Pipeline Project installed pipelines, 20,000 gallons of drilling fluid ended up in a waterway connected to the Maumee River. This occurred near Haskins on Findlay Road. NEXUS identified the substance as bentonite, a naturally occurring clay that is non-toxic. There were two significant pipeline incidents in 2022. In April, a gasoline pipeline released produce in Troy Township off Genoa Road. This was discovered by the pipeline operator, they shut down the line, and cleaned up the site. Private wells were monitored afterward and no contamination was found. There were no other identified impacts upon inspection and incident management by local authorities with assistance from the Ohio EPA, U.S. EPA, ODNR and USDA.

Wood County LEPC has 106 highway incidents on record from 2019 through 2023 that involved spills and releases on highways and state routes. There were five CSX Transportation rail incidents in that time frame, involving diesel fuel in four of those, and a seven-car derailment within railroad property that did not list specific chemicals being spilled. Mineral oil spills due to blown transformers owned by an electric company property numbered eight in the five-year span, and there were four pipeline releases in that time. The pipeline incidents involved crude oil and gasoline.

2.2.6 Invasive Species

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

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

Invasive terrestrial wildlife is much less common than other types of invasive species but can still cause significant damage to natural habitats. Aquatic invasive species are plants and animals that impact the quality of waterways. These can affect large bodies of water, such as Lake Erie and the Ohio River, and much smaller rivers, lakes, and streams. Invasive insects and diseases are insects, fungus, and other small organisms that can negatively impact plants, forests, and the health of wildlife. Table 2-29 identifies the invasive species across these categories that have the greatest impact in Ohio.

Table 2-31: Invasive Species in Ohio

Aquatic	Insects and Diseases	Plants, Weeds & Shrubs	Terrestrial Wildlife
Asian Carp	Asian Longhorned Beetle	Japanese Honeysuckle	Feral Pig
Curlyleaf Pondweek	Emerald Ash Borer	Japanese Knotweed	Unwanted/Exotic Pets
Hydrillia	Gypsy Moth	Autumn Olive	
Round Goby	Hemlock Wooly Adelgid	Buckthorns	
Ruffe	(HWA)	Purple Loosestrife	
Red Swamp Crayfish	Walnut Twig Beetle	Common Reed or	
Sea Lamprey	Spotted Lanternfly	Phragmites	
White Perch		Reed Canary Grass	
Zebra Mussel		Garlic Mustard	
		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	
		Marestail	
		Mile-a-Minute	
		Musk Thistle	
		Oxeye Daisy	
		Palmer Amaranth	
		Poison Hemlock	
		Russian Thistle	
		Shattercane	
		Wild Carrot	
		Wild Parsnip	
		Poison Ivy	

Invasive Species Risk Assessment

As part of the Great Black Swamp region, Wood County has many wooded areas and large numbers of trees along with extremely flat terrain. These wooded areas are vulnerable to damage from invasive species. The county's 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.

Local Invasive Species History

The most recent invasive species to impact Wood County 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.

Wood County stakeholders reported 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 in Wood County when the cars sit waiting to be unloaded, or the infested cargo is shipped to receiving parties.

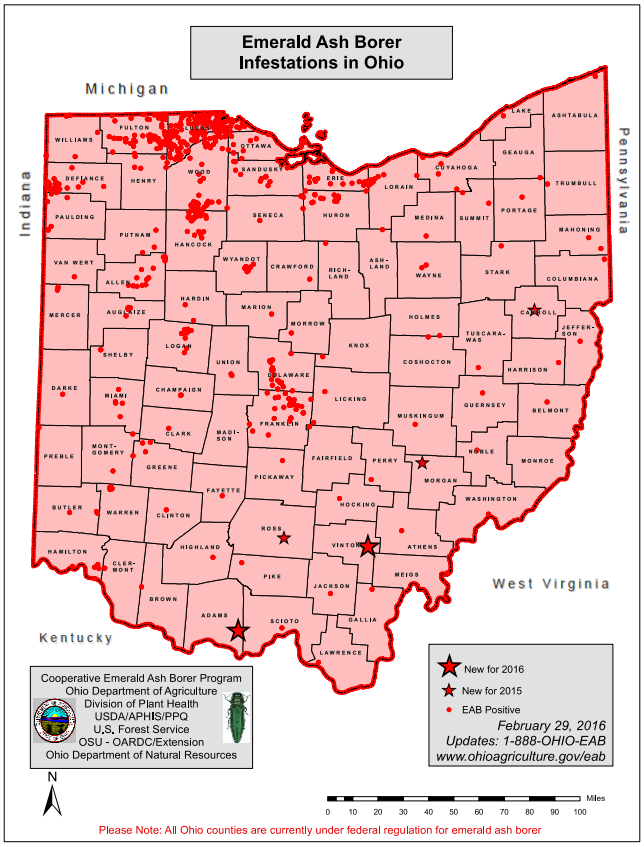
Wood County and all of its jurisdictions have experienced significant effects from the EAB infestation. As diseased trees along rivers and streams have died, they have fallen into waterways, impacting drainage and the flow of water. Although many of these have been removed, many remain and continue to 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. The Wood County Engineer and municipal street and road departments have aggressively removed diseased trees along the public right-of-way. A significant effort to clear dead trees from the Portage River north of Pemberville was completed almost five years ago, and that removed many dead trees that were obstructing flow. 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 big 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. Ferel 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 wet, hot environments. These changes will exacerbate invasive species problems. If the food supply for predator or nuisance wildlife further limits their food supply, the problems with 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 northwest Ohio may migrate into the area, adding to this problem in an area that is developing and growing considerably. The problem of invasive species could take on a new importance as residential areas develop along waterways and recreational areas are created to serve younger people who choose to live in multi-family housing and use parks for all recreation.

Map 2-13: Emerald Ash Borer Infestation Map



2.2.7 Landslide/Mudslide

A landslide is defined as the downward and outward movement of soil and rock material on slopes. Landslides can be caused by steep slopes, jointed rocks that allow moisture to penetrate and weaken the rock, find-grained permeable rock that is conducive to moisture that reduces the bonding strength of the grains, groundwater penetration of clay or shale, or excessive amounts of water from rainfall or snowmelt that saturates the ground. For a landslide to occur, there must be a triggering mechanism to trigger the downslope movement. Triggers can include vibrations, over-steepened slopes caused by undercutting streams or wave erosion, increased weight on a slope, or removal of vegetation and trees.

Landslide/Mudslide Risk Assessment – limited to the City of Perrysburg and several townships

In Wood County, the area at risk for landslide is limited to steepened slopes areas along the Maumee River. The shoreline is significantly higher than the river in these areas. As the river passes through, the stream can undercut the bank, causing erosion and weakening of the bank. Some homes have been built along the riverfront; in an extreme case, the land could erode to the point that the structure is at risk. This has not occurred to-date, nor is this an anticipated risk. However, there have been anecdotal reports of property loss along shorelines where the waterway undercuts the land on outside curves. Due to the depth of the Maumee River, this damage is guesstimated to be low. It is believed to all be private land covered by private landowners' insurance.

Some areas of the county have roads with steep ditches on one or both sides to facilitate drainage. Oftentimes these are ditches modified through engineering to help with flooding issues. When the rain is heavy and large trucks get off into the berm, this causes the embankment to break down and erode away very quickly. When heavy rain continues, this degradation of the embankment can become severe. Some roads have eroded this way for years and are to the point where the erosion is at the edge of the pavement. These roads can become unstable in a single heavy rain incident.

Along the Maumee River, there are places where the embankment is eroding and dirt is falling into the river. This is generally on an outer curve where rapidly moving water erodes away the embankment on the outside, and once the foundational land is gone, the soils above it will collapse. This can grow over the years unnoticed in locations of steep, vegetation covered riverbanks. Since the dirt on the top is the last to show obvious signs of erosion, this can surprise landowners and become a critical situation. Slowing the velocity of these waterways would lessen the problem.

Outside of these specific river bank areas, Wood County does not have risk for landslide because of its very flat elevation.

Local Landslide/Mudslide History
Wood County has no documented occurrences of landslide. The State of Ohio estimates Wood County's loss potential to be $1,163,085.

2.2.8 Power Failure

A 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. 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 or more, however, can cause major disruption and harm to a community.

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 Failure Risk Assessment
Power failures do not generally cause significant structural damage. Fires caused by downed transmission lines present the greatest risk for structural damage. The most common and significant loss relates to the hardship and discomfort inflicted on the population and potential impact on the local economy. When power systems fail, people with special needs, including

children, the elderly, and those with serious medical conditions, suffer the most. These groups often rely on electricity more than others and have less ability to adapt or access alternate power sources. The economic effects of a power outage can also be severe. If an outage lasts only a few hours, businesses may have to close. The economic impact of a short-term closure of a few hours is damaging to businesses but most can absorb this. If, however, the power outage lasts several days or longer, the economic impact can quickly become catastrophic. If businesses are forced to close for days or weeks, they lose significant revenue. Employees at these establishments are unable to work and lose wages, further impacting the local economy. Businesses may also experience significant loss in products or materials they keep in stock. This is especially true for food service businesses. Restaurants, grocery stores, and others that sell food products must dispose of any products that were not maintained at appropriate temperatures. If farms that produce milk, eggs, and other agricultural products are not able to function on their normal schedule, some of those products may also require disposal. Over a multi-day power outage, this can result in thousands of dollars in economic loss. Power failure is a countywide hazard that can affect all jurisdictions and areas of Wood County.

Local Power Failure History

Wood County has not experienced many extended power outages. Some jurisdictions experience brief interruptions to their local electric service; these incidents are infrequent and rarely last more than an hour or two. During the last five years, there have been outages that affected a few thousand customers for a few hours, but no outages that lasted for lengthy periods of time have been reported. Walbridge is experiencing outages that have not been explained at the time this plan was written; work is continuing to determine the cause.

While more jurisdictions have generators than five years ago, there is still a significant vulnerability to power outages. Most jurisdictions need to at least add to their generator pool to be able to function well during an extended outage. 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.

Many areas in Wood 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. BGSU stated that they have generator capacity for only four hours, and after that would be required to completely shut down. Pemberville's provider plant is in need of updates

The 2003 Northeast Blackout is one of the most significant power failures to impact Ohio that was not the direct result of a natural disaster. On August 14, 2003, a series of electrical generation facility failures in Michigan, Ohio, and throughout the northeast region of the United States caused massive power outages throughout the entire region and stretching into Canada. Across Ohio, more than 500,000 people lost power. In Wood County, the direct impact was minimal and short term. This incident, however, demonstrated the frailty of the nation's electrical grid and prompted local officials to discuss the need for alternate and backup power sources.

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

Severe Thunderstorm Risk Assessment

Wood County experiences many thunderstorm events each year. During the spring and summer when heat builds in the afternoon hours, a muggy and hot day can easily end with thunderstorms that include hail, lightning, heavy rain and wind. Microbursts often add strong straight-line winds that destroy standing crops ready for harvest. These storms can come on quickly, give little warning, and be very destructive. The majority of these events include 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. 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.

Thunderstorms that include hail are generally spotty and inconsistent. Stakeholders felt there is less hail now than in years past. The varying temperatures in the atmosphere needed to create hail do not occur frequently. When hail does fall, it can damage vehicles, roofs, and siding. Injuries or loss of life are rare. The winds associated with thunderstorms 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 this point and beyond, when stalks are mature, hail and wind can shred and tear the leaves, flatten the stalks, and destroy the ears. This situation can drastically reduce crop yields, causing significant or even extreme loss to farmers for that year's crop. Stakeholders felt that the wind associated with severe storms is worse than it used to be, and some felt it is extremely more dangerous now than in the past. They felt that damages to roofs, trees and signs are damaged by winds now more than in the past.

Stakeholders felt that spring months are wetter than in the past, and this causes difficulty for farmers to plant their crops. The saturated soils during times of extended rain are unable to support power poles, and they see more of them go down now than in the past. They noted longer dry periods and longer wet periods, with more extreme consequences to manage regardless of the hazard.

Some communities feel vulnerable to severe storms because they don't have adequate shelters and places of refuge. Homeless and disadvantaged populations lack safe places to wait out a storm. They also question the timing in issuance of warnings. Because Wood County is on the western-most side of the Cleveland Office of the National Weather Service, they feel warnings are issued to late, sometimes after the storm has actually passed. Concern was expressed over a lack of adequate insurance coverage for many citizens.

Thunderstorms are a frequent but low risk hazard in Wood 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.

Table 2-32: Lightning (L) and Hail (H) NRI Vulnerability Analysis

	Total	Building Exposure	Population Equivalence	Population	Agricultural Value
L	**$1,567,681,303,616**	$34,370,108,616	$1,533,311,200,000	132,182.00	n/a
H	**$1,567,863,932,498**	$34,370,108,616	$1,533,311,200,000	132,182.00	$182.623.882

Local Severe Thunderstorm History

Thunderstorms are a frequent hazard in Wood County. According to NCDC records, the county has experienced more than 433 incidents since 1950. While many of these incidents are minor and cause little or no damage, some incidents in the county's history have caused considerable property damage and injuries. Collectively, thunderstorm incidents have caused nearly $12.5M in property damage, $2,000,000 in crop loss, and 23 injuries.

Table 2-33: Wood County Severe Thunderstorm History

Hazard	Incidents	Property Loss	Crop Loss	Deaths	Injuries
Thunderstorm Wind	284	$9.895M	$2M	0	22
Hail	143	$2.063M	$115K	0	0
Lightning	6	$445K	0	0	1

One of the more severe and damaging thunderstorms to impact Wood County occurred on July 8, 2003. A line of severe storms moved across the county in the early afternoon, causing widespread damage and power outages. In Bowling Green, wind gusts as high as 101 mph were measured. A terminal building and seventeen aircraft were damaged at Wood County Airport. Multiple buildings and signs were damaged at Bowling Green State University, as were other homes and buildings in the city. Hundreds of trees and limbs fell, causing streets to close for debris cleanup. Buildings and trees were also damaged in the villages of Bradner, Grand Rapids, and Tontogany. Winds speeds of 75 mph were recorded in Tontogany. Because the storm occurred in mid-summer when fields are planted, crop losses were also significant across the

county. Countywide, losses for this event exceeded $2,500,000 for property and $2,000,000 for crops.

In 2006, Wood County was again impacted by a severe and damaging thunderstorm event. A line of severe thunderstorms moved across the central section of the county. Wind speeds of 75 mph were recorded at the Wood County Airport where one hangar and twelve airplanes were destroyed. North of Bowling Green, damages were also recorded in Perrysburg where falling trees damaged several residences and utility poles were downed. Losses for this incident totaled $2,300,000.

In June 2020, Wood County was impacted in the North Baltimore area when remnants of Tropical Storm Cristobal caused warm and moist air to enter the area, and as temperature rose, instability increased. Several areas of Ohio incurred significant damage, including residents in North Baltimore who reported trees down, roof damaged and windows blown out. Extreme storms struck again on March 6, 2022, damaging a home in Cygnet. These two storms caused combined damage of approximately $40K.

2.2.10 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 table is provided by FEMA and indicates the type of damages per Enhanced Fujita Scale tornado classification.

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 rarely occur as independent incidents. Emerging out of a storm front or super cell, the tornado can be extremely damaging, especially when accompanied by heavy rain, straight-line wind, lightning, and hail. 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.

Tornado Risk Assessment

Unlike in the Great Plains states, tornadoes in Ohio and Wood County are generally narrow, and do not grow to the width of the mega-tornadoes. They are generally 25-500 yards wide and stay on the ground for a few miles. Ohio ranks among the top twenty states in injuries, fatalities, and property damage from tornado events. While tornadoes do not occur frequently in the Wood County, the severity and impact when they can be substantial. The magnitude of past tornadoes has ranged from F/EF0 to F/EF4, with the highest number of incidents classified as EF-0. Tornadoes are most common in the spring, although they can develop throughout the summer and fall. In Wood County, tornadoes are a countywide hazard and can affect all areas and jurisdictions.

The majority of residential structures in the county are constructed from wood, concrete, brick, and stone. Many older homes are constructed using limestone and other masonry materials;

these homes are built on traditional foundations with basements or crawl spaces. Newer residential construction is frequently built on concrete slabs without basements or crawl spaces. These homes are most prone to superficial damage, roof damage, and falling trees during tornadoes and severe windstorms. Mobile homes are more vulnerable to wind damage because they are less secured to the ground than buildings with foundations, are lighter weight, and constructed of less wind-resistant material than traditionally built homes.

Property damage from tornadoes in Wood County most frequently includes damaged roofs, gutters, downspouts, trees, and, on occasion, and 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. In the most serious tornado incidents, entire neighborhoods and large numbers of homes have been damaged or destroyed.

Table 2-34: Tornado Scenario NRI Exposure Assessment

Total Exposure	Building value	Population Equivalence	Population	Agriculture Value
$,567,863,932,498	**$34,370,108,616**	$1,533,311,200,000	132,182.00	$182,623,882

Local Tornado History

Wood County has been affected by 28 documented tornado incidents. While not all of these incidents have been severe, the county has experienced significant loss of life and property as a result of some tornado incidents. The map below identifies the location and magnitude of tornado incidents in the county.

Map 2-14: Tornado History

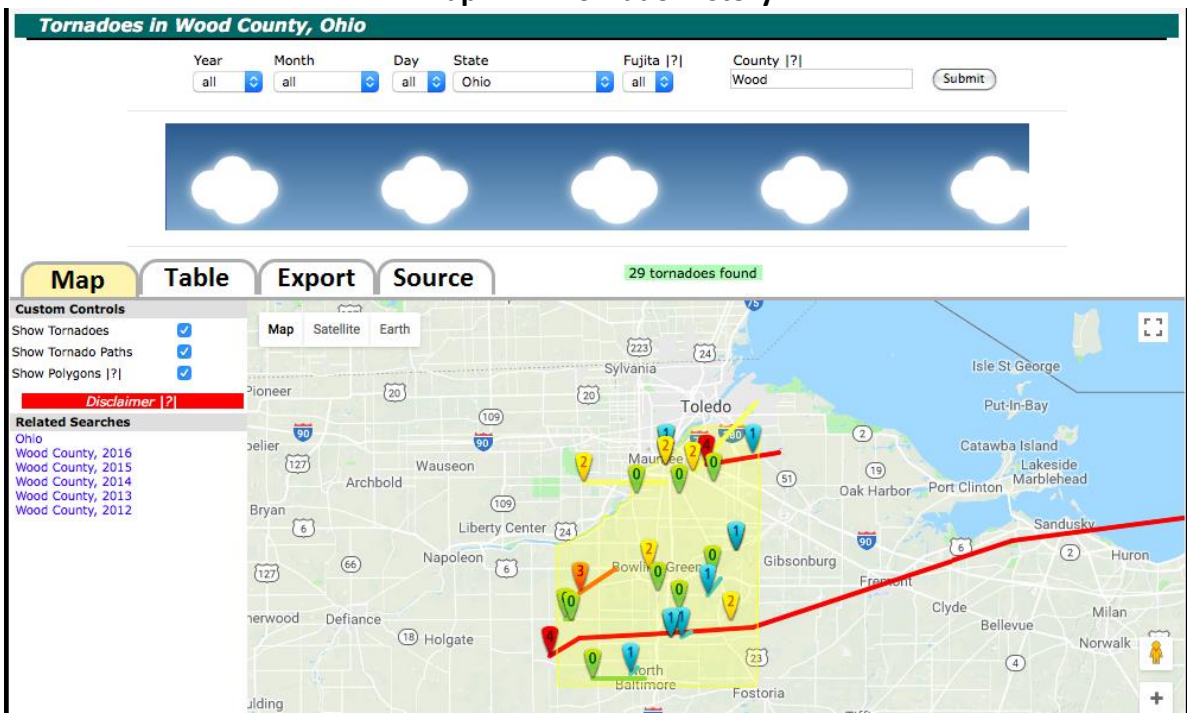


Table 2-35: Wood County Tornado History

Hazard	Incidents	Property Loss	Crop Loss	Deaths	Injuries
Tornado	28	$132.717M	$1.5K	11	78

The most damaging tornado in Wood County's history occurred on June 5, 2010. During the late evening, a tornado moved across the northeast section of Wood County. The twister grew from an EF0 to EF4 as it moved east along the State Route 795 corridor. The storm caused seven fatalities, 28 injuries, and devastating damage in Lake Township, the village of Millbury, and the surrounding areas. Lake High School and Lake Township Police Department and Administrative Building were destroyed, along with multiple school buses and police vehicles. At least 60 homes were destroyed or heavily damaged. The massive tornado stayed on the ground for nearly 6.5 miles. Total property damages for the event exceeded $100,000,000. Lake Township suffered at least $5,000,000 in damages to township infrastructure; Lake Local Schools suffered tens of millions in damages to their facilities.

Prior to the 2010 incident, the most damaging tornado in Wood County's history occurred on May 2, 1983. In the late morning hours, an F3 tornado ripped through the village of Weston. The twister caused major damage to a mobile home park, destroying more than 30 mobile homes and damaging several more. One person was killed when his mobile home was destroyed; 22 people were injured in the incident. Property damages exceeded $25,000,000.

There have been no tornadoes in Wood County from 2018 until July 31, 2023.

2.2.11 Water Quality Emergency

Water quality refers to the chemical, physical, biological, and radiological characteristics of water. It is a measure of the water relative to the requirements of one or more biotic species and human need or purpose. A water quality emergency exists when the quality of water available for human consumption is compromised. In recent years, water quality has become a growing concern in northwest Ohio. Lake Erie and its associated rivers and streams are a primary water source for most communities in Wood County and the region. These waters are susceptible to harmful algal blooms. These algal blooms occur when colonies of algae grow out of control and produce toxins that can cause 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. Inland lakes, reservoirs, and other water sources are also susceptible to algal blooms. Some of these algal blooms can produce the toxin microcystin, which can sicken or kill people, fish, birds, and other animals. When microcystin is present in a public water supply, the water becomes contaminated and is not safe for human consumption without additional treatment. If the water supply becomes unsafe, the human and economic toll on the region ~~is~~ can be significant.

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.

Wood County has participated in the H2Ohio Program to reduce contaminants through agricultural runoff, and farmers have participated in manure management and nutrient and pesticide management plans to help improve the source water quality. The water treatment plants in Wood County have updated and upgraded their ability to test and treat water supplies to maintain a safe and adequate potable water supply for county residents.

Water Quality Emergency Risk Assessment

The greatest risks to the community in a water quality emergency concern public health and the local economy. When the water supply is contaminated, residents lose access to drinking water in their homes. Restaurants, grocery stores, and other businesses that rely on safe water, are forced to close for the duration of the emergency because there is no safe way to conduct business without clean water. Other retail businesses and services may also be affected as the public travels to other areas for their shopping and food service needs for the duration of the emergency. This has a significant negative effect on the local economy because businesses lose critical revenue generating opportunities and employee wages are reduced. The longer the outage lasts, the more significant the immediate economic impact. To protect the region's water supply, upgrades to the water treatment infrastructure and improvements to detection and treatment methods are necessary. This work is often very expensive, increasing the long-term economic impact of a water quality emergency. When jurisdictions lack the funds to implement major infrastructure improvements, the funds must be obtained through increases to user fees. This ultimately costs residents more money as increases to water rates, user fees, and local taxes are considered to fund the necessary improvements.

From a public health perspective, people can become seriously ill if they consume contaminated water. People with special medical needs, compromised immune systems, and the elderly, and very young are most susceptible to illness. Animals, including family pets and livestock, are also susceptible to illness from contaminated water. An issue with the public water supply also damages the trust relationship between the public and government officials. People become fearful about the safety of their water and may question the information provided by local officials.

Water quality is a countywide hazard that can affect all areas and jurisdictions.

Local Water Quality Emergency History

On August 3, 2014, Wood County experienced the region's most significant water quality emergency to date. In the early morning hours, the water treatment plant for the City of Toledo detected microcystin in the water supply and declared the water unsafe to drink. The City of Toledo supplies municipal water to many communities in the metro Toledo region, including most of northern Wood County. With the do not drink order, 400,000 people were effectively cut off from safe drinking water. Local emergency management and government officials scrambled to provide drinking water to the affected communities. Restaurants and food service businesses were forced to close for several days and hospitals experienced an increase in patients who believed they had become sick from consuming contaminated water. Within

hours, stores across the region sold out of bottled water. The water was declared safe to drink within three days but the economic and political ramifications lasted much longer.

While the region has not experienced another event like the 2014 water crisis, the risk continually exists. Government officials and the public closely monitor water quality. Improvements to infrastructure and testing at many water treatment facilities have been implemented to improve detection of contamination and reduce its occurrence. A variety of government agencies, agriculture organizations, and advocacy groups are working together to identify and reduce activities that contribute to poor water quality.

There have been no water quality incidents between 2018 and October 2023.

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

Windstorm Risk Assessment

The flat topography of northwest Ohio is vulnerable to damage from high wind incidents, making windstorms a countywide hazard and can affect all areas and jurisdictions. 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 severe wind events 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.

Wind incidents most commonly damage trees, which can 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, negatively impacting the county's economy.

Erosion is another potential outcome of wind in Ohio, especially in areas like Wood County that are very flat. Because the soils provide fertile farmland, nearly every available acre of land is used for agriculture. Land that was once wooded and covered with vegetation has been cleared and windbreaks removed to create more productive farm land. When winds cross the flat

terrain and wide expanse of farm fields, the topsoil can blow away. Most Wood County farmland is vulnerable to this. Because the extremely flat topography cannot be changed nor can the winds be stopped, the mitigating action to prevent the loss of soil is to plant windbreaks, use sod strip farming techniques, and to create vegetative buffer lines where possible.

Almost all stakeholders felt that while winds are not necessarily higher in speeds than they used to be, the constant wind has increased. Many stakeholders said there seems to be continual winds that are 1-20 miles per hour, and very few days with a simple breeze. They also felt that high winds without precipitation and storms were far more common than in the past. Participants cited more damage to trees from wind, and more damage to roofs that were just starting to wear, damage that years ago would not have occurred as quickly. They also felt the constant wind is causing power poles more stress and shortening their life span as well. Most jurisdictions felt that debris is harder to manage because winds now make it a constant task.

Table 2-36: Wind Storm Scenario Vulnerability Analysis

Total	Building Value	Population Equivalence	Population	Agriculture Value
$1,567,863,932,498	$34,370,108,616	$1,533,311,200,000	132,182,00	$182,623,882

Local Windstorm History

Although not common, when wind events occur as an independent hazard, the impact can be severe. Wood County has experienced 38 high wind incidents since 1950, according to NCDC records. These incidents have caused considerable property and crop loss as well as multiple injuries.

Table 2-37: Wood County Windstorm History

Hazard	Incidents	Property Loss	Crop Loss	Deaths	Injuries
High Wind	38	$8.432M	$1.6M	0	2

The most severe windstorm in Wood County's history occurred on September 14, 2008 when the remnants of Hurricane Ike moved across Ohio. Damage across Ohio exceeded $500,000,000. In Wood County, winds gusts of up to 60 mph caused extensive tree damage and widespread power outages that lasted several days. downed trees and utility lines. Significant crop losses were also incurred; according to some estimates, corn yields were reduced by 3-5% because of wind damage. In total, the county suffered $5,000,000 in property loss and $1,500,000 in crop loss.

Another significant wind event impacted Wood County on March 9, 2002. A cold front moved across northern Ohio, bringing with it damaging winds that caused damage across 28 counties. In Wood County, wind speeds of 58 mph were measured at Toledo Executive Airport and 100 mph in Bowling Green. Widespread power outages were reported after hundreds of trees and utility lines were damaged. In North Baltimore, a large building collapsed, causing damage to two adjacent buildings and forcing three businesses to temporarily close. Although significantly

less damaging than the 2008 event, this storm caused $750,000 in property damage across the county.

On February 24, 2019 Wood County experienced high winds that caused $80K in damages. Winds of 64 miles per hour were recorded at Toledo Express Airport, and 63 miles per hour at Findlay Airport. This resulted in power outages for over two hundred thousand customers, with part of those in Wood County. Power lines were downed, especially in Pemberville. A semi tractor-trailer overturned on US 6 near Bradner, and debris was relatively heavy across the area. This windstorm was felt by almost a third of Ohio's counties.

2.2.13 Winter Storm

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

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

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

Another type of severe winter storm that can affect northwest Ohio begins with extremely cold weather (below 10 degrees Fahrenheit) and heavy snowfall, high winds, and extreme cold. A severe storm of this nature would likely pack sustained winds of 15-25 miles per hour, over ten inches of snow, and temperatures below ten degrees Fahrenheit for more than 24 hours. This kind of storm can easily dump a foot or more of snow on Wood 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 snowdrifts and blocks roads.

Ice storms are another type of winter storm event that can impact the area. An ice storm occurs when damaging ice accumulations occur during freezing rain situations. The accumulated ice can cause trees and utility lines to come down, resulting in loss of utilities and communications systems. As ice accumulates on roadways, travel also becomes dangerous. A significant ice accumulation is considered anything of one-quarter inch or more.

Winter Storm Risk Assessment

Severe winter weather is a risk across all of Ohio. These storms range from short, mild bursts of snow and ice to cold snaps with significant snowfall that last several days. In Wood County, winter storms are a countywide hazard and can affect all areas and jurisdictions. Winter storm damages have the potential to impact every home, business, or property in Wood County; no one area is more or less vulnerable to snowfall or ice than another. The flat terrain and consistent elevations contribute to drifting and blowing snow, creating hazardous travel conditions as visibility is reduced and roads become icy-covered and slick.

The most common winter storms include a combination of hazards, such as ice and snowfall. Ice begins to accumulate as temperatures fall; it then turns to snow, creating a dangerous layer of snow-covered ice. Sleet and ice make roadways slick and dangerous, increasing the potential for vehicular accidents. Road crews are challenged to clear 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. Extreme 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.

Stakeholders did not feel that winter storms have worsened, but perhaps the heavy snow is coming later in the season. Heavy snow in December is unusual, but in March is not. In general, snowstorms were viewed as an inconvenience, but jurisdictions felt prepared to handle them. Some said they use more brine on roads now than salt, and they viewed that as an improvement.

Even though it does not seem like climate change should affect snow and winter storms, it does. As more moisture is taken up into the atmosphere, storms will drop more precipitation; when it is cold, that comes in the form of snow instead of rain. Rising temperatures of the oceans facilitate this movement of moisture into the atmosphere. According to NOAA, research is beginning to indicate that reductions in Artic sea ice may change atmospheric circulation patterns to be more favorable to winter storm development in the eastern United States. The New York Times ran an article by reporter Henry Fountain in December 2022 that predicted heavier lake effect snow as well because as there are warmer temperatures, lakes like Lake Erie are less likely to freeze over, and open water allows storms to pick up additional moisture that then becomes snowfall. While Wood County is not susceptible to lake effect

weather, as conditions become more pronounced, the area could expand to include places as far away from Lake Erie as Wood County.

In a practical sense, Wood County needs to prepare for more variation of weather during the winter season. The effect of warmer temperatures, warmer water, more water-filled storms is dependent upon atmospheric temperature to determine how that effect hits the ground. The county could have greater amounts of snow, blowing snow conditions in the flat terrain, and harder work to maintain safe travel conditions by plowing and removing snow. On the other hand, if temperatures stay below freezing, heavy rain could hit. Heavy rain on frozen ground inhibits drainage and leads to surface freezing and flooding. Even if the air temperature is above freezing, the surface and soil temperatures may not be. That results in freezing precipitation and ice formation.

The greatest risk associated with winter storms is the loss of utilities. More ice through fluctuating temperatures could make this worse. Power outages can occur during ice storms or winter storms that include significant wind or snowfall. Most electric lines are mostly above ground and vulnerable to damage from wind and ice. Many electric providers have improved their distribution systems since ice storms in 2005 and 2008, but ice storms could end the last decade hiatus and return to northern Ohio and beyond. In the developing areas of the county, most new residential construction includes underground electric lines. The major supply lines are above ground as they enter Wood County from the generation plants so substations continue to be vulnerable to wind and ice. In spite of this, power outages are infrequent and are not widespread. The elderly and young children are most at risk when this occurs. When medications, health equipment, and food supplies cannot reach destinations, these populations endure the greatest hardship. One of the biggest difficulties associated with winter storms was expressed by the public schools. Getting buses through country roads that are snow covered and drifting is oftentimes very difficult, and causes them to close schools frequently. Buses experience difficulty turning around on rural roads and private driveways, and have difficulty maneuvering small country roads that may be poorly paved or not paved at all.

The loss estimates for winter storms are relatively low. Reasonably anticipated losses from winter storms include content loss such as food and perishables due to power interruptions, and minor economic loss due to short-term business closures. With the exception of an extreme and rare winter storm event, losses would not include structures or infrastructure. Most winter storms are a temporary inconvenience that make residents uncomfortable but last for only a short period of a time – from a few hours to a day or two. It is extremely rare for casualties to occur, with the exception of traffic accidents that result from dangerous road conditions.

Table 2-38: Winter Storm Scenario NRI Exposure Values

Total	Building Value	Population Equivalence	Population	Agricultural Value
$1,567,863,724,879	$34,370,106,132	$1,533,310,994,865	132,181.98	$182,623,882

Local Winter Storm History

Wood County has experienced more than 37 winter weather incidents since 1950, according to records maintained by NCDC. While none of these incidents caused loss of life in Wood County, the county has experienced property loss as a result of ice storms and winter storms. Interruption of local services, cancellation of school classes and other events, and workplace disruption are common effects of winter storms that are not necessarily calculated to a dollar value, but do have a negative impact upon the residents of the county.

Table 2-39: Wood County Winter Storm History

Hazard	Incidents	Property Loss	Crop Loss	Deaths	Injuries
Blizzard	0	0	0	0	0
Extreme Cold	6	0	0	0	0
Ice Storm	4	$7.14M	0	0	0
Winter Storm	27	$5.91M	0	0	2

For most of Ohio, the most significant historical winter weather event is the Blizzard of 1978. Wood County, and most of Ohio, was severely 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 Wood County, approximately fifteen inches of snow fell on top of the significant accumulation already on the ground. The high winds caused blowing and drifting so severe that roads were impassable and buildings were buried. Roads were impassable for almost a week and schools remained closed for several days. Most businesses were forced to close because transportation was at a standstill until roads could be cleared. Statewide, 50 people lost their lives and damages exceeded $100,000,000. To date, this remains one of the most significant winter weather events in Wood County's history.

More recently, Wood County was impacted by two major winter storms within a two-week period in late 2004 and early 2005. On December 22, 2004, a strong winter storm moved across the state, depositing up to two feet of snow in the area. Strong winds caused blowing and drifting on county roadways, making travel extremely difficult and dangerous. A few days later, on January 5, 2005, the county was affected by another historic winter weather event, this time in the form of an ice storm. A mixture of rain and snow transitioned to freezing rain. This caused significant ice accumulation on trees and utility lines, ultimately causing widespread power outages. Losses from these back-to-back storms exceeded $8,000,000 in Wood County.

During the last five years, there have been two episodes of extremely cold weather with life-threatening wind chill. On January 30 and 31, 2019, temperatures dipped to -9 Fahrenheit with winds of 30 to 35 miles per hour, plummeting wind chill into -25 to -36 Fahrenheit over the two-day period. Although four deaths were reported from this storm in the Greater Cleveland area, Wood County did not experience any deaths or injuries.

Again, on December 23, 2022 low temperatures with high wind and snow struck the area. Snow fell and wind speeds reached as high as 50 to 60 mph in some areas. In Wood County, temperatures dropped from the 30's and 40's to sub-zero readings in about eight hours

overnight on December 22. The flash freeze made roadways extremely slippery and dangerous. Temperatures stayed below zero and winds continued for two days, giving some relief by Christmas Day. A wind chill of -36 Fahrenheit was recorded in Lemoyne. In the interim, many roads were closed or treacherous, there were innumerable accidents on highways, secondary routes and local roads, and some power outages occurred. Wood County declared a Level 2 snow emergency and encouraged residents to stay home. Weather spotters measured snow in Perrysburg at 2 inches, Pemberville 2 inches, and Bowling Green 1.2 inches.

2.3 VULNERABILITY ASSESSMENT

The Vulnerability Assessment addresses each jurisdiction's vulnerability to the identified hazards.

2.3.1 Floodplain Mapping and the National Flood Insurance Program

Wood County last adopted floodplain regulations on May 26, 2011 for areas of special flood hazard that are necessary for participation in the National Flood Insurance Program.

While the non-participating communities do not have designated floodplain areas, the lack of participation in NFIP prevents any of their residents or businesses from obtaining flood insurance as individual property owners. This inability to purchase flood insurance could impact a business that is victim to flash flooding or unusual flood events due to their location, below-grade facilities, or other unusual risk and vulnerability.

Table 2-40: Communities Participating in NFIP

Community	Init FHBM Identified	Init FIRM Identified	Curr EFF Map Date	Reg-Emer Date
Wood County	12/17/78	01/05/84	09/02/11	01/05/84
Bowling Green	08/15/75	09/02/11/	09/02/11	03/19/84
Perrysburg	03/22/74	05/02/83	09/02/11	05/02/83
Rossford	03/01/74	05/02/83	09/02/11	05/02/83
Cygnet	05/10/74	08/02/82	09/02/11	08/02/82
Grand Rapids	03/01/74	05/02/83	09/02/11	05/02/83
Millbury	03/01/74	05/02/83	09/02/11	05/02/83
North Baltimore	02/08/74	09/02/82	09/02/11	09/02/82
Pemberville	10/18/74	08/02/82	09/02/11	08/02/82
Portage	04/18/75	04/14/82	09/02/11	04/15/82
Walbridge	12/13/74	10/18/83	09/02/11	10/18/83

Several communities are not part of NFIP and are sanctioned. These include the following.

Table 2-41: Communities Not in NFIP (Sanctioned)

Community	Init FHBM Identified	Init FIRM Identified	Curr EFF Map Date	Sanction Date
Northwood	07/05/75	09/02/11	05/28/1976	07/25/76
Hoytville	--	09/02/11	09/02/11	09/02/12
Luckey		09/02/11	09/02/11	09/02/12
West Millgrove		09/02/11	09/02/11	09/02/12

Bairdstown, Bloomdale, Custar, Haskins, Jerry City, Milton Center, Risingsun, Tontogany, Wayne and Weston do not currently participate in NFIP because they have no identified flood hazard areas.

The Wood County floodplain manager is available to assist any jurisdiction with floodplain management, regulations, or other needs. The following table lists the floodplain managers for Wood County jurisdictions.

Table 2-42 Wood County Floodplain Managers

Community	Floodplain Manager	Position
Wood County	David Steiner	Director Planning Commission
Bowling Green	Heather Savler	Planning Director
Cygnet	Steve VanScoder	Zoning Inspector
Grand Rapids	Chad Bever	Village Administrator
Millbury	Dave Sims	Zoning Inspector
North Baltimore	Allyson Murray	Village Administrator
Pemberville	Carol Bailey	Mayor
Perrysburg	Brody Walters	Dep. Planning/Zoning Administrator
Portage	Rex Lee	Zoning Inspector
Rossford	Mark Zuchowski	Zoning Inspector
Walbridge	Ed Kolanko	Mayor

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, please refer to FEMA's Substantial Improvement/ Substantial Damage Desk Reference, P-758 or contact the ODNR Floodplain Management Program

2.3.2 Repetitive and Severe Repetitive Loss Structures

Across Wood County, few structures experience repetitive flood loss. Table 2-33 lists the repetitive loss structures that has been identified through loss claims. There is one Severe Repetitive Loss structure on record for the Village of Pemberville, and it is the highlighted property in Table 2-37, row one.

Table 2-43: Wood County Repetitive Loss Properties

Community	County	Type	**Number of Properties**	Losses	Total Paid Out	Average per Incident	Severe Rep Loss Flag
Bowling Green City	Wood	Single Family	1	2	$18,225.51	$9,112.76	No
Grand Rapids Village	Wood	2-4 Family	2	5	$142,162.08	$52,077,74	No
Grand Rapids Village	Wood	Busi-Nonres	2	5	$56,114.01	$25,243.75	No
Grand Rapids Village	Wood	Other Nonres	5	11	$98,711.23	$***47,003,21***	No
Grand Rapids Village	Wood	Single Family	1	4	$30,139.29	$7,534,82	No
Millbury Village	Wood	Single Family	1	2	$17,273.64	$8,636.82	No
Northwood City	Wood	Single Family	1	2	$12,295.00	$6,147.50	No
Pemberville Village	Wood	Single Family	6	15	$162,222.47	$72,754.09	No
Pemberville Village	Wood	Single Family	1	4	$298,973.82	$24,743.46	Yes
Wood County	Wood	Other Nonres	1	4	$26,552.67	$6,638.17	No
Wood County	Wood	Single Family	5	12	$59,697.37	$22,605.60	No
TOTAL			**26**	**66**		**$722,367.09**	

The data above is provided by State of Ohio Emergency Management Agency. Additional or newly identified repetitive and/or severe repetitive loss structures may exist in Wood County.

Other parcels may experience flooding because of recent development activities or building projects, public or private, that did not identify drainage issues on a scale larger than the project site plan. It is possible for building projects, especially private landowner projects, not to identify cascading consequences in flood risk or to mitigation those unidentified risks.

2.3.2 Social Vulnerability

The National Risk Index rates Wood County's social vulnerability as very low. Only 4% of the counties across the United States have a lower social vulnerability score than Wood County, and in Ohio, only thirteen counties are rated better in that category. While this could be perceived as a county-wide plethora of resources, that may not actually be the case. According to input during plan development meetings, numerous social issues were discussed and multiple concerns raised.

All stakeholders expressed concern over similar groups of people as it relates to disaster vulnerability. The aging population in Wood County is larger than ever before. The over-65 segment of the population amounts to over 15% of the total population, and the over-80 crowd amounts to 1.7% of the population (included in the 15.3% elderly). This group is more likely to be injured in an incident, they commonly require multiple medications and sometimes durable medical equipment, and they often need help with activities of daily living. In-home caregivers, relatives and friends typically provide assistance, but during and after a disaster may be unable to do that. As a group, they are more susceptible to illness, injury and recover to a lesser degree than other adults. Disasters are more likely to result in lifelong deterioration for them.

Children are also a concerning group related to disasters. There are almost seven thousand children under five years old. Poverty affects children more than adults, and unhealthy children do not survive disasters well. They are more susceptible to disease, especially diseases brought on through disasters that tend to be respiratory and communicable in nature. Children are dependent upon adults for their care, and post-disaster caregiving challenges would be difficult.

Single-parent households, especially when the head -of-household is female, need additional help when disasters occur. While the schools are well-aware of some of these households, they don't always know home circumstances. A single parent, when faced with having to either care for their children or go to work, is in an impossible situation. Additional assistance would be difficult to provide as well as the need be difficult to identify.

Persons with behavioral health issues are hard to identify, and even harder to serve. Many are dependent upon medications to manage their conditions as well as regular counseling and/or group therapy. They come from all walks of life, and there is no way to identify who they are. After a disaster, some of this group may relapse into dependency-based behaviors because they struggle with high levels of stress and anxiety.

Especially since the pandemic, children with behavioral needs are more prevalent than ever before. Anxiety and other social-emotional conditions are quite common. School children are reported to be more stressed and have more worry than ever before. Coupled with increasing

numbers of special needs children who have ongoing disabilities that require special help, serving children adequately could be a difficult challenge.

Communication during disasters could be difficult for non-English speaking persons. Some foreign workers provide help on farms and agribusinesses in the county, and others may find themselves in Wood County when an incident occurs. They drive delivery trucks and pass through the county on interstates and state highways. The two colleges have foreign students who travel to the USA for an education. Both institutions are able to provide translation services; however, mass communication systems in Wood County are not always multi-lingual, and some individuals may struggle to understand warnings and directions.

One of Wood County's disaster-related social vulnerability concerns is associated with the differences in resources between the very metropolitan areas and the very rural parts of the county. While in Perrysburg and Bowling Green, for example, public or mass transit options are widely available, the village of West Millgrove or Luckey may not have any alternate transit options. Disadvantaged and underserved populations in the four cities are generally able to find transportation to access assistance. Those similar populations who live in the very rural parts of the county may not be able to access assistance. When the difficulties of travel in the aftermath of severe storms and the damages caused, travel from the more remote areas of the county may be extraordinarily challenging due to road closures as well as lacking transportation providers.

Transportation is a concern in and of itself. While a "no-car" designation applies to only 4.5% of the population, that translates to 2,339 households that do not have their own transportation, and are reliant upon other people, systems, and responders for all transportation. Combined with the 2,199 residents over the age of 80 years who may not be able to drive in extremely adverse conditions, and 15,655 residents with disabilities, that amounts to a huge transportation problem in a mass evacuation scenario. Stakeholders were well aware of their dependence upon local public schools for busing, realizing that the 60-passenger vehicles used as school buses do not meet the needs of mobility challenged riders.

In spite of these factors, Wood County is rated in the NRI as having "very low" social vulnerability. Justification of this very low rating would include considerations as listed below:

- Poverty statistics, compared to the nation in 2020, are better than average. The Neighborhoods at Risk study identified 31,819 (6.8%) families in Wood County who live in poverty; there were 1,655 (5.2%) families with children, and 1,079 (3.4%) single mother families who live in poverty. These numbers are up less than 1% since 2010.
- Wood County has 35.8% rental properties and 5.9% mobile homes; therefore, there would theoretically be problems with landlords repairing and maintaining property. Dampness, mold, and exposure to toxic substances or allergens would statistically be more problematic the higher the rental numbers reach. The metropolitan areas in Wood County are likely to have a higher percentage of residents who rent homes as opposed to the rural and small village areas.

- The number of mobile homes causes the private property damages to rise after disasters because mobile homes are much less resistant to storms than other types of homes.
- There are about half as many households without health insurance than the national average. That theoretically helps residents have better access to medical care, and may be associated with proximity to healthcare resources in Bowling Green and the greater Toledo area.
- Wood County has an average percentage of persons with disabilities. The local percentage, 12.0%, is half a percent (0.5%) lower than the national average.
- Local stakeholders said that they are concerned about homeless persons. While some of these people live "on the streets" without a roof over the heads, many more are believed to live transiently. Some live for a few days at a time with one person, and then move on to reside with someone else for a few days. Some live in vehicles for extended periods of time; others live in a sub-standard rental for a month or two while they go through the eviction process, and move on to another form of residence. This means of having shelter can result in difficulty reaching them with services during disasters, but can also mean there are shelter occupants that have no where to go when the shelter closes.

Lack of financial resources makes people less resilient to disasters. Those living in poverty must make detrimental changes, such as eating unhealthy food or not obtaining medical care when needed, after damages caused by disasters. Families in poverty have less flexibility in food purchases, and often must eat highly processed and preserved food. They may live in less healthy structures, enduring mold, rodent infestation, or insufficient heat. Relocation, isolation and homelessness are far more likely for impoverished families. These families are more likely to live in rental property, and sometimes properties are not well maintained by landowners. They often must select mobile homes as their residence, and these are less safe and secure during natural disasters. Renters do not achieve the emotional well-being and sense of satisfaction that sometimes those who own their own home receive, and this contributes to behavioral health problems. Financial shortages lead to not having insurance, savings accounts, or cash to use for disaster needs.

Wood County has far less ethnic and racial diversity than the national average. Approximately 12.6% of the population is made up of people of color and Hispanics, compared to a national average of 40.6%. There are 699 people, or 0.6% of the population, who do not speak English fluently.

- There are few non-English-speaking populations, so warning and notification effectiveness is theoretically high.

Wood County's warning and notification systems are more likely to be effective and result in action taken by individuals than in communities where there are significant language barriers. The lack of language barriers allows people to receive services locally without additional difficulty, and enables them to trust the messengers who deliver emergency public information.

- There are limited minority populations which indicates most people have a familial support system that would connect them to one another before and after a disaster.

Wood County has slightly less children under 5 years old than the national average, but slightly more elderly over 65, and elderly over the age of 80, than the national average. This means their difficulty in serving people who are unable to direct their own care is about the same as other areas in the United States. This is an important statistic when it comes to heat, high humidity, and emergencies that include threats to respiratory health.

The percentage of households without a car is about half the national average, indicating that evacuation and travel necessary to obtain help would be less problematic than many communities. People who own vehicles are likely to be employed, and to enjoy a higher level of financial independence due to their access to a wider span of opportunities. Access to transportation allows individuals to travel for services they need. They are more likely to go to a shelter when needed, for overnight shelter or for environmental comfort and healthier existence during a hot or cold spell.

The Climate and Economic Justice Screening Tool identified the census tract that includes West Millgrove and south to the county line, and as far west almost to Bloomville as "disadvantaged". It is rated as low income with household income less than or equal to two times the federal poverty level, has a lack of green space, and has modeled toxic concentrations at parts of steams within 500 meters to be assigned this designation.

The section of the City of Bowling Green from Poe Road on the north to Wooster Street on the south, and I-75 on the east to Manville Avenue on the west is designated "disadvantaged". Conditions that triggered this designation include high energy cost, high housing costs, Low median income, poverty, unemployment, and low high school education completion.

No area of Wood County is in a designated Community Disaster Resilience Zone according to FEMA.

2.3.3 Capability Assessment

Mitigation Project Implementation

Wood County is significantly capable of implementing mitigation projects. The four cities (Bowling Green, Northwood, Perrysburg and Rossford), Wood County, and the three developing townships (Lake, Middleton, and Perrysburg), and the two special districts (BGSU and NWWSD) have sufficient staff, expertise and oversight to develop and design projects, apply for and administer mitigation grants, and to properly manage construction. Northwood and Rossford have contracted engineering services; Bowling Green and Perrysburg employ engineers. The Port Authority is available to assist if needed with a variety of technical services. City budgets are sufficient to provide the local financial support for significant improvements. Bowling Green State University and the Northwest Water and Sewer District also have this capability. All have budgets sufficient to provide the local share of funding required by mitigation grant programs, and the staff to manage the projects.

The larger villages, including North Baltimore and Walbridge, have some staff and could manage smaller projects, or rely on some assistance from Wood County, or through a temporarily contracted service. They would be able to provide administrative support to apply for funding support and manage a project in compliance with grant requirements. Their budgets are sufficient to provide the local contribution for smaller or more amply grant funded activities.

Haskins, Luckey, Millbury, Pemberville and Weston have some ability to provide administrative support, but would likely face difficulty in providing a significant local cash match for grant programs. They may or may not have paid staff, and that staff may not be administrative but instead field-based such as streets, utilities, and public works employees. They would probably be required to hire oversight and management, as well as administrative, assistance for a significant grant-funded capital improvement project. Smaller projects would be feasible with local staff as it exists.

The villages of under 1,000 residents (Bairdstown, Bloomdale, Bradner, Custar, Cygnet, Grand Rapids, Hoytville, Jerry City, Milton Center, Portage, Risingsun, Tontogany, Wayne and West Millgrove) would be very challenged to provide the administrative support for a grant-funded project on their own, but could participate in a scaled-down project that did not involve complex funding sources. Their elected officials are totally volunteer, and they do not generally have any paid staff. Their budgets are minimal, and a local contribution of significance would be difficult.

Wood County itself is fully staffed, and provides services to all townships in the county. The Engineer's Office works regularly with Regional Planning, Soil and Water Conservation, and the Building Inspection Department. They collaborate with other county departments as well as agencies across the county to design and implement a wide variety of projects. The Port Authority steps up and helps with multi-jurisdictional projects regularly. They have, at any given time, a list of prioritized projects ready to implement when funding becomes available. They have the staff to quickly address funding opportunities, submit requests for funding, and administer the programs when awarded. Various plans, including the county's comprehensive plan, the land use plan, the mitigation plan and capital improvements are kept up to date and used as reference points as projects develop.

All townships, except the three described previously, function as part of Wood County from a mitigation perspective, and projects and grants would be managed by the county. The Wood County Engineer assists the townships with projects and tasks that require engineering expertise. Regional Planning helps with development issues, floodplain management, and other areas of planning and regulation. Townships have three volunteer trustees and one volunteer fiscal officer. They may have a paid employee or two who manage the roads, other infrastructure, public safety, and other critical field services. They generally have no administrative paid staff. Therefore, it is impossible for them to conduct independent mitigation projects utilizing mitigation grants without the administrative benefit of Wood

County's resources. Wood County would step forward and help these jurisdictions with the administrative and technical work that needed to be done.

Community Lifelines

Wood County is one of Ohio's largest counties geographically, and is staffed to conduct the business as a county jurisdiction. Following is an assessment of capabilities and gaps, organized by each of the seven community lifelines.

Safety and Security Community Lifeline

Wood County has ample law enforcement resources to manage day-to-day demand for service and moderately intense incidents. The Sheriff's Office is supplemented by police departments in all four cities, plus the BGSU Police Department, the Wood County Parks District, and ten municipal police departments. There is also a post of the Ohio State Highway Patrol in Bowling Green. This provides ample staffing for situational assessment of complex incidents, on-scene security, protection and law enforcement, and operational communications.

Adequate dispatch centers exist for communications management. Bowling Green, Perrysburg, Perrysburg Township, Lake Township, Northwood, and Wood County operate fully-staffed dispatch centers. Ohio State Highway Patrol, BGSU Police Department, and other townships and villages have some capacity to assist with call-taking and field unit communications. The Wood County Emergency Management Agency has a fully-equipped Emergency Operations Center that can provide significant assistance, with several alternate centers able to provide services.

Mass search and rescue could be a challenge, but an all-hands-on-deck approach in Wood County would provide large numbers of first responders to perform these tasks if the search did not include the need for highly specialized personnel.

The county is well staffed in fire services for daily demand for assistance in some areas by full-time departments, but there are daytime gaps in coverage within the areas covered by volunteer departments. Two of the four cities (Perrysburg and Bowling Green) and all three developing townships (Lake, Middleton, and Perrysburg) have full-time departments that are staffed at minimum or better levels at all times. Two of the cities have volunteer or part-time staff at the station most of the time. The remainder of the county, which includes all the rural area and most villages, are covered by volunteer departments.

Challenges in fire service can be categorized by type of department (full-time vs. part-time vs. volunteer), training level (volunteer firefighter vs. NFPA Level I firefighter vs. NFPA Level II Firefighter), specialty certification (hazardous materials, structural collapse, confined space/trench rescue, vehicle rescue, high-angle rescue, etc. as defined by NFPA), and degree to which positions in the department are filled. In general, the higher capabilities in these areas are present within the geographic areas where population is most dense; they are lower in the less-densely populated rural areas. The highest levels of expertise (Level II Firefighter with specialty capabilities) fall within the full-time departments, generally speaking. The full-time

paid departments have a more complete staff than the volunteer departments because not many rural residents want to become a firefighter or they don't have adequate time to dedicate to being a volunteer firefighter.

Incidents that would challenge Wood County resources to the point of collapse include any very large-scale incident (storm of any destructive type in multiple locations, major riverine flood with rescues, multiple building occupied working structure fires, any incident causing the need for mass evacuation, massive hazardous materials spill or explosion with evacuation, etc.). While the majority of the resources to handle those situations exist in the more densely populated cities and key townships, the population at risk is also commensurately placed.

A more daunting challenge would be maintenance of adequate coverage inside the highly populated areas when major resources were called to a specific site. This played out in the 2010 tornado incident when all departments were called to the scene in Lake Township which then left the remainder of the county completely uncovered. Just-in-time decision making kept one major department on station to provide that coverage for a critical incident outside the tornado response. Wood County fire chiefs are fully aware of this need, and deployment orders are now given in consideration of gap areas.

The root cause of fire service coverage shortages in Wood County is the lack of available and trained volunteers. Recent years have seen the demise of volunteerism, especially in an area of service that is often unsafe, untimely and physically demanding. The emotional burden put upon public safety volunteers is often not palatable for today's younger people. Therefore, many of the fire departments have an average-age of over 50 years old for their staff.

In summary, law enforcement staffing is likely to be adequate, and the Ohio Chiefs of Police and Buckeye Sheriffs Association mutual aid plans provide an option for automatic mutual aid from other departments, as needed. Fire service is challenged on a daily basis in areas of volunteer service. While the Ohio Fire Chiefs Association mutual aid plan provides for automatic assistance, if the volunteers do not exist, mutual aid is ineffective. Wood County fire service is working as part of the State of Ohio task force to improve volunteer fire service coverage.

Food, Water, Shelter Community Lifeline

Stakeholders felt that providing food and water for large numbers of disaster survivors would not be a significant problem for Wood County. Unless a disaster rendered the entire county non-functional and isolated, they felt that suppliers would respond generously to requests for food and water. They also have an up-to-date and accurate emergency operations plan that describes who would respond and how they would fill this need. However, distribution system execution and sheltering would likely be problematic.

The Wood County Emergency Operations Plan identifies American Red Cross as the operator of shelters established in Wood County. Recent changes in the organization have caused stakeholders to question whether a widespread need for mass sheltering could be satisfied by ARC alone, or if the organization is equipped to provide this service at all. Therefore,

discussions focused on shelter or community information center locations in each community, scaled in size to the population in that jurisdiction. Who would supply, operate and fund such shelters was a concern. All stakeholders were concerned about supplying an operating shelter and where they would find items like cots, blankets, hygiene items, and medical equipment. Some jurisdictions felt they could adequately support local shelters for their residents to some degree; some felt they did not have the funding to do so at all. The lack of suitable facilities was an expressed concern, with more concern in the southern half of the county than the north.

Sheltering for people with specific needs was a concern across the county. Those with mobility needs would require assistance in evacuation as well as moving about a shelter and obtaining assistance. People with sensory deprivation would need special help. Those with medical needs would require electricity to operate medical equipment, and caregivers to administer life-sustaining care and medications. Behaviorally challenged individuals could require professional care and intervention, especially in the context of high stress, danger, and significant loss.

The major entities – public health, long-term care facilities, hospitals, EMS, and law enforcement all have mutual aid agreements in place that would help garner the resources needed to execute a full-scale evacuation. Most agreements are in writing; some are automatic through organizational agreements; others remain casual and should be detailed and written.

While stakeholders recognized that a situation requiring mass sheltering and feeding would be extremely rare, and the Wood County EOP does give guidance in providing these services, they were concerned about an extreme situation and being able to meet those needs.

Health and Medical Community Lifeline

Wood County Hospital provides the foundation for healthcare services in Wood County. With several specialty centers able to provide advanced care in multiple areas, including but not limited to emergency services, orthopedics, pediatrics, and a wide variety of other areas. They provide education to both the medical community and the public through special courses and internships, community classes, and individualized programs. They are able to facilitate health and wellness as well as medical care through a network of licensed and acclaimed professionals. Wood County Hospital is located in Bowling Green. The Falcon Health Primary Care Center and Urgent Care is located at BGSU, and there are various other facilities throughout Wood County.

Mercy Health provides emergency and urgent care in Perrysburg at a free-standing emergency department. Very close by are Bay Park Hospital and Mercy St. Charles in Oregon, both which staff fully capable emergency departments and hospital medical and surgical departments, as well as a full menu of other medical services.

In the case of massive medical or trauma transports to Wood County hospitals, there are multiple specialty medical centers in Toledo and the surrounding Lucas County area that would be available. Toledo Hospital and St. Vincent Medical Center are large trauma centers not a

long distance from Wood County. There are hospitals nearby in Fremont, Napoleon, Defiance, and Findlay. Patients could be referred or transferred to those hospitals for care.

The likelihood of a patient surge so great that hospital healthcare, either inpatient or outpatient, were not available is highly unlikely. Even in the COVID-19 pandemic, hospital care was generally available although it was stressed and limited in specific ways. The number of individual physicians, community health clinics and other generalized medical resources are sufficient to expect at least minimal sufficient coverage in an extreme incident. Behavioral health services are also widely available, although wait times for individual appointments may involve delays of several days or a week, even in a crisis situation.

Emergency medical services are provided across Wood County through the public sector, and could be vulnerable to shortages. Bowling Green, Fostoria, Lake Township, Perrysburg, Perrysburg Township and Lake Township provide full-time EMS staff available for calls within their assigned jurisdictions at any time. The remainder of the county, including almost everything south of US 6 and a majority of the area outside the cities, is covered by volunteer EMS. It was widely stated that in areas covered by volunteers, there is a critical shortage of staff Monday through Friday during the workday, on holidays, and at other random times. When a majority of the residents of small villages and townships work outside the jurisdiction, they become unavailable for calls while they are at work. Many employers in these communities are less willing to release staff for emergency calls as the volume and demand rises as staffing options decrease, therefore causing an additional shortage of personnel. Should a mass casualty incident occur at these times, staffing all county ambulances would be very difficult. Mutual aid from adjoining counties would be possible but would not provide a great number of squads, and there would be serious delays in reaching a scene. These mutual aid resources are twenty to forty minutes from some of the more rural areas of the county.

Should an incident be complicated by specialized rescue or air medical needs, resources exist for the asking. Wood County's full-time fire departments are highly trained in many areas of vehicle rescue, structural rescue, high angle rope rescue, and hazardous materials. Specialized resources are also available through the City of Toledo and Lucas County. Resources to the south include the City of Lima and Allen County special rescue units, and air medical resources from both Lima hospitals. Air medical units are available from Toledo, Fremont, Bluffton, Defiance, and Ft. Wayne, IN. Others from Cleveland and northeast Ohio would also be available. The most likely shortage in an extremely high-victim incident would be ground transport EMS units. The staffing shortage, distance from rural areas to the hospitals, and lengthy return times would be the most significant challenges.

In general, stakeholders cited the number of people needing durable medical equipment and medical supplies while living in their homes is increasing significantly. Staffing shelters for people with these needs, as well as elderly and other disabled groups would be difficult. Public health and its Medical Reserve Corps could provide some help, but no one felt that would meet the need for caregiver staffing.

Evacuation of long-term care facilities was a concern. Responses would have to involve multiple community groups, and some guidance is provided in the Wood County Emergency Operations Plan. Whether the plan would sufficiently cover the needs of a growing elderly and disabled home-residing population was not known.

Energy Lifeline

Wood County electricity is provided by multiple companies and cooperatives, including Toledo Edison, Hancock-Wood Electric Cooperative, Tri-County Rural Electric and AEP. Natural gas is provided by Columbia Gas of Ohio as well as Arlington Natural Gas Company, Suburban Natural Gas Company, Waterville Gas and Oil Company, and KNG Energy, Inc.

Electrical outages are common in Wood County, but are generally short in duration and relatively easily restored. The electric and gas companies are in contact with the Wood County EMA when outages or shortages occur, and they work together to address emergency needs. Most municipalities in the cities and villages over 1,000 residents have generators, and some of the smaller villages do as well. Several communities said that their generators lack sufficient capacity to power critical services, or that the generators are old and should be replaced with updated equipment.

The Wood County Emergency Operations Plan addresses power outages and the county's response to such an incident by assigning duties and responsibilities in response, and outlining resources that are available.

Stakeholders felt that electrical outages that last less than 24 hours are well tolerated for the most part; however, and outage lasting several days to several weeks would present a significant challenge. People who need special equipment, or who have medical conditions that make them more vulnerable to injury from extreme temperatures would be at a severe disadvantage. Most communities expressed concern should they need to open warming or cooling centers during extreme temperatures combined with an extended power outage. They felt somewhat ill-prepared to do this. Providing overnight shelters in this situation also would be very problematic, and was addressed in the Food, Water and Shelter Lifeline section. Most designated shelters do not have generators.

Communications Lifeline

Stakeholders cited continuing interoperability issues with two-way radios, the primary way that first responders communicate in an incident. With departments and agencies using VHF, UHF and 800 MHz platforms for their radio systems, this provides almost no interoperability between jurisdictions. Some departments, including street departments, utilities, and administrative workers, have only cellular phones for emergency communication, yet a few have 800 MHz radios. Some communities are fairly capable of talking internally, but when an incident reaches beyond their municipality or township, they are unable to talk to them. Less traditional parties in the first responder group, like long-term care providers and behavioral health professionals, have no two-way communication at all besides personal cellular phones.

An incident that involved multiple jurisdictions or widespread disciplines would be problematic. Many workers would use personal cell phones for communication, and since those numbers are not openly published, it would be very difficult.

Currently the alarm systems across the board in Wood County utilize traditional landline communications. There is no progress toward wireless notifications or other new technology. Stakeholders cited a lack of confidence in the technology at this time.

Warning and notification systems are in place using both hard-wired and wireless technology. The elderly population is less likely to be comfortable with modern technology, putting them at a distinct disadvantage. When an incident occurs and residents don't get the information they want, they call 9-1-1 dispatchers who quickly become overwhelmed with calls. There is little capacity to quickly and effectively provide expanding capacity for dispatch facilities.

A 2-1-1 Center can be used for dissemination of general information in an incident. This has been used in the past, and should be used more now. Completing links between various parties can be successfully done through 2-1-1. Communication between EMS, Job and Family Services and/or Children's Services, the ADAMHS Board, social agencies, and others currently happens, but needs to be slightly more formalized so everyone knows the connections between all of them and how to serve clients.

Transportation Lifeline

Because Wood County is so large geographically, transportation problems could arise. Evacuation of massive numbers of people could be difficult. The smaller villages tend to have older populations, and they are more isolated from the cities. These individuals may need special assistance due to mobility issues. Transporting them to shelters or medical care could become a huge challenge, especially if weather conditions caused unsafe roads or travel.

Transportation in the southern half of Wood County would be more problematic than in the northern half because it is entirely rural with no mass transit providers at all. The roads in the south are more likely to be snow-covered and drifted, or debris covered, because they are less travelled. Blocked railroad crossings, state highway detours, and local road work can impede travel at times, and GPS does not always provide an effective detour route.

School districts were somewhat aware of the need to use school buses for evacuation, but felt that they are ill-prepared to provide the primary transportation services. They felt that details need to be worked out for collaboration, and were positive about participating in that activity. They felt the schools could provide an array of assistance with evacuations and sheltering.

Evacuation and transportation are outlined in the county's Emergency Operations Plan, but may need to be reviewed and expanded to accommodate the changing population and those with special needs or disabilities. Underserved and disadvantaged populations may need more help than the plan outlines.

Hazardous Materials Community Lifeline

Wood County first responders, especially the fire departments, are well prepared to handle everyday incidents involving hazardous materials. Departments are trained to the technician level and have adequate equipment to handle a typical one-chemical accident of average magnitude. Cleanup contractors are generally available to mitigate the scene and properly dispose of contaminated material. However, should an incident involve multiple vehicles hauling hazardous substances, especially with the release of more than one chemical, they could be challenged to meet the incident needs. Should a rail incident occur that involves multiple cars hauling chemicals, the responders could easily be overwhelmed. A serious explosion or release at a fixed facility could exceed the capabilities of local fire departments.

In the southern part of the county where trains and trucks are more likely to travel at higher speeds, accidents can easily be more serious. This is the same area where first responder availability and capabilities are less suited to a complex incident. Likewise, an accident on I-75 or the Ohio Turnpike could easily involve vehicles travelling at high speeds, in excess of 75 miles per hour, and in groups of six, ten or twelve vehicles without adequate stopping distance in between. Passenger vehicles would likely be part of the incident. Multi-vehicle pile-ups are very likely to occur on these busy four and six-lane highways.

Accidents of smaller magnitude are very likely on the secondary highways. When road construction detours traffic off any of these highways, personal GPS systems can route trucks inappropriately. The drivers often are not familiar with the area, and end up on roads with low load limits, narrow bridges, and insufficient intersections for maneuverability. This leads to damaged highways, dumped loads and spilled chemicals, and injuries.

Wood County has the option to contact the Ohio Fire Chiefs Association for mutual aid, and can call specialized resources out of Toledo or Lima. Response time could be measured in hours, so local crews would have to manage the initial scene with defensive tactics to contain the spill, and with scene control to limit exposures to the chemical.

The Wood County Local Emergency Planning Committee (LEPC) meets regularly to manage this vulnerability and response. They develop a hazardous materials response plan and continually assess the county's vulnerability and exposure to chemical incidents. Stakeholders felt confident that the LEPC is effectively managing this lifeline.

Summary of Community Lifelines Assessment

Wood County has significant capability to maintain community lifelines. When an incident reaches a high magnitude, they have established mutual aid resources to call upon. Vulnerability to this kind of hazard is high, and their actions are believed to keep capabilities at a level sufficient to respond to incidents.

2.3.5 Community Resilience

Wood County is rated by the RAPT tool as having "very high" resiliency and the stakeholders agreed with that assessment. There are multiple safety net organizations in place, in addition

to a full array of government services at the county, city and village level. The townships are even able to collaborate with one another to assist after localized storms affect specific areas.

The first advantage in Wood County is the strength and dependability of their Emergency Operations Center (EOC). This communications center functions to collect needs from jurisdictions, departments and agencies, and in turn provide resources to fill those needs. Their Wood County Emergency Operations Plan provides the structure for the EOC, calling for representation of key providers in all functional areas. For example, there are specific EOC representatives that handle protective actions like evacuation and or sheltering in place. There are others that manage resources for debris collection, sheltering and feeding, or fire service. This facility has detailed operational guidelines and activation plans that put it into action for any kind of disaster. Whether the incident involves a few villages and townships, or if it is a major event involving cities and highly populated areas, the EOC system automatically goes into action. There primary focus is to provide resources where they are needed based upon the field assessment given by first responders and key officials.

The second layer of resiliency is tied to an existing system with operational guidelines in place and responsibilities assigned to carry those responsibilities out. The Wood County EOP is written in a functional annex format, which provides guidance in every action area necessary during and after an incident. This document is updated regularly, reviewed annually and/or after an incident, and shared with all agencies and departments involved in any way. The basis of this document is the county's risk assessment, including natural and specific hazards included in this plan as well as others documented elsewhere. Examples may be the Sheriff's plan for a terrorist attack, or the health department's plan for a pandemic.

Supporting these two important layers of resiliency are individual agencies and capabilities unique to Wood County. The "No Wrong Door" program shares information across agencies, businesses and government so that everyone can help people in need be connected to resources. The 2-1-1 system with United Way is used frequently to identify needs or to convey solutions to those who call. They also have a Family and Children First program that serves single parents, families in need, and those with special circumstances. Schools have designated coordinators to help homeless students and those with other social and economic needs. The ADAMHS Board ensures the delivery of services to individuals with behavioral needs, including mental and emotional health, addictions and substance abuse, and other needs.

The social services agencies in Wood County meet regularly to share information, communicate needs and services, and to ensure that they all work together to maximize effectiveness and efficiency of their programs.

2.3.6 Countywide Vulnerability

This section describes the vulnerability of the unincorporated areas of Wood County, with the exception of Lake, Middleton, and Perrysburg Townships. Because these particular townships function more like incorporated municipalities than their rural counterparts, their vulnerability is discussed in a separate section for each township.

Wood County's unincorporated townships comprise the rural area of the county that is actively engaged in production agriculture, as well as home to industries and small businesses. In townships, the primary form of leadership is provided by the township trustees. In some countywide matters, including hazard mitigation, the Wood County Commissioners act on behalf of the townships. The Planning Team included representatives from all townships in the county, and the Wood County Trustees Association was utilized to communicate face-to-face with this group of elected officials. Trustees, public safety officials, residents, and county officials were directly involved in the hazard identification and risk assessment. Political subdivision lines are not always clear in rural areas; describing Wood County's unincorporated area in the context of townships is the only organized way to ensure the entire population is included in planning efforts. While census-designated areas are used in many of the online assessments, including the U.S. Census and others, they are not used in any formal way locally. These areas have no elected, appointed or anecdotal officials, and have no legal authority in Ohio.

Representatives from rural Wood County identified a water quality emergency as a top concern, although the past five years have had no water emergency incidents. The risk of nitrogen and phosphorus surface runoff is high in areas of the county where fertilizers and chemicals are used; this includes farmland as well as industrial areas and residential neighborhoods where lawns are groomed and treated regularly. Uneven and varying tiling systems across the farmland allow for inconsistent surface runoff and percolation of chemicals through the soil before runoff occurs. On Wood County's clay soils, untiled fields drain without much nutrient percolation into the soil. Isolated farms that do not have effective nutrient management systems contribute to runoff that isn't processed and neutralized. Runoff from these surfaces increases the risk for toxic algal blooms in western Lake Erie and the surrounding rivers, creeks, and streams. Because these waterways are the primary water source for public water systems in the region, these systems are susceptible to contamination from these toxic algal blooms. Wood County receives potable water from a variety of systems, including Northwest Water and Sewer District and municipal water treatment plants in Bowling Green, Perrysburg, Toledo, and Oregon. Some rural areas are supplied by wells and are not part of any public water system. The concern is that a water quality emergency, involving any or all of these sources and limiting the region's water supply would be overwhelming. It would be nearly impossible to supply drinking water to all the residents, as well as livestock operations, businesses, industries, and service providers. If the Toledo water system were to be shut down, it is believed that the Oregon and Bowling Green systems could not collectively provide sufficient water for the whole area. In this scenario, the economic impact of business closures would be catastrophic, including the closure of critical services like health care, child care, and food service. The cost of hauling water, communicating with residents, and measuring service delivery was almost unimaginable to the participants. The planning team also assumes that some older homes in the county still have lead pipes, which contribute to lead contamination in the drinking water for residents of these homes. While this issue is not as high of a concern as contamination of municipal water systems, it is a relevant issue for Wood County.

That said, stakeholders did recognize that the ability to test and treat water has improved significantly over the past five years. All providers of water have improved their operations and well as their communication with customers. Toledo has made significant changes it the way it handles outside water customers, and this has enhanced communication significantly. Farmers have willingly and enthusiastically participated in the H2Ohio Voluntary Nutrient Management Plan over the past few years. Significant reductions in the use of chemicals as well as farming techniques has occurred, preserving the soils better, reducing chemical runoff, and contributing far less to water quality issues in the rivers and streams. Industries have been willing to change methods to reduce the use of chemicals and lessen runoff problems. In spite of significant progress, though, Wood County felt these efforts and prioritization of this highly collaborative effort to protect natural resources should continue.

Wood County residents were very concerned about hazardous materials spills and leaks, ranking it as their second highest fear. With state and interstate highways and railroads crossing the entire county, the chance of a vehicle accident or derailment is significant given the number of trucks and trains that use those routes. The devastating incident in East Palestine, Ohio could have easily happened in Wood County, and they are well aware of that fact. Railroad cross the entire county, local officials are well aware of poor maintenance of rail property including culverts, bridges, and other structures, and communication – while greatly improved – is not as transparent and ongoing as local officials want. They have made no progress on lessening crossing blockages for hours at a time, even when those blockages impede local responders' ability to access and act in life-threatening emergencies. There are many pipelines buried in the county that carry both gas and liquid chemicals to refineries in the Oregon and Toledo area, and to the Port of Toledo to be hauled across the Great Lakes to other ports. There are new pipelines that are larger and longer than the petroleum product lines that have existed for years. The new pipelines are part of a regional network of buried transport systems comprised of pipes three to four feet in diameter as well as the equipment to filter, manage, and deliver the substances in the pipes to various states and facilities. These rarely experience severe problems, but the people and property that would be affected is high, and a serious incident could be devastating and deadly.

Wood County, because of its extensive growth, plentiful small industry and manufacturing sectors, amid exploding retail development, is vulnerable to potential hazardous materials incidents. Semi tractor-trailers, box and bin trucks, pressurized and non-pressurized tankers, and trains haul a wide variety of hazardous chemicals through the jurisdiction every day. A commodity study completed in 2020 identified 99 hazardous chemicals transported in and through Wood County in just thirty hours of observation. These chemicals were carried on roads and rail in various kinds of containers, tanks and boxes. The most frequently observed chemicals included flammable liquids, flammable gases, cryogenic gases, corrosives, toxic substances, and poisons. Hazardous materials haulers were so concentrated on some highways like the Ohio Turnpike and I-75 that observers had difficulty capturing every hauler's placard number. Traffic congestion causes vehicle accidents and high wind tips semi-trailers over on the interstates. The flat and open terrain lends itself to high-speed traffic on roads and rail, opening the door for high-speed crashes with significant amounts of force. Oftentimes the opposing

vehicles in a crash are of dissimilar mass, velocity, and speed; therefore, one vehicle obliterates the other and damage is spread across a large area. It is reasonable, under those circumstances, to imagine punctured tankers, leaking cars and containers, some fires, and exploding pressurized cars. Rural roads are peppered with farm tractors and other slow-moving vehicles transporting farm chemicals, such as anhydrous ammonia, during planting and growing seasons. Crop dusting airplanes buzz and swoop fields, barely navigating around power poles, buildings, and radio towers. Constant loading, unloading, packaging, and use of chemicals make the county vulnerable to a hazardous material spill or release. Railroad crossings are plentiful across the county; trains and block intersections every hour of every day, causing frustration, restricting access, and contributing to traffic congestion. Signage is sometimes inadequate and destinations and alternate routes are not clearly marked. This increases the likelihood of crashes. In fixed facilities, manufacturing or industrial plants are hazardous substance users or disposers due to the process, product, or activity at the businesses. Some of these facilities have thousands of gallons of hazardous substances on site. A spill or release via a transportation or fixed facility incident could pollute the air, seep into streams and ditches, and contaminate lawns, roadways and public property. Pipeline incident risk is a growing component of hazardous materials vulnerability as new pipelines are being installed across the area to carry hazardous substances that might include, among other substances, hydrocarbons and organic chemicals. Existing pipelines already carry a variety of hydrocarbon products to area refineries and distributors. At areas where compressors are installed in gas lines, there can be a release of chemicals such as methane, benzene, toluene, sulfuric oxide, and formaldehyde into the surrounding area as a result of “blowdowns” that remove liquids, dirt, particles and impurities from the gas. There can also be emissions into the atmosphere from mufflers installed to deaden the sound of the compressors as they purify the gas. An incident, dependent upon the population density and presence of businesses at a specific leak site could be cause evacuations, fire, air or water quality issues, or soil contamination if there were a pipeline leak or release. A serious hazardous material spill or pipeline incident could contribute to evacuations, fires, and damage to the city’s air or water quality. While public officials are concerned about evacuation; residents are concerned about contamination of their property; and farmers are worried about loss of crops, life, and property. Any time digging occurs, be that plowing, installing a fence, revitalizing a home’s landscaping, or building a new structure, the chance of rupturing a pipeline that lies below the surface exists. As the county becomes more populated, as houses and outbuildings are built, and as older homes and properties are renovated, the chances of a pipeline incident increase. Again, evacuations and loss of property, fire, explosion, or injury are concerns in Wood County.

Highways across Wood County flood and sections close with as little as two inches of fast-falling rain. Stakeholders across the county reported heavier rain, higher winds, more consecutive days of rain, wetter spring and fall, and generally harder, more intense rainfall. They said that surface flooding and flash flooding can be worse now given the changes in how the rain comes. As surface drainage flows through the watersheds, flooded streets, roads, and properties follow. Tree debris, lawn clippings, crop fodder, and general rubbish delay drainage as culverts and sewer basins clog. Many culverts and basins are not of sufficient size; some are old or damaged and have collapsed; others are blocked and not well-maintained. In areas where

railroad tracks are highly elevated, storm water dumps on roads, yards, and driveways; this causes flooding and limits the property owners use of the area until the water drains, usually within several days. The need for debris collection frequently stretches the capabilities of rural work crews so culverts and basins remain clogged, preventing effective drainage for extended periods of time. Roadside drainage ditches in Wood County are wide and deep; when these ditches fill up and run with force, they can cause sanitary and storm sewers to back up into basements and homes simply because there is far more pressure in the ditch than the sewer line. Water ends up filling basements, crawl spaces, yards, and, occasionally, living spaces until the ditch levels decrease and water can once again flow out of the home. In and around areas that are commercially developed, detention ponds are not always adequate to manage storm water. Some detention ponds are designed to drain very, very quickly. Others are pumped out as they fill. In either situation, the rate at which storm water is dumped into the system is too fast and flash flooding occurs. Most stakeholders reported retention and detention basins that are new are working well, and do provide relief from surface flooding. They said in some areas the basins need to be larger, and some areas of heavy development do not have enough basins. They cited the Crane Creek area as one that needs additional basins. As all of this water drains into ditches that flow across the county's flat terrain, causing road berms to wash away and sediment to be deposited alongside other debris. Some of the berms along roads that have large, deep road ditches are eroding away with the heavy rains of recent years. The water comes down very fast, and rushes to the ditch gravitationally; with it goes eroded pavement and soils in the berms. When vehicles drive over the eroded edge of the pavement, it eventually crumbles. That starts deterioration of the road surface, and a cycle of rain, washout, erosion, crumbling begins. A few roads in southern Wood County are not paved; the heavy rains cause these roads to wear and deteriorate quickly. Multiple state highway detours over the past few years have dumped heavy, large truck traffic on county roads as GPS systems provide their own routing to drivers. When the size of vehicles exceeds the load limits, there is extensive road damage, especially when heavy rains occur. In some areas, beavers have built dams in waterways, causing additional drainage and flooding issues. The process to remove these beaver dams is time consuming and costly. As hazardous materials, pipelines, and industrial use of chemicals increases, the chance of floating or flooded propane tanks, delivery trucks and storage tanks increase. Crop damage can be extensive, especially along waterways and in low-lying parts of fields. Livestock can be isolated and suffer health effects from extreme outdoor conditions and loss of food and water.

Some rural areas along the Maumee River are susceptible to landslide/mudslide. This risk is limited to very specific properties along the Maumee River on SR 65. Along State Route 65, or River Road between the county line in Grand Rapids and Rossford, some homes are built very close to the riverbank. The Maumee River runs relatively straight through Wood County. There are minimal outer turns in the river where undercutting of the shoreline would naturally occur but there are small bends and turns that create some long-term vulnerability to landslides. The elevation difference between the roadway and the river bottom ranges between 35 and 80 feet; some areas along the bank are steep and high while most are gradual and slight. Some homes are built on a wide span of property that slopes gradually to the river; these homes are less vulnerable to landslide than those on steep, high inclines. Many of these homes are old

structures while others are newer construction. There are no documented occurrences of landslide but the State of Ohio estimates Wood County's loss potential to be $1,163,085.

Windstorms, tornadoes, and severe thunderstorms all result in similar damages. Structures are destroyed, roofs are damaged, siding is ruined, and entire buildings collapse. This can include houses, barns, storage buildings, livestock barns, and other outbuildings. Crops in fields like corn and beans are flattened and often are plowed under because they do not recover. Grain bins, drying systems, elevators and conveyors, and equipment kept outdoors is bent and battered beyond use. Hail and lightning strike barns, equipment, and grain systems. Grain systems are particularly vulnerable to lightning strikes and the resulting fires, which destroy the system and the contents. Lightning strikes to hay and straw-filled barns can cause fires that ignite and burn quickly, destroying thousands of dollars of product. In southern Wood County especially, and other rural areas to some extent, the delivery of warnings and notifications is difficult. Internet, wireless telephone, and broadband services are not consistently available in all areas. In some areas, the services work only during clear, unobstructed weather conditions. When precipitation and wind increase, communications cease to function. This, combined with the county's location near the border of the North Webster to Cleveland National Weather Service districts, makes warning and notification imprecise at best, and non-existent at worst. After storms pass, the debris deposited all over the county is difficult and costly to collect, haul, and dispose of in commercial landfills. The county is challenged to provide enough personnel and equipment to manage the debris, let alone absorb the expense associated with disposal. Winter storms can be treacherous in a county that is so flat and open. In northwest Ohio, winter storms often include significant ice on roadways, making them extremely slippery and dangerous to navigate. With so many miles of straight county roads, as well as the state and interstate highways that cross the county, the maintenance of such is difficult, expensive, and never-ending. When heavy snow is added to the mix, plowing to keep roadways free of drifting and blowing snow is nearly impossible. The county and townships have a very difficult time keeping up with clearing of roads in the worst blizzard conditions. This causes rural residents to become isolated, and they are vulnerable to medical emergencies, fires, and other unforeseen incidents without the ability to summon and receive help.

Drought and extreme heat are infrequent and generally well tolerated. The most common drought-related losses are crops that are impacted during the growing season when the most water is necessary for plant development. For livestock operations, water for animals must be hauled if ponds, wells, and other water systems are inadequate to meet the needs of the animals. This is extraordinarily expensive for farmers. For the majority of the county that is served by public water systems, their resilience to this hazard depends on the capacity of the local system.

Rural Wood County is home to several dams. Many of these structures are described in the vulnerability section for the jurisdiction in which they are located; this includes several high hazard dams in the county, as well as those considered to be significant hazard dams. Many of the dams are upground reservoirs intended to collect water from waterways and precipitation to treat for distribution. Two dams, both near the Williamsburg Subdivision in Washington

Township, are privately owned and hold water back for recreational purposes. Two are low-head dams on the Maumee River in Grand Rapids. All have recently-updated emergency plans on file and most are in good repair. Both Candlewood Dams in Washington Township are considered poor condition. If they were to breach, the water would mostly flow into the Maumee River, just as the water would with the Bowling Green Upground Reservoir and the two dams in Grand Rapids. None of the inundation zones are highly populated and there are no known incidents of failure. Losses would consist of flooding of farm fields, possible displacement of some livestock, and minor flooding of county roads around the facility. There is no likely loss of life or significant property damage. The dams are not located on a single waterway; they are not close to one another. In most cases, they are ten miles or more apart. If for some bizarre reason all of them were to fail at the same time, there would be no anticipated joint consequences. Each would affect a totally separate area. Candlewood dams and the BG reservoir would flow into the Maumee at a place where it is wide and mighty, close to Lake Erie, and no stakeholders anticipated that the river could not handle the water. The Grand Rapids dams are low-head dams and would have very little effect on the river if they were to breach.

Power failures in Wood County are uncommon. Lines, poles, and transformers are relatively new and rarely fail. Several upgrades and improvements have been completed recently. If a widespread failure did occur, it could be devastating to livestock operations if farm products like milk and eggs spoil and are unable to be sold. Outages that occur during grain drying can cause fires, inefficient drying, or molded grain. If poles and lines are damaged like they were in the 2012 derecho, repairs can take several weeks. In that time frame, a significant amount of milk must be destroyed, eggs dumped, and slaughter animals destroyed. Some businesses may be forced to close for the duration of the power outage, reducing their revenue and impacting employee wages. Food service businesses may also be forced to dispose of spoiled products that were not maintained at proper temperatures. Individual households must also dispose of spoiled food. Persons with medical needs suffer during these situations when they are unable to use power-dependent medical equipment and are unable to adequately heat or cool their home environment. People who rely on cellular and wireless communication devices can become totally isolated when they have no way to recharge communication devices. If a power failure occurred in a widespread fashion and lasted for a long time, like the outages with the 2012 Derecho did in southeast Ohio, there could be severe water treatment and distribution and stormwater treatment problems. If combined with heavy rains, pumps and sump pumps would not work, and flooding on public and private property would be without any control

Earthquake damage in Wood County would include destruction to grain operations, including bins, dryers, and elevators and transfer legs. Water lines, storm sewers, sanitary sewers, and utility poles would be damaged or destroyed. Masonry and brick structures, including much of the county's critical infrastructure, would crack, weaken, or possibly fall in a strong earthquake. Water distribution networks, storm water systems, underground electrical lines, and communications infrastructure would be severely impacted. Pipelines that transport petroleum products, liquid gases and other volatile chemicals would be damaged and destroyed. History indicates that strong earthquake is not likely in Wood County; however, a

fault line does pass nearby and earthquakes have occurred in the past in areas close to Wood County.

County representatives indicated invasive species infestation was the lowest of their concerns. They feel that the Emerald Ash Borer infestation has been resolved and diseased and weakened trees are gone. They estimate 30% of all the trees in Wood County were ash trees. They are most concerned about the debris factor of an infestation and the cost in personnel and disposal that involves. Ohio's list of potential insects, nuisance wildlife, plant diseases, and aquatic infestations is long; stakeholders realized that any of these could quickly affect Wood County by being hauled in on trains, trucks or in cargo. Some stakeholders reported known damage from Army worms, marestail, fox tail barley, elephant weed, phragmites, garden crest, water crest, beavers, deer, feral cats, coyotes, and geese. They attributed some infestations to rail car and cargo shipments from other parts of the country bringing in contaminated cargo and transplanting the insects or diseases here.

Following are the property valuations for the entire county less the properties listed below under each municipality or Lake, Middleton, or Perrysburg Townships; these are taxable values at 35% of the fair market value. The numbers represent the loss that could be experienced if all properties were destroyed

2.3.7 Jurisdiction Vulnerability

While jurisdictions across Wood County share many common characteristics, each individual jurisdiction is also somewhat unique in how it is affected by the identified hazards. This section describes how each jurisdiction is impacted by hazards.

Bairdstown

Located on the southern border of Wood and Hancock counties, residents in the small village of Bairdstown are most concerned about hazardous materials incidents, water quality emergencies, and wind damage. With a railroad running the length of town, a train derailment could easily affect the most residences in the village, and after recent incidents, this is extremely concerning. Prevailing winds out of the southwest could take airborne contaminants across the entire residential area that lies to the northeast of the railroad. Natural drainage flows to the north, so a liquid spill would also move to the north and affect many homes, especially if facilitated by rainfall or ice melt and left un-diked. An abrupt left-right jog in SR 18 in the middle of the village increases the risk of vehicle accidents, especially for the semi-trucks that haul hazardous chemicals through the village and must navigate a small, narrow highway. There are pipelines in the vicinity that could be ruptured through excavation or other digging. A rupture could cause leaks of volatile substances and cause explosion or fire, as well as air or water quality problems. The potential isolation of some areas when a significant spill would occur and where, service to an aging and disadvantaged population, and distance from significant mutual aid resources makes this a big concern for the village.

Another concerning vulnerability is water quality. The village's water comes from the Maumee River, and although water testing and treatment has improved immensely over the past several

years, there is still a risk of water emergencies. Application of anhydrous ammonia to grain crops, application of fertilizers and pesticides, and transport of those chemicals through town could contaminate streams and creeks and, ultimately, the local aquifer that supplies wells for others not using public water systems. For homes that use treated water, runoff from agricultural and lawn care chemicals can contribute to the algal bloom toxin contamination cycle.

Because the village is located on open and flat terrain, residents are concerned about windstorms, severe thunderstorms, and tornadoes that damage roofs, siding, and trees; throw debris onto buildings and vehicles; and damage cars, farm equipment and outbuildings. All stakeholders reported worsening storms with higher intensity, increased severity, and heavier precipitation. The vast amount of debris generated by wind incidents can also be costly to collect, haul and dispose of in landfills. Accompanying heavy rain can cause flash flooding; however, historically, this has not occurred frequently in the village. Only when extremely fast and heavy rain falls do streets and basements flood. When this occurs, the water drains away relatively quickly. They do not currently experience heavy areal flooding.

Invasive species can impact many trees in this community, putting homes at risk of damage from falling trees during wind storms and thunderstorms. Streets can also become blocked by trees that fall during storms. Weakened trees also contribute blockages and log jams on streams and creeks. As temperatures increase, there is some concern for other invasive species that could thrive in warmer temperatures.

Winter storms cause some drifting on roads and streets as well as business closures but, unless accompanied by an extended power outage, the impact is more inconvenience than measurable loss. When ice forms as part of a winter storm and coats roadways, vehicle crashes can occur, damaging property and injuring passengers.

Power failure is not a great concern in Bairdstown because of their reliable electric service but outages could cause health problems for elderly and functional needs populations, people requiring power-dependent medical equipment, and anyone unable to compensate for extreme temperatures. Business loss can occur when power outages require destruction of partially processed raw materials or production line shut down with extended restart process. Drought and extreme heat are only a concern if accompanied by a power outage due to the effect on elderly and functional needs populations.

Earthquake is a low concern and not highly probable. If an earthquake did occur, there would be damage to buried infrastructure like water lines and sewers as well as above ground utility lines. Some foundations could be compromised but most buildings are not large or multi-story so damage would likely be limited to contents.

Bairdstown is not vulnerable to dam failure or landslide/mudslide.

Bloomdale

This tiny village on the Wood-Hancock County border identified hazardous materials spills and releases, windstorms, tornadoes, and flooding as their top four hazards. Hazardous materials spills occur on State Route 18, as trucks travel through the village on a narrow highway. The South Branch of the Portage River begins near Bloomdale and adjacent land naturally drains into that waterway, making it vulnerable to contamination if a spill occurs. Rail passes through the southern side of the village, making the entire residential area to the north and east susceptible to air contamination in a derailment of aerosolized chemicals. After recent rail incidents with extended and long-term damages and consequences, local stakeholders are very concerned about derailments. An intermodal rail switching yard is just a few miles to the west brings a wide variety of chemicals and containers through Bloomdale every day on railcars. There are pipelines in the vicinity that could be ruptured through excavation or other digging. A rupture could cause leaks of volatile substances and cause explosion or fire, as well as air or water quality problems. Officials are concerned about the capacity to respond to and manage a large hazardous materials incident, especially if it is a major derailment. They are very concerned about a lack of capacity to transport, shelter and care for residents in those circumstances.

Sitting in the midst of flat terrain, the community is vulnerable to roof, siding, and outbuilding damage during wind events, including tornadoes and straight-line winds. Trees, especially if diseased or weakened by invasive species, fall on structures, cars, and roadways, and form log jams in ditches and streams. All participants reported more wind, heavier rain, and more frequent and severe storms no matter the specific kind of storm. They reported an extraordinary amount of lightning when storms hit, evidenced by repeated strikes on their water tower and houses in the village. They are concerned about timing of warnings; the warnings from Cleveland NWS often come too late, and are received after the storm has passed.

When heavy precipitation rain falls, the streets in Bloomdale flood for a brief period of time. Recent locally funded improvements of storm sewer basins have significantly improved drainage, reducing the community's risk for flash flooding. Invasive species have negatively affected the village in the past as trees diseased and weakened by the Emerald Ash Borer have become more susceptible to damage in wind events, landing in streams, ditches, and private property.

Water quality emergencies are a concern to Bloomdale residents because the village is located in the midst of farmland where chemicals are used regularly and their water supply is an aquifer underneath the surface. Some residents receive water from Northwest Water and Sewer District, which pulls raw water from the Maumee River. Although this river is highly vulnerable to algal bloom and high phosphorus and nitrogen levels, NWWSD has increased their capacity to test and treat water significantly over the past few years. Agricultural participation in programs to reduce toxic runoff has been high; therefore, their concerns are diminishing. The new wastewater treatment plant helps calm local concerns but does not entirely negate these fears.

Severe thunderstorms and winter storms that include high winds, occasional hail or ice, and heavy precipitation can cause roads to close due to flash flooding or blowing and drifting snow. If accompanied by a power outage, which was deemed as unusual and unlikely, the damages could include loss of medical equipment use, loss of HVAC, and production stoppages for local businesses. If extremely high temperatures were accompanied by a power outage, there could be loss of medical care, injury or death in extreme cases. They are concerned about vulnerable and underserved populations who would need extra help after damaging incidents, and they are concerned about being able to provide adequate help as the fire and EMS industry is challenged to maintain staffing.

Earthquake is not a high vulnerability and, should one occur, the low magnitude event would likely damage utility lines and some foundations but would not cause extensive structural damage to buildings.

Bloomdale is not vulnerable to dam failure or landslide/mudslide.

Bowling Green

Bowling Green, the largest municipality in the county and county seat, is dedicated to providing a safe water supply through the city's water system to all customers of the city. Bowling Green has its own water treatment system and pulls raw water from the Maumee River. A large reservoir in Middleton Township between West River Road and Frost Road holds the water drawn from the river before treatment and distribution. (The structure, classified as a high hazard dam, is discussed later in this section.) The Maumee River is one of the waterways most vulnerable to high phosphorus and nitrogen runoff and resulting toxic algal blooms because the watershed it serves is so geographically huge. A water emergency, similar to what happened in Toledo in 2014, could affect Bowling Green, as well as the communities served by them. Microsystin cannot be boiled out of water; it must be treated over a period of days. Therefore, water emergencies from algal bloom can be lengthy. Shutting down water distribution would cause tremendous economic loss from business closures. This would include extensive industrial loss as plants shut down due to occupancy and production stoppages; hospitals, schools, and other institutions close without an alternate water supply, and residents would be forced to purchase bottled water. Bowling Green State University houses approximately 6,000 students on campus; this population would also be affected and require an alternate water supply. The business cost and loss to the city, as operator of the water system, would be significant. Additionally, a water emergency outside the city's system would place undue burden on the plant as Bowling Green would most likely become an alternate supplier the affected jurisdictions.

Another concern in Bowling Green is hazardous materials incidents and contamination. With several state highways that traverse the city, there is a high chance of collisions during transport or spills during transfer or use. There are many chemistry labs in the city, including at the university and businesses. During the past five years, there have been many new businesses open in the city, and many of them use hazardous substances in their manufacturing process.

Traffic can be very congested, especially in the sections of town with high population and significant pedestrian and bicycle traffic. Rail lines cross through the university and the city and highway traffic includes State Routes 6, 25, and 64. Interstate highway 75 lies on the east side of Bowling Green and serves as a major route for many trucks and commercial vehicles. Some carry chemicals while others do not, but the crash history makes an incident involving hazardous substances a likely problem. A leaking chemical spill on SR 6 south of town would envelop the entire city in a 3-mile radius; 65% of the city in a 2-mile radius; and a 20% section of residences and retail in a 1-mile radius. A spill on I-75 could easily cause a 2-mile radius evacuation which would envelop half of the city. Any spill on SR 64 or SR 25 could affect the entire city, including the hospital and the university. A rail spill would likely affect the northern half of the city, with an emphasis upon the NE quadrant that includes the university. First responders have noted a very significant increase in foreign commercial drivers, including those who operate vehicles carrying hazardous materials. These drivers oftentimes speak no English and are very difficult to communicate with or understand. They do not have a functional comprehension of the GPS devices they use to navigate the roads, so when they take an unmapped or incorrect path of travel, they lack the communication skills to ask for help. This puts them in residential areas, on roads with insufficient load limits, or in very congested traffic areas.

Evacuation due to a hazmat release, in addition to being disruptive, would be difficult because of the high number of people potentially affected. As the hub of county government, the disruption to business would also be significant. There are pipelines that carry gas and liquid chemicals to the City of Toledo area for refineries and distributors of petroleum products. These lines can be damaged or deteriorate, and leaks and releases can occur during transfer to tanks or tank cars, or if there is a vent that releases too much gas, malfunctions, or otherwise contributes to an air quality problem. Excavation is always a potential compromise of a pipeline if the digger doesn't do adequate notification and have lines marked before digging. A trench response can occur when a line is breached through excavation and release whatever chemical is being transported through the line at that time.

A concern identified by Bowling Green residents and officials is wind. Structural damage, especially to historic and high use public buildings, is costly to repair. Trees and vegetation in the beautifully landscaped city would be destroyed and take years to restore. Commercial buildings with glass exteriors, power poles and overhead utility distribution systems, and slate, shingle, and metal roofs are easily destroyed and vulnerable to wind damage. Stakeholders said that they have noticed an increase in the frequency and duration of high wind events over the past five years, and are more concerned about wind damage today than they were five years ago. Wind storms are no longer associated with precipitation, and often occur as wind only.

Five to six inches of rain causes widespread street flooding in the city, and this kind of event is becoming much more frequent. Rain is falling faster, harder and for a longer period of time with heavier spring and fall rain. Neighborhoods in the northwest section incur basement flooding and depend on pump systems to keep water out of homes. Storm sewer pump stations across the city are dependent upon generators in a power outage, which can sometimes

accompany heavy precipitation events. Culverts and storm basins, especially on the east side, are undersized, inadequate, and often clogged with lawn debris, leaves, and fallen trees after heavy rain, further impeding drainage. Improvements to Main Street have eased some flooding, but basement flooding is still problematic at times. Some streets without curbs suffer damage from rapidly draining water and signage to mark flooded streets is insufficient. Power supply is important to flood control because of pumping stations and sump pumps. More generators are needed to harden this resource for mitigation efforts.

Power supply is critical to the city's flood and storm mitigation. The city handles their own power distribution and has installed a new sub=station at Brim and Bishop Roads. Battery backup has been added to all major intersections for the purpose of maintaining traffic control. The city is host to 280 MW of emergency generation consisting of gas-fired turbines. Their fuel is dependent on a single 60+ year old gas transmission line. Also, while the city is partially served by a second gas company, the vast majority of customers, including those housed at BGSU, would be severely affected if this single transmission line or its metering stations, were to be damaged by earthquake, terrorism, vandalism, explosive failure, etc. especially during the winter. Tree damage and fallen branches continue to cause many of the power outages in the city.

Severe thunderstorms and tornadoes cause very similar damage as windstorms and heavy rain. Additionally, there is hail damage to roofs, siding, vehicles, and outdoor equipment. Rarely does lightning cause fires, but that is possible, especially if there has been an extremely dry period before the storms hit. Invasive species, especially the Emerald Ash Borer, has caused trees to weaken and fall, damaging homes, businesses, and creating a heavy load of debris to be managed and disposed of after storms. This management costs the city time and money to resolve. There is a serious deficiency in the number of storm shelters and residential safe rooms, putting residents at risk during any severe storm. However, communication systems have improved warning and notification through various options for hard wired and wireless notification of individuals and residents.

Today, invasive species issues include not only tree disease, but also ticks that cause human and pet illness. Nuisance wildlife like deer and wild turkeys do incredible amounts of damage to property, and cause accidents that damage vehicles and injure people.

Winter storms and extreme heat and drought are uncommon. Both can cause discomfort and inconvenience but rarely result in the loss of business, property, or life. Blowing and drifting snow on roadways and icy highways can cause crashes, but road crews are generally able to keep up with the need to manage this. As the population ages and more people are elderly and disabled, and as disadvantaged populations increase in size, the city has some concern about heat waves and extreme cold. There are few places to shelter people when this happens.

Earthquake is unlikely, but a low-grade rumble could destroy underground utilities and infrastructure, crack underground pipelines and tiles, and damage foundations to stone and masonry buildings and the water treatment plant. Some above ground utility poles could fall,

and roads might be affected. Buildings are mostly two or three stories, but none of the buildings have been constructed to withstand an earthquake. Building codes established through the Wood County Building Department are enforced in the city, but those are only minimally effective for earthquake. Debris management would be a major problem area if a significant quake were to occur.

While Bowling Green is not susceptible to dam failure inside the city-proper, the city owns and operates an upground reservoir at its water treatment plant in Middleton Township. This structure is considered a high-hazard dam. The city has created an Emergency Action Plan, the reservoir has been inspected by ODNR and deemed to be in satisfactory condition, and the structure is maintained on a regular basis. The city is planning to construct an additional reservoir on the same property. While the city and its residents would not incur physical damage should the reservoir fail, they are responsible for the upkeep and operation of dam, and damages caused should it fail. The reservoir is a stand-alone structure, and sits several miles from the dams in Grand Rapids and the dams at the Williamsburg Subdivision. An all-dam failure kind of incident is highly unlikely to occur, even after heavy rains. The reservoir is an off-stream structure on the Maumee River. It was professionally engineered and constructed by the City of Bowling Green in 1989. Stakeholders did not see this dam as a significant hazard because the inundation zone is not heavily populated, and the reservoir is not physically connected to the Maumee River.

Bowling Green is not susceptible to landslide or mudslide.

Bowling Green State University

BGSU is located inside the city of Bowling Green, and is vulnerable to all the same hazards as the city. They house approximately 6,000 students in their facilities and employ slightly over a thousand workers. They have prepared an on-campus hazard identification and risk assessment which calls out food emergencies as their leading concern because their food service is such a large endeavor. For the purposes of this plan, they assessed the hazards that are covered by the Wood County Hazard Mitigation Plan.

Extreme cold is a high concern for the university because many students walk or use bicycles for transportation. Extreme cold, coupled with high winds, makes transportation problematic. The buildings on campus are vulnerable to frozen pipes during extended extreme cold, and broken pipes cause a lot of stress on their maintenance crews. If combined with a power outage, providing warming centers for residential students is difficult. Extreme heat does not cause nearly the problems as cold, and usually occurs during the summer when classes are not in session and students are home for the summer.

Lack of power closes the university. Generators are capable of short-term power for four hours only. A lack of power results in canceled classes and no business being conducted. Some research projects are destroyed when power outages occur because maintaining environmental controls in laboratories must happen constantly. This is a costly loss in terms of financial support, research progress, and study time and energy. Several large buildings on campus,

including the recreational center, the stadium, and others are contracted for sheltering services by Red Cross, Wood County Health Department, and the EMA. If these buildings have no power, they are not adequately generator-supplied to serve those needs.

Hazardous materials releases are a concern. Recreational facilities use chemical systems to create ice in the skating rink; the pools have chlorination systems. Students in the aviation program fly over and past campus from the airport on Poe Road. Some of the student flights also cross over businesses that have multiple hazardous substances on their property. A crash would be complicated by hazmat at those locations.

Flooding is problematic. There are underground tunnels all over campus that contain power line, technology infrastructure, and communication lines. Flooding impacts these tunnels and affects services in a debilitating manner.

Wind and tornadoes could impact the university in a significant manner. Roof damage, structural damage, window and landscaping damage are all very likely from either hazard. These incidents will also impact a wide array of outdoor activities, either classroom related or extra-curricular. The university does not have shelters to protect students, athletes and visitors when this occurs.

BGSU is not susceptible to dam failure or landslide and mudslide.

Bradner

Bradner is located just inside Wood County on the eastern boundary with Sandusky County. At less than one square mile, the village is most concerned with invasive species that topple their ash, maple, and elm trees. Weakened trees fall on roofs and buildings, block ditches and streams, and create debris to be collected and hauled away by a village with limited resources. With an ever-growing state list of invasive species, the village is diligent about protecting its trees and vegetation from disease, insects and other infestations.

Along those same lines, windstorms are a significant concern because of the potential damage to homes and the amount of debris that is generated. Few homes have basements due to rock under the surface, so sheltering from wind events is difficult. Safe rooms are not available, putting people and property at risk. Officials reported increasing rainfall during incidents, and higher severity of wind and rain. Storms are more frequent, the precipitation falls faster and harder, and the total accumulation is greater compared to just a few years ago.

State Route 281 and the railroad that runs north to south through the village creates a concern for hazardous materials incidents. Both could expose residents to exposure in cases of a crash. Rail crossing blockages make it difficult for first responders to arrive on scene frequently, putting additional burden on public safety to protect the residents through timely containment of a spill. A plume would also affect at least half of the residents, dependent upon wind direction. Either direction would result in 50% exposure. There are pipelines in the vicinity that could be ruptured through excavation or other digging. A rupture could cause leaks of volatile

substances and cause explosion or fire, as well as air or water quality problems. They are very concerned about derailments and being able to communicate effectively with the haulers to protect citizens in time and to the extent necessary given the specific hazardous chemicals that could be involved.

Recent storm sewer improvements have diminished flooding considerably. Street flooding is now temporary and has little long-term effect. Tornadoes have affected Bradner in the past, causing structural damage and fallen trees, but this is not considered frequent enough to be a priority concern. Bradner residents experienced water restrictions in 1988 due to drought, but most feel this is a low risk. There are five water towers owned by the Village of Bradner; residents are concerned about security at those towers. Fencing to secure the sites would make them more resistant to intentional sabotage. Severe thunderstorms have caused lightning and hail in the past with few significant damages. Winter storms cause some drifting and blowing snow and, once in a while, ice will cause a power outage. Neither are considered highly costly or damaging. Most of the effect is inconvenience. They did cite increasing extreme temperatures, both hot and cold, and the difficulty for elderly and disadvantaged populations to deal with these extremes.

Power outage is considered very low probability because Bradner owns its own distribution system that relies upon Toledo Edison, a highly dependable provider, for electricity. Because the village maintains trees and distribution lines regularly, and because they have generators as an alternate supply of power, outages are not considered a major threat. Drought and extreme heat would only be damaging to the health of elderly if a power outage occurred at the same time, so drought and heat are considered low risk list as well. Most of the hazards that fall low on the vulnerability list cause inconvenience rather than actual damages to properties that must be repaired or replaced. Bradner is not susceptible to dam failure or landslide/mudslide.

Bradner is not susceptible to dam failure or landslide and mudslide.

Custar

This village of less than two hundred residents is most concerned about wind damage. With flat terrain, the homes and small buildings are vulnerable to roof damage, siding damage, and flying debris. There is little protection from the wicked winds of northwest Ohio, placing tornado and severe thunderstorm high on the list of vulnerabilities. To worsen the issue, stakeholders reported that winds are increasing in both speed and frequency, and it seems like there are more damages from incidents of extremely high winds, generally above 30 miles per hour. Most homes have no basement; some are mobile or manufactured homes built on concrete slab foundations and there are no storm shelters or safe rooms in the village. Sheltering is big concern for officials. This trifecta puts residents at risk when severe storms strike. The few homes that do have basements tend to experience basement flooding in heavy rains and the streets become temporarily impassable due to flash flooding. There are no open waterways in the village; the single ditch that passes through town is enclosed and thus has limited capacity to drain properties. The enclosure maintains a low-lying ravine area that does facilitate gravitational drainage but the water does stand in yards and streets for a period of time before

it is able to drain. Custar residents know from experience that their homes are vulnerable to damage to roofs, siding, and windows as well as flying debris and rubble during severe wind events.

The grain elevator inside the village emits unpleasant odors from fertilizer and farm chemicals. Barely distanced from farm fields where pesticides and fertilizers are applied, the village is vulnerable to hazardous substance incidents like accidents while hauling or applying anhydrous ammonia. State Route 281 crosses the middle of town and trucks hauling chemicals also place the residents at risk of a release or spill. A CSX rail line passes to the northeast through town and poses a derailment risk and a crossing risk as it intersects the state highway. Recent rail incidents have peaked residents' concerns about derailments. Public safety crews are often shut off from half of town when the tracks are blocked and response is delayed until crews can drive miles around the crossing blockage. There are pipelines in the vicinity that could be ruptured through excavation or other digging. A rupture could cause leaks of volatile substances and cause explosion or fire, as well as air or water quality problems.

Power failure is rare in Custar since Toledo Edison has worked on trees and transformers outside of the village. The village owns the power distribution system in the village and keeps it in excellent repair. Trees are trimmed regularly. The village has purchased and installed a generator at the American Legion to serve as a community center or cooling/warming station in an extended power outage or severe storm.

Invasive species is of little concern after aggressive tree trimming in years past and continual upkeep. If new species infest the area, there could be additional damages or a repeat of the ash tree problem over the past decade. As temperatures warm in general, there is some thought about insects that may thrive in the warmer temperatures and create a nuisance. Winter storms do little but cause inconvenience and a few drifted streets and extreme heat and drought have little effect on this resilient village. The village feels confident in NWWSD water service and considers a water emergency the lowest of their concerns. They have not experienced any water problems since signing on with NWWSD in 2010.

Custar is not susceptible to dam failure or landslide/mudslide.

Cygnet

This village of not quite 600 residents is located on the east side of Interstate 75 in southern Wood County. Residents and community leaders feel that flooding is their biggest vulnerability because homes flood, sanitary sewers back up into basements, and streets are impassable in sections of town after any kind of heavy rain. The Rocky Ford River runs between I-75 and the village and flooding affects a number of homes two to three times in a typical year. As rainstorms increase in intensity and frequency, this is happening more frequently. Low areas near bridges flood and yards are filled with water for a few days. Flood water has reached the main living area of homes in the past. Approximately thirty properties, primarily but not exclusively in the northwest quadrant of town, are affected.

Being so close to I-75 where SR25 ends at Cygnet Road, there is a high amount of truck traffic in the area. The I-75 interchange brings large commercial trucks onto narrow roads along with farm implements and passenger vehicles on Cygnet Road. Many of these trucks are associated with an area recycling plant and a nursery, as well as area business and industry. This puts the risk of a hazardous spill or release high on the list. The interstate is so close to the village that a crash there would easily, with prevailing southwest winds, place the village within a plume or drainage pattern. There are pipelines in the vicinity that could be ruptured through excavation or other digging. A rupture could cause leaks of volatile substances and cause explosion or fire, as well as air or water quality problems.

Windstorms, tornadoes, and severe thunderstorms pose vulnerability to buildings, farm and business equipment, and stock at local businesses. With little protection from high wind caused by any of these hazards, damages can be extensive. Roofs, siding, and vehicles round out the list of at-risk property. Because these incidents can also bring heavy rain, flooding is al additional associate risk.

Sharing their concern with much of the county, Cygnet residents are concerned about water quality. They participate in NWWSD water and sewer services but realize raw water from the Maumee River is at risk of algal bloom problems. The nearby wastewater treatment lagoons are too far away to pose a risk to Cygnet but the entire water system could suffer a microsystin toxin problem. This would inconvenience households and small businesses, at the very least, depending on the duration of the water emergency. Because NWWSD has increased their capacity to test and treat the water, confidence in the system is on the increase.

Invasive species is not currently a big concern because most ash trees damaged by the Emerald Ash Borer are gone. Should another infestation occur, more trees would be affected, depending on the specific species. There are potential new insects and diseases that have been found in other areas, and those could migrate to Cygnet. Power failure is unlikely because outages are generally very short-lived and often associated with a vehicle crash rather than weather incidents. Drought, extreme heat, and winter storms pose inconvenience but rarely damage any property. There is some concern over elderly, disadvantaged and underserved people if extreme temperatures were coupled with a power outage. Residents can become isolated by blocked roads but the duration is usually short and measured in hours, not days. An extended power outage combined with high winds and extremely hot weather could cause impact if water supplies were limited and elderly or those needing medical equipment were impacted for a long duration. This is not typical.

Cygnet is not susceptible to dam failure or landslide/mudslide.

Grand Rapids

This village sits on the south side of the Maumee River just inside the western border of Wood County. Flooding is the biggest concern, the greatest cost, and the hazard that poses, by far, the most risk to Grand Rapids. Flooding occurs in Grand Rapids Village Estates and the area where Dollar General sits. Catastrophic riverine failure is considered because the wide and

mighty Maumee River flows through the entire village. Some low-lying area is recreational and park area, but homes that sit slightly higher are at risk of riverine flooding. The highway could be covered by water and rendered impassable, as could some local streets.

Grand Rapids is built where Providence Dam and Grand Rapids Dam cross the Maumee River. Providence Dam crosses part of the Maumee from the northern Lucas County shoreline to Howard Island. Grand Rapids Dam continues at a slightly different angle from Howard Island to the southern shore of the village. Both are low-head dams that were built in the 1840's to hold water back, making the Maumee River more navigable for traders and transportation and for recreational purposes. There is also an inlet to the Erie Canal System at the west end of Front Street and the historic business district. The canal is now part of the Maumee River Water Trail, and watercraft use the canal to enter the village and dock at public docks. This inlet is owned and maintained by the Ohio Department of Natural Resources. In times of extremely heavy precipitation, snow and ice melt, or drainage down the river, water can overflow the canal levees and backs up into the downtown through the storm sewer system. Homes in the area are flooded well into the main living area. Businesses are flooded into the selling floors, display areas, stock rooms, and customer areas. The flooding is relieved when the river levels go down and the water is able to flow back into the river. The damage and duration of significant flooding is extensive and destructive. Business owners say that floods last at least two days, sometimes more. Pre-incident sandbagging is ineffective due to the amount of water that floods the village. Prior to a flood, business owners and homeowners habitually move possessions from the flood zone, but this pre-emptive activity takes days and results in financial loss for businesses and residents. After the water is gone, the sediment and debris left behind is devastating and dirty, and takes weeks of work to restore the areas to previous status. Access can be problematic as the approach to the bridge on SR 295 floods; the hump of the bridge is not flooded but instead is isolated by flooded approaches. Flash flooding due to inadequate and undersized storm sewers increases loss because of backed up water and sedimentation associated with standing water.

Secondary to flooding, the village is concerned about wind events, including windstorms, tornadoes, and severe thunderstorms. These events cause damage to historic properties and new structures, taking off roofs, damaging siding, and destroying equipment and vehicles. Many historic structures are wood sided and the siding takes a beating in any wind event. It is expensive to restore to historical standards. Lightning and hail are destructive forces, destroying stone and masonry surfaces, cobblestone and brick, and wood.

Water quality emergencies are less of a concern today because Bowling Green Water Department has significantly improved their ability to test and treat water in consideration of algal bloom and toxic runoff problems that were highlighted several years ago.

Hazardous materials incidents concern Grand Rapids because SR 65 winds through residential and business areas and is vulnerable to vehicle accidents. Spills and leaks could cause evacuation of the entire town and contamination could reach the historic downtown business district by surface runoff or plume. With the concentration of residential properties and

predominant winds from the southwest, the entire village could be evacuated due to a release inside the village limits.

While not necessarily high on the probability scale, village officials do have concern over earthquake possibilities. They feel even a slight tremor could damage the two dams. The bridge over the Maumee River could also be damaged and rendered unsafe. If the dams were to fail, about ten houses would be impacted. They associate most dam failure risk with earthquake. The 1840s constructed dams are made of concrete reinforced rock-crib materials, were rebuilt in 1996, and have emergency plans in place. If they were to be removed, given their purpose is currently recreational, the effect of planned and controlled water release would be negligible according to many studies.

Even though Grand Rapids is lined with deciduous trees, they do not see invasive species infestation as a high risk. Trees are trimmed regularly and there would be few cases of damage. Drought and extreme heat, as well as power failure and winter storms have little negative effect. Most of the impact is simply inconvenience and occasional isolation until roads are cleared. There is little financial loss.

Haskins

Haskins is concerned about flooding because it affects homes, storm sewers, and streets. A subdivision on the east side of town of almost 200 homes floods. A retention pond has been added, and this helps control some of the flooding, but when rain comes very fast and heavy there is still flash flooding. Drainage ditches along King and Liberty High Roads are overtopped and have nowhere to go so the water floods into adjoining properties. Some properties have not tapped into the NWWSD sanitary sewers because they cannot afford the tap-in and maintenance fees, so not all property is part of the storm sewer system. Their wells are vulnerable to ground water contamination, a possible outcome of agricultural practices or accident contamination of the aquifer.

A grain elevator located amidst the railroad tracks is described as a significant threat by village residents. A derailment could cause catastrophic damage. Explosion, fire, and dissipation of toxic chemicals into the environment is possible. There are pipelines in the vicinity that could leak, or could be ruptured through excavation activities. A rupture could cause leaks of volatile substances and cause explosion or fire, as well as air or water quality problems.
Wind, in any form, damages roofs, siding, windows, farm outbuildings, barns, grain bins, and storage sheds. People who use the bike path through town are generally unaware of severe weather warnings and the village would be challenged to immediately shelter them in a critical situation.

The risk of invasive species has not been obvious, but diseases, noxious weeds and insects are being identified in nearby areas. A power failure is reasonably possible because of trees falling in the power lines, and tree disease would make that worse. Property owners do not always trim their trees. Ice storms can easily cause power outages, but are infrequent and not

generally long-lasting. Diseased tress would make that worse. Haskins is in dire need of more generators to provide power during an extended outage.

Extreme cold and extreme heat would be problematic for elderly and those with medical needs or conditions that reduce tolerance. The growing elderly population and underserved people concern Haskins officials. They are concerned with vulnerability of disadvantaged groups and others with specific special needs at a time of disaster, especially if power outages are involved. These populations would experience serious impacts from an extended power outage or isolation from supplies that are necessary.

Earthquake is very low risk because Haskins has few buildings that would be at risk for heavy damage. There are some underground utility lines, but other utilities are above ground. All of these would be at risk in a significant earthquake.

Haskins is not susceptible to dam failure or landslide/mudslide.

Hoytville

This rural village of 300 is situated along a major east-west railroad in southwestern Wood County. The hazard that presents the most risk to the village is flooding. Two to three times each year, water covers the roads and streets after heavy downpours. Field debris, lawn clippings, and tree debris clog the waterways and the pooled and rapidly draining water on the streets damages pavement and berms. Culverts owned by the railroads are poorly maintained and clogged and water is unable to drain through in a timely fashion, forcing it to back up onto properties. Many basements are flooded and residents replace mechanical systems repeatedly, year after year. The railroad tracks are raised as they are repaired, which simply dumps more water onto the village as tracks drain gravitationally onto lower-lying properties. As severe storms are becoming more intense, more frequent, and dump more water on the village, this issue is getting worse over the past few years. Flooding takes longer to drain, and the areal flooding lasts for several days. Damage to houses is more significant, taking out basement appliances more than in the past. Railroad owners have not cleaned culverts or changed their lack of maintenance, so that issue is worse than in years past.

Sitting in a National Weather Service dead zone between North Webster and Cleveland, Hoytville residents do not always receive timely weather warnings. They depend on Toledo television channels to supply weather information but if the power is out, they have little warning information. The county's Code RED system has helped with this, but timely notification is partly a National Weather Service and tower issue they cannot correct. They are concerned about structural damages due to wind of any origin, as well as personal injury and death due to tornado and sudden straight-line wind. Wireless signals and broadband access are frequently unavailable, and cellular transmission is sketchy in bad weather. Therefore, tornadoes, wind storms, and severe thunderstorms are considered high risks. As winds increase, microbursts seem to be more common, and straight-line winds become more damaging, this gap in communication is seen as a critical issue.

Hazardous materials concern residents. They observe many ethanol products being transported through town and realize the risk of fire or explosion in a crash or other accident. Pipelines and oil wells are being laid and drilled; residents realize these are new risks. There is a pipeline valve station near the village. They fear damages from fire, explosion, or gas release, and most of those fears are for health and well-being of residents. They are concerned the pipelines will leak, negatively impacting their water supply. With a CSXT rail running through the village, they are highly vulnerable to derailment and exposure through problems with rail cars. The state highway crosses the tracks, and vehicles on the road sometimes travel at high speeds. A crash could be very serious, especially if the train were traveling at full speed as well. A derailment could easily place all homes in the village in the hot zone.

Power failures, especially during winter storms, could prevent elderly and people with medical needs from getting the care they need. The village has no generators and lacks personnel to manage portable generators. They feel this lack of alternate power generation is a capability gap for the village. A lack of power would also incapacitate heating and cooling systems and communication. The resulting isolation could be harmful to residents and put them at risk during no-notice weather events. They are especially concerned about elderly, underserved and disabled residents who may have little internet connectivity to become aware of threats in a timely fashion.

Invasive species is not perceived as a vulnerability because the village is very aggressive about tree trimming. While preventive action has significantly reduced their vulnerability to this hazard, Ohio's list of invasive species is long. With rail coming through town and shipments arriving for residents on a regular basis, it would be easy for a non-native species to find its way in. New infestations are not unusual and Hoytville could be vulnerable to this. Drought and extreme heat are only threatening if the power goes out, which is not likely. An extended power outage could put elderly and disabled populations at risk as their medical equipment and resources often need power to operate. Winter storms do little but cause inconvenience; they do not cause costly damages unless an extremely unusual event would cause roof collapse on flat roof structures.

Hoytville is not susceptible to dam failure or landslide/mudslide.

Jerry City

Flooding is the primary concern in Jerry City. As Bull Creek flows through the village, it can overflow and flood basements when rainfall is heavy. Some streets flood and the village does not have sufficient signage to mark them as flooded. Residents risk driving into flood water because they don't realize how deep it is; this occurs, however, only in the most serious and unusual flood conditions. Areal flooding can leave ponding water that takes a couple days to drain.

Windstorms are the second concern because the village is populated by many deciduous trees but lacks the financial and human resources to clear significant debris after a wind event. Stakeholders reported that wind storms are more frequent and of more magnitude today than

even a few years ago. Damages have increased recently, including both public and private property. Past and present storms have damaged houses and businesses; roofs, siding, windows, and doors have been damaged or destroyed. Wind, tornado, and thunderstorms result in significant amounts of debris that strain the village's resources when it must be collected and disposed of. Jerry City has had to request county assistance in the past to support debris clean up. The village does have some history of lightning damage and fire; residents are concerned mostly about barn fires and hail damage to outdoor equipment and vehicles. They report this as a worsening hazard as well.

Along with most of the county, Jerry City residents share concern over contamination of the water supply through chemical exposure. They sit in the midst of livestock farms and fields and are concerned about manure management and chemical application as it leeches into the ground water, dissipates into the air, and ends up in the Maumee River, the source of potable water for both BG and NWWSD. They did express increasing confidence in a potable water supply as NWWSD has increased their ability to test and treat water for contaminants, and there has not been a water emergency in almost a decade. They associate hazardous materials risk with farm accidents, application equipment on roadways, and release of chemicals during application.

Most other weather events, including winter storms and drought/extreme heat, are well managed by Jerry City. Residents are resilient and have personal means to alternative supplies and services. They are very concerned about an aging population and more people with disadvantages and disabilities. This provides challenges in public safety, and in general in providing for their special needs. There are no shelters to house them if homes are uninhabitable, and there are no shelters for people without special needs.

The village is not susceptible to dam failure or landslide/mudslide.

Lake Township

Located in northeast Wood County, Lake Township is one of the higher populated areas of the county. With Interstate 280 and the Ohio Turnpike intersecting in the township, they have the biggest transient population of any area in the county due to semi-trucks and commercial vehicles. Several trucking industry food and fuel stops along I-280 serve as temporary homes for as many as 5,000 people at any given time. When this transient population is included in residential population, Lake Township is equal in size to the City of Perrysburg.

Tornado is, by far, the greatest concern to Lake Township. The devastating 2010 tornado that affected the county contributes to this rank. That incident caused local officials to more realistically assess their vulnerability to tornado, or any other severe, rapidly developing storm. The township's transient population – in hotels, sleeping in commercial trucks at truck stops, and actively travelling on the roadways – are not always privy to storm warnings. While those on the road can see developing weather, many are not local and do not understand tornado behavior or risk. The increasing number of foreign truck drivers makes this threat and possible impact much harder to communicate; there are sometimes language barriers and it is not

always known if the drivers even carry cell phones. Many of these individuals are not able to hear outdoor warning sirens and do not receive local weather alerts on their cell phones. Officials describe them as "sitting ducks" when it comes to severe weather.

Tornadoes, wind storms, and severe thunderstorms can destroy homes and businesses. Lake Township experienced this in 2010 when the high school, police station, and dozens of homes were destroyed by a tornado. Seven deaths and multiple injuries were attributed to the tornado. Vehicles – cars, trucks, SUVs, boats, and jet skis – were thrown into trees, ditches, and fields. Debris levels were astronomical. Crews worked 16-hour days for almost two weeks; special arrangements with the Toledo landfill helped the township dispose of the debris without incurring overwhelming expense. Power was out in some areas for two weeks. Business loss was immeasurable; some businesses were closed for two weeks before they could recover to the point of re-opening. Farms were destroyed; equipment was scattered, crops were flattened, barns were obliterated. Among residents, fear of another similar incident is high because tornadoes have frequented a similar pathway multiple times in the past. While these storms have not always touched down or caused damage, the pathway and potential damage zone is all too familiar to residents, and it is hard to disregard the 2010 consequences. Stakeholders reported that although there have been no tornado incidents in the past five years, the wind in general is stronger and more frequent, and does more damage to homes, roofs, and trees than before. Straight line winds no longer are confined to storms with precipitation but occur alone, and concerns have shifted to all wind events, not just rotational wind. All wind events, depending on the strength of the wind, have similar loss potential in Lake Township. Sheltering the population is an additional concern relative to wind hazards.

Severe thunderstorms are a concern because of the amount of traffic on highways at any given time. With thousands of vehicles passing through every day, the I-280 interchange at the Ohio Turnpike is the busiest interchange in Ohio. Combined with many other vehicles that traverse the township, the risk of accidents during thunderstorm events is high. Area fields experience a great deal of areal flooding as water drains through slow-moving ditches and creeks. Some sections of roads can be flooded for several days as the water slowly disappears. Wetter springs have brought more periods of saturated ground where electrical poles are vulnerable to collapse, especially when wind events occur. There is some erosion around catch basins in areas where water stands after precipitation.

The significant highway system in Lake Township also contributes to hazardous materials vulnerability. Recent wind storms have toppled cargo trucks; spills and releases can accompany those accidents. With state routes close to schools, hospitals, industry, and homes, the chance of an evacuation is high if an airborne chemical spill were to occur or if fire or explosion were possible. The prevalence of railways in the area as they are routed toward the switching yards in Walbridge and the ports in Toledo increases the chance of a derailment and resulting chemical exposure and evacuation. Toledo Executive Airport is also located in the township, increasing the potential for incidents during airport operations. There are pipelines in the vicinity that could be ruptured through excavation or other digging. A rupture could cause leaks of volatile substances and cause explosion or fire, as well as air or water quality problems.

Power outages, especially resulting from thunderstorms or tornadoes, could cripple the township. The township does not have a significant history of power failure, however, and most critical buildings are generator powered. Lack of access to fuel could affect the operation of generators but it is anticipated that adaptations could be made and consequences would be minimal. Township participants said that portable power stations would be extremely helpful during an extended outage.

Lake Township has multiple raw water suppliers so water quality is a concern. Some homes have wells in the midst of farmland and livestock operations and could be vulnerable to seepage and surface runoff. The use of farm chemicals and the resulting algal bloom problems are real in Lake Township. Parts of the township use Oregon water while others receive water from Toledo. Both these systems have had algal bloom issues in the past, although there have been no recent incidents.

Invasive species is not considered a high concern, but the presence of ticks is on a rapid increase. There are still some consequences seen from the Emerald Ash Borer, and arborists are on the watch for other tree and vegetation disease. Debris management is a high concern, but officials feel that actively trimming trees and managing disease will prevent significant impact of an invasive species as it relates to storm debris.

Winter storms have an impact given the miles of interstate and state highways. Stranded travelers are a concern from a sheltering and safety perspective. Ensuring these individuals are not stranded along the highway can be a burden on law enforcement crews and potentially necessitate opening a temporary shelter. The risk of extreme heat is more evident in its potential effect on overheated vehicles, leaving travelers stranded on hot, busy highways. There are a few areas where a power outage in extreme temperatures would affect elderly and special needs populations. Those areas are known to individuals and somewhat to public safety; some special attention can be placed on these neighborhoods with reasonable limitations. School closures due to extreme temperatures are decreasing as all schools will soon be air conditioned.

Earthquake is not considered to be a high risk, but the presence of so many pipelines causes some concern. The fact that water is piped in from Oregon and Toledo add to that vulnerability. Most buildings are only one or two stories, but none were built to withstand an earthquake. Most damage would be incurred on masonry buildings, bridges, and culverts. Some bridges could be deemed unsafe. Underground utilities in newer neighborhoods could incur some breakage and damage.

Lake Township is not susceptible to dam failure or landslide/mudslide.

Luckey

While vulnerability to hazardous materials exposure is still present, the Village of Luckey is far less vulnerable than it was five years ago. It had been identified by the EPA as having a federal

hazardous materials facility clean-up site, which caused high levels of concern to local residents. An old abandoned manufacturing facility located on the north side of Luckey was once used for the Manhattan Project, a federal research and development effort to create atomic bombs in the 1940s. The Luckey plant had been owned by multiple entities over the years once it ceased to operate, and the 40-acre site contained soil contaminated with beryllium, lead, and radioactive waste. Since World War II, several owners had purchased and sold the property. The United States Army Corps of Engineers has conducted a clean-up process in recent years. The site in the process of being eliminated at this time. Removal of contaminated materials has put significantly increased numbers of trucks carrying extremely hazardous materials on the roads as they leave the Luckey area enroute to waste sites out of the area. Upon completion, this will significantly reduce the village's susceptibility to radioactive and carcinogenic chemicals that were known to be present. However, there are still pipelines in the vicinity of the village that could be ruptured through excavation or other digging, and cause exposure to hazardous chemicals. A new larger and more robust pipeline was installed in recent years to carry gas substances to a regional facility in Michigan; this pipeline, if it malfunctions, could cause air and water quality problems as well as fires or explosions under some circumstances. Evacuation could be an outcome of a release. A rupture could cause leaks of volatile substances and cause explosion or fire, as well as air or water quality problems. Hazardous materials incidents continue to concern the village.

Transportation issues increase the community's concerns. Trucks travel SR 582, a highway that jogs through the village. Traffic on this highway is increasing in volume all the time. Farmland on which farmers apply fertilizers, herbicides, and pesticides to improve crop quality and production surrounds the community. It is common to see tractors transporting anhydrous ammonia tanks through the village on the way to fields. Chances of collisions are high as trucks and cars navigate jogs in the highway and tractors move slowly through town. This sets up a scenario where hazardous materials could be involved and a leak or spill could affect the village. With so much anhydrous ammonia being transported, the chances of an airborne release are high.

Wind storms and tornadoes can result in significant damage to homes, property, vehicles and village parks. The tree-lined village has experienced wind damage in the past as roofs are ripped apart, siding is pelted with wind and hail, and windows are broken by gusts. In the worst wind events, a debris field could develop in the village that deposits contaminated construction materials and waste from the abandoned beryllium facility across town and currently under remediation. While flooding is generally minor and mostly flash flooding, yards and a few basements can become rain-soaked in heavier storms. Stakeholders did report heavier rain and higher winds, compared to just a few years ago. Storms are more intense and dump more precipitation on the area.

Invasive species concern the local officials. They are currently working with the county engineer to address phragmites in the village. Deer, feral cats, coyotes are all increasing. Some lawns have been affected by army worms. Emerald Ash Borer damage is still affecting the village as debris after storms and dead trees that need to be removed.

Water quality is a moderate concern as the village sits amid production agricultural land where chemicals are used. Many homes receive potable water from wells and, between farm chemicals and general hazardous materials in the area, there is concern for contamination.

Winter storms, including ice and heavy snow with blowing and drifting, are a minor concern for Luckey. These cause little actual damage but disruption of daily activities is common. Power failures are infrequent and short in duration and drought and extreme heat are generally an inconvenience. Outages are rare. The wastewater treatment lagoons to the north of the village are not a significant concern as the inundation area does not include the populated area of the village. The earthen upground facilities are well maintained, making structural failure unlikely. An earthquake would likely damage very little as infrastructure is minimal and there are few multi-story buildings. Underground utilities and lines would be affected, and services could be interrupted for a long period of time.

Luckey officials reported that they are in serious need of shelter facilities, supplies and staff to operate the shelter. There is currently no identified Red Cross or other shelter. Being a long distance from other communities, they need to be self-sufficient and be able to house their own residents if an evacuation occurs.

Luckey is not susceptible to landslide/mudslide.

Middleton Township

As one of Wood County's growing areas, Middleton Township is located between Perrysburg and Bowling Green. The township is a prime setting for the sprawl of businesses, retail centers, houses and subdivisions from Perrysburg. This is prime land for commercial and retail development along SR 25 and I-75. Access to transportation is excellent, and the area has few, if any, natural impediments to development. The rural area is highly sought-after land for small subdivisions as people look to live in the quieter countryside but still have easy access to metropolitan amenities. Because of the growth, the township operates more like a municipality than a township and is included as a specific jurisdiction in this plan.

Wind causes significant damage in the township, whether it is from straight-line winds, tornadoes, or severe thunderstorms. There is little protection in the wide-open spaces with little change in terrain, and minimal wooded areas to break the wind. The township is peppered with houses and residential developments because it lies between two large metropolitan areas that provide jobs, retail, and services. However, farms of all sizes also populate the area that is rich with productive soils. All of these homes and farmsteads are damaged by wind, hail, and heavy precipitation. Roofs, siding, and windows can be damaged or destroyed. Farm barns, out-buildings, grain bins and drying systems, elevator legs and conveyors, and general farm equipment are likely to be tossed around or damaged by severe wind. Lightning can strike and cause fires, especially in barns filled with forage crops; wind can take down power poles and trees. Even though the effects of the Emerald Ash Borer were minimal, some weakened trees still stand and are especially vulnerable to wind damage. A large percentage of the land is used for production agriculture; crops like corn, wheat and soybeans

are damaged by the force of wind. Middleton Township could easily find itself in need of an emergency shelter in a tornado that destroyed multiple residential properties.

Stakeholders reported that storms are worse than they used to be just a few years ago. Rain falls harder, faster, and in much greater volume. Several inches of rain can easily fall in a days' time or less, inundating the area with surface flooding. Because there are so many roads, including major highways, there is extensive runoff from the pavement. The township reaches all the way to the Maumee River, and so serves as a drainage area for fields and land at higher elevations. The amount of water draining through Middleton Township is ever-increasing. Winds are higher, and more damaging. Sustained winds are commonly 30-35 miles per hour, and even higher, which can be damaging to homes and businesses. It was the common opinion of stakeholders that vulnerability to precipitation and wind is higher now than it was five years ago.

State Route 25 bisects the township; the trucks that travel between metropolitan areas carry gases, liquids, and solid hazardous materials as well as hazardous waste to and from businesses in the area. Intermixed with passenger vehicles and other commercial traffic on the highway, accidents are common. State Route 582 and several county roads are local thoroughfares for trucks, farm equipment, and cars, making crashes commonplace. Spills can leech into the deep drainage ditches along the roads and spread quickly if the waterways are filled with floodwater.

Railroad tracks cross the township on both the east and west; trains that run at top speeds across busy local roads are at risk for crashes and hazardous spills. Underground pipelines cross the township. With the construction of new homes and facilities, the full tillage practices on some of the farms, and the general need for digging in a busy developing area, pipeline emergencies are expected to increase as pipelines, valves, vents, and access markers are disturbed. A ruptured pipeline could cause large leaks, explosion or fire, as well as air or water quality problems. Evacuation would be a major concern if this were to occur. There are not adequate shelters with the proper supplies and staff to house township residents in a large evacuation.

Water quality is critical for development and, between the surface runoff from lawns and commercial properties and the runoff from farmland, the source water is vulnerable to contamination. Middleton Township is home to the reservoir owned by the City of Bowling Green; however, the township gets its water from other sources. Therefore, there are multiple concerns about protection of the water and water supply. First, the township is concerned about protection of the water table, aquifers and ultimately the reservoir that feeds the Bowling Green water system because it is located in the township. The township does not own, nor is it a customer of, this reservoir. The Bowling Green Reservoir is a high-hazard dam in satisfactory condition, inspected just a year ago by ODNR. The dam does have an emergency action plan. The inundation area is farmland and natural habitat so the vulnerability to residential or commercial damage is low. The nearest municipality in the drainage area is Waterville, in Lucas County, with the Maumee River in between and likely to absorb the water into its own. However, the chance of contamination of the water supply before it reaches the

reservoir and as it is held in the reservoir is a concern for the township. With reference to the water supply they purchase and use, it comes from other suppliers. The township currently obtains water from Toledo and Oregon in the northern section customers, most of the southern portion is from NWWSD reservoirs, and a third small section comes from Fostoria, the township's water concerns span several providers. There is a high confidence level today that these systems are able to test and treat the water and provide a safe potable water supply to residents.

Flooding is a moderate concern, primarily because a few roads do flood after heavy storms and must be closed for a period of time. Ditches that provide drainage are deteriorating as the berms between the slope into the ditch and the roadways get smaller with every rain event. Many of these ditches are road ditches that were created to collect the runoff water during and after storms; they are not naturally occurring ditches placed by nature. The road ditches at one time had sufficient berm area on each side, but those berms have eroded into the ditch over the years, and some road ditches are just inches from the edge of the pavement. It isn't practical or affordable to install curbs on country roads, so the faster the rain comes and the more surface flooding occurs, the more the berms deteriorate through erosion. Some ditches are filling with sediment, possibly from the eroded berms and surrounding soils as well as within the flood water, and debris and need to be cleaned. The road closures affect mostly residential areas and are short-lived. As more businesses move into the township, this will become more problematic and costlier every year. As the roads are used more and more, and vehicles get off the sides and damage the edge of the pavement, more movement of soils takes place. This creates roads in bad condition, berms that are dangerously narrow, and sediment in the waterway.

Winter storms are problematic only when winds make it difficult for road crews to plow and maintain roads. Flat roads out in the open drift easily and quickly; this requires an inordinate amount of effort to keep roads open. It is sometimes difficult to know the edge of the road and the berm, and where the drop to the road ditch is located. These open roads can be dangerous under these conditions. Closed roads isolate residents, keep farm products from being shipped out, and prevent business and farm shipments from coming in. Once in a while, winter storms include ice that freezes on power lines and causes outages, making roads impassable for a brief period of time.

Stakeholders reported that storms are worse because there is more rain, the rain falls as "rain bombs" in very concentrated areas at extremely heavy rates, and the rain last longer. Dry spells are longer, and contiguous days of rain are more common. While the overall annual averages may not change much, the way that rain is spread across the days and months has changed. They also said that winds are more constant, they are stronger, and a higher percentage of days have wind that is noticeable. Many said there are no more breezes, only high winds. While tornado winds have diminished the past few years, the damage from straight line winds has increased significantly.

Power failure is a concern in severe wind situation but outages are infrequent. Improvements to substations have been completed and have made power more dependable. While there is some generator capacity, there is a need to increase the number of generators available for critical facilities. Pump stations and water management facilities also need more generators. As the township grows residentially and commercially, more are dependent upon the township government to help them function through large scale emergencies, and more people are dependent upon the township to provide direct services. Serving their elderly, underserved, disabled, and disadvantaged populations is becoming harder as the numbers increase, and representatives were concerned about that. They said sheltering is completely inadequate as one example of their concern.

Middleton Township is slightly susceptible to landslide/mudslide; this risk applies to very specific properties along the Maumee River on SR 65. State Route 65, or River Road, is populated by numerous houses along the southern riverbank between SR 582 (Middleton Pike) and Roachton Road. These homes are mostly newer large homes on large plots of land along the river. The Maumee River is relatively straight through this section of Wood County so undercutting of the properties on outside turns of the river is minimal. There are very few turns and twists at this point in the river; it is wide and deep and runs fairly straight as it heads to Lake Erie. The difference in elevation between the road and the properties is, on the average, about 50 to 75 feet. There is no incidence of landslide in this area, but the State of Ohio identified potential loss for this reason.

Millbury

Flooding is the primary concern in Millbury. Ditches and streams are filled with debris, including garbage, old appliances, furniture, debris, and sediment. Henry and Crane Creeks join together in the southwest corner of the village, then flow through housing development to the northeast. In some areas, the ditch is a higher elevation than the homes and water naturally flows into streets, driveways and basements. When northeast winds are extremely strong and the lakeshore communities in Ottawa and Lucas Counties are flooding, Millbury can feel the effects of water being pushed back up the waterways onto land by the wind. Stakeholders said that high lake levels and nor'easter storms have more negative impact on Millbury today than five years ago. Two subdivisions in Millbury flood more today than in the past, and flooding issues have become ongoing. Stakeholders believe this is because Crane Creek does not drain well due to garbage dumped in the waterway. Yards at these homes are filled with floodwater any time 2-3 inches of rain falls. Flooding is worse past the point where the two creeks join together because of the volume of water. The storm sewers are operated by the City of Oregon in Lucas County; improvements are needed to increase the size of sewers, basins, and culverts. Sitting amid farm fields and developments, storm basins and culverts are clogged with crop and lawn fodder. An overall storm water management plan is necessary to keep water out of homes, preventing damage to furnaces, air conditioners, water heaters, and other appliances and household goods in lower levels of homes. Most flooding is flash flooding and, once the water recedes to the waterways, damage is left behind to clean up multiple times per year. Some fields have areal flooding because water doesn't drain properly through clogged ditches.

Winter storms are damaging in Millbury, but stakeholders felt that the volume of snow and the frequency of winter storms has diminished over the past five years. The unobstructed flat terrain facilitates blowing and drifting snow and maintenance crews cannot keep up with clearing roads. This closes business, disrupts normal daily activities, is dangerous for those who require medical care in the home, and causes schools to close frequently. With no grocery stores, fuel stations, or other providers for basic essentials, residents can be isolated for several days. The elderly and disabled are particularly vulnerable. Elderly population numbers are growing, so the isolation and lack of mobility will likely increase.

In 2010 a tornado ripped through the village, causing widespread destruction and several fatalities. This incident has made residents incredibly fearful of windstorms and tornadoes, but over the past five years with no recurrence, the threat seems more tolerable. The 2010 EF-4 twister obliterated many homes and sent vehicles and equipment flying. Farmsteads were destroyed and seven lives were lost. Power poles became a twisted maze and there was no electricity for an extended period of time. Just outside the village, a high school and police station were completely destroyed. Crop fodder, uprooted trees, and construction materials were strewn everywhere, creating a debris field that was exorbitantly expensive and labor intensive to manage. There was no storm shelter available to the public; those who attempted to take shelter in the police station were injured and even killed. Residents realize this situation could repeat itself in the future, but are somewhat calmed by the fact that there has been no repeat recently. They did make note of stronger, more frequent wind, and possibly more damage due to straight line winds rather than tornadoes. Many times, the wind now comes without precipitation and is simply a “windy day”. There is occasional damage to trees and roofs.

Dead ash trees have continued to create excessive debris. They block waterways and prevent proper drainage. Homes are commonly very close to wooded areas or planted fields, and the incidence of finding ticks has increased a great deal in the last couple years.

Hazardous materials are a concern because railroad tracks cross the village. The devastating incident in East Palestine, Ohio has heightened the public awareness of risk and concern for rail hazards. They feel that Millbury could be “East Palestine” quite easily because approximately 208 trains travel through the village on a daily basis. Communication from the railroad is not sufficient for the village to be prepared for what might occur. The rail lines are not well maintained, contributing to the likelihood of a derailment. Crossings are blocked for long periods of time, impairing public safety response and other critical traffic to pass through crossings. The approaches to rail lines are steep, causing large vehicles, trailers, and other specialty vehicles to get stuck on the crossing. Local efforts to improve these conditions have gone unnoticed and nothing has been done. Stakeholders worry that communication with the railroads would fail completely if there were to be a large incident.

The petroleum products hauled by rail and highway are enroute to refineries in Toledo and can be difficult and tedious to manage when fire is involved. Spills can be carried away by one of two creeks, expanding the impact zone and potentially leading to evacuations. There are

pipelines leading to refineries in the City of Toledo and the City of Oregon that are very close to Millbury and could be ruptured through excavation or other digging. A rupture could cause leaks of volatile substances and cause explosion or fire, as well as air or water quality problems

Water quality is concerning due to algal bloom issues. The village's water comes from the City of Oregon where testing and treating capacity needs improvements to deal with microsystin. The village has no control over these operations and fears unrealistically high water rates as improvements to the public water infrastructure are mandated by regulatory bodies. The Northwestern Water & Sewer District has added a new water tower in the township that has improved water pressure and made the water supply more resilient.

Power outages not connected to severe storms or wind events are uncommon. Millbury is adequately stocked with generators, and could assist other communities with alternate power sources if necessary. Stakeholders reported that wetter springs have caused electrical poles to fall during thunderstorms more than they used to fall. An earthquake would likely be very mild and damages negligible, although the underground pipelines and utilities could easily suffer damage. Structures were not built to withstand earthquake stress. Water supply is ample to avoid restrictions during drought and high temperatures would only be problematic if power went out and elderly were left in uncooled homes. There was no indication that heat or drought is causing any problems, nor has it changed in magnitude or frequency. Millbury is not vulnerable to dam failure or landslide/mudslide, but soils around catch basins and ditch banks are eroding slightly.

Millbury is not susceptible to dam failure or landslide/mudslide.

Milton Center

This quiet village sits on the west side of Wood County where Mermill Road intersects Milton Road. Both are active county roads with significant local traffic, including farm implements commercial vehicles. CSX Transportation has a railroad that cuts diagonally through town on the way to the Port of Toledo and switching yards in northern Wood County. The primary concern is for the village is hazardous materials spills and releases as these transportation routes intersect. A derailment would cause evacuation and could easily destroy homes and businesses as part of a collision. The straight and highly traveled county roads facilitate high speed crashes. Any of those incidents could easily push a toxic plume over the entire town or wash surface drainage through yards, parks and village facilities. The village is far enough from fully staffed first responders that a derailment involving lethal chemicals could put many residents at severe risk of injury or death. Ensuing fires and explosions would easily occur before many responders could arrive to help. Almost any kind of derailment would be catastrophic for Milton Center.

Tornado, wind storms, and severe thunderstorms can place Milton Center at risk of missing warnings, leaving people without appropriate shelter and caught outdoors in dangerous conditions. With gaps in wireless and broadband capabilities across rural Wood County, residents are at risk. Elderly, underserved and disadvantaged residents often have little internet

access and storms pass through before they are warned. The special needs they have and the consistently late warnings places them at high risk of injury or other damage. Homes and structures can be damaged by hail or wind ripping off roofs, destroying buildings, or affecting siding and windows. Farm equipment, grain bins, and vehicles stored outside are frequently damaged or destroyed. Outbuildings and farm sheds and barns are at risk of destruction by strong winds, hail, and lightning that can cause fires. Surface flooding frequently occurs during heavy rainfall, flooding yards and streets when precipitation is fast and heavy. There are no storm sewers so all drainage is gravitational and it takes time for this water to recede. With increasing intensity and frequency of these storms of all types, the areal and surface flooding is getting worse and lasting longer.

Winter storms cause inconvenience in Milton Center. While the area can get 8-10 inches of snow and winds can reach 25 or 30 miles per hour, this causes little permanent damage. Residents do experience significant inconvenience, however, as people cannot go to work, schools close, and residents stay home until roads are safe again. Unless accompanied by a power outage, that lasts several days, which is rare, winter storms are a short-term inconvenience more than a major hazard.

Milton Center is concerned about a water quality emergency if the source of their water, which is provided by NWWSD, becomes contaminated. Locals feel that aquifer and groundwater protection measures should be implemented to ensure the safety of ground water. They see farm chemicals used on fields and hazardous substances used to treat lawns and parks and feel that these actions put the water supply at risk. Confidence in the NWWSD service is increasing as they have improved their ability to test and treat water in recent years.

Power outages have become unusual. Because of aggressive tree trimming and care, few dead or diseased trees remain to get in the way of power lines. Electric companies have improved the quality of distribution lines, resulting in fewer outages. When they do occur, outages are generally short in duration. A rare outage can cause loss of HVAC in homes and businesses, and incapacitation of medical equipment in the home. If temperatures were extremely high or low, loss of life could occur although this is extremely rare.

Milton Center is not vulnerable to dam failure or landslide/mudslide.

North Baltimore

This village is immediately east of the CSX Intermodal Transport Yard and, because of that, has heavy railroad traffic through the village. Most of these trains carry intermodal containers. While they are supposed to be marked appropriately, there is a possibility of mixed cargo, mismarked cargo, and combinations of all kinds of cargo in the containers. As they are transferred, they can be dropped or punctured, or damaged in a way that results in released chemicals. There are significant numbers of trains in the village that haul a wide variety of hazardous substances. Trains block crossings, which frequently delays first responders as they attempt to reach emergencies. Accidents on Main Street and Water Street are common. Leaking diesel fluid from the trains happens frequently; this can cause contamination of the

area surrounding the spill, waterways and ditches, and can potentially ignite. As mutual aid is activated and adaptations are made to normal response routes, communication between departments can be difficult due to radio systems. This results in delayed response, delayed treatment of injuries, and extensive damages to property. There are gas and liquid substance pipelines in the vicinity that could be ruptured through excavation or other digging, and cause evacuation to be necessary. A rupture could cause leaks of volatile substances and cause explosion or fire, as well as air or water quality problems. North Baltimore is extremely concerned about being victim to a multi-car derailment in the village, given recent rail history, and the ensuing problems due to hazardous chemicals that are released. This could be catastrophic for the village.

North Baltimore has a great deal of flooding from the Rocky Ford River. Streets flood and become impassable; basements also flood throughout the village. Some households are displaced for several days. Many homes lose HVAC systems and water heaters annually or more often. The park and local golf course flood for a few days. A ditch on railroad property frequently fills with debris; cleaning the debris is necessary but does not occur, causing more flooding and slower drainage in other areas. Uncurbed streets deteriorate due to damage to the pavement and berms by the standing water. With rain and wind coming harder and faster now, and with precipitation amounts on the increase, this vulnerability is ever expanding.

Dam failure could occur at the two reservoirs in North Baltimore that are considered high-hazard dams. Both structures, however, have emergency plans in place and are well maintained. Additional reinforcement of the reservoirs has been added to provide additional protection to a housing subdivision near one of the dams. That said, they can potentially overtop in extremely high rain events but there is no significant damage when this happens. The overtopping results in flooding at the park and roadway. There are no other dams nearby that would experience an emergency at the same time, and enhance the vulnerability to village residents.

Wind is a concern to North Baltimore. Whether tornado, straight-line wind, or severe thunderstorm, houses are vulnerable to roof damage and pitted siding. Vehicles can be pelted with forceful rain or hail. Barns, grain bins, grain dryers, elevators and conveyors, and other farm equipment can be damaged or destroyed by wind. Planning team members noted that brick has been ripped off homes by past wind events. Internet access problems in the county and lack of alternate warning systems allow sudden storms to take North Baltimore people by surprise, which prevents them from getting critical things inside before the storm hits. Damage includes equipment and vehicles. The village completes significant tree trimming to avoid damages from untrimmed vegetation. Officials are beginning to notice problems with bagworms on trees that were brought in from out-of-village suppliers when the round-about was built on State Route 18 at Main Street. While at this time, there are no other infestations of concern, it is highly likely that an insect or a disease will make its way to North Baltimore and cause the next wave of dying trees or swarming bugs. Ohio's list of such is extensive, and this puts the village at risk.

Winter storms are difficult because of blowing and drifting snow. Residents are isolated from critical services and supplies because they cannot get in and out when roads are closed. With very small berms on roads, there is little place to leave plowed snow; the snow gets dumped in ditches and then causes ice jams when early thaw stages take place.

Power outages are inconvenient but do not cause long-term damage. An earthquake would likely be minor and lead to limited structural damage. Water quality is of low concern; water comes from NWWSD and is very dependable. A drought would have almost no effect on North Baltimore.

The village is not vulnerable to landslide/mudslide.

Northwestern Water and Sewer District (NWWSD)

Northwestern Water and Sewer District provides services to treat and distribute water, and to collect and manage stormwater. They own 458 miles of water distribution pipe, 12 booster stations, 9 master metered public water systems, one water treatment plant, ten water towers, four clearwells, 3,963 fire hydrants, 13 watersheds, and 7 bulk water stations on the water distribution side. The storm sewer side owns 13 wastewater treatment facilities, 94 pumping stations, 365 miles of collection network, 60 submersible stations, 19 wet/dry well configurations, and 6,502 manholes.

A significant earthquake could be devastating for the district as its distribution and collection lines are underground. They could be destroyed or severely damaged, and the assessment process would be complex and lengthy. Water towers are vulnerable to severe damage or destruction in an earthquake. Pumping stations, booster stations, fire hydrants, manholes, submersible stations, and clearwells are all vulnerable to the movement of an earthquake.

NWWSD concerns include dam failure and water quality incidents/hazardous materials spills and releases because the upground reservoirs in Wood County provide the raw water for their treatment and distribution system. If these structures fail or the water is contaminated through some kind of accident, the district has to take emergency action to compensate for that and have water to distribute to its customers. They consider dam failure and water quality issues a moderate risk, but their operational vulnerability once it occurs is extremely high.

Power failure would cause far-reaching problems, especially if combined with severe storms or earthquake. Loss of power to processing plants, pumps, and other equipment would be devastating. The generators that operate and provide redundancy for the District are very high-capacity pieces of equipment. An electrical outage could cause the whole system to go down, and distribution of water or collection of storm water could be at a standstill. It could cause the release of untreated water or sewage into rivers or streams, and could cause sewage back up into homes, factories, and industries.

Drought is another concern that negatively affects the raw water supply. Much of the water in the reservoirs comes from the rivers, and if the rivers are extremely low, that process is

negatively impacted. Ground water responds to drought in the same way, and for the areas that collect water through wells, an extreme drought could have a very negative impact.

Because processing and pumping either raw water for distribution, or stormwater for collection are dependent upon electricity, a widespread power failure could be very damaging. The district has generators to provide power, but the scale at which they would be dependent upon fuels for the generators could make them vulnerable to shut down. Treatment plants and pumps have to be fed electricity to operate, and without it, they would be in a difficult spot.

Heavy rain is a valid risk for the district. Heavy rain over the entire area, or a significantly large area, could overtax their systems if the downpours continued for a long time. They have the capacity to adjust when localized torrential rains occur; widespread involving their entire coverage area is another thing. Treatment and processing could be seriously impaired under heavy stress of ongoing torrential rain. Lightning and hail could damage property, but would not likely take the systems out of operation.

Windstorms could, at their worst, damage or destroy water towers. Tornadoes could as well.

Landslide and invasive species are not considered hazards for the district.

Northwood

Northwood is a hub of transportation activity with multiple major highways, factories and industries, and railroads that lead to switching yards and ports in other jurisdictions, making hazardous materials incidents a primary concern. The number of vehicles that pass through this city just as they enter the City of Toledo is staggering. East Toledo is peppered with oil refineries; the raw products for these facilities enter through Northwood and the finished products leave through Northwood. Blow-over air quality emergencies are possible in Northwood if a severe incident were to happen at the nearby processing plants. The local public school sits next to I-280 and just north of the Ohio Turnpike. Several routes are near hospitals, city buildings, medical facilities, and residences. Spills, leaks and releases can occur in handling, transport, and use. All three occur in Northwood.

Various pipelines headed to the refineries and the Port of Toledo pass through Northwood. These pipelines carry hydrocarbons and other hazardous chemicals through the city in pipelines to be processed or distributed from locations in Oregon and Toledo. Leaks, transfer accidents, and distribution problems can all lead to a release that causes air quality compromise, fire or explosion, or property contamination.

A very large landfill is also located in Northwood; the specific materials present there cannot be determined. A deposit of arsenic industrial waste sits at the facility and its damage potential is unmeasurable. The city is on the flight path of Toledo Executive Airport, which is a very busy small airport. Hazardous materials pose health risk to residents, workers, and public safety personnel. Consequences could include injury, respiratory and cardiac injury, exposure to raw chemical, or even death.

Because of the abundance of hazardous materials and the number of residences and businesses in Northwood, wind is another concern. Stakeholders were quick to share the opinion that wind is increasing in speed. They said that it is "windy" all the time, and that high winds are much more common, defining those as wind in excess of 20 mph. Stakeholders reported more damage from straight line winds the past several years, including tree issues, sign damage, and damage to roofs. Large commercial buildings have been damaged more than smaller residential properties in most recent years. Buildings are at risk for structural damage; vehicles and trains can also be blown over. There are many slab-constructed homes without basements, multiple family housing units, like apartments, and mobile homes that are all at risk in wind-based storms. The mobile home parks in Northwood are in particular need of shelters from storms. There is no existing shelter for residents in these types of homes.

Should a wind storm pick up debris from the landfill, items from the arsenic waste pile, or containers from the refineries, damages could be multiple and severe. Explosion, fire, and medical/trauma injury would be common. Wind damage can be assumed to include straight-line winds, tornadoes, and severe thunderstorms. Northwood is concerned about tornadoes and severe thunderstorms because of the 2010 tornado that devastated the northeast section of Wood County, but there has not been a tornado strike the area since then. They were hit hard with structural damage, debris inundation, flooding, injury and death, and other property damage, but there has not been a recurrence to date.

Northwood receives source water from Toledo and Oregon, and the water is treated and distributed by the Northwestern Water and Sewer District. If one plant is impacted by contamination, the other may not have adequate capacity to fulfill the needs of the entire area. Northwood has no say in how either plant is operated and concerns over plant capabilities were expressed by the planning team. There is no redundancy between the two plants; Northwood is concerned about reliance on a single source because so many businesses, residents, and industries need a constant supply of potable and usable water. This concern has not eased over the past five years even though there have been no water emergencies. Stakeholders reported that high tap fees are an impediment to development and growth within the city

Flooding can occur in Northwood with two to three inches of rain. Stakeholders said that rain amounts and rates seem to be increasing, and when more rain falls onto already-saturated or frozen ground, flooding is worse than in the past. Insufficient residential renovation standards have enabled property owners to implement ineffective solutions to flooding on their own property, often worsening flooding in other areas. Current efforts to adopt updated regulations will require drainage plans for all development, including residential properties to help with this. There is vastly insufficient detention of runoff from impervious surface across the city. Ditches that carry water from Northwood are not well maintained and are filled with debris, jams, and clogs. Dry Creek and Cedar Creek are blocked by this debris in many areas, especially outside of Wood County. Stakeholders reported that the downstream ditches need to be cleaned by Ottawa County so the water can flow to the lake. They reported increasing amounts of refuse in these waterways, especially downstream. Otter Creek does not drain adequately

and causes flooding to isolate the fire department. Garbage, old appliances, and general junk are dumped in some of the creeks, causing clogs and jams so water cannot drain effectively. This type of flooding can last several days in Northwood, but could be alleviated by cleaning up the waterways in Wood County and downstream. Areas near the old shopping mall previously needed to be pumped to keep water out of houses, including living spaces and basements, yards, and driveways. Redevelopment efforts have corrected some of those issues.

Northwood's storm sewers are operated by Oregon and the system is shut down when it is over capacity. This causes significant flooding of properties in driveways, yards, basements, and even some living spaces. Streets without curbs deteriorate when water stands on them and washes the sides away. Otter Creek does not drain adequately and causes flooding to isolate the fire department. Massive holding tanks have been installed to hold stormwater. This is a holding tank that retains the stormwater and sanitary sewer water until the City of Oregon can allow it to flow into their treatment plant for processing. Heavy rains are now causing flooding of the East Broadway viaduct, closing the road to traffic and preventing emergency crews from having access to areas beyond the viaduct. Vehicular accidents are very common, and the potential for people to get caught up in floodwaters is high.

Invasive species, specifically Emerald Ash Borer and now additional tree disease, has weakened many trees, increasing debris when the city is impacted by a severe storm. City parks now have pine tree disease which is making ongoing debris problems worse. The management of debris is costly, both in terms of a personnel resources and disposal fees.

Winter storms cause an extreme amount of trouble in Northwood. Roads ice and drift very easily. Deep ditches line the roads and cars slide into the ditches, especially when winter storms have a wind component. This closes business, schools, and disrupts daily activities. The cost is mostly in public support to plow roads, respond to accidents, and patrol and manage the roadways.

Power failure is low in frequency, but would effectively shut critical services down if an outage lasted more than a few hours. The city does not have adequate generators to power safety and critical services so first response could be delayed and some services could be unavailable. A great deal of inconvenience and service interruption would occur during any power outage that lasted for very long. Should an extended outage occur during temperature extremes, there are no warming or cooling centers in Northwood, and no overnight shelters.

Landslide used to be considered not a threat; however, there are now ditches along Tracy Road and Curtice Road that have steep embankment that are deteriorating. Heavy truck traffic has worsened berm deterioration due to slipping and eroding soils where the ditch is closer and closer to the roadway every year.

Earthquake threats resulted in discussion about hazardous materials release potential because of all the pipelines, holding tanks, and control valves that run below Northwood. Maintaining water service including the receipt of raw water from Oregon or Toledo is a potential problem

in the case of any significant earthquake. Firefighting capacity would diminish as the distribution grid was impacted by an earthquake, leaving residents without fire suppression services.

Stakeholders are becoming concerned about temperature extremes, especially drought and heat waves. With an ever-increasing elderly population, this is a problem if power is interrupted or water supplies are shortened. Although all schools are now air conditioned as are most businesses, there are many homes and businesses without this amenity. This is another case-in-point to develop shelters and community centers.

Northwood is not vulnerable to dam failure because there are no dams or levees.

Pemberville

Pemberville sits on the Portage River shortly before it enters Sandusky County. The North Branch and Middle Branch of the Portage River join together in the village, bringing two significantly large branches together into an even larger, deepened and rapidly flowing waterway. Because of tree damage from the Emerald Ash Borer infestation upstream from the village, the river is filled with tree debris and log jams for miles before reaching Pemberville. A recent river cleaning project removed log jams and trees from the south branch of the river, but there is still a significant number of blockages in the north branch of the river. The water does move faster into Pemberville, but it is unable to move quickly between Pemberville and Woodville, and still has some backup into the village too. Just a few inches of rain can cause the streets in Pemberville to flood, homes to get water in basements, and businesses to close temporarily. Because the river flows behind the downtown business district where lower levels of buildings are not very far elevated from the riverbank, the storerooms, stock areas of stores and businesses in the downtown are in the midst of flooding. This interferes with deliveries and causes damage to stock and supplies even though the upper-level storefronts are largely unaffected by the flooding. During periods of heavy rain, business owners spend much time protecting their properties and inventory with sandbags and other barriers. After floods, they spend time cleaning up water and sediment and replacing stock. On the opposite side of the river, which has a slightly lower elevation than the business district, a large section of homes and a few businesses are vulnerable to severe flooding that affects not only basements but also main living spaces on the first floor. Four separate bridges in the village become clogged with log jams and debris, preventing water from natural drainage down the river. Some homes in proximity to the river where surface drainage flows through get up to four feet of water in the living spaces; others lose mechanical systems, appliances, and furnishings every time it floods. Some homes in the high flood zone have incurred damage to their foundations and many have mold issues from repeated moisture. Others are uninsurable and cannot even be sold. Most homes are privately insured but owners say that premiums for specific flood insurance are unaffordable. Flooding on the north side of town, away from the river, is caused when a ravine and a ditch were filled in years ago with an insufficiently sized tile given amount of surface drainage the tile has to handle. As homes were built, this caused increasing flooding in this residential area where driveways, basements, and yards now fill with water, basements are inundated with several feet of water, and loss of mechanical systems and furnishings is

common. This flood scenario can take place with 2-3 inches of rain over two days, or with ice jams caused by rapidly warming mid-winter weather that melts the ice quickly.

The Emerald Ash Borer has caused extreme amounts of damage in Pemberville, especially along the Portage River and within the Portage River basin in past years, and the village has taken the initiative to remove infested and fallen trees. The village has worked to protect its tree-lined streets through partnering with a local nursery to provide state inspected trees to be planted, thus preventing the entry of infested trees to the village through planting of uninspected tree stock. However, this care being exercised, tree infestation can spread in many other ways that are unknown and unidentified to the village. Wood for campfires, fireplaces, and wood stoves can be contaminated; one tree planted by an unknowing resident can be infected. Both these situations could expose Pemberville to infestation despite its efforts to protect its trees. An infestation of maples, pine trees, or walnut trees – claimed to be happening locally by counties to the south – could become very expensive to the village through debris management expenses after a storm. Small villages have limited resources to clear, haul, and dispose of tree debris after the winds that often blow across Pemberville.

Windstorms and severe thunderstorms cause more trees to fall on houses and vehicles, into the river and ditches, and onto the streets. Heavy rain causes flash flooding, mostly in streets and the access roadway along the river behind businesses. Roofs and siding can be damaged by hail and heavy winds, obliterating roofs and vehicles.

As the railroad passes through the east and west sides of the village, there is concern over hazardous materials incidents. Trucks travel through town on SR 105 and farm chemicals are hauled from one end of town to the other every day in the spring. With the upstream river flowing through farmland, spills could place hazardous water in the river as it runs through Pemberville. This could contaminate the river, force the shutdown of Pemberville's water system, causing economic and residential disruption. A no-use water emergency could shut down businesses, cause evacuation, and damage personal property. There are pipelines in the area that could be ruptured through excavation or other digging. A rupture could cause leaks of volatile substances and cause explosion or fire, as well as air or water quality problems. These pipelines carry petroleum products to refineries in the City of Toledo, the City of Oregon, and to vessels in the Port of Toledo.

Water quality is also a concern. The village's primary water comes from wells that are rich in quantity and quality. The village is very active in providing water quality information to residents to prevent improper disposal of household chemicals in an effort to protect its water source. However, a chemical spill or improper disposal by a party other than a Pemberville resident could have a disastrous impact. As part of a larger watershed area that historically has shown high levels of phosphorus and nitrogen and is part of the Lake Erie Western Basin water quality impact zone, Pemberville is concerned about preservation of its water source. Contamination of the aquifer or ground water source could be a serious problem for residents and businesses. They have recently closed two open loops in the water mains inside the village which has improved supply and pressure immensely.

Heavy snow and blizzard conditions can make streets in Pemberville difficult to maintain and, in the most extreme storms, impassable. The flat terrain makes blowing snow likely and extremely difficult for crews to keep up with street clearing. This type of storm, rare but very possible, can isolate residents and prevent them from obtaining the medical care, supplies, and services they need. It closes schools and businesses and increases the incidence of vehicle crashes, placing a great burden on public safety services to meet the needs of the community.
Power failure is infrequent and not a frequent situation, but outages are often beyond Pemberville's control and that does concern officials. The village does have generators to power critical resources like fire stations and city utilities. Pemberville is a co-operative electrical provider and has two plants. The south plant is in need of parts to operation while the north plant needs to be updated and renovated to meet current service needs. The village needs more generators to provide emergency power if severe storms hit or the system goes down.

Pemberville is not vulnerable to dam failure or landslide/mudslide.

Perrysburg

Perrysburg considers tornado to be one of their highest risks. Given their population density, significant number of daily visitors, and the presence of business, industry and retail, the city is concerned about quickly warning, protecting, and sheltering the community. Damages to residential structures could be extensive with anything from total destruction to roof and siding damage. Injuries and death are a possibility, given the city's population of residents and visitors. The population most vulnerable to not being warned – visitors, shoppers, travelers, diners – is significant. Due to extensive costs of maintaining outdoor warning sirens, and the availability of wireless notifications by way of cellular phones, the city is planning to take outdoor warning sirens offline. Damage to large retail establishments and shopping areas, most of which feature with flat roofs and massive support spans, and the number of vehicles on roadways and in parking lots and any given time could result in massive damage should a tornado touch down in the city. They are very concerned about underserved and disadvantaged populations under these conditions, considering how difficult and lengthy the recovery period would be for them. Elderly are also a concern, both for mobility and medical needs reasons as well as the limited ability to recover from a major incident.

Because of significant highway, rail, and airport traffic in the area, as well as pipelines, hazardous material incidents are another primary concern. Spills and leaks during transfer, use, and disposal of substances is possible. Storms with wind can easily turn a routine hazardous materials transport into a large spill when trucks are upended by wind. Rain can spread a chemical into sewers or roadways very quickly. The management of chemicals in underground pipelines is subject to pipeline deterioration, leaks during transfer to tanks and tankers, and by-products of the management process that may release other hazardous by-products into the atmosphere. The city is located on the landing path to Toledo Express in Swanton; take-off and landing is where most air accidents happen. The expansion of distribution centers and massive facilities in the area has made the influx and handling of packages and larger shipments increase substantially by air, rail and highway. Stakeholders report that truck drivers are oftentimes non-English-speaking and there is great difficulty communicating with them. There

is no single language they typically speak, so it is difficult to prepare communication through translation. These unfamiliar drivers, regardless of language barriers, get lost inside the city and often end up transporting hazardous materials through residential areas and others where those trucks are not supposed to travel. An incident with an airplane could douse houses or businesses with chemicals or could cause an air quality issue during response and clean up. Railroad crossings are common across the city; trains and block intersections every hour of every day, causing driver frustration, restricting access, and contributing to traffic congestion. Signage is sometimes inadequate and destinations or alternate routes are not clearly marked for disoriented and distracted operators. This increases the likelihood of crashes. Any hazardous materials incident, dependent upon the population density and presence of businesses at a specific leak site could be cause evacuations, fire, air or water quality issues, or soil contamination if there were a pipeline leak or release in the City of Perrysburg.

Storms that involve wind concern are another concern for Perrysburg officials. Hail and wind damage vehicles, roofs on buildings, and siding, and it is commonly believed that wind is increasing in frequency and severity. People who are stranded outside can be injured or killed. Tree damage, especially in the shadow of Emerald Ash Borer and other tree infestations, results in extensive amounts of debris that is costly to manage, haul, and dispose of. Debris problems caused by wind damage have increased over the past few years. There is more debris and the debris is far more frequent. Damage to equipment that sits outside, cars on auto sales lots, and other types of inventories that is kept outside is destroyed or significantly damaged. Roof damages are increasing to a large degree, and residents are finding that some insurance companies have excluded roofs from coverage. Many residents are underinsured and find themselves in financial difficulty repairing their homes after storm damage and wind damage.

A water quality problem in Perrysburg is very possible. The city buys water from the City of Toledo. If Toledo's system goes down, the alternate supplier is undetermined although the city is working with the City of Bowling Green and Northwest Water and Sewer District to develop redundancy. Communication between the two cities has improved immensely with the creation of a satellite office for suburban water distribution management. The city feels that Toledo has improved the water treatment capabilities by adding ozone treatment ability, and that improves the overall water quality. They do have concerns over aging distribution lines that feed Perrysburg, and cite the water supply being dependent upon these aging and deteriorating lines.

Perrysburg residents experience some yard and basement flash flooding in spite of a robust ditch cleaning program. It has been difficult to clean all ditches due to a lack of access to private properties along the ditches. In some areas, storm sewers are too small and catch basins and culverts need repair and replacement. Continued growth in the city has worsened the stormwater management issues as the stormwater moves faster and with more force as development occurs. Ft. Meigs ditch creates water problems in the Rivercrest subdivision. Grassy Creek is filled with debris; other creeks are used for illegal dumping of old appliances and garbage. The city has struggled with EPA regulations that impede the city's ability to clean this debris and garbage out of creeks and, as a result, flooding reaches yards, driveways,

basements, and commercial properties. A few houses experience flooding inside the home. Many buildings are experiencing flood-related foundation erosion due to ponding stormwater and areal flooding. There is some vulnerability of the city's wastewater treatment plant on the Maumee River, but there have been no issues to date. The lagoon is in good condition and is structurally sound. It is not classified as a dam on the National Dam Inventory, and is not listed on the National Levee Inventory either. The city has installed underground water storage vessels and above ground retention ponds that have helped with flooding, but rain events are more severe now. The rain is more intense, more frequent, and longer in duration. When ground is saturated and another rain event occurs, flooding is worse than in the past. These events tax the drainage system.

Winter storms cause icing and drifting, but the severe winter weather seems to be arriving later in the winter season now. Roads are impassable or very unsafe, resulting in crashes and injuries. Freezing rain is a common with winter storms. These situations require extensive effort from the street division to salt and clear the city's many roadways. Road crews are using more brine to treat roads now in compliance with Ohio EPA recommendations. The direct cost of this work is expensive, as is the lost commerce when businesses are unable to open due to road conditions. A loss of power during winter storms puts elderly, underserved and disadvantaged populations at additional risk because most of them have little resiliency to cold and lack alternatives to provide themselves with heat.

A loss of power would be difficult for city emergency crews. Both fire stations have old and out-of-date generators that are no longer dependable. They have insufficient capacity to operate the minimal equipment needed. Power failures are rare but would cause significant discomfort and health risk for the elderly and those who rely on home medical equipment. Improvements to the city's generators would improve this situation. A wastewater treatment plant located near the Maumee River would be vulnerable to damages during a power outage, and could cause sewer back up into homes, basements, and businesses.

Drought and extreme heat have not been considered a high risk for the city unless accompanied by a power outage, but a growing elderly and underserved population has caused the city to reevaluate this risk. There are low-income housing apartments and mobile homes that are occupied by elderly, disabled, and disadvantaged people, and these areas would be at high risk for heat injury or worsening of medical conditions during a heat wave. An extended power outage would require alternate sheltering, and that would be difficult for the city to do.

Perrysburg's wastewater treatment plant has a levee along the Maumee River that is not listed on the National Inventory of Dams. In spite of that, a 2016 emergency plan is on file with the Wood County EMA. The levee was renovated in 1978 and is well maintained. The inundation area is unlikely to include any homes or populated area. Any potential overflow would mostly likely flow to Orleans Park and back into the Maumee River. The loss potential is very low.

The city is somewhat susceptible to landslide/mudslide. This risk only applies to very specific properties along the Maumee River on State Route 65. SR 65, known as River Road, is

populated by numerous houses along the southern riverbank along the river. This area begins at Roachton Road and continues to West Boundary Street where the riverfront road that continues east is called Front Street, and SR 65 diverts. Front Street follows the river until it reaches East Boundary Street, and the road again becomes SR 65, or River Road. Many homes in these sections were built more than 40 years ago. In the downtown and to the east, some shoreline property is dedicated to parks and utility services but is not vulnerable to landslide. The Maumee River runs straight through this section of Wood County so undercutting of the properties on outside turns of the river is minimal. The difference in elevation between the road and the properties can be 75 to 100 feet, especially on River Road and Front Street to the west of downtown. There is no known incidence of landslide in this area. There is a divergence ditch on I-75 on the south side of the city that is showing evidence of erosion and places some increased threat on homes in that area. The city is attempting to slow the velocity of water in the ditch to lessen this threat.

Earthquake would only be damaging to the city if the quake were especially strong, which is not likely. A moderate earthquake could crack some masonry buildings and old stone buildings. Most homes and businesses would have very little damage. Some damage could affect underground utilities in the city, especially older sewer lines, sanitary sewers, or water lines. There are no tall buildings that would be seriously affected. Contents of some buildings and homes could be damaged in shaking, and sidewalks could crack. The city's water towers are vulnerable to damages, including four towers with 1.5 days' water supply in storage. Underground water reservoirs that hold a day's water supply would be vulnerable to structural damage and contamination. Underground utilities, including water and sewer lines, communication lines, and electric and gas lines would be vulnerable to damages. Pipelines and underground storage tanks would be very likely to be damaged. New development includes multi-story hotels and multi-family housing that would be vulnerable to earthquake damage.

Perrysburg is not vulnerable to dam/levee failure because it has no identified structures.

Perrysburg Township

Perrysburg Township is located in the northeast quadrant of Wood County and is one of the county's primary growth areas. Because of several past exposures to tornado events, township officials and residents are concerned about tornado risk. While the township has experienced several incidents where funnel clouds have passed over the township, sometimes touching down and others skirting around the township, none have actually touched down in the township. The township has an abundance of multi-family housing structures, mobile homes, manufactured homes, and homes built on concrete slab foundations, which makes them especially vulnerable to tornado damage. Storm shelters are necessary because these types of housing do not have basements. Mobile homes, manufactured homes, and slab constructed homes would be destroyed by a tornado. Other traditionally built homes could suffer significant damage or be destroyed. There are critical services in the township, including health care providers, churches, public safety forces, and retail establishments, and other businesses that are critical to the residents of the township and the adjacent jurisdictions. These facilities could be destroyed or significantly damaged; roofs would be destroyed, siding torn off, windows and

doors shattered, and vehicles tossed to the wind. Many industries in the township have an array of hazardous substances on their property, and this could extend an incident to include a major hazmat release or exposure. Notification systems for tornado warnings have improved over the past few years. The wireless notification system in place provides individualized warnings to those who sign up for the service. First responder communication systems have improved as they moved to the Lucas County 800 MHz radio system. This would enable more effective communication between responding units and other units of government.

Flooding is another serious concern in Perrysburg Township. Two to three inches of rain can cause basement flooding in many neighborhoods; in some areas, this flooding reaches first floor living spaces. Areas around the retail corridor on US 20 are prone to flash flooding. Water detention is insufficient and ditch maintenance does not keep the streams clear of debris and blockages. Water pools on roads, parking lots, streets, and driveways. Pavement is continually repaired and culverts and storm basins are constantly cleared of debris. The pavement and basins, due to the stress of all the debris and water, deteriorate quickly. Grassy Creek and Oregon Creek have logs, debris, and garbage clogging them, and beavers have built dams that block the flow of water. Culverts are undersized and detention ponds do not connect properly to waterways or drain effectively. Some neighborhoods, such as Starbright Subdivision, flood so badly that residents' ingress and egress is blocked. Vehicle accidents are common as drivers try to avoid or drive through standing water. Buttonwood Park on the Maumee River consistently floods. Some ditch cleaning projects have helped improve natural drainage, but cleaning out sediment, log jams, and refuse in the ditches needs to continue. Ditch banks are in good condition, so cleaning needs to include the waterway itself. Enforcement of Wood County stormwater regulations has helped reduce problems. New development has been required to use retention and detention structures to manage stormwater, and this has reduced flooding in areas where new development takes place.

Perrysburg Township's water is supplied by the City of Perrysburg, which buys water from the City of Toledo. Toledo's treatment plant is old and not up to current standards for detection and treatment. In the aftermath of the area's 2014 water crisis, there was serious concern about the quality and dependability of the water supply. This can contribute to development issues as water rates are high and the township has no involvement in managing the supplier's system or process. Perrysburg Township is dependent upon Northwest Water and Sewer District, Toledo Water Department, Perrysburg Sewer Department, Oregon Water Department and Bowling Green Water Department to provide adequate water and sewer services.

A significant amount of hazardous chemicals moves through the township on a daily basis, creating a significant concern for spills, leaks, and releases. The Ohio Turnpike, I-75, and US 20 are primary transportation routes for all sorts of hazardous materials. Railroads traverse the entire township on the way to switching yards and ports in Toledo. The eastern and southern periphery of the township is unzoned; this allows any kind of industry or operation to make its home there. The township is concerned over what chemicals will be used or stored in the township, particularly in this unzoned area. Businesses that store, receive, and ship hazardous substances increase the township's risk for vehicle accidents, spills and leaks during transfer,

and other incidents. Perrysburg Township, because of its commercial growth, plentiful small industry and manufacturing sectors, and exploding retail development, is vulnerable to hazardous materials incidents. Semi tractor-trailers, box and bin trucks, tankers, and trains haul a wide variety of hazardous chemicals through the township every day. The addition of numerous distribution centers has brought significantly more traffic to the area as goods are brought in, and then shipped out to customers from the distribution center. Traffic congestion causes vehicle accidents and high wind tips semi-trailers over on the interstates. Constant loading, unloading, packaging, and use of chemicals make the city vulnerable to a hazardous material spill or release. Railroad crossings are common across the township; trains and block intersections regularly, causing driver frustration, restricting access, and contributing to traffic congestion. Signage is sometimes inadequate and destinations or alternate routes are not clearly marked for disoriented and distracted operators. Non-English speaking truck drivers sometimes get confused and lost, and end up using unsuitable roads with insufficient turning space or load limits to get where they are going. This increases the likelihood of crashes and causes seriously higher wear and tear on the roadways. Pipeline incident risk is a component of hazardous materials vulnerability as existing lines combine with new pipelines being installed across the area to carry gas and liquid substances as part of a regional network. Existing pipelines already carry other gas and liquid products to area refineries and distributors. An incident, dependent upon the population density and presence of businesses at a specific leak site could be cause evacuations, fire, air or water quality issues, or soil contamination if there were a pipeline leak or release.

Wind is a concern because of the quantity of structures in the township. Stakeholders reported increasing wind speeds and frequency that adds to debris issues, structural damage, and vehicle accidents. Damaged roofs, siding, and windows are all common in wind events. Tree damage is also common, with limbs falling on buildings, vehicles, and equipment. Strong winds overturn semi tractor-trailers, some with additional trailers, on highways and roads. Thunderstorms leave similar damage, with the frequent addition of flash flooding in parking lots, basements, driveways, roads, and streets. With many retail parking lots, wind and severe rain can cause electrical problems with lighting in parking lots. Stakeholders felt that the rain comes faster and harder now, and the amounts are higher than just a few years ago.

Perrysburg Township considers invasive species and power failure to be related hazards. Diseased and weakened trees are the most common cause of power outages as trees fall on and break power lines. While outages are generally brief, an extended outage would create a sheltering issue for the township. There is currently no shelter location that has a backup generator. Other township buildings are generator powered but none of these could be used as a public shelter. Additionally, manufacturing businesses and other industries would incur significant cost in stopping and starting production lines if power was unexpectedly lost for a significant period of time.

Earthquake is not considered a significant risk for the township. Should one occur, it could cause significant damage to buildings constructed of stone, masonry, and concrete. Underground utilities, water lines, and sub-surface manufacturing plant floors would be

damaged badly. There are some multi-story hotels and businesses that would incur structural damage. Any underground infrastructure or storage would be exceptionally vulnerable to damage. Although an earthquake strong enough to cause this level of damage is highly unlikely, it would cause excessive amounts of debris that would be expensive and difficult to manage. The township does not have a detailed debris management plan that would tell them where and how to segregate and stage specific types of debris, and how to finally dispose of it.

Drought and extreme heat would be an inconvenience for township residents, especially if power failure occurred. The township could be affected by water restrictions, should they be put in place by the City of Toledo. Residents with medical needs or who depend on powered medical equipment would also be impacted, as would the elderly and underserved, disadvantaged people.

Perrysburg Township is slightly susceptible to landslide/mudslide; this risk applies to very specific properties along the Maumee River on State Route 65. SR65, or River Road, is populated by numerous houses along the southern riverbank between and Hufford Road and Rosedale Place. The Maumee River runs straight through this section of Wood County so undercutting of the properties on an outside turn of the river is unlikely. The difference in elevation between the road and the properties can be 50 feet or less. There is no incidence of landslide in this area.

Perrysburg Township is not vulnerable to dam failure or landslide/mudslide.

Portage

In the small village of Portage, the streets are higher than yards; when it rains, surface drainage flows into yards, crawl spaces, and basements, making flooding their primary concern. This areal flooding can last for days. Most streets do not have curbs, which facilitates surface drainage onto private property. The North Branch of the Portage River also flows through town. More water detention is needed to allow rainwater to gradually flow into this major creek as it drains, which would prevent water from collecting in yards and homes.

Windstorms, another high concern for the village, cause significant structural damage to businesses and homes. Roofs are damaged, siding and masonry surfaces are deteriorated and pitted, and windows are broken. Tornadoes are a threat to life and property, damaging homes, vehicles, and, in the worst situations, causing injuries or fatalities. People outdoors, including migrant workers in fields and children and adults attending the local church camp, can be caught outside without adequate warning from these fast-approaching storms. There is a local outdoor warning siren but it has no battery back-up; given the siren's age, it is unlikely there will be one. The siren is 1947 model and new parts are no longer made. Warnings from the NWS in Cleveland are often received after the storm has begun, so timeliness is an issue. The county's wireless notification system has helped, and residents are encouraged to sign up for this free service.

Tornadoes can cause serious structural damages and, potentially, destruction. Without adequate warning, deaths would be expected. Debris could be significant, which creates an expensive clean up and disposal issue for the village.

State Route 25 is a primary roadway through the village; many trucks and commercial vehicles use this highway to avoid interstate congestion. This heavy traffic increases the village's risk for hazardous materials incidents. If an evacuation were necessary in a hazardous materials incident, the village would be challenged to identify an appropriate facility to house evacuees. Persons with special medical needs, disabilities, or elderly would be very difficult to shelter due to a lack of facilities and personnel to operate the shelter. Limited public warning capabilities also increase risk to residents because the village would struggle to notify them of the incident.

Power outages are a moderate risk for the village. Portage does not have a backup generator for any of its public facilities. If an extended outage did occur, it would cause hardship for people who have medical issues or rely on power-dependent medical equipment. The village's elderly population would likely be most affected, as well as underserved and disadvantaged residents.

Winter storms are inconvenient but do not typically cause long-term damage. The village's water quality concerns relate to security at the two water towers located in the village. As a general rule, however, residents feel that the water system is safe and adequate. Earthquakes are unlikely but could impact underground utilities, structural foundations, and old masonry or stone structures.

Portage is not susceptible to dam failure or landslide/mudslide.

Risingsun

This community of 600 residents is primarily concerned about damages cause by windstorms. These typically include roof and siding damage. The village does not have an adequate storm shelter, making population protection a major concern because the village is not close by any other village for assistance. Most homes do not have basements because of the village's rocky sub-structure. Stakeholders all reported that windstorms are more severe and more frequent now than even a few years ago.

Flooding is a secondary concern for the village. In heavy rain events, surface runoff floods yards and streets. Storm sewers are relatively adequate so floodwater does not remain for very long. Hail has damaged vehicles, roofs on buildings, and siding on homes in the past; village residents are concerned that future storms will do the same. The possibility of a tornado is frightening to some, especially those without a basement or storm shelter and whose homes, outbuildings, and vehicles are susceptible to damage. Again, the prospect of sheltering an aging population with all kinds of special needs and disadvantages was concerning.

Because of the village's location on State Route 23, hazardous materials are a serious concern. SR 23 is a primary truck route between Toledo and Columbus; commercial vehicles haul all sorts

of chemicals and hazardous substances through Risingsun. The village's rural setting also includes fertilizers, herbicides, and pesticides used in agriculture. These substances are a hazardous materials risk and affect runoff during heavy precipitation events. There are pipelines in the vicinity that could be ruptured through excavation or other digging. A rupture could cause leaks of volatile substances and cause explosion or fire, as well as air or water quality problems. They are concerned about timeliness of response, adequacy of equipment and personnel, and extensive damage to local natural resources and utilities.

Risingsun residents' concern about the water supply is generalized and focuses on the algal bloom issue and the Lake Erie watersheds. The village receives water from NWWSD and feel their supply is safe. They do believe, however, that general contamination of the Maumee River is a serious concern for the region and they monitor the capability of NWWSD to test and treat the water.

Winter storms are a low concern for the village. Residents consider them an inconvenience more than an incident that causes significant damage. Roads drift and can become ice-covered. If ice forms on power lines and trees, power outages are a concern. This is rare, however, and residents consider their electrical system highly reliable. Drought and extreme temperatures are also a low concern. These are rare and uncomfortable but rarely cause damage. The only caveat is if the incident were to be extended in duration and/or accompanied by a power failure. Underserved, elderly and disadvantaged individuals would suffer the consequences without significant help from mutual aid providers.

Risingsun is not susceptible to dam failure and landslide/mudslide.

Rossford

Rossford is negatively impacted by flooding. Many streets do not have curbs; heavy rainfall results in excessive wear and tear to the pavement and berms and pushes surface drainage into basements, crawl spaces, yards, driveways, and parking lots. Homeowners lose furnaces, water heaters, and air conditioning systems as well as appliances, furniture, and personal items on a frequent basis, some at least once per year. Ponding water lies in low spots for extended periods of time and causes inconvenience and nuisance for an extended period. As rains become harder and faster, with more precipitation, as reported by stakeholder, this problem worsens. Insufficient water management and detention in the city's commercial and business zones causes flash flooding as rainfall backs up and cannot drain quickly enough. Six inches of rain causes very serious city-wide flooding. Parking lots are covered in standing water, storm sewers are backed up into basements, and ditches are filled to the brim with storm water. An area along the Maumee River, including Riverside Drive and commonly known as "The Colony", is subject to coastal flooding when winds come out of the north and east. If winds are strong and the river is high, the wind can push water onshore and cause flooding of homes, the marina, and adjacent park area. These homes have been there for many years and are built on rock under the soil. While they are very stable, they are affected by wind and water damage from this type of storm.

Rossford's entire storm water system is undersized and inadequate. Officials describe the storm sewer system as "poor at best". Continual commercial and residential development in this suburban area worsens the city's flooding issues. In spite of tax assessments to fund sewer improvements and building regulation that requires detention in commercial areas, the city is inundated with water. Grassy Creek is a primary drainage outlet but the large creek can't keep up with demand and some detained water isn't even directed into the creek. The Crossroads, a commercial area near US 20 adjacent to Perrysburg Township, is especially vulnerable to flash flooding. Detention ponds at the many shopping centers and retail strips end up holding pooled water and breeding mosquitoes. While new development meets storm management regulations, this is simply a rapidly developing area. As multiple additions are made simultaneously through thoroughly engineered plans, consequences sometimes are different than expected when there are underlying stormwater management problems. The speed with which development is happening, coupled with rapidly worsening storms makes flooding a critical concern for Rossford.

Because of its commercial growth, plentiful small industry and manufacturing sectors, and exploding retail development, Rossford is vulnerable to hazardous materials incidents. Semi tractor-trailers, box and bin trucks, tankers, and trains haul a wide variety of hazardous chemicals through the city every day. Warehouses and distribution centers have increased the handling and transfer of packages containing chemicals a great deal, and releases at these facilities are common. Industrial growth includes increased manufacturing as well as more hazardous materials logistics, exposing the city to even more risk. Traffic congestion causes vehicle accidents and high wind tips semi-trailers over on the interstates. Constant loading, unloading, packaging, and use of chemicals make the city vulnerable to a hazardous material spill or release. Railroad crossings are common across the city; trains and block intersections every hour of every day, causing driver frustration, restricting access, and contributing to traffic congestion. The city is incredibly vulnerable to derailments and crossing accidents. Street signage is sometimes inadequate and destinations or alternate routes are not clearly marked for disoriented and distracted operators, especially non-English-speaking drivers who rely completely on their GPS to direct them. This increases the likelihood of crashes. Pipeline incident risk is a component of hazardous materials vulnerability as existing lines combine with new pipelines being installed across the area to carry gas and liquid substances as part of a regional network. Existing pipelines already carry other gas and liquid products to area refineries and distributors. An incident, dependent upon the population density and presence of businesses at a specific leak site could be cause evacuations, fire, air or water quality issues, or soil contamination if there were a pipeline leak or release.

Wind, which can take the form of an independent wind storm, tornado, or severe thunderstorm, has high negative consequences for Rossford. Stakeholders report that storms are getting worse with higher winds, more precipitation, and more damage. Trucks blow over on the highways; houses and businesses are destroyed; streets and highways are blocked; and bridges, overpasses and culverts are obstructed by debris. This level of damage, which adjacent jurisdictions experiences in the 2010 tornado, is impact Rossford if a significant wind event occurs. The high transient population, including travelers, visitors, and shoppers at local

establishments, are at risk of not receiving adequate warning. This could lead to injury or death from wind events. Vehicles are destroyed when hail pelts them, as are mobile homes, travel trailers, and semi-trailers. The city's marina is vulnerable to northeast winds coming off the river, pushing water back into streets and homes, and obliterating the marina and boats with excessive wave action and flooding. Evacuation and sheltering of residents are a significant concern for city officials. There are not adequate shelters for residents let alone transient populations. There are no facilities for elderly, underserved, medically challenged, or disabled people to use. The debris created by a serious wind or flood event is another concern, as the volume of debris and expense to clear it could have devastating financial consequences for the city.

Water quality is a concern for the city. Rossford is dependent on Toledo's water department for their water supply. Concerns have eased the past few years as suburban customers of Toledo are served by a separate office, and their input in taken into account. The ability to test and treat water has improved. However, the city is still concerned about providing alternate water sources, providing critical and accurate emergency information to the public, and influencing improvements to current systems.

Winter storms frequently create transportation issues in Rossford. The Crossroads retail area is especially vulnerable to blowing and drifting snow and ice that creates a slick, glass-like surface in strong winds. This heavily traveled area becomes increasingly dangerous. Multiple accidents occur during every winter weather event, straining public safety services and causing injuries and property damage. Although recent storms have seemed to be fewer than years ago, the devastating cold waves cause problems and the once-a-season blizzard makes a temporary critical situation for this busy commercial center.

Power outages are not common, but when they do occur, the city has no generators to power critical facilities. Public safety departments cannot open doors to access vehicles. The city has no generator-powered shelter to support people with medical needs and there is nowhere to charge a radio or a cell phone. Rossford is at risk of total shutdown in a major power outage. Unless powered privately, businesses are at the mercy of the power company during an outage. This would likely result in widespread, temporary business closures, leading to thousands of dollars in lost business.

Invasive species has caused a lot of tree damage in Rossford but the city is keeping up with debris management during regular operations. When a storm hits, however, an economical option to dispose of debris is a major need. The volume of debris in the city has increased as more trees have been impacted by Emerald Ash Borer so the city considers this issue a growing concern. Ohio's list of potential and growing invasive species in extensive, and Rossford continually watches for signs of new infestations, fully realizing that one day, they will find something. This could be a serious problem if the bug or disease is highly spreadable.

Earthquake damage would be minimal for all but industrial buildings that are multi-story and masonry with lots of underground service lines and distribution lines. Infrastructure would be

impacted, and pipelines, railroad tracks, distribution lines and overhead distribution could be destroyed or severely damaged. The repairs could take a long time and be financially devastating.

Rossford is slightly susceptible to landslide and mudslide. In the neighborhood called "The Colony" along Riverside Drive, homes are vulnerable to washing away of back yards, outbuildings, and sophisticated landscaping that includes stone walkways, swimming pools, and recreational areas. These homes are built on rock and are very solid. Where the rock ends and the slopes become completely soil, however, trees have been cleared for and soil has been hauled in as fill dirt. These areas are vulnerable to deterioration.

Rossford is not susceptible to dam failure.

Tontogany

Tontogany's greatest concern is hazardous materials incidents. The village is located at the intersection of Kellogg and Tontogany Roads; a CSX railroad track also dissects the village. These roads and railways are heavily traveled and bring significant traffic through the small village. Residents are concerned about accidents and derailments and the potential for evacuation should an incident involve a hazardous substance. Because the village is small and these thoroughfares cross the center of town, an incident could require evacuation of the entire population. With a school located within the village, student safety is a concern during an evacuation or shelter-in-place situation. Residents feel that the railroad is poorly maintained and that poor maintenance has been a contributing factor to previous rail incidents. They are even more concerned after recent railroad history that involves safety system failures and lack of communication from the railroads to the communities.

Tornadoes, severe thunderstorm, and wind incidents can cause significant damage to roofs, siding, equipment, and vehicles. Tontogany does not have a public shelter in town so there is concern about a lack of storm shelter for residents in homes without basements. Flooding is another concern in the village. After significant rainfall of a few inches, some homes have flooding that damages mechanical systems. Tontogany Creek floods badly; the village's storm sewers are inadequate for the heavier precipitation events that have impacted the village in recent years. Debris jams the creek, blocking drainage. Some of these blockages are the result of log jams from dead ash trees. Not all jams that affect the flow of rainwater are inside the village; many are downstream and the village has no control over resolving the problem. These dead and disease-weakened trees are also problem in windstorms, thunderstorms, tornadoes, and winter storms with ice or heavy snow. The village had one death caused by a tree that fell onto a car so they fully realize the danger this hazard can cause.

Power failure is a less significant concern although increasing elderly and underserved population numbers stand out. Outages are rare and generally short-lived. The village does not have a generator to run critical facilities during an outage. This would be a problem if an outage lasted more than a few hours. The village purchases power from the City of Bowling Green and distributes it through their municipal utility. The public's concern over water quality has

decreased in recent years because Bowling Green's water treatment plant has significantly improved the ability to test and manage the water quality, and participation in H2Ohio programs is improving the toxic runoff issues that prevailed several years ago.

Earthquake is considered a very low risk. If a quake did impact the village, damage would be minimal and likely limited to damage at the school, which is masonry construction, and other similar structures. Most residential structures would withstand a minor earthquake. Underground utilities could be impacted.

Tontogany is not susceptible to dam failure and landslide/mudslide.

Walbridge

Walbridge residents and officials are most concerned about the hazards they've experienced most recently: flooding, tornadoes, high winds, hazardous materials incidents, and water quality emergencies. Most recently they have added power outages to that list.

Flooding is a major concern for this small village. Approximately 50 households can be displaced with just a few inches of rainfall. Residents across the village have learned that redundant sump pumps and other backups are necessary; if their primary pump fails, floodwater will seep into their home before they can replace the damaged equipment. A power outage at the same time as a thunderstorm can render them helpless to protect their property from flooding inside living spaces and basements, and prevent them from having ingress and egress from their home. Storm water frequently infiltrates the village's sanitary sewers, backing up in homes and sending raw sewage into basements and lower levels. Streets in the village can be impassable for days after a storm. In the worst cases, streets can hold floodwater for seven to ten days. Much of Walbridge's water drains into Dry Creek and Cedar Creek, which both run through the village. Dry Creek is maintained by Wood County Engineer's Office and is part of the county's ditch maintenance program; Cedar Creek is not. In some areas, Cedar Creek is filled with garbage and debris, such as old appliances, furniture, dead trees, overgrown vegetation, and beaver dams built by pesky wild animals. Flooding is so significant in Walbridge that residents often talk about their "flood trifecta,", a serious event that includes riverine flooding from heavy rainfall, flash flooding caused by inadequate drainage, and sewer back up due to insufficient storm sewers. They could add areal flooding to that mix and include the waters that remain standing in yards, parks, and other open areas for days until the ditches slowly carry the water away. More storm water management efforts would help a lot, including more retention and detention of storm water. An event like this occurs at least once a year. Most damages are not covered by any kind of insurance, leaving residents on their own to recover.

The village's elderly population is a concern to officials when wind events, including tornadoes, severe thunderstorms, and windstorms, are discussed. This population is much more vulnerable to the effects of these hazards than others in Walbridge. The village also has a significant number of mobile homes; these structures are exceptionally vulnerable wind events and can suffer anything from minor roof and siding damage to complete destruction. Most manufactured-type homes fare only slightly better than mobile homes, and there are many of

this type home in the village. Traditionally constructed homes in Walbridge are generally older and more susceptible to wind damage than newer construction. Because many of the village's trees have been impacted by the Emerald Ash Borer infestation, many are weak or dead and prone to falling on homes, vehicles and people. Public warning and notification of impending hazards is a challenge and accentuates the risk of wind events.

The village's warning systems are old; reverse 9-1-1 and digital mass notification systems are not currently available. Walbridge also has no storm shelter so it is difficult for some residents to take protective action. There are no warming or cooling centers for extreme temperatures or power outages. Within village hall, there is an open space where residents could temporarily gather to seek shelter during severe wind events, but it is not specially equipped or supplied to provide this service. It is simply a roof over the heads.

Walbridge was hit hard by the 2014 water emergency. The village receives water from Toledo. In the 2014 incident, they were without public water for three days. As the region addresses the growing water quality issue, village officials are concerned that the costs associated with improving Toledo's water treatment facility will be an overwhelming financial burden for elderly and disadvantaged Walbridge residents.

Because the village is home to a large railroad switching yard operated by CSX, Walbridge officials are concerned about hazardous materials incidents. The village has a positive working relationship with CSX and the railroad has contributed to first responder training and cooperative projects. They still have concern about evacuation, sheltering, spill clean-up, environmental restoration, and the cost of spills associated with rail and highway transportation if and when hazardous materials spills occur. There are pipelines in the vicinity that could be ruptured through excavation or other digging. A rupture could cause leaks of volatile substances and cause explosion or fire, as well as air or water quality problems.

Power outages in Walbridge are frequent and the cause of the outages has not been determined. Toledo Edison is investigating the cause, but to date there has been no cause determination. The village does not have generators for critical facilities; they are quite interested in portable power generation since power outages have become frequent. While invasive species, specifically the Emerald Ash Borer, have destroyed many trees, the power company has maintained their lines well, reducing the risk of power outages from falling trees.

Winter storms are considered an inconvenience but rarely cause property damage of loss of life. There have been no recent ice storms in the village. Unless there is a winter storm with several inches of extremely heavy, wet snow that causes damage or collapse to flat roofs, winter storms come and go without fanfare.

Walbridge is not susceptible to dam failure and landslide/mudslide.

Wayne

Flooding is a primary concern in Wayne. Just three inches of rain can cause serious problems for this small village, and they have reported that rain is coming faster, harder and in greater quantities than ever before. They report increasing flooding of the Portage River in low-lying agricultural areas; areal flooding lasts long after the storm because it has no way to drain through clogged and undersized ditches. Aging storm sewers are easily overwhelmed results in flooding to basements and crawl spaces, destruction of HVAC systems, and street closures. Surface runoff has to fight gravity, running uphill to the ditch that feeds the South Branch of the Portage River. The ditches are filled still with debris, and need to be cleaned so they flow better. Storm water cannot drain as quickly as necessary without help from pumps. Broken tiles, undersized culverts, and clogged drainage basins keep roads and properties flooded long after they should have drained. Areal flooding is a continual problem for Wayne residents and farms. The subdivision on the southeast side of the village has installed a retention pond that has reduced flooding, but has not solved the problem.

Severe thunderstorms and tornadoes have caused damage in Wayne in the past. The village has some history of lightning, which have started fires and damaged property, and tornadoes. Whether the wind and heavy rain are caused by a tornado, severe thunderstorm, or windstorm, homes, buildings, and equipment are all likely to be severely damaged or even destroyed by strong wind events. Grain bins, elevators, and other farm equipment are at risk of destruction, which is extremely costly to replace. The village also experiences damage and inconvenience when trees fall, streets flood, and traffic is blocked. Stakeholders reported that strong and severe windstorms have increased in frequency and magnitude, and damages are continually rising.

In the drought of 1988, the village experienced water use restrictions. Wayne's water is provided by a well system. These wells are generally plentiful but, because the village sits in a low-lying bowl, they are vulnerable to contamination from hazardous materials spills. The village's risk for spills comes from the trucks and commercial traffic that travel State Routes 199 and 281 as well as use of chemicals on farm fields and residential properties. Collisions increase the likelihood of a chemical spill; topography dictates that spills will drain towards the village rather than away from it. Some officials believe there are signs that the water table will become insufficient to provide the village's water in the future. As deep-rooted trees become less healthy and die from lack of water, officials believe this is an indicator that the aquifer that supplies their wells is drying up. If the village were again affected by a serious drought, water restrictions would likely be necessary.

Wind is a major factor in winter storms. While heavy snow, cold temperatures, and moderate ice are all manageable, the village lacks the resources to maintain safe and passable roadways when high winds create blowing and drifting conditions in the area. When these conditions are present, roads blow shut almost as quickly as they are cleared. Keeping the primary roads open becomes a major challenge for local road crews; secondary streets can quickly become impassable. In these situations, residents become isolated from other areas of the county. If a power outage occurred at the same time, residents could experience serious consequences.

While power outages are rare, an outage combined with a winter storm and cold temperatures could cause significant hardship for residents.

Wayne is concerned about a growing elderly and medically dependent population. More elderly are disadvantaged because children leave the area and there is no one to care for them in later years. People are experiencing various disadvantages in the form of financial hardship, illness and disability, and other behavioral health problems. It is important to Wayne officials to help these populations, but resources are short. They lack community shelters and protective areas to house people during the aftermath of disasters. They are concerned their public safety crews will diminish to where they cannot serve their citizens as needed, and worry that mutual aid will not sufficiently help them when needed.

The village does not have a generator to power any of its critical facilities, further increasing the inconvenience and potential damage in a power failure incident. Wayne has aggressively trimmed and removed diseased, dead, and overgrown trees so power lines are generally free and clear of debris damage. This reduces, but does not eliminate, the village's risk for power failure.

Wayne does have a wastewater lagoon at their treatment plant that is considered a dam. The structure is well maintained and is considered a low risk for the village. It is located in an open area with no structures in the immediate vicinity. The inundation zone contains no homes or buildings. Fencing around the water tower in the village would help make it more secure, but it is also well maintained and in good repair. Wayne is not susceptible to landslide/mudslide.

West Millgrove

The tiny village of West Millgrove can be devastated by wind events. With no storm shelter in the village and no dependable warning system, residents can easily be surprised by a fast-moving severe storm. Sitting on the western edge of the Cleveland office of the National Weather Service, they feel that warnings sometimes come too late. Straight-line winds, severe thunderstorms with hail and lightning, and tornadoes can all arrive without much warning most of the time. The wind causes structural damage, crop and tree destruction, damage to vehicles and outside equipment, and utility damage. With as little two inches of rain, streets can flood, basements can take on water, and storm sewers can fill with lawn and crop debris, further exacerbating the flooding. Many homes do not have basements because of the rocky substructure, so storm sheltering is non-existent. Debris clogs drainage in both storm sewers and streams, especially as trees have been weakened by the Emerald Ash Borer infestation. The East Branch of the Portage River flows through the village; when heavy rain causes the stream to rise beyond its banks, streets and yards flood throughout town. Areal flooding is often present for days after a heavy downpour.

Loss of life in severe storms is rare but not impossible. West Millgrove is fairly isolated and lacks a dependable warning system. The village is located in wireless signal dead zone and lacks adequate broadband Internet service. This limits the village's options in implementing a warning system. Cellular service booster towers and repeaters are needed to ensure they

receive a signal. Tornado, severe wind, and severe thunderstorm are considered the village's most concerning threats.

The transport of hazardous materials in a concern for West Millgrove residents and officials. This includes substances hauled on State Route 199 in semis and commercial vehicles and heavy trucks that haul stone from the local quarries. Invasive species, like the Emerald Ash Borer, can destroy trees in the village; West Millgrove does not have the personnel, equipment, or budget to handle the additional debris that weakened and dead trees would cause in a severe storm, and other invasive species are on the horizon, making this threat even more apparent. The village would require assistance from the county or township to support debris removal if this were to occur. There are pipelines in the vicinity that could be ruptured through excavation or other digging. A rupture could cause leaks of volatile substances and cause explosion or fire, as well as air or water quality problems.

Residents in West Millgrove receive water from private wells. A water emergency could occur if these wells became contaminated through a hazardous materials release, or the aquifer were otherwise compromised. While service from NWWSD is available in some areas, tap in fees are very high for West Millgrove residents and not all who could connect to this system have done so. Contaminated surface runoff, filled with lawn chemicals, fertilizers and pesticides and herbicides, is also a threat. Wells could suddenly become unpotable, especially if a drought were to negatively affect the ground water.

Power outages are a concern because West Millgrove is isolated and at risk for damage to above ground power lines and infrastructure. The village also has no backup generators to power critical facilities or an emergency shelter. Winter storms and ice could easily strand motorists in the village if SR 199 were blocked for extended periods of time, which due to the open, flat terrain is entirely possible.

An earthquake would cause very little damage in West Millgrove and is considered a low risk. The village is populated by mostly small residences that would likely withstand a mild earthquake with little or no damage. There are few underground utilities, but there are pipelines and utilities overhead that would incur damages.

West Millgrove is not susceptible to dam failure or landslide/mudslide.

Weston

Weston is a village of nearly 1,600 that is located in southwest Wood County. State Route 235 cuts through town, as does a rail line. The neatly landscaped village's primary concern is damage from wind, including straight-line winds, tornadoes, and severe thunderstorms. Severe wind events damage roofs, siding, and windows on homes and destroy barns, outbuildings, and farm equipment. A large grain operation on the south side of Weston could be severely impacted by high winds or tornado, as could a very large mobile home neighborhood on the north side of town. The management of debris following these incidents, which would include building debris as well as trees and vegetation, is overwhelming for a small village. Depending

on the impact to power lines and communication towers, wind events can hamper residents' ability to communicate.

Flooding is a moderate concern in Weston. During heavy precipitation events, basements often flood when the West Branch of Tontogany Creek cannot carry water away fast enough. Taylor Street and Brook Lane are known to flood; several other streets can become water-covered in extreme rainfall events. Most streets in town are in close proximity to the creek and are prone to flooding when the creek is out of its banks. Debris from lawns and crops can clog the storm sewers and storm basins, making the flooding situation worse. As the volume of rain increases and storms become more intense, these problems are all showing an increase in severity.

Because State Route 235 runs through the village, hazardous materials are a frequent presence in town. The railroad that cuts diagonally through Weston also carries many chemicals. A derailment on the south end of Weston could expose many residents to airborne contamination and necessitate an evacuation. A spill to the north, however, would bypass most of the homes if prevailing winds were out of the southwest. Southern winds could change that scenario significantly and necessitate widespread evacuation. A derailment that involved a large number of cars, fire or explosions, high speeds, or had vehicle involvement could be catastrophic.

Water quality and power outages are a moderate concern to village officials. There is no history of significant failure to either system; Toledo Edison and NWWSD are considered to be dependable utility providers. If a long-term failure of either were to take place, the effect on Weston residents could be significant. Food supplies would be ruined, the elderly and people with medical needs would suffer, and local industries businesses would be forced to close temporarily. Underserved, disadvantaged and disabled residents would be the most severely affected, and social services would be necessary.

Winter storms, invasive species, and drought/extreme heat are considered to be low risk. While these incidents are inconvenient to residents, actual damages would be minimal. If temperatures become more extreme through climate change, the vulnerability would increase, especially for populations with special needs or disadvantages.

Earthquake, while possible, is also considered a low-risk hazard. Infrastructure, rail lines, and roadways would be easily damaged, and underground utilities are very vulnerable to damage. Most homes and other buildings are expected to withstand a mild or moderate earthquake.

Weston is not susceptible to dam failure and landslide/mudslide.

2.3.3 Vulnerability Summary

The following chart provides a summary of the hazard rank developed by each jurisdiction.

Table 2-44: Jurisdictional Vulnerability

Jurisdiction	Dam/Levee Failure	Drought/Extreme Heat	Earthquake	Flood	Hazardous Materials Incident	Invasive Species	Landslide/Mudslide	Power Failure	Severe Thunderstorm	Tornado	Water Quality Emergency	Windstorm	Winter Storm
Wood County	10	9	12	3	2	13	4	11	7	6	1	5	8
Bairdstown	X	10	11	8	1	6	X	9	5	4	2	3	7
Bloomdale	X	10	11	4	1	5	X	8	7	3	6	2	9
Bowling Green	12	10	11	4	2	8	X	7	5	6	1	3	9
Bowling Green State University	X	9	10	5	4	11	X	1	7	3	2	6	8
Bradner	X	10	11	5	3	1	X	9	7	4	6	2	8
Custar	X	9	10	4	5	7	X	6	3	2	11	1	8
Cygnet	12	8	11	1	2	7	X	9	5	4	6	3	10
Grand Rapids	8	10	7	1	6	9	13	11	4	3	5	2	12
Haskins	X	10	11	1	2	7	X	9	5	4	6	3	8
Hoytville	X	10	11	1	5	9	X	7	2	3	6	4	8
Jerry City	X	10	11	1	3	7	X	8	5	6	4	2	9
Lake Township	X	11	9	5	4	10	X	8	2	1	6	3	7
Luckey	13	10	11	4	1	7	X	8	6	3	5	2	9
Middleton Township	13	11	9	5	4	10	12	8	2	3	6	1	7
Millbury	X	10	11	1	5	8	X	9	5	4	6	3	7
Milton Center	X	9	10	5	1	11	X	7	4	2	6	3	8
Northwestern Water & Sewer District	3	8	1	4	2	X	X	4	9	7	5	6	10
Northwood	X	10	11	2	1	8	X	9	4	5	6	2	7
North Baltimore	3	12	11	2	1	9	X	10	6	5	7	4	8
Pemberville	X	10	11	1	4	2	X	9	6	8	5	3	7
Perrysburg	11	9	13	6	2	10	12	8	5	1	4	3	7
Perrysburg Township	X	11	9	5	4	10	X	8	3	2	6	1	7
Portage	X	10	11	4	5	7	X	8	2	3	6	1	9
Risingsun	X	10	11	6	3	4	X	7	8	5	2	1	9
Rossford	X	10	11	2	1	8	X	9	5	4	6	3	7
Tontogany	X	10	11	4	1	6	X	7	5	2	8	3	9
Walbridge	X	10	11	1	4	6	X	9	7	2	5	3	8
Wayne	10	12	13	1	3	4	X	9	6	7	2	5	8
West Millgrove	X	10	11	4	5	6	X	9	2	3	7	1	8
Weston	X	11	10	3	4	9	X	7	5	2	6	1	8

2.4 RISK ANALYSIS

Based on the available hazard and vulnerability information, Wood 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 2-67 describes the overall scale used to score each hazard. Table 2-68 explains the scale used to measure magnitude. The composite scores and overall rank for each hazard are in table 2-69.

Table 2-45 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 to a particular hazard is anticipated to last.

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

Speed of Onset

Speed of onset addresses the amount of advance warning a community has before each hazard 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 in Wood County.

Table 2-46: 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

For all other hazards, the impact was measured as follows:
- 1 = < 10% of population affected directly
- 2 = 11-25% of population affected directly
- 3 = 26-50% of population affected directly
- 4 = > 50% of population affected directly

Business Impact
Business impact refers to the potential economic impact a hazard event is likely to have on a community. The definition of each score refers to the amount of time critical facilities are likely to be shut down in the impacted community.
- 1 = Less than 24 hours
- 2 = 1 week
- 3 = At least 2 weeks
- 4 = More than 30 days

Human Impact
Human impact is defined as the number of lives potentially lost for a particular hazard.
- 1 = Minimum/Minor injuries
- 2 = Low/Some injuries
- 3 = Medium/Multiple severe injuries
- 4 = High/Multiple fatalities

Property Impact
Property impact is defined as the number amount of property potentially lost in a hazard 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. Adjustment factors included the estimation of the comprehensive energy and resources the potential incident would consume, the emotional effect on the residents of the county, and the overall long-lasting impact it would have on underserved and disadvantaged populations.

Table 2-47: Comprehensive Countywide Risk Analysis

Hazard	Frequency	Response Duration	Speed of Onset	Magnitude	Business Impact	Human Impact	Property Impact	Score	Rank
Tornado	3	4	4	2	2	4	2	21	1
Severe Thunderstorm	5	2	4	3	1	1	3	19	2
Hazardous Materials Incident	5	2	4	2	1	3	1	18	3
Flood	4	3	3	2	2	1	3	18	4
Water Quality Emergency	3	3	4	3	2	1	1	17	5
Power Failure	2	2	4	2	2	1	2	15	6
Windstorm	4	3	2	1	1	1	3	15	7
Earthquake	1	3	4	1	1	2	2	14	8
Winter Storm	4	2	1	4	1	1	1	14	9
Landslide/Mudslide	3	3	2	1	1	1	1	12	10
Drought/Extreme Heat	3	1	1	1	1	2	2	11	11
Dam/Levee Failure	1	3	1	1	2	1	1	10	12
Invasive Species	2	1	1	1	1	1	2	9	13