Lawrence County 2021 Hazard Mitigation Plan

Prepared for:
Lawrence County Department of
Planning & Community Development
430 Court Street
New Castle, PA 16101

Prepared by:
MCM Consulting Group, Inc.
2595 Clyde Avenue, Suite #1
State College, PA 16801

MCM Consulting Group, Inc.
Solutions for an unsafe world.™

Certification of Annual Review Meetings

YEAR	DATE OF MEETING	PUBLIC OUTREACH ADDRESSED? *	SIGNATURE
2021			
2022			
2023			
2024			
2025			

**Confirm yes here annually and describe on record of change page.*

Record of Changes

DATE	DESCRIPTION OF CHANGE MADE, MITIGATION ACTION COMPLETED, OR PUBLIC OUTREACH PERFORMED	CHANGE MADE BY (PRINT NAME)	CHANGE MADE BY (SIGNATURE)

REMINDER: ***Please attach all associated meeting agendas, sign-in sheets, handouts and minutes.***

Table of Contents

Figures

Tables

Executive Summary

Mitigation is the effort to reduce loss of life and property by lessening the impact of disasters. Hazard mitigation focuses attention and resources on county and municipal policies and actions that will produce successive benefits over time. State and local governments engage in hazard mitigation planning to identify risks and vulnerabilities associated with natural as well as human-caused hazards and develop long-term strategies for protecting people and property from future hazard events. Mitigation plans are key to breaking the cycle of disaster damage, reconstruction, and repeated damage. This plan represents the work of citizens, elected and appointed government officials, business leaders, and volunteer and nonprofit groups to protect community assets, preserve the economic viability of the community, and save lives.

In 2020, Lawrence County Department of Public Safety contracted the services of a consulting agency to revise and update the Lawrence County Hazard Mitigation Plan. The plan was successfully updated in accordance with the requirements set forth by PEMA and FEMA. The updated Lawrence County Hazard Mitigation Plan was adopted by the Lawrence County Commissioners in 2021.

The Lawrence County Commissioners secured a grant to complete the 2021 update to the Lawrence County Hazard Mitigation Plan. MCM Consulting Group, Inc. was hired to assist the county with the update of the plan. The planning kick-off meeting was conducted February 5, 2020.

The planning process for the 2021 Lawrence County Hazard Mitigation Plan Update consisted of the following:

- Identification and prioritization of the hazards that may affect the county and its municipalities.
- Assessment of the county's and municipalities' vulnerability to these hazards.
- Identification of the mitigation actions and projects that can reduce that vulnerability.
- Development of a strategy for implementing the actions and projects, including identifying the agency(ies) responsible for that implementation.

Throughout the planning process, the general public was given the opportunity to comment on the existing HMP and provide suggestions for the updated version. Due to COVID-19, public meetings were conducted via an online survey to provide residents an opportunity to provide input on the HMP. Several meetings were held virtually, and participants were invited to submit surveys and other documents via an online survey.

The following hazards were identified by the local planning team as presenting the highest risk to the county and its municipalities:

- Emergency Services
- Invasive Species
- Pandemic and Infectious Disease
- Winter Storms
- Tornado and Windstorms
- Transportation Accidents
- Drought
- Radon Exposure
- Flash Flood
- Drowning

- Disorientation
- Environmental Hazards – Transportation and Fixed Facility
- Wildfire
- Lightning Strikes
- Urban Fire and Explosions
- Earthquake
- Nuclear
- Dam Failure
- Hurricane and Tropical Storm
- Ice Jam Flooding
- Landslides
- Terrorism
- Civil Disturbance

A total of twenty-five hazards are identified in the 2021 Lawrence County Hazard Mitigation Plan. A total of twenty-three identified hazards were listed in the previous 2015 plan update. New hazards identified in this plan include emergency services, opioid epidemic, and invasive species. It should be noted that flooding, flash flooding, and ice jam flooding were separated out into separate profiles. Additionally, tornado/windstorms were profiled together for this plan update.

To mitigate against the effects of these hazards, the local planning team identified the following goals for hazard mitigation over the next five years:

- Reduce potential injury/death and damage to existing community assets due to floods, flash floods, and ice jams.
- Reduce potential injury/death and damage to existing community assets due to all hazards.
- Promote disaster-resistant future development.
- Promote hazard mitigation as a public value in recognition of its importance to the health, safety, and welfare of the population.
- Improve response and recovery capabilities.
- Protect critical infrastructure.

Mitigation actions are specific projects and activities that help achieve goals. A total of fifty-one actions were developed for this plan update as they pertain to hazards identified by the local planning team. The 2015 Lawrence County Hazard Mitigation Plan consisted of forty-three total actions. The individual objectives and actions that will be implemented are shown in section 6.4. Each municipality was provided the opportunity to submit new project opportunity forms for this update. A total of forty-nine project opportunity forms were submitted during the 2015 HMP update. Municipalities were asked to indicate the current status of these projects submitted in 2015, of which ten indicated completed projects. A total of forty-one project opportunities were submitted for this plan update.

The 2021 Lawrence County Hazard Mitigation Plan is the cornerstone to reducing Lawrence County's vulnerability to disasters. It is the commitment to reducing risks from hazards and serves as a guide for decision makers as they commit resources to reducing the effects of hazards. Hazard mitigation is the only phase of emergency management specifically dedicated to breaking the cycle of damage, reconstruction, and repeated damage.

The 2021 Lawrence County Hazard Mitigation Plan is a living document that reflects ongoing hazard mitigation activities and requires monitoring, evaluating, and updating to ensure the mitigation actions are implemented. To facilitate the hazard mitigation planning process and adhere to regulatory requirements, the plan will be reviewed annually, and any major revisions will be incorporated into the five-year update.

1. Introduction

1.1. Background

The Lawrence County Board of Commissioners, in response to the Disaster Mitigation Act of 2000 (DMA 2000), organized a countywide hazard mitigation planning effort to prepare, adopt and implement a multi-jurisdictional Hazard Mitigation Plan (HMP) for Lawrence County and all of its twenty-seven municipalities. The Lawrence County Department of Public Safety and Planning Department was charged by the County Board of Commissioners to prepare the 2021 plan. The 2015 HMP has been utilized and maintained during the five-year life cycle.

The Lawrence County Commissioners were successful in securing hazard mitigation grant funding to update the county hazard mitigation plan. The pre-disaster mitigation grant funding was administered by the Pennsylvania Emergency Management Agency and provided to Lawrence County as a sub-grantee. The Lawrence County Commissioners assigned the Lawrence County Department of Public Safety with the primary responsibility to update the hazard mitigation plan. MCM Consulting Group, Inc. was selected to complete the update of the HMP. A local hazard mitigation planning team was developed comprised of government leaders and citizens from Lawrence County. This updated HMP will provide another solid foundation for the Lawrence County Hazard Mitigation Program.

Hazard mitigation describes sustained actions taken to prevent or minimize long-term risks to life and property from hazards and to create successive benefits over time. Pre-disaster mitigation actions are taken in advance of a hazard event and are essential to breaking the disaster cycle of damage, reconstruction and repeated damage. With careful selection, successful mitigation actions are cost-effective means of reducing risk of loss over the long term.

Hazard mitigation planning has the potential to produce long-term and recurring benefits. A core assumption of mitigation is that current dollars invested in mitigation practices will significantly reduce the demand for future dollars by lessening the amount needed for recovery, repair and reconstruction. These mitigation practices will also enable local residents, businesses, and industries to reestablish themselves in the wake of a disaster, getting the economy back on track sooner and with less interruption.

1.2. Purpose

The purpose of this all-hazard mitigation plan (HMP) is:

- Protect life, safety, and property by reducing the potential for future damages and economic losses that result from hazards.
- Qualify for additional grant funding, in both the pre-disaster and the post-disaster environment.
- Speed recovery and redevelopment following future disaster events.
- Demonstrate a firm local commitment to hazard mitigation principles.
- Comply with both state and federal legislative requirements for local hazard mitigation plans.

1.3. Scope

This Lawrence County Multi-Jurisdictional Hazard Mitigation Plan serves as a framework for saving lives, protecting assets and preserving the economic viability of the twenty-seven municipalities in Lawrence County. The HMP outlines actions designed to address and reduce the impact of a full range of natural

hazards facing Lawrence County, including drought, earthquakes, flooding, tornadoes, hurricanes/tropical storms, and severe winter weather. Human caused hazards such as transportation accidents, hazardous materials spills and fires are also addressed.

A multi-jurisdictional planning approach was utilized for the Lawrence County HMP update, thereby eliminating the need for each municipality to develop its own approach to hazard mitigation and its own planning document. Further, this type of planning effort results in a common understanding of the hazard vulnerabilities throughout the county, a comprehensive list of mitigation projects, common mitigation goals and objectives and an evaluation of a broad capabilities assessment examining policies and regulations throughout the county and its municipalities.

1.4. Authority and Reference

Authority for this plan originates from the following federal sources:

- Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C., Section 322, as amended
- Code of Federal Regulations (CFR), Title 44, Parts 201 and 206
- Disaster Mitigation Act of 2000, Public Law 106-390, as amended
- National Flood Insurance Act of 1968, as amended, 42 U.S.C. 4001 et seq.
- Authority for this plan originates from the following Commonwealth of Pennsylvania sources:
- Pennsylvania Emergency Management Services Code. Title 35, Pa C.S. Section 101
- Pennsylvania Municipalities Planning Code of 1968, Act 247 as reenacted and amended by Act 170 of 1988
- Pennsylvania Storm Water Management Act of October 4, 1978. P.L. 864, No. 167

The following Federal Emergency Management Agency (FEMA) guides and reference documents were used to prepare this document:

- FEMA 386-1: Getting Started. September 2002
- FEMA 386-2: Understanding Your Risks: Identifying Hazards and Estimating Losses. August 2001
- FEMA 386-3: Developing the Mitigation Plan. April 2003
- FEMA 386-4: Bringing the Plan to Life. August 2003
- FEMA 386-5: Using Benefit-Cost Review in Mitigation Planning. May 2007
- FEMA 386-6: Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning. May 2005
- FEMA 386-7: Integrating Manmade Hazards into Mitigation Planning. September 2003
- FEMA 386-8: Multijurisdictional Mitigation Planning. August 2006
- FEMA 386-9: Using the Hazard Mitigation Plan to Prepare Successful Mitigation Projects. August 2008
- FEMA Local Multi-Hazard Mitigation Planning Guidance. July 1, 2008
- FEMA National Fire Incident Reporting System 5.0: Complete Reference Guide. January 2008
- FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards. January 2013

The following Pennsylvania Emergency Management Agency (PEMA) guides and reference documents were used to prepare this document:

- PEMA: Hazard Mitigation Planning Made Easy!
- PEMA Mitigation Ideas: Potential Mitigation Measures by Hazard Type: A Mitigation Planning Tool for Communities. March 6, 2009
- PEMA: Standard Operating Guide. October 18, 2013

The following document produced by the National Fire Protection Association (NFPA) provided additional guidance for updating this plan:

- NFPA 1600: Standard on Disaster/Emergency Management and Business Continuity Programs. 2011

2. Community Profile

2.1. Geography and Environment

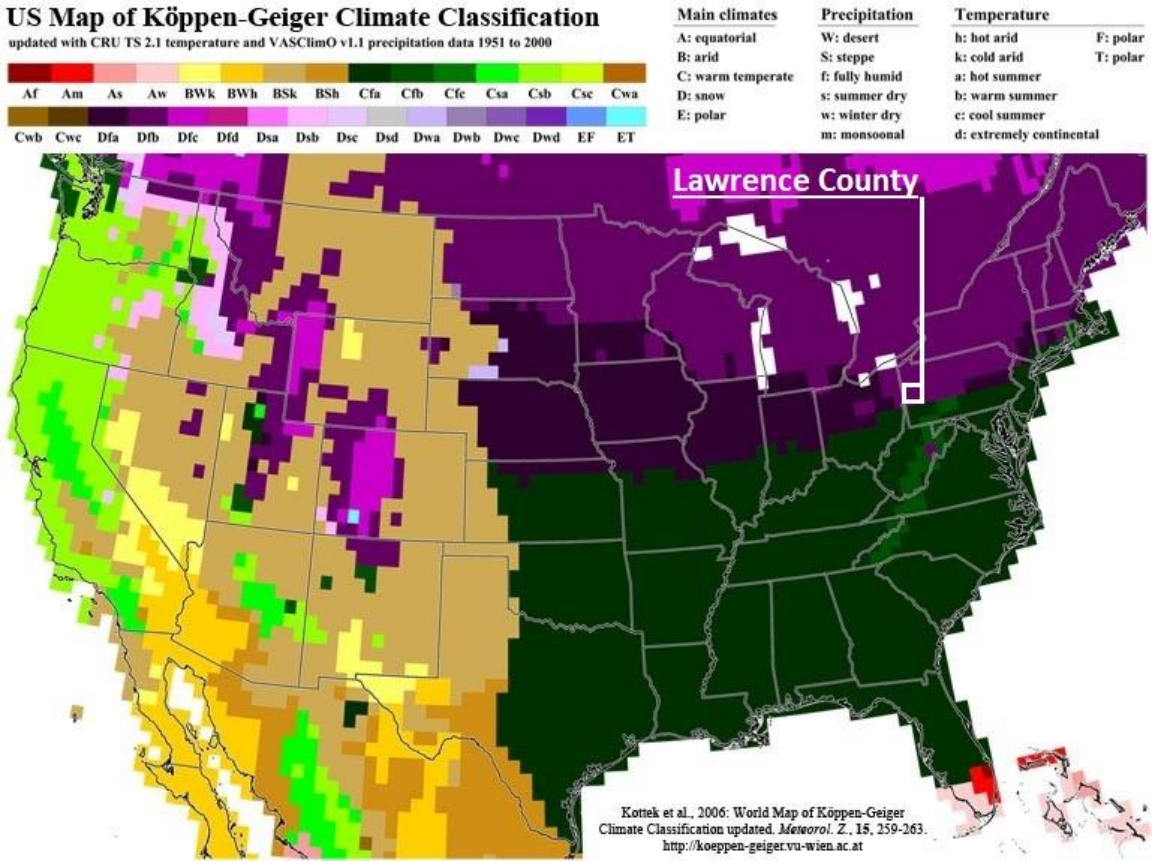
Lawrence County was created on March 20, 1849, from parts of Beaver and Mercer Counties due to the rapid growth of New Castle, which was primarily in Mercer County but was rapidly expanding into Beaver County. The former borders between Beaver and Mercer Counties are still evident in Lawrence County today, as the northern borders of North Beaver Township, Shenango Township and Slippery Rock Township (respectively) with the southern borders of Mahoning Township, Hickory Township and Scott Township making up the former boundaries between Beaver and Mercer Counties. In addition, County Line Street in New Castle where the Lawrence County Courthouse is located also marks a former boundary. Lawrence County was named after naval officer James Lawrence, who died during the War of 1812.

According to the 2010 U.S. Census Bureau, the county has a total area of 363 square miles (940.2 km2), of which 358.2 square miles (927.7 km2) are land and 4.5 square miles (11.7 km2) (1.2%) are water. Major waterways are the Shenango River, Neshannock Creek and the Mahoning River which form the Beaver River. Slippery Rock Creek and Connoquenessing Creek also empty into the Beaver River.

Lawrence County, on average, receives thirty-eight inches of rain per year. The US average is thirty-seven. Snowfall averages thirty-two inches in comparison to the average U.S. city receiving twenty-five inches of snow per year. The warmest month is July where the high is around 85°F and the coldest month is January with an average low of 19°F.

The Köppen-Geiger Climate Areas map classifies Lawrence County and the rest of Pennsylvania, as Humid Continental. While all of Pennsylvania's counties share many weather similarities, there are a few unique characteristics to certain regions.

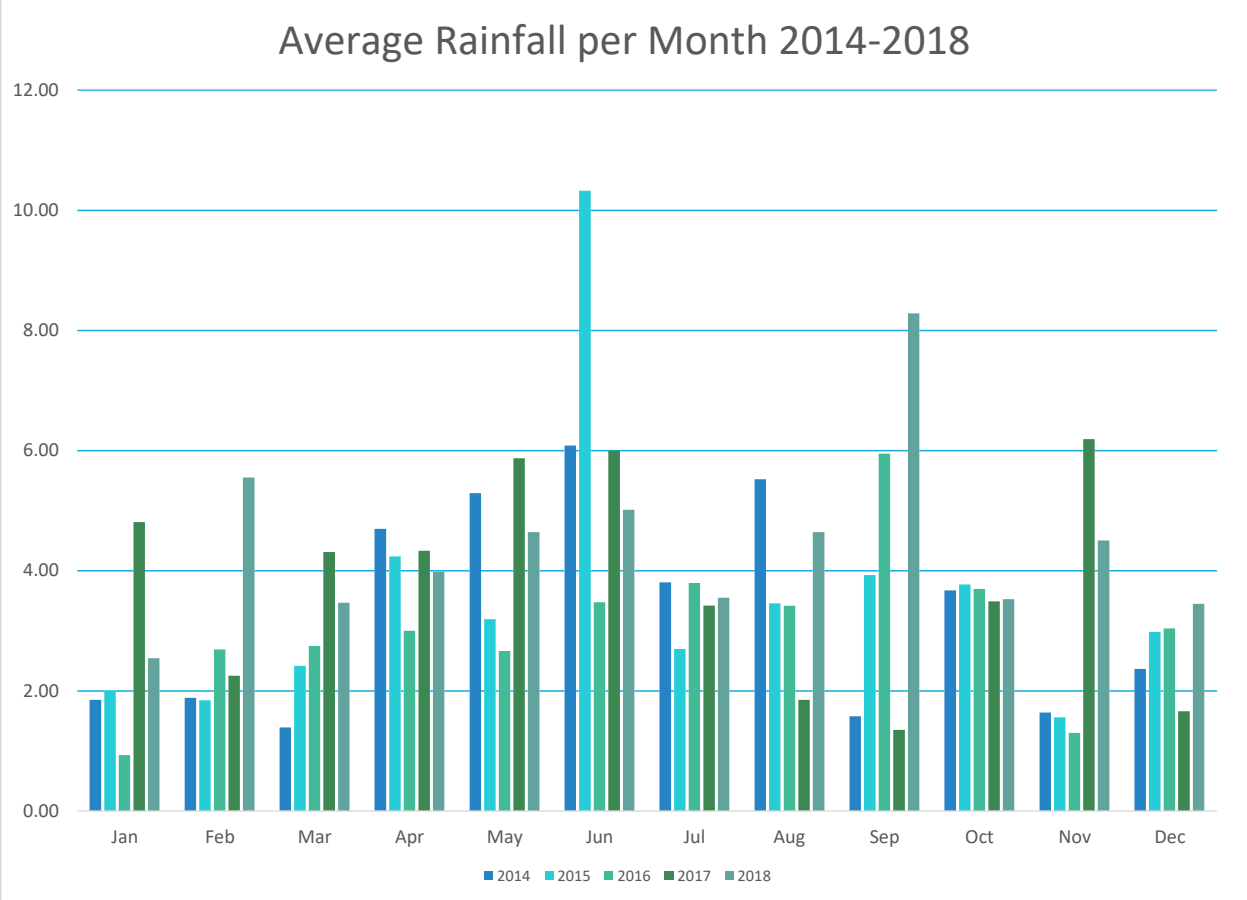
Figure 1- Köppen-Geiger Climate Areas map



Located in the west central region of Pennsylvania, Lawrence County shares its western border with the state of Ohio. The weather patterns and climatic conditions of Lawrence County are a major risk factor. The county's weather extremes are the primary contributors to many of the county's natural hazard events, including flash floods, hurricanes, tropical depressions, blizzards, tornadoes, drought, high wind, and lightning.

The Lawrence County Conservation District monitors rainfall from nine stations. This information is recorded and analyzed once a year. Below in *Figure 2- Average Rainfall 2014-2018* is the historical data collected between 2014 and 2018.

Figure 2- Average Rainfall 2014-2018



2.2. Community Facts

Although it is well known that various American Indian civilizations inhabited the county prior to its settlement by the European migrants, little definitive knowledge is available on this portion of Lawrence County's history.

At the time of the first excursions of “white men” into the area, the Delaware Tribe was the predominating tribe. Their capital was in the general New Castle area, named Kus-Kus-Ki. The settlement of Lawrence County had its foundations laid with the colonization movements of the Seventeenth Century. Even though the first colony in the Commonwealth was founded under a Dutchman named Peter Miniut, William Penn must be regarded as the real "father of Pennsylvania".

King Charles II of England gave Penn a Royal Charter on April 2, 1681, as proprietor and governor of this land. Although armed with a Royal Charter, Penn also came to the country and made treaties with the American Indian tribes to secure his colony.

Between the time of Penn's charter and the year of 1758, there were undoubtedly various trappers, hunters, and explorers within the Lawrence County area. It was not until 1750, however, that we have historical evidence of a visit. In that year, Christian Frederick Post visited local American Indian tribes to argue the cause of the English before them as part of the French and English power struggle in the New World.

In 1770 there is evidence that two Moravian missionaries, Zeisberger and Sensemen, founded a settlement near Moravia along the Beaver River. These men, leading a band of Christian Delaware Indians, developed a town known as Friedenstadt (City of Peace). Evidently the settlement continued until 1773, when the group moved into the Ohio area. Their church and buildings were destroyed and no trace of Friedenstadt was left.

According to the United States Office of Management and Budget, Lawrence County is designated as the New Castle, PA micropolitan statistical area, ranking as the third most populous micropolitan area in Pennsylvania in the 2010 U.S. Census. Lawrence County is also a part of the Pittsburgh-New Castle-Weirton, PA-OH-WV combined statistical area.

The following cities, boroughs and townships are in Lawrence County:

City (1):

New Castle (county seat)

Boroughs (10):

Bessemer, Ellport, Ellwood City (partly in Beaver County), Enon Valley, New Beaver, New Wilmington, S.N.P.J., South New Castle, Volant, Wampum

Townships (16):

Hickory, Little Beaver, Mahoning, Neshannock, North Beaver, Perry, Plain Grove, Pulaski, Scott, Shenango, Slippery Rock, Taylor, Union, Washington, Wayne and Wilmington

Today, Lawrence County has a workforce size of 39,800 people. According to the Lawrence County Economic Development Corporation the unemployment rate in Lawrence County has fluctuated from a high of 9.9 percent in 2009 to a low of 4.6 percent in 2017. According to the Pennsylvania Department of Labor and Industry, the unemployment rate for Lawrence County in 2019 was 6.1 percent and for the Commonwealth of Pennsylvania was 4.5 percent. The Lawrence County Comprehensive Plan, October 2016, reports the county had recovered some employment losses resulting from the 2007-2009 recession, but at the time of the report was still 10,000 jobs short of its pre-crisis total. The Lawrence County Comprehensive Plan stated that employers are having to replace educated and trained workers due to the aging population; especially the manufacturing industry, which has a higher rate of employees at or nearing retirement age.

Table 1 - Top 10 Employers of Lawrence County in Q2 of 2019

Company	Industry
Jameson Memorial Hospital	Healthcare
Don Services Inc.	Home Care Services
Excel Companion Care LLC	Home Care Services
Kiewit Power Constructors Co.	Engineering
New Castle Area School District	Education Services
County of Lawrence	Government
Iss Facility Services Inc.	Services
State Government	Government
Westminster College	Education Services
Wal-Mart Associates Inc.	Retail

Source: PA Department of Labor and Industry Center for Workforce Information and Analysis January 2020

Occupation within Lawrence County is classified under the following categories with the associated percentage of civilians employed at 16 years of age and over (2010 Census):

- Management, business, science, and arts occupations 20.3%
- Production, transportation, and material moving occupations 21.1%
- Service Occupations 25.5%
- Sales and office occupations 22.2%
- Natural resources, construction, and maintenance occupations 10.9%

Education services, healthcare, and social assistance; public administration; retail trade; manufacturing and arts, entertainment and recreation were classified as the largest employers during the 2010 census; encompassing over half of the workers.

2.3. Population and Demographics

Lawrence County is classified politically as a fifth-class county. The 2010 population was 91,108 people. The 2017 estimated population for Lawrence County was 87,069 for a loss of just over 4%. Lawrence County is composed of one city, ten boroughs and sixteen townships. The populations per municipality are identified in *Table 2 - Lawrence County Municipal Population* below. Population density is 254.4 people per square mile (based on the 2010 Census figures). The 2016 census five-year estimates (2011-2016) age distribution for Lawrence County is 4,603 age under five, 15,581 age five to nineteen, and 17,706 age sixty-five plus. The median age is 44.6 (2016 Census) which is up one year from the 2010 census estimated median age 43.6 within the county. *Table 3 - Lawrence County Population by Race*.

Table 2 - Lawrence County Municipal Population

Municipality	Population	Municipality	Population
City of New Castle	23,273	Neshannock	9,609
Bessemer Borough	1,111	North Beaver	4,121
Ellport	1,180	Perry	1,938
Ellwood City	7,289	Plain Grove	813
Enon Valley	306	Pulaski	3,452
New Beaver	1,502	Scott	2,347
New Wilmington	2,466	Shenango	7,479
S.N.P.J. Borough	19	Slippery Rock	3,283
South New Castle	709	Taylor	1,052
Volant Borough	168	Union	5,190
Wampum Borough	717	Washington	799
Hickory Township	2,470	Wayne	2,606
Little Beaver	1,411	Wilmington	2,715
Mahoning	3,083	Source: 2010 Census Bureau	

Table 3 - Lawrence County Population by Race

Race	2010 Census (Total)	5-year estimate 2014-2018 (Percentage)
White	85,484	93.2%
Black	3,501	3.7%
Other	2,123	3.2%
Hispanic Origin	0	1.4%

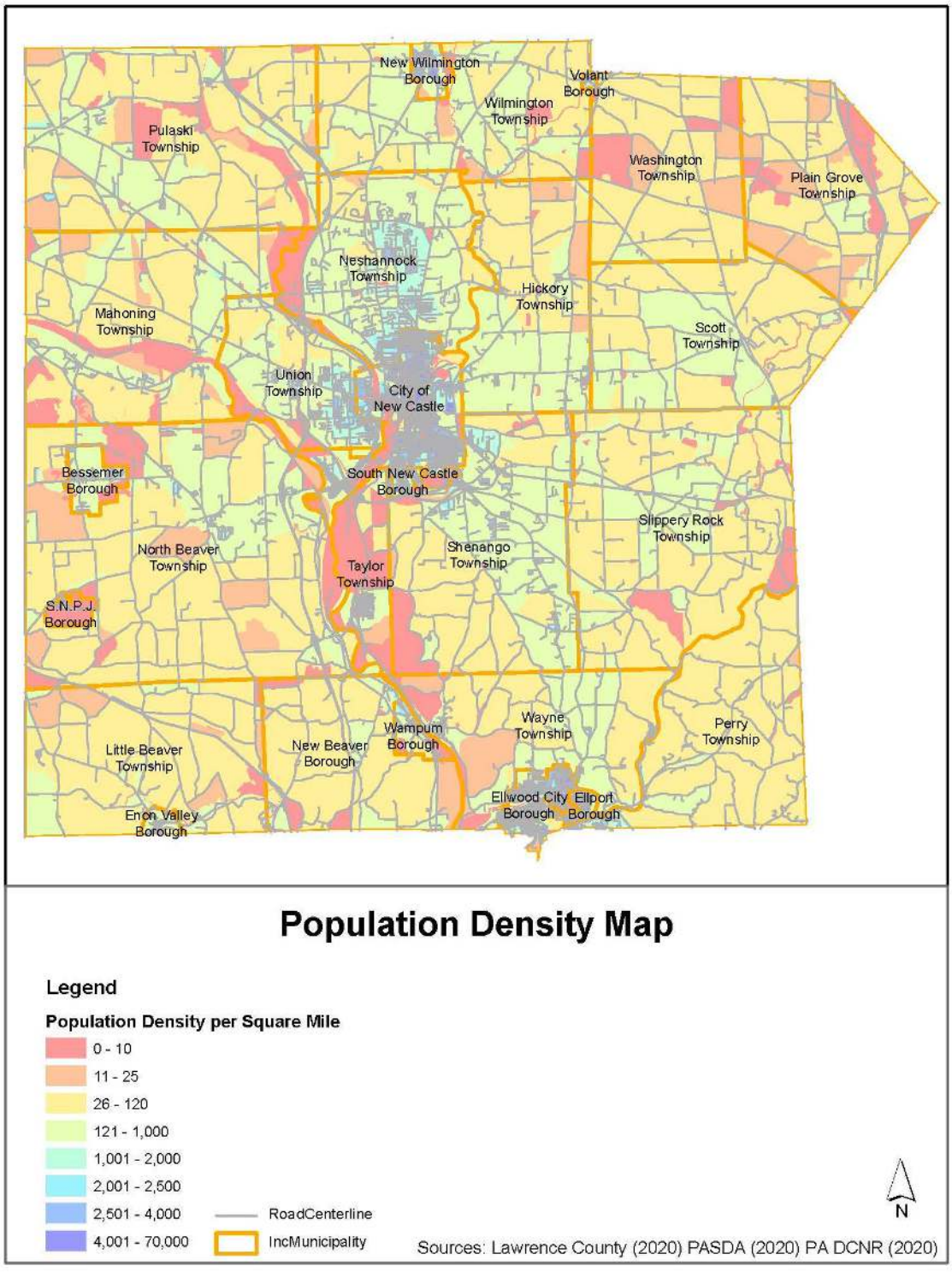
There were 37,126 households in 2010. Married couples with children made up 50%, 28.9% were married couples with no children, 8.2% were single parent households, 12.9% were single person households and 9.6% were other types of households. The average household size is 2.39 and the average family size is 2.94. Lawrence County has a median household income of $44,079.00 with a median per capita income of $22,722.00. (2010 Census). According to the US Census 5-Year Estimate from 2014 to 2018 there were 6,252 veterans in Lawrence County. The median veteran income was estimated at $30,194.00, whereas the median non-veteran income for Lawrence County was $25,446.00.

There are fourteen major transportation routes within the county: Interstate 79, 376 and 76; State Routes 18, 65, 108, 168, 351, 388, 488 and 551 and US Routes 19, 224 and 422. Lawrence County is also twelve miles away from Interstate 80.

Troop D, New Castle Station of the Pennsylvania State Police provides state law enforcement coverage to Lawrence County, along with sixteen township or borough police agencies within the county. There is also the Lawrence County K-9 Search and Rescue team, and the county is forming a hazardous materials response team. The Lawrence County Sheriff has countywide jurisdiction as well. Twenty-one fire stations and eight ambulance services provide emergency services to the county. Source: http://leoc.net/emergency-services/

There are two hospitals within Lawrence County and numerous hospitals near the county. The hospitals in Lawrence County are UPMC Jameson, which is a 254-bed hospital located in the City of New Castle, and the Ellwood City Hospital, which is a forty-six-bed facility located in Ellwood City Borough.

Figure 3 - Population Density Map



2.4. Land Use and Development

The county consists of rolling lands cut by major streams, except in the southeastern portion, which is unglaciated and as a result has a steep topography. A large percentage (41%) of the county's soil has characteristics which, when generalized, resemble the Ravenna type (deep, somewhat poorly drained, nearly level and rippling soils on till plains formed in glacial till material) and are located (with the exception of the unglaciated southeastern section) throughout the entire county. The three other major soil groups in the county are the Canfield soils (16%), Cotton soils (12%) and the Gilpin soils (14%) which are only found in the southeastern section of the county.

Soils suitable for agriculture for the major portion of the county fall in the Class II and Class III range, with cropland suitability classes ranging from I to IV. Class I soils have few limitations and are best suited for cropland while Class IV soils have severe limitations. Soils in Classes V through VII are generally unsuited for cropland and as the class numbers get higher, have increasing limitations as well. Therefore, the county contains a moderately high capability for sustainable agriculture. Common limitations experienced throughout the county, especially in the glaciated section, are seasonal wetness in low spots, erosion on exposed hillsides and occasional stoniness from past glacial deposits.

The glacial till soils of the northeastern and north-central section of the county (Plain Grove, Washington, and Wilmington Townships) are the most extensive supporters of agricultural activities of a wide commercial value. Dairying ranks as the principal type of farming with considerable poultry rising as well. A sizable portion of the county's well drained land is used for intensive cultivation of cropland.

The northwest corner of the county (Pulaski Township) displays a high grade of agricultural productivity with relatively flat land and gentle to moderate slopes. The sandstone, shale and limestone-mixed till supports specialized farming in the form of mature orchards, dairy and beef cattle farming and raising of hays and grain. Much of the area, which is mostly bushy and or low productivity, remains in woodland and unimproved pastures.

The west central part of the county (North Beaver Township, Mahoning Township, and a section of Little Beaver Township) has a relatively high distribution of farming activity. The principal type of farming is dairy with other livestock, poultry, orchards and grain and hay production. Strip mining of limestone and coal has affected large areas that were formerly agricultural lands. Many of the former farms are presently idle and used as a rural residence.

Agricultural activity in the other section of the county is less extensive. The southeast, for example, has a considerable number of farms, but steep slopes, wooded areas, public lands, and forests cover much of the land area. Many of this area's valuable farms have been leased by coal and limestone strip mining operations.

Approximately 92,000 acres (about 40%) of Lawrence County is both public and privately owned forestland. The native forest vegetation in the county is the eastern hardwood: oak, hickory, maple, walnut, wild cherry, ash, and many others. McConnells Mill State Park encompasses 2,546 acres of the Slippery Rock Creek Gorge, a National Natural Landmark. There are six state game lands in Lawrence County; these are state game lands 148, 150, 151, 178, 216 and 284.

The soils are not well drained and inhibit development in areas where public sewers are not available. These areas must often use acceptable (passes perc tests) on-lot sewage to allow for development.

The two major urban centers in the county are the City of New Castle and Ellwood City Borough. Most of the population is located within the urban centers and the townships that surround them. The rest of the county's residents are scattered in rural areas and small boroughs or townships.

According to the 2010 U.S. Census, Lawrence County has a total of 40,975 housing units. Of the available housing units, 90.6% are occupied. Most of these housing units were built prior to 1939. From 2000 or later there was only an increase of 7.0% of housing units. *Figure 4 - Housing Units* outlines the quantity of housing units built prior to 1939 through 2005 or later.

Figure 4 - Housing Units

The total number of farms as of 2012 is 659 farms with 80,468 total acres. The average size of a farm in Lawrence County is 122 acres. Of the 659 farms, 204 are considered very small farms (Under 50 acres), 339 are small farms (50-179 acres), 76 are medium size farms (180-499 acres) and 24 are large farms (500+ acres).

2.5. Data Sources

The county relied heavily on existing data sources developed by other Lawrence County departments, including:

- Lawrence County Hazard Vulnerability Analysis.
- Lawrence County Comprehensive Plan.
- Lawrence County Assessment Department data.
- Lawrence County Subdivision and Land Development Ordinance.
- Lawrence County Open Space Management Plan.
- Lawrence County Greenways Plan
- Lawrence County Digital Tax Assessment Data.
- Lawrence County Commodity Flow Study.

The following are additional data sources used during the update process:

- U.S. Census Bureau.
- National Climatic Data Center (NCDC).
- National Oceanic and Atmospheric Administration (NOAA).

- Pennsylvania Department of Conservation and Natural Resources.
- Pennsylvania Groundwater Information System.
- Pennsylvania Emergency Incident Reporting System.
- Pennsylvania Emergency Management Agency.
- Pennsylvania Department of Labor and Industry

The countywide digital flood insurance rate maps (DFIRM), were used for all flood risk analysis and estimation of loss. The Lawrence DFIRMs were approved and effective on January 18, 2012. The DFIRM database provides flood frequency and elevation information used in the flood hazard risk assessment. Other Lawrence County GIS datasets including road centerlines, parcels and structures were utilized in conjunction with the DFIRM. In addition to the county's existing spatial datasets, the Lawrence County Department of Planning & Community Development developed a database and maps of the county's critical facilities, special needs populations, transportation systems and hazardous materials facilities. Potential losses were then analyzed by using existing county tax assessment data and DFIRM data.

Geographic Information Systems (GIS) Data

GIS data was utilized in risk assessment, estimation of loss and the development of map products for the hazard mitigation plan update. A core foundation of data was available from the Lawrence County Department of Public Safety and Lawrence County Department of Planning & Community Development. Some data was downloaded from the Pennsylvania Spatial Data Access (PASDA) and utilized. The following is a list of existing GIS data that was utilized in the plan update process and a list of new GIS data that was developed to complete the 2015 mitigation plan update.

Existing Lawrence County GIS Data Used:

- Structures
- Road Centerlines
- Driveways
- Elevations of the County
- Tax Parcels
- Municipality Boundaries
- Digital Flood Insurance Rate Maps
- Watershed and Sub-Sheds
- Lakes and Streams

New GIS Data Developed and Used:

- Critical Facilities
- Mobile Homes
- Mobile Home Parks
- Utility Locations
- Tornado Paths

The Lawrence County parcel dataset includes a value for the land in each parcel, as well as a combined value for all buildings on each parcel. Some parcels that contain multiple buildings with one or more buildings in the flood plain and one or more buildings out of the flood plain. The individual value by specific building within any given parcel was indeterminate from the data provided by Lawrence County. Therefore,

the combined value of all buildings in that parcel has been used – not simply the value of only the structures in the floodplain.

Mobile home parks, depicted in the "Lawrence County Tornado Risk" map, were provided by Lawrence County as parcel polygons. The total building values in these parcels designated as mobile home parks were used to estimate the possible economic loss associated with a disaster.

HAZUS calculations and statistics were based on a total of 131 reaches. There were zero failed reaches.

The following maps provide a base map of Lawrence County and other specific features of the county.

Figure 5 - Lawrence County Base Map

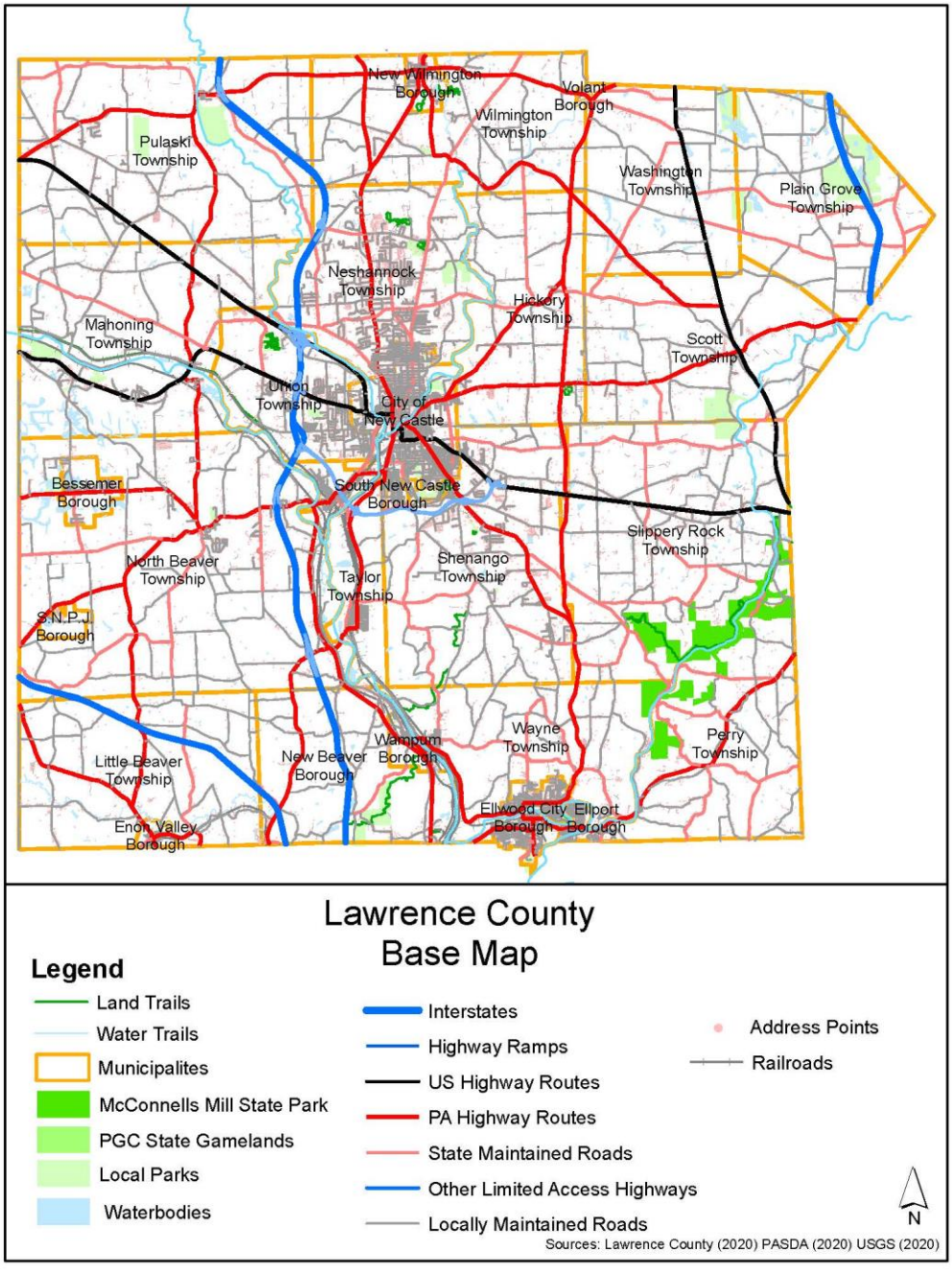


Figure 6 - Lawrence County Land Use Map

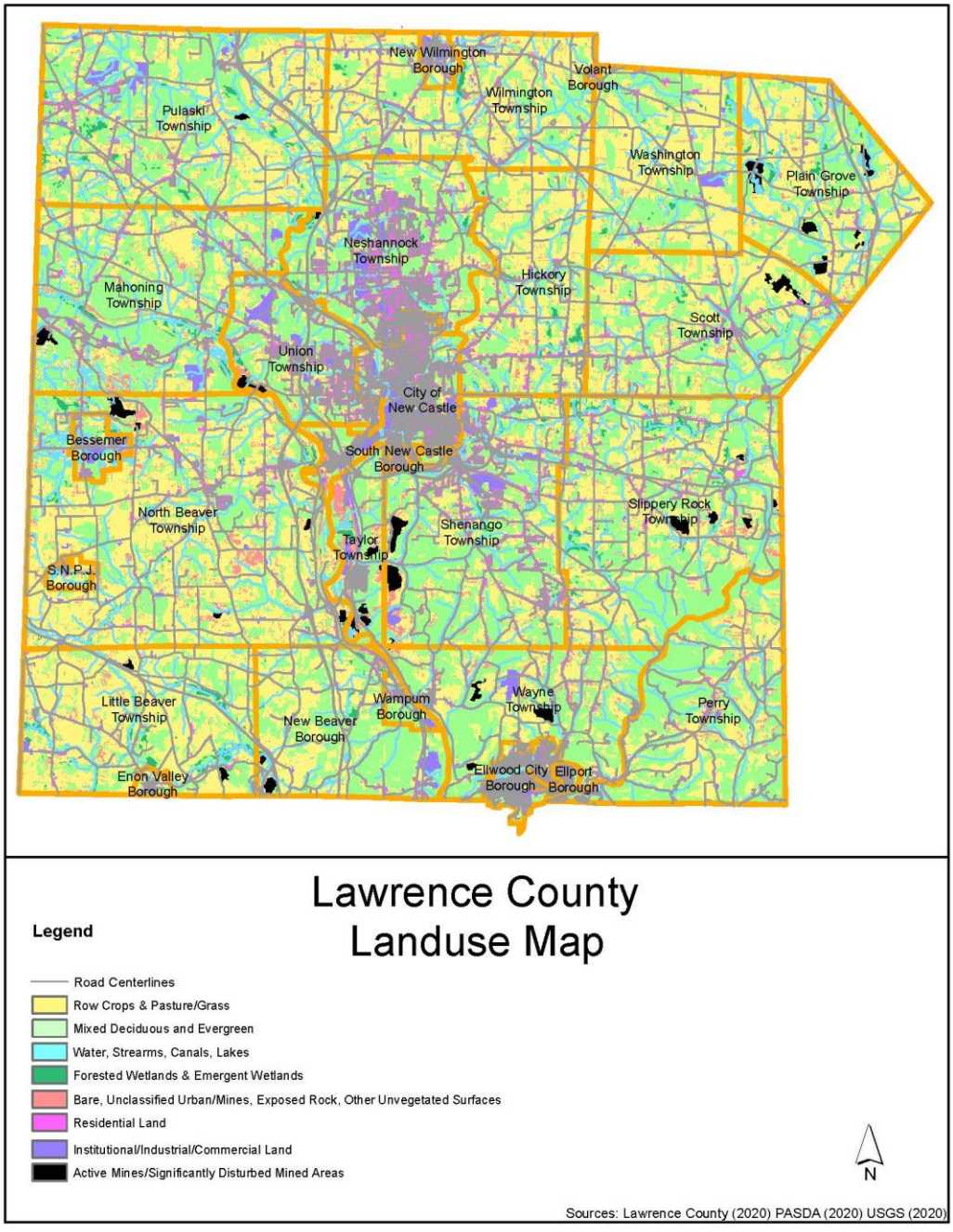


Figure 7 - Recreational Opportunities Map

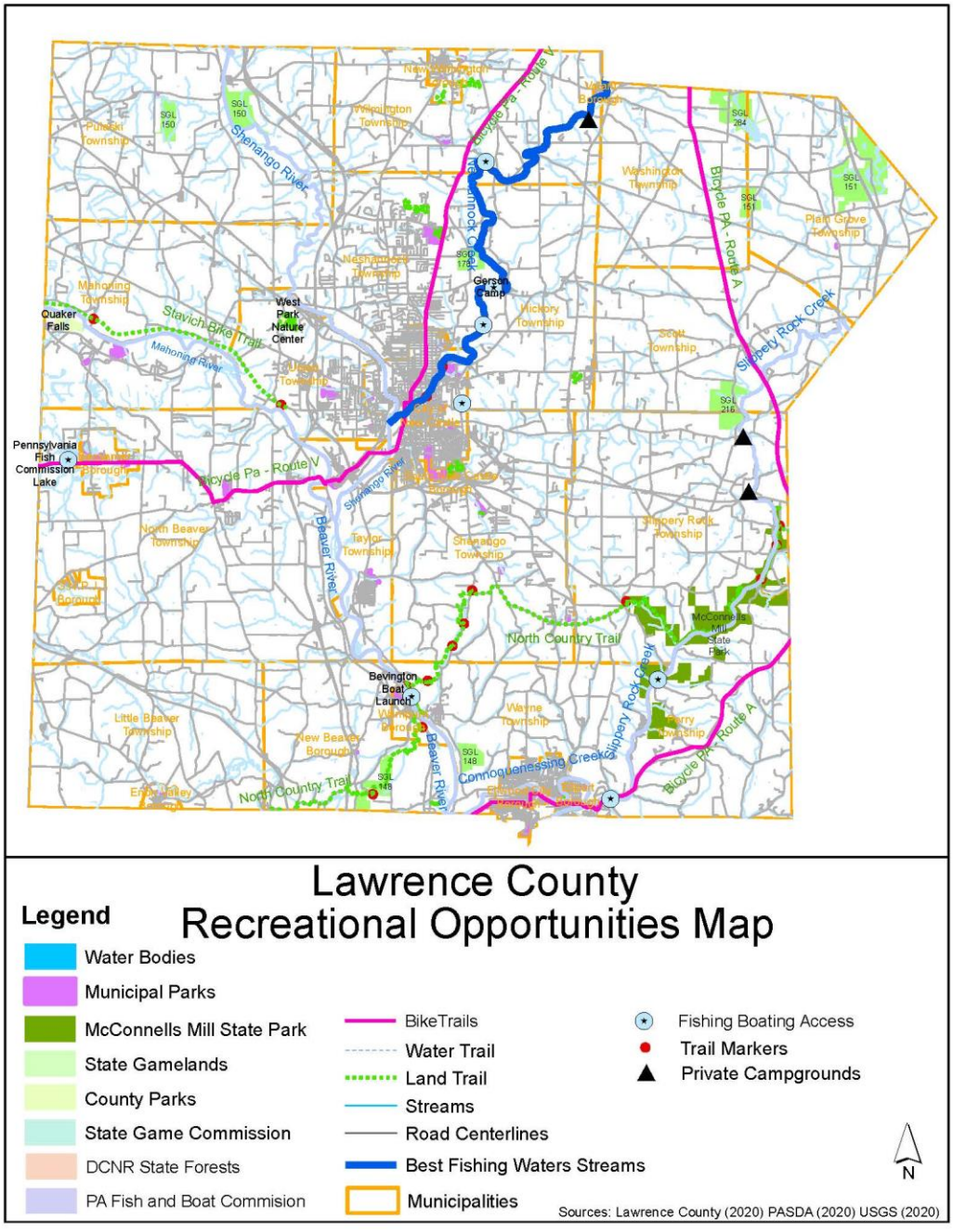
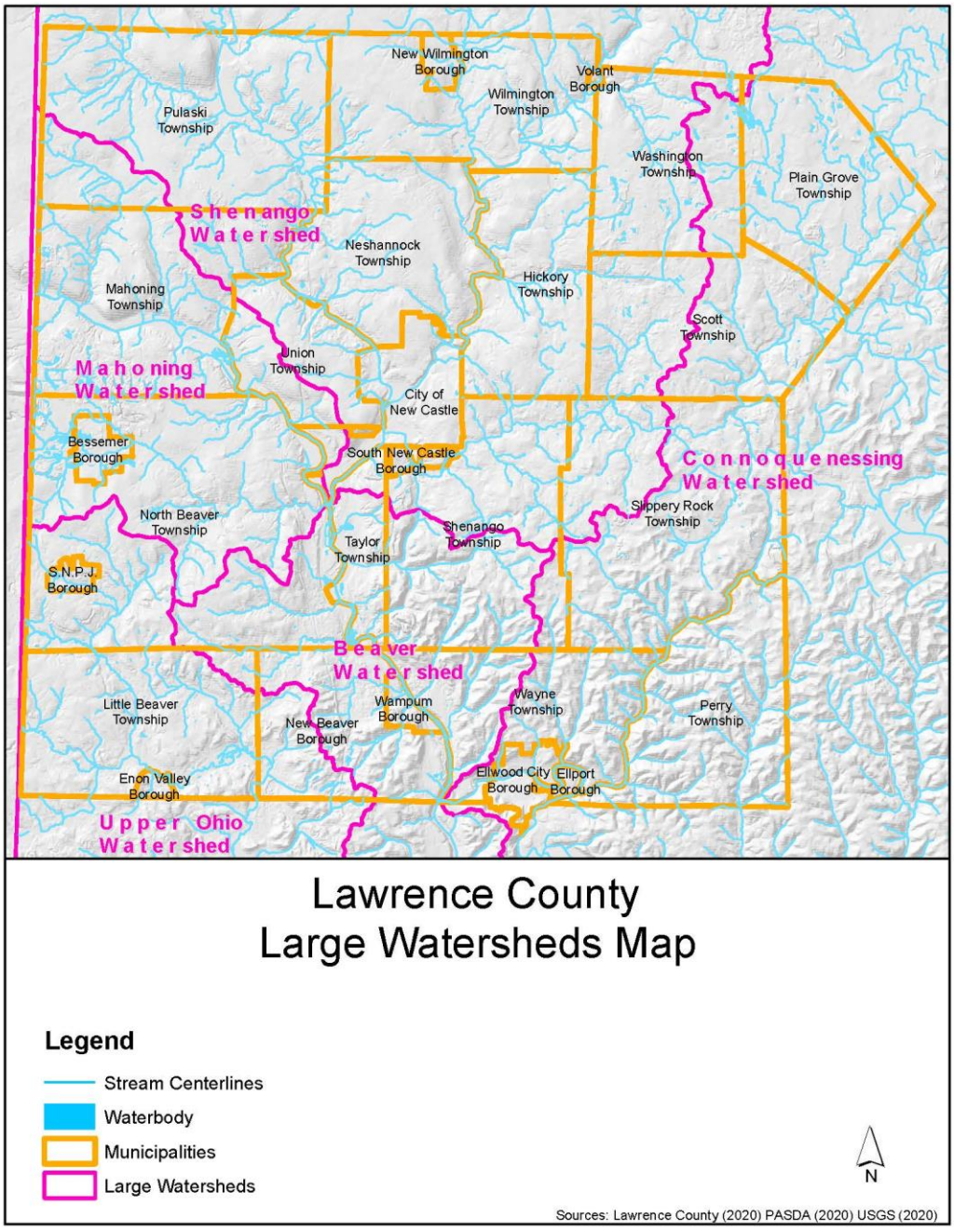


Figure 8 - Watershed Map



3. Planning Process

3.1. Update Process and Participation Summary

The Lawrence County Hazard Mitigation Plan update began February 5, 2020. The Lawrence County Commissioners were able to secure a hazard mitigation grant to start the process. The Lawrence County Department of Public Safety was identified as the lead agency for the Lawrence County Hazard Mitigation Plan update. The planning process involved a variety of key decision makers and stakeholders within Lawrence County. Lawrence County immediately determined that the utilization of a contracted consulting agency would be necessary to assist with the plan update process. MCM Consulting Group, Inc. was selected as the contracted consulting agency to complete the update of the hazard mitigation plan. The core hazard mitigation team, which was referred to as the steering committee, included officials from the Lawrence County Department of Public Safety, Lawrence County Department of Planning & Community Development and MCM Consulting Group, Inc. (MCM).

The process was developed around the requirements laid out in the Federal Emergency Management Agency (FEMA) Local Hazard Mitigation Crosswalk, referenced throughout this plan, as well as numerous other guidance documents including, but not limited to, Pennsylvania's All-Hazard Mitigation Standard Operating Guide, FEMA's State and Local Mitigation Planning How-to Guide series of documents (FEMA 386-series) and the National Fire Protection Association (NFPA) 1600 Standard on Disaster/Emergency Management and Business Continuity Programs.

MCM Consulting Group, Inc. assisted Lawrence County Department of Planning & Community Development as well as Lawrence County Department of Public Safety in coordinating and leading public involvement meetings, local planning team meetings, analysis, and the writing of the updated HMP. The Lawrence County Local Planning Team (LPT) worked closely with MCM in the writing and review of the HMP. MCM conducted project meetings and local planning team meetings throughout the process. Due to COVID-19, most meetings were held virtually. Meeting agendas, meeting minutes and sign in sheets were developed and maintained for each meeting conducted by MCM. These documents are detailed in Appendix C of this plan.

Public meetings with local elected officials were held, as well as work sessions and in-progress review meetings with the Lawrence County Local Planning Team and staff. Due to COVID-19, a majority of meetings were held virtually. At each of the public meetings, respecting the importance of local knowledge, municipal officials were strongly encouraged to submit hazard mitigation project opportunity forms, complete their respective portions of the capabilities assessment and review and eventually adopt the county hazard mitigation plan. Lawrence County will continue to work with all local municipalities to collect local hazard mitigation project opportunities.

The HMP planning process consisted of:

- Applying for and receiving a hazard mitigation planning grant (HMPG) to fund the planning project.
- Announcing the initiative via press releases and postings on the county website.
- Involving elected and appointed county and municipal officials in a series of meetings, training sessions and workshops.
- Identifying capabilities and reviewed the information with the municipalities.

- Identifying hazards.
- Assessment of risk and analyzing vulnerabilities.
- Identifying mitigation strategies, goals, and objectives.
- Developing an implementation plan.
- Announcing completion via press releases and postings on the county website.
- Plan adoption at a public meeting of the Lawrence County Board of Commissioners.
- Plan submission to FEMA and PEMA.

The 2021 Lawrence County HMP was completed February 23, 2021. The 2021 plan follows an outline developed by PEMA which provides a standardized format for all local HMPs in the Commonwealth of Pennsylvania. The 2021 HMP format is consistent with the PEMA recommended format. The 2021 Lawrence County HMP has additional hazard profiles that were added to the HMP and these additional profiles increased the subsections in section 4.3 of the HMP.

3.2. The Planning Team

The 2021 Lawrence County Hazard Mitigation Plan update was led by the Lawrence County Steering Committee. The Lawrence County Steering Committee provided guidance and leadership for the overall project. The steering committee assisted MCM Consulting Group, Inc. with dissemination of information and administrative tasks. *Table 4 - Steering Committee* outlines the individuals that comprised this team.

Table 4 - Steering Committee

Lawrence County Hazard Mitigation Plan Update Steering Committee		
Name	**Organization**	**Position**
Allen Miller	Lawrence County Department of Planning & Community Development	Deputy Director
Jeffrey Parish	Lawrence County Department of Public Safety	Director
Chad Strobel	Lawrence County Department of Public Safety	Deputy Director
Tina Marshall	Lawrence County Department of Public Safety	EMA Planner
Fran Occhibone	Lawrence County Department of Public Safety	Administrative Assistant
Michael T. Rearick	MCM Consulting Group, Inc.	Senior Consultant
Corbin Snyder	MCM Consulting Group, Inc.	Consultant

In order to represent the county, the Lawrence County Steering Committee developed a diversified list of potential local planning team (LPT) members. Members that participated in the 2015 hazard mitigation plan were highly encouraged to join the 2021 team. The steering committee then provided invitations to the prospective members and provided a description of duties to serve on the LPT. The following agencies, departments and organizations were invited to participate in the LPT: Lawrence County Commissioners, Penn State Extension, Westminster College, Don Services, Taylor Engineering, Penn Power, PA American Water Co., Wilmington Area School District UPMC, PennDOT, National Weather Service, United Way of Lawrence County, City of New Castle, Ellwood City Borough, Lawrence County Community Action Partnership, and all twenty-seven municipalities. The invitations for membership of the LPT were disseminated by the Lawrence County Department of Public Safety utilizing letters, email, and telephone calls. The LPT worked throughout the process to plan and hold meetings, collect information, and conduct public outreach.

The stakeholders listed in *Table 5 - Local Planning Team* served on the 2021 Lawrence County Hazard Mitigation Local Planning Team, actively participated in the planning process by attending meetings, completing assessments, surveys and worksheets and/or submitting comments.

Table 5 - Local Planning Team

Lawrence County Hazard Mitigation Plan Update Local Planning Team		
Name	**Organization**	**Position**
Allen Miller	Lawrence County Department of Planning & Community Development	Deputy Director
Amy McKinney	Lawrence County Department of Planning & Community Development	Director
Jeffrey Parish	Lawrence County Department of Public Safety	Director
Chad Strobel	Lawrence County Department of Public Safety	Deputy Director
Tina Marshall	Lawrence County Department of Public Safety	EMA Planner
Fran Occhibone	Lawrence County Department of Public Safety	Administrative Assistant
Michael Kobbe	City of New Castle Fire Department	Chief
Al Burick	Shenango Township	Supervisor
Jeff Darnley	National Weather Service	Observation & Climate Program
Brian Dickinson	Penn State Extension	Business Operations Manager
Chris Frye	City of New Castle	Mayor
Vanessa Lovlie	Lawrence County Community Action Partnership	Director of Transportation
Kenneth Jewell	Wilmington Area School District	Superintendent
Rick Myers	Ellwood City Fire Department	Chief
Gayle Young	United Way	Director
Anita McKeever	Don Inc.	Administrator of Community Resources
Drita Crawford	New Beaver Borough	Elected or Appointed Official
Caleb Cragle	Ellwood City Borough	Elected or Appointed Official
George Celli	Ellwood City Borough	Elected or Appointed Official
Sue Dean	Wampum Borough	Elected or Appointed Official
Jesse Altman	Wampum Borough	Elected or Appointed Official
Carol Loughhead	Wampum Borough	Elected or Appointed Official
David Allen	Ellwood City Borough	Elected or Appointed Official
Kathleen Abranovich	Hickory Township	Elected or Appointed Official
Lisa Schlemmer	Hickory Township	Elected or Appointed Official
Tom Houston	Hickory Township	Elected or Appointed Official
Janice Marshall	Perry Township	Elected or Appointed Official
John Sharmo	Bessemer Borough	Elected or Appointed Official
Janet Novad	Bessemer Borough	Elected or Appointed Official
Joe Cisco	Ellport Borough	Elected or Appointed Official
Sharonn Emiston	New Wilmington Borough	Elected or Appointed Official
Tim Jergel	SNPJ Borough	Elected or Appointed Official
Mark Sackin	Mahoning Township	Elected or Appointed Official
Joe Gierlach	Neshannock Township	Elected or Appointed Official
Grant McKinley	North Beaver Township	Elected or Appointed Official
Scott Barth	North Beaver Township	Elected or Appointed Official
Jeff Bishop	Plain Grove Township	Elected or Appointed Official

Lawrence County Hazard Mitigation Plan Update Local Planning Team		
Name	**Organization**	**Position**
Guy Morse	Pulaski Township	Elected or Appointed Official
Tom McCosby	Scott Township	Elected or Appointed Official
Justin Data	Shenango Township	Elected or Appointed Official
Jim McConnell	Washington Township	Elected or Appointed Official
Dan Kennedy	Wilmington Township	Elected or Appointed Official
Ryan Baney	Wayne Township	Elected or Appointed Official
George Johnson	Slippery Rock Township	Elected or Appointed Official

3.3. Meetings and Documentation

Meetings with local elected officials and the local planning team were held as needed. Meetings were mostly held via conference call and virtual meeting rooms due to COVID-19. At each of the meetings, municipal officials were strongly encouraged to submit hazard mitigation project opportunity forms, complete their respective portions of the capability assessment, review and eventually adopt the multi-jurisdictional HMP. *Table 6 - HMP Process Timeline* lists the meetings held during the HMP planning process, which organizations and municipalities attended and the topic that was discussed at each meeting. All meeting agendas, sign-in sheets, presentation slides, any other documentation is located in Appendix C.

The draft plan was made available for public review on October 21, 2020. The draft was advertised on Lawrence County's social media page and was made available digitally on the Lawrence County website at: www.co.lawrence.pa.us/departments/planning-community-development/hazard-mitigation-plan.

The public comment period remained open until November 20, 2020. All public comments were submitted via an online survey or in writing to Allen Miller at the Lawrence County Department of Planning & Community Development. All public comments have been included in this plan in Appendix C.

Table 6 - HMP Process Timeline

Lawrence County HMP Process - Timeline		
Date	**Meeting**	**Description**
02/05/2020	Lawrence County Hazard Mitigation Plan (HMP) Kick-Off Meeting	Identified challenges and opportunities as they relate to fulfilling the DMA 2000 requirements. Identified existing studies and information sources relevant to the hazard mitigation plan. Identified stakeholders, including the need to involve local officials.
02/27/2020	Local Planning Team Initial Meeting	Defined hazard mitigation planning and identified roles and responsibilities. Discussed the 2015 hazard mitigation plan and defined a timeline to complete the update.
02/27/2020	Municipal Kick-Off Meeting	Discussed the risk assessment and disseminated capability assessment surveys.
04/02/2020	Local Planning Team Meeting – Selection of Hazards	Lawrence County LPT met via WebEx to discuss hazards profiled in the previous plan and identify any *new* hazards to be included in the plan update.
05/07/2020	Local Planning Team Meeting – Risk Factor Assessment	Lawrence County LPT met via WebEx to determine a risk factor score for each of the selected hazards in the 2020 update. A municipal comparison document was then sent to all municipalities in Lawrence County for their input.
06/03/2020	Local Planning Team Meeting – Mitigation Strategy	Lawrence County LPT met via WebEx to start mitigation strategy development by reviewing goals and objectives from the 2015 plan. Additionally, the LPT discussed *new* goals and objectives for the 2020 plan update.
07/08/2020 – 07/09/2020	Meetings with Municipal Officials	Educated county and local elected officials on the hazard mitigation planning process. Presented the findings of the hazard vulnerability analysis and risk

Lawrence County HMP Process - Timeline		
Date	**Meeting**	**Description**
		assessment. Sought input for mitigation projects throughout the county. Distributed hazard mitigation project opportunity forms. This meeting was held both in-person and via conference calls due to COVID-19.
07/08/2020	Local Planning Team Meeting – Mitigation Strategy	Lawrence County LPT met via WebEx to continue mitigation strategy development by finalizing the goals and objectives to be included in this plan update. The LPT also reviewed all mitigation actions from the 2015 plan and discussed new actions for the plan update.
08/06/2020	Local Planning Team Meeting – Mitigation Strategy	Lawrence County LPT met via WebEx to discuss 2020 goals, objectives, and actions for mitigation strategy development.
09/10/2020	Risk Factor Assessment Public Comment	Due to COVID-19, the risk factor assessment results of the Lawrence County Hazard Mitigation Plan were posted via social media and on the county website. Members of the public were encouraged to read and submit any comments on this via email or online survey.
10/06/2020	Local Planning Team Meeting – Draft Plan Review	The draft HMP was made available to all members of the LPT prior to the start of the public review period. All were invited to submit any changes to the document before it was released to the public.
10/21/2020	Lawrence County Hazard Mitigation Plan – Draft Plan Public Review	The draft HMP was made available for all members of the public to review. All were invited to submit any comments via an online survey or provide comments to the Lawrence County Department of Planning & Community Development.

3.4. Public and Stakeholder Participation

Lawrence County engaged numerous stakeholders and encouraged public participation during the HMP update process. Advertisements for public meetings were completed utilizing the local newspaper and the Lawrence County website. Copies of those advertisements are located in Appendix C. Municipalities and other county entities were invited to participate in various meetings and encouraged to review and update various worksheets and surveys. Copies of all meeting agendas, meeting minutes and sign-in sheets are located in Appendix C. Worksheets and surveys completed by the municipalities and other stakeholders are located in appendices of this plan update as well. Municipalities were also encouraged to review hazard mitigation related items with other constituents located in the municipality like businesses, academia, private and nonprofit interests.

The tools listed below were distributed with meeting invitations, provided directly to municipalities to complete and return to the Lawrence County Department of Public Safety or at meetings to solicit information, data and comments from both local municipalities and other key stakeholders. Responses to these worksheets and surveys are available for review at the Department of Public Safety.

1. **Risk Assessment Hazard Identification and Risk Evaluation Worksheet:** Capitalizes on local knowledge to evaluate the change in the frequency of occurrence, magnitude of impact and/or geographic extent of existing hazards and allows communities to evaluate hazards not previously profiled using the Pennsylvania Standard List of Hazards.
2. **Capability Assessment Survey:** Collects information on local planning, regulatory, administrative, technical, fiscal, and political capabilities that can be included in the countywide mitigation strategy.
3. **Municipal Project Opportunity Forms and Mitigation Actions:** Copies of the 2015 mitigation opportunity forms that were included in the current HMP were provided to the

municipalities for review and amendment. These opportunities are located in Appendix G. The previous mitigation actions were provided and reviewed at update meetings. New 2021 municipal project opportunity forms are included as well, located in Appendix G.

As a result of COVID-19, the normal approach to engaging public input could not be taken. In an effort to capture public input, in lieu of a traditional approach to hazard mitigation, the Lawrence County LPT decided to utilize a virtual survey platform where any member of the public can pose a question or comment regarding the entire HMP document. Members of the public were also encouraged to contact Lawrence County Department of Planning & Community Development, Lawrence County Department of Public Safety or MCM Consulting Group, Inc. with any comments or questions regarding this update. Any public comment that was received during public meetings or during the draft review of the plan were documented and included in the plan. Copies of newspaper public meeting notices, website posted public notices and other correspondence are included in Appendix C of this plan.

Lawrence County invited all contiguous counties to review the 2021 draft hazard mitigation plan. A letter was sent to the emergency management coordinator in Mercer, Butler, and Beaver Counties in Pennsylvania, and Mahoning and Columbiana Counties in Ohio on October 21, 2020. Copies of these letters are included in Appendix C.

3.5. Multi-Jurisdictional Planning

Lawrence County used an open, public process to prepare this HMP. Meetings and letters to municipal officials were conducted to inform and educate them about hazard mitigation planning and its local requirements. Municipal officials provided information related to existing codes and ordinances, the risks and impacts of known hazards on local infrastructure and critical facilities and recommendations for related mitigation opportunities. The pinnacle to the municipal involvement process was the adoption of the final plan. *Table 7 - Worksheets, Surveys and Forms Participation* reflects the municipality participation by completing worksheets, surveys, and forms.

Table 7 - Worksheets, Surveys and Forms Participation

Municipality Participation in Worksheets, Surveys and Forms			
Municipality	**Capability Assessment Survey**	**Risk Assessment Hazard Identification and Risk Evaluation Worksheet**	**Hazard Mitigation Opportunity Form Review and Updates**
City of New Castle	**X**	**X**	**X**
Bessemer Borough	**X**	**X**	
Ellport Borough	**X**	**X**	**X**
Ellwood City Borough	**X**	**X**	**X**
Enon Valley Borough	**X**	**X**	
Hickory Township	**X**	**X**	
Little Beaver Township			
Mahoning Township	**X**	**X**	
Neshannock Township			**X**
New Beaver Borough	**X**	**X**	**X**
New Wilmington Borough	**X**	**X**	
North Beaver Township	**X**	**X**	**X**
Perry Township	**X**	**X**	**X**
Plain Grove Township	**X**	**X**	
Pulaski Township	**X**	**X**	**X**

Municipality Participation in Worksheets, Surveys and Forms			
Municipality	**Capability Assessment Survey**	**Risk Assessment Hazard Identification and Risk Evaluation Worksheet**	**Hazard Mitigation Opportunity Form Review and Updates**
Scott Township	**X**	**X**	
Shenango Township	**X**	**X**	
Slippery Rock Township	**X**	**X**	**X**
S.N.P.J. Borough			
South New Castle Borough	**X**	**X**	
Taylor Township	**X**	**X**	
Union Township			
Volant Borough	**X**	**X**	
Wampum Borough	**X**	**X**	**X**
Washington Township	**X**	**X**	**X**
Wayne Township	**X**	**X**	**X**
Wilmington Township	**X**	**X**	**X**

In March of 2020, Pennsylvania and the rest of the world experienced a pandemic event entitled COVID-19. Unfortunately, because of the pandemic, public meetings were unable to be held as normal during the hazard mitigation planning process. In lieu of a public meeting for the risk factor assessment results of the plan update were posted to Lawrence County's website as well as their social media platforms. Members of the public were encouraged to submit any comments via SurveyMonkey, an online survey platform, or to contact MCM Consulting Group, Inc. with any questions or comments.

All twenty-seven municipalities within Lawrence County adopted the 2015 Lawrence County Hazard Mitigation Plan as the municipal hazard mitigation plan. The goal of the Lawrence County Local Planning Team is to 100% participation by municipalities in adopting the 2021 Lawrence County Hazard Mitigation Plan.

4. Risk Assessment

4.1. Update Process Summary

A key component to reducing future losses is to first have a clear understanding of what the current risks are and what steps may be taken to lessen their threat. The development of the risk assessment is the critical first step in the entire mitigation process, as it is an organized and coordinated way of assessing potential hazards and risks. The risk assessment identifies the effects of both natural and manmade hazards and describes each hazard in terms of its frequency, severity, and county im-pact. Numerous hazards were identified as part of the process.

A risk assessment evaluates threats associated with a specific hazard and is defined by probability and frequency of occurrence, magnitude, severity, exposure, and consequences. The Lawrence County risk assessment provides in-depth knowledge of the hazards and vulnerabilities that affect Lawrence County and its municipalities. This document uses an all-hazards approach when evaluating the hazards that affect the county and the associated risks and impacts each hazard presents.

This risk assessment provides the basic information necessary to develop effective hazard mitigation/prevention strategies. Moreover, this document provides the foundation for the Lawrence County Emergency Operations Plan (EOP), local EOPs and other public and private emergency management plans.

The Lawrence County risk assessment is not a static document, but rather, is a biennial review requiring periodic updates. Potential future hazards include changing technology, new facilities and infrastructure, dynamic development patterns and demographic and socioeconomic changes into or out of hazard areas. By contrast, old hazards, such as brownfields and landfills, may pose new threats as county conditions evolve.

Using the best information available and Geographic Information Systems (GIS) technologies, the county can objectively analyze its hazards and vulnerabilities. Assessing past events is limited by the number of occurrences, scope and changing circumstances. For example, ever-changing development patterns in Pennsylvania have a dynamic impact on traffic patterns, population density and distribution, storm water runoff and other related factors. Therefore, limiting the risk assessment to past events is myopic and inadequate.

The Lawrence County Local Planning Team reviewed and assessed the change in risk for all natural and manmade hazards identified in the 2015 hazard mitigation plan. The mitigation planning team then identified hazards that were outlined within the Pennsylvania Hazard Mitigation Plan but not included in the 2015 Lawrence County Hazard Mitigation Plan that could impact Lawrence County. The team utilized the Hazard Identification and Risk Evaluation worksheet that was provided by the Pennsylvania Emergency Management Agency.

The Lawrence County Steering Committee met with municipalities and provided guidance on how to complete the municipal hazard identification and risk evaluation worksheet. Nineteen municipalities returned a completed worksheet. This information was combined with the county information to develop an overall list of hazards that would need to be profiled.

Once the natural and manmade hazards were identified and profiled, the local planning team then completed a vulnerability assessment for each hazard. An inventory of vulnerable assets was completed utilizing GIS

data and local planning team knowledge. The team used the most recent Lawrence County assessment data to estimate loss to particular hazards. Risk factor was then assessed to each profiled hazard utilizing the hazard prioritization matrix. This assessment allows the county and its municipalities to focus on and prioritize local mitigation efforts on areas that are most likely to be damaged or require early response to a hazard event.

4.2. Hazard Identification

4.2.1. Presidential and Gubernatorial Disaster Declarations

Table 8 - Presidential & Gubernatorial Disaster Declarations presents a list of all Presidential and Governor's Disaster Declarations that have affected Lawrence County from 1955 through 2020, according to the Pennsylvania Emergency Management Agency.

Table 8 - Presidential & Gubernatorial Disaster Declarations

Presidential Disaster Declarations and Gubernatorial Declarations and Proclamations		
Date	**Hazard Event**	**Action**
September, 1955	Drought	Gubernatorial Declaration
January, 1966	Heavy snow	Gubernatorial Declaration
February, 1972	Heavy snow	Gubernatorial Declaration
June, 1972	Flood (Agnes)	Presidential Disaster Declaration
February, 1974	Truckers strike	Gubernatorial Declaration
January, 1978	Heavy snow	Gubernatorial Declaration
February, 1978	Blizzard	Gubernatorial Declaration
March, 1993	Blizzard	Presidential Emergency Declaration
January, 1994	Severe winter storms	Presidential Disaster Declaration
September, 1995	Drought	Gubernatorial Declaration
January, 1996	Severe winter storms	Presidential Disaster Declaration
January, 1996	Flooding	Presidential Disaster Declaration
July, 1999	Drought	Gubernatorial Declaration
September, 1999	Hurricane Floyd	Presidential Disaster Declaration
December, 1999	Drought	Gubernatorial Declaration
September, 2003	Hurricane Isabel/Henri	Presidential Disaster Declaration
September, 2004	Tropical Depression Ivan	Presidential Disaster Declaration
September, 2005	Hurricane Katrina – to render mutual aid and to receive and house evacuees	Presidential Emergency Declaration
September, 2005	Hurricane Katrina	Gubernatorial Proclamation of Emergency
September, 2006	Tropical depression Ernesto	Gubernatorial Proclamation of Emergency
February, 2007	severe winter storm	Gubernatorial Proclamation of Emergency
February, 2007	Waive the regulations regarding hours of service limitations for drivers of commercial vehicles	Gubernatorial Proclamation of Emergency
April, 2007	Severe storm	Gubernatorial Declaration
April, 2007	Severe winter storm	Gubernatorial Proclamation of Emergency
February, 2010	severe winter storm	Gubernatorial Proclamation of Emergency
October, 2010	Hurricane Sandy	Presidential Emergency Declaration
January, 2011	Severe winter storm	Gubernatorial Proclamation of Emergency
September, 2011	Severe storms and flooding (Lee/Irene)	Gubernatorial Proclamation of Emergency
April, 2012	Spring winter storms	Gubernatorial Proclamation of Emergency
October, 2012	Hurricane Sandy	Gubernatorial Proclamation of Emergency
June, 2013	High winds, thunderstorms, heavy rain, tornado, flooding	Gubernatorial Proclamation of Emergency

Presidential Disaster Declarations and Gubernatorial Declarations and Proclamations		
Date	**Hazard Event**	**Action**
January, 2014	Extended prolonged cold	Gubernatorial Proclamation of Emergency
January, 2014	Driver hours waived due to prolonged and continued severe winter weather	Gubernatorial Proclamation of Emergency
February, 2014	Severe winter weather	Gubernatorial Proclamation of Emergency
February, 2014	Severe winter storm	Presidential Proclamation of Emergency
March, 2017	Severe winter storm	County and Municipal Declarations
July, 2017	Flash flooding	County and Municipal Declarations
January, 2018	Opioid crisis	Gubernatorial Proclamation of Emergency
March, 2020	COVID-19	Presidential Disaster Declaration

Source: Pennsylvania Emergency Management Agency and Federal Emergency Management Agency

4.2.2. Summary of Hazards

The Lawrence County Local Planning Team (LPT) was provided the Pennsylvania Standard List of Hazards to be considered for evaluation in the 2021 HMP Update. Following a review of the hazards considered in the 2015 HMP and the standard list of hazards, the local planning team decided that the 2021 plan should identify, profile and analyze twenty-five hazards. These twenty-five hazards include all of the hazards profiled in the 2015 plan. The list below contains the twenty-five hazards that have the potential to impact Lawrence County as identified through previous risk assessments, the Lawrence County Hazards Vulnerability Analysis and input from those that participated in the 2021 HMP update. Hazard profiles are included in Section 4.3 for each of these hazards.

Identified Natural Hazards

Drought

Drought is a natural climatic condition which occurs in virtually all climates, the consequence of a natural reduction in the amount of precipitation experienced over a long period of time, usually a season or more in length. High temperatures, prolonged winds and low relative humidity can exacerbate the severity of drought. This hazard is of particular concern in Pennsylvania due to the presence of farms as well as water-dependent industries and recreation areas across the Commonwealth. A pro-longed drought could severely impact these sectors of the local economy, as well as residents who depend on wells for drinking water and other personal uses. (National Drought Mitigation Center, 2006).

Earthquake

An earthquake is the motion or trembling of the ground produced by sudden displacement of rock usually within the upper ten to twenty miles of the Earth's crust. Earthquakes result from crustal strain, volcanism, landslides, or the collapse of underground caverns. Earthquakes can affect hundreds of thousands of square miles, cause damage to property measured in the tens of billions of dollars, result in loss of life and injury to hundreds of thousands of persons and disrupt the social and economic functioning of the affected area. Most property damage and earthquake-related deaths are caused by the failure and collapse of structures due to ground shaking which is dependent upon amplitude and duration of the earthquake. (FEMA, 1997).

Extreme Temperatures

Extreme cold temperatures drop well below what is considered normal for an area during the winter months and often accompany winter storm events. Combined with increases in wind speed, such temperatures in Pennsylvania can be life threatening to those exposed for extended periods of time. Extreme heat can be described as temperatures that hover 10°F or more above the average high temperature for a region during the summer months. Extreme heat is responsible for more deaths in Pennsylvania than all other natural disasters combined.

Flood, Flash Flood, Ice Jam

Flooding is the temporary condition of partial or complete inundation on normally dry land and it is the most frequent and costly of all hazards in Pennsylvania. Flooding events are generally the result of excessive precipitation. General flooding is typically experienced when precipitation occurs over a given river basin for an extended period of time. Flash flooding is usually a result of heavy localized precipitation falling in a short time period over a given location, often along mountain streams and in urban areas where much of the ground is covered by impervious surfaces. The severity of a flood event is dependent upon a combination of stream and river basin topography and physiography, hydrology, precipitation and weather patterns, present soil moisture conditions, the degree of vegetative clearing as well as the presence of impervious surfaces in and around flood-prone areas. Winter flooding can include ice jams which occur when warm temperatures and heavy rain cause snow to melt rapidly. Snow melt combined with heavy rains can cause frozen rivers to swell, which breaks the ice layer on top of a river. The ice layer often breaks into large chunks, which float down-stream, piling up in narrow passages and near other obstructions such as bridges and dams. All forms of flooding can damage infrastructure.

Hurricanes, Tropical Storms

Hurricanes, tropical storms, and nor'easters are classified as cyclones and are any closed circulation developing around a low-pressure center in which the winds rotate counterclockwise (in the Northern Hemisphere) and whose diameter averages 10-30 miles across. While most of Pennsylvania is not directly affected by the devastating impacts cyclonic systems can have on coastal regions, many areas in the state are subject to the primary damaging forces associated with these storms including high-level sustained winds, heavy precipitation and tornadoes. Areas in southeastern Pennsylvania could be susceptible to storm surge and tidal flooding. The majority of hurricanes and tropical storms form in the Atlantic Ocean, Caribbean Sea and Gulf of Mexico during the official Atlantic hurricane season (June through November). (FEMA, 1997).

Invasive Species

An invasive species is a species that is not indigenous to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health. These species can be any type of organism: plant, fish, invertebrate, mammal, bird, disease, or pathogen. Infestations may not necessarily impact human health, but can create a nuisance or agricultural hardships by destroying crops, defoliating populations of native plant and tree species, or interfering with ecological systems (Governor’s Invasive Species Council of Pennsylvania, 2009).

Landslide

A landslide is the downward and outward movement of slope-forming soil, rock and vegetation reacting to the force of gravity. Landslides may be triggered by both natural and human-caused changes in the environment, including heavy rain, rapid snow melt, steepening of slopes due to construction or erosion, earthquakes, and changes in groundwater levels. Mudflows, mudslides, rock falls, rockslides and rock topples are all forms of a landslide. Areas that are generally prone to landslide hazards include previous landslide areas, the bases of steep slopes, the bases of drainage channels, developed hillsides and areas recently burned by forest and brush fires. (Delano & Wilshusen, 2001).

Lightning Strikes

Lightning is a discharge of electrical energy resulting from the build-up of positive and negative charges within a thunderstorm. The flash or "bolt" of light usually occurs within clouds or between clouds and the ground. A bolt of lightning can reach temperatures approaching 50,000°F. On average, eighty-nine people are killed each year by lightning strikes in the United States. Within Pennsylvania, the annual average number of thunder and lightning events in a given area can expect ranges between forty and seventy events per year (FEMA, 1997).

Pandemic and Infectious Diseases

A pandemic occurs when infection from of a new strain of a certain disease, to which most humans have no immunity, substantially exceeds the number of expected cases over a given period of time. Such a disease may or may not be transferable between humans and animals. (Martin & Martin-Granel, 2006).

Radon Exposure

Radon is a cancer-causing natural radioactive gas that you cannot see, smell, or taste. It is a large component of the natural radiation that humans are exposed to and can pose a serious threat to public health when it accumulates in poorly ventilated residential and occupation settings. According to the USEPA, radon is estimated to cause about 21,000 lung cancer deaths per year, second only to smoking as the leading cause of lung cancer (EPA 402-R-03-003: EPA Assessment…, 2003). An estimated forty percent of the homes in Pennsylvania are believed to have elevated radon levels (Pennsylvania Department of Environmental Protection, 2009).

Tornadoes, Windstorm

A windstorm can occur during severe thunderstorms, winter storms, coastal storms, or tornadoes. Straight-line winds such as a downburst have the potential to cause wind gusts that exceed 100 miles per hour. Based on forty years of tornado history and over 100 years of hurricane history, FEMA identifies western and central Pennsylvania as being more susceptible to higher winds than eastern Pennsylvania. (FEMA, 1997). A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud extending to the ground. Tornadoes are most often generated by thunderstorm activity (but sometimes result from hurricanes or tropical storms) when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. The damage caused by a tornado is a result of high wind velocities and wind-blown debris. According to the National Weather Service, tornado wind speeds can range between thirty to more than 300 miles per hour. They are more likely to occur during the spring and early summer months of March through June and are most likely to form in the late afternoon and early evening. Most tornadoes are a few

dozen yards wide and touch down briefly, but even small, short-lived tornadoes can inflict tremendous damage. Destruction ranges from minor to catastrophic depending on the intensity, size, and duration of the storm. Structures made of light materials such as mobile homes are most susceptible to damage. Waterspouts are weak tornadoes that form over warm water and are relatively uncommon in Pennsylvania. Each year, an average of over 800 tornadoes is reported nationwide, resulting in an average of eighty deaths and 1,500 injuries (NOAA, 2002). Based on NOAA Storm Prediction Center Statistics, the number of recorded F3, F4, & F5 tornadoes between 1950-1998 ranges from <1 to 15 per 3,700 square mile area across Pennsylvania (FEMA, 2009). A waterspout is a tornado over a body of water (American Meteorological Society, 2009).

Wildfire

A wildfire is a raging, uncontrolled fire that spreads rapidly through vegetative fuels, exposing and possibly consuming structures. Wildfires often begin unnoticed and can spread quickly, creating dense smoke that can be seen for miles. Wildfires can occur at any time of the year, but mostly occur during long, dry hot spells. Any small fire in a wooded area, if not quickly detected and suppressed, can get out of control. Most wildfires are caused by human carelessness, negligence, and ignorance. However, some are precipitated by lightning strikes and in rare instances, spontaneous combustion. Wildfires in Pennsylvania can occur in fields, grass, brush, and forests. 98% of wildfires in Pennsylvania are a direct result of people, often caused by debris burns (PA DCNR, 1999).

Winter Storm

Winter storms may include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. A winter storm can range from a moderate snowfall or ice event over a period of a few hours to blizzard conditions with wind-driven snow that lasts for several days. Many winter storms are accompanied by low temperatures and heavy and/or blowing snow, which can severely impair visibility and disrupt transportation. The Commonwealth of Pennsylvania has a long history of severe winter weather. (NOAA, 2009).

Identified Human Caused Hazards

Civil Disturbance

Civil disturbance hazards encompass a set of hazards emanating from a wide range of possible events that cause civil disorder, confusion, strife, and economic hardship. Civil disturbance hazards include the following:

- Famine; involving a widespread scarcity of food leading to malnutrition and in-creased mortality (Robson, 1981).
- Economic Collapse, Recession; Very slow or negative growth, for example (Economist, 2009).
- Misinformation: erroneous information spread unintentionally (Makkai, 1970).
- Civil Disturbance, Public Unrest, Mass Hysteria, Riot; group acts of violence against property and individuals, for example (18 U.S.C. § 232, 2008).
- Strike, Labor Dispute; controversies related to the terms and conditions of employment, for example (29 U.S.C. § 113, 2008).

Dam Failure

A dam is a barrier across flowing water that obstructs, directs, or slows down water flow. Dams provide benefits such as flood protection, power generation, drinking water, irrigation, and recreation. Failure of these structures results in an uncontrolled release of impounded water. Failures are relatively rare, but immense damage and loss of life is possible in downstream communities when such events occur. Aging infrastructure, hydrologic, hydraulic, and geologic characteristics, population growth and design and maintenance practices should be considered when assessing dam failure hazards. The failure of the South Fork Dam, located in Johnstown, Pennsylvania, was the deadliest dam failure ever experienced in the United States. It took place in 1889 and resulted in the Johnstown Flood which claimed 2,209 lives (FEMA, 1997). Today there are approximately 3,200 dams and reservoirs throughout Pennsylvania (Pennsylvania Department of Environmental Protection, 2009).

Disorientation

Large numbers of people are attracted to Pennsylvania's rural areas for recreational purposes such as hiking, camping, hunting, and fishing. As a result, people can be-come lost or trapped in remote and rugged wilderness areas. Search and rescue may be required for people who suffer from medical problems or injuries and those who become accidentally or intentionally disoriented. Search and rescue efforts are focused in and around state forest and state park lands (DCNR, 2009).

Drowning

Drowning is death from suffocation, typically associated with swimming, fishing, boating or bridge accidents, or suicide. It can be a significant hazard in communities with numerous residential pools or water bodies (e.g. ponds, lakes, rivers, etc.) and extensive outdoor recreational activity. Drowning rates are particularly high for children ages one to fourteen. The Centers for Disease Control and Prevention estimates that drowning is the second leading cause of injury death (after motor vehicle crashes) among children ages one to fourteen. (CDC, 2008).

Emergency Services

Emergency medical services (EMS) and fire department services play a crucial role in the emergency response system, and the functionality of these emergency services directly impacts many of the other hazards profiles in this report. Both EMS and fire services face challenges from lack of funding and lower rates of volunteerism.

Environmental Hazards

Environmental hazards are hazards that pose threats to the natural environment, the built environment and public safety through the diffusion of harmful substances, materials, or products. Environmental hazards include the following:

- Hazardous material releases: at fixed facilities or as such materials are in transit and including toxic chemicals, infectious substances, biohazardous waste and any materials that are explosive, corrosive, flammable, or radioactive (PL 1990-165, § 207(e)).

- Air or Water Pollution; the release of harmful chemical and waste materials into water bodies or the atmosphere, for example (National Institute of Health Sciences, July 2009; Environmental Protection Agency, Natural Disaster PSAs, 2009).
- Superfund Facilities: hazards originating from abandoned hazardous waste sites listed on the National Priorities List (Environmental Protection Agency, National Priorities List, 2009).
- Manure Spills: involving the release of stored or transported agricultural waste, for example (Environmental Protection Agency, Environmental Impacts of…, 1998).
- Product Defect or Contamination; highly flammable or otherwise unsafe consumer products and dangerous foods (Consumer Product Safety Commission, 2003).

Nuclear Incidents

Nuclear accidents generally refer to events involving the release of significant levels of radioactivity or exposure of workers or the general public to radiation (FEMA, 1997). Nuclear accidents/incidents can be placed into three categories: 1) Criticality accidents which involve loss of control of nuclear assemblies or power reactors, 2) Loss-of-coolant accidents which result whenever a reactor coolant system experiences a break or opening large enough so that the coolant inventory in the system cannot be maintained by the normally operating make-up system, and 3) Loss-of-containment accidents which involve the release of radioactivity. The primary concern following such an incident or accident is the extent of radiation, inhalation, and ingestion of radioactive isotopes which can cause acute health effects (e.g. death, burns, severe impairment), chronic health effects (e.g. cancer), and psychological effects. (FEMA, 1997).

Opioid Epidemic

The opioid epidemic is the rapid increase in the use of prescription and non-prescription opioid drugs in the United States beginning in the late 1990s and continuing throughout the first two decades of the 2000s. Opioids are a diverse class of moderately strong painkillers, including oxycodone, hydrocodone, and a very strong painkiller, fentanyl, which is synthesized to resemble other opiates such as opium-derived morphine and heroin. The potency and availability of these substances, de-spite their high risk of addiction and overdose, have made them popular both as for-mal medical treatments and as recreation-al drugs. Due to their sedative effects on the part of the brain which regulates breathing, opioids in high doses present the potential for respiratory depression and may cause respiratory failure and death.

The Commonwealth of Pennsylvania, along with other states in the nation has enact-ed legislation to curb the prescription and distribution of these drugs to try to prevent addiction rising from abuse as a painkiller. This includes but is not limited to restrictions to prescribing to minors, quantity limits, a prescription database with entry requirements and other limits to its availability.

Terrorism

Terrorism is use of force or violence against persons or property with the intent to intimidate or coerce. Acts of terrorism include threats of terrorism; assassinations; kidnappings; hijackings; bomb scares and bombings; cyber-attacks (computer-based); and the use of chemical, biological, nuclear, and radiological weapons. (FEMA, 2009).

Transportation Accidents

Transportation accidents can result from any form of air, rail, water, or road travel. It is unlikely that small accidents would significantly impact the larger community. However, certain accidents could have secondary regional impacts such as a hazardous materials release or disruption in critical supply/access routes, especially if vital transportation corridors or junctions are present. (Research and Innovative Technology Administration, 2009). Traffic congestion in certain circumstances can also be hazardous. Traffic congestion is a condition that occurs when traffic demand approaches or exceeds the available capacity of the road network. This hazard should be carefully evaluated during emergency planning since it is a key factor in timely disaster or hazard response, especially in areas with high population density. (Federal Highway Administration, 2009).

Urban Fire and Explosions

An urban fire involves a structure or property within an urban or developed area. For hazard mitigation purposes, major urban fires involving large buildings and/or multiple properties are of primary concern. The effects of a major urban fire include minor to significant property damage, loss of life, and residential or business displacement. Explosions are extremely rapid releases of energy that usually generate high temperatures and often lead to fires. The risk of severe explosions can be reduced through careful management of flammable and explosive hazardous materials. (FEMA, 1997).

Utility Interruption

Utility interruption hazards are hazards that impair the functioning of important utilities in the energy, telecommunications and public works and information network sectors. Utility interruption hazards include the following:

- Geomagnetic Storms; including temporary disturbances of the Earth's magnetic field resulting in disruptions of communication, navigation, and satellite systems (National Research Council et al., 1986).
- Fuel or Resource Shortage; resulting from supply chain breaks or secondary to other hazard events, for example (McGrady County, PA, 2005).
- Electromagnetic Pulse; originating from an explosion or fluctuating magnetic field and causing damaging current surges in electrical and electronic systems (Institute for Telecommunications Sciences, 1996).
- Information Technology Failure; due to software bugs, viruses, or improper use (Rainer Jr., et al, 1991).
- Ancillary Support Equipment; electrical generating, transmission, system-control, and distribution-system equipment for the energy industry (Hirst & Kirby, 1996).
- Public Works Failure; damage to or failure of highways, flood control systems, deep-water ports and harbors, public buildings, bridges, dams, for example (Unit-ed States Senate Committee on Environment and Public Works, 2009).
- Telecommunications System Failure; Damage to data transfer, communications, and processing equipment, for example (FEMA, 1997)
- Transmission Facility or Linear Utility Accident; liquefied natural gas leakages, explosions, facility problems, for example (United States Department of Energy, 2005)

- Major Energy, Power, Utility Failure; interruptions of generation and distribution, power outages, for example (United States Department of Energy, 2000).

4.2.3. Climate Change

Impacts of Climate Change on Identified Hazards

Humans have become the dominant species on Earth and our society and influence is globalized. Human activity such as the large-scale consumption of fossil fuels and de-forestation has caused atmospheric carbon dioxide concentrations to significantly in-crease and a notable diversity of species to go extinct. The result is rapid climate change unparalleled in Earth's history and an extinction event approaching the level of a mass extinction (Barnosky et al., 2011; Wake & Vredenburg, 2008). The corresponding rise of average atmospheric temperatures is intensifying many natural hazards, and further threatening biodiversity. The effects of climate change on these hazards is expected to intensify over time as temperatures continue to rise, so it is prudent to be aware of how climate change is impacting natural hazards.

The most obvious change is in regard to extreme temperature (Section 4.3.3). As average atmospheric temperatures rise, extreme high temperatures become more threatening, with record high temperatures outnumbering record low temperatures 2:1 in recent years (Meehl et al., 2009). As climate change intensifies, it is expected that the risk of extreme heat will be amplified whereas the risk of extreme cold will be attenuated. Less immediately apparent, climate change could increase the prevalence of the West Nile Virus (Section 4.3.7). Some studies show increased insect activities during a similar rapid warming event in Earth's history (Curano et al., 2008). Other studies make projections that with the warming temperatures and lower annual precipitation that are expected with climate change, there will be an expansion of the suitable climate for mosquitos and West Nile Virus, potentially increasing the risk that the disease poses (Harrigan et al., 2014).

Climate change is likely to increase the risk of droughts (Section 4.3.1). Higher average temperatures mean that more precipitation will fall as rain rather than snow, snow will melt earlier in the spring, and evaporation and transpiration will increase. Along with the prospect of decreased annual precipitation, the risk of hydrological and agricultural drought is expected to increase (Sheffield & Wood, 2008). Correspondingly this will impact wildfires (Section 4.3.9). Drought is accompanied by drier soils and forests, resulting in an elongated wildfire season and more intense and long-burning wildfires (Pechony & Shindell, 2010). However, the Southwest United States is at a greater risk of this increased drought and wildfire activity than Monroe County in the Eastern United States.

While it may seem counterintuitive considering the increased risk of drought, there is also an increased risk of flooding associated with climate change (Section 4.3.4). As previously mentioned, warmer temperatures mean more precipitation will fall as rain rather than snow. Combined with the fact that warmer air holds more moisture, the result is heavier and more intense rainfalls, increasing the risk of flooding and dam and levee failures. Similarly, winter storms are expected to become more intense, if possibly less frequent (Section 4.3.10). Climate change is also expected to result in more intense hurricanes and tropical storms (Section 4.3.5). With the rise of atmospheric temperatures, ocean surface temperatures are rising, resulting in warmer and moister conditions where tropical storms develop (Stott et al., 2010). A warmer ocean stores more energy and is capable of fueling stronger storms. It is projected that the Atlantic hurricane season is elongating, and there will be more category 4 and 5 hurricanes than before (Trenberth, 2010).

Climate change is contributing to the introduction of new invasive species (Section 4.3.6). As maximum and minimum seasonal temperatures change, non-native species are able to establish themselves in

previously inhospitable climates where they have a competitive advantage. This may shift the dominance of ecosystems in the favor of non-native species, contributing to species loss and the risk of extinction.

This type of sudden global change is novel to humanity. Despite the myriad of well thought out research, there is still much uncertainty surrounding the future of the Earth. All signs point to the intensification of the hazards mentioned above, especially if human society and individuals do not make swift and significant changes to reduce emissions and species losses.

4.3. Hazard Profiles

4.3.1. Drought

4.3.1.1 Location and Extent

While Pennsylvania is generally more water-rich than many U.S. states, the Commonwealth may be subject to drought conditions. A drought is broadly defined as a time period of prolonged dryness that contributes to the depletion of ground and surface water. Droughts are regional climatic events, so when such an event occurs in Lawrence County, impacts are not restricted to the county and are often more widespread. The spatial extent of the impacted area can range from localized areas in Pennsylvania to the entire Mid-Atlantic region.

There are three types of drought:

Meteorological Drought – A deficiency of moisture in the atmosphere compared to average conditions. Meteorological drought is defined by the duration of the deficit and degree of dryness and is often associated with below average rainfall. Depending on the severity of the drought, it may or may not have a significant impact on agriculture and the water supply.

Agricultural Drought – A drought inhibiting the growth of crops, due to a moisture deficiency in the soil. Agricultural drought is linked to meteorological and hydrologic drought.

Hydrologic Drought – A prolonged period without rainfall that has an adverse effect on streams, lakes, and groundwater levels, potentially impacting agriculture.

Leaving areas with little moisture, droughts are often one of the leading contributing factors to wildfires.

Droughts have several effects:

- Depletion of consumable water supply
- Depletion of agricultural water supply
- Depletion of forest water and water used to fight forest fires
- Depletion of water for navigational and recreational purposes
- Depletion of water for natural irrigation (besides crops and forests)
- Poor water quality

Droughts can have adverse effects on farms and other water-dependent industries. This can result in a local economic loss. According to the 2017 U.S. Census of Agriculture, there are 587 farms consisting of 82,125 acres that produce livestock and crops; the average size of a farm in Lawrence County is 140 acres.

Public safety is an issue in terms of consumable water not being available, as well as water for fire protection and emergency services.

4.3.1.2 Range of Magnitude

Lawrence County's Comprehensive Plan (October 2016) states that some of its objectives are these: protection of natural resources; providing for wetlands and a reliable supply of water that considers current and future availability; and, preservation and enhancement of prime agricultural land to encourage compatibility between regulations and operations. Drought can provide serious challenges to the plan's objectives because over thirty-five percent of the county's land use is in agriculture and the county is home to thousands of acres of forests, state and local parks and thirty-five areas of natural heritage significance.

Nearly fifty percent of the annual precipitation of 41.4 inches is during the spring/summer. Fall is usually the driest. Average snowfall for the county is 35.4 inches. Rural farming areas of Lawrence County are most at risk when a drought occurs. A drought can be a significant financial burden as approximately fifty-four percent of the county farmland use is devoted to crop cultivation and another forty-six percent to livestock and poultry. (U.S. Census of Agriculture, 2017). Wildfires are often the most severe secondary effect associated with drought. Wildfires can devastate wooded and agriculture areas, threatening natural resources, structures near high wildfire loads, and farm production facilities. Prolonged drought conditions can have a lasting impact on the economy and can cause major ecological changes, such as increases in scrub growth, flash flooding and soil erosion.

Drought preparation includes three phases: drought watch, drought warning, and drought emergency, by way of shown in the table below.

Table 9 - Drought Preparation Phases

Drought Preparation Phases *(PA DEP, 2017)*				
Phase	**General Activity**	**Actions**	**Request**	**Goal**
Drought Watch	Early stages of planning and alert for drought possibility	Increased water monitoring, awareness and preparation for response among government agencies, public water suppliers, water users and the public	Voluntary water conservation	Reduce water use by 5%
Drought Warning	Coordinate a response to imminent drought conditions and potential water shortages	Reduce shortages - relieve stressed sources, develop new sources if needed	Continue voluntary water conservation, impose mandatory water use restrictions if needed	Reduce water use by 10-15%
Drought Emergency	Management of operations to regulate all available resources and respond to emergency	Support essential and high priority water uses and avoid unnecessary uses	Possible restrictions on all nonessential water uses	Reduce water use by 15%

Local Water Rationing: Although not a drought phase, local municipalities may, with the approval of the Pennsylvania Emergency Management Council, implement local water rationing to share a rapidly dwindling or severely depleted water supply in designated water supply service areas. These individual water rationing plans, authorized through provisions of 4 PA Code Chapter 120, will require specific limits on individual water consumption to achieve significant reductions in use. Under both mandatory restrictions imposed by the Commonwealth and local water rationing, procedures are provided for granting of variances to consider individual hardships and economic dislocations.

Long-term water shortages during severe drought conditions can have a significant impact on agribusiness, public utilities, and other industries reliant on water for production services. Lawrence County also has a growing agritourism business that would be threatened by long-term drought. *Table 9 - Drought Preparation Phases* shows the FEMA defined levels of drought severity along with suggested actions, requests and goals. Drought can cause municipalities to enforce water rationing and distribution.

The Commonwealth uses five parameters to assess drought conditions:

- Stream flows (compared to benchmark records);
- Precipitation (measured as the departure from normal, thirty-year average precipitation);
- Reservoir storage levels in a variety of locations such as three New York City reservoirs in the upper Delaware River Basin;
- Groundwater elevations in a number of counties (comparing to past month, past year and historic record); and
- Soil moisture via the Palmer Drought Index (See *Table 10 - Palmer Drought Severity Index*) - a soil moisture algorithm calibrated for relatively homogeneous regions which measures dryness based on recent precipitation and temperature.

Table 10 - Palmer Drought Severity Index

Palmer Drought Severity Index	
Severity Category	**PDSI**
Extremely wet	4.0 or more
Very wet	3.0 to 3.99
Moderately wet	2.0 to 2.99
Slightly wet	1.0 to 1.99
Incipient wet spell	0.5 to 0.99
Near normal	0.49 to -0.49
Incipient dry spell	-0.5 to -0.99
Mild drought	-1.0 to -1.99
Moderate drought	-2.0 to -2.99
Severe drought	-3.0 to -3.99
Extreme drought	-4.0 or less

4.3.1.3 Past Occurrence

Between 1930 and 1994, the Commonwealth of Pennsylvania experienced five significant droughts: 1930-1934, 1939-1942, 1953-1955, 1961-1967, and 1991-1992. The drought of 1991 had a significant impact on Lawrence County agricultural production. During the drought, Lawrence County farmers felt the negative impact. Specific data is limited, but the Governor's Proclamation of Disaster Emergency stated that the drought caused "millions of dollars" in damages to crops and agricultural businesses.

A significant drought occurred in 1963 when precipitation statewide averaged below normal for ten of twelve months. Drought emergency status led to widespread water use restrictions, and reservoirs dipped to record low levels. Corn, hay, and other agricultural products desiccated in parched fields, causing economic losses. Governor William Scranton sought drought aid for Pennsylvania in the face of mounting agricultural losses, and the event became a presidentially declared disaster in September 1963.

Lawrence County experienced a major drought in 1988. The Soil Conservation Service responded to inquiries by area farmers concerning deficient water supplies for livestock. Federal assistance for loss of crops in the county received in the form of drought disaster payments totaled $222,506. These payments were divided between losses for corn, hay and other vegetables. A total of 1,901,247 pounds of emergency feed worth $69,093 was given to farmers who had losses of forty percent or more of their normal crops. Farmers continued to suffer the effects of drought in 1989, where $75,851 was distributed for crop losses. Vegetables, oats, rye, soybeans and corn were lost due to drought. In 1990, only $502 dollars were distributed for buckwheat and corn losses. In 1991, $64,598 was disbursed for crop losses. These conditions continued into 1992, where $53,389 was given to Lawrence County farmers due to crop losses. Drought conditions in 1993 brought $113,963 worth of federal aid to Lawrence County. In 2000, $23,182 in federal assistance was distributed to farmers in Lawrence County due to crop losses stemming from drought.

A Commonwealth-wide devastating drought began in December 1998 and continued into 1999, culminating with the governor of Pennsylvania declaring a drought emergency for most of the Commonwealth on July 21, 1999. Corn crop losses alone were estimated to be approximately $100 million with total crop losses estimated at over $500 million. Other than agricultural losses, the drought resulted in low stream levels which caused some deaths of fish in abnormally dry streams. The drought emergency was lifted on September 30, 1999 with the arrival of Hurricane Floyd on September 16, 1999.

From 1999 through early 2003, the area experienced a severe drought (per PA DEP), as did most of the mid-Atlantic region.

Lawrence County most recently experienced drought emergencies and water supply deficiencies during the drought watches of 2016-2017. Drought conditions impacted land covering Lawrence County and the potential for wildfire increased dramatically during extended drought conditions.

According to the Pennsylvania Department of Environmental Protection, the last time Lawrence County was in any declared drought status (watch) was in November 2016. The Commonwealth itself, however, endured an extended drought watch into May 2017 (

), but dissolved the Commonwealth Drought Task Force on May 17, 2017 after a couple of rainy seasons.

According to the Palmer Drought Severity Index map below, Lawrence County spent 5% - 9.9% of the time between 1895 and 1995 in a severe and extreme drought.

Figure 9 - Palmer Drought Severity Index Map

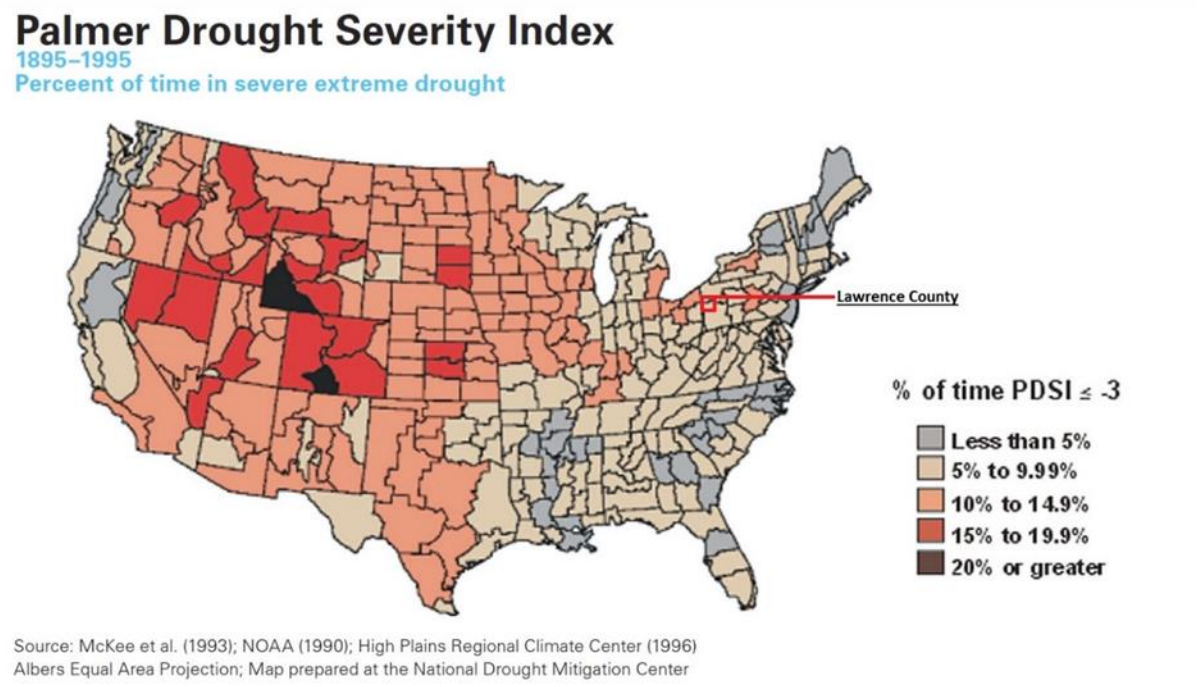


Table 11 - Drought Occurrence shows declared drought status for Pennsylvania from 1980 to January 2020 as reported by the Pennsylvania Department of Environmental Protection (PA DEP). The table also includes one disaster declaration that included Lawrence County due to drought events. In the summer of 1999, the entire mid-Atlantic region was in severe drought conditions.

Table 11 - Drought Occurrence

Drought Occurrence in Pennsylvania *(PA DEP, 2019)*			
Start	**End**	**Status**	**Duration**
11/18/1980	04/20/1982	Emergency	1 year, 5 months, 2 days
04/26/1985	12/19/1985	Watch	7 months, 23 days
07/07/1988	08/24/1988	Watch	10 months, 8 days
08/24/1988	12/12/1988	Warning	
12/12/1988	05/15/1989	Watch	
06/28/1991	07/24/1991	Warning	11 months, 26 days
07/24/1991	04/20/1998	Emergency	
04/20/1998	06/23/1992	Warning	
09/01/1995	09/20/1995	Warning	3 months, 17 days
09/20/1995	11/08/1995	Emergency	
11/08/1995	12/18/1995	Warning	
07/17/1997	01/16/1998	Watch	5 months, 30 days
12/03/1998	12/14/1998	Watch	1 year, 5 months, 2 days
12/14/1998	03/15/1999	Warning	
03/15/1999	06/10/1999	Watch	
06/10/1999	07/20/1999	Warning	

Drought Occurrence in Pennsylvania *(PA DEP, 2019)*			
Start	**End**	**Status**	**Duration**
07/20/1999	09/30/1999	Emergency**	
09/30/1999	05/05/2000	Watch	
08/24/2001	06/14/2002	Watch	9 months, 21 days
09/05/2002	11/07/2002	Watch	2 months, 2 days
04/11/2006	06/30/2006	Watch	2 months, 19 days
08/06/2007	01/11/2008	Watch	5 months, 5 days
09/16/2010	11/10/2010	Watch	1 month, 25 days
08/05/2011	09/02/2011	Watch	28 days
03/24/2015	07/10/2015	Watch	3 months, 16 days
08/02/2016	05/16/2017	Watch	9 months, 14 days
**Gubernatorial Disaster Declaration			

Figure 10 - Declared Drought Status Spring 2020 shows the drought status from May 16, 2017 to present throughout the Commonwealth. However, at the time of the writing of this plan (Summer 2020), several counties were experiencing an abnormally dry period and were being placed on Drought Watch and Warning status. *Figure 11 - Drought Conditions Summer 2020* shows Summer 2020 drought conditions.

The following link shows drought status in real time, and readers can see ground water levels, surface water levels and precipitation indicators by county: https://pa.water.usgs.gov/apps/drought/.

Figure 10 - Declared Drought Status Spring 2020

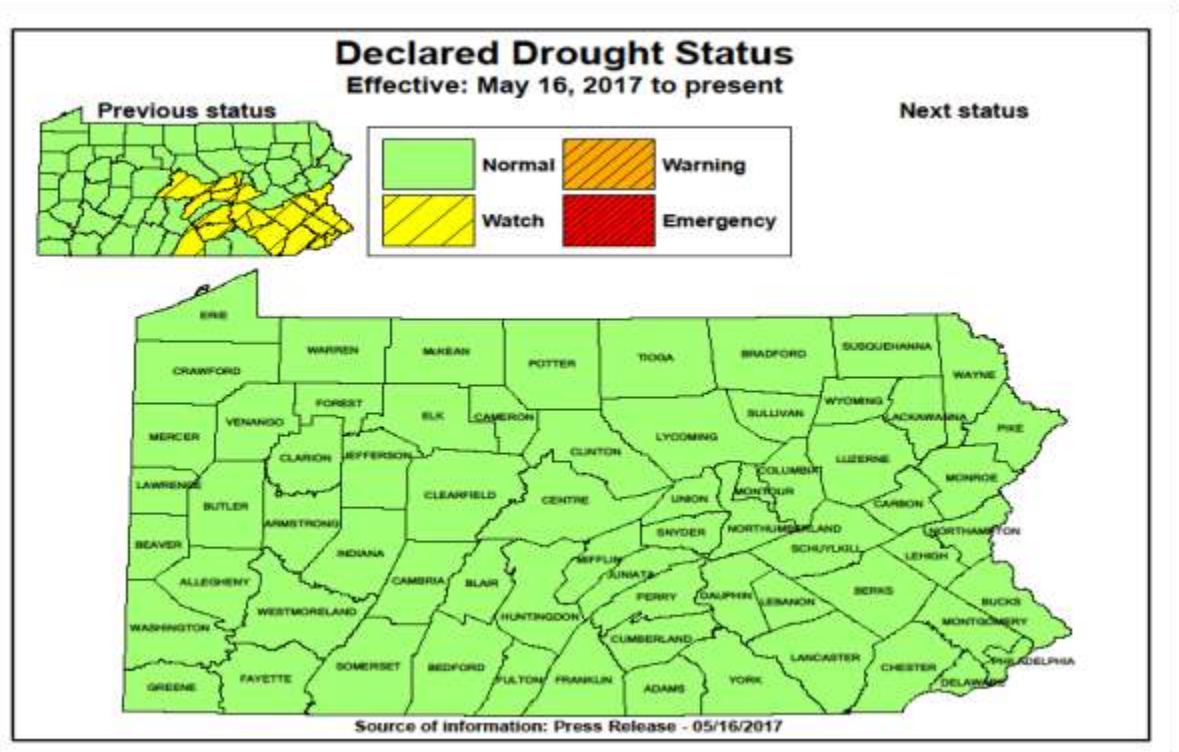
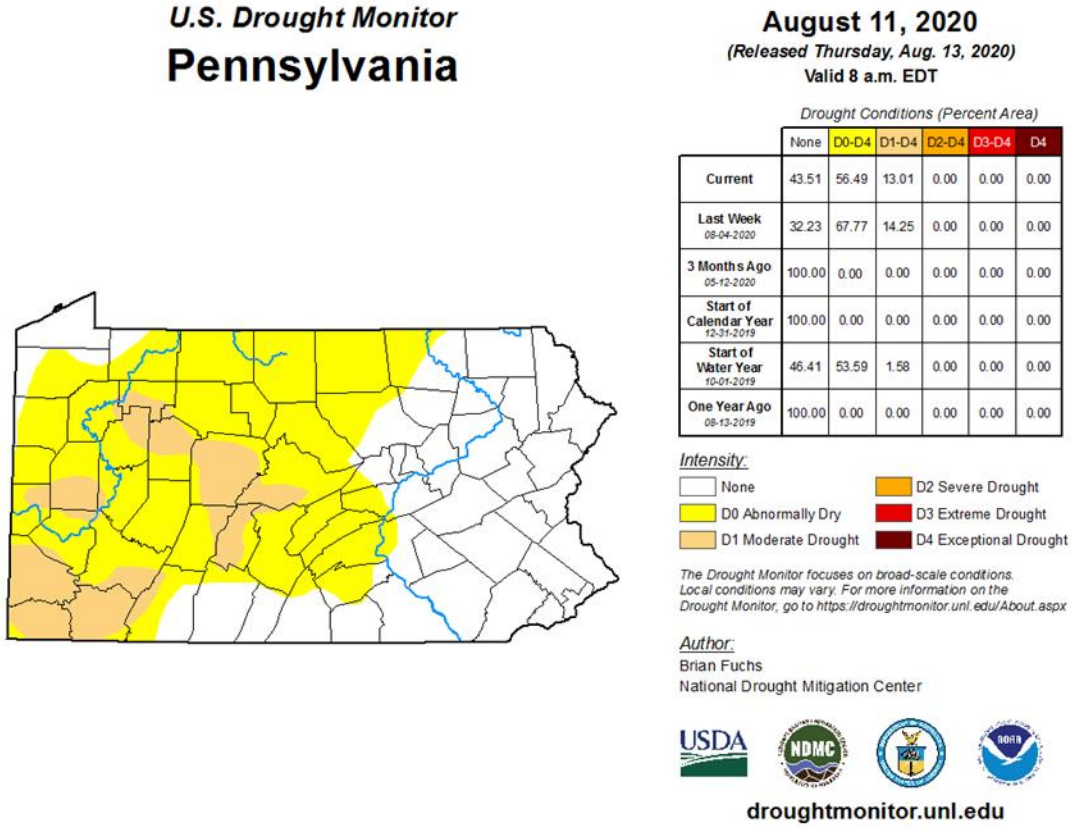


Figure 11 - Drought Conditions Summer 2020



4.3.1.4 Future Occurrence

It is difficult to forecast the exact severity and frequency of future drought events. The future of climate change will lead to increased uncertainty and extremity of climate events, suggesting that it is best to be prepared for potentially adverse conditions. As Lawrence County has experienced severe drought between 5 - 10% of the time between 1895 and 1995 (*Figure 9 - Palmer Drought Severity Index Map* – a 100-year data collection), the report can be used to make a rough estimate of the future probability of drought in Lawrence County. Drought conditions are expected to become more severe with climate change, as evaporation and transpiration will increase with higher temperatures (Sheffield & Wood, 2008; EPA, 2016).

Figure 9 - Palmer Drought Severity Index Map shows a recent Palmer Drought Severity Index reading for the continental United States. As of January 2020, Lawrence County is experiencing an extremely moist spell, with a PDSI above 4.0.

The potential for a drought to occur in Lawrence County is, nevertheless, high. Given the frequency of drought watches issued for Lawrence County and its municipalities, the county can reasonably expect to be under a drought watch at least once per year. While some form of drought condition frequently exists in Lawrence County, the impact depends on the duration of the event, severity of conditions, and area affected.

Figure 12 - The Drought Monitor

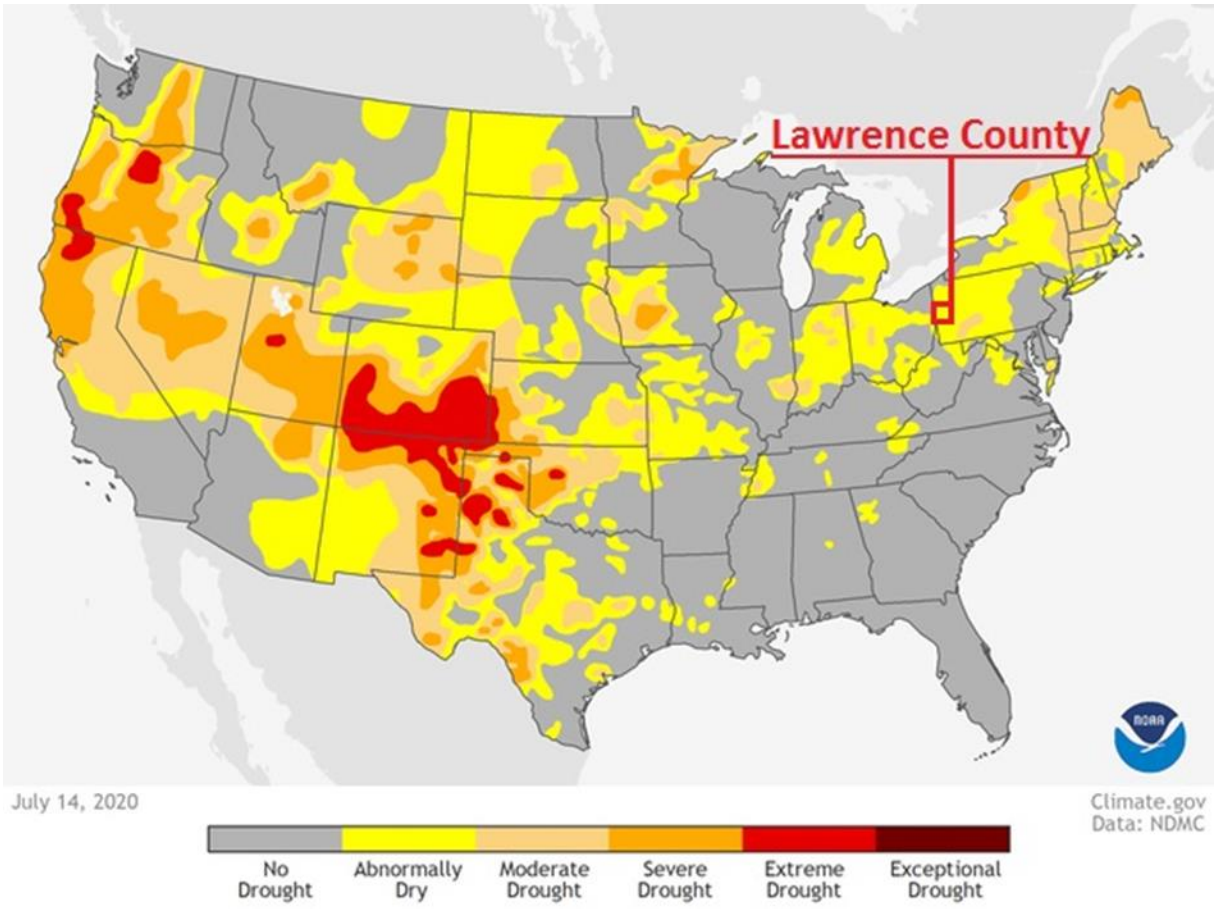


Figure 12 - The Drought Monitor above shows that Lawrence County/all of western Pennsylvania, at the time of the writing of this plan, is in a short-term abnormally dry period.

4.3.1.5 Vulnerability Assessment

Drought vulnerability depends on the duration and area of impact. However, other factors contribute to the severity of a drought. Unseasonably high temperatures, prolonged winds, and low humidity can heighten the impact of a drought.

Extended periods of drought can lead to lowered stream levels, altering the delicate balance of riverine ecosystems. Certain tree species are susceptible to fungal infections during prolonged periods of soil moisture deficit. Fall droughts pose a particular threat because groundwater levels are typically at their lowest following the height of the summer growing season.

Wildfire is the most severe secondary effect associated with drought. Wildfires can devastate wooded and agricultural areas, threatening natural resources and farm production facilities.

Prolonged drought conditions can cause major ecological changes, such as increases in scrub growth, flash flooding, and soil erosion.

Droughts can have adverse effects on farms and other water-dependent industries. This can result in a local economic loss. The 2017 U.S. Census of Agriculture lists 82,125 acres of prime agricultural land in Lawrence County. McConnells Mill State Park encompasses over 2,500 acres and there are multiple recreational sites across the county dependent on consistent water sources and replenishment. From a societal perspective, public safety is an issue in terms of consumable water not being available, as well as water for fire protection and emergency services.

The most significant losses resulting from drought events are typically found in the agriculture sector. The 1999 Gubernatorial Proclamation was issued in large part due to significant crop damage. Preliminary estimates by the Pennsylvania Department of Agriculture indicated possible crop losses across the Commonwealth in excess of $500 million. This estimate did not include a twenty percent decrease in dairy milk production which also resulted in million-dollar losses (NCDC, 2009).

While these were statewide impacts, they illustrate the potential for droughts to severely impair the local economy in more agricultural communities. The 2017 Census of Agriculture reports there were 587 farms in Lawrence County, at an average size of 140 acres. Lawrence County ranks 43rd of sixty-seven counties in the Commonwealth for agricultural production, totaling just under $35,000 (USDA, 2017). Agricultural production from crops, including nursery and greenhouse crops, accounts for $18,919 in commerce annually. Production from livestock, poultry and their products accounts for $15,854 annually. A map of properties with tillable agricultural land use and other land in the county vulnerable to drought is shown at *Figure 13 - Lawrence County Drought Vulnerability Map*.

Public or municipal water supplies are also vulnerable to the effects of drought because supply sources include rivers, reservoirs, and groundwater. Public water service areas cover only some of the land area in the county, also depicted in *Figure 13 - Lawrence County Drought Vulnerability Map*.

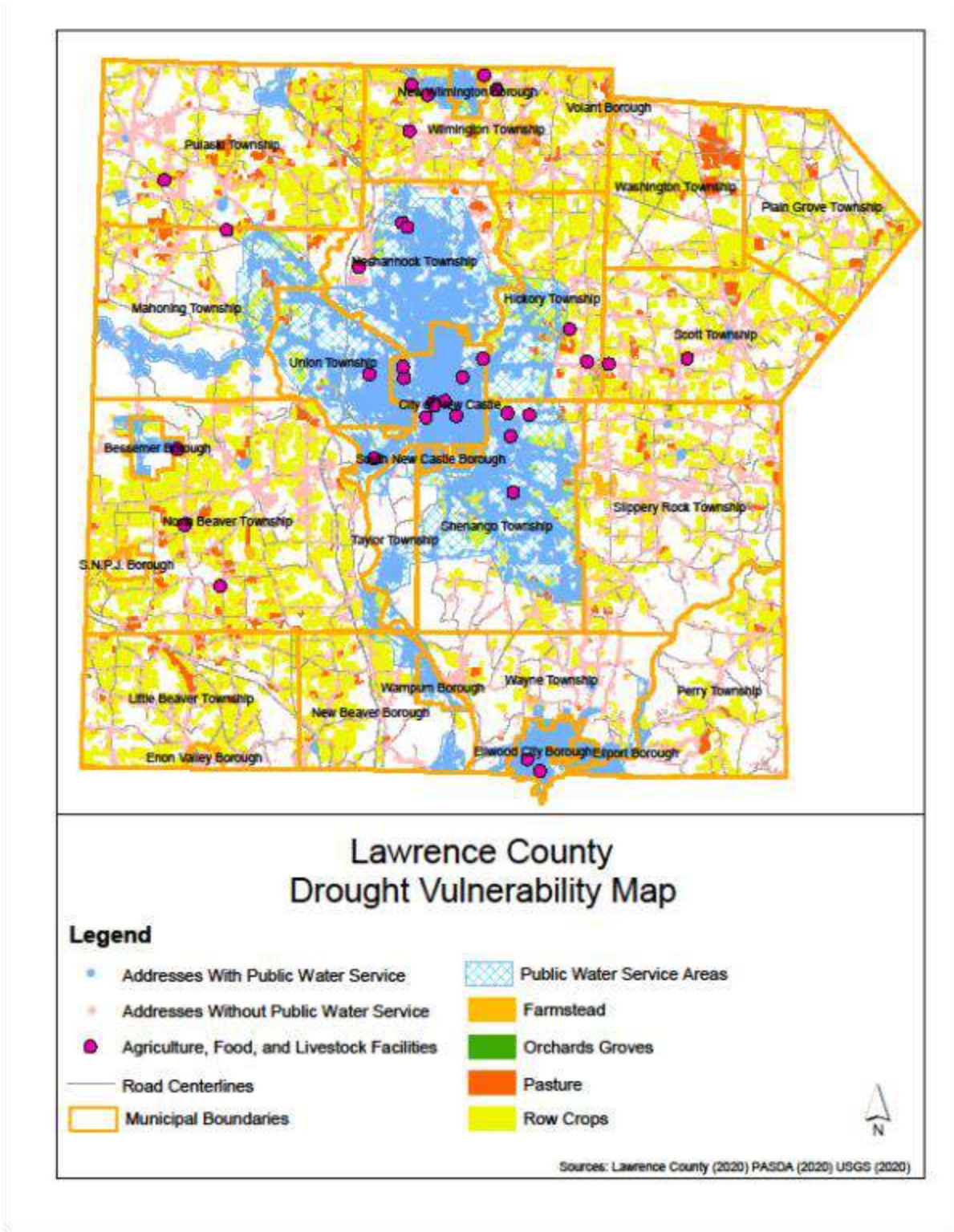
The majority of the county relies on domestic wells for their fresh drinking water. Droughts will quickly affect systems that rely on surface supplies, whereas systems with wells are more capable of handling short-term droughts without issue. Longer-term droughts inhibit the recharging of groundwater aquifers which has an impact on well owners. Depending on the severity of the drought, this could cause the well to dry up, rendering the well owner at a loss for useable water. *Table 12 - Domestic Wells Per Municipality in Lawrence County* shows the number of wells in each municipality in Lawrence County. Well data was gathered from the Pennsylvania Groundwater Information System (PaGWIS), which relies on voluntary submissions by well drillers. While this is the best dataset of domestic wells available for Lawrence County, it is not comprehensive due to the voluntary nature of the data submission. The PAGWIS water well data is considered a vastly low estimate of the number of wells throughout Lawrence County, meaning the threat that drought poses to water supply from groundwater is much greater than the table initially indicates. Some of the wells listed are also for monitoring purposes, which may be tapped to assess vulnerability in real time.

Compared to the information reported in the previous hazard mitigation plan, there has been a significant increase in the number of domestic water wells throughout the county despite a slight population decrease. An explosion of drilled domestic wells occurred in the municipalities of North Beaver, Pulaski, Shenango and Slippery Rock townships. Considering the vulnerability of domestic wells to drought, their increased prevalence suggests an increase in drought vulnerability for the more rural regions of Lawrence County. Through 2017, the USGS has conducted many baseline water quality studies throughout Pennsylvania, but one for Lawrence County has not yet been completed. The studies comprise a useful reference to get a

general sense of the water quality and challenges associated with domestic water wells in the Commonwealth.

The EPA provides a guide published in October 2017 for water utilities to aid in drought response and recovery. The guide outlines what goes into a good drought response plan, how to manage water supply and demand during a drought, best practices for communication and partnerships with other local utilities. It also provides case studies to discuss examples of drought management practices (EPA, 2017).

Figure 13 - Lawrence County Drought Vulnerability Map



As shown, public water service is not available to most regions of the county. Residents or water authorities that use private domestic wells are more vulnerable to droughts because their drinking water can literally dry up. *Table 12 - Domestic Wells Per Municipality in Lawrence County* shows the number of domestic wells per municipality. There are a total of 6,298 domestic wells in the county. It is important to note that the well data was obtained from the Pennsylvania Groundwater Information System (PaGWIS). PaGWIS relies on voluntary submissions of well record data by well drillers; as a result, it is not a complete database of all domestic wells in the county. This is the most complete dataset of domestic wells available.

Table 12 - Domestic Wells Per Municipality in Lawrence County

Domestic Wells Per Municipality in Lawrence County	
MUNICIPALITY	**DOMESTIC WELLS**
City of New Castle	181
Bessemer Borough	12
Ellport Borough	0
Ellwood City Borough	30
Enon Valley Borough	30
Fulton Township	1
New Beaver Borough	195
New Wilmington Borough	52
S.N.P.J. Borough	1*
South New Castle Borough	5
Volant Borough	6*
Wampum Borough	10
Hickory Township	296
Little Beaver Township	283
Mahoning Township	320
Neshannock Township	336
North Beaver Township	739
Perry Township	226
Plain Grove Township	187
Pulaski Township	477
Scott Township	384
Shenango Township	583
Slippery Rock Township	579
Taylor Township	26
Union Township	147
Washington Township	155
Wayne Township	344
Wilmington Township	360
No Municipality Listed	232
Listed as UNKNOWN	90
TOTAL	**6,298 (4,076 2015 Plan)**
*Source: Pennsylvania Groundwater Information System (*not listed)*	

4.3.2. Earthquake

4.3.2.1 Location and Extent

An earthquake is sudden movement of the earth's surface caused by the release of stress accumulated within or along the edge off the earth's tectonic plates, a volcanic eruption, or by a human induced explosion (DCNR, 2007). Earthquake events in Pennsylvania, including Lawrence County, are usually mild events, impacting areas no greater than sixty-two miles in diameter from the epicenter. A majority of earthquakes occur along boundaries between tectonic plates, and some earthquakes occur at faults on the interior of plates. Today, Eastern North America, including Lawrence County, Pennsylvania, is far from the nearest plate boundary. That plate boundary is the Mid-Atlantic Ridge and is approximately 2,000 miles to the east. The Ramapo Fault System runs through New York, New Jersey and eastern Pennsylvania (See *Figure 14 - Ramapo Fault System*). This fault system is associated with some small earthquakes, and it is thought unlikely to produce large earthquakes.

When the supercontinent of Pangaea broke apart about 200 million years ago, the Atlantic Ocean began to form. Since then, many faults have developed. Locating all of the faults would be an idealistic approach to identifying the region's earthquake hazard; however, many of the fault lines in this region have no seismicity associated with them. The best way to determine earthquake history for Lawrence County is to conduct a probabilistic earthquake-hazard analysis with the earthquakes that have already happened in and around the county (See *Figure 15 - Earthquake Hazard Zones*).

Natural gas extraction of the Marcellus/Utica Shale formation is possible in Lawrence County. Hydraulic fracturing or fracking is used to extract the gas, and the process is thought to lead to an increase seismic activity (Meyer, 2016).

Figure 14 - Ramapo Fault System

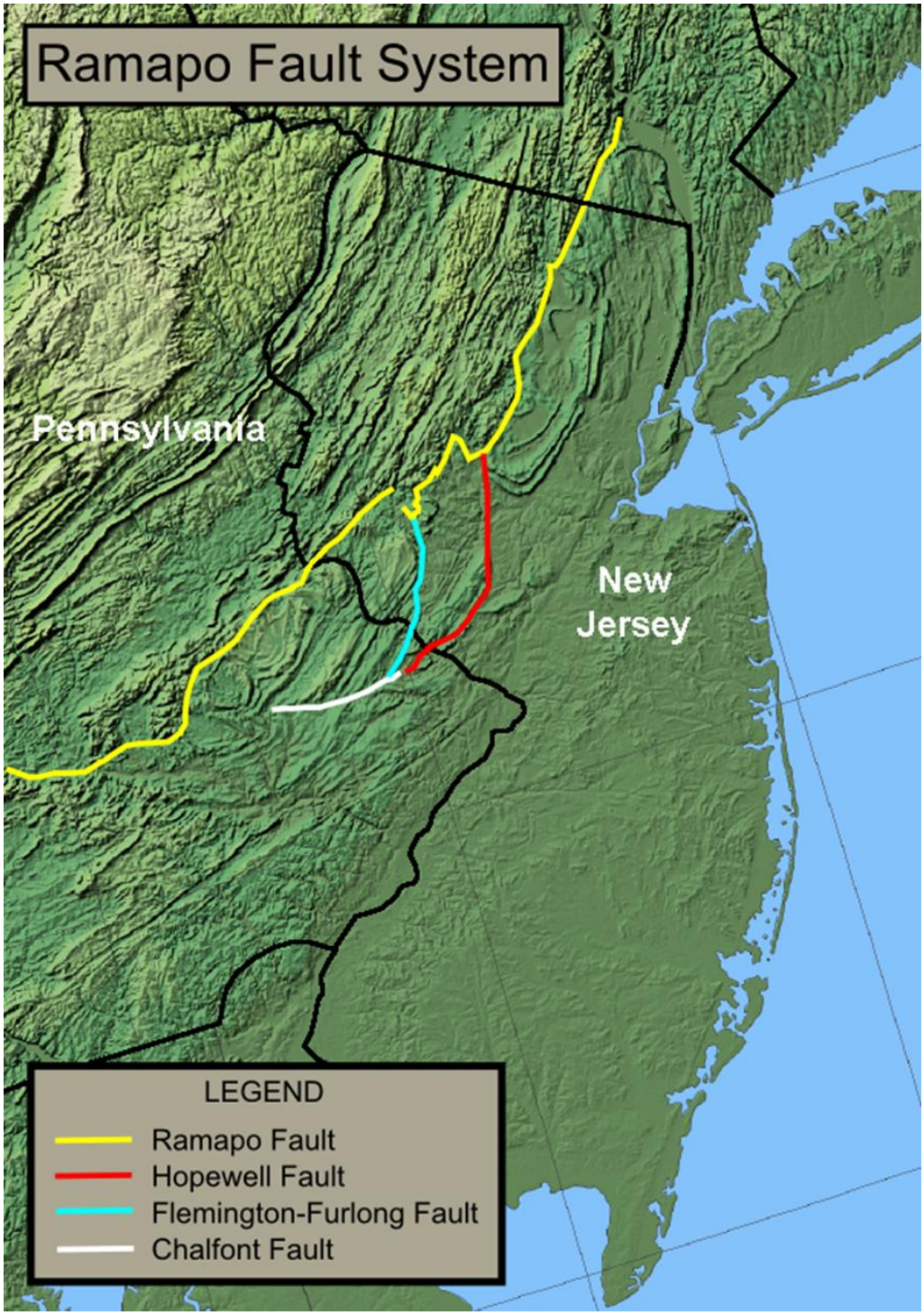
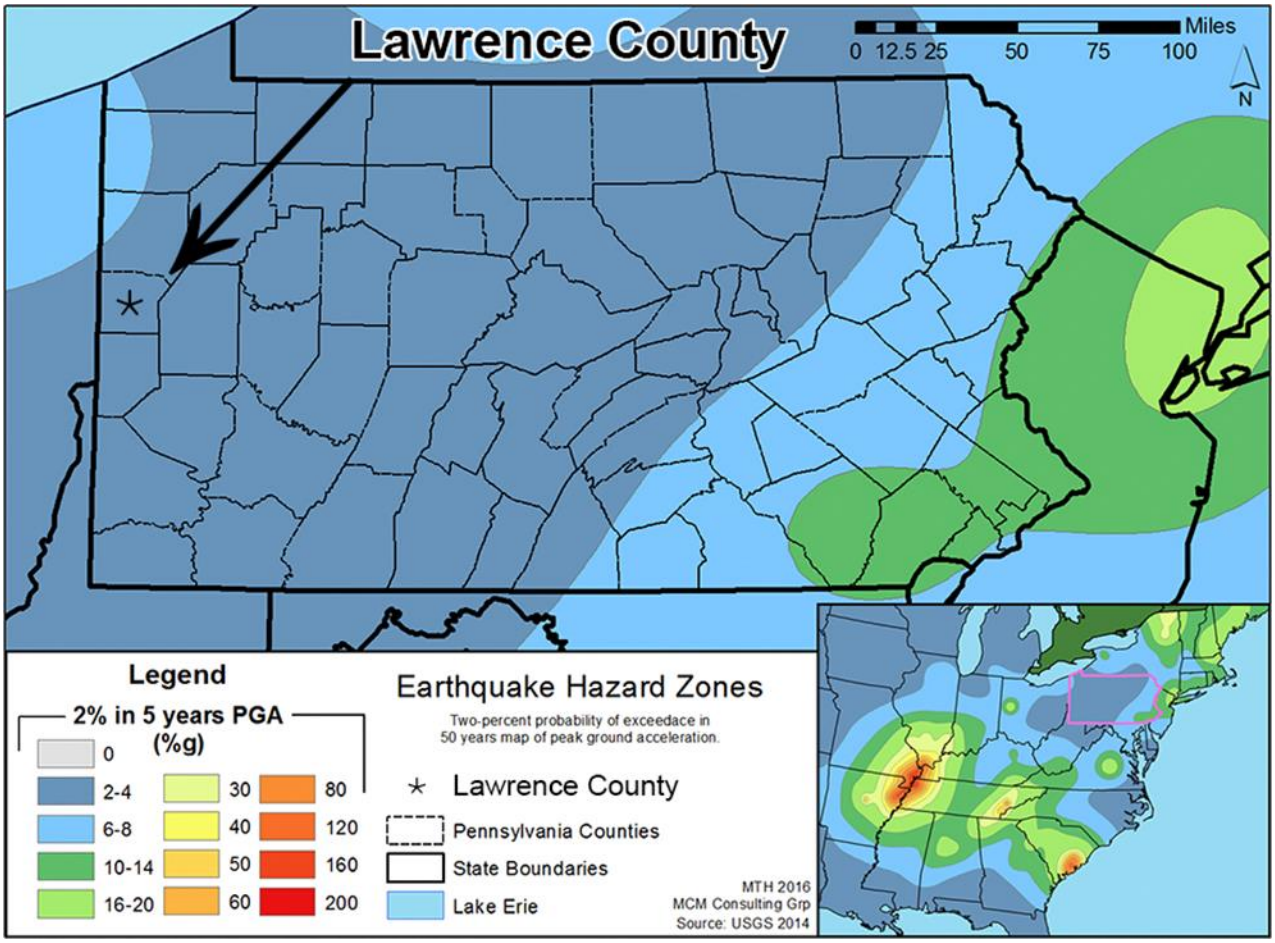


Figure 15 - Earthquake Hazard Zones



4.3.2.2 Range of Magnitude

Earthquakes result in the propagation of seismic waves, which are detected using seismographs. These seismograph results are measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake. *Table 13 - Richter Scale* summarizes Richter Scale magnitudes as they relate to the spatial extent of impacted areas. The Modified Mercalli Intensity Scale (*Table 14 - Modified Mercalli Intensity Scale*) is an alternative measure of earthquake intensity that is broken down by the impacts of the earthquake event. Earthquakes have many secondary impacts, including disrupting critical facilities, transportation routes, public water supplies and other utilities.

Table 13 - Richter Scale

Richter Magnitude	Earthquake Effects
Less than 3.5	Generally, not felt, but recorded.
3.5-5.4	Often felt, but rarely causes damage.

Richter Magnitude	Earthquake Effects
Under 6.0	At most, slight damage to well-designed buildings; can cause major damage to poorly constructed buildings over small regions.
6.1-6.9	Can be destructive in areas where people live up to about 100 kilometers across.
7.0-7.9	Major earthquake; can cause serious damage over large areas.
8.0 or greater	Great earthquake; can cause serious damage in areas several hundred kilometers across.

Table 14 - Modified Mercalli Intensity Scale

Scale	Intensity	Earthquake Effects	Richter Scale Magnitude
I	Instrumental	Detected only on seismographs	<4.2
II	Feeble	Some people feel it	
III	Slight	Felt by people resting; like a truck rumbling by	
IV	Moderate	Felt by people walking	
V	Slightly Strong	Sleepers awake; church bells ring	<4.8
VI	Strong	Trees sway; suspended objects swing; objects fall off shelves	<5.4
VII	Very Strong	Mild alarm, walls crack, plaster falls	<6.1
VIII	Destructive	Moving cars uncontrollable, masonry fractures, poorly constructed buildings damaged	<6.9
IX	Ruinous	Some houses collapse, ground cracks, pipes break open	
X	Disastrous	Ground cracks profusely, many buildings destroyed, liquefaction and landslides widespread	<7.3
XI	Very Disastrous	Most buildings and bridges collapse, roads, railways, pipes and cables destroyed, general triggering of other hazards	<8.1
XII	Catastrophic	Total destruction, trees fall, ground rises and falls in waves	>8.1

The strongest recorded earthquake in Pennsylvania was a magnitude 5.1 on the Richter Scale, so it could be expected that effects of such an event could be felt in Lawrence County from earthquake events that happen around the Commonwealth.

4.3.2.3 Past Occurrence

There have been no recorded earthquakes occurring in Lawrence County, however on December 31, 2011 a 4.0 earthquake occurred around Youngstown, Ohio; August 23, 2011 a 5.9 earthquake occurred in Virginia and in January 2007, a 2.5 earthquake occurred just north of Meadville. Parts of the county experienced some of the shock waves from these minor earthquakes that have occurred around the region. Tremors were also felt from earthquakes in Ontario Canada on June 23, 2011 and McDonald, Ohio on December 31, 2011.

4.3.2.4 Future Occurrence

Earthquake activity and intensities are difficult to predict, but a probabilistic analysis of prior earthquakes can assist in gauging the likelihood of future occurrences. *Figure 15 - Earthquake Hazard Zones* shows that Lawrence County is in the lowest non-zero hazard zone for earthquake activity according to the USGS

(2014), suggesting a low probability of earthquake occurrence. However, according to the USGS, there has been a recent trend increasing the frequency of magnitude 3 and larger earthquakes in the central and eastern US (*Table 15 - Recent Earthquake Trends in Central and Eastern United States*). This uptick in seismicity is considered to be due to hydraulic fracturing activities, and specifically occurs as a result of wastewater from the fracking process being injected into the earth (Meyer, 2016). Recent studies have moved towards being able to predict such induced seismicity by looking at uplift after injections, but more work needs to be done to confirm uplift as a reliable indicator of induced seismicity (Shirzaei et al., 2016). As of August 2017, Lawrence County has fifty-two active wells. It is important to note that seismicity can occur even after wells become inactive and injections rates decline (Shirzaei et al., 2016).

Isostatic Rebound is a hypothesis for earthquake occurrence that has been kicked around for a lot of years, according to Charles Scharnberger, a retired professor of geology at Millersville University, who monitors the seismic station there. Scharnberger said Pennsylvania earthquakes are more of a mystery but could have something to do with the westward shift of the North American tectonic plate. Though the plates meet in California, where most of the seismic activity occurs, that movement still causes stress, squeezing and pressure along the entire length of the plate, reverberating as far back as the East Coast. A 3.4 earthquake like the one in Mifflintown, Juniata County in 2019 is in the medium range for Pennsylvania and may occur every couple of years. According to the USGS, this was the strongest earthquake felt or originating in Pennsylvania last year. It was followed by a 1.3 aftershock.

The chances of a devastating earthquake here are low, but Scharnberger said it's not impossible. His calculations on the probability of that happening based on the historic record indicate it's about a 1 in 200 chance in any given year.

Table 15 - Recent Earthquake Trends in Central and Eastern United States

Earthquake Trends in Central and Eastern U.S. *(USGS, 2016)*	
Year	**Number of M3+ Earthquakes (average per year)**
1973-2008	21
2009-2013	99
2014	659
2015	1000+

4.3.2.5 Vulnerability Assessment

According to the U.S. Geological Society Earthquake Hazards Program, an earthquake hazard is anything associated with an earthquake that may affect a resident's normal activities. For Lawrence County, this could include surface faulting, ground shaking, landslides, liquefaction, tectonic deformation, and seiches (sloshing of a closed body of water from earthquake shaking).

Earthquakes usually occur without warning and can impact areas a great distance from their point of origin (epicenter). Ground shaking is the greatest risk to building damage within Lawrence County. Risk to public safety and loss of life from an earthquake is dependent upon the severity of the event. Injury or death to

those inside buildings, or people walking below building ornamentation and chimneys is a higher risk to Lawrence County's general public during an earthquake.

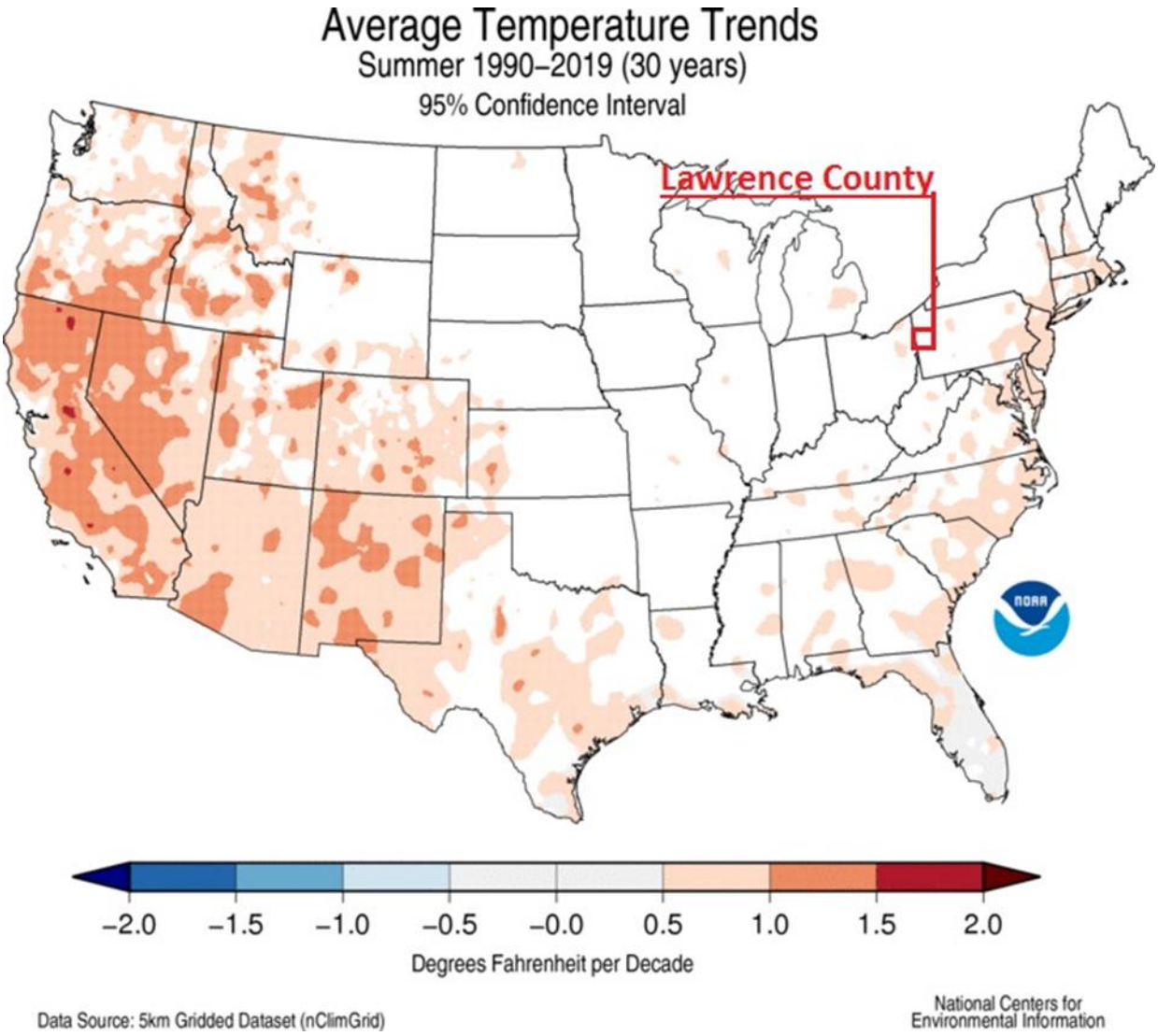
While historically the risk of earthquakes in southwestern Pennsylvania is low (See *Figure 15 - Earthquake Hazard Zones*), the uptick in seismicity due to hydraulic fracturing increases the likelihood of Lawrence County experiencing a damaging earthquake. Marcellus shale exploration for natural gas is widespread throughout Pennsylvania and is moderate in Lawrence County, meaning there has been moderate hydraulic fracturing. Considering the current knowledge of increased seismicity due to hydraulic fracturing, and the recent trends in Pennsylvania, Lawrence County could expect to experience more magnitude 2 and larger earthquakes. Increased seismic activity is expected to last even after hydraulic fracturing stops, so the increased seismic risk should be expected to last well into the future. This induced seismicity is dependent on local conditions, and the impacts of hydraulic fracturing on earthquakes is variable geographically (Van der Baan & Calixto, 2017). While seismicity is likely to increase, it is thought that regions that before were relatively inactive seismically will not experience uncharacteristically catastrophic earthquakes due to hydraulic fracturing (Zhao et al., 2018).

4.3.3. Extreme Temperatures

4.3.3.1 Location and Extent

Extreme temperatures can be devastating – extreme heat can cause sunburn, heat cramps, heat exhaustion, heat stroke, and dehydration, while extreme cold can cause hypothermia and frostbite. Both can potentially cause long-lasting disabilities. July has typically been the warmest month for Lawrence County, with normal temperatures ranging from low to mid 70s. January is typically the coldest month for Lawrence, with normal temperatures ranging from teens to upper 20s. Temperatures can vary across Lawrence County due to elevation changes in topography. Data shows that Lawrence County is experiencing an increase in average temperatures of 2.9°F since records began in 1900.

Figure 16 - Average Maximum Temperature Trends



4.3.3.2 Range of Magnitude

When extreme temperature events occur, they typically impact the entirety of Lawrence County, including the surrounding region. Extreme heat is described as temperatures that hover at least 10ºF above the average high temperature for a region during the summer months. Extreme heat is responsible for more deaths in Pennsylvania than all other natural disasters combined. The apparent temperature of the air increases as relative humidity increases, and the National Weather Service created a Heat Index chart (*Figure 17 - National Weather Service Heat Index*) which shows the likelihood of heat disorders relative to the temperature and relative humidity. Heat Advisories are issued when the heat index temperature is expected to be equal to 100°F or higher for two consecutive days. Excessive Heat Watches are issued when there is a possibility that excessive heat warning criteria may be experienced within twenty-four to seventy-two hours, but their occurrence and timing are still uncertain. Excessive Heat Warnings are issued within twelve hours of the onset of extremely dangerous heat conditions when the maximum heat index temperature is expected to be

105°F or higher for at least two days and night-time air temperatures will not drop below 75°F. (NOAA NWS, 2020). A potential worst-case extreme temperature scenario would be if widespread areas of the Commonwealth experienced 90°F or higher temperatures for an extended number of days. The heat could overwhelm the power grid and cause widespread blackouts, cutting off vital HVAC services for residents. It could create crisis management issues for senior citizens on fixed incomes and the homeless population.

Extreme cold temperatures drop well below typical temperatures and are often associated with winter storm events. Wind can make the apparent temperature drop further, and exposure to such extreme cold temperatures can cause hypothermia, frost bite and death. The National Weather Service created a wind chill chart (*Figure 18 - National Weather Service Wind Chill*) which shows the time frostbite takes to set in depending on temperature and wind speed. Wind Chill Warnings are issued when wind chills drop to -25°F or lower. Wind Chill Advisories are issued in the southeast and western sections of Pennsylvania when wind chill values drop to -10°F to -24°F. Wind chill advisories are issued in the south central to northern sections of the Commonwealth when wind chills drop to -15°F to -24°F (NOAA NWS, 2010).

Figure 17 - National Weather Service Heat Index

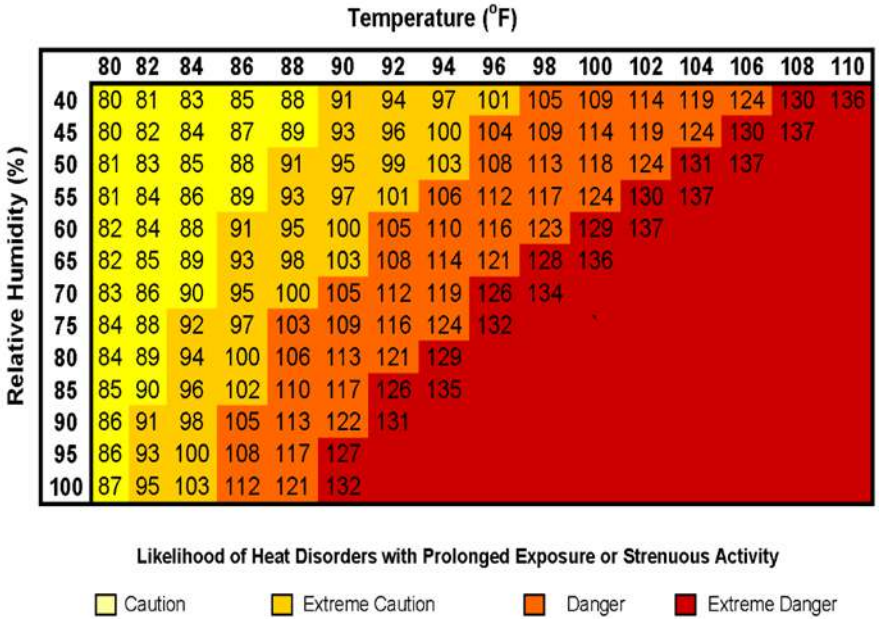
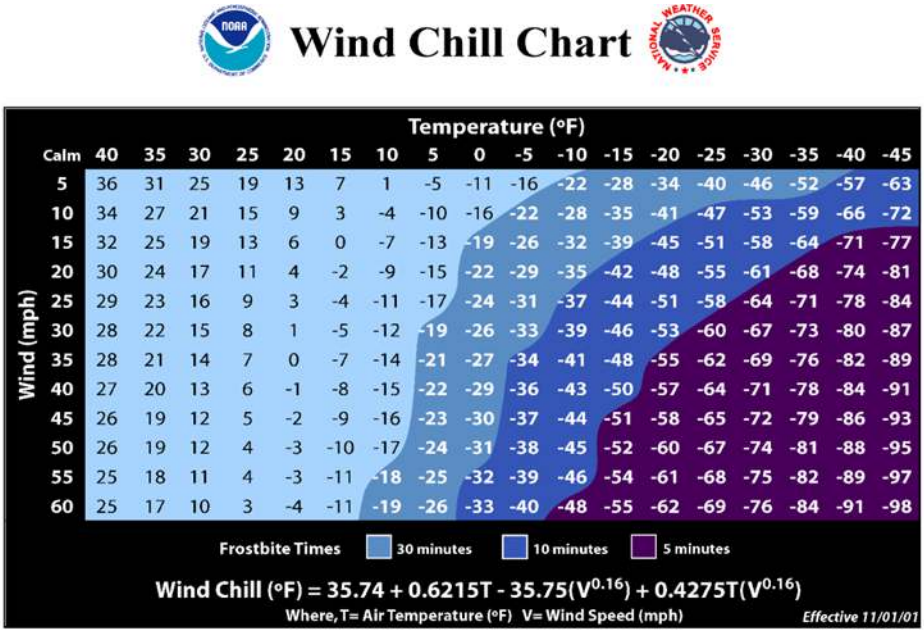


Figure 18 - National Weather Service Wind Chill



4.3.3.3 Past Occurrence

Lawrence County experiences extreme heat commonly during the summer months. Between 1960 and 2020, the highest recorded temperatures in the county were in 1988: 103°F (July 7); 101°F (July 16); and, 100°F (August 17). There was also a 100°F degree day recorded in 1995 (July 15).

In January 1994, an arctic air mass caused temperatures to plunge 20°F - 40°F below normal. The ambient air temperatures fell below zero for the overnight low. In Lawrence County, a seventy-year-old New Castle woman was found frozen to death on her porch. Hospitals area-wide reported numerous cases of frostbite, hypothermia, and heart attacks from the extreme cold. *Table 16 - Extreme Temperature Occurrences* summarizes the extreme temperature occurrences since 1988.

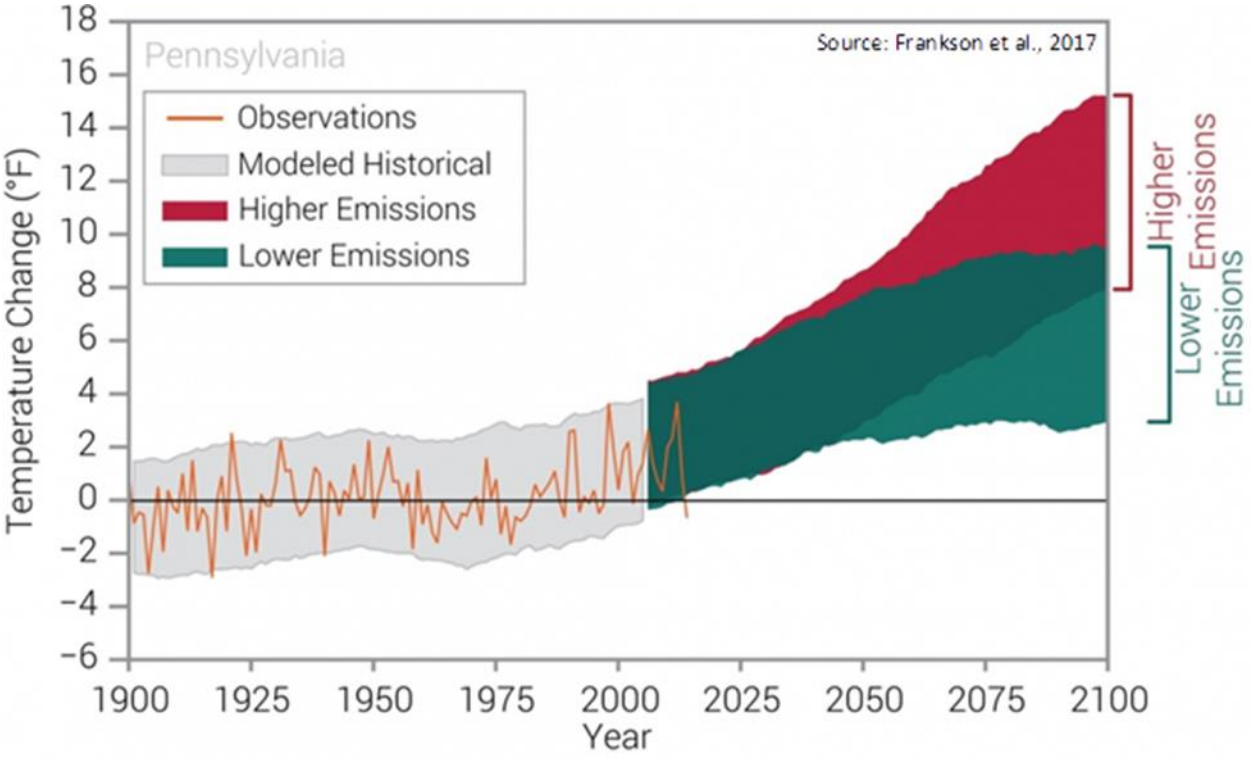
Table 16 - Extreme Temperature Occurrences

Why Identified	Past Occurrences (*NCEI, 2020*)
Extreme heat is responsible for more fatalities than all other hazards combined: about 50 fatalities a year in Pennsylvania. Extreme cold can cause serious human and pet health hazards in minutes; homeless populations are highly vulnerable.	**Extreme Heat** Highest temperatures on record (1960 - 2020): July 16, 1988 (103°F) July 7, 1988 (101°F) August 17, 1988 (100°F) July 15,1995 (100°F) **Extreme Cold** January 1994 -22°F at Pittsburgh International Airport January 1, 2014 Arctic Cold Front -13°F, wind chill -36°F at New Castle Airport 2/15/15 – Arctic Cold Front -16°F, -25°F wind chill at New Castle 2/20/15 – Low temp -20°F at New Castle 2/24/15 – Low temp -24°F at Elwood City 1/30/19 – Arctic Cold Front -26°F, -30°F wind chill at New Castle

4.3.3.4 Future Occurrence

Extreme temperatures will continue to impact Lawrence County. Anthropogenic climate change is causing extreme climatic events to occur more frequently, suggesting that extreme temperatures are becoming a more threatening hazard as the impacts of climate change intensify. The annual average temperature has increased by 1.2˚F across the continental United States during the years 1986 to 2016 compared to the time period 1901 to 1960 and temperatures are expected to continue rising (Vose et al., 2017). *Figure 19 - Observed and Projected Temperature Change* shows these projected changes in temperature for Pennsylvania based on climate models considering the possibilities of increased and decreased levels of greenhouse gas emissions (Frankson et al., 2017). In recent years, record high temperatures have outnumbered record low temperatures 2:1 (Meehl et al., 2009; Vose et al., 2017) so it is expected that the risk of extreme heat will be amplified whereas the risk of extreme cold will be attenuated. The Northeastern United States is expected to experience 20-30 more days with temperatures above 90˚F, and 20-30 fewer days below freezing by approximately 2050 (Vose et al., 2017). While there may be fewer extreme cold events, those that do occur are expected to more often reach record-setting low temperatures (Vose et al., 2017). Historically, Lawrence County has had more extreme cold events than extreme heat due to the geographic location of the county; however, this balance is expected to shift somewhat in the coming years to include a greater proportion of extreme heat events.

Figure 19 - Observed and Projected Temperature Change



4.3.3.5 Vulnerability Assessment

Extreme temperatures are usually a regional hazard when they occur. The very old and the very young (22% and 5.2% of the county's population as of July 2019, respectively) are most vulnerable to extreme temperatures due to risk factors, mobility challenges and disabilities (United States Census Bureau, Quick Facts).

Extreme temperatures can increase the demand for utility services, often resulting in an increased cost to consumers. The increased expense can make it difficult for the consumer to afford the service. The increased demand for services may cause a decrease in availability of these services or failure of the system. A decrease or failure of the utility system during extreme temperature events puts a large population at great risk. Extreme temperature events can also drastically increase the volume of emergency calls, potentially overwhelming the public safety answering point. Extreme heat events can also contribute to drought conditions, which in turn increase the risk of wildfires.

4.3.4. Flood, Flash Flood and Ice Jams

4.3.4.1 Location and Extent

Flooding is the temporary condition of partial or complete inundation on normally dry land and it is the most frequent and costly of all hazards in Pennsylvania. Flooding events are generally the result of excessive precipitation. General flooding is typically experienced when precipitation occurs over a given river basin for an extended period. Flash flooding is usually a result of heavy localized precipitation falling in a short time period over a given location, often along mountain streams and in urban areas where much of the ground is covered by impervious surfaces. Flash floods are the most common type of flooding in Lawrence County. The severity of a flood event is dependent upon a combination of creek, stream and river basin topography and physiography, hydrology, precipitation and weather patterns, present soil moisture conditions, the degree of vegetative clearing as well as the presence of impervious surfaces in and around flood-prone areas.

Most of Lawrence County's municipalities are flood prone. Flood problems exist mostly in Shenango, Wilmington, Slippery Rock, Neshannock, and Pulaski Townships, and the City of New Castle. Municipal maps showing the special flood hazard area are in Appendix D. The Shenango and Neshannock Rivers flow through the City of New Castle and are subject to flooding. Flooding occurs on an unnamed tributary of the Little Beaver Creek in the vicinity of Vine Street in Enon Valley Borough. The Lakewood and Neshannock Falls areas of Hickory Township have been affected by flooding in the past and continue to pose a threat to the area. Some areas of Little Beaver Township are prone to flooding. However, only a small area of the population is directly affected.

Winter flooding can include ice jams which occur when warm temperatures and heavy rain cause snow to melt rapidly. Snow melt combined with heavy rains can cause frozen rivers to swell, which breaks the ice layer on top of a river. The ice layer often then breaks into large chunks, which float downstream, piling up in narrow passages and near other obstructions such as bridges and dams. All forms of flooding can damage infrastructure.

Floodplains are lowlands adjacent to rivers, streams and creeks that are subject to recurring floods. The size of the floodplain is described by the recurrence interval of a given flood. Flood recurrence intervals are explained in more detail in Section 4.3.4.4. However, in assessing the potential spatial extent of flooding, it is important to know that a floodplain associated with a flood that has a ten percent chance of occurring in a given year is smaller than the floodplain associated with a flood that has a 0.2 percent annual chance of occurring. The National Flood Insurance Program (NFIP) publishes digital flood insurance rate maps (DFIRMs). These maps identify the one percent annual chance of flood area. Special flood hazard area (SFHA) and base flood elevations (BFE) are developed from the one percent annual chance flood event, as seen in *Figure 20 - Flooding and Floodplain Diagram*. Structures located in the SFHA have a twenty-six percent chance of flooding in a thirty-year period. The SFHA serves as the primary regulatory boundary

used by FEMA, the Commonwealth of Pennsylvania and Lawrence County local governments. Federal floodplain management regulations and mandatory flood insurance purchase requirements apply to the following high-risk special flood hazard areas in *Table 17 - Flood Hazard High Risk Zones*. Appendix D of this hazard mitigation plan includes a flooding vulnerability map for each municipality in Lawrence County with vulnerable structures and functional needs facilities identified using the most current DFIRM data for Lawrence County dated January 18, 2012.

Past flooding events have been primarily caused by heavy rains which cause small creeks and streams to overflow their banks, often leading to road closures. Flooding poses a threat to functional needs facilities, agricultural areas, and those who reside or conduct business in the floodplain. The most significant hazard exists for facilities in the floodplain that process, use and/or store hazardous materials. A flood could potentially release and transport hazardous materials out of these areas. As the water recedes it would spread the hazardous materials throughout the area. Most flood damage to property and structures located in the floodplain is caused by water exposure to the interior, high velocity water and debris flow.

Figure 20 - Flooding and Floodplain Diagram

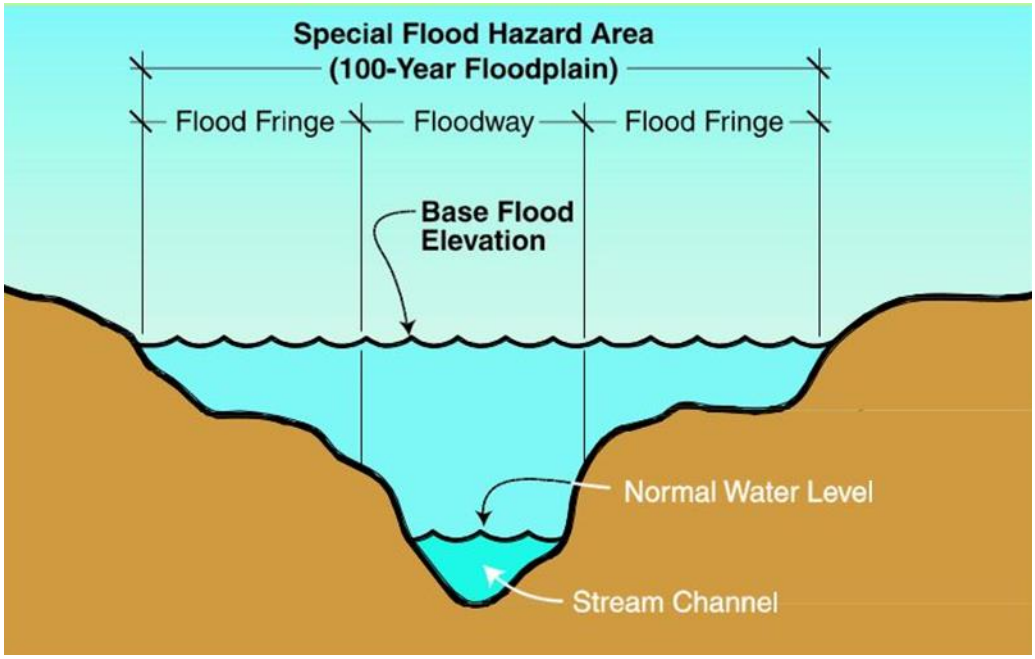


Table 17 - Flood Hazard High Risk Zones

Flood Hazard High Risk Zones *(FEMA, 2017)*	
Zone	**Description**
A	Areas subject to inundation by the 1% annual chance flood event. Because detailed hydraulic analysis have not been performed, no base flood elevations or flood depths are shown
AE	Areas subject to inundation by the 1% annual chance flood event determined by detailed methods. BFEs are shown within these zones.

Flood Hazard High Risk Zones *(FEMA, 2017)*	
Zone	**Description**
AH	Areas subject to inundation by the 1% annual chance shallow flooding (usually areas of ponding) where average depths are 1-3 feet. BFEs derived from detailed hydraulic analysis are shown in this zone.
AO	Areas subject to inundation by the 1% annual chance shallow flooding (usually sheet flow on sloping terrain) where average depths are 1-3 feet. Average flood depths derived from detailed hydraulic analysis are shown within this zone.
AR	Areas that result from the decertification of a previously accredited flood protection system that is determined to be in the process of being restored to provide base flood protection.

4.3.4.2 Range of Magnitude

Several factors determine the severity of floods, including rainfall intensity and duration, topography, ground cover and rate of snowmelt. Water runoff is greater in areas with steep slopes and little to no vegetative ground cover. Urbanization typically results in the replacement of vegetative ground cover with impermeable surfaces like asphalt and concrete, increasing the volume of surface runoff and stormwater, particularly in areas with poorly planned stormwater drainage systems. A large amount of rainfall over a short time span can cause flash floods. Additionally, small amounts of rain can cause floods in locations where the soil is frozen, saturated from a previous wet period, or if the area is rife with impermeable surfaces such as large parking lots, paved roadways and other developed areas. The county occasionally experiences intense rainfall from tropical storms in late summer and early fall which can potentially cause flooding as well.

Severe flooding can cause injuries and deaths and can have long-term impacts on the health and safety of the citizens. Severe flooding can also result in significant property damage, potentially disrupting the regular function of critical facilities and have long-term negative impacts on local economies. Industrial, commercial and public infrastructure facilities can become inundated with flood waters, threatening the continuity of government and business. The functional needs population must be identified and located in flooding situations, as they are often home-bound. Mobile homes are especially vulnerable to high water levels. Flooding can have significant environmental impacts when flood waters release and/or transport hazardous materials and can also result in spreading diseases.

Flash floods can occur very quickly with little warning and can be deadly because of the rapid rises in water levels and devastating flow velocities. The more developed areas in the county can be especially susceptible to flash floods because of the significant presence of impervious surfaces, such as streets, sidewalks, parking lots, and driveways.

Severe flooding also comes with many secondary effects that could have long lasting impacts on the population, economy and infrastructure of Lawrence County. Power failures are the most common secondary effect associated with flooding. Coupled with a shortage of critical services and supplies, power failures could cause a public health emergency. Critical infrastructure, such as sewage and water treatment facilities, can be severely damaged, having a significant effect on public health. High flood waters can cause sewage systems to fail and overflow, contaminating groundwater and drinking water. Flooding also has the potential to trigger other hazards, such as landslides, hazardous material spills and dam failures.

The maximum threat of flooding in Lawrence County is estimated by looking at potential loss data and repetitive loss data, both analyzed in the risk assessment portion of the hazard mitigation plan. In these cases, the severity and frequency of damage can result in permanent population displacement, and businesses may close if they are unable to recover from the disaster.

HAZUS software was used to estimate potential losses from a one-hundred-year flood event, and the full report can be found in Appendix F. Total building related loss from a one-hundred-year flood is expected to be approximately $219.07 million, with $47.08 million of that coming from residential homes. After adjusting for business interruption and extenuating circumstances after a flood event, total economic loss was estimated at $241.34 million. Residential occupancies account for nearly 60.33 million of all flooding related losses as estimated by HAZUS. In total, building and economic loss would 460.41 million.

Although floods can cause deaths, injuries and damage to property, they are naturally occurring events that benefit riparian systems which have not been disrupted by human actions. Such benefits include groundwater recharge and the introduction of nutrient rich sediment which improves soil fertility. However, human development often disrupts natural riparian buffers by changing land use and land cover, and the introduction of chemical or biological contaminants that often accompany human presence can contaminate habitats after flood events. Hazardous materials facilities are potential sources of contamination during flood events.

4.3.4.3 Past Occurrence

Lawrence County has experienced numerous flooding, flash flooding and ice jam flooding events in the past. The flooding and flash flooding were caused by a variety of heavy storms, tropical storms and other issues. A summary of flood event history for Lawrence County from 1994 until June 2019 is found in *Table 18 - Flood Event History*. Details of each event can be found in NOAA's NCEI Storm Events Database.

Table 18 - Flood Event History

Flood Event History *(NOAA, 2019)*			
Location	**Date**	**Type**	**Property Damage Estimate**
Countywide	04/12/94	Flood/Flash Flood	$0*
Bessemer	07/23/94	Flash Flood	$0*
Clover	06/11/95	Flood/Flash Flood	$0*
Clover	06/11/95	Flood/Flash Flood	$0*
New Castle	06/27/95	Flood/Flash Flood	$0*
Bessemer	01/18/96	Flash Flood	$0*
New Castle	01/19/96	Flash Flood	$30,000
Bessemer	02/20/96	Flash Flood	$0*
New Castle	03/19/96	Flash Flood	$20,000
West Pittsburg	03/19/96	Flash Flood	$0*
Nashua	05/11/96	Flash Flood	$8,000
Nashua	05/12/96	Flash Flood	$0*
New Castle	06/22/96	Flash Flood	$0*
Pulaski	12/11/96	Flash Flood	$4,000
PAZ013	09/10/97	Flooding	$4,000

Flood Event History *(NOAA, 2019)*			
Location	**Date**	**Type**	**Property Damage Estimate**
Countywide	01/23/99	Flooding	$0*
Countywide	07/28/99	Flash Flood	$250,000
Princeton	07/29/99	Flash Flood	$0*
New Castle	08/23/00	Flooding	$1,000
West Pittsburg	04/07/01	Flooding	$0*
PAZ013	04/14/02	Flooding	$5,000
New Castle	06/13/03	Flash Flood	$0*
New Castle	07/04/03	Flash Flood	$0*
New Castle	07/04/03	Flash Flood	$0*
New Castle	07/22/03	Flash Flood	$0*
Hillsville	07/22/03	Flash Flood	$0*
PAZ013	07/23/03	Flooding	$0*
New Castle	07/27/03	Flash Flood	$0*
PAZ013	07/28/03	Flooding	$0*
New Castle	08/07/03	Flash Flood	$20,000
New Castle	08/09/03	Flash Flood	$0*
New Castle	08/26/03	Flash Flood	$10,000
New Castle	09/01/03	Flash Flood	$0*
Neshannock Falls	09/01/03	Flash Flood	$90,000
New Castle	09/03/03	Flash Flood	$0*
New Castle	11/19/03	Flash Flood	$0*
PAZ013	01/04/04	Flooding	$0*
Ellwood City	05/22/04	Flash Flood	$0*
PAZ013	05/22/04	Flooding	$5,000
New Wilmington	08/28/04	Flash Flood	$10,000
PAZ013	09/08/04	Flooding	$40,000
PAZ013	09/17/04	Flooding	$265,000
PAZ013	01/06/05	Flooding	$0*
Volant	06/22/06	Flash Flood	$0*
New Castle	07/30/06	Flash Flood	$60,000
New Castle	07/31/06	Flash Flood	$0*
Ellwood City	08/20/07	Flash Flood	$75,000
New Castle	08/20/07	Flash Flood	$75,000
Mahoningtown	08/20/07	Flash Flood	$75,000
Ellwood City	02/06/08	Flooding	$10,000
Coverts	03/19/08	Flooding	$5,000
New Castle	05/31/08	Flooding	$10,000
Neshannock Falls	02/08/09	Flooding	$50,000

Flood Event History *(NOAA, 2019)*			
Location	**Date**	**Type**	**Property Damage Estimate**
Harlansburg	02/09/09	Flooding	$25,000
Ellwood City	12/01/10	Flooding	$50,000
Energy	02/28/11	Flooding	$75,000
Nashau	02/28/11	Flooding	$25,000
New Castle	07/10/13	Flash Flood	$10,000
Ellwood City	07/10/13	Flash Flood	$5,000
New Castle	07/10/13	Flash Flood	$75,000
Mahoning	07/10/13	Flash Flood	$35,000
Plain Grove	06/25/14	Flooding	$5,000
Possum Hollow	06/15/15	Flash Flood	$5,000
New Castle	06/23/15	Flash Flood	$5,000
Harbor Bridge	06/23/15	Flooding	$2,000
East New Castle	06/23/15	Flash Flood	$10,000
Edinburg	01/12/17	Flash Flood	$5,000
New Castle	01/12/17	Flooding	$10,000
Coverts	01/12/17	Flooding	$10,000
Duck Run	06/13/17	Flash Flood	$1,000
Leesburg	02/15/18	Flooding	$0*
New Castle	09/09/18	Flooding	$1,000
Irish Ripple	09/09/18	Flooding	$1,000
Eastbrook	09/10/18	Flooding	$0*
Edinburg	05/28/19	Flash Flood	$10,000
Ellwood City	05/28/19	Flash Flood	$10,000
Ellwood City	06/19/19	Flash Flood	$0*
Bessemer	06/27/19	Flash Flood	$0*
Walmo	06/27/19	Flash Flood	$0*
Parkstown	06/27/19	Flash Flood	$0*
Coverts	06/28/19	Flash Flood	$0*
Parkstown	06/28/19	Flash Flood	$0*
Edinburg	06/28/19	Flash Flood	$0*
** Indicates insufficient data*			
Total			**$1,782,000**

The National Flood Insurance Program identifies properties that frequently experience flooding. Repetitive loss properties are structures insured under the NFIP which have had at least two paid flood losses of more than $1,000 over any ten-year period since 1978. The hazard mitigation assistance (HMA) definition of a repetitive loss property is a structure covered by a contract for flood insurance made available under the NFIP that has incurred flood-related damage on two occasions, in which the cost of the repair, on the

average, equaled or exceeded twenty-five percent of the market value of the structure at the time of each such flood event; and at the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage.

A property is considered a severe repetitive loss property either when there are at least four losses each exceeding $5,000 or when there are two or more losses where the building payments exceed the property value. There are sixteen repetitive loss properties in Lawrence County. This is an increase from 2015 when there were no repetitive loss properties listed.

Most municipalities in Lawrence County participate in the NFIP except for New Wilmington Borough, and S.N.P.J. Borough. Information on each participating municipality is in *Table 20 - Municipal NFIP Policies & Vulnerability*.

Table 19 - Repetitive Loss Properties

Repetitive Loss Properties *(PEMA, 2018)*					
Community Name	**Comm. Num.**	**Building Payments**	**Contents Payments**	**Losses**	**Properties**
City of New Castle	420568	$73,634.11	$8.940.78	14	5
Hickory Township	421792	$14,040.98	$.00	2	1
Mahoning Township	421793	$109,838.59	$.00	5	2
Neshannock Township	421794	$7,613.66	$.00	2	1
New Beaver Borough	422465	$3,921.24	$11,071.81	2	1
Scott Township	421799	63,667.06	$19,643.23	5	2
Shenango Township	421029	10,896.55	$.00	2	1
Wilmington Township	421802	49,512.88	$.00	6	3
Totals		**$333,125.07**	**$30,715.04**	**38**	**16**

Table 20 - Municipal NFIP Policies & Vulnerability

Municipal NFIP Policies & Vulnerability *(PEMA, 2018; Lawrence Co. GIS, 2019)*					
Community Name	**Comm Num.**	**Contract Count**	**Policy Count**	**Total Coverage**	**Premium + Police Fee**
City of New Castle	420568	122	122	$20,617,500	$288,808
Bessemer Borough	422627	2	2	$116,800	$1,600
Ellport Borough	422462	2	2	$315,000	$655
Ellwood City Borough	420567	6	6	$828,000	$2,346
Enon Valley Borough	422463	2	2	$165,000	$2,587
Hickory Township	421792	12	12	$1,548,700	$12,598
Little Beaver Township	422464	8	8	$1,208,300	$8,292
Mahoning Township	421793	9	9	$530,400	$6,502
Neshannock Township	421794	10	10	$2,428,600	$9,324
New Beaver Borough	422465	2	2	$82,800	$2,828
New Wilmington Borough	N/A	N/A	N/A	N/A	N/A

Municipal NFIP Policies & Vulnerability *(PEMA, 2018; Lawrence Co. GIS, 2019)*					
Community Name	**Comm Num.**	**Contract Count**	**Policy Count**	**Total Coverage**	**Premium + Police Fee**
North Beaver Township	421795	6	6	$1,100,100	$4,432
Perry Township	421796	2	2	$251,000	$1,065
Plain Grove Township	421797	2	2	$518,000	$1,282
Pulaski Township	421798	4	4	$430,000	$4,826
Scott Township	421799	9	9	$1,307,300	$8,449
Shenango Township	421029	15	15	$4,136,800	$15,202
Slippery Rock Township	422466	1	1	$85,000	$887
S.N.P.J Borough	N/A	N/A	N/A	N/A	N/A
South New Castle Borough	422467	2	2	$70,000	$372
Taylor Township	421800	1	1	$280,000	$418
Union Township	421801	3	3	$1,360,000	$2,291
Volant Borough	421790	2	2	$813,600	$7,667
Wampum Borough	421791	6	6	$755,000	$5,109
Washington Township	421816	9	9	$1,898,100	$9,429
Wayne Township	421679	13	13	$1,404,000	$11,695
Wilmington Township	421802	12	12	$2,410,700	$10,779
Total		**262**	**262**	**$44,660,700**	**$419,443**

4.3.4.4 Future Occurrence

Flooding is a frequent problem throughout Pennsylvania. Lawrence County will certainly be impacted by flooding events in the future – Lawrence County experiences some degree of flooding annually. The threat of flooding is compounded in the late winter and early spring months, as melting snow can overflow streams, creeks and tributaries, increasing the amount of groundwater, clogging stormwater culverts and bridge openings. The NFIP recognizes the one percent annual-chance flood, also known as the base flood or one-hundred-year flood, as the standard for identifying properties subject to federal flood insurance purchase requirements. A one-percent annual-chance flood is a flood which has a one percent chance of occurring over a given year or is likely once every one-hundred years. The digital flood insurance rate maps (DFIRMs) are used to identify areas subject to the one percent annual-chance flooding. A property's vulnerability to a flood is dependent upon its location in the floodplain. Properties along the banks of a waterway are the most vulnerable. The property within the floodplain is broken into sections depending on its distance from the waterway. The ten-year flood zone is the area that has a ten percent chance of being flooded every year. However, this label does not mean that this area can-not flood more than once every ten years. It just designates the probability of a flood of this magnitude every year. Further away from this area is the fifty-year flood plain. This area includes all of the ten-year floodplain plus additional property. The probability of a flood of this magnitude occurring during a one-year period is two percent. A summary of flood probability is shown in *Table 21 - Flood Probability Summary*.

Table 21 - Flood Probability Summary

Flood Probability Summary *(FEMA)*	
Flood Recurrence Intervals	**Annual Chance of Occurrence**
10-year	10.00%
50-year	2.00%
100-year	1.00%
500-year	0.20%

4.3.4.5 Vulnerability Assessment

River and Stream Flooding:

Lawrence County is vulnerable to flooding events. Flooding puts the entire population at some level of risk, whether through the flooding of homes, businesses, places of employment, or the road, sewer and water infrastructure. *Table 18 - Flood Event History* includes a metric for estimated economic impact from flooding events and shows how economically damaging flooding events can be. Flooding is also associated with power outages and poor road conditions that can lead to heightened transportation accident risk.

Functional needs facilities are facilities that if damaged would present an immediate threat to life, public health and safety. Facilities that use and store hazardous materials pose a potential threat to the environment during flooding events if flooding causes leaks or equipment failure. Appendix D of this hazard mitigation plan includes a flooding vulnerability map for each municipality in Lawrence County with vulnerable structures, functional needs facilities and hazardous material locations identified. There are eleven critical facilities that are located within the floodplain. (*Table 22 - Critical Facilities Located in Floodplain by Municipality*.) Municipalities not listed in the chart below do not have critical facilities within the floodplain.

Table 22 - Critical Facilities Located in Floodplain by Municipality

Critical Facilities Located in Floodplain by Municipality *(Lawrence Co GIS, 2020)*	
Municipality	**Number of Critical Facilities in Floodplain**
City of New Castle	5
Mahoning Township	1
Neshannock Township	1
Pulaski Township	1
Union Township	1
Wampum Borough	1
Wayne Township	1
Total	**11**

Flash Flooding:

Flash flooding can occur anywhere within Lawrence County when the conditions are right. Locations that are more populated and have more impervious ground have a higher vulnerability to flash flooding. During the risk assessment process, numerous resources were utilized to determine flash flooding locations. Municipalities were asked to identify locations within the municipality that are prone to frequent flash flooding.

The National Climatic Data Center was also queried to determine flash flood vulnerable areas. This data is reflected in *Table 18 - Flood Event History* above.

Locations that are identified as vulnerable to flash flooding in Lawrence County are as follows:

- City of New Castle
- Neshannock Township
- Pulaski Township
- Shenango Township
- Slippery Rock Township
- Wilmington Township

Although the above locations were identified as vulnerable areas within Lawrence County, they are not the only locations that are vulnerable to flash flooding. The Lawrence County Hazard Mitigation Team will continue to work with municipalities to identify vulnerable flash flooding locations and identify vulnerable functional needs population and critical facilities.

Ice Jam Flooding:

Ice jam flooding has affected five specific locations within Lawrence County. Areas along Neshannock Creek are the most vulnerable. The affected areas are Volant Borough, Washington Township, Wilmington Township, Hickory Township and Neshannock Township. The ice jam flooding also causes erosion to the riverbanks in the area as well. The last significant ice jam event was in 2009.

The Lawrence County Hazard Mitigation Team will continue to work with municipalities to identify vulnerable ice jam flooding locations and identify vulnerable functional needs population and critical facilities.

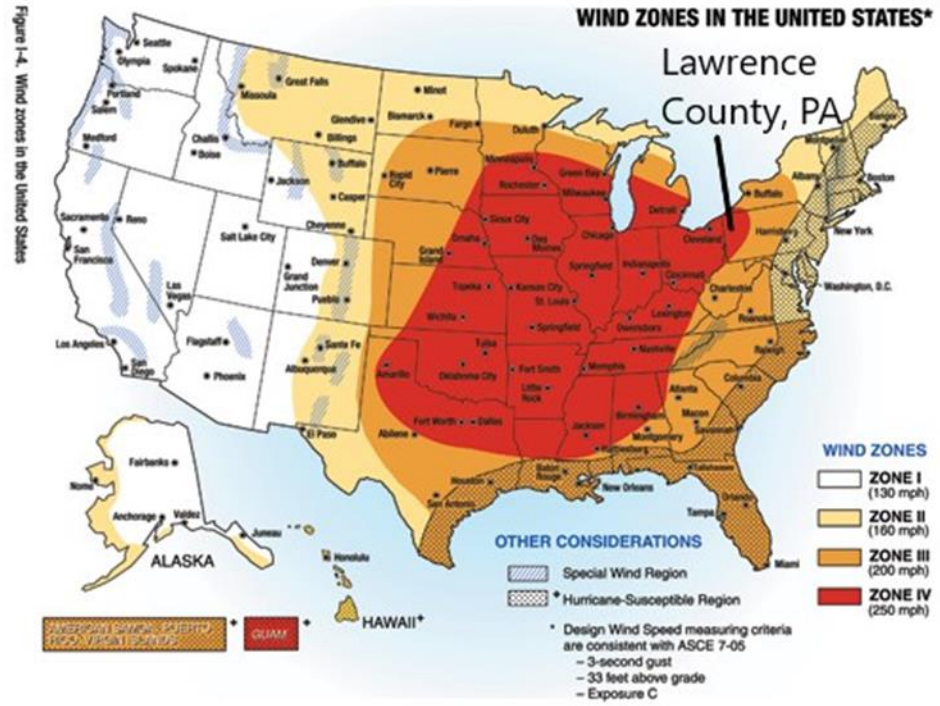
4.3.5. Hurricane, Tropical Storms

4.3.5.1 Location and Extent

Tropical depressions are cyclones with maximum sustained winds of less than thirty-nine miles per hour (mph). The system becomes a tropical storm when the maximum sustained winds reach between thirty-nine to seventy-four miles per hour. When wind speeds exceed seventy-four mph, the system is considered a hurricane. Tropical storms impacting Lawrence County develop in tropical or sub-tropical waters found in the Atlantic Ocean, Gulf of Mexico. Another type of tropical storm is nor'easters, which are large cyclones that rotate clockwise and are typically associated with the Atlantic Ocean and the East Coast of the United States between North Carolina and Massachusetts. The name nor'easter comes from the direction that the strongest winds typically blow from the cyclone.

While Lawrence County is located over two hundred miles inland of the East Coast of the United States, tropical storms can track inland and cause heavy rainfall and strong winds. Lawrence County is located just inland of the East Coast region designated by FEMA as being Hurricane-Susceptible *Figure 21 - Wind Zones*. Lawrence County falls within the wind Zone IV, which suggests that shelters and functional needs facilities should be able to withstand a three-second gust of wind up to two hundred fifty miles per hour (*Figure 21 - Wind Zones*). All communities within Lawrence County are equally subject to the impacts of hurricanes and tropical storms that track near the county. Areas in Lawrence County which are subject to flooding, wind and winter storm damage are particularly vulnerable.

Figure 21 - Wind Zones



4.3.5.2 Range of Magnitude

The impact tropical storm or hurricane events have on an area is typically measured in terms of wind speed. Expected damage from hurricane force winds is measured using the Saffir-Simpson Scale (*Table 23 – Saffir-Simpson Scale)*. The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds, barometric pressure, and storm surge potential (characteristic of tropical storms and hurricanes, but not a threat to inland locations like Lawrence County). Categories three, four, and five are classified as "major" hurricanes. While major hurricanes comprise only twenty of all tropical cyclones making landfall, they account for over seventy percent of the damage in the United States. While hurricanes can cause high winds and associated impacts, it is also important to recognize the potential for flooding events during hurricanes, tropical storms and nor'easters; These storms have the ability to produce high volumes of rainfall that cause flash flooding initially and then follow with stream and river flooding. The risk assessment and associated impact for flooding events is included Section 4.3.2.5.

Table 23 - Saffir-Simpson Scale

Saffir-Simpson Hurricane Scale		
Category	Wind Speed	
	mph	knots
5	≥156	≥135
4	131-155	114-134
3	111-130	96-113
2	96-110	84-95
1	74-95	65-83
Non-Hurricane Classifications		
Tropical Storm	39-73	34-64
Tropical Depression	0-38	0-33

4.3.5.3 Past Occurrence

Table 24 - History of Coastal Storms lists all coastal storms that have impacted Lawrence County from 1955 to December 2018. Although impacts of tropical storms are commonly felt in the Commonwealth, it is rare that a hurricane would track through Lawrence County.

Hurricane Agnes was a severe coastal storm event in 1972 that impacted Lawrence County. After making first landfall as a hurricane near Panama City, Florida, Agnes weakened and exited back into the Atlantic off the North Carolina coast. The storm skirted along the coast and made a second landfall near New York City as a tropical storm and merged with an extra-tropical low-pressure system over northern Pennsylvania. This brought extremely heavy rains to Pennsylvania, with a concentration of rain in the Susquehanna River Basin. Pennsylvania incurred $2.1 billion in damages and 48 deaths statewide. Fire and flood destroyed 68,000 homes and 3,000 businesses and left 220,000 Pennsylvanians homeless. The event triggered a Presidential Disaster Declaration for the region. Rainfall of seven to ten inches was noted across the Commonwealth, with some areas reporting as much of eighteen inches locally. Many roadways in Lawrence County were damaged.

In September 2004 Tropical Storm Ivan caused extensive flooding as well, also resulting in a Presidential Disaster Declaration for regions in Pennsylvania. The Ivan event produced flooding somewhat less than 100-year event crests in some locations. Flooding damage in Lawrence County totaled an estimated $300 thousand dollars as a result of over 3.5 inches of rain. (NOAA Storm Events Database, 2019).

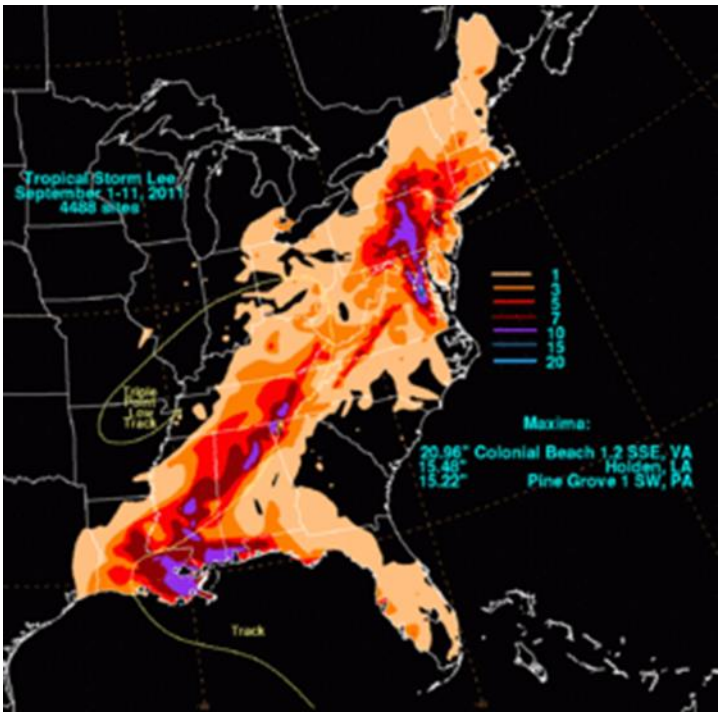
Hurricane Sandy was the deadliest and most destructive hurricane of the 2012 Atlantic hurricane season, and the second-costliest hurricane in US history. Sandy was a Category three storm at its peak intensity when it made landfall in Cuba. It was classified as a Category two storm off the coast of the Northeastern United States, but because of the unusual merge with a frontal system, the hurricane was termed “Superstorm Sandy.” At least 285 people were killed along the path of the storm in seven countries. In the United States, there were seventy-two people killed with an additional eighty-seven fatalities as indirect result of the storm. Superstorm Sandy caused an estimated $65 billion in damages in the United States alone.

Table 24 - History of Coastal Storms

History of Coastal Storms Impacting Lawrence County (HomeFacts)	
Year	**Name**
1955	Hurricane Connie

History of Coastal Storms Impacting Lawrence County (HomeFacts)	
Year	**Name**
1959	Hurricane Gracie
1968	Tropical Storm Candy
1972	Tropical Storm Agnes
1979	Hurricane Frederic
1989	Hurricane Hugo
1995	Hurricane Opal
1996	Hurricane Fran
1999	Hurricane Floyd
2002	Hurricane Isidore
2003	Tropical Storm Isabel/Henri
2004	Tropical Depression Ivan/Frances
2012	Hurricane Sandy
2006	Tropical Depression Ernesto
2008	Hurricane Ike
2011	Hurricane Irene
2011	Tropical Storm Lee
2012	Hurricane Sandy
2017	Tropical Storm Cindy

Figure 22 - Tropical Storm Lee Rainfall Totals



4.3.5.4 Future Occurrence

Although hurricanes and tropical storms can cause flood events consistent with 100- and 500-year flood levels, the probability of occurrence of hurricanes and tropical storms is measured relative to wind speed.

Table 25 - Annual Probability of Wind Speeds shows the annual probability of winds that reach the strength of tropical storms and hurricanes in Lawrence County and the surrounding areas based on a sample period of forty-six years. NOAA's Hurricane Research Division estimates that Lawrence County will experience impacts from a named tropical storm or hurricane up to once every ten years, with a probability between 0 – 10% annually. However according to FEMA, there is a high probability each year that Lawrence County will experience winds from coastal storms that could cause minimal to moderate damages (*Table 25 - Annual Probability of Wind Speeds*). The probability of winds exceeding 118 mph is less than 0.1 percent annually.

Table 25 - Annual Probability of Wind Speeds

Annual Probability of Wind Speeds *(FEMA, 2000)*		
Wind Speed (mph)	**Saffir-Simpson Scale**	**Annual Probability of Occurrence (%)**
45-77	Tropical Storms// Category 1 Hurricane	91.59
78-118	Category 1 to 2 Hurricanes	8.32
119-138	Category 3 to 4 Hurricanes	.0766
139-163	Category 4 to 5 Hurricanes	.0086
164-194	Category 5 Hurricanes	.00054
195+	Category 5 Hurricanes	.00001

Climate change is causing atmospheric temperatures to rise, which corresponds to a rise in ocean surface temperatures, resulting in warmer and moister conditions where tropical storms develop (Stott et al., 2010). Warmer oceans store more energy, and are capable of fueling stronger storms and it is projected that Atlantic hurricanes will become more intense and produce more precipitation as ocean surface temperatures rise (Trenberth, 2010). There are expected to be more category four and five hurricanes in the Atlantic, and the hurricane season may be elongating.

4.3.5.5 Vulnerability Assessment

The impacts of climate change are no longer hypothetical concepts set in the future, but rather tangible and hazardous realities. The unexpectedly devastating Hurricane Harvey in August 2017 in Houston is widely regarded as an example of a hurricane supercharged by warmer ocean temperatures (Trenberth et al., 2018). The damage Harvey caused to Houston was also exacerbated by urbanization, causing the storm system to stall over Houston with few locations where water could naturally sink into the ground (Zhang et al., 2018).

Tropical storms tracking nearby Lawrence County can still cause high winds and heavy rains. A vulnerability assessment for hurricanes and tropical storms focuses on the impacts of flooding and severe wind. The assessment for flood-related vulnerability is addressed in Section 4.3.4.5 and discussion of wind related vulnerability is addressed in Section 4.3.11.5.

4.3.6. Invasive Species

4.3.6.1 Location and Extent

An invasive species is a species that is not indigenous to a given ecosystem and that, when introduced to a non-native environment, tends to thrive. The spread of an invasive species often alters ecosystems, which can cause environmental and economic harm and pose a threat to human health. The phenomenon of invasive species is due to human activity. Human society is globalized, and people have the capability to traverse

the globe at rates unparalleled in human history. Either intentionally or unintentionally, other species may accompany people when they travel, introducing the stowaway species to a novel ecosystem. In a foreign ecosystem, a transported species may thrive, potentially restructuring the ecosystem and threatening its health. Common pathways for invasive species introduction to Pennsylvania include (Pennsylvania Invasive Species Management Plan, 2017):

- Contamination of internationally traded products
- Hull fouling
- Ship ballast water release
- Discarded live fish bait
- Intentional release
- Escape from cultivation
- Movement of soil, compost, wood, vehicles or other materials and equipment
- Unregulated sale of organisms
- Smuggling activities
- Hobby trading or specimen trading

Invasive species threats are typically divided into two main subsets:

Aquatic Invasive Species (AIS) are nonnative, invertebrates, fishes, aquatic plants, and microbes that threaten the diversity or abundance of native species, the ecological stability of the infested waters, human health and safety, or commercial, agriculture, or recreational activities dependent on such waters.

Terrestrial Invasive Species (TIS) are nonnative plants, vertebrates, arthropods, or pathogens that complete their lifecycle on land whose introduction does or is likely to cause economic or environmental harm or harm to human health.

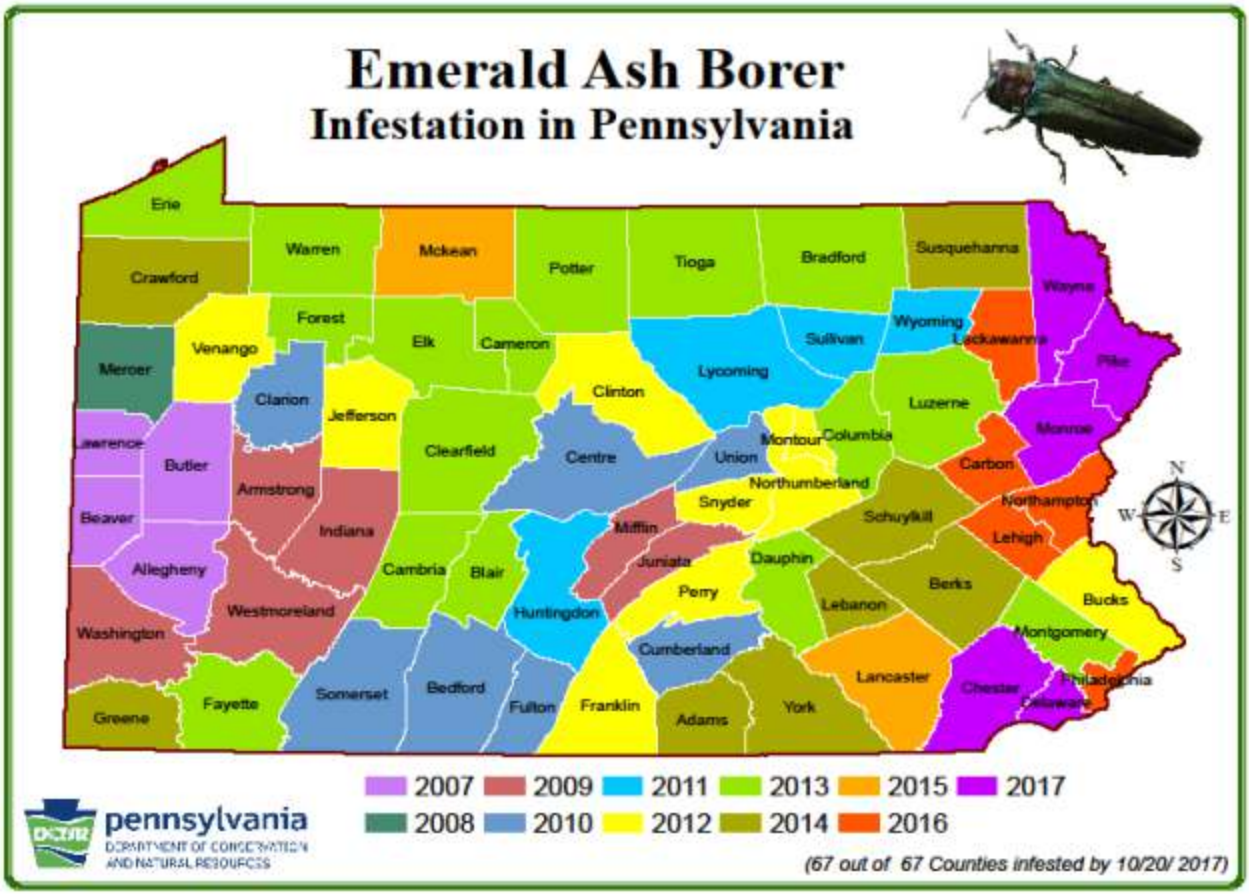
The location and extent of invasive threats is dependent on the preferred habitat of the species, as well as the species' ease of movement and establishment. *Table 26 - Prevalent Invasive Species* lists invasive species that have been found in Lawrence County.

4.3.6.2 Range of Magnitude

Some invasive species are not considered agricultural pests, and do not harm humans or cause significant ecological problems. Other invasive species can have many negative impacts and cause significant changes in the composition of ecosystems. For example, the Emerald Ash Borer has a ninety-nine percent mortality rate for any ash tree it infects. Didymo, an aggressive form of algae not yet found in Lawrence County, can clog waterways and smother native aquatic plants and animals.

The aggressive nature of many invasive species can cause significant reductions in biodiversity by crowding out native species. This can affect the health of individual host organisms as well as the overall well-being of the affected ecosystem. An example of a worst-case scenario for invasive species is the success of the Emerald Ash Borer in Lawrence County and the surrounding region. The Emerald Ash Borer has already become established in Lawrence County (2015 – see *Figure 23 - Emerald Ash Borer Infestation in Pennsylvania*) and the surrounding region, and there is a high mortality rate for trees associated with this pest.

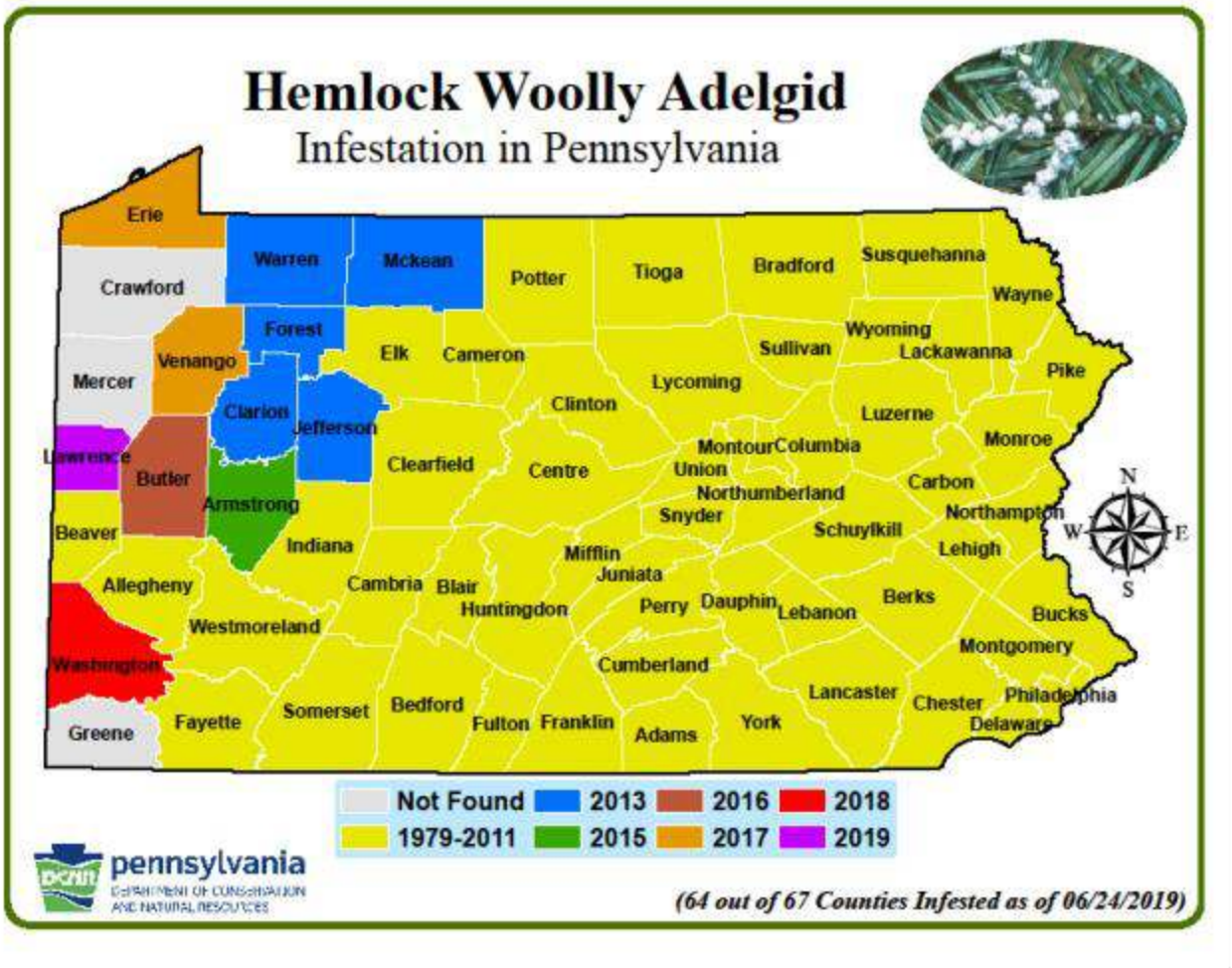
Figure 23 - Emerald Ash Borer Infestation in Pennsylvania



Another example is Adelges tsugae, the hemlock woolly adelgid (HWA). Hemlock woolly adelgid is a fluid-feeding insect that feeds on hemlock trees throughout eastern North America, including Pennsylvania. The egg sacs of these insects look like the tips of cotton swabs clinging to the undersides of hemlock branches.

Hemlock woolly adelgid was introduced from Asia into the Pacific Northwest in 1924. It was probably introduced into the northeastern United States in the 1950s and it was first discovered in Pennsylvania in 1967. This insect has been damaging hemlock ever since and it is spreading. To date, sixty-four counties in Pennsylvania, including Lawrence County just last year, have been infested with this insect. See *Figure 24 - Hemlock Woolly Adelgid Infestation in Pennsylvania*.

Figure 24 - Hemlock Woolly Adelgid Infestation in Pennsylvania



Eastern hemlock (Pennsylvania's state tree) and Carolina hemlocks (found further south in the Smoky Mountain sections of the Appalachians) are more susceptible to hemlock woolly adelgid damage than Asian and western hemlock trees due to feeding tolerance and predators that protect the latter species. Hemlock woolly adelgid sucks fluid from the base of hemlock needles. It may also inject toxins into the tree as it feeds, accelerating needle drop and branch dieback. Although some trees die within four years, trees often persist in a weakened state for many years. Hemlocks that have been affected by hemlock woolly adelgid often have a grayish-green appearance (hemlocks naturally have a shiny, dark green color).

In recent years, hardwood forests in the county have been increasingly negatively impacted due to these invasive species and there have been many tree fatalities. Degradation of forest health cascades into other problems. Among other benefits, forests prevent soil degradation and erosion, protect watersheds, and sequester carbon from the atmosphere. Forests have a key role in hydrologic systems, so losing a forest amplifies the effects of erosion and flooding. Forest degradation also has adverse economic effects, impacting such activities as logging, tourism, foraging and other production activities dependent on lumber.

The magnitude of an invasive species threat is generally amplified when the ecosystem or host species is already stressed, such as in times of drought. The already weakened state of the native ecosystem causes it

to more easily succumb to an infestation. A worst-case example could be the Hemlock Woolly Adelgid causing reduced biodiversity, increased wildfire potential and thermal harm to small stream cold water fisheries and habitats.

4.3.6.3 Past Occurrence

Invasive species have been entering Pennsylvania since the arrival of European settlers.

Since there are large swatches of public land in Lawrence County, including McConnells Mill State Park, seven local parks, 1,228 acres of State Game Lands (148, 178, 216) another 3,409 acres of State Game Lands (150, 151, 284) shared with contiguous counties, and a series of trail systems – there are risks for invasive species. There are many invasive plants that are widespread in Lawrence County that are common problems throughout the Commonwealth, some of the most problematic include:

- Japanese Knotweed
- Garlic Mustard
- Japanese Stiltgrass
- Multiflora Rose
- Japanese Barberry

In the past these species have been cut back to slow their spread and treated with foliar herbicide when they re-sprout. However, when species are so widespread and established, they may not be actively treated unless they are in a project area that is receiving attention otherwise.

There are several invasive pests that have moved through Lawrence County and the surrounding region which have resulted in the deaths of many trees. PennDOT summarizes these invasive species:

> *Pennsylvania has been inhabited by an invasive beetle known as the Emerald Ash Borer. This green-colored insect has infested many ash trees, which has resulted in a pandemic level of dead ash trees. In addition, the Gypsy Moth Caterpillar defoliated Western Pennsylvania at least twice within the last twenty years. This insect infested the oak tree species and many of those trees have died as well. The Wooly Adelgid and needle blight fungi are also currently affecting the white pine and hemlock trees, resulting in their premature deaths. (PennDOT, 2017)*

These occurrences represent lost battles to invasive species. Once a species is established in an area and it causes a change in the ecology, it can be quite difficult if somewhat futile to turn back the clock on the prevalence of the species; however, Lawrence County can work towards limiting the spread and mitigating the negative impacts of such widespread invasive species. In the case of the Emerald Ash Borer, Hemlock Wooly Adelgid and other tree killing invasive species, PennDOT has identified one way that the threat needs to be mitigated in the wake of the surge of dead trees:

> *[The Emerald Ash Borer, Gypsy Moth and Wooly Adelgid] have left … tens of thousands of dead trees either within the State Department of Transportation's (PennDOT) right-of-way, on other public property or on private property, but within close proximity to falling on our highways. Although random in nature, several fatalities have been associated with trees falling on motorists or motorists running into downed trees across the highway...*

PennDOT has been incorporating select tree removal into roadway construction projects using both federal and state funding. Since July 1, 2016, PennDOT Department Force Crews have also increased their efforts in select manual tree removal. This work is often done during the winter when crews are not engaged in snow removal operations. Dead tree removal is quickly becoming a major focus of PennDOT, however a sustained funding source to remove all of these potential hazards is simply not available. The PA Department of Agriculture has established strict firewood and lumber quarantine areas in some of these districts so additional costs may be incurred.

Table 26 - Prevalent Invasive Species lists problematic non-native species that are established in Lawrence County. While all species listed here are not native to Lawrence County, those species highlighted in red are considered to pose a larger ecological threat than some of the others (see 4.3.6.5. Vulnerability Assessment for additional discussion). For some species such as the European Bark Beetle and the Sirex Woodwasp, Lawrence County is on the edge of the species range, meaning control efforts taken in the county can help limit the propagation of the threat even beyond the county.

Table 26 - Prevalent Invasive Species

Prevalent Invasive Species *(EDDMaps, 2019; PA DCNR, 2019; USDA FS, 2019; iMapInvasives, 2019)*		
Scientific Name	**Common Name**	**Type**
Corbicula fluminea	Asiatic Clam	Aquatic Animal
Cyprinus carpio	Common Carp	Aquatic Animal
Craspedacusta sowerbyi	Freshwater Jellyfish	Aquatic Animal
Etheostoma blennioides	Greenside Darter	Aquatic Animal
Misgurnus anguillicaudatus	Oriental Weatherfish	Aquatic Animal
Orconectes rusticus	Rusty Crayfish	Aquatic Animal
Dreissena polymorpha	Zebra Mussel	Aquatic Animal
Potamogeton crispus	Curly-Leaf Pondweed	Aquatic Plant
Myriophyllum spicatum	Eurasian Water-Milfoil	Aquatic Plant
Hydrilla verticillata	Hydrilla	Aquatic Plant
Persicaria hydropiper	Marshpepper Knotweed, Smartweed	Aquatic Plant
Mentha aquatica	Water Mint	Aquatic Plant
Nasturtium officinale	Watercress	Aquatic Plant
Nymphoides peltata	Yellow Floatingheart	Aquatic Plant
Neonectria (N.) & Cryptococcus fagisuga	Beech Bark Disease Complex	Disease
Sirococcus clavigignenti-juglandacearum	Butternut Canker	Disease
Diaporthales: Cryphonectriaceae	Chestnut Blight	Disease
Discula destructiva	Dogwood Anthracnose	Disease
Hemiptera: Diaspididae	Elongate Hemlock Scale	Disease
Neonectria faginata	Neonectria Canker	Disease
Cronartium ribicola	White Pine Blister Rust	Disease
Coleoptera: Buprestidae	Emerald Ash Borer	Insect

Prevalent Invasive Species (EDDMaps, 2019; PA DCNR, 2019; USDA FS, 2019; iMapInvasives, 2019)		
Scientific Name	**Common Name**	**Type**
Hymenoptera: Diprionidae	European Pine Sawfly	Insect
Letpidoptera: Tortricidae	European Pine Shoot Moth	Insect
Lepidoptera: Lymantriidae	Gypsy Moth	Insect
Adelges tsugae	Hemlock Woolly Adelgid	Insect
Plagiodera versicolora	Imported Willow Leaf Beetle	Insect
Coleoptera: Scarabaeidae	Japanese Beetle	Insect
Sirex noctilio	Sirex Woodwasp	Insect
Lonicera maackii	Amur Honeysuckle	Plant
Elaeagnus umbellata	Autumn Olive	Plant
Ranunculus bulbosus	Bulbous Buttercup	Plant
Cirsium vulgare	Bull Thistle	Plant
Lonicera spp.	Bush Honeysuckles (Exotic)	Plant
Cirsium arvense	Canada Thistle	Plant
Tussilago farfara	Colt's Foot	Plant
Securigera varia	Common Crown-Vetch	Plant
Phragmites australis ssp. australis	European Common Reed	Plant
Alliaria petiolata	Garlic Mustard	Plant
Berberis thunbergii	Japanese Barberry	Plant
Reynoutria japonica	Japanese Knotweed	Plant
Microstegium vimineum	Japanese Stiltgrass	Plant
Sorghum halepense	Johnson Grass	Plant
Lonicera morrowii	Morrow'S Honeysuckle	Plant
Rosa multiflora	Multiflora Rose	Plant
Conium maculatum	Poison Hemlock	Plant
Lythrum salicaria	Purple Loosestrife	Plant
Phalaris arundinacea	Reed Canarygrass	Plant
Acorus calamus	Sweetflag, Calamus	Plant
Ailanthus altissima	Tree-Of-Heaven	Plant
Myosotis scorpioides	True Forget-Me-Not	Plant
Rubus phoenicolasius	Wineberry	Plant
Iris pseudacorus	Yellow Iris	Plant

4.3.6.4 Future Occurrence

According to the Pennsylvania Invasive Species Council (PISC), the probability of future occurrence for invasive species threats is growing due to the increasing volume of transported goods, increasing efficiency and speed of transportation, and expanding international trade agreements. Expanded global trade has created opportunities for many organisms to be transported to and establish themselves in new counties and

regions. Climate change is contributing to the introduction of new invasive species. As maximum and minimum seasonal temperatures change, pests are able to establish themselves in previously inhospitable climates. This also gives introduced species an earlier start and increases the magnitude of their growth, possibly shifting the dominance of ecosystems in the favor of non-native species.

In order to combat the increase in future occurrences, the PISC (a collaboration of state agencies, public organizations and federal agencies) released the Invasive Species Management Plan in April 2010 and updated the plan in 2017. The plan outlines the Commonwealth's goals for managing the spread of nonnative invasive species and creates a framework for responding to threats through research, action, and public outreach and communication. More information can be found here: https://www.agriculture.pa.gov/Plants_Land_Water/PlantIndustry/GISC/Pages/default.aspx.

There are several invasive species that are found near Lawrence County but have not yet been detected inside the county (see *Table 27 - Vulnerable Species*). Especially in cases like this, control efforts, heightened awareness, and public outreach and education can help prevent an invasive species from becoming established. Once a species is established, it is much more difficult to eradicate it from an ecosystem meaning prevention is very important. Bush Honeysuckle species, the Spotted Lanternfly, Mile-A-Minute Vine and the Asian Long-Horned Beetle are all widespread and highly problematic in nearby counties but have not been reported in Lawrence County. The forests of Lawrence County would greatly benefit if these species can be kept out of the area. For a more inclusive list of invasive plants found in Pennsylvania and a list of invasive plants on the Pennsylvania watch list, see the referenced PA DCNR publication DCNR Invasive Plant List (PA DCNR, 2016 at: http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/dcnr_20033786.pdf).

The Spotted Lanternfly is a harmful invasive pest with a healthy appetite for our plants and can negatively impact the quality of life and enjoyment of the outdoors. According to the Penn State Extension, the Spotted Lanternfly is a significant threat to Pennsylvania agriculture, landscapes and natural ecosystems, including grape, tree-fruit, hardwood, and nursery industries, which collectively are worth nearly $18 billion to the state's economy, outdoor recreation, and biodiversity. The Spotted Lanternfly is currently found in twenty-six counties in Pennsylvania, all of which are under a state-imposed quarantine. The Spotted Lanternfly is undoubtedly traveling west as the State Department of Agriculture announced on March 3, 2020 that an additional twelve counties in Pennsylvania were added to the quarantine area. At the writing of this plan, Lawrence County is not among them.

Table 27 - Vulnerable Species

Vulnerable Species *(EDDMaps, 2019; PA DCNR, 2019; USDA FS, 2019; iMapInvasives, 2019)*		
Scientific Name	**Common Name**	**Type**
Nelumbo lutea	American Water Lotus	Aquatic Plant
Veronica anagallis-aquatica	Water Speedwell	Aquatic Plant
Ophiostoma novo-ulmi	Dutch Elm Disease	Disease
Ceratocystis fagacearum	Oak Wilt	Disease
Anoplophora glabripennis	Asian Long-Horned Beetle	Insect
Crytepistomus castaneus	Asiatic Oak Weevil	Insect
Adelges piceae	Balsam Woolly Adelgid	Insect

Vulnerable Species (EDDMaps, 2019; PA DCNR, 2019; USDA FS, 2019; iMapInvasives, 2019)		
Scientific Name	**Common Name**	**Type**
Scolytus schevyrewi	Banded Elm Bark Beetle	Insect
Phyllaphis fagi	Beech Woolly Adelgid	Insect
Fenusa pusilla	Birch Leafminer	Insect
Otiorhynchus sulcatus	Black Vine Weevil	Insect
Dryocosmus kuriphilus	Chestnut Gall Wasp	Insect
Hylastes opacus	European Bark Beetle (H. Opacus)	Insect
Contarinia baeri	European Pine Needle Midge	Insect
Epinotia nanana	European Spruce Needleminer	Insect
Gilpinia hercyniae	European Spruce Sawfly	Insect
Coleophora laricella	Larch Casebearer	Insect
Pristiphora erichsonii	Larch Sawfly	Insect
Homadaula anisocentra	Mimosa Webworm	Insect
Pristiphora geniculata	Mountain-Ash Sawfly	Insect
Asterolecanium minus	Oak Pit Scale A. Minus	Insect
Lepidosaphes ulmi	Oystershell Scale	Insect
Caliroa cerasi	Pear Sawfly	Insect
Taeniothrips inconsequens	Pear Thrips	Insect
Acantholyda erythrocephala	Pine False Webworm	Insect
Trichiocampus viminalis	Poplar Sawfly	Insect
Matsucoccus resinosae	Red Pine Scale	Insect
Hylurgus ligniperda	Redhaired Pine Bark Beetle	Insect
Diaspidiotus perniciosus	San Jose Scale	Insect
Scolytus multistriatus	Smaller European Elm Bark Beetle	Insect
Lycroma delicatula	Spotted Lanternfly (Lycorma)	Insect
Otiorhynchus ovatus	Strawberry Root Weevil	Insect
Lonicera spp. (species unknown)	Bush Honeysuckle (Species Unknown)	Plant
Heracleum mantegazzianum	Giant Hogweed	Plant
Lonicera japonica	Japanese Honeysuckle	Plant
Persicaria perfoliata	Mile-A-Minute Vine	Plant
Celastrus orbiculatus	Oriental Bittersweet	Plant
Cardamine impatiens	Touch-Me-Not Bittercress	Plant

4.3.6.5 Vulnerability Assessment

Lawrence County's vulnerability to invasion depends on the species in question. Human activity and mobility are ever increasing, and combined with the prospects of climate change, invasive species are becoming increasingly threatening. Invasive species can have adverse economic effects by impacting agriculture and logging activities. Natural forest ecosystems provide clean water, recreational opportunities, habitat for

native wildlife, and places to enjoy the tranquility and transcendence of nature. The balance of forest ecosystems and forest health are vulnerable to invasive species threats. While there is significant acreage of state park and game lands in Lawrence County where forest managers can impact invasive species, private lands can provide refuge for invasive species if landowners are unaware of or apathetic towards the threat.

An interesting facet of the invasive species problem in Pennsylvania is that deer do not eat many invasive plants, giving invasive species a competitive advantage over the native species that deer prefer. As such, the management of deer populations in Lawrence County has a significant impact on the vulnerability of an ecosystem to invasive species, where overpopulation of deer favors invasive species.

The Governor's Invasive Species Council of Pennsylvania (PISC), the lead organization for invasive species threats, has identified over 100 species threats that are or could potentially become significant in Pennsylvania. Of these threats, county and municipal leaders believe that the most significant are invasive forest pests like the Emerald Ash Borer, Eurasian Wood Wasp, Exotic Bark Beetle, Asian Long Horned Beetle, Sudden Oak Death, Hemlock Woolly Adelgid, the Gypsy Moth and vascular plants, especially Purple Loosestrife, Japanese Knotweed, Garlic Mustard and Multi-flora Rose.

There are five primary components to managing invasive plants:

Prioritize: Public use areas such as state parks and other healthy forest ecosystems should be prioritized over developed and private areas. Locations with lower densities of invasive plants are often easier to control and should be given quick attention. Locations where humans are disturbing the landscape opens up niche space, and often times the aggressive invasive species move in faster than native species. Such locations include areas around road work, ditch/culvert work, logging activities, stream improvement/stabilization and bridge work. Some species pose a higher risk than others - invasive species are easiest to control before they become widespread and established in an area, and for that reason, species that are less widespread should be prioritized for management.

Species highlighted in red in *Table 26 - Prevalent Invasive Species* and *Table 27 - Vulnerable Species* are species that have been considered priority species throughout Pennsylvania. Priority species of note for Lawrence County include the Emerald Ash Borer, Zebra Mussels, Japanese Knotweed and the Hemlock Woolly Adelgid.

It is best to take action before a species can become established in the county, so management should be aware of invasive species found nearby Lawrence County but not yet present in the county (priority species in *Table 27 - Vulnerable Species*). Public outreach and education are important for these species in order to improve identification and prevention of invasion. The Asian Long-horned Beetle first attacks red maple trees, followed by many other hardwoods by boring half inch holes through the trees, weakening them structurally and causing limbs to break off, ultimately killing trees. Lawrence County has many red and sugar maple trees, so if the Asian Long-horned Beetle ever became established in the county, it could spread quickly and have a devastating impact.

Locate: Detailed locations should be recorded for invasive plants so sites can be easily relocated, treated and monitored.

Delineate: The scale and extent of the infestation should be recorded and mapped so that the progress of the infestation can be monitored.

Control: Methods of control depend on the specific infestation, but the most common approaches are mechanical (cutting and hand-pulling) and chemical (herbicide treatments).

Monitor: Identified sites should be monitored and revisited as often as several times in a growing season (depending on the location/species). Monitoring can allow for early detection of spreading infestations. Most importantly, it prevents a relapse towards full-blown infestation.

Due to the instances and extent of the current infestations, it is reasonable to project that the county's vulnerability will increase.

4.3.7. Landslides

4.3.7.1 Location and Extent

Landslides are described as downward and outward movement of slope-forming soil, rock and vegetation reactive to the force of gravity. Rockfalls, rockslides, rock topples, block glides, debris flows, mudflows and mudslides are all forms of landslides. Natural causes of landslides include heavy rain, rapid snow melt, erosion, earthquakes and changes in groundwater levels. Landslides occur most frequently in areas with moderate to steep slopes and high precipitation, and most often slope failures happen during or after periods of sustained above average precipitation or snowmelt events. Human activity can increase the likelihood of landslides by reducing vegetation cover, altering the natural slope gradient or increasing the soil water content. One location where this type of human activity is common are areas that were excavated along highways and other roadways.

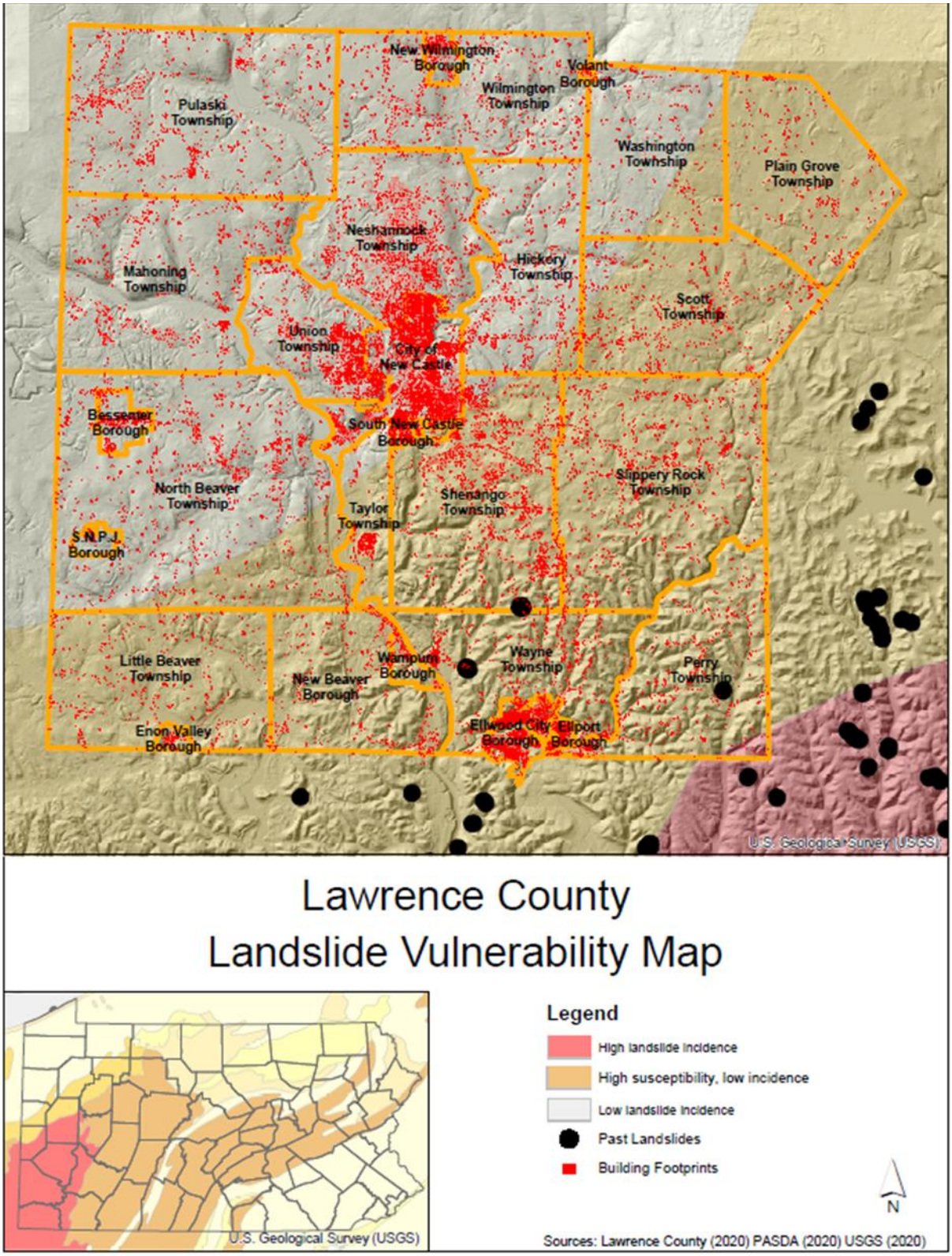
Most landslides are slow moving and more often cause property damage rather than causing human injury. These landslides are due to geologic properties of the area that make it easily prone to erosion.

4.3.7.2 Range and Magnitude

Landslides can cause damage to utilities as well as transportation routes, resulting in road closure or travel delays. Fortunately, deaths and injuries due to landslides are rare in Pennsylvania and Lawrence County. Most reported deaths due to landslides have occurred when rockfalls or other slides along highways have involved vehicles. Storm-induced debris flows can also sometimes cause death and injury. As residential and recreational development increases on and near steep mountain slopes, the hazard from these rapid events will also increase. Most Pennsylvania landslides are moderate to slow moving and damage property rather than people.

The Pennsylvania Department of Transportation and large municipalities incur substantial costs due to landslide damage and to extra construction costs for new roads in known landslide-prone areas. A 1991 estimate showed an average of ten million per year is spent on landslide repair contracts across the Commonwealth and a similar amount is spent on mitigation costs for grading projects. A number of highway sites in Pennsylvania are in need of permanent repair at estimated costs of $300,000 to $2 million each (DCNR, 2010). The USGS identifies most of Lawrence County in a zone of high susceptibility with low incidence with a small southeastern portion as well as a portion of the City of New Castle and South New Castle Borough in a zone of high landslide susceptibility (see *Figure 25 - Landslide Vulnerability*). Areas that are susceptible to landslides are geologically prone to giving way after significant precipitation events.

Figure 25 - Landslide Vulnerability



4.3.7.3 Past Occurrence

In 2004 a minor landslide occurred as a result of heavy rains from Tropical Depression Ivan. No comprehensive list of landslide incidents in Lawrence County is available, as there is no formal reporting system in place. PennDOT and municipal maintenance departments are responsible for slides that inhibit the flow of traffic or damage to roads and bridges, but they can generally only repair the road itself and right-of-way areas.

4.3.7.4 Future Occurrence

The majority of Lawrence County is not at high risk for landslides, however mismanaged development in steeply sloped areas would increase the frequency of occurrence of landslides. Road cuts are the most common development that puts an area at a heightened probability of a slide. The PA Department of Environmental Protection has an Erosion and Sediment (E&S) program that sets requirements for development projects of a certain scale that are intended to mitigate erosion, which are similar practices to prevent causing landslides.

4.3.7.5 Vulnerability Assessment

Landslides are often precipitated by other natural hazards such as earthquakes or floods, and a serious landslide can cause millions of dollars in damages. Continued enforcement of floodplain management and proper road and building construction helps to mitigate the threat of landslides. Floodplain management is important where mining has occurred within close proximity to watercourses and associated flat-lying areas. Surface water may permeate into areas that still have open fractures and the build-up of surface water in fractures could lead to unexpected flood events.

A comprehensive database of land highly prone to erosion and landslides is difficult to come by. Construction projects in Lawrence County should be wary of erosion and the potential for landslides. There are several general factors that can be indicators of a landslide prone area:

- On or close to steep hills
- Areas of steep road cuts or excavations
- Steep areas where surface run-off is channeled
- Fan shaped areas of sediment and rock accumulations
- Evidence of past sliding such as tilted utility lines, tilted trees, cracks in the ground and irregularly surfaced ground.

4.3.8. Lightning Strike

4.3.8.1 Location and Extent

Lightning is a massive electrostatic discharge between electrically charged regions within clouds, or between a cloud and the Earth's surface. The charged regions within the atmosphere temporarily equalize themselves through a lightning flash, commonly referred to as a strike if it hits an object on the ground. There are three primary types: from a cloud to itself (intra-cloud or IC); from one cloud to another cloud (CC); and, finally, between a cloud and the ground (CG). Lightning is always accompanied by the sound of thunder, although distant lightning may be seen but be too far away for the thunder to be heard. Thunder is *caused* by lightning. The bright light of the lightning flash caused by the expansion of electrons (called the “return stroke”) represents a great deal of energy. This energy heats the air in the channel to above

50,000°F in only a few millionths of a second. The air that is now heated to such a high temperature had no time to expand, so it is now at a very high pressure. The high-pressure air then expands outward into the surrounding air compressing it and causing a disturbance that propagates in all directions away from the stroke. The disturbance is a shock wave for the first ten yards, after which it becomes an ordinary sound wave, or thunder.

Lawrence County is subject to lightning strikes and thunderstorm activity throughout the year. Overall, the most active time for lightning strikes is from early spring to early fall seasons. While the impact of flash events is highly localized, strong storms can result in numerous widespread events over a broad area. In addition, the impacts of an event can be serious or widespread if lightning strikes a particularly significant location such as a power station, a campground or large public venue.

4.3.8.2 Range of Magnitude

Severe thunderstorms have lightning risks and can cause significant damage and be life threatening, though only a small percentage of thunderstorms become severe. Western Pennsylvania sits clearly in a region of the country susceptible to lightning strikes but not in the high danger zones of the southeastern or central parts of the country (see *Figure 26, National Lightning Detection Network 2018*). The 2018 Commonwealth of Pennsylvania All Hazards Mitigation Plan states that Pennsylvania ranks ninth among the fifty states in the country's number of lightning deaths. Additionally, western Pennsylvania has a higher flash density than the rest of the Commonwealth (see *Figures 26 and 27, National Lightning Detection Network 2018* and *U.S. Lightning Strike Fatalities*). Lawrence County gets twenty-five to thirty-two days per year of thunderstorms with lightning. Lightning can cause severe injury and is fatal in some cases, though most fatal strikes are not direct strikes to persons but the result of ground current and most people survive them. Deaths and injuries to livestock and other animals from ground current, thousands of forest and brush fires, and millions of dollars in damage to buildings, communications systems, power lines and electrical systems across the country are also the result of lightning (2015 Hazard Mitigation Plan)

Figure 26 - National Lightning Detection Network 2018

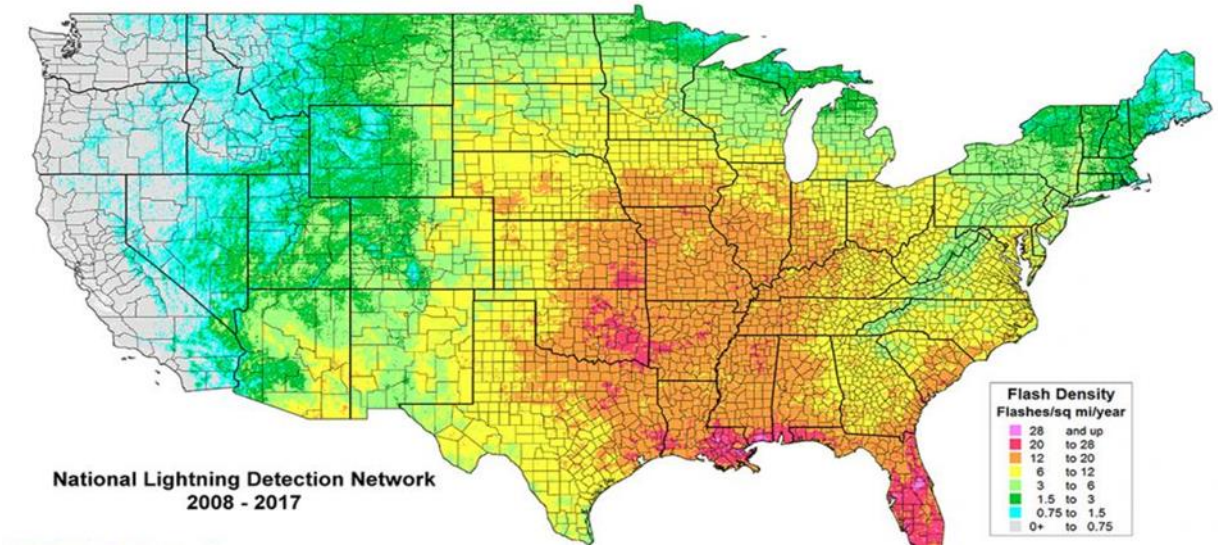
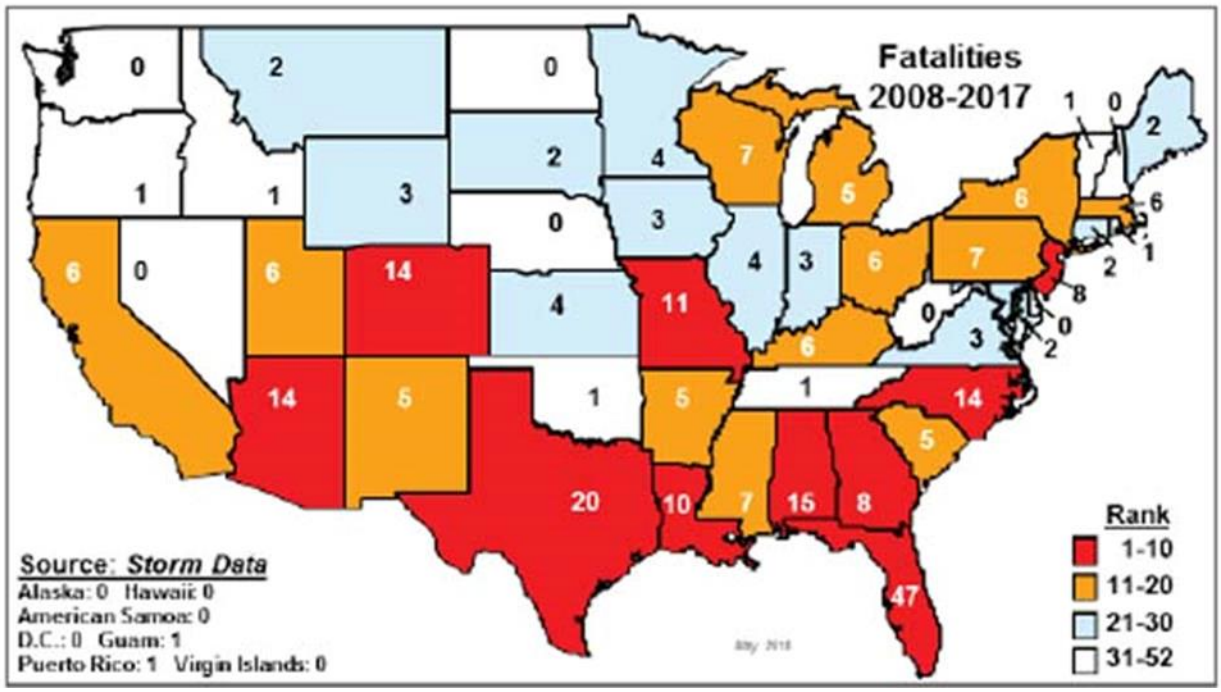


Figure 27 - U.S. Lightning Strike Fatalities



4.3.8.3 Past Occurrence

Thunderstorms and lightning occur many times each year in Pennsylvania. Lightning has been responsible for eleven deaths and 312 injuries in Pennsylvania between the years of 2003-2012. Pennsylvania dropped in rank from 26th to 28th in the United States for cloud-to-ground flash densities since the 2015 Hazard

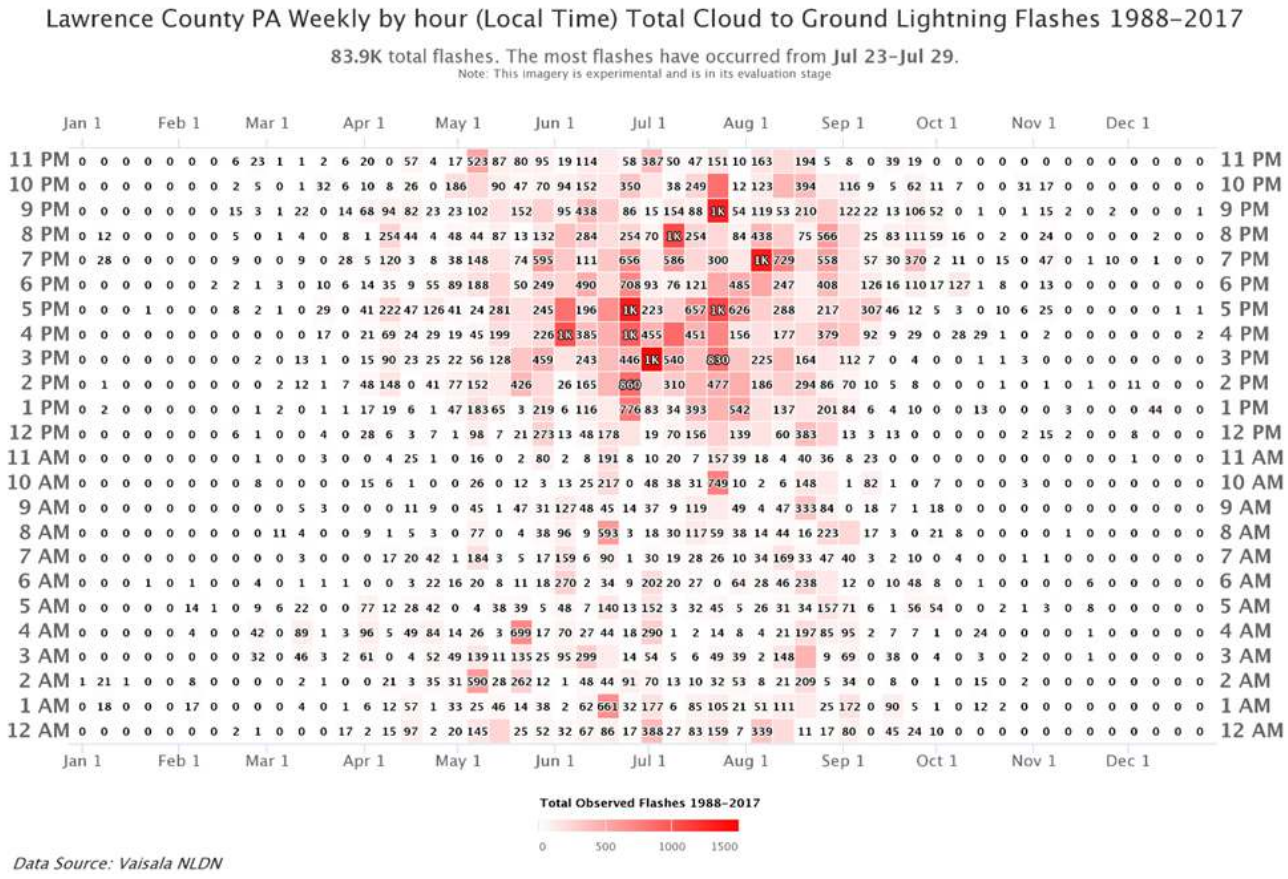
Mitigation Plan. During 2017, the National Lightning Detection Network (NLDN) recorded 147,458 cloud-to-ground flashes in the Commonwealth, compared to the 393,759 reported for 2008 in the 2015 Hazard Mitigation Plan. *Table 28 - Lawrence County Annual Lightning Strikes* outlines the annual lightning strikes for Lawrence County from 1995 through 2015.

Table 28 - Lawrence County Annual Lightning Strikes

Lawrence County Annual Lightning Strikes			
Year	**Lightning Strikes**	**Year**	**Lightning Strikes**
1996	1112	1995	57
1998	82	1997	74
2000	201	1999	152
2002	77	2001	124
2004	208	2003	114
2006	266	2005	178
2008	175	2007	185
2010	183	2009	136
2012	335	2011	227
2014	392	2013	262
Unavailable data from 2015 to current.		2015	1180
Source: National Climatic Data Center			

Figure 28 - Lawrence County Weekly Total Cloud to Ground Lightning Flashes 1988-2017, depicts that nearly 84,000 flashes were recorded in the county in the twenty-nine- year period for the chart. Most of the recorded flashes occurred between the annual dates of July 23-29 and most of those during the mid-afternoon to mid-evening hours, data that may prove useful for planning or public announcement purposes.

Figure 28 - Lawrence County Weekly Total Cloud to Ground Lightning Flashes 1988-2017



Data Source: Vaisala NLDN

4.3.8.4 Future Occurrence

Lightning strikes and thunderstorms are expected during and around the spring and summer months. These events have occurred in Lawrence County in the past and will continue to occur in the future, although multiple casualties or deaths are highly unlikely given the hazard's recorded history of casualties in the county. The table above has some data prediction quality for future occurrence, though it cautions its imagery is experimental and in its evaluation stage. The chart will be revisited with the next annual plan update.

4.3.8.5 Vulnerability Assessment

The odds of being struck by lightning in a person's lifetime are one in 15,300, according to the National Oceanic and Atmospheric Administration's National Severe Storms Laboratory. News channels carried the story of that 1 in 15,300 in the early 2000s – a New Castle man who survived a lightning strike while he was with his family at a reunion; he was clinically dead, but his aunt started CPR and saved his life. He spent 20 days in a coma.

Nine out of every ten people in the United States who are struck survive, according to a 2016 study presented at the International Lightning Detection Conference and International Lightning Meteorology

Conference. However, lightning strikes can leave a person with many long-term health problems, including muscle soreness, headaches, cognitive problems and nausea.

The potential for lightning strikes and thunderstorms exists in all municipalities in Lawrence County. Events being held outdoors during the summer months are particularly vulnerable to lightning strikes. Due to the recreational land and waterways use in Lawrence County, the potential for death or injury will remain present, although the risk may be on a downward trend based on the reduced number of cloud-to-ground flashes reported in the Commonwealth in the five-year span since the last assessment.

4.3.9. Pandemic and Infectious Disease

4.3.9.1 Location and Extent

Pandemic & Epidemic

A pandemic is a disease that attacks or affects the population of an extensive area. This is sometimes an entire country or continent. In 2020, a pandemic encompassed the entire planet. An epidemic is an outbreak or disease affecting or tending to affect a disproportionately large number of individuals within a population, community, or region at the same time. It is characterized by very widespread growth or extent that spreads quickly and affects many individuals at the same time. A pandemic is a type of epidemic (one with greater range and coverage), an outbreak of a disease that occurs over a wide geographic area and affects an exceptionally high proportion of the population. While a pandemic may be characterized as a type of epidemic, an epidemic is not a type of pandemic. Pandemics travel more effectively than epidemics.

Each year, different strains of influenza are labeled as potential pandemic threats. Pandemics happen when novel (new) viruses emerge and can infect people easily and spread efficiently and are sustained from person to person. The spread of a disease depends on the mode of transmission of the disease, how contagious it is, and the amount of contact between infected and non-infected persons. In the event of a pandemic occurring in the eastern United States, the entirety of Lawrence County would likely be affected. Strains of influenza, or the flu, are highly contagious, have caused epidemics and pandemics, and they commonly attack the respiratory tract in humans. Influenza pandemic planning began in response to the H5N1 (avian) flu outbreak in Asia, Africa, Europe, the Pacific, and the Near East in the late 1990s and early 2000s. Avian flu did not reach pandemic proportions in the United States, but the country began planning for flu outbreaks. The Pennsylvania Department of Health (PADOH) Influenza Pandemic Response Plan states that "an influenza pandemic is inevitable and will probably give little warning" (PADOH, 2005).

The 2009 H1N1 flu virus resulted in seventy-eight deaths in Pennsylvania by the time the pandemic ended. Studies after the 2009 H1N1 influenza pandemic showed that the strain disproportionately impacted people younger than twenty-four years old (CIDRAP, 2010). Schools have potential to become outbreak centers due to their large young adult populations, high levels of close social contact, and permeable boundaries. During a pandemic or disease outbreak, the population affected may exceed the seasonal norm of one-third of the student population. Because universities and schools can be sites of transmission, they may cause a virus to spread among the surrounding community as well.

On March 11, 2020 the World Health Organization (WHO) characterized the outbreak of a coronavirus disease as a pandemic. The virus has been named "SARS-CoV-2" and the disease it causes is named "coronavirus disease 2019" (COVID-19). Coronaviruses are common in people and many different species of animals to include camels, cattle, cats, and bats. The disease is believed to have started in Wuhan Province,

China in late 2019 and spread around the globe. At the epicenter in China, the virus was linked to a large seafood and live animal market; however, community spread of the virus rapidly ensued.

Infectious Disease

Infectious diseases include influenza, pneumonia, tuberculosis, rabies, Middle East Respiratory Syndrome (MERS), Lyme Disease, Zika, Ebola, and HIV/AIDS.

West Nile virus is contracted through a mosquito bite and is aided by warm temperatures and wet climates conducive to mosquito breeding, with most cases occurring between April and October. West Nile virus is a vector-borne disease. This means an animal, usually an insect or a tick, transmits parasitic microorganisms to people and animals, and therefore, the diseases they cause. The disease causes headaches, high fever, neck stiffness, disorientation, tremors, convulsions, muscle weakness, paralysis, and death in its most serious form.

Lyme Disease, spread by the bite of infected blacklegged ticks, is a bacterial disease with symptoms including fever, headaches and characteristic skin rash (erythema migrans). Untreated, Lyme Disease can spread to joints, the heart and the nervous system (CDC, 2016). To prevent the disease, it is recommended to use insect repellent, removing ticks promptly, applying pesticides, and reducing tick habitat.

The Zika virus is another infectious disease that is spread by mosquito bites and it is related to West Nile virus. Zika virus can also be spread through sexual intercourse, blood transfusion, or passed from mother to child in the womb. The virus was first identified in 1947, but largely came to the attention of the United States in 2015 when there was an outbreak of Zika in Brazil. The direct illness caused by Zika can include fever, red eyes, joint pain, headache and a rash, or sometimes have no symptoms at all. Zika is troubling for pregnant mothers as the virus can result in microcephaly or cause other problems for brain development. For adults, the virus can be linked to increased incidence of Guillain-Barré syndrome.

Although brought under control in 2004, Severe Acute Respiratory Syndrome (SARS) has shown the potential of becoming a pandemic. Neither the WHO nor the Centers for Disease Control and Prevention (CDC) has classified SARS.

4.3.9.2 Range of Magnitude

Pandemic & Epidemic

Public health emergencies typically occur on a regional basis. Sources include infected animals, contaminated food, and improperly prepared food. As evidenced during the 2019/2020 COVID-19 pandemic, the whole county, Commonwealth, country and world are vulnerable to a public health emergency. The likely source of a severe infection may be a farm, animal market or restaurant; see Location and Extent.

Advancements in medical technologies have greatly reduced the number of deaths caused by influenza over time. In the early 1900s, flu pandemics could cause tens of millions of deaths, while the 2009 swine flu caused fewer than 20,000 deaths world-wide, and many people infected with swine flu in 2009 recovered without needing medical treatment. However, the modern flu viruses are still quite dangerous. About seventy percent of those who were hospitalized with the 2009 H1N1 flu virus in the United States belonged to a high-risk group (CDC, 2009). High risk populations for influenza include children, the elderly, pregnant women, and patients with reduced immune system capability.

While there are limited secondary hazards related to public health emergencies, an outbreak could cause a variety of general secondary effects. Civil disorder is the most likely hazard to result from a public health emergency. Further potential secondary effects could include a shortage of medical supplies and personnel; hoarding of household paper and cleaning supplies; school, business, and government closings; government restrictions on travel; low attendance at places of employment, as well as slowed productivity.

The WHO has six phases of pandemic alert for incorporation of new recommendations and approaches for preparedness and response plans. These phases are listed below in *Table 29 - Pandemic Influenza Phases*.

Table 29 - Pandemic Influenza Phases

Phase	Characteristics
Phase 1	No viruses circulating among animals have been reported to cause infections in humans.
Phase 2	An animal influenza virus circulating among domesticated or wild animals is known to have caused infection in humans and is therefore considered a potential pandemic threat.
Phase 3	An animal or human-animal influenza reassortant virus has caused sporadic cases or small clusters of disease in people but has not resulted in human-to-human transmission sufficient to sustain community-level outbreaks.
Phase 4	Characterized by verified human-to-human transmission of an animal or human-animal influenza reassortant virus able to cause "community-level outbreaks".
Phase 5	Characterized by human-to-human spread of the virus into at least two countries in one WHO region.
Phase 6	The pandemic phase is characterized by community level outbreaks in at least one other country in a different WHO region in addition to the criteria defined in Phase 5. Designation of this phase will indicate that a global pandemic is under way.
Source: WHO http://www.who.int/en/	

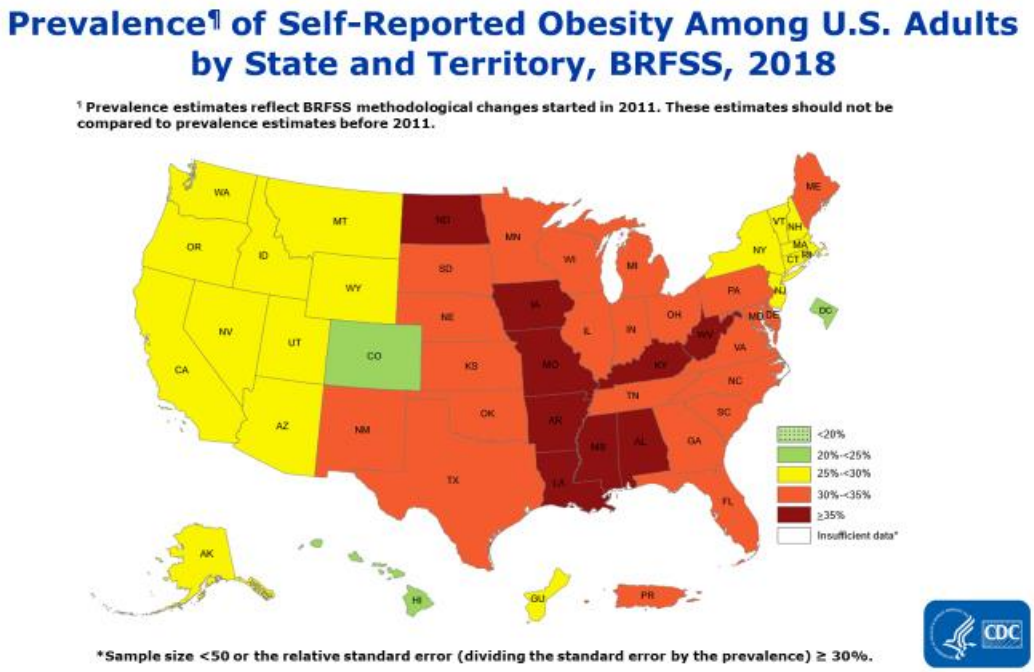
At the writing of this plan, the United States was in an Opioid epidemic. The opioid epidemic specifically refers to the growing number of deaths and hospitalizations from opioids, including prescriptions, illicit drugs, and analogues. In recent years, death rates from these drugs have ramped up to over 40,000 a year, or 115 a day, across the country. In 2020 drug overdose was the leading cause of accidental death in the United States, largely due to the opioid epidemic. The opioid epidemic first gained notoriety around 2010, but the factors behind it had begun several years earlier.

Obesity is a serious health problem in the United States: nearly thirty-five percent of Americans have obesity. Obesity is not just a problem of "girth control"; it is now considered a chronic disease by the American Medical Association, the American Association of Clinical Endocrinologists, the American College of Endocrinology, the Endocrine Society, the Obesity Society, the American Society of Bariatric Physicians, and the National Institutes of Health (NIH).

It is, in fact, a national epidemic according to the Centers for Disease Control and Prevention (CDC). And it is not just a weight problem: it can have serious effects on a person's physical, metabolic and psychological health. And it affects some populations more than others.

The global nature of the obesity epidemic was formally recognized by a World Health Organization consultation in 1997.

Figure 29 - Prevalence of Self-Reported Obesity



Infectious Disease

Smallpox

This was an infectious disease unique to humans, caused by either of two virus variants, Variola major and Variola minor. The last naturally occurring case of smallpox (Variola minor) was diagnosed in October 1977 in Somalia. The last reported case in the United States was in 1949. Variola major is the more severe and has an overall mortality rate of 30% - 35%. Variola minor only has a mortality rate of one percent. Long-term complications of Variola major include characteristic scars. Less common complications are blindness, and limb deformities due to arthritis and osteomyelitis.

West Nile Virus

This is found in temperate and tropical regions of the world and is a mosquito-borne zoonotic arbovirus. It was first identified in the West Nile sub-region in the East African nation of Uganda in 1937. It was considered a minor risk to humans until an outbreak in Algeria in 1994. At that time there were cases of West Nile virus that caused encephalitis. The virus has spread globally. In 2019, West Nile virus infected 326 people and killed fifteen people in the United States, a significant decrease from previous years. Pennsylvania infections were seven with zero deaths (CDC, 2019.) Most West Nile infections in humans are

subclinical, causing no symptoms. Approximately twenty percent of infections cause symptoms and less than one percent of cases result in severe neurological disease or death. Symptoms typically appear between two and fifteen days after infection and there is currently no vaccine for West Nile virus. Person to person transmission of West Nile is less prevalent than person to person transmission of influenza.

Lyme Disease

Since 2011, Pennsylvania has led the country in the number of Lyme disease cases, according to the CDC. Each year since 2005, the number of confirmed cases of Lyme disease in Pennsylvania has grown, with 10,208 confirmed cases in 2018. This number was well below the number of cases reported in 2016 and 2017, perhaps as a result of a reduced number of acorns available to feed field mice, one of the lead carriers of the disease; and/or perhaps as a result of public awareness due to the actions of a Pennsylvania Task Force formed to focus on prevention, education, awareness, and surveillance of the tick-borne illness. In 2015, the state Department of Conservation and Natural Resources placed signs in the 120 state parks and twenty state forest districts warning visitors and staff about the presence of ticks. (PA DOH June 2019). While most cases of Lyme disease can be treated over a few weeks with antibiotics, undetected Lyme disease can seriously damage a body's musculoskeletal and nervous systems, sometimes resulting in death.

Zika Virus

Zika virus has spread to Pennsylvania primarily by persons from Pennsylvania traveling to locations where the virus is a transmission risk. These places include certain countries in South America, Central America, the Caribbean, the Pacific Islands, Africa and Southeast Asia. No locations within the United States are considered to have significant risk of Zika virus transmission (PA DOH, 2019). If a Pennsylvania resident does contract Zika virus, preventing the spread of the disease is important. If an infected individual is bitten by a mosquito within three weeks of infection, the mosquito can transmit the virus to anyone else it bites. Infected individuals should strictly avoid any possibility of mosquito bites to prevent the spread of Zika virus. Additionally, Zika can be transmitted through sexual intercourse, so infected individuals should use condoms or abstain from sex while they have the virus.

4.3.9.3 Past Occurrence

Pandemic & Epidemic

Influenza

H1N1

Lawrence County was impacted with the H1N1 virus during 2009. The Pennsylvania Department of Health set up clinics throughout the county to administer vaccines.

Spanish Flu

Prior to the COVID-19 world-wide pandemic, the 1918 influenza (Spanish Flu) pandemic was classified as the "Mother of all Pandemics". An estimated one third of the world's population was infected and had clinically apparent illnesses during the 1918 - 1919 influenza pandemic. Pennsylvania was one of the hardest hit states in the country because influenza tended to strike cities very hard. The impact of the 1918 - 1919 influenza is not limited to that time frame. All Influenza-A pandemics since that time have been caused by 1918 virus descendants (including "drifted" H1N1 viruses and reasserted H2N2 and H3N2

viruses). Only Influenza Type A viruses are known to have caused pandemics. *Table 30 - Notable Influenza A Events in the United States* lists past Influenza A events.

Table 30 - Notable Influenza A Events in the United States

Year(s)	Common Name
1889	Russian Flu
1918 - 1919	Spanish Flu
1957	Asian influenza
1968	Hong Kong influenza
1976	Swine Flu
2009	Novel H1N1 "swine flu"
2020	COVID-19
Sources: WHO and CDC	

Legionella

The CDC estimates about 25,000 annual cases of pneumonia due to Legionella bacteria (Legionella pneumophila) in the United States. Only 5,000 cases are reported, however, because of the disease's nonspecific signs and symptoms. About ten percent of people infected with Legionella bacteria will die from the infection. Legionella is also known as Legionnaires' disease.

Legionnaires' disease outbreaks and clusters have been linked to a number of sources, including: water systems, such as those used in hospitals, nursing homes, and hotels; large plumbing systems; hot-water tanks and heaters; cooling towers of air conditioning systems; showers and faucets; mist machines and hand-held sprayers; swimming pools; hot tubs and whirlpools; equipment used in physical therapy; decorative fountains.

In August of 2013, Legionella bacteria were found in the Liberty Mutual Insurance Co. building in Lawrence County, PA during routine HVAC system maintenance and testing. The company acted promptly and contacted the state and county boards of health to ensure appropriate protocol. The building has been closed and the employees were notified of the situation (www.WPXI.com).

In June of 2020, the Pennsylvania Health Alert Network warned of an anticipated increase in Legionellosis cases due to the summer season and building re-openings as the Commonwealth relaxed its risk mitigation strategies for COVID-19. See below.

COVID-19

This is an on-going pandemic at the time of the writing of this plan, so websites are used to provide the most up-to-date statistics. The first cases in Pennsylvania were reported on March 6, 2020 in Delaware and Wayne counties. The first confirmed case of COVID-19 in Lawrence County was on March 24, 2020.

The June 12, 2020 CDC *COVIDView*, a weekly surveillance summary of U.S. COVID-19 activity, reports that:

- The overall cumulative COVID-19 associated hospitalization rate is 89.3 per 100,000, with the highest rates in people 65 years of age and older (273.8 per 100,000) followed by 50-64 years

(136.1 per 100,000). Hospitalization rates are cumulative and will increase as the COVID-19 pandemic continues.

- Non-Hispanic American Indian or Alaska Native persons have a rate approximately five times that of non-Hispanic White persons; non-Hispanic Black persons have a rate approximately 4.5 times that of non-Hispanic White persons, and Hispanic or Latino persons have a rate approximately four times that of non-Hispanic White persons.
- Cumulative hospitalization rates for COVID-19 in adults (18-64 years) at this time are higher than cumulative end-of-season hospitalization rates for influenza over each of the past five influenza seasons.
- For people 65 years and older, current cumulative COVID-19 hospitalization rates are within ranges of cumulative influenza hospitalization rates observed at comparable time points during recent influenza seasons.
- For children (0-17 years), cumulative COVID-19 hospitalization rates are much lower than cumulative influenza hospitalization rates at comparable time points during recent influenza seasons.

Infectious Disease

Infectious Disease

2019/2020 Influenza Season

As of week thirteen, ending March 28, 2020, the PA DOH stopped updating its 2019-2020 influenza data page when influenza activity was known to have decreased significantly and was below epidemic limits. At that juncture, Lawrence County had reported 268 cases of influenza A and 203 cases of influenza B for a total of 470 cases of the flu. The PA DOH also reports that during the same time frame a total of 102 Pennsylvanians have died from influenza. Of this number, those aged 65 and older had the highest mortality rate. The most up-to-date information may be found here: https://www.health.pa.gov/topics/disease/Flu/Pages/2019-20-Flu.aspx

West Nile Virus

West Nile virus reached the United States in 1999 and a year later was detected in Pennsylvania when mosquito pools, dead birds, and/or horses in nineteen counties tested positive for the virus. A comprehensive network has been developed in Pennsylvania that includes trapping mosquitoes, collecting dead birds and monitoring horses, people and, in past years, sentinel chickens. *Table 31 - West Nile Virus Control Program in Lawrence County Since 2015* outlines the West Nile Virus within Lawrence County since 2015.

Table 31 - West Nile Virus Control Program in Lawrence County Since 2015

West Nile Virus Control Program in Lawrence County Since 2015				
Year	**Total Positives**	**Human Positives**	**Mosquito Positives**	**Bird Positives**
2020	0	0	0	0
2019	8	0	8	0
2018	101	0	100	1
2017	34	0	34	0
2016	2	0	2	0

West Nile Virus Control Program in Lawrence County Since 2015				
Year	**Total Positives**	**Human Positives**	**Mosquito Positives**	**Bird Positives**
2015	11	0	11	0

Source: http://www.depgis.state.pa.us/WNV/index.html

Lyme Disease

The PA DOH lists the following information regarding cases in Lawrence County, *Table 32 - 2018 Lyme Disease Data for Lawrence County*. The case count shows an alarming and consistent rise in cases over the past several years, although it should be noted that information represented for each county "may vary with respect to the resources they have to devote to investigation of Lyme cases". It should also be noted that these figures represent a rough estimate of the Lyme disease burden in Lawrence County.

Table 32 - 2018 Lyme Disease Data for Lawrence County

2018 Lyme Disease Data for Lawrence County			
Year	**Number of cases**	**Year**	**Number of cases**
1980	0	2000	0
1981	0	2001	<4
1982	0	2002	<4
1983	0	2003	0
1984	0	2004	<4
1985	0	2005	<4
1986	0	2006	0
1987	0	2007	<4
1988	<4	2008	5
1989	<4	2009	8
1990	<4	2010	7
1991	<4	2011	<4
1992	0	2012	6
1993	0	2013	13
1994	<4	2014	18
1995	<4	2015	31
1996	<4	2016	56
1997	<4	2017	82
1998	<4	2018	112
1999	0	2019	Not available
Source: https://www.health.pa.gov/topics/disease/Pages/Lyme-Disease.aspx			

4.3.9.4 Future Occurrence

Pandemic & Epidemic

The probability of a widespread pandemic public health emergency is every ten years or less with varying degrees of severity. Minor outbreaks of less serious communicable disease, such as influenza, occur much more frequently. Lawrence County is vulnerable to these diseases and infections since people commute to the larger urban areas outside the county for employment and from the larger urban areas to the county for recreation and sport related activities.

There is useful prediction data in a report released by Carnegie Mellon University during the COVID-19 pandemic in May 2020. The report, inclusive of employment travel patterns that may aid in prevention protocols or early stay-at-home/work-from-home orders, may be found here:

https://www.governor.pa.gov/wp-content/uploads/2020/05/20200529-CMU-Risk-Based-Decision-Support-Tool-05-28-2020.pdf

Infectious Disease

West Nile Virus

The best defense against West Nile virus is to remove mosquito breeding locations – stagnant water sources. Another defense is to prevent insect bites by wearing shoes, socks, long pants and a long-sleeved shirt when outdoors for long periods of time, or when mosquitoes are most active. Also, mosquito repellent can be considered whenever people are outside.

Influenza

It is estimated that 5% - 20% (600,000 to 2,400,000) of Pennsylvanians get the flu each year, and 120 to 2,000 die from complications of influenza (PA DOH 2020). The CDC recommends that everyone six months and older get a flu vaccine every season. People who are at a high risk of serious flu illness should take flu antiviral drugs as soon as they get sick.

Lyme Disease

Lyme disease is best combated using insect repellent, removing ticks promptly, applying pesticides, and reducing tick habitat. Once a person realizes they have been bitten by a tick, they should seek medical attention, as undetected Lyme Disease can seriously damage a body's musculoskeletal and nervous systems or result in death.

4.3.9.5 Vulnerability Assessment

It is extremely difficult to predict a pandemic or an epidemic. The National Institute on Drug Abuse estimates the epidemic of opioid use and overdose is estimated to cost the country annually $78.5 billion in healthcare costs, addiction treatment, lost productivity and criminal justice involvement. The Harvard School of Public Health estimates the obesity epidemic costs the country annually $190 billion in obesity-related healthcare costs alone.

The severity of the next pandemic cannot be predicted, but modeling studies suggest the impact of a pandemic on the United States could be substantial. In the absence of any control measures (vaccination or drugs), it is estimated that a "medium-level" pandemic could cause 89,000-207,000 deaths, 314,000-734,000 hospitalizations, eighteen to forty-two million outpatient visits, and another twenty to forty-seven million sick people in the United States. Between 155 - 35% of the U.S. population could be affected by an influenza pandemic, and the economic impact could range between $71.3 - $166.5 billion. These data for the 2020 pandemic have fluctuated widely but, at the time of the writing of this plan, were on pace for "medium level" or greater pandemic. The COVID 19 virus, however, has severely affected populations over the age of 65 – especially those in nursing homes – disproportionately; it has also severely affected different races disproportionately, e.g. non-Hispanic American Indian and Black people. The CDC reports that long-standing systemic health and social inequities have put some members of racial and ethnic minority groups at increased risk of getting COVID-19 or experiencing severe illness, regardless of age.

As of June 25, 2020, according to the Johns Hopkins Coronavirus Resource Center, there were over nine million confirmed cases of COVID-19 resulting in nearly 500,000 deaths world-wide. The World Health Organization also reports that as of March 12, 2020 there were 188 countries, areas or territories with cases.

The most up-to-date United States information, including data by county, may be found here: https://coronavirus.jhu.edu/us-map

Influenza pandemics are different from many of the threats for which public health and health-care systems were currently planning. A pandemic will last much longer than most public health emergencies and may include "waves" of influenza activity separated by months (in 20th Century pandemics, a second wave of influenza activity occurred three to twelve months after the first wave). The numbers of healthcare workers and first responders available to work will likely reduce as they will be at high risk of illness from exposure in the community and healthcare settings. Some may have to miss work to care for ill family members. Resources in many locations could be limited depending on the severity and spread of an influenza pandemic. These limited resources could also be affected by unrelated shortages.

Because of these differences and the expected size of an influenza pandemic, it is important to plan preparedness activities that will permit a prompt and effective public health response. The U.S. Department of Health and Human Services (DHHS) supports pandemic influenza activities in the areas of surveillance (detection), vaccine development and production, strategic stockpiling of antiviral medications, research, and risk communications. In May 2005, the U.S. Secretary of DHHS created a multi-agency National Influenza Pandemic Preparedness and Response Task Group. This unified initiative involves CDC and many other agencies (international, national, state, local, and private) in planning for a potential pandemic. Its responsibility includes revision of a U.S. National Pandemic Influenza Response and Preparedness Plan.

Elderly individuals, children and immune deficient individuals are most vulnerable to influenza. Nursing facilities, personal care facilities, daycares, schools and hospitals are considered more vulnerable since there are normally groups of these functional-needs population present at the facilities. Spread of disease is at an increased risk due to the vulnerability and density of these populations. Correctional institutions would also be at an increased risk due to the lack of social distancing required to help stop the spread of a pandemic. During the early and middle stages of the COVID-19 pandemic, nursing homes and personal care homes in Pennsylvania suffered staggering numbers of cases and deaths and several county jails and state correctional institutions reported wide community spread.

Table 33 - Lawrence County Congregated Populations

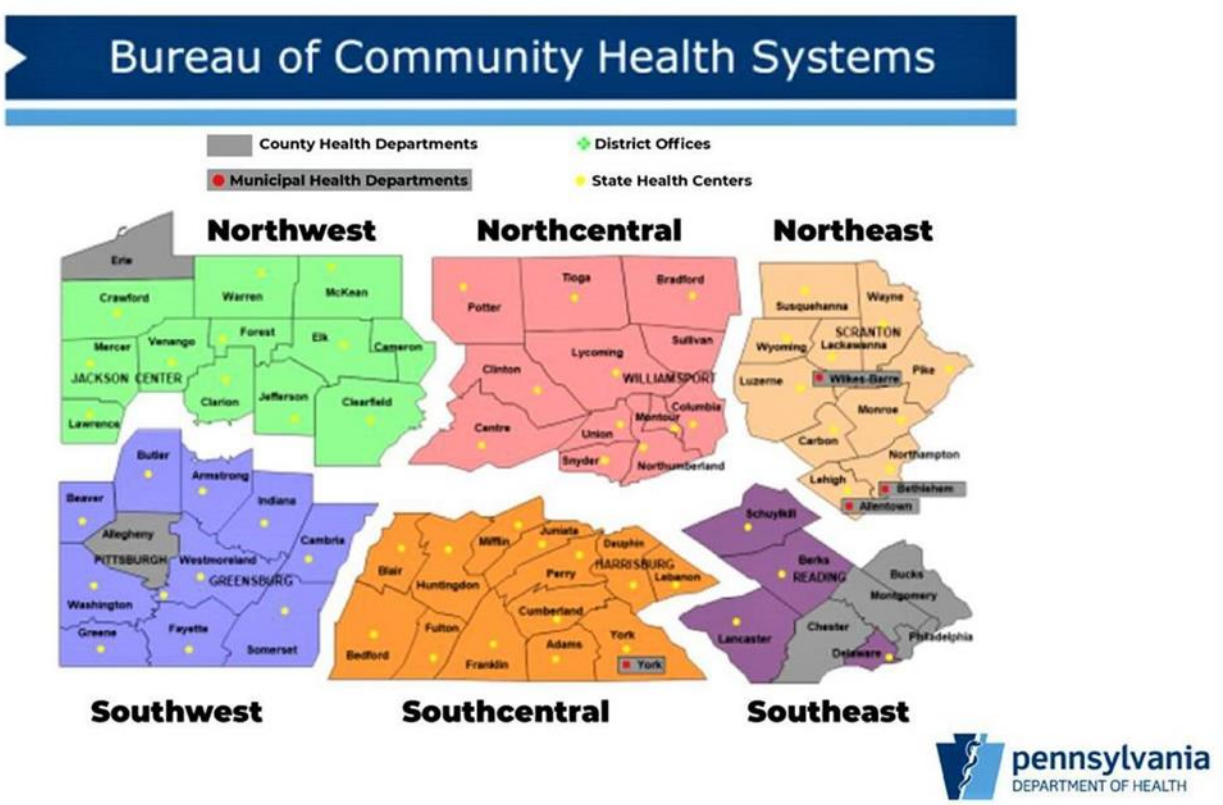
Lawrence County Congregated Populations	
Location	**Number of Beds**
Jameson Hospital North	254
Ellwood City Hospital	62
Avalon Place Nursing Care	84
Edison Manor Nursing and Rehab	118
The Grove at New Castle	62
The Grove at Wilmington	115
Haven Convalescent Home	91
Jameson Care Center	78
Quality Life Services – New Castle	204
Shenango Presbyterian Seniorcare	32
ARC Housing of Lawrence County	29
Caritas Human Service Center	11
Carriage Manor	48
Cedar Manor	32
Clen-Moore Place	47
Jameson Place	71
La Casa Personal Care Home	13

Lawrence County Congregated Populations	
Location	**Number of Beds**
Northview Estates	75
Rhodes Estates	90
Shenango Presbyterian Home	46
Westfield	8
Lawrence County Jail	~275
Total	1,845

It is important to plan preparedness activities that will permit a prompt and effective public health response. During a public health emergency, the PA DOH may open emergency medicine centers called Points of Dispensing (PODs) to ensure that medicine, supplies, vaccines, and information reach Pennsylvania residents during a public health emergency. An open POD is where the general public goes to receive free emergency medicine and supplies from public health officials, while a closed POD provides free emergency medicine and supplies to a specific community, like a university, including faculty, staff and students. Dispensing of medications/vaccines is a core function of the Strategic National Stockpile's Mass Dispensing of Medical Countermeasures Plan.

PODs are coordinated with county emergency managers by the PA DOH with through the six regional healthcare districts (see *Figure 30 - Pennsylvania Department of Health Districts*). Lawrence County is in the northwest district. At the time of the writing of this plan, POD planning for mass vaccinations against COVID-19 was occurring; no vaccine had yet been announced.

Figure 30 - Pennsylvania Department of Health Districts



Health-care workers and those working in direct-care situations (such as correctional institutions or those who can't social distance due to their jobs) are more likely to be exposed to a pandemic disease. Those that work outdoors for extended periods of time in warm months may be more vulnerable to West Nile, Lyme disease or the Zika virus.

4.3.10. Radon Exposure

Airborne radon gas is radioactive, and is a step in the radioactive decay of uranium to radium. Radon is a noble gas, cannot be seen and has no odor. Like other noble gasses, radon gas is very stable, so it does not easily combine with other chemicals. Two isotopes of radon are commonly found: 222Rn and 220Rn. The 220Rn isotope has a very short half-life, so it often only exists for fifty-five seconds, not long enough to pose a hazard to humans. The 222Rn isotope has a half-life of 3.8 days which is long enough to pose a threat to humans. Still, due to the relatively short half-life of 222Rn, it only exists in relatively close proximity to its radioactive parent, usually within tens of feet away. Radon is a carcinogen and when inhaled, it causes humans to develop lung cancer.

Radon was discovered as a significant source of natural radiation for humans in 1984 in the Reading Prong geologic province in Eastern Pennsylvania (east of Lawrence County), when routine monitoring of employees leaving the not yet active Limerick nuclear power plant showed readings that a construction worker working on the plant frequently exceeded expected radiation levels despite the fact that the plant was not active. The Environmental Protection Agency (EPA) guidelines state that mitigation actions should be taken if levels exceed 4pCi/L in a home, and most uranium miners have a maximum exposure of 67 pCi/L. Subsequent testing of the Limerick power plant worker's home showed high radon levels of 2,500 pCi/L (pico Curies per Liter), triggering the Reading Prong to become the focus of the first large-scale radon scare.

Radon gas is considered ubiquitous and can be found in indoor and outdoor environments, however there is no known safe level of exposure to radon. For most people in Pennsylvania, the greatest risk of radon exposure is from within their home in rooms that are below, directly in contact with, or immediately above the ground. Sources of radon include radon in the air from soil and rock beneath homes, radon dissolved in water from private wells and exsolved during water use (rare in Pennsylvania), and radon emanating from uranium-rich building materials such as concrete blocks or gypsum wallboard (also rare in Pennsylvania). Key factors in radon concentration in homes are the rates of air flow into and out of the house, the location of air inflow, and the radon content of air in the surrounding soil. Because of the flow dynamics of air inside of most houses, even a small rate of soil radon gas inflow can lead to elevated radon concentrations.

There are several factors that contribute to higher radon levels in soil gas:

- Proximity to elevated uranium rich deposits (>50ppm). Areas within a few hundred feet of such deposits are most at risk. Such deposits are rare in Pennsylvania.
- Some more common rocks have higher than average uranium content (5 to 50 ppm), and proximity to such rocks also increases the risk of radon exposure. These rock types include black shales as well as granitic and felsic alkali igneous rocks. This is the most common source of high radon levels in Pennsylvania. The Reading Prong elevated radon levels come from Precambrian granitic gneisses.
- Other soil and bedrock properties that facilitate radon mobility. The amount of pore space in the soil and its permeability – more porous soils will allow radon to travel more easily. Limestone-dolomite soils can also be predisposed to collect radon from radium resultant from

weathering of iron oxide or clay surfaces. In some cases (like in State College in Centre County, PA) even with underlying bedrock having normal uranium concentrations (.5 to 5 ppm), the vast majority of locations built on limestone-dolomite soils exceed radon concentrations of 4pCi/L, and many exceeded 20 pCi/L.

4.3.10.2 Range and Magnitude

According to the EPA, about 21,000 lung cancer deaths each year in the U.S. are related to radon - it is the second leading cause of lung cancer after smoking and the number one cause of lung cancer among non-smokers. There is no evidence that children are at a greater risk than adults. Radon causes lung cancer by continuing to radioactively decay after being inhaled, and turning into a daughter product (218Po, 214Pb, 214Bi) which may become attached to lung tissue and induce lung cancer due to their continued radioactive decay. *Table 34 - Radon Risk* (EPA, 2017) describes the relative risk to lung cancer that people experience depending on the radon level and their experience with smoking.

The EPA reports that the national average radon concentration of indoor air of homes is about 1.3 pCi/L, and they recommend that homes be fixed if the radon level is 4pCi/L or more. There is however no safe level of radon exposure, so the EPA also recommends to consider fixing a home if the radon level is between 2 pCi/L and 4 pCi/L.

Table 34 - Radon Risk

RADON LEVEL (pCi/L)	IF 1,000 PEOPLE WERE EXPOSED TO THIS LEVEL OVER A LIFE-TIME…*	RISK OF CANCER FROM RADON EXPO-SURE COMPARES TO...***	ACTION THRESH-OLD
SMOKERS			
20	About 260 people could get lung cancer	250 times the risk of drowning	Fix Structure
10	About 150 people could get lung cancer	200 times the risk of dying in a home fire	
8	About 120 people could get lung cancer	30 times the risk of dying in a fall	
4	About 62 people could get lung cancer	5 times the risk of dying in a car crash	
2	About 32 people could get lung cancer	6 times the risk of dying from poison	Consider fixing structure be-tween 2 and 4 pCi/L
1.3	About 20 people could get lung cancer	(Average indoor radon level)	Reducing radon levels below 2pCi/L is difficult
0.4	About 3 people could get lung can-cer	(Average outdoor radon level)	
NON-SMOKERS			
20	About 36 people could get lung cancer	35 times the risk of drowning	Fix Structure
10	About 18 people could get lung cancer	20 times the risk of dying in a home fire	
8	About 15 people could get lung cancer	4 times the risk of dying in a fall	

RADON LEVEL (pCi/L)	IF 1,000 PEOPLE WERE EXPOSED TO THIS LEVEL OVER A LIFETIME…*	RISK OF CANCER FROM RADON EXPOSURE COMPARES TO...***	ACTION THRESHOLD
4	About 7 people could get lung cancer	The risk of dying in a car crash	
2	About 4 people could get lung cancer	The risk of dying from poison	Consider fixing structure between 2 and 4 pCi/L
1.3	About 2 people could get lung cancer	(Average indoor radon level)	Reducing radon levels below 2pCi/L is difficult
0.4	-	(Average outdoor radon level)	
*Note: Risk may be lower for former smokers * Lifetime risk of lung cancer deaths from EPA Assessment of Risks from Radon in Homes (EPA 402-R-03-003). ** Comparison data calculated using the Centers for Disease Control and Prevention's 1999-2001 National Center for Injury Prevention and Control Reports.*			

4.3.10.3 Past Occurrence

In 1984, the Pennsylvania Radon Bureau responded to the newly detected high radon levels with a massive radon monitoring, educational, and remediation effort. As of November 1986, over 18,000 homes had been screened for radon and approximately fifty-nine percent were found to have radon daughter levels in excess of the 0.020 Working Level (WL) guideline. Radon daughter levels ranged up to 13 WL or 2600 pCi/L or radon gas.

The EPA estimates that the average indoor radon concentration in Pennsylvania basements is about 7.1 pCi/L (3.6 pCi/L on the first floor), well above their estimated national average of 1.3 pCi/L. Data on abundance and distribution of radon as it impacts individual houses in Lawrence County and Pennsylvania at large is incomplete and biased towards higher radon concentrations – most data is based on test results submitted by concerned homeowners who suspect they might be at risk for high radon levels. Results are skewed to overrepresent homes that have high radon levels, and under-represent homes with low radon levels. That being said, any homes with high radon levels are problematic, and there are many reported homes in Lawrence County with elevated radon concentrations.

The Pennsylvania Department of Environmental Protection (PA DEP) provides information for homeowners about how to test for radon in their homes, and when they receive a test result over 4 pCi/L, the PA DEP Bureau of Radiation Protection works to help homeowners repair the home and mitigate the hazard. The Pennsylvania Department of Environmental Protection (PA-DEP) records all the tests they receive and categorize them in a searchable database by zip code. *Table 35 - Radon Level Test Results* shows there are fourteen zip codes in Lawrence County where sufficient tests were reported for the PA DEP to report their findings. The highest average radon levels were reported from the 16120 and 16123 zip codes which covers parts of Enon Valley and Fombell with average readings of 10.8 pCi/L. Most reporting zip codes in Lawrence County have average basement Radon levels above the suggested EPA action level of 4 pCi/L - The average basement reading for reporting zip codes in the county is 6.0 pCi/L, and the average first floor reading is 3.1 pCi/L.

Table 35 - Radon Level Test Results

Radon Level Test Results (PA DEP, 2016)				
Zip Code	**Location**	**Number of Tests**	**Max Result pCi/L**	**Average Result pCi/L**
16057	Basement	577	130.2	6.2
	First Floor	41	20	2.9
16101	Basement	1184	121.3	4.5
	First Floor	68	38.1	3.3
16102	Basement	208	128.0	6.3
16103	Insufficient Data			
16105	Basement	1613	92.5	4.3
	First Floor	73	19.0	3.5
16107	Insufficient Data			
16108	Insufficient Data			
16112	Basement	57	42.6	7.2
16116	Basement	105	41.4	5.7
16117	Basement	1033	128.2	5.7
	First Floor	40	11.2	2.6
16120	Basement	67	158.5	10.4
16123	Basement	111	110.9	10.4
16132	Insufficient Data			
16140	Insufficient Data			
16141	Basement	37	35.8	6.3
16142	Basement	493	105.9	5.2
	First Floor	41	11.2	3.4
16143	Basement	113	19.6	4.6
16155	Insufficient Data			
16156	Basement	80	29.0	4.5
16157	Basement	114	152.9	8.8
16160	Insufficient Data			
16172	Insufficient Data			

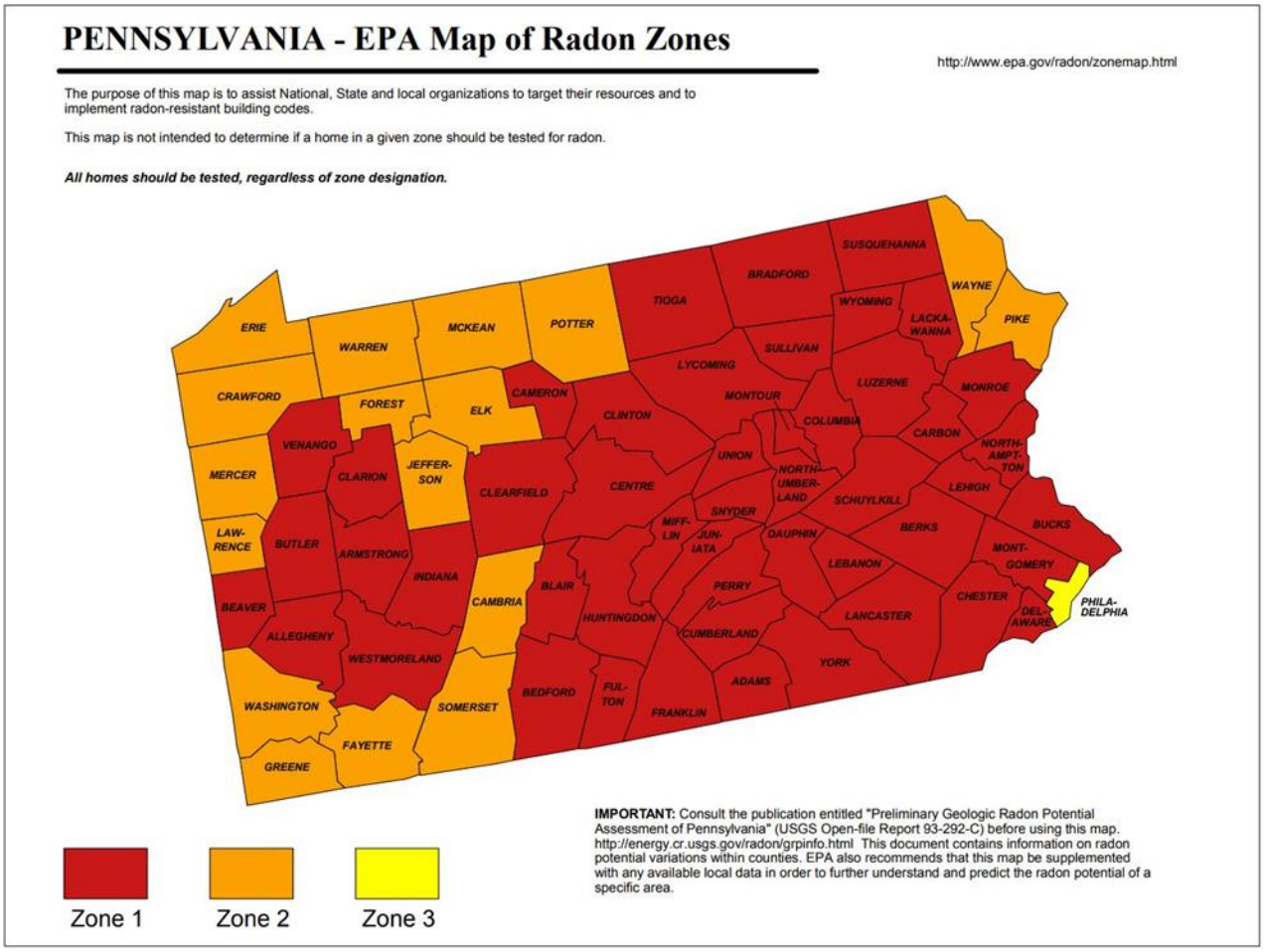
4.3.10.4 Future Occurrence

Radon exposure is inevitable given the geologic and geomorphic conditions in Lawrence County. The EPA and USGS have mapped radon potential in the US to help target resources and assist local governments in determining if radon-resistant features are applicable for new construction. The designations are broken down in three zones and are assigned by county, as shown in *Figure 31 - Radon Zones (EPA, 2017)*. Each zone reflects the average short-term measurement of radon that can be expected in a building without radon controls. Lawrence County is located within Zone 2, counties with potential for radon.

- Zone 1 has the highest potential and readings can be expected to exceed the 4 pCi/L recommended limit.
- Zone 2 has a moderate potential for radon with levels expected to be between 2 and 4 pCi/L and

- Zone 3 has a low potential with levels expected to be less than 2 pCi/L.

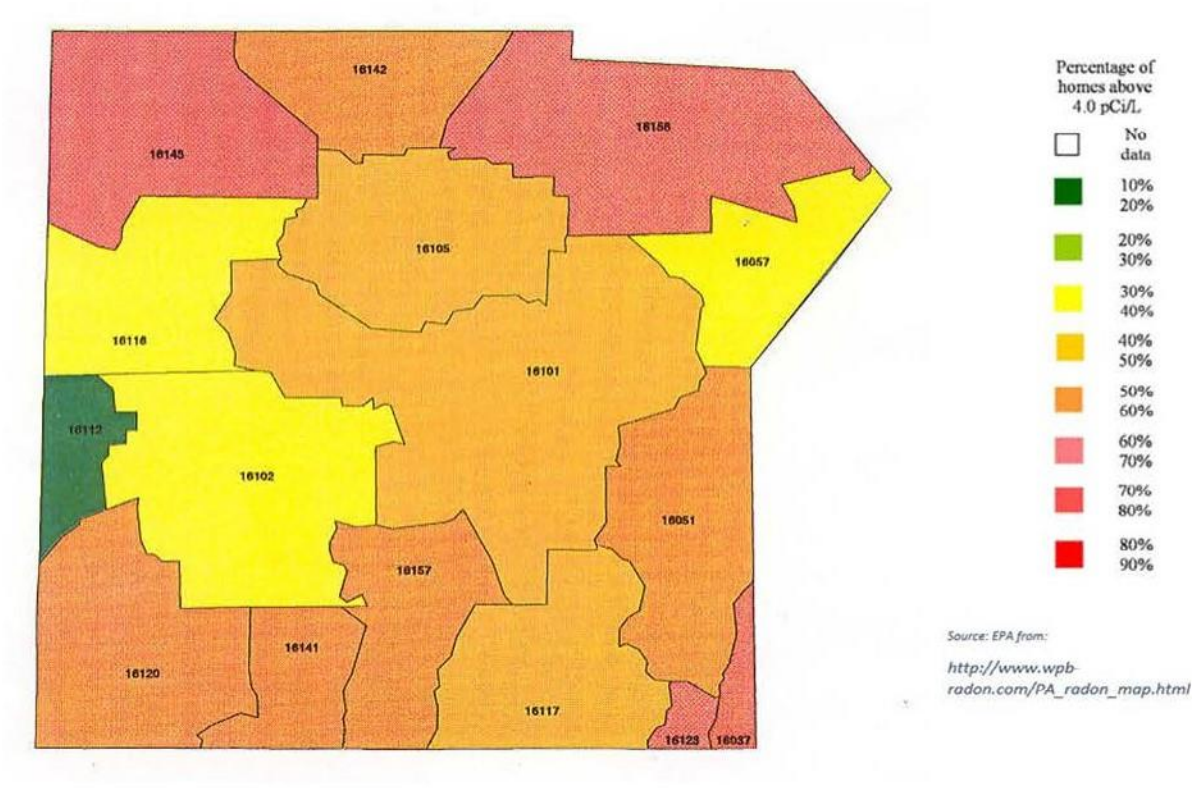
Figure 31 - Radon Zones (EPA, 2017)



4.3.10.5 Vulnerability Assessment

Lawrence County is in the EPA radon hazard zone 2, meaning there is a moderate risk of radon exposure. Older homes that have crawl spaces or unfinished basements are more vulnerable to having high radon levels. Average basement radon levels for homes who reported their results to the PA DEP are often found to be above the EPA action level of 4 piC/L. *Figure 31 - Radon Zones (EPA, 2017)* shows the best available data from the EPA about the percentage of homes with radon levels at or above the EPA action level. Homeowners across Lawrence County should test radon levels in their homes in order to determine their level of radon exposure. The EPA estimates that an average radon mitigation system costs approximately $1,200. The PA DEP Bureau of Radiation Protection provide short- and long-term tests to determine radon levels, as well as information on how to mitigate high levels of radon in a building. The 2018 PA HMP estimates that there are 37,883 buildings in Lawrence County that are in areas with high radon test results, and the cost to mitigate the most impacted of those buildings (an estimated 20% of them or 7,577 buildings) would be $9,091,920.

Figure 32 - Radon Vulnerability



4.3.11. Tornadoes and Windstorms

4.3.11.1 Location and Extent

Tornadoes occur in the Commonwealth most frequently during the spring and summer months and are most likely at the warmest times of the day. In the past sixty-nine years, records show that 960 tornadoes have been reported across the sixty-seven counties in Pennsylvania during the period of 1950 – December 2019 (NOAA NCEI, 2019). The National Weather Service estimates that the Commonwealth will experience ten tornadoes annually. According to the National Centers for Environmental Information (NCEI), wind speeds in tornadoes range from values below that of hurricane speeds to more than 300 miles per hour. The NCEI continues by reporting that, "the maximum winds in tornadoes are often confined to extremely small areas and vary tremendously over short distances," which explains why one house may be completely demolished by a tornado and a neighboring house could be untouched. The width of tornadoes can vary greatly, from one hundred feet wide to over a mile, and the forward motion of tornadoes can range from speeds between zero and fifty miles per hour.

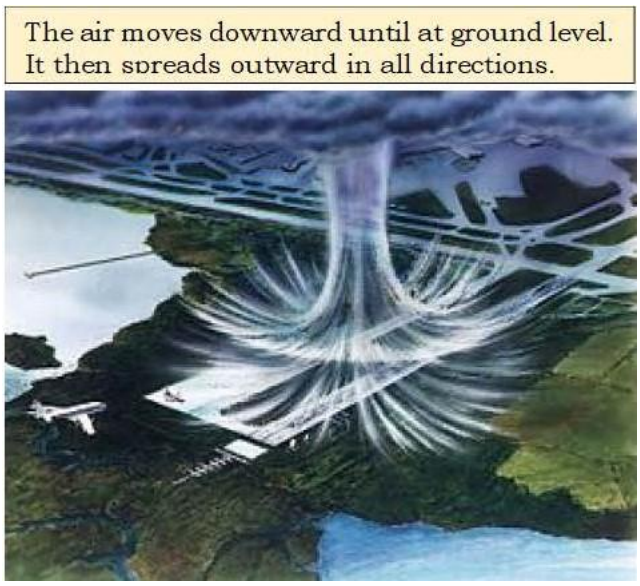
Windstorms may be caused by thunderstorms, hurricanes and tornadoes, but the most frequent cause of windstorms in western Pennsylvania is thunderstorms. Straight-line winds and windstorms are experienced on a more regional scale. While such winds usually also accompany tornadoes, straight-line winds are caused by the movement of air from areas of high pressure to low pressure. Windstorms are generally defined with sustained wind speeds of forty miles per hour or greater, lasting for at least one hour, or winds

of fifty-eight miles per hour or greater lasting for any du-ration. A microburst is a very-localized column of sinking air, capable of producing damaging opposing and straight-line winds at the surface. A wind shear is usually found when a violent weather front is moving through; wind speeds have been recorded up to one-hundred miles per hour. Wind shear is defined as a difference in wind speed and direction over a relatively short distance in the atmosphere.

4.3.11.2 Range of Magnitude

Each year, tornadoes account for $1.1 billion in damages and cause over eighty deaths nationally. 2011 was the second worst year on record for deadly tornadoes, the worst being 1936. The number of tornado reports has increased by fourteen percent since 1950. While the extent of tornado damage is usually localized, the vortex of extreme wind associated with a tornado can result in some of the most destructive forces on earth.

Figure 33 - Microburst

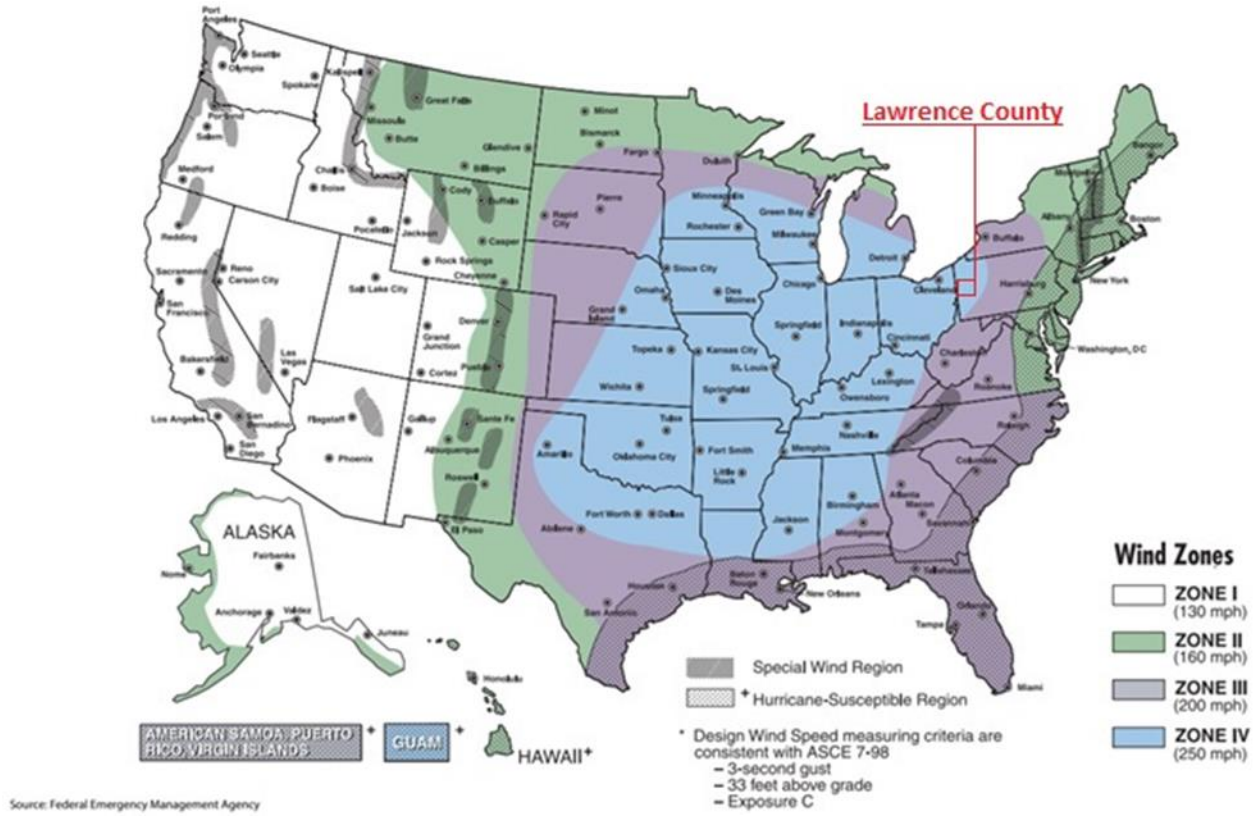


Rotational wind speeds can range from one hundred mph to more than 250 mph. In addition, a tornado's speed of forward motion can range from zero to fifty miles per hour. Therefore, some estimates place the maximum velocity (combination of ground speed, wind speed, and upper winds) of tornadoes at about 300 mph. The damage caused by a tornado is a result of the high wind velocity and wind-blown debris, also accompanied by lightning or large hail. The most violent tornadoes have rotating winds of 250 mph or more and are capable of causing extreme destruction and turning normally harmless objects into deadly projectiles.

Damages and deaths can be especially significant when tornadoes move through populated, developed areas. The destruction caused by tornadoes ranges from light to inconceivable depending on the intensity, size and duration of the storm. Typically, tornadoes cause the greatest damages to structures of light construction. The Enhanced Fujita Scale, also known as the "EF-Scale," measures tornado strength and associated damages. The EF-Scale is an update to the earlier Fujita Scale, also known as the "F-Scale," that was published in 1971. It classifies United States tornadoes into six intensity categories based upon the estimated maximum winds occurring within the wind vortex (*Table 36 - Enhanced Fujita Scale*). Since its implementation by the National Weather Service in 2007, the EF-Scale has become the definitive metric for estimating wind speeds within tornadoes based upon damage to buildings and structures. Previously recorded tornadoes are reported with the older F-Scale values, but *Table 36 - Enhanced Fujita Scale* shows F-Scale categories with corresponding EF-Scale wind speeds.

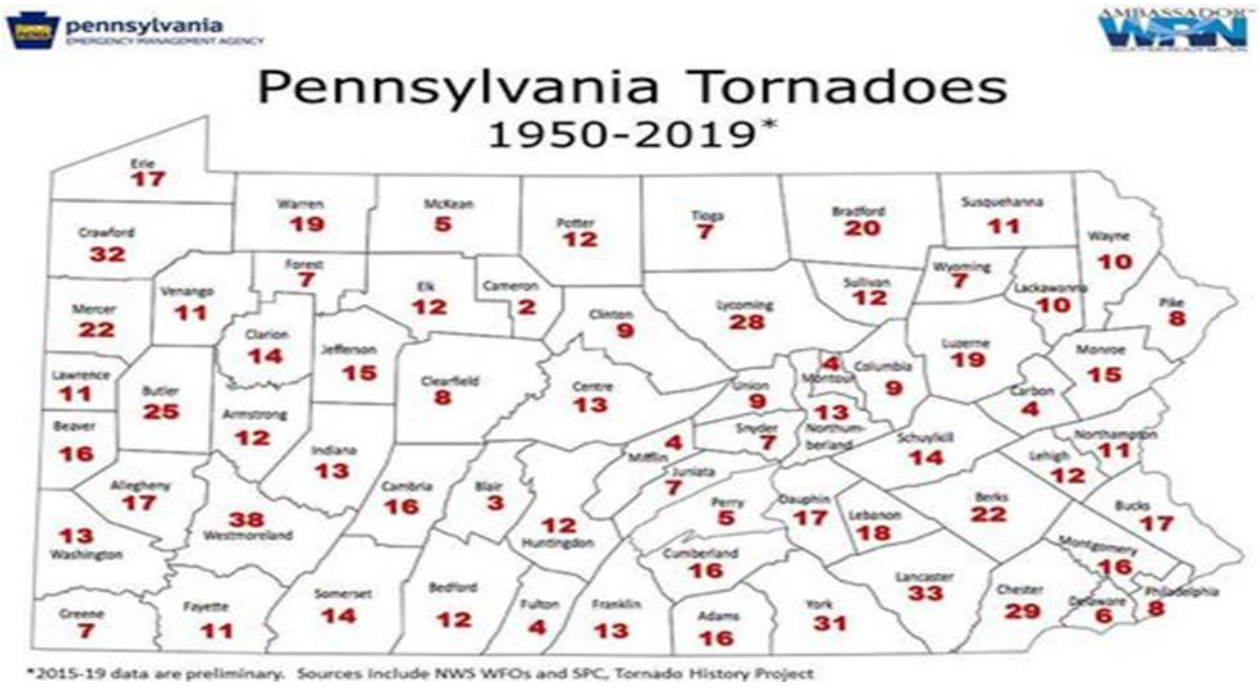
Figure 21 - Wind Zones in Section 4.3.5.1 depicts the wind speed zones developed by the American Society of Civil Engineers based on tornado and hurricane historical events. These wind speed zones are intended to guide the design and evaluation of the structural integrity of shelters and critical facilities.

Figure 34 - Wind Zones



Lawrence County falls within Zone IV, meaning shelters and critical facilities should be designed to withstand a three-second gust of up to 250 mph, regardless of whether the gust is the result of a tornado, coastal storm, or windstorm event. Therefore, these structures should be able to withstand the wind speeds experienced in an EF4 tornado event. While it is difficult to pinpoint the exact locations at the greatest risk of a tornado, the southeast, southwest and northwest sectors of the Commonwealth are more prone to tornadoes.

Figure 35 - Pennsylvania Tornadoes 1950-2019



Tornadoes can have varying secondary effects. The most common is power failure. The severe wind can dismantle power sources and cause significant structural damage. Hazardous material spills can occur if a tornado comes near a holding tank, or the spill stems from a traffic accident caused by high winds.

Windstorms of all types have caused the following problems within Lawrence County:

- Power failures lasting four hours or longer;
- Loss of communications networks lasting four hours or more;
- Residents requiring evacuation or provision of supplies or temporary shelter;
- Severe crop loss and or damage;
- Trees down or snapped off high above the ground/tree debris-fire fuel; and
- Toppled high profile vehicles, including those containing hazardous materials.

Table 36 - Enhanced Fujita Scale

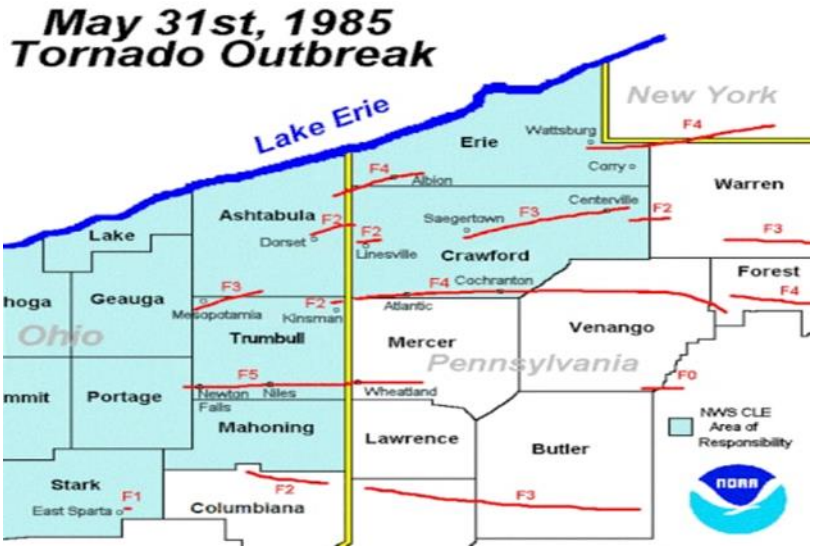
Enhanced Fujita Scale			
EF-Scale Number	**Wind Speed (MPH)**	**F-Scale Number**	**Description of Potential Damage**
EF0	65–85	F0-F1	**Minor damage**: Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e., those that remain in open fields) are always rated EF0.

Enhanced Fujita Scale			
EF-Scale Number	**Wind Speed (MPH)**	**F-Scale Number**	**Description of Potential Damage**
EF1	86-110	F1	**Moderate damage**: Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111–135	F1-F2	**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.
EF3	136–165	F2-F3	**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.
EF4	166–200	F3	**Devastating damage**: Well-constructed houses and whole frame houses completely leveled; cars thrown and small projectiles generated.
EF5	>200	F3-F6	**Extreme damage**: Strong frame houses leveled off foundations and swept away; automobile-sized projectiles fly through the air in excess of 100 m (300 ft.); steel reinforced concrete structure badly damaged; high-rise buildings have significant structural deformation.

4.3.11.3 Past Occurrence

Lawrence County has experienced eleven tornadoes since 1950 (see *Table 37 - Tornado History*). One of the deadliest tornado events in Pennsylvania history occurred on May 31, 1985, with a total of twenty-one tornadoes in the Ohio and Northwest Pennsylvania region (two of which skirted just north and south of Lawrence County; one of them an F5 – see *Figure 36 - May 31, 1985 Tornado Outbreak*). These tornadoes result-ed in seventy-six deaths, upwards of 1,000 injuries, and hundreds of millions of dol-lars in property damage.

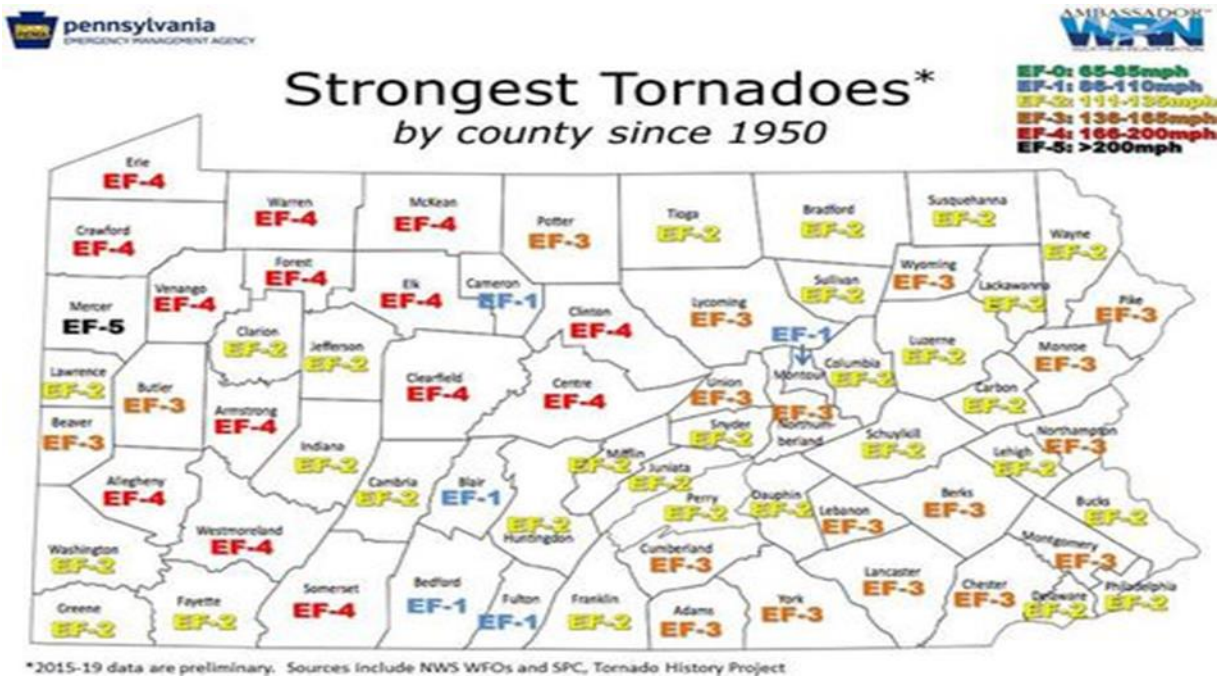
Figure 36 - May 31, 1985 Tornado Outbreak



The most recent tornado impacts in Lawrence County occurred in July 2013 when an EF1 was reported in Beaver Township, and two F2 tornadoes occurred on the same day in August 1992. The events continued the fortunate trend in the county of "few and far between" and low in magnitude.

The most damaging tornado to affect Lawrence County was an F2 on September 24, 1977 at 6:45 p.m. reported to have caused $2,500,000 in damages. From a relatively low magnitude tornado, the damages were great because it struck inside the city limits New Castle.

Figure 37 - Strongest Tornadoes by County Since 1950



Aside from tornadoes, Lawrence County has had fourteen severe wind reports from 1997 through 2019 causing minor property damage over the years (NOAA NCEI, 2019). Most often these are the result of intense thunderstorms, which often fell trees and damage power lines, causing power outages in some areas.

See *Table 37 - Tornado History, Table 38 - High Wind History* and *Figure 38 - Tornado History and Vulnerability Map 1950-2020* below.

Table 37 - Tornado History

Date	Magnitude (F/EF Scale)	Deaths	Injuries	Property Damage
06/10/54	F2	0	2	$25,000
09/24/77	F2	0	0	$2,500,000
07/19/83	F1	0	0	$25,000
08/09/87	F0	0	0	0
07/22/90	F0	0	0	0
07/23/91	F0	0	0	$250,000
07/12/92	F0	0	0	$250
08/08/92	F2	0	11	$250,000
08/08/92	F2	0	0	$25,000
04/09/01	F0	0	0	$5,000
07/10/13	EF1	0	0	$100,000
		0	13	**$3,180,250**

Table 38 - High Wind History

Lawrence County High Wind History *(NOAA NCEI, 2019)*					
Location	**Date**	**Mag. (knots)**	**Deaths**	**Injuries**	**Property Damage**
Countywide	02/27/1997	52	0	0	0
Countywide	01/10/2000	50	0	0	$5,000
Countywide	12/12/2000		0	0	$25,000
Countywide	12/14/2001	50	0	0	$5,000
Countywide	03/09/2002		0	0	$10,000
Countywide	03/08/2003	55	0	0	0
Countywide	07/21/2003	52	0	0	$1,000
Countywide	03/05/2004	50	0	0	0
Countywide	12/01/2006	55	0	0	$25,000
Countywide	01/30/2008	50	0	0	$50,000
Countywide	09/14/2008	55	0	0	$1,000,000
Countywide	02/12/2009	50	0	0	$100,000
Countywide	12/09/2009	50	0	0	0
Countywide	02/24/2019	50	0	0	0
Totals			0	0	**$1,221,000**

4.3.11.4 Future Occurrence

It is possible for a disastrous tornado to hit Lawrence County, given the fact that one F2 tornado recorded in the county caused over two million dollars in 1977 damages. While the chance of being hit by a devastating tornado is somewhat small, the damage that results when the tornado arrives can be catastrophic. An EF5 tornado with a 0.019 percent annual probability of occurring can carry wind velocities of 200 mph, resulting in a force of more than one hundred pounds per square foot of surface area. This is a "wind load" that exceeds the design limits of most buildings.

Additionally, based on historic patterns, tornadoes are unlikely to remain on the ground for long distances, especially in areas of the county with hilly terrain. However, the high historical number of windstorms with winds at or over fifty knots (see *Table 38 - High Wind History*) indicates that the annual chance of a windstorm in the county is higher.

According to FEMA (See the Hurricane Profile, Section 4.3.5 *Table 25 - Annual Probability of Wind Speeds*), there is high probability (~92%) each year that Lawrence County will experience winds of 45-77 mph; however, there is under a ten percent chance of winds of 78-118 mph and the risk declines even more dramatically as higher wind speeds are calculated.

The number of days when tornadoes occur in the United States has decreased; how-ever, there has been an increase in tornado activity on those days. The tornado season has also been lengthening, with the season starting earlier than it has historically. Pennsylvania had, for example, a record number of tornadoes in April and May 2019 compared to any other April or May on record. Climate change is causing temperatures and air moisture to increase, and it is thought that these changes could result in an increase in frequency and intensity of tornadoes and severe windstorms; however, there is somewhat low confidence in these conclusions and there is still much uncertainty (Kossin et al., 2017).

4.3.11.5 Vulnerability Assessment

Tornadoes can occur at any time of the year, though they are more likely during peak months, which are during the summer for the northern part of the United States. Tornadoes are most likely to occur between 3 P.M. and 9 P.M. but have been known to occur at all hours of the day or night. Factors that impact the amount of damage caused by a tornado are the strength of the tornado, the time of day and the area of impact. Usually such distinct funnel clouds are localized phenomena impacting a small area; however, the high winds of tornadoes make them one of the most destructive natural hazards. There can be many secondary impacts of tornadoes and windstorms, including transportation accidents, hazardous material spills, flooding, and power outages. A proper warning system is vital for the public to be informed of what to do and where to go.

Dangers that accompany thunderstorms which can produce tornadoes:

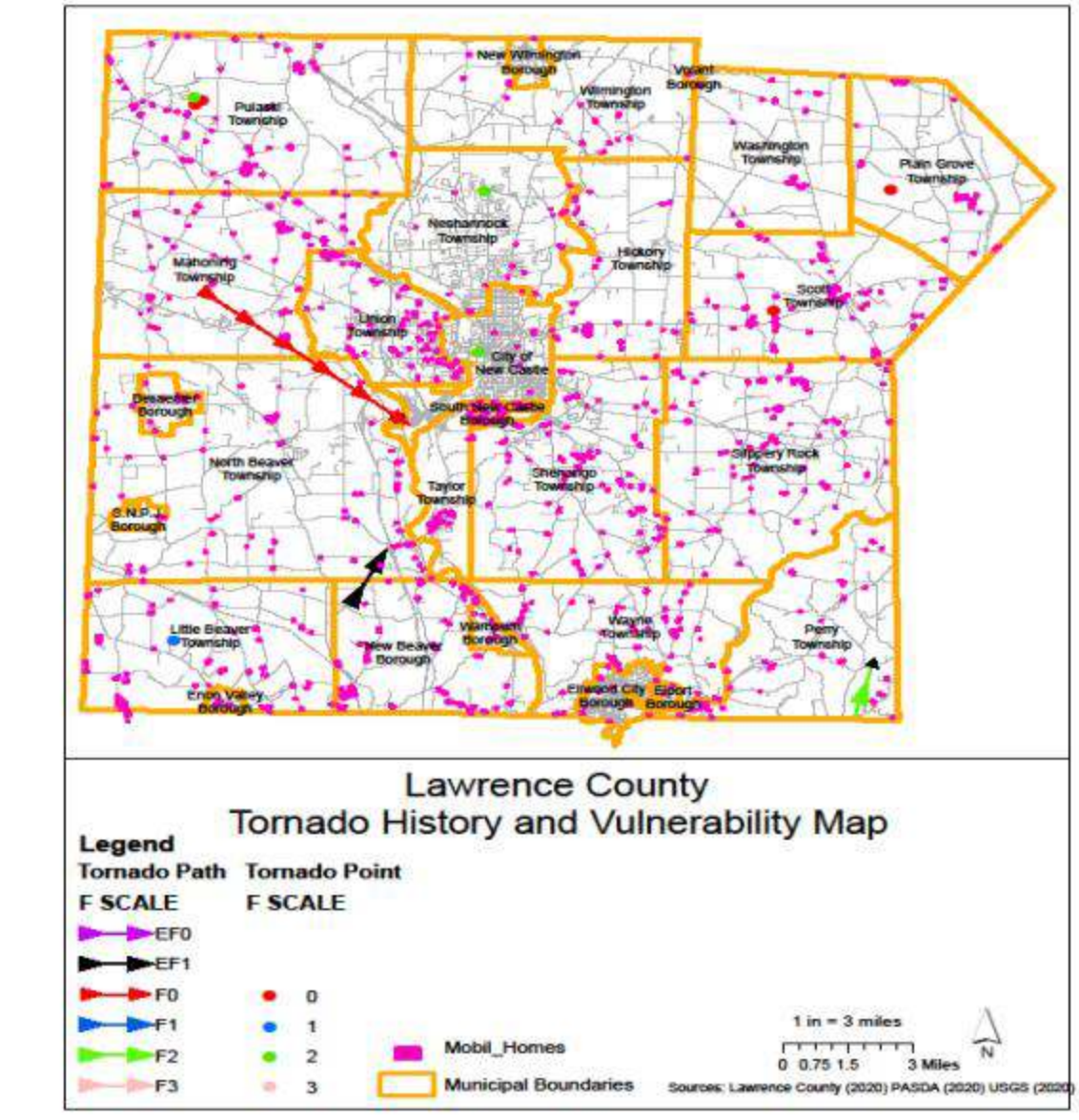
- Flash floods – with 146 deaths annually nationwide.
- Lightning – 75 to 100 deaths annually nationwide.
- Damaging straight-line winds – reaching 140 mph wind speed; and
- Large hail – can reach the size of a grapefruit and causes several hundred mil-lion dollars in damages annually to property and crops.

Critical facilities are highly vulnerable to high windstorms. While many severe storms can cause exterior damage to structures, tornadoes can also completely destroy structures, along with their surrounding

infrastructure, abruptly halting operations. Tornadoes are often accompanied by severe storms which can be threatening to critical facilities within the county in their own right. Many critical facilities are particularly vulnerable to power outages which can leave facilities functionless, potentially crippling infrastructure supporting the population of the county. With a storm's ability to destroy structures, citizens and their possessions are often left at the will of the storm. The elderly and disabled people and non-English speaking residents are at risk when faced with tornadoes. Without assistance to evacuate or difficulty under-standing public information, they may be unable to prepare themselves or their homes and other possessions to safely weather the storm. Campgrounds and mobile homes are also particularly vulnerable to tornadoes and windstorms, and locations of mobile home parks in Lawrence County can be found in *Figure 38 - Tornado History and Vulnerability Map 1950-2020*; however, this is not a comprehensive list of buildings vulnerable to strong windstorms. It should also be noted that the state parks and state forests in Lawrence County have designated camping locations where visitors often pitch tents and can be vulnerable to severe windstorms.

The local economy can also be crippled by tornadoes and windstorms and their secondary effects when buildings and supporting infrastructure are destroyed in the storm. Power outages can create work stoppages while transportation accidents and road closings can limit the transportation of goods and services. Additionally, flooding cannot be discounted as it can destroy the physical structures, merchandise and equipment essential for business operation. In the case of hazardous material spills caused by windstorms, the local environment can also be negatively impacted, requiring extensive clean-up and mitigation efforts.

Figure 38 - Tornado History and Vulnerability Map 1950-2020



4.3.12. Wildfire

4.3.12.1 Location and Extent

The most prevalent causes of devastating wildfires are droughts, lightning strikes, arson, human carelessness, and in rare circumstances, spontaneous combustion. Most fires in Pennsylvania are caused by anthropogenic fires such as debris burns that spread and get out of control. A fire, started in somebody's backyard, could travel through dead grasses and weeds into bordering woodlands starting a wildfire. Major urban fires

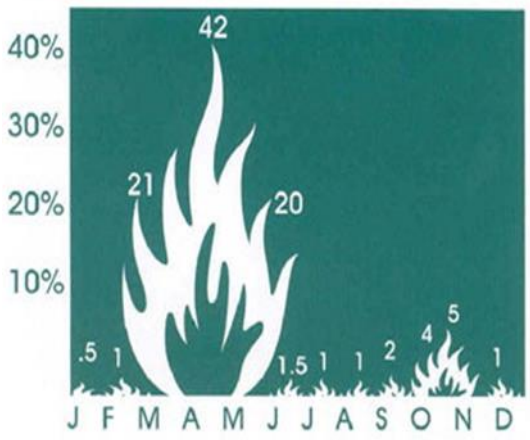
can cause significant property damage, loss of life, and residential or business displacement. While wildfires are a natural and essential part of many native Pennsylvania ecosystems (e.g. pitch pine – scrub oak woodlands), wildfires can also cause devastating damage if they are undetected and allowed to propagate unfettered. Wildfires most often occur in less developed areas such as open fields, grass, dense brush or forests where they can spread rapidly by feeding off of vegetative fuels. Wildfires are most prevalent under prolonged dry and hot spells, or generally drought conditions. The greatest potential for wildfires (83% of all Pennsylvania wildfires) occur in the spring months of March, April, and May, and the autumn months of October and November. In the spring, bare trees allow sunlight to reach the forest floor, drying fallen leaves and other ground debris increasing wildfire vulnerability. In the fall, the surplus of dried leaves is fuel for fires. *Figure 39 - Season Wildfire Percentage* shows the wildfire percentage occurrence during each month in Pennsylvania.

The county's 2016 comprehensive plan infers wildfire risk where it acknowledges that "rural landscapes stretch across a large extent of the county's land area, offering well-preserved natural conditions suited to agriculture and recreation. Homes sparsely scattered along country lanes represent a quiet and traditionally rural way of life." For recreational enjoyment, DCNR and Wikipedia report one state park of 2,546 acres (McConnells Mill), seven local parks, 1,228 acres of State Game Lands (148, 178, 216) another 3,409 acres of State Game Lands (150, 151, 284) shared with contiguous counties, and a series of trail systems – all at risk for wildfire. Over 4,100 acres in Lawrence County are protected under the Conservation Greenways Network. (Experience Lawrence County, Greenways Plan Update 2017).

4.3.12.2 Range of Magnitude

The forested areas of the county are at the greatest risk for wildfires. Lawrence County must be watchful of wildfires that could severely hinder farming, recreation, or industry. Wildfires usually occur following prolonged periods of dry weather; and with Lawrence County covered in forests, State Parks and game lands, a wildfire could prove to be costly.

Figure 39 - Season Wildfire Percentage



If an urban fire or wildfire is not contained, certain secondary hazards may affect Lawrence County. Power outages may be the most prevalent of these hazards. Environmental hazards could also result from a wildfire or urban fire.

They county's 2016 comprehensive plan cites two goals that may affect the range of magnitude of wildfire: protecting agricultural areas and the rural character of the county (rural character was identified as being an extremely important asset) and sustainment of an open space system to maintain rural character, and to increase connections between the various parts of the county (using a series of greenways, linear paths and parks).

Almost all of the wildland fires in the county occur in remote areas or areas away from residential structures. Unlike the wildland fires that occur in other parts of the country and affect vast areas of land and residential areas, most of the fires in Lawrence County are contained before they cause any damage or extensive property loss (2015 Hazard Mitigation Plan). However, the county recognizes that wildfires of some magnitude will continue to occur in Lawrence County, and

will have more devastating effects if development in or around wildlands increases – in contradiction to the stated goals of the 2016 Lawrence County Comprehensive Plan.

The United States Forest Service utilizes the Forest Fire Assessment System to classify the dangers of wildfire. *Table 39 - Wildland Fire Assessment System* identifies each threat classification and provides a description of the level.

Table 39 - Wildland Fire Assessment System

Wildland Fire Assessment System *(U.S. Forest Service)*	
Rank	**Description**
Low (L)	Fuels do not ignite readily from small firebrands although a more intense heat source, such as lightning, may start fires in duff or punky wood. Fires in open cured grasslands may burn freely a few hours after rain, but woods fires spread slowly by creeping or smoldering and burn in irregular fingers. There is little danger of spotting.
Moderate (M)	Fires can start from most accidental causes, but with the exception of lightning fires in some areas, the number of starts is generally low. Fires in open cured grasslands will burn briskly and spread rapidly on windy days. Timber fires spread slowly to moderately fast. The average fire is of moderate intensity, although heavy concentrations of fuel, especially draped fuel, may burn hot. Short-distance spotting may occur but is not persistent. Fires are not likely to become serious and control is relatively easy.
High (H)	All fine dead fuels ignite readily and fires start easily from most causes. Unattended brush and campfires are likely to escape. Fires spread rapidly and short-distance spotting is common. High-intensity burning may develop on slopes or in concentrations of fine fuels. Fires may become serious and their control difficult unless they are attacked successfully while small.
Very High (VH)	Fires start easily from all causes and, immediately after ignition, spread rapidly and increase quickly in intensity. Spot fires are a constant danger. Fires burning in light fuels may quickly develop high intensity characteristics such as long-distance spotting and fire whirlwinds when they burn into heavier fuels.
Extreme (E)	Fires start quickly, spread furiously and burn intensely. All fires are potentially serious. Development into high intensity burning will usually be faster and occur from smaller fires than in the very high fire danger class. Direct attack is rarely possible and may be dangerous except immediately after ignition. Fires that develop headway in heavy slash or in conifer stands may be unmanageable while the extreme burning condition lasts. Under these conditions the only effective and safe control action is on the flanks until the weather changes or the fuel supply lessens.

4.3.12.3 Past Occurrences

The State Department of Natural Resources (DCNR) has an extensive history of reported wildfires. Lawrence County is located in the Clear Creek State Forest (District 8), formerly the Kittanning State Forest. Not all the reported fires are necessarily wildfire hazards as many occurred in lightly urban environments.

District 8 reports the following sixteen-year wildfire summary, which indicates wide fluctuations between years, and no observed downward or upward trend:

- So far in 2020, the county has experienced three brush fires at the time of the writing of this plan.

- In 2019, there were eighty-one wildfires burning 115 acres, more wildfires than any other forestry district in the Commonwealth.
- In 2018, there were eighty-five wildfires burning 116 acres, again more wildfires than any other forestry district in the Commonwealth.
- In 2017, there were thirty-nine wildfires burning twenty-nine acres.
- In 2016, there were fifty-nine wildfires burning 182 acres.
- In 2015, there were sixty-seven wildfires burning 139.5 acres.
- In 2014, there were 141 wildfires burning 377.5 acres.
- In 2013, there were fifty-six wildfires burning 235 acres.
- In 2012, there were seventy-three wildfires burning 103 acres.
- In 2011, there were eighteen wildfires burning 96.5 acres.
- In 2010, only eight wildfires caused the burning of 274.4 acres.
- In 2009, there were eleven wildfires burning eighty-five acres.
- In 2008, there were seven wildfires burning eighty-three acres.
- In 2007, there were six wildfires burning 18.9 acres.
- In 2006, there were twenty-two wildfires burning 239.6 acres.
- In 2005, there were two wildfires burning 60.1 acres.
- In 2004, there were four wildfires burning 26 acres.
- In 2003, there were 18 wildfires burning 667 acres.

Far and away, the primary cause of the wildfires is consistently listed as "debris burning". See more detail at the following link:

http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/dcnr_20033433.pdf

In recent years, the number of prescribed burns in Pennsylvania has been increasing. This corresponds to an embrace of the need for fire in many natural ecosystems and management strategies for reducing vulnerability to wildfire; it also improves hunting opportunities. In April 2020 there were dozens of prescribed burns in State Game Lands at the time of the writing of this plan, but none on Game Lands in Lawrence County were listed (PA Prescribed Fire Council, 2020).

4.3.12.4 Future Occurrence

Annual occurrences of urban and wildfires in Lawrence County are expected. Urban fires are most often a result of human errors, outdated wiring or occasionally malintent (arson). The occurrence of large scale and intensity wildfires is somewhat unpredictable and highly dependent on environmental conditions and human response. Weather conditions play a major role in the occurrence of wildfires, so in the event of drought conditions, wildfire caution should be heightened. Any fire without the quick response or attention of firefighters, forestry personnel, or visitors to the forest, has the potential to become a wildfire. The Lawrence County Department of Public Safety coordinates county-wide burn bans when the conditions are ideal for wildfires. Public information and press releases are issued to help decrease the risk of a major fire thus reducing the possibility of future occurrences. Lawrence County Department of Public Safety disseminates all red flag warnings.

Climate change is expected to bring an elongated wildfire season and more intense and long-burning fires (Pechony & Shindell, 2010). Unfortunately, in some regions of the United States, this is not a hypothetical, but a devastating reality – Northern California has experienced unprecedentedly devastating wildfires in

2017, 2018 and 2019, and the fires are thought to be burning faster and hotter due to worsening drought conditions caused by climate change (Cvijanovic et al., 2017). Wildfire conditions in Pennsylvania are not nearly as severe as in Northern California currently, but the intensification is a signal that the changes brought by climate change are not to be ignored. In Pennsylvania, higher air temperatures and earlier warming in the spring are expected to continue, resulting in more wildfire prone conditions in the summer and fall (Shortle et al., 2015).

4.3.12.5 Vulnerability Assessment

The size and impact of a wildfire depends on its location, climate conditions and the response of firefighters. If the right conditions exist, these factors may often mitigate the effects of wildfires; however, during a drought, wildfires can be devastating. The highest risk for wildfires in Pennsylvania occurs during the spring (March–May) and fall (October–November) months and ninety-nine percent of all wildfires in Pennsylvania are caused by people (DCNR). Firefighters and other first responders can encounter life-threatening situations due to forest fires. Traffic accidents during a response and the impacts of fighting the fire once on scene are examples of first responder vulnerabilities.

The Wildland Urban Interface (WUI) was nationally mapped by a United States Department of Agriculture Forest Service effort in 2015 that used data from 1990-2010 to develop a robust dataset that relates housing density and vegetative density. The dataset provides a way to help identify locations where larger numbers of humans are living in or near natural areas that could be at risk in the event of a wildfire. The WUI defines two types of communities – interface and intermix: intermix WUI refers to are-as where housing and wildland vegetation intermingle, and interface WUI refers to areas where housing is in the vicinity of a large area of dense wildland vegetation (Martinuzzi et al., 2015). The WUI was the fastest-growing land use type in the United States between 1990 and 2010. Factors behind the growth include population shifts, expansions of cities into wildlands, and new vegetation growth. The primary cause has been migration of people, not vegetation growth. Of new WUI areas, ninety-seven percent were the result of new housing (Wikipedia, 2019).

Pennsylvania is among the states with the largest area of WUI and the most housing units in a WUI designated area. Pennsylvanians desire the proximity of natural beau-ty in their daily lives, and the growth in WUI housing noted above shows it. *Table 40 - Buildings in Wildfire Hazard Areas* shows the total Lawrence County addressable structures and critical facilities that are located in, near, adjacent to or among state game lands, state parks, state forests and local parks and other locations designated by the Wildland Urban Interface. Wildfire hazard is defined based on conditions that affect wildfire ignition and/or behavior such as fuel, topography and local weather. Cells in the chart that have a zero numerical entry had zero vulnerable addressable structures or critical facilities according to this analysis at that time. The many addressable structures in the Wildland Urban Interface and Intermix zones are broken up by assessed parcel use codes – the "other" land use is comprised of Industrial, Agriculture, Service, Transportation, Communication, Utility, Natural Resources and other Land uses. *Figure 41 - Wildland Urban Interface Locations* depicts the data in *Table 40 - Buildings in Wildfire Hazard Areas* in mapping format, inclusive of state game lands, state parks, state forests, local parks and the major parks and forests along the Appalachian Trail.

Several citations, including one from the U.S. Department of Agriculture Forest Ser-vice, indicate a better data-driven WUI model will be available soon; if available, that data will be included in the 2021 Lawrence County Hazard Mitigation Plan Annual Update. As a complement to that upcoming data. *Figure 40 - Fire*

Departments and Forested Areas shows the locations of fire departments in relative proximity (or lack thereof) to state owned natural areas which represent vast swatches of forests within the county.

There are twenty-seven fire departments that service Lawrence County, a list of which can be seen in *Table 49 - Emergency Responders*. Each fire department conducts its own schedule of in-house training sessions for its members.

The likelihood that fire services will fail is a real threat to county communities' safety. Many communities have already experienced the unfortunate fact that services have failed. It is recommended that each municipality assess their own vulnerabilities by maintaining and building a relationship with their local providers to make the determination and begin to plan accordingly if a local service was to shut down its operation. The statistics, response times and call times associated with all units dispatched are easily obtainable from the local 911 center.

These departments must be supported to create and or discover new ways to not only recruit but to retain volunteers. If left unattended, the issues will continue and the lack of response will grow, leaving the community more vulnerable to loss of life and loss of property to the threat of wildfire.

At the time of this writing, it is possible that the continuing or resurgent COVID-19 pandemic will impact the availability of firefighters, also.

It is recommended that the entire community be educated on the perpetual needs as-sociated with providing these services. In addition, continued support and efforts to inform the State legislature could prove to be paramount in assuring these services remain in operation into the future. At the time of the writing of this plan, a flurry of bills had been introduced in both the House of Representatives and the Senate as a result of a two-year study initiated by Senate Resolution 6 (SR 6). The final report can be found here: http://pehsc.org/wp-content/uploads/2014/05/SR-6-REPORT-FINAL.pdf

Table 40 - Buildings in Wildfire Hazard Areas

Buildings in Wildfire Hazard Areas *(Lawrence Co GIS, 2019; Radeloff et al. 2016)*						
Municipalities	**Wildland Urban Interface**			**Wildland Urban Intermix**		
	High Density	**Medium Density**	**Low Density**	**High Density**	**Medium Density**	**Low Density**
Bessemer Borough	0	9	39	0	16	216
City of New Castle	0	8	38	0	10	197
Ellwood City Borough	54	52	30	0	39	56
Enon Valley Borough	107	88	157	41	750	463
Hickory Township	169	190	16	0	0	0
Mahoning Township	18	62	0	0	25	1
Neshannock Township	0	5	25	0	28	99
New Beaver Borough	46	98	6	0	74	2
New Wilmington Borough	185	0	0	0	58	1
North Beaver Township	0	20	19	0	0	0

Buildings in Wildfire Hazard Areas *(Lawrence Co GIS, 2019; Radeloff et al. 2016)*						
Municipalities	**Wildland Urban Interface**			**Wildland Urban Intermix**		
	High Density	**Medium Density**	**Low Density**	**High Density**	**Medium Density**	**Low Density**
Perry Townships	33	155	371	0	108	509
Pulaski Township	37	53	3	0	230	8
Scott Township	0	18	0	0	9	57
Shenango Township	287	744	433	55	624	1,198
Slippery Rock Township	0	137	341	0	19	218
Taylor Township	0	353	0	0	17	13
Union Township	66	290	4	0	18	73
Volant Borough	26	24	198	0	1	345
Wampum Borough	113	152	4	1	65	10
Wayne Township	0	94	35	0	416	96
Total	**5,388**	**8,001**	**3,928**	**139**	**4,960**	**9,325**

For a complete list of fire departments in Lawrence County please visit section 4.3.24.2 Urban Fire and Explosions.

Figure 40 - Fire Departments and Forested Areas

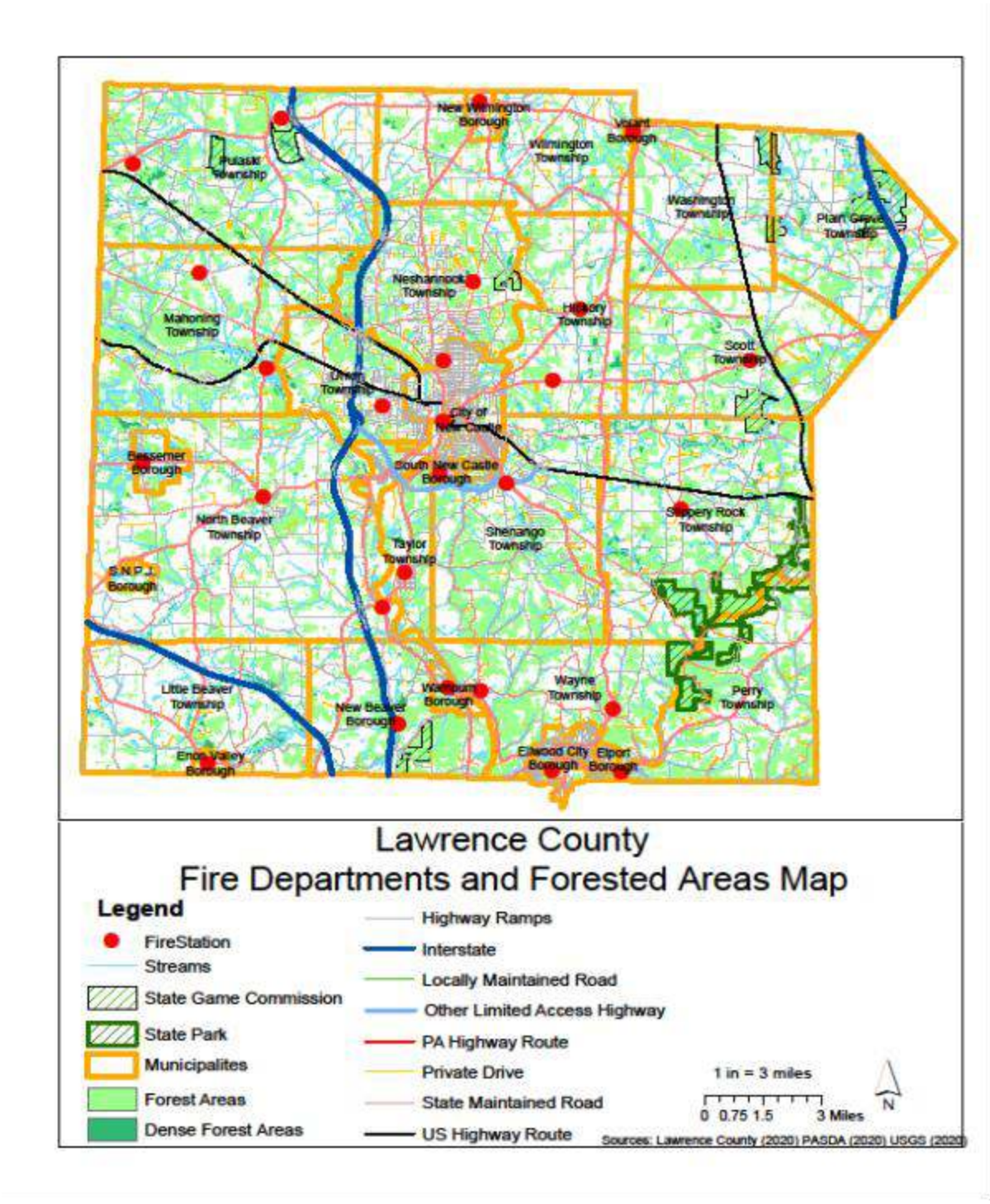
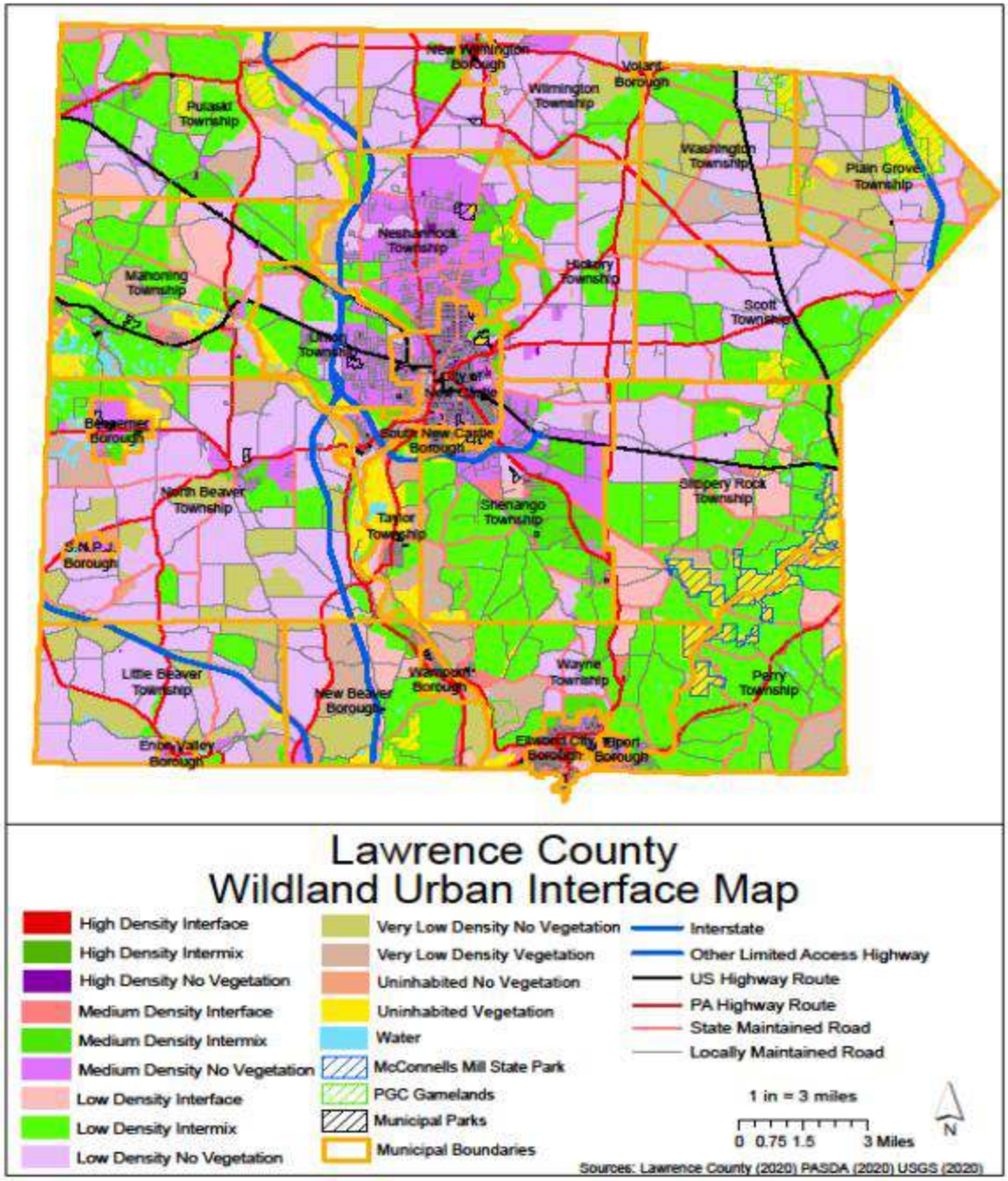


Figure 41 - Wildland Urban Interface Locations



4.3.13. Winter Storms

4.3.13.1 Location and Extent

There is an average of thirty-five winter weather events that impact Pennsylvania each year. Such winter storms are regional events, so each county in Pennsylvania shares these hazards; however, the northern tier, western counties and mountainous regions generally experience storms more frequently and with a greater severity due to lake effects and geographic influence. Within Lawrence County there are variations in the average amount of snowfall that is received throughout the county because of differences in terrain; higher elevations experience greater snowfalls than lower-lying areas, especially the elevated sections of the Allegheny Plateau.

On occasion Lawrence County can be affected by a Nor'easter, depending on its track. A Nor'easter is a storm characterized by a central low-pressure area that deepens dramatically as it moves northward along the U.S. East Coast. The name came from the strong northeast winds that precede and accompany the storm as it passes over New England. Nor'easters are notorious for producing heavy snow in the Central and Northeastern Mountains (including the Alleghenies), but typically make lighter snow (or even no snow) for counties in the west. Nor'easters will ordinarily produce a heavy, wet snow. There is usually a fairly consistent demarcation between rain, mixed precipitation, and snow which moves along with the storm and generally parallel to the track of the surface low. The demarcation typically pivots with the storm as the track changes direction. The mixed precipitation and rainfall are generated when warmer marine air is pulled into the storm. The heaviest snow in a Nor'easter falls to the north and west of the track of the surface low (NWS).

4.3.13.2 Range of Magnitude

Winter storms consist of cold temperatures, heavy snow or ice and sometimes strong winds. Descriptions of types of winter storms can be found in *Table 41 - Winter Weather Events*. In severe cases, secondary effects of winter storms involve flooding, and disruption to traffic, EMS response capabilities, communications, electric power and other utilities. Power outages can be caused by large amounts of snow or ice weighing on and breaking power lines. Especially in rural areas, loss of electric power can result in a loss of heat for residential customers, potentially posing a threat to human life.

Long cold spells can cause rivers and lakes to freeze over. A subsequent thaw and rise in the water level breaks the ice into large chunks and can result in ice jams when the ice begins to flow. The ice jams can act as dams and result in flooding. Environ-mental impacts often include damage to shrubbery and trees due to heavy snow loading, ice build-up and/or high winds which can break limbs or even bring down large trees. While gradual melting of snow and ice provides excellent groundwater re-charge, high temperatures following a heavy snowfall can cause rapid surface water runoff and severe flooding. *Figure 42 - Pennsylvania Annual Snowfall 1981-2010* shows mean annual snowfall in Lawrence County to be between thirty-one and forty inches. *Table 42 - Recent Annual Snowfall by Snow Station* summarizes annual snowfall accumulation for recent years not covered *in Figure 42 - Pennsylvania Annual Snowfall 1981-2010* as recorded in the weather station at Slippery Rock.

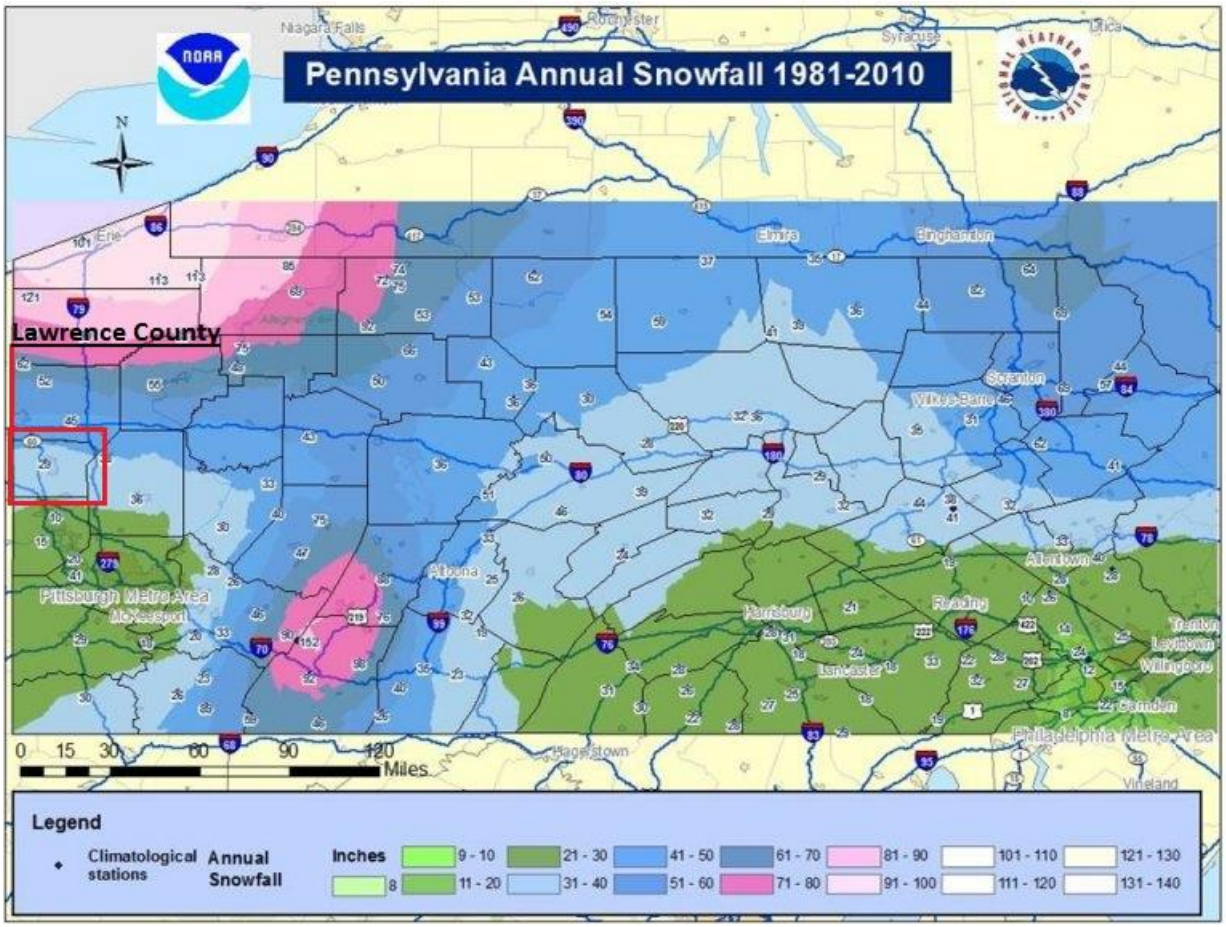
Table 41 - Winter Weather Events

Winter Weather Events	
Weather Event	**Classification**
Heavy Snowstorm	Accumulations of four inches or more in a six-hour period, or six inches or more in a twelve-hour period.
Sleet Storm	Significant accumulations of solid pellets which form from the freezing of raindrops or partially melted snowflakes causing slippery surfaces posing hazards to pedestrians and motorists.
Ice Storm	Significant accumulations of rain or drizzle freezing on objects (trees, power lines, roadways, etc.) as it strikes them, causing slippery surfaces and damage from the sheer weight of ice accumulation.
Blizzard	Wind velocity of thirty-five miles per hour or more, temperatures below freezing, considerable blowing snow with visibility frequently below one-quarter mile prevailing over an extended period of time.
Severe Blizzard	Wind velocity of forty-five miles per hour, temperatures of 10˚F or lower, a high density of blowing snow with visibility frequently measured in feet prevailing over an extended period time.

Table 42 - Recent Annual Snowfall by Snow Station

Monthly Snowfall Average by Snow Station at Slippery Rock (NOAA, 2020)			
Month	**Inches**	**Winter Season**	**Slippery Rock**
July	0.0”	2010-2011	43.4”
August	0.0”	2011-2012	38.4”
September	0.0”	2012-2013	42.2”
October	0.2”	2013-2014	47.3”
November	1.5”	2014-2015	35.7”
December	9.9”	2015-2016	38.8”
January	11.7”	2016-2017	48.2”
February	8.7”	2017-2018	47.9”
March	4.8”	2018-2019	61.0”
April	0.8”	2019-2020	31.4”
May	0.0”		
June	0.0”		
Annual	**37.6”**		

Figure 42 - Pennsylvania Annual Snowfall 1981-2010

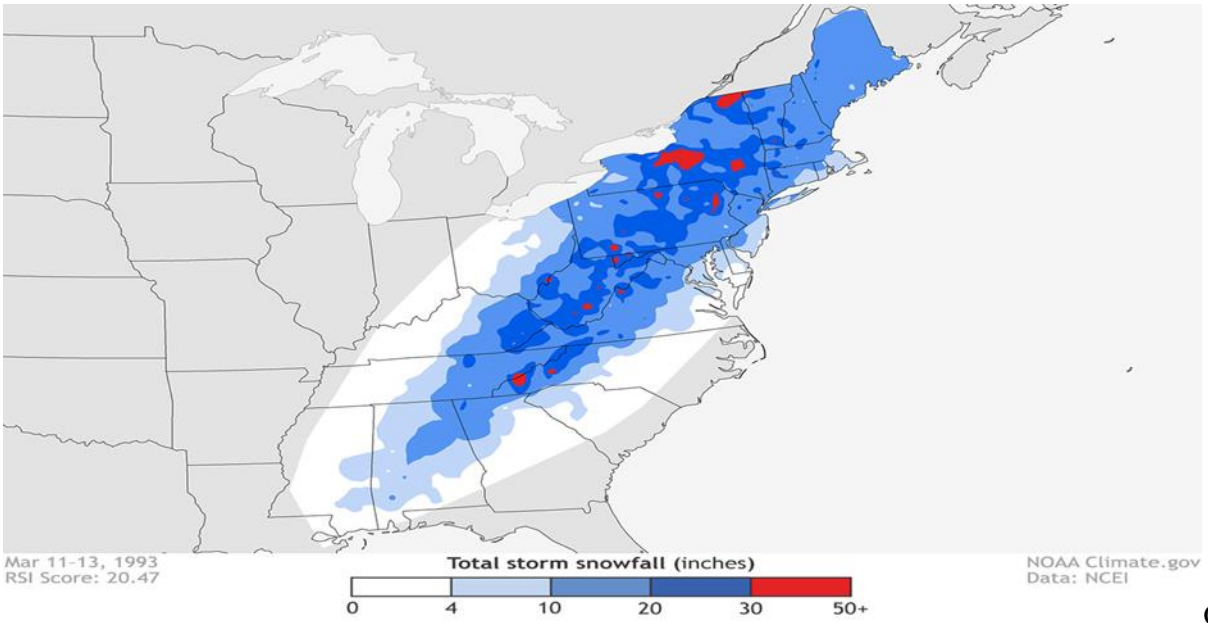


4.3.13.3 Past Occurrence

Winter storms occur an average of five times per year in Lawrence County. In January 1996, a series of severe winter storms with twenty-seven and twenty-four inches of snow accumulated across the Commonwealth and was followed by fifty to sixty-degree temperatures resulting in rapid melting and flooding. Another severe winter event in the county's history was in the winter of 1993 – 1994 when the state was hit by a series of protracted winter storms. The severity and nature of these storms combined with accompanying record-breaking frigid temperatures posed a major threat to the lives, safety and well-being of Commonwealth residents and caused major disruptions to the activities of schools, businesses, hospitals, and nursing homes. One of these devastating winter storms occurred in early January 1994 with record snowfall depths in many areas of the Commonwealth, strong winds and sleet/freezing rains. Numerous storm-related power outages were reported and as many as 600,000 residents were without electricity, in some cases for several days at a time. A ravaging ice storm followed which closed major arterial roads and downed many trees and power lines. Utility crews from a five-state area were called to assist in power restoration re-pairs. Officials from PPL Corporation stated that this was the worst winter storm in the history of the company – related damage-repair costs exceeded $5,000,000. Serious and sporadic power supply outages continued through mid-January in many lo-cations due to record cold temperatures. The entire Pennsylvania-New

Jersey-Maryland grid and its partners in the District of Columbia, New York and Virginia experienced fifteen to thirty minute rolling blackouts, threatening the lives of people and the safety of the facilities in which they resided. Power and fuel shortages affecting Pennsylvania and the East Coast power grid system required the Governor to recommend power conservation measures be taken by all commercial, residential and industrial power consumers. The record cold conditions (with temperatures as low as -31˚F) resulted in numerous water-main breaks and interruptions of service to thou-sands of municipal and city water customers throughout the Commonwealth. The extreme cold in conjunction with accumulations of frozen precipitation resulted in acute shortages of road salt. Trucks were dispatched to haul salt from New York to expedite deliveries to Pennsylvania Department of Transportation storage sites. The year prior, the country's so-called "Storm of the Century" clobbered the east coast. See *Figure 43 - Storm of the Century Total Storm Snowfall*.

Figure 43 - Storm of the Century Total Storm Snowfall



On March 12–14, 1993, a massive storm system bore down on nearly half of the U.S. population. Causing approximately $5.5 billion in damages ($9.9 billion in 2020 dollars), America's "Storm of the Century," as it would become known, swept from the Deep South all the way up the East Coast. With a central pressure usually found in Category 3 hurricanes, the storm spawned tornadoes and left coastal flooding, crippling snow, and bone-chilling cold in its wake. Of the more than 250 weather and climate events with damages exceeding $1 billion since 1980, this storm remains the country's most costly winter storm to date.

The great blizzard of January 1978 (also known as The Cleveland Superbomb) dumped nearly twenty-seven inches of snow on western and southwestern Pennsylvania and closed schools and businesses for days.

All recorded winter weather events in Lawrence County from 1966 - 2019 are summarized in *Table 41 - Winter Weather Events*. No direct deaths or injuries were reported for the following winter weather events in Lawrence. Detailed reports of each event can be found on NOAA's Storm Events Database (www.ncdc.noaa.gov/stormevents). These storms can result in closure of businesses and schools, blockages

and damage to roadways, and loss of electricity and telephone service. The main transportation routes in the county (e.g. US-76, and 376, PA 18, PA 19, PA 422) are normally opened immediately for emergency traffic, but secondary roads can remain impassable for days. Most residents and travelers in Lawrence County are aware of the winter weather reputation in the county and avoid travel when under a winter storm watch.

Lawrence County is vulnerable to an array of winter weather. This weather has the ability to close businesses, close schools and block and damage roadways throughout the county. The history of major winter storms in Lawrence County since 1966 is out-lined in *Table 43 - History of Winter Storms in Lawrence County*.

Table 43 - History of Winter Storms in Lawrence County

History of Winter Storms in Lawrence County					
Location	**Date**	**Type**	**Death**	**Injury**	**Property Damage, $K**
Statewide	January 1966	Heavy snow	UNK	UNK	UNK
Statewide	February 1972	Heavy snow	UNK	UNK	UNK
Statewide	January 1977	Severe Winter Weather	UNK	UNK	UNK
Statewide	January 1978	Heavy snow	UNK	UNK	UNK
Statewide	February 1978	Blizzard	UNK	UNK	UNK
Statewide	March 1993	Blizzard	UNK	UNK	UNK
Statewide	January 1994	Severe Winter Storms	UNK	UNK	UNK
Statewide	January 1996	Severe Winter Storms	0	0	0
Statewide	January 1999	Severe Winter Storm	0	0	0
Statewide	December 2000	Severe Winter Storm	0	0	0
Statewide	December 2002	Ice Storm/Heavy Snow	0	0	0
Statewide	February 2003	Heavy Snow	0	0	0
Statewide	December 2003	Heavy Snow	0	0	0
Statewide	January 2005	Heavy Snow	0	0	0
Statewide	March 2005	Heavy Snow	0	0	0
Statewide	February 2007	Heavy Snow/Ice Storm	0	0	0
Statewide	December 2007	Severe Winter Storm	0	0	0
Statewide	February 2008	Severe Winter Storm	0	0	0
Statewide	December 2009	Severe Winter Storm/Ice Storm	0	0	0
Lawrence County	January 9, 2009	Severe Winter Storm/Ice Storm	0	0	0
Lawrence County	February 6 2010	Winter Storm	0	0	0
Lawrence County	February 8, 2010	Emergency Declaration - Wayne Township	0	0	0
Lawrence County	February 18, 2010	Roof Collapses (in 2 municipalities)	0	0	0
Lawrence County	February 19, 2010	Emergency Declaration Adverse/Severe Weather-Enon Valley Boro	0	0	0
Lawrence County	January 31, 2011	Winter Weather Warning	0	0	0
Lawrence County	February 22, 2011	Winter Weather Events	0	0	0
Lawrence County	March 10, 2011	Heavy Snow	0	0	0
Lawrence County	December 26, 2012	Heavy Snow	0	0	0
Lawrence County	November 26, 2013	Heavy Snow	0	0	0
Lawrence County	February 4, 2014	Winter Storm	0	0	0
Lawrence County	February 15, 2016	Heavy Snow	0	0	0

Lawrence County	January 12, 2018	Winter Storm	0	0	0
Lawrence County	February 7, 2018	Heavy Snow	0	0	0
Lawrence County	January 18, 2019	Winter Storm	0	0	0
Lawrence County	February 13, 2020	Adverse/Severe Weather – Snow*	0	0	0
Lawrence County	February 20, 2020	Winter Weather	0	0	0

4.3.13.4 Future Occurrence

There is a likely probability of winter weather and winter storms occurring in Lawrence County, with expected annual events. The county is located in an area with a chance of equaling or exceeding total snow depths of thirty-one to forty inches. An analysis of the past occurrences indicates that this trend will continue annually in the future.

Meanwhile, climate change is expected to bring changes to the future of winter storms impacting Pennsylvania. Climate scientists believe that extreme winter storms are expected to occur more frequently – there have been about twice as many extreme snow events in the United States in the latter half of the 20th century as occurred in the first half (NOAA, 2018). This uptick is caused in part by higher than normal ocean surface temperatures that result in an increased source of moisture for storms that develop over the Atlantic Ocean. Conditions for severe winter storms are particularly heightened in the eastern United States due to changes in atmospheric circulation patterns caused by higher temperatures and melting Arctic sea ice (Francis & Vavrus, 2012). Winters in 2000 and 2001 were mild in Pennsylvania and led to spring-like thunderstorms during the winter months rather than snowstorms. Such thunderstorms can be followed by cold fronts and winter storms resulting in temperature drops of 50˚F in a few short hours. With warmer average temperatures, more precipitation is expected to fall as rain rather than snow, and data from NOAA show that Lawrence County has experienced a significant decrease in the amount of snowfall relative to the amount of rainfall, with a change of -10% to -20% from 1949 to 2016 (NOAA, 2016; PA HMP, 2018). Even though average temperatures are expected to be higher overall and there are expected to be fewer extreme cold days, those that do occur are expected to more often reach record setting low temperatures (Vose et al., 2017).

Winter storms are a regular, annual occurrence in Lawrence County and should be considered highly likely. Approximately thirty-five winter storm events occur across Pennsylvania annually and about five of them are estimated to impact Lawrence County each year.

4.3.13.5 Vulnerability Assessment

Winter storms are a moderately frequent event in the county, but they tend not to be as severe as in other areas of western or southwestern Pennsylvania. Detrimental im-pacts of severe winter storms are mitigated by salting, plowing and snow removal by PennDOT and local municipalities. Icy and snow-covered roads often result in in-creases in traffic incidents. Swift response to utility outages during winter storms is another significant way to mitigate damages. Residents of the mountainous and more rural areas of the county may be more susceptible during severe storms, especially when emergency medical assistance is required due to the location's potential for isolation. There are rural areas which are susceptible to isolation due to winter storms. Residents in outlying areas often find it beneficial to keep an emergency food and fuel stock in the event of isolation or utility interruption during a winter storm. The economic impacts from snow removal, road and infrastructure repair and other secondary effects impart a great strain on the budgets and material resources of local municipalities.

Even for communities that are prepared to respond to winter storms, severe events involving snow accumulations that exceed six or more inches in a twelve-hour period can cause a large number of traffic accidents, strand motorists due to snow drifts, interrupt power supply and communications, and cause the failure of inadequately designed and/or maintained roof systems. Similar to the vulnerability assessment discussion for tornados and severe wind, vulnerability to the effects of winter storms on buildings is dependent on the age of the building, construction material used and condition of the structure. Unfortunately, no comprehensive database of these variables could be identified for Lawrence County.

4.3.14. Civil Disturbance

4.3.14.1 Location and Extent

Civil disturbance refers to mass acts of disobedience where participants can become hostile to authority and there is a threat to maintaining public safety and order. Such disturbances can often be forms of protest in the face of socio-political problems. Riots have not been frequent occurrences throughout the history of the Commonwealth, however when they occur, they can cause significant property damage, injury and even loss of life. The scale and scope of civil disturbance events varies widely. Government facilities, local landmarks, prisons, and universities are common sites where crowds and mobs may gather.

4.3.14.2 Range of Magnitude

Civil disturbances can take the form of small gatherings or large groups blocking or impeding access to a building or disrupting normal activities by generating noise and intimidating people. They can range from a peaceful sit-in to a full-scale riot, in which a mob burns or otherwise destroys property and terrorizes individuals. Even in its more passive forms, a group that blocks roadways, sidewalks, or buildings interferes with public order. There are two types of large gatherings typically associated with civil disturbances: a crowd and a mob. A crowd may be defined as a casual, temporary collection of people without a strong, cohesive relationship. Crowds can be classified into four categories:

Casual Crowd: A casual crowd is merely a group of people who happen to be in the same place at the same time. Violent conduct does not occur.

Cohesive Crowd: A cohesive crowd consists of members who are involved in some type of unified behavior. Members of this group are involved in some type of common activity, such as worshipping, dancing, or watching a sporting event. Although they may have intense internal discipline, they require substantial provocation to arouse to action.

Expressive Crowd: An expressive crowd is one held together by a common commitment or purpose. Although they may not be formally organized, they are assembled as an expression of common sentiment or frustration. Members wish to be seen as a formidable influence. One of the best examples of this type is a group assembled to protest.

Aggressive Crowd: An aggressive crowd is comprised of individuals who have assembled for a specific purpose. This crowd often has leaders who attempt to arouse the members or motivate them to action. Members are noisy and threatening and will taunt authorities. They may be more impulsive and emotional and require only minimal stimulation to arouse violence. Examples of this type of crowd could include demonstrators and strikers, though not all demonstrators and strikers are aggressive.

A mob can be defined as a large disorderly crowd or throng. Mobs are usually emotional, loud, tumultuous, violent and lawless. Similar to crowds, mobs have different levels of commitment and can be classified into four categories:

Aggressive Mob: An aggressive mob is one that attacks, riots and terrorizes. The object of violence may be a person, property, or both. An aggressive mob is distinguished from an aggressive crowd only by lawless activity. Examples of aggressive mobs are the inmate mobs in prisons and jails, mobs that act out their frustrations after political defeat, or violent mobs at political protests or rallies.

Escape Mob: An escape mob is attempting to flee from something such as a fire, bomb, flood, or other catastrophe. Members of escape mobs are generally difficult to control and can be characterized by unreasonable terror.

Acquisitive Mob: An acquisitive mob is one motivated by a desire to acquire something. Riots caused by other factors often turn into looting sprees. This mob exploits a lack of control by authorities in safeguarding property.

Expressive Mob: An expressive mob is one that expresses fervor or revelry following some sporting event, religious activity, or celebration. Members experience a release of pent up emotions in highly charged situations.

In the event of a significant civil disorder event, local government operations and the delivery of services in the community may experience short-term disruptions. The greatest secondary effect is the impact on the economic and financial conditions of the affected community, particularly in relation to the property, facilities, and infrastructure damaged as a result of the disturbance. More serious acts of vandalism may result in limited power failure or hazardous material spills, leading to a possible public health emergency. Altered traffic patterns may increase the probability of a transportation accident.

Lawrence County's greatest threat to civil disorder is in New Castle City, the county seat. Citizens, property, and infrastructure could be affected if a large-scale disorder were to take place. Typically, government facilities, landmarks, prisons, and universities are common sites where crowds or mobs may gather. Notable locations in Lawrence County include; the county courthouse, the county jail, the New Castle police station, Troop D New Castle PSP barracks, and Westminster College.

4.3.14.3 Past Occurrence

There have not been any recent major civil disturbances or riots in Lawrence County; however, when violence erupted nationwide in late May 2020 over the death in Minneapolis of George Floyd, an African American man, there were two peaceful marches in New Castle. Floyd died by asphyxiation due to sustained pressure after a Minneapolis police officer kneeled on his neck for over eight minutes. Demonstrations spurred by Floyd's death occurred in all 50 states after the May 25 incident. On May 31, 2020, a calm assemblage of more than 100 people in downtown New Castle culminated with a peaceful march led by local police. A stop in front of the city police station during the march ended with a prayer led by the mayor of New Castle – himself an African American man and the first ever elected African American mayor of New Castle – before the group returned to its origin at Kennedy Square, then dispersed. The mid-afternoon event was organized largely through Facebook postings, and people who read about it and held up signs said they went into the downtown to voice their disapproval about police violence and racism. The calm

protest came a day after crowds rioted in the streets of downtown Pittsburgh, smashing windows, burning police cars, looting businesses and injuring people who had gathered along the city's main thoroughfares.

Another peaceful protest on June 2, 2020 gathered in front of the Lawrence County Courthouse and marched to the Diamond and then toward East Street, where they were greeted with snacks, water, and an assortment of speakers.

In February 1974, a conflict between truckers and farmers erupted. Pennsylvanian truckers went on a statewide strike causing frustration from dairy farmers across the Commonwealth who feared monetary losses if their milk could not be transported. A violent confrontation between truckers and farmers was narrowly avoided, and State Police escorts and governmental negotiations were used to ensure the transport of the raw milk and mitigate the conflict. A 3,000-person force of the Pennsylvania National Guard was mobilized to guard overpasses to prevent violence against the truckers.

4.3.14.4 Future Occurrence

While unlikely, civil disturbances may occur in Lawrence County, and it is difficult to accurately predict the probability of future occurrence for civil disturbance events over the long-term. It is estimated that a civil disturbance event could occur every 30 years or less in Lawrence County.

4.3.14.5 Vulnerability Assessment

All municipalities in Lawrence County can be vulnerable to civil disturbance; however. the anticipated impact from such events is minimal. These events may be sparked for varying reasons and the seriousness of the event may well be exacerbated by how authorities handle the crowd. Some critical facilities are important to be aware of as both potential locations for civil disturbance events, and important locations during civil disturbance response. Maps showing critical facilities by municipality can be found in Appendix E.

4.3.15. Dam Failure

4.3.15.1 Location and Extent

A dam restricts the flow of water or underground streams. The reservoirs created by these barriers not only suppress floods but also provide water for activities such as irrigation, human consumption, industrial use aquaculture, and navigability. Levees are a type of dam and are used to prevent water entering an area that would otherwise be submerged. This allows for reclaiming land for human use. According to the US Army Corps of Engineers National Inventory of Dams and Levees there are two dams and zero levees in Lawrence County. *Table 44 - Lawrence County Dams* list these.

Table 44 - Lawrence County Dams

Lawrence County Dams						
Name	**River**	**Owner Type**	**Type**	**Purpose**	**Year Completed**	**Hazard Potential**
Slovene Camp	TR Sugar Creek	Private	Earth	Recreation	1966	Low
Silt Pond	-	Private	Earth	Other	-	Significant

There are no high hazard dams located within Lawrence County, but there are five dams outside of Lawrence County that could significantly impact population and structures within the county in the event of

dam failure. The county does not have digital copies of dam inundation maps. Paper maps are found at the county courthouse. Flood insurance rate maps were analyzed to determine the water bodies that were dammed and the direction of the downstream flow of flooding that would come from dam failures. Three of the dams impact the Mahoning River or tributaries into the Mahoning River. One dam impacts the Shenango River. One dam impacts Muddy Creek that quickly converges into Slippery Rock Run. Since the exact inundation areas were not known at the time of the update, all communities that have the dammed water bodies running through them are listed. The actual impact of flooding from dam failures could be greater or less than the communities listed below.

- Shenango River Dam (Mercer County) - The Shenango River Dam dams the Shenango River in Mercer County. Pulaski, Neshannock, Mahoning, Union, New Castle and Taylor Townships in Lawrence County are downstream of the dam on the Shenango River and could be impacted with flooding caused by a dam failure.
- Moraine State Park Dam (Butler County) - The Moraine State Park Dam dams the Muddy Creek in Butler County. Muddy Creek flows downstream into Slippery Rock Run in Slippery Rock Township, Lawrence County. Slippery Rock Township could be impacted by flooding caused by dam failure on Muddy Creek. If the flooding from a dam failure continued along Slippery Rock Run, Perry and Wayne Townships could also be impacted.
- Mosquito Creek Dam (Ohio) - The Mosquito Creek Dam dams the Mosquito Creek in Trumbull County, Ohio. Mosquito Creek flows downstream into the Mahoning River in Trumbull County, Ohio. Mahoning, Union, New Castle, North Beaver and Taylor Townships in Lawrence County are downstream of the dam on the Mahoning River and could be impacted with flooding caused by a dam failure.
- Berlin Lake Dam (Ohio) - The Berlin Lake Dam dams the Mahoning River in Mahoning County, Ohio. Mahoning, Union, New Castle, North Beaver and Taylor Townships in Lawrence County are downstream of the dam on the Mahoning River and could be impacted with flooding caused by a dam failure.
- M.J. Kirwan Dam & Reservoir (Ohio) - The M.J. Kirwan Dam dams the West Branch of the Mahoning River in Portage County, Ohio. The West Branch of the Mahoning River flows downstream into the Mahoning River in Trumbull County, Ohio. Mahoning, Union, New Castle, North Beaver and Taylor Townships in Lawrence County are downstream of the dam on the Mahoning River and could be impacted with flooding caused by dam failure.
- The Nashua Bridge area of Pulaski Township would be heavily impacted by a failure of the Shenango River Dam. A dam failure at Lake Arthur could directly affect certain areas of Slippery Rock Township.

4.3.15.2 Range of Magnitude

Dam safety laws are embodied in the Dam Safety and Encroachments Act ("DSE Act")-enacted July 1, 1979 and last amended in 2011. Rules pertaining to dam safety are found in Title 25-Rules and Regulations; Part I-Department of Environmental Resources; Subpart C-Protection of Natural Resources; Article II-Water Resources; Chapter 105-Dam Safety and Waterway Management ("the Rules") adopted September 16, 1980. (www.damsafety.org)

Dams assigned the significant-hazard potential classification are those dams where failure or incorrect operation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or other concerns. Significant hazard potential classification dams are often

located in predominantly rural or agricultural areas but could be in areas with population and significant infrastructure. Dams assigned the high-hazard potential classification are those where failure or incorrect operation has a great possibility of causing loss of human life.

4.3.15.3 Past Occurrence

There have been no major dam failures in Lawrence County. Other small dam failures have occurred over the years with very limited impacts.

4.3.15.4 Future Occurrence

Minor dam failures occur quite frequently. However, they often go unnoticed and cause little or no damage or effects on the general population. Significant dam failures occur much less frequently. The probability of a significant dam failure in Lawrence County is unlikely to occur. Dam failures are often a secondary effect, resulting from another hazard, such as heavy rainfall from a hurricane or tropical storm.

4.3.15.5 Vulnerability Assessment

There is always the possibility any dam could fail; however, the probability is unlikely in Lawrence County. According to PEMA, minor dam failures occur every year, but their impact is minimal. Usually they are gradual, low volume releases that are unexpected and do not cause loss of life or damage to the environment. No significant high hazard or low hazard dams have been identified in Lawrence County. The local planning team anticipates that some agricultural dams may be present throughout Lawrence County. The local planning team will develop a hazard mitigation strategy to inventory and document all dams throughout the county and possibly in other counties that would impact Lawrence County during a failure.

4.3.16. Disorientation

4.3.16.1 Location and Extent

Large numbers of people are attracted to Pennsylvania's rural areas for recreational purposes such as hiking, camping, hunting, and fishing. As a result, people can become lost or trapped in remote and rugged wilderness areas. Lawrence County attracts environmental tourists due to the natural beauty of the county and the expanses of forested area, both state land and otherwise. Lawrence County is known for large, regional public recreation destinations such as McConnells Mill State Park and multiple state game lands. In the event of disorientation, search and rescue may be required for people who suffer from medical problems or injuries and those who become accidentally disoriented. Search and rescue efforts are often focused in and around state forest and state park lands as they contain numerous miles of hiking and biking trails.

4.3.16.2 Range of Magnitude

Approximately 92,000 acres, or forty percent of Lawrence County is both public and privately owned forestland. A wide variety of factors can contribute to the outcome of a search and rescue mission but the most common dangers associated with disorientation are lack of food, water and shelter. Lawrence County generally has an abundance of water, and during the warmer summer months shelter is less of a necessity than during winter months when extreme temperatures can pose a threat. Age, physical fitness, and familiarity with the area can also have a bearing on the outcome.

Initial search and rescue efforts are often made with teams of dogs, people on horseback, and or volunteers from fire departments, and for longer term incidents, drones may be employed.

4.3.16.3 Past Occurrence

Wilderness search and rescue has required considerable resources, sometimes resulting in the expenditure of hundreds of man-hours. *Table 45 - Disorientation Events* identifies the disoriented and missing person incidents in Lawrence County through July 2020 where emergency service personnel assistance was required.

McConnells Mill State Park encompasses 2,546 acres and is a national natural landmark that attracts thousands of tourists each year. Unfortunately, it is not uncommon for search and rescue teams to respond to several calls per year for a lost or injured hiker. As recently as May 25, 2020 a woman was airlifted to a hospital after receiving head and leg injuries from falling into Slippery Rock Creek in McConnells Mill State Park, marking the fourth time search and rescue teams were called since the start of the year. Another significant incident took place at the park in May of 2020 unfortunately taking the life of a thirty-eight-year-old man that fell into Slippery Rock Creek and drowned. This event lasted nearly two months and involved volunteer first responders, dog teams, kayakers, divers, drones, and other search and rescue personnel.

Table 45 - Disorientation Events

Disorientation Incidents ***(Knowledge Center, 2020; 2015 HMP)***			
Description	**Category**	**Location**	**Date and Duration**
Missing Hikers	Search & Rescue	Slippery Rock Township	05/02/09 – 2 hours
Search Party	Search & Rescue	Lawrence Township	05/13/09 – 1 hour
Search Detail	Search & Rescue	North Beaver Township	05/22/09 – 2 hours
Three Missing Juveniles	Search & Rescue	Lawrence Township	08/15/09 – 2 hours
Bessemer Missing Person	Search & Rescue	Bessemer Borough	08/15/20 – 16 hours
Missing Person	Search & Rescue	New Castle City	09/01/10 – 5 hours
Search Detail	Search & Rescue	Wayne Township	12/29/10 - 5 hours
Missing Person	Search & Rescue	Lawrence Township	03/19/11 – 8 hours
Lost Hikers	Search & Rescue	Slippery Rock Township	08/09/11 – 4 hours
Missing Wanted Person	Search & Rescue	Lawrence Township	08/26/11 – 95 hours
Missing Person	Search & Rescue	Neshannock Township	03/04/12 – 1 hour
Missing Person/Body Located	Search & Rescue	New Castle City	04/22/12 – 19 hours
Missing Person	Search & Rescue	Taylor Township	08/02/12 – 5 hours
Missing Person Search Detail	Search & Rescue	Neshannock Township	11/05/12 – 30 min
Missing Individual	Search & Rescue	Perry Township	11/29/12 – 4 hours
Search Detail	Search & Rescue	Neshannock Township	02/10/12 – 2 hours
Search Detail	Search & Rescue	Slippery Rock Township	05/11/13 – 45 min
Missing Person	Search & Rescue	Lawrence County	07/25/13 – 12 hours
Search for Lost Person	Search & Rescue	Neshannock Township	09/05/13 – 90 hours
Search Detail	Search & Rescue	Lawrence County	10/13/13 – 2 hours
Missing 7-Year-Old	Search & Rescue	Lawrence County	02/01/14 – 1 hour
Lost Hikers McConnells Mill State Park	Search & Rescue	Slippery Rock Township	03/10/14 – 4 hours
Search Detail – Missing Male	Search & Rescue	Slippery Rock Township	09/27/14 – 23 hours
Search Detail	Search & Rescue	New Beaver Borough	11/01/14 – 1 hour
Search	Search & Rescue	Lawrence Township	11/10/14 – 2 hours
Search Detail	Search & Rescue	Slippery Rock Township	06/24/15 – 5 hours
Missing Elderly Male	Search & Rescue	Union Township	08/22/15 – 10 hours
Missing Juvenile	Search & Rescue	Hickory Township	06/09/16 – 3 hours
Missing Child	Search & Rescue	Lawrence County	07/15/17 – 1 hour
Search Detail	Search & Rescue	Lawrence County	01/22/18 – 6 hours
Missing Hiker – McConnells Mill	Search & Rescue	Slippery Rock Township	04/26/18 – 1 hour

Disorientation Incidents *(Knowledge Center, 2020; 2015 HMP)*			
Description	**Category**	**Location**	**Date and Duration**
Search Detail	Search & Rescue	Slippery Rock Township	05/04/18 – 1 hour
Search Detail	Search & Rescue	Mahoning Township	07/09/18 – 3 hours
Missing Person	Search & Rescue	Slippery Rock Township	08/28/18 – 4 hours
Missing Person	Search & Rescue	Slippery Rock Township	06/22/19 – 2 hours
Missing Person	Search & Rescue	Pulaski Township	02/21/20 – 24 hours
Search Assist	Search & Rescue	Slippery Rock Township	05/02/20 – 8 hours
Search	Search & Rescue	Slippery Rock Township	05/02/20 – 2 months
Missing Hikers	Search & Rescue	Slippery Rock Township	07/10/20 – 5 hours

4.3.16.4 Future Occurrence

During the warm summer months, as activities such as hiking, biking and camping increase, so does the likelihood of individuals become disoriented. November also has many search and rescue events because of hunters getting lost during hunting season. Disorientations are most likely in state parks and state forests where outdoor recreation is most abundant and the forest is most dense. Medical emergencies occur regularly in the county, especially in the elderly that could result in disorientation.

4.3.16.5 Vulnerability Assessment

Individuals are most likely to become disorientated in areas of vast, open wilderness. Children and the elderly are more vulnerable to the exposure of elements. The elderly tend to be more vulnerable to disorientation due to medically related issues. Many times, a dementia or Alzheimer individual will become disoriented in wilderness or residential areas.

The most dangerous period to become lost outdoors is during the winter months when heat and shelter are vital. Lawrence County regularly experiences winter storms and temperatures below freezing, so persons participating in outdoor recreational activities in the winter are at a higher risk in the event of disorientation. A majority of the county is forested and relatively rural. Due to hunting seasons and the number of hunters taking to the woods, November is often also a high-volume time for search and rescue events, especially in state game lands and the surrounding areas.

4.3.17. Drowning

4.3.17.1 Location and Extent

Drowning can be a significant hazard in communities with numerous water bodies (e.g. ponds, lakes, rivers, etc.) and extensive outdoor recreational activity. This profile focuses on the threat of drowning in natural bodies of water, not swimming pools or other commercial/residential settings.

Major waterways in Lawrence County include the Shenango River, Neshannock Creek, and the Mahoning River which joins with Beaver River. Additionally, Slippery Rock Creek and Connoquenessing Creek eventually feed into Beaver River as well which leads to the Ohio River. *Table 46 - Lawrence County Water Features* lists the waterways, streams and lakes in Lawrence County.

Table 46 - Lawrence County Water Features

Lawrence County Water Features			
Name	**Type**	**Name**	**Type**
Beaver Dam Run	Creek	Jordans Run	Dam
Name	**Type**	**Name**	**Type**
Big Run	Creek	Lakewood Dam	Dam

Brush Run	Creek	Little Neshannock	Creek
Big Beaver Pond	Pond	Madden Run	Creek
Cascade Lake	Lake	Mahoning River	River
Cheeseman Run	Creek	Marshall Run	Creek
Clarks Run	Creek	Mckee Run	Creek
Coffee Run	Creek	Muddy Creek	Creek
Connoquenessing Creek	Creek	Neshannock Creek	Creek
Deer Creek	Creek	Quakertown Falls	Creek
Duck Run	Creek	Shenango River	Creek
Eckles Run	Creek	Skunk Run	Creek
Edwards Run	Creek	Slippery Rock Creek	Creek
Harman Run	Creek	Small Run	Creek
Hell Run	Creek	Snake Run	Creek
Hickory Creek	Creek	Spill Way Falls	Creek
Hickory Run	Creek	Squaw Run	Creek
Homewood Falls	Creek	Stockman Run	Creek
Honey Creek	Creek	Sugar Creek	Creek
Hottenbaugh Run	Creek	Thompson Run	Creek
Jenkins Run	Creek	Wampum Run	Creek

4.3.17.2 Range of Magnitude

According to the Center for Disease Control (CDC), drowning is the third leading cause of death from unintentional injury worldwide. In the United States, children under the age of five and adults over the age of eighty-five have the highest risk of drowning. As surveyed above, there are many creeks, lakes, rivers, and ponds in Lawrence County where various water recreation activities are common, and it follows that there are many places and times in Lawrence County when drownings could occur. *Table 46 - Lawrence County Water Features* lists many prominent locations where water recreation can occur in the county.

A secondary hazard from a drowning is the potential for a rescuer to lose their life in their effort of rescuing a drowning person, or recovering a drowned person's body. There is also a hazard of droning during flash flooding. The National Weather Service has adopted the "Turn Around, Don't Drown" slogan to inform the public of the hazards of traveling through or near flood waters. People often underestimate the force and power of water, especially flood water. Many of the deaths occur in automobiles as they are swept downstream. The next highest percentage of flood-related deaths is due to walking into or near flood waters. A mere six inches of fast-moving water can knock over an adult, and it takes only two feet of rushing water to carry away most vehicles, including sizable pickup trucks and SUVs.

4.3.17.3 Past Occurrence

Table 47 - Water Rescue Events list the past occurrence of water rescues performed within Lawrence County between 2009 and March of 2020 per the Lawrence County Knowledge Center™ log.

Table 47 - Water Rescue Events

Water Rescue Events in Lawrence County		
Event Date(s)	**Event Type/Details**	**Location**
06/29/09	Search & Rescue - Water rescue	Taylor Twp.
02/28/11	Search & Rescue – Evacuation via boat	Wilmington Twp.
02/28/11	Search & Rescue – Evacuation via boat	Hickory Twp.
02/28/11	Search & Rescue – Water Rescues	New Beaver Borough
04/30/11	Search & Rescue – River Search	Slippery Rock Twp.

Water Rescue Events in Lawrence County		
Event Date(s)	**Event Type/Details**	**Location**
02/25/12	Search & Rescue – Body found in the river	New Castle City
06/01/12	Search & Rescue – Water rescue	Ellwood City Borough
08/02/12	Search & Rescue – Water rescue/search	Taylor Twp.
05/20/13	Search & Rescue – Water rescue	Slippery Rock Twp.
05/29/13	Search & Rescue – Water rescue	Slippery Rock Twp.
07/10/13	Search & Rescue – Water rescue at Kerrs' Trailer Park	Shenango Twp.
07/10/13	Search & Rescue – Water rescue	New Castle City
04/22/14	Possible Drowning	Lawrence County
06/09/14	Possible Drowning	Lawrence County
07/13/14	Possible Drowning/Water rescue	Lawrence County
08/15/14	Possible Drowning	Slippery Rock Township
05/15/15	Possible Drowning	Lawrence County
08/02/15	Drowning	Wilmington Township
10/10/15	Search & Rescue – Water rescue	Slippery Rock Township
01/27/16	Search & Rescue – Water rescue	New Castle City
05/13/17	Search & Rescue – Canoe Overturned	Neshannock Township
07/01/17	Search & Rescue – Water rescue	Scott Township
04/30/18	Search & Rescue – Water rescue	Lawrence County
05/28/18	Search & Rescue – Water rescue	Lawrence County
10/13/18	Search & Rescue – Water rescue	New Castle City
11/27/18	Search & Rescue – Vehicle into water	Union Township
06/12/19	Search & Rescue – Water rescue	Wayne Township
06/16/19	Search & Rescue – Water rescue	Slippery Rock Township
07/29/19	Search & Rescue – Water rescue	Ellport Borough
08/02/19	Search & Rescue – Water rescue	New Castle City
08/10/19	Search & Rescue – Water rescue	Pulaski Township

4.3.17.4 Future Occurrence

The potential exists for future occurrence of drowning due to the large number of bodies of water within Lawrence County. Visitors entering McConnell's Mill State Park for example should be aware of the natural hazards and steep terrain of the Slippery Rock Creek Gorge. This area contains smooth rocks that are often damp and slippery and varying degrees of whitewater conditions, including deep pools, rapids and swift currents. Slippery Rock Creek is a Class II to IV River, depending on water level. Numerous accidents here have resulted in injury and death. Research will continue on this hazard.

Table 48 - River Difficulty Scale

International Scale of River Difficulty	
Class I	Fast moving water with riffles and small waves. Few obstructions, all obvious and easily missed with little training. Self-rescue is easy.
Class II	Novice - Straightforward rapids with wide, clear channels which are evident without scouting. Occasional maneuvering may be required, but rocks and medium-sized waves are easily missed by trained paddlers.
Class III	Intermediate - Rapids with moderate, irregular waves which may be difficult to avoid and which can swamp an open canoe. Complex maneuvers in fast current and good boat control in tight passages or around ledges is often required. Strong eddies and powerful current effects can occur.
Class IV	Advanced - Intense, powerful but predictable rapids requiring precise boat handling in turbulent water. May be large, unavoidable waves and holes or constricted passages demanding fast maneuvers under pressure. Rapids require "must" moves above dangerous hazards. Self-rescue is difficult.

4.3.17.5 Vulnerability Assessment

With the lakes and streams that are listed above in *Table 46 - Lawrence County Water Features* and the numerous unnamed ponds the potential for a drowning to occur is great. Those that are vulnerable to a drowning include all ages of the population and the emergency services personnel that assist in these disasters.

4.3.18. Emergency Services

4.3.18.1 Location and Extent

Lawrence County subdivisions, townships, boroughs and cities, have assignment of services for their municipalities. Fire, emergency medical services (EMS), emergency management (EMA), and law enforcement service agencies are defined per municipality. In addition to the local services, the county hosts numerous special teams. These county-wide special response teams are for those specialty services like hazardous materials incidents, K9 search, incident command management and auxiliary communications services. Regional and state-wide services are also available.

The county's vast areas increase the travel time for responders to an incident. Most areas are served by volunteers instead of career personnel which can add response time due to the volunteer availability. Agencies do struggle with the availability of personnel depending on the time of day and skills/resources needed. The number of responders in general has decreased due to funding and retention of personnel issues.

4.3.18.2 Range of Magnitude

Finances, changing political climates, leadership, or a significant high-profile event can all trigger a system to be declared as "success" or a "failure". In some cases, a combination of these factors can create a perfect storm. Unfortunately, many "failed" systems are measured by recent events, no matter how successful they may have been in the past. Although financial problems are often blamed on poor leadership, they have many root causes. Labor rates, benefits, poor productivity, operational design, insurance reimbursements and market regulation all have a significant direct impact on the financial viability of an organization.

Two fundamental yet misunderstood topics are the financial and economic variables that drive emergency service systems. These systems typically generate revenue through tax subsidies, memberships, direct sales, diversification into other lines of business, grants or fundraising. They spend most of these revenues on direct and indirect labor and benefits, with the remaining dollars going to infrastructure, fuel, medical supplies, insurances, fleet maintenance, dispatch and other essential items with hopefully some left over for recapitalization or fund balance development.

4.3.18.3 Past Occurrence

Most agencies are private organizations that lack local funding and exist based on tax dollars, fund raisings and donations received from their community. The time demand for fund raising adds to the demands of the struggling availability of volunteers. Past practices are not sustaining the needed funds or manpower.

Without financial support from the community's services may not be able to remain in operation to serve the same communities they have served for decades. Recruitment and personnel retention are a key to success.

4.3.18.4 Future Occurrence

Volunteerism has been a significant component of the fire services. Most, if not all, members of our community fire departments are volunteers. Commonly a problem is recruitment and retention of volunteers to staff both fire and emergency medical services. There has been a decline in volunteerism due to the required training requirements for firefighters and emergency medical technicians (EMTs) in the region.

Today, it is difficult for small communities to have a paid service therefore requiring the use of volunteers. The trend has devastating effects. With fewer volunteers to perform the tasks associated with fires and rescue operations it is imperative to facilitate fundraising. If there are fewer volunteers to raise funds, then the operational needs are impacted as well. Without fundraising and community support these fire departments will experience broader challenges.

The individual volunteers also face many challenges. Most volunteers must address their own needs by providing for their family and, in many cases, are part of a two-income family. In some cases, they may have to have multiple jobs to sustain their needs. It requires hundreds of hours to become certified as a firefighter. With the limitation of time, most members of our society find it personally challenging to find the time to dedicate to a volunteer position. Volunteers are becoming less reliable. Many current volunteers are aging and unable to perform at the same levels they once were.

Fire departments perform many tasks, not just fighting fires. It would perhaps be more appropriate to call these departments "All Hazards Departments" as they respond to various hazards such as vehicle accidents, commercial accidents, flooded basements, wires down, trees down, trench rescues, hazardous material spills, traffic control and sometimes even standbys to support other agencies or events to name only a few.

4.3.18.5 Vulnerability Assessment

The likelihood that EMS agencies and fire services will fail is a real threat to our communities' safety. Many communities have already experienced the unfortunate failure of services. It is recommended that each municipality assess their own vulnerabilities by maintaining and building a relationship with their local providers to make the determination and begin to plan accordingly if a local service was to shut down its operation. The statistics, response times and all times associated with all units dispatched are easily obtainable from the local 911 centers.

These departments must be supported to create and or discover new ways to not only recruit but to also retain volunteers. If left unattended the issues will continue and the lack of response will grow, leaving the community more vulnerable to loss of life and loss of property.

It is recommended that the entire community be educated on the perpetual needs associated with providing these services. In addition, continued support and efforts to inform legislatures could all prove to be paramount in assuring these services remain in operation into the future. At the time of the writing of this plan, a flurry of bills had been introduced in both the House of Representatives and the Senate as a result of a two-year study initiated by Senate Resolution 6 (SR 6). The final report can be found here: http://pehsc.org/wp-content/uploads/2014/05/SR-6-REPORT-FINAL.pdf

Table 49 - Emergency Responders

Emergency Responders *(Lawrence County)*		
Municipality	**Station Name**	**Address**
Lawrence County	Lawrence County Hazardous Material Response Team (3700)	1451 County Line Road, New Castle, PA 16101 Phone: 724.658.7485
Lawrence County	Lawrence County Mobile Command Response Team (3700)	1451 County Line Road, New Castle, PA 16101 Phone: 724.658.7485
Lawrence County	Lawrence County K9 Search & Rescue Team	1451 County Line Road, New Castle, PA 16101 Phone: 724.658.7485
Lawrence County	Lawrence County ACS Team	1451 County Line Road, New Castle, PA 16101 Phone: 724.658.7485
Neshannock Township	Neshannock Volunteer Fire Department (100)	3135 Mercer Road, New Castle, PA 16105 Phone: (724) 654-4800
Mahoning Township	Mahoning Volunteer Fire Department (200)	PO Box 145, Edinburg Pa 16116 Phone: (724) 667-8431
Hickory Township	Hickory Township Vol. Fire Department (300)	110 Eastbrook Road, New Castle Pa 16105 Phone: (724) 658-8600
Bessemer Borough	Bessemer Borough Vol. Fire Department (400)	5 North Main Street, Bessemer Pa 16112 Phone: (724) 667-8391
Pulaski Township	Pulaski Township Vol. Fire Department and Ambulance (500)	PO Box 336, New Bedford Pa 16140 Phone: (724) 964-1046
Volant Borough	Volant Vol. Fire Company (600)	PO Box 203, Volant Pa 16156 Phone: (724) 533-2000
North Beaver Township	North Beaver Vol. Fire Department (700)	969 Mount Jackson Road, New Castle Pa 16102 Phone: (724) 667-8490
Taylor Township	Taylor Township Vol. Fire Department (800)	PO Box 241, West Pittsburg Pa 16160 Phone: (724) 535-1170
New Wilmington Borough	New Wilmington Vol. Fire Department (1100)	140 West Neshannock Ave, New Wilmington Pa 16142 Phone: (724) 946-2544
Shenango Township	Shenango Area Fire District (1200)	2424 E. Washington Street, New Castle Pa 16101 Phone: (724) 658-9250
Union Township	Union Township Vol. Fire Department (1300)	304 S. Scotland Lane, New Castle Pa 16101 Phone: (724) 654-7115
Slippery Rock Township	Slippery Rock Township Vol. Fire Department (1400)	149 Firehall Road, New Castle Pa 16101 Phone: (724) 924-9592
Scott Township	Scott Township Vol. Fire Department (1500)	3712 Harlansburg Road, New Castle Pa 16101 Phone: (724) 656-8299
New Beaver Borough	New Beaver Vol. Fire Department (1600)	PO Box 446, Wampum Pa 16157 Phone: (724) 535-3300
Wampum Borough	Wampum Borough. Vol Fire Department (1700)	709 Church Street, Wampum Pa 16157 Phone: (724) 535-0322
Wampum Borough	Chewton Volunteer Fire Department (1800)	196 Alice Street, Wampum Pa 16157 Phone: (724) 535-8287
Wayne Township	Wayne Township Vol. Fire Department (1900)	PO Box 937, Ellwood City Pa 16117 Phone: (724) 758-1146
Enon Valley Borough	Enon Valley Vol. Fire Department (2100)	PO Box 275, Enon Valley Pa 16120 Phone: (724) 336-4696

Emergency Responders *(Lawrence County)*		
Municipality	**Station Name**	**Address**
Wurtemburg / Perry Townships	Wurtemburg-Perry Vol. Fire Department (2200)	PO Box 469, Ellwood City Pa 16117 Phone: (724) 758-9126
Ellwood City Borough	Ellwood City Vol. Fire Department (2300)	411 6th Street, Ellwood City pa 16117 Phone: (724) 758-8149
City of New Castle	New Castle Fire Department (2400)	10 Margaret Street, New Castle Pa 16101 Phone: (724) 656-3566
City of New Castle	Noga Ambulance (5100)	2615 Wilmington Road, New Castle Pa 16105 Phone: (724) 652-6677

4.3.19. Environmental Hazards

4.3.19.1 Location and Extent

One of the greatest threats to those who reside in the Commonwealth is the constant production, storage, use and transportation of hazardous materials. The release of these materials from a facility is less dangerous than the release of these materials while being transported. Hazardous materials include flammable liquids, solids, gasses, combustible liquids, explosives, blasting agents, radioactive materials, oxidizing materials, corrosive materials, poisons, refrigerated liquids, hazardous waste/substances and other regulated material. With the multiple forms of transportation in Lawrence County, hazardous materials such as chemicals, fuels and other hazardous materials are frequently transported through the county. The carriers of hazardous materials, however, must have response plans in place in the event of an accident.

Pennsylvania was the first place in the world where a commercial successful well was drilled for oil production. Natural gas wells followed. Pennsylvania is a significant producer of natural gas in the northeast United States. Since the first commercial oil well was drilled in Pennsylvania in 1859, perhaps as many as 350,000 oil and gas wells have been drilled in the state.

Any facility in Pennsylvania that uses, manufactures or stores hazardous materials must comply with Title III of the Superfund Amendments and Reauthorization Act (SARA). This is also known as the Emergency Planning and Community Right-to-Know Act (EPCRA). They must also comply with the reporting requirements, as amended, in Pennsylvania's Hazardous Materials Emergency Planning and Response Act (1990-165). The community right-to-know reporting requirements keep communities abreast of the presence and release of chemicals at individual facilities. EPCRA was designed to ensure that state and local communities are prepared to respond to potential chemical accidents through Local Emergency Planning Committees (LEPCs). LEPCs are charged with developing emergency response plans for SARA Title III facilities; these plans cover the location and extent of hazardous materials, establish evacuation plans, response procedures, methods to reduce the magnitude of a materials release and establish methods and schedules for training and exercises. Information about the chemicals that are being manufactured or processed in facilities can be found in the U.S. Environmental Protection Agency's (USEPA) Toxic Release Inventory (TRI) database:

(http://www.epa.gov/enviro/geo_data.html).

Transportation of hazardous materials on highways involves tanker trucks or trailers. Unsurprisingly, large trucks are responsible for the greatest number of hazardous material release incidents.

Table 50 - SARA Facilities lists the SARA Title III facilities located in Lawrence County, as well as whether or not the facility resides in the floodplain. Lawrence County has a total of twenty-seven SARA facilities.

Table 50 - SARA Facilities

Lawrence County SARA Facilities		
Name	**Location**	**100-year Floodplain**
Advanced Waste Services of PA, LLC	101 River Park Drive, New Castle, PA 16101	x
AT&T	Fowler Lane, New Castle, PA 16101	
Axion Power Battery Manufacturing	3601 Clover Lane, New Castle, PA 16105	
Dairy Farmers of America, Inc.	925 State Route 18, New Wilmington, PA 16142	
Deerfield Farms	193 Black Road, Volant, PA 16156	
Ellport WWTP	1 Third Street, Ellwood City, PA 16117	
Ellwood Quality Steels Company	700 Moravia Street, New Castle, PA 16101	x
Ferguson Perforating Company	901 Commerce Avenue, New Castle, PA 16101	
Flowline Division, Ezeflow USA, Inc.	1400 New Butler Road, P O Box 7027, New Castle, PA 16107	
Inmetco	One Inmetco Drive, Ellwood City, PA 16117	
Kennametal, Inc.	599 Northgate Circle, New Castle, PA 16105	
New Castle Sanitation Authority	512 Montgomery Avenue, New Castle, PA 16101	x
New Castle Service Center	215 East North Street, New Castle, PA 16101	
New Wilmington Borough WWTP	155 Maple Street Ext., New Wilmington, PA 16142	
NRG Power Midwest LP	2189 State Route 168, West Pittsburg, PA 16160	
Pennsylvania American Water Company	907 Lundys Lane, Ellwood City, PA 16117	x
Pennsylvania American Water Company	546 Leasure Avenue Ext., New Castle, PA 16105	x
Sears Auto Center	2500 West State Street, New Castle, PA 16101	
Tanner Industries	501 Industrial Street, New Castle, PA 16101	x
Verizon - Ellwood City	209 5th Street, Ellwood City, PA 16117	
Verizon - New Bedford	Main Street, New Bedford, PA 16140	
Verizon - New Castle	40 South Mercer Street, New Castle, PA 16101	x
Verizon - New Wilmington	127 West Vine Street, New Wilmington, PA 16142	
Verizon - Princeton	2280 Mill Bridge Road, New Castle, PA 16101	
Wampum Borough WWTP	101 Water Street, Wampum, PA 16157	
Wilmington Township Sewer Treatment Plant	204 Orchard Terrace Drive, New Castle, PA 16105	x
Young Galvanizing	8281 Mercer Street, Pulaski, PA 16143	

Source: Lawrence County Emergency Management Agency

4.3.19.2 Range of Magnitude

Hazardous material releases can contaminate air, water and soils, possibly resulting in death and/or injuries. Dispersion can take place rapidly when transported by water and wind. While often accidental, releases can occur as a result of human carelessness, intentional acts, or natural hazards. When caused by natural hazards, these incidents are known as secondary events. Hazardous materials can include toxic chemicals, radioactive materials, infectious substances and hazardous wastes. Such releases can affect nearby populations and contaminate critical or sensitive environmental areas. With a hazardous material release, whether accidental or intentional, there are several potentially exacerbating or mitigating circumstances that will affect its severity or impact. Exacerbating conditions are characteristics that can enhance or magnify the effects of a hazard. Mitigating conditions, on the other hand, are characteristics of the target and its physical environment that can reduce the effects of a hazard. These conditions include:

- Weather conditions – affects how the hazard develops.
- Micro-meteorological effects of buildings and terrain – alters dispersion of materials.
- Shielding in the form of sheltering-in-place – protects people and property from harmful effects.
- Non-compliance with applicable codes (e.g. fire and building codes) and maintenance failures (e.g. fire protection and containment features) – can substantially increase the damage to the facility itself and to surrounding buildings.

4.3.19.3 Past Occurrence

According to the Bureau of Transportation Statistics, in 2000, of the 1,115 spills in Pennsylvania, 1,065 happened on highways. These spills cost the Commonwealth approximately $2.5 million. With Lawrence County having Marcellus shale formation, there has been an increase in this type of well drilling. This type of well drilling brings with it different hazards not seen with shallow well drilling. There have been incidents involving wells in the past including well heads being struck, gas migrating into water wells and gas migrating into structures. One such incidence of gas migrating happened in Pulaski Township on June 1, 2012.

Table 51 - Past Environmental Hazard Occurrences lists past environmental hazards occurrences in Lawrence County from October 2008 to March 2020, as reported on Knowledge Center™.

Table 51 - Past Environmental Hazard Occurrences

Past Environmental Hazard Occurrences in Lawrence County		
Date	**Incident**	**Location**
10/18/08	Waste oil spill	Mahoning Township
10/25/08	Diesel fuel spill	Plain Grove Township
12/29/08	Minor fuel spill	Union Township
02/08/09	Kerosene leak	Union Township
05/18/09	Nitric acid spill	Wilmington Township
06/12/09	MVA with gas leak	Neshannock Township
06/17/09	Home heating oil spill due to flooding	Bessemer Borough
06/30/09	Gas well leaking	Washington Township
07/09/09	MVA involving a car on a gas pump	Shenango Township
07/11/09	Natural gas leak	Ellwood City Borough
07/20/09	Natural gas well leak	Plain Grove Township

Past Environmental Hazard Occurrences in Lawrence County		
Date	**Incident**	**Location**
07/30/09	Fuel leak from underground tank	Slippery Rock Township
08/14/09	Hazardous material fire	New Castle City
08/14/09	Hazardous material fire	Hickory Township
12/05/09	Oil leak from holding tank	New Castle City
12/07/09	Natural gas odor	Ellwood City Borough
01/24/10	Ammonia leak	Wayne Township
04/08/10	Gas leak	New Castle City
05/29/10	Hazardous materials	Mahoning Township
07/26/10	Gas leak	New Castle City
07/30/10	Gas leak	Union Township
11/16/10	Gas leak	Ellwood City Borough
02/03/11	Natural gas leak with evacuation	Ellwood City Borough
04/09/11	Diesel fuel leak	Taylor Township
07/18/11	Heating oil spill	Plain Grove Township
08/08/11	Natural gas leak	New Castle City
08/17/11	Diesel Fuel Spill	Plain Grove Township
09/11/11	MVA with damage to a gas meter	Shenango Township
10/13/11	Gas leak	New Castle City
02/28/12	Natural gas smell	New Castle City
06/01/12	Gas migration	Pulaski Township
10/11/12	Gas line struck	New Castle City
04/30/13	Natural gas leak	New Castle City
04/30/13	Fuel leak from tractor trailer	Neshannock Township
05/16/13	Hazardous material spill	Neshannock Township
06/17/13	Heating oil spill	Shenango Township
06/23/13	Ethanol leak	Taylor Township
08/06/13	Lube oil spill	Enon Valley Borough
08/15/13	Gas leak in apartment complex	Unknown jurisdiction within Lawrence County
08/22/13	Hazmat spill	Lawrence County
09/11/13	Natural Gas Leak	Lawrence County
11/08/13	Main Gas Line Struck	New Castle City
12/23/13	Fuel Spill	Shenango Township
04/12/14	Oil in residence basement	Shenango Township
08/09/14	Smell of natural gas	New Castle City
08/14/14	Vehicle fire with runoff into creek	Union Township
09/15/14	Gas line struck	New Castle City
11/14/14	Diesel fuel spill	Taylor Township
12/15/14	Hazmat dumping	Enon Valley Borough
12/27/14	Possible carbon monoxide exposure	Lawrence County
01/06/15	Gas leak	Lawrence County
04/21/15	MVA with hazmat	Lawrence County
06/19/15	Fuel spill	Little Beaver Township
07/09/15	Hazardous waste spill	New Castle City
10/10/15	Struck gas main	Union Township
03/29/16	Widespread natural gas odor	Lawrence County
04/04/16	Diesel fuel spill	Lawrence County
04/15/16	Hazmat incident	Lawrence County
06/23/16	Natural gas leak	Mahoning Township
06/10/17	Chemical release into Mahoning River	Mahoning Township
07/24/17	Oil spill	Volant Borough

Past Environmental Hazard Occurrences in Lawrence County		
Date	**Incident**	**Location**
07/26/17	Gas line struck	Ellwood City Borough
07/31/17	High pressure gas line struck	Ellwood City Borough
08/01/17	Gas line struck	Ellwood City Borough
08/01/17	Underground propane tank leak	Neshannock Township
08/04/17	Oil spill	Neshannock Township
08/11/17	Freon leak	Shenango Township
09/11/17	Gas line struck by construction company	Shenango Township
09/12/17	Struck gas line	Shenango Township
10/17/17	Oil spill	Perry Township
10/29/17	Gas release	North Beaver Township
11/09/17	Gas line struck	Union Township
11/20/17	Possible diesel fuel release	Wayne Township
12/11/17	Fuel leak/structure fire	North Beaver Township
02/27/17	Gas line struck	Shenango Township
06/25/17	Gas leaking from ground	Washington Township
06/25/17	Gas line struck	Shenango Township
07/09/18	Struck gas line	Neshannock Township
07/09/18	Hit gas line	New Castle City
07/26/18	Struck gas line	New Castle City
09/04/18	Oil spill	Shenango Township
09/04/18	Fuel leak	New Castle City
10/11/18	Crude oil spill	New Castle City
11/12/18	Crude oil discharge	Taylor Township
03/04/19	Odor of natural gas	Shenango Township
05/22/19	Gas line struck	Perry Township
06/18/19	Struck gas line	New Castle City
06/27/19	Struck gas line	New Castle City
07/03/19	Gas line rupture	Perry Township
07/06/19	Ruptured gas line	Shenango Township
07/12/19	Gas line raptured	Union Township
07/20/19	Gas odor	Shenango Township
09/12/19	Oil release	Nehannock Township
10/18/19	Ruptured fuel tank	Slippery Rock Township
03/06/20	Odor of natural gas	New Castle City

The majority of the environmental hazards within Lawrence County are oil and/or oil-based products. There was one instance where a SARA facility had a spill of Nitric acid in 2009.

4.3.19.4 Future Occurrence

The overall probability of Lawrence County experiencing an environmental hazard is possible. A risk factor of 2.1 has been assigned to this hazard utilizing the risk factor methodology probability criteria. The increase in drilling activities increases the potential for incidents. The occurrence of this event is high, however; the potential for a large-scale event is present.

Transportation hazardous material spills occur annually. While minor spills are more common than larger spills, both can occur with varying levels of severity. It is extremely difficult to predict a transportation hazardous material incident. Weather conditions, roadway conditions and other human factors impact the occurrence of these incidents.

Fixed facility hazardous material releases do occur but not as frequently as transportation incidents. The Local Emergency Planning Commission (LEPC) for Lawrence County maintains and updates emergency plans for SARA Title III facilities throughout the county. The county LEPC also identifies the facilities that must report the Tier II chemicals for their facility through the Hazardous Materials Emergency Planning and Response Act (1990-165) as amended.

4.3.19.5 Vulnerability Assessment

Hazardous material releases can occur at facilities (fixed sites) or along transportation routes. Hazardous material releases can create direct injuries and death and contaminate air, water, and soils. They can occur as a result of human carelessness, intentional acts, or natural hazards. When caused by natural hazards, these incidents are known as secondary hazards. Hazardous materials can include toxic chemicals, radioactive materials, infectious substances, and hazardous wastes. An accidental hazardous material release can occur wherever hazardous materials are manufactured, used, stored, or transported. Such releases can affect the nearby population and contaminate critical or sensitive environmental areas.

There are increasingly large numbers of chemicals, oils, radioactive materials and other hazardous substances spilled as the result of highway, rail and waterway accidents, storage tank leakage, pipeline break, and/or other accidents. On occasion, these events become a major disaster and force people to evacuate and/or lose their homes and businesses.

There are currently twenty-seven fixed SARA sites in Lawrence County which use, manufacture, store, or treat hazardous materials (Source: Local Emergency Planning Committee).

The following municipalities are threatened by hazard material incidents unique to their area.

Bessemer Borough
Hazardous materials are transported through Bessemer Borough on State Route 317.

Bessemer Borough has a Sara Title III facility within its municipal borders.

City of New Castle
Parts of major transportation arteries pass through the City of New Castle making it susceptible to Hazardous Materials Transportation Incidents.

Several SARA facilities are located within the City of New Castle.

Ellport Borough
The proximity of Ellport Borough to the Nalco Chemical Facility and the Ellport Borough Wastewater Treatment Plant makes it vulnerable to an event at either of these facilities.

A portion of State Route 488 travels through Ellport Borough. Commercial vehicles transporting hazardous materials travel through heavily populated areas of Ellport Borough while using this route.

Ellwood City Borough
The proximity of a section of the Pennsylvania Turnpike could affect some parts of the municipality in the event of a hazardous materials transportation incident in that area.

Enon Valley Borough
The Norfolk and Southern railway travels through Enon Valley Borough and transports high quantities of hazardous materials that, in the event of an incident, would affect populations around the incident.

A feed mill is a large part of the business infrastructure of Enon Valley Borough. A fire at that facility would affect the entire municipality.

Little Beaver Township
The Norfolk and Southern Railroad and the Pennsylvania Turnpike pass through the southern part of the Municipality, making it susceptible to a transportation hazardous materials Incident.

Mahoning Township
US Routes 224 and 422 and State Route 551 pass through Mahoning Township and are heavily traveled by commercial vehicles transporting hazardous materials. Also, the main line of the CSX railroad passes through Mahoning Township. Any type of transportation incident would have a direct effect on the municipality.

Zambelli Fireworks and Wampum Hardware are located within the municipal boundaries of Mahoning Township. Both facilities store large quantities of explosives.

Neshannock Township
I-376 and PA Route 18 pass through Neshannock Township and are heavily traveled by vehicles transporting hazardous materials.

Several SARA Facilities are located within Neshannock Township and have the potential to affect the municipality.

New Beaver Borough
The proximity of New Beaver Borough to both highways and railroads that transport hazardous materials make it susceptible to the impact of a transportation hazardous materials incident.

Aleron, a facility that processes nuclear waste is located within close proximity to the population of New Beaver Borough. An incident at that facility would impact all parts of the population.

North Beaver Township
A part of the Norfolk and Southern Rail Road passes through the southern part of the Township, making it susceptible to the impact of a transportation hazardous material incident.

I-76 and I-376 traverse the township making it susceptible to the impact of a transportation hazardous material incident.

The Neomet facility located on State Route 551 in North Beaver Township stores hazardous materials. An incident at that facility would affect populations within that area.

Perry Township
Route 488 in Perry Township is traveled by commercial vehicles transporting hazardous materials into and out of the Ellwood City area.

Plain Grove Township
Interstate 79 passes through Plain Grove Township and is heavily traveled by vehicles transporting hazardous materials.

Pulaski Township
Parts of US Route 422 and Interstate 376 pass through Pulaski Township and are heavily traveled by commercial vehicles transporting hazardous materials.

Young Galvanizing, a SARA Facility, is located in close proximity to the village of Pulaski. An incident at the facility would heavily impact the residents of that area.

Scott Township
US Route 19 passes through Scott Township and is heavily traveled by both commercial and non-commercial vehicles.

Shenango Township
All portions of U.S. Route 422 and PA Route 65 which pass through Shenango Township are heavily traveled by commercial vehicles transporting hazardous materials.

SARA Facilities located within Shenango Township have a potential for hazardous materials incidents.

SNPJ Borough
The Pennsylvania Turnpike and a part of the Norfolk and Southern Railroad pass close, but not through SNPJ Borough. A transportation incident could affect the entire area. Each rail company has a hazardous materials response team which is fully equipped to respond when needed.

Some amounts of Chlorine are stored in the area of the Municipal swimming pool. A chlorine leak could affect the Municipality.

Taylor Township
The CSX Railroad has a yard and terminal located within Taylor Township. State Route 168 also passes through Taylor Township and is heavily traveled by commercial vehicles.

An incident at one of the SARA Facilities located within Taylor Township would affect all areas and populations of the Municipality.

Slippery Rock Township
Portions of three major transportation arteries pass through Slippery Rock Township. All of these highways are heavily traveled by hazardous materials carriers.

Slippery Rock Township has no municipal water supply. All areas are served by wells. A hazardous materials spill would have direct impact on these wells.

Union Township
All portions of Interstate 376, US 422, and US 224 are heavily traveled by commercial vehicles, many of which are transporting hazardous materials.

Volant Borough
State Routes 168, and 208 pass through Volant Borough. These highways are traveled by commercial vehicles, many of which are transporting hazardous materials.

Wampum Borough
The CSX and Norfolk and Southern Railway systems pass through Wampum Borough. Both transport large quantities of hazardous materials. An incident on either of these railroads would affect all residents and

areas of Wampum Borough. Also, Route 18 passes through the Municipality and is also heavily traveled by transporters of hazardous materials.

The Wampum Wastewater Treatment Facility is located in Wampum Borough. An incident at this facility would affect all residents of Wampum Borough.

Washington Township
US Route 19 passes through Washington Township and is heavily traveled by vehicles transporting hazardous materials.

The D.M. Boyd Company located within Washington Township stores hazardous materials on the premises.

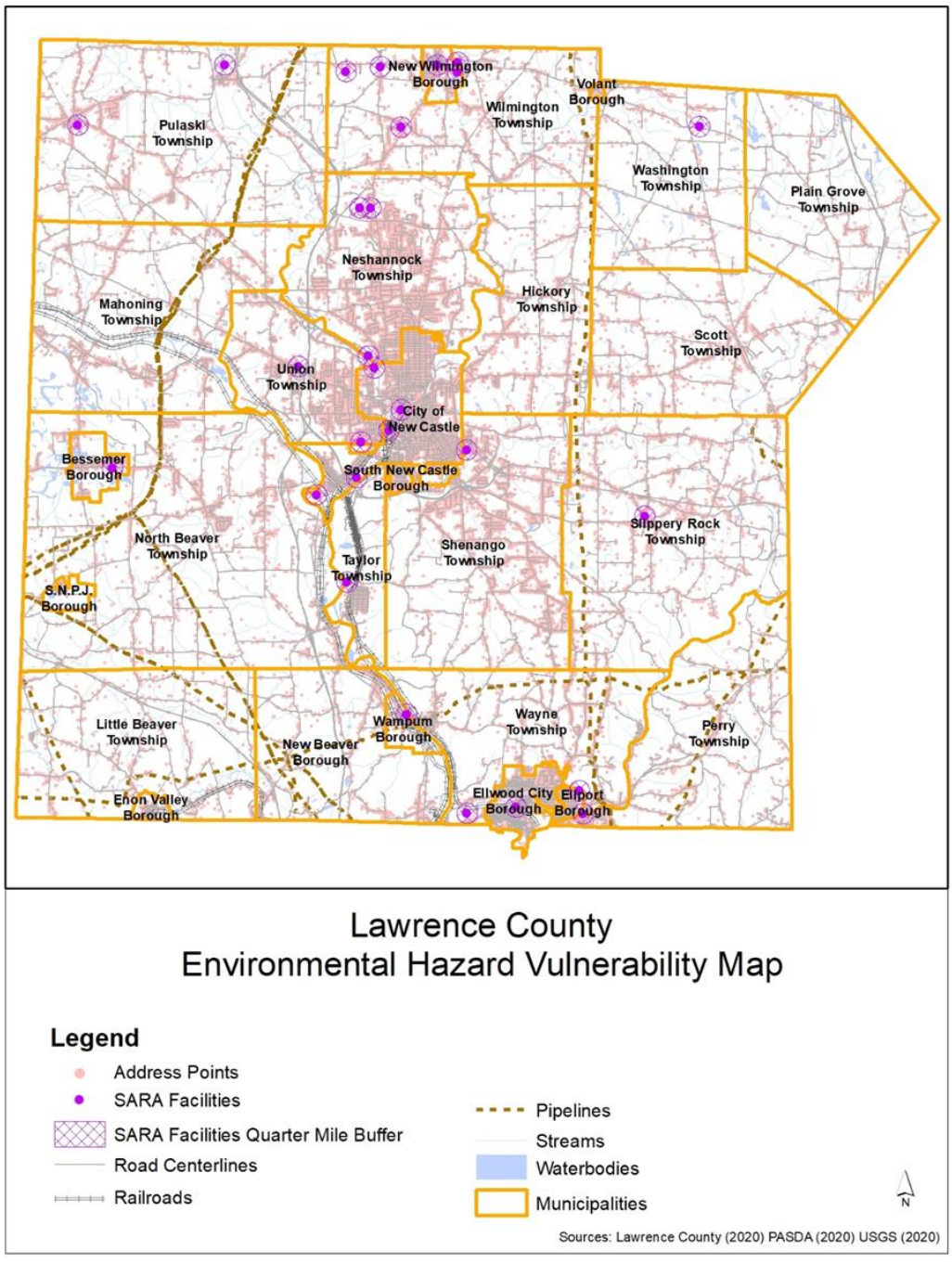
Wayne Township
The CSX Railway passes through Wayne Township. This rail carrier regularly transports hazardous materials through the area.

An incident at the wastewater treatment facility located within Wayne Township would affect both the population and business infrastructure.

Wilmington Township
Traffic in the past has been re-routed from Interstate 80, US Route 19, State Route 18, and Interstate 376 through Wilmington Township. Hazardous materials are regularly transported on these routes.

SARA Title III facilities are located within the borders of Wilmington Township. The Agway facility, located in Wilmington Township, stores large quantities of hazardous chemicals and fertilizers.

Figure 44 - Hazard Vulnerability Map



4.3.20. Nuclear Incidents

4.3.20.1 Location and Extent

There is a Fixed Nuclear Facility (Beaver Valley Power Station) within forty miles of the entire population of Lawrence County.

Figure 45 - Beaver Valley Power Station, Shippingport, Pennsylvania

A nuclear power reactor facility makes electricity by continuously splitting uranium atoms. Within the Commonwealth of Pennsylvania there are four nuclear power stations. These are:

- Beaver Valley Power Station, Beaver County;
- Limerick Generating Station, Montgomery County;
- Peach Bottom Atomic Power Station, York County;
- Susquehanna Steam Electric Station, Luzerne County

The Beaver Valley Power Station is an electric-generating plant powered by two Westinghouse Pressurized Water Reactors (PWR). The power station employs 1,000 people and has a total capacity of 1,872 mega-watts, enough to power more than one million homes.

Outside Middletown, Pennsylvania, the Three Mile Island Nuclear Generating Station, is the former site of the most significant accident in U.S. commercial nuclear power plant history. Mixed protective actions by government officials lead to thousands of residents evacuating the area over three days in March 1979. Three Mile Island shut down on September 20, 2019 after nearly a half century of operation.

Lawrence County serves as a support county for the Beaver Valley Power Station: in case of an accident at the plant, emergency plans have designated reception centers for evacuees; one of them is located within A nuclear power reactor facility makes electricity by continuously splitting uranium atoms. Within the Commonwealth of Pennsylvania there are four nuclear power stations. These are:

- Beaver Valley Power Station, Beaver County.
- Limerick Generating Station, Montgomery County.
- Peach Bottom Atomic Power Station, York County.
- Susquehanna Steam Electric Station, Luzerne County

The Beaver Valley Power Station is an electric-generating plant powered by two Westinghouse Pressurized Water Reactors (PWR). The power station employs 1,000 people and has a total capacity of 1,872 mega-watts, enough to power more than one million homes.

Outside Middletown, Pennsylvania, the Three Mile Island Nuclear Generating Station, is the former site of the most significant accident in U.S. commercial nuclear power plant history. Mixed protective actions by government officials lead to thousands of residents evacuating the area over three days in March 1979. Three Mile Island shut down on September 20, 2019 after nearly a half century of operation.

Lawrence County serves as a support county for the Beaver Valley Power Station: in case of an accident at the plant, emergency plans have designated reception centers for evacuees; one of them is located within North Beaver Township.

4.3.20.2 Range of Magnitude

Table 52 - Emergency Planning Zones

Emergency Planning Zones	
EPZ	**Description**
Plume Exposure Pathway	Has a radius of about 10 miles from each reactor site. Predetermined protective action plans are in place and include sheltering, evacuation and the use of potassium iodide where appropriate.
Ingestion Exposure Pathway	Has a radius of about 50 miles from each reactor site. Predetermined protective action plans are in place and are designed to avoid or reduce dose from potential ingestion of radioactive materials. These actions include a ban of contaminated food and water.

Source: U.S. Nuclear Regulatory Commission http://www.nrc.gov/about-nrc/emerg-preparedness/about-emerg-preparedness/planning-zones.html

NUREG-0654 prescribes two kinds of emergency planning zones, listed in *4.3.20.2 Range of Magnitude*

Table 52 - Emergency Planning Zones above; each has specific risks and protective actions. None of Lawrence County is in the Plume Exposure Pathway but all of Lawrence County is in the ingestion exposure pathway of the Beaver Valley Power Station.

There are three categories of nuclear accidents:

- Criticality accidents: Involve loss of nuclear assemblies or power reactors;
- Loss of coolant accidents: Occur when a reactor coolant system experiences a break or opening large enough that the coolant inventory in the system cannot be maintained by the normally operating make-up system; and
- Loss of containment accidents: Involve the release of radioactivity from materials such as tritium, fission products, plutonium and natural, depleted, or enriched uranium; the primary concern following such an incident or accident is the extent of radiation, inhalation and ingestion of radioactive isotopes which can cause acute health effects (e.g. death, burns and severe impairment), chronic health effects (e.g. cancer) and psychological effects (FEMA, 1997).

The Nuclear Regulatory Commission uses four classification levels for nuclear incidents:

- Unusual Event: Events are in process or have occurred which indicate potential degradation in the level of safety of the plant. No release of radioactive material requiring offsite response or monitoring is expected unless further degradation occurs;

- Alert: Events are in process or have occurred which involve an actual or potential substantial degradation in the level of safety of the plant. Any releases of radioactive material from the plant are expected to be limited to a small fraction of the EPA Protective Action guides (PAGs);
- Site Area Emergency: Involves events in process or which have occurred that result in actual or likely major failures of plant functions needed for protection of the public. Any releases of radioactive material are not expected to exceed the EPA PAGs except near the site boundary; and
- General emergency: Involves actual or imminent substantial core damage or melting of reactor fuel with the potential for loss of containment integrity. Radioactive releases during a general emergency can reasonably be expected to exceed the EPA PAGs for more than the immediate site area.

4.3.20.3 Past Occurrence

Lawrence County has not been affected by an incident at the Beaver Valley Power Station at the time of the writing of this plan.

4.3.20.4 Future Occurrence

Lawrence County has minimum potential to be affected by a fixed nuclear facility's incident, but the possibility exists due to the proximity of the Beaver Valley Power Station.

The Pittsburgh Post-Gazette reported the Beaver Valley Power Station was scheduled to shut down next year (2021), but Energy Harbor Corporation, formerly FirstEnergy Solutions, announced in March 2020 that it will keep the plant open. FirstEnergy Solutions notified regulators in March 2018 that it planned to close the plant claiming it was not economic to operate without some subsidies for carbon-free electricity. The company pushed for legislative help in Pennsylvania and Ohio, where it operates two nuclear plants. The effort did not progress in Pennsylvania, but in 2019 Ohio passed legislation that FirstEnergy credited with keeping its power plants viable.

What changed in Pennsylvania, according to Energy Harbor, was the Commonwealth's announcement it would join the Regional Greenhouse Gas Initiative, a program for capping and gradually decreasing carbon dioxide emissions from the power sector in ten Northeast and Mid-Atlantic states.

It requires coal, gas and oil-fired power plants in the participating states to pay a fee for their carbon emissions. Much of the resulting revenue is spent on efforts to improve air quality and cut greenhouse gas emissions further.

The governor of Pennsylvania announced the Commonwealth's intention to join the 10-state program in October 2019, and the Department of Environmental Protection is writing rules to guide Pennsylvania's participation. The goal is to join the program in 2022, although at the writing of this plan it appeared the State Legislature had some membership willing to challenge the governor's goal, fearing its impact on the natural gas industry.

4.3.20.5 Vulnerability Assessment

Lawrence County has potential to be affected by a disaster at the Beaver Valley Power Station. All parts and populations of Lawrence County are within forty miles of the facility. Lawrence County is a support county in the event of a nuclear emergency at the Beaver Valley Power Station. The Beaver Valley Power Station, Beaver County Emergency Management Agency and the Lawrence County Emergency

Management Agency have emergency response plans in place for a fixed nuclear incident. The Plume Exposure Pathway plans are tested every two years and the Ingestion Exposure Pathway plans are tested every five years. The exercises are evaluated by the Federal Emergency Management Agency and PEMA.

4.3.21. Opioid Epidemic

4.3.21.1 Location and Extent

Pennsylvania and the nation at large have been experiencing an epidemic of opioid drug abuse. Opioids are a class of drugs that interact with receptors on nerve cells in the body and brain, producing euphoria and pain relief (NIH, 2017). Opioid drugs are highly addictive, and the Commonwealth and country at large have been experiencing an epidemic of opioid addiction and abuse, resulting in increasing numbers of overdose deaths from both prescribed (e.g. fentanyl) and illicit (e.g. heroine) opioids. Overdose deaths from opioids occur when a large dose slows breathing, which can be especially likely when opioids are combined with alcohol or antianxiety drugs. While generally prescribed with good intentions, opioids can often be over-prescribed, resulting in addiction due to their highly addictive nature.

While other addictive substances such as methamphetamines and alcohol can be problematic for the health of individuals and the community in Lawrence County, this profile focuses on opioid drugs and the opioid epidemic.

The opioid crisis was declared to be a public health emergency on October 26, 2017. While the declaration provides validation for the scope and severity of the problem, it was not accompanied by any release of funding for mitigating actions. On January 10, 2018, Governor Wolf declared the opioid epidemic to be a statewide public health disaster emergency for Pennsylvania. The declaration is intended to enhance response and increase access to treatment.

4.3.21.2 Range of Magnitude

According to the CDC, more than 192 Americans die every day from an opioid overdose. In 2014, 2,732 overdose deaths were reported across Pennsylvania. This number increased to 3,264 reported overdose deaths in 2015, an increase of 19.5 percent (DEA, 2015). Reported overdose deaths increased again in 2016 to 4,627, an increase of 41.7 percent from 2015 (DEA & PITT, 2017), then again to a total of 5,388 deaths in 2017. From 2015 to 2017, the increase in reported drug related overdose deaths in Pennsylvania increased sixty-five percent. This increase gave rise to the need for the gubernatorial disaster declaration in Pennsylvania that was made on January 10, 2018. Heroin and Fentanyl are the two drugs most often found in overdose deaths, and they are considered highly available and nearly ubiquitous in Pennsylvania (DEA & PITT, 2018).

4.3.21.3 Past Occurrence

In 2018, there were a total of 67,367 drug-related overdose deaths in the United States. Lawrence County experienced a total of 141 drug-related overdose deaths from 2015-2017.

In 2017, the national average of drug related overdose deaths was twenty-two deaths per 100,000 people. The death rate in Pennsylvania is nearly double this national average, at almost forty-three deaths per 100,000 people. In 2017, Lawrence County had approximately fifty-one opioid related overdose deaths. The year of 2018 saw a slight decrease to thirty-seven (DEA & Pitt, 2018). *Figure 47 - Pennsylvania Opioid Overdose Deaths 2015-2017* shows overdose deaths from 2014 to 2019 for Pennsylvania by county. Statistics for the year 2020 were incomplete during the update process. Prescription opioids were the most

prevalent drugs present in opioid drug-related overdose deaths that occurred in Lawrence County. *Figure 46 - Lawrence County Overdose Death History 2014-2019* shows recorded overdose deaths in Lawrence County as reported by the PA Coroner's Office and Overdose Free PA. From 2014 to 2019, there has been a significant increase in the abuse of Fentanyl in Pennsylvania. Fentanyl is the most prevalent opioid drug trafficked, abused and overdosed on in Pennsylvania, and is found in seventy percent of overdose victims in 2018 in Pennsylvania (see *Table 53 - Drugs Present in 2018 PA Overdose Deaths*).

Figure 46 - Lawrence County Overdose Death History 2014-2019

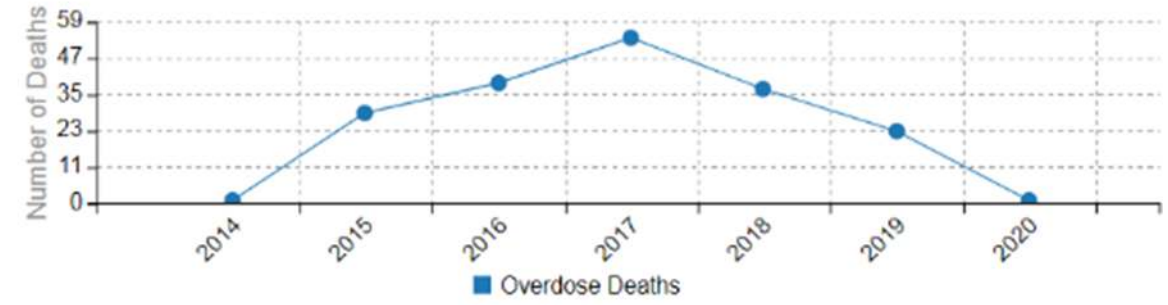
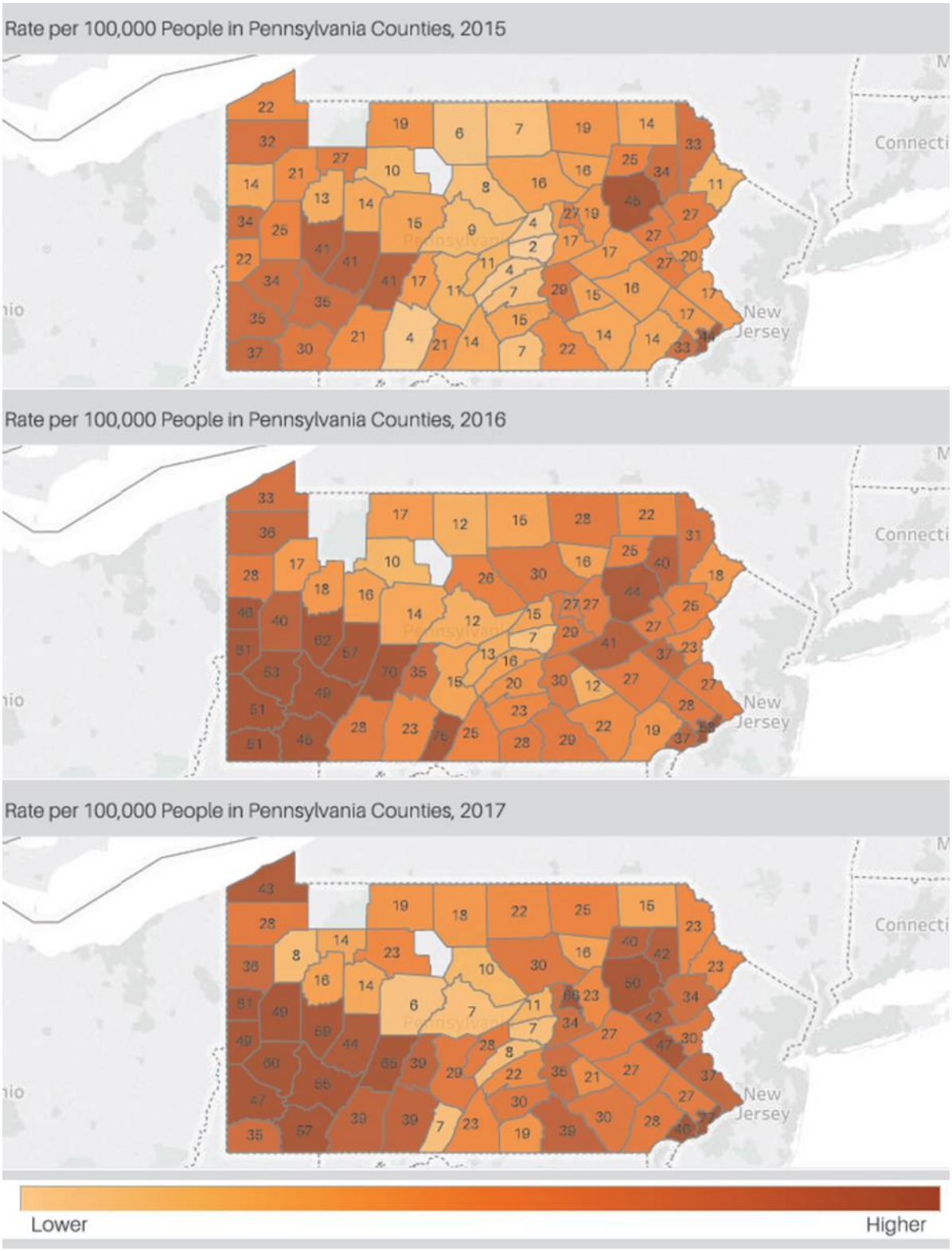


Table 53 - Drugs Present in 2018 PA Overdose Deaths

Drugs Present in 2018 PA Overdose Deaths *(DEA & Pitt, 2018)*	
Drug Category	**Percent Reported Among 2018 Decedents**
Fentanyl	70%
Heroin	35%
Cocaine	33%
Benzodiazepines	28%
Prescription Opioids	23%
Ethanol	18%
FRSs & NPSO	18%
Other Illicit Drugs	14%

Figure 47 - Pennsylvania Opioid Overdose Deaths 2015-2017



4.3.21.4 Future Occurrence

In the event of an opioid overdose, death can sometimes be prevented with the use of the drug naloxone. Emergency medical responders have access to the treatment, and as of 2015, naloxone is available without a prescription in Pennsylvania. Furthermore, with the January 10, 2018 disaster declaration, emergency medical technicians (EMTs) are now allowed to leave naloxone behind at a scene, further increasing distribution and accessibility of this lifesaving medication. According to a study published in September 2018, drug users reported that users often have multiple overdoses in the course of their drug use, and the availability of naloxone has saved many lives (DEA & PITT, 2018). While the introduction of naloxone has been a significant benefit to the fight against opioid abuse, efforts to prevent overdoses are still underway.

Rather than reduce pain, in some cases high doses of opioid painkillers can actually increase pain due to a phenomenon known as opioid-induced hyperalgesia (OIH). It is difficult to know how much of an influence OIH has on the opioid epidemic. Some researchers think that OIH could be increasing patients' pain and in turn, increasing their dosages and dependence on opioid drugs, suggesting that patients should work with lower dosages of opioids (Servick, 2016). However, other researchers are unsure of the importance of OIH for opioid users (Servick, 2016).

Opioid drugs have been a problematic and addictive solution for patients to deal with pain. Employing alternative approaches to pain management could prevent patients from ever being introduced to addictive opioids, especially considering the most common overdose drug in Lawrence County has been prescription opioids (DEA & PITT, 2018). A possible alternative pain treatment comes from hemp extracted cannabidiol, or CBD. Unlike THC (the psychoactive constituent of cannabis) CBD is non-psychoactive and does not have the same intoxicating effect as THC; however, CBD can provide relief from pain (Lynch & Campbell, 2011), inflammation (Burstein, 2015), anxiety (Scuderi et al., 2009) and even psychosis (Iseger & Bossong, 2015). CBD is legal without a prescription throughout the United States of America.

4.3.21.5 Vulnerability Assessment

Deaths from prescription opioid drugs like oxycodone, hydrocodone, and methadone have increased more than four-fold since 1999. Opioid overdoses have resulted in many tragic deaths in Pennsylvania and most people have been affected by the epidemic through the loss of either a family member, close friend, or member of their community. Opioid addiction is a direct detriment to the personal wellbeing of addicts, a burden to their families and communities, and a strain to the emergency response system that cares for overdose victims.

While opioid addiction is often viewed as a criminal problem, a more productive way to view the epidemic can be to view opioid addiction as a chronic disease. This paradigm shift moves away from faulting the abuser and incentivizing quick cures, to viewing the abuser as a patient and working towards long-term management of the disease (ASAM, 2014). In general, it is important to consider alternative approaches to pain treatment in order to avoid beginning a dependence on highly addictive prescribed opioids.

There have been several reports nationally of first responders accidentally overdosing on fentanyl or carfentanyl through brief skin contact or the drug becoming airborne. It is best for first responders to err on the side of caution to avoid any potential exposure. The American College of Medical Toxicology (ACMT) and the American Academy of Clinical Toxicology (AACT) suggest that nitrile gloves provide sufficient protection for handling of fentanyl, and for "exceptional circumstances where the drug particles or droplets

suspended in the air, an N95 respirator provides sufficient protection" (Moss et al., 2017). Their official position paper suggests that "the risk of clinically significant exposure to emergency responders is extremely low" (Moss et al., 2017).

4.3.22. Terrorism

4.3.22.1 Location and Extent

Following several serious international and domestic terrorist incidents during the 1990's and early 2000's, citizens across the United States paid increased attention to the potential for deliberate, harmful actions of individuals or groups. The term "terrorism" refers to intentional, criminal, malicious acts. The functional definition of terrorism can be interpreted in many ways. Officially, terrorism is defined in the Code of Federal Regulations as "...the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives." (28 CFR §0.85)

The Federal Bureau of Investigation (FBI) further characterizes terrorism as either domestic or international, depending on the origin, base, and objectives of the terrorist organization. Often, the origin of the terrorist or person causing the hazard is far less relevant to mitigation planning than the hazard itself and its consequences. However, it is important to consider that the prevalence of Homegrown Violent Extremists (HVEs) has increased in recent years, with individuals able to become radicalized on the internet. In a speech on August 29, 2018 addressed to the 11th annual Utah National Security and Anti-Terrorism Conference, FBI Director Christopher Wray describes HVEs as "the primary terrorist threat to the homeland here today, without question."

Critical facilities are either in the public or private sector that provide essential products and/or services to the general public. Critical facilities are often necessary to preserve the welfare and quality of life in the county, or fulfill important public safety, emergency response, and/or disaster recovery functions. Critical facilities identified in the county are shelters; gas, electric and communication utilities; hospitals and other health care facilities; water and wastewater treatment plants, hazardous waste sites; and schools.

In addition to critical facilities, the county contains at risk populations that should be factored into a vulnerability assessment. These populations include not only the residents and workforce in the county, but also the tourists that visit the area on a daily basis, those that are traveling through the county on any of the major highways and marginalized groups such as LGBTQ persons and racial minorities. Potential targets for attack include:

- Commercial facilities
- Abortion or family planning clinics and other organizations associated with controversial issues.
- Education facilities
- Events attracting large amounts of people
- Places of worship
- Industrial facilities, especially those utilizing large quantities of hazardous materials
- Transportation infrastructure
- Historical sites
- Government facilities

4.3.22.2 Range of Magnitude

Terrorism refers to the use of Weapons of Mass Destruction (WMD) (including, biological, chemical, nuclear, and radiological weapons) arson, incendiary, explosive, armed attacks, industrial sabotage, intentional hazardous materials releases and cyber-terrorism. Within these general categories, there are many variations. There are a wide variety of agents and ways for them to be disseminated, particularly in the case of biological and chemical weapons. Terrorist methods can take many forms, including:

- Active assailant
- Agri-terrorism
- Arson/incendiary attack
- Armed attack
- Assassination
- Biological agent
- Chemical agent
- Cyber-terrorism
- Conventional bomb or bomb threat
- Hijackings
- Hazardous material release (intentional)
- Kidnapping
- Nuclear bomb
- Radiological agent

The rural areas of Lawrence County are most susceptible to disruptive actions like active assailant threats and transportation incidents.

Active assailant incidents and threats can disrupt the learning atmosphere in schools, interfere with worship services, cause traffic to be re-routed, and use taxpayer assets from deploying police, EMS and or fire units. Lawrence County has ten school districts (per Public Schools K12) and seven colleges throughout the county.

The areas along major transportation routes including Interstate 76 and 376 along with US-422, US-208 and US-224 can be susceptible to forms of public transit terrorist attacks. Rail transportation also has a large county presence. More populated areas of the county and its larger populated neighboring cities (Youngstown, OH and Pittsburgh, PA) can be susceptible to chemical, biological, radiological, nuclear or explosive (CBRNE) events due to the concentration and density of residential communities. Secondary effects from CBRNE incidents can be damaging as well. Mass evacuations could result in congestion of roadways and possibly result in breakdown of civil order, further exacerbating the situation. Government operations may be disrupted due to the need to displace or operate under reduced capacity. Radiation fallout, hazardous chemical introduction into the groundwater, or biologic/germ agents can cause long-term environmental damage.

Cyber-terrorism is becoming increasingly prevalent. Cyber-terrorism can be defined as activities intended to damage or disrupt vital computer systems. These acts can range from taking control of a host website to using networked resources to directly cause destruction and harm. Protection of databases and infrastructure are the main goals for a safe cyber environment. Cyber-terrorists can be difficult to identify because the internet provides a meeting place for individuals from various parts of the world. Individuals or groups

planning a cyber-attack are not organized in a traditional manner, as they are able to effectively communicate over long distances without delay. The largest threat to institutions from cyber-terrorism comes from any processes that are networked and controlled via computer. Any vulnerability that could allow access to sensitive data or processes should be addressed and any possible measures taken to harden those resources to attack.

4.3.22.3 Past Occurrence

Active assailants (shooters), as defined by the US Department of Homeland Security, are individuals actively engaged in killing or attempting to kill people in a confined area; in most cases, active shooters use firearm(s) and there is not necessarily a pattern or method to their selection of victims. Throughout the year in 2019, there were a total of 417 mass shooting incidents in the United States according to the non-profit GunViolenceArchive.org. Often these shooters can be homegrown violent extremists. One significant event that occurred in Pennsylvania happened on October 27th 2018, when eleven people were killed by a gunman in the Pittsburgh, PA neighborhood of Squirrel Hill. The gunman (an HVE) attacked the congregation at the Tree of Life Synagogue in a shooting that targeted the Jewish population and was fueled by the gunman's anti-Semitic, anti-immigrant, and anti-refugee sentiments.

A few other significant active shooter events include those that occurred at Virginia Tech (April 2007), Sandy Hook elementary School (December 2012), San Bernardino California (December 2015), an Aurora, Colorado movie theater (July 2012) and a church in Charleston, South Carolina (June 2015). A 2014 study by the FBI concluded that there has been a significant recent increase in frequency of active shooter incidents, and the vast majority (154 of 160 shooters between 2000 and 2013) were male (FBI, 2014). Of these 160 incidents, 45.6 percent took place in commercial environments, 24.3 percent took place in an educational environment, and the remaining 30.1 percent took place at other locations such as open spaces, military and other government properties, residential locations, houses of worship, and health care facilities (FBI, 2014). *Figure 48 - Active Shooter Incidents 2000-2013 (FBI, 2014)* summarizes the FBI's findings in the study.

Significant international terrorism incidents in the USA include: the World Trade Center bombing in 1993, the bombing of the Murrow Building in Oklahoma City in 1995, and the September 11, 2001 attack on the World Trade Center. One of the aircrafts hijacked in the September 11, 2001 attack crash landed in Somerset County, Pennsylvania before it reached the intended target. While fatalities and destruction at the intended target were avoided, all passengers on the flight perished.

While the largest scale terrorist incidents have often had international stimulus, many other incidents are caused by home grown actors who may have become radicalized through hate groups either in-person or online, and who may struggle with mental health issues. Hate groups such as the Ku Klux Klan (KKK), Aryan Nation and, more recently, the Alt-Reich have been a part of domestic terrorism in different forms.

Knowledge Center reports of terrorist activity in Lawrence County as of January 2020 can be found in *Table 54 - Terrorist Activity History*; however, these incidents are not all inclusive of the history of terrorism in the county. Entries very due to the reporter's selection of category and description.

A recent event took place on September 22, 2020 when a white powder was found inside an envelope addressed to two councilmembers. New Castle City Hall was evacuated, and meetings were postponed until more information could be obtained about the suspicious letter. The councilman sought treatment after opening the dangerous letter and unfortunately reported his hospital test showed traces of fentanyl in his

system. Lawrence County treated this as a potential terrorist activity and law enforcement will continue to investigate this incident as this plan is updated.

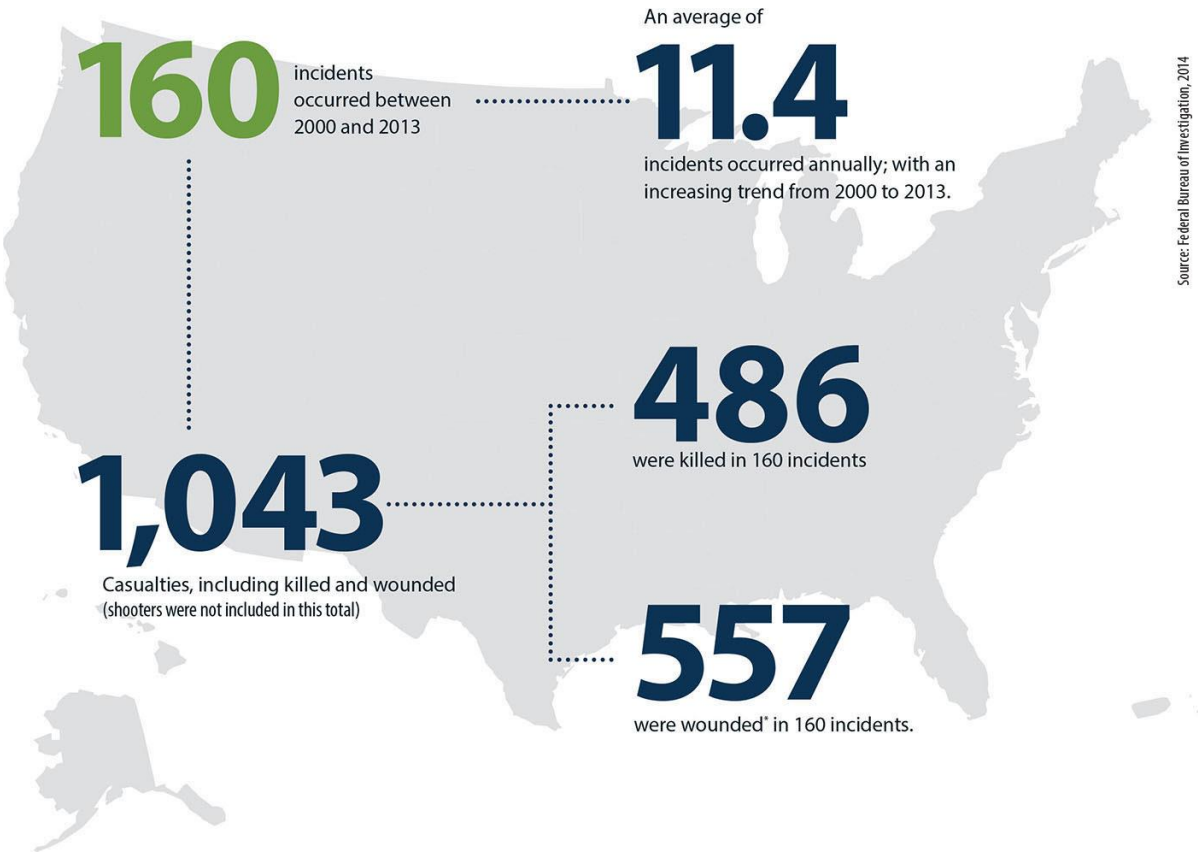
Table 54 - Terrorist Activity History

Terrorist Activity History *(Knowledge Center, 2020)*			
Title	**Location**	**Location Type**	**Date**
Terroristic Threat	Wilmington High School – New Wilmington Borough	Education	09/16/2006
Lock Down	Shenango High School – Shenango Township	Education	10/31/2006
Bomb Threat	Sky Bank – New Castle City	Commercial	11/14/2006
Terroristic Threat	Shenango High School – Shenango Township	Residential	04/20/2007
Bomb Threat	New Castle High School – New Castle City	Education	04/23/2007
Bomb Threat	Lincoln High School – Ellwood City Borough	Education	04/24/2007
Bomb Threat	Wilmington High School – New Wilmington Borough	Education	04/25/2007
Bomb Threat	Union Area High School – Union Township	Education	04/25/2007
Bomb Threat	Union Area Elementary School – Union Township	Education	05/09/2007
Bomb Threat	Ellwood City Borough	Unknown	06/02/2007
Bomb Threat	Wampum Borough	Unknown	06/05/2007
Bomb Threat	Lawrence County Government Center -New Castle City	Government	06/25/2007
Man with Gun	Union Township	Unknown	07/28/2007
Bomb Threat	Shenango High School – Shenango Township	Education	09/11/2007
Bomb Threat	Union Area High School – Union Township	Education	09/13/2007
Bomb Threat	New Castle High School – New Castle City	Education	09/14/2007
Bomb Threat	New Castle High School – New Castle City	Education	09/14/2007
Bomb Threat	Union Township	Unknown	09/20/2007
Unknown Powder	Shenango Township	Unknown	09/20/2007
Bomb Threat	School – Ellwood City Borough	Education	09/21/2007
Bomb Threat	School – New Castle City	Education	09/28/2007
Bomb Threat	School – New Castle City	Education	10/01/2007
Barricaded Individual	North Beaver Township	Residence	10/02/2007
Bomb Threat	Union High School – Union Township	Education	10/04/2007
Barricaded Individual	New Beaver Borough	Unknown	10/05/2007
Bomb Threat	Mohawk High School – North Beaver Township	Education	10/10/2007
Bomb Threat	Neshannock High School – Neshannock Township	Education	10/17/2007
Bomb Threat	New Castle High School – New Castle City	Education	10/30/2007
Bomb Threat	Wilmington High School – New Wilmington Borough	Education	11/12/2007
Bomb Threat	Union Area High School – Union Township	Education	11/14/2007
Bomb Threat	New Castle High School – New Castle City	Education	11/16/2007
Phone Sweep	New Castle High School – New Castle City	Education	11/19/2007
Bomb Threat	Neshannock High School – Neshannock Township	Education	01/03/2008
Bomb Threat	Lawrence County Vo-Tech – New Castle City	Education	03/14/2008
Bomb Threat	New Castle City	Unknown	03/26/2008
Bomb Threat	Mohawk High School – North Beaver Township	Education	04/05/2008
Bomb Threat	Union High School – Union Township	Education	04/23/2008
Bomb Threat	Credit Union – New Castle City	Business	07/03/2008
Bank Robbery	New Castle City	Commercial	08/14/2008

Terrorist Activity History *(Knowledge Center, 2020)*			
Title	**Location**	**Location Type**	**Date**
Barricaded Male	Shenango Township	Unknown	08/24/2008
Bomb Threat	Union Township	Unknown	10/13/2008
Bomb Threat	Union High School – Union Township	Education	11/06/2008
Bomb Threat	New Castle High School – New Castle City	Education	11/06/2008
Possible Hostage Situation	Mahoning Township	Unknown	11/17/2008
Barricaded Individual	Union Township	Unknown	11/22/2008
Shooting	Union Township	Unknown	11/29/2008
Suspicious Package	Shenango Township	Unknown	07/10/2009
Barricaded Individual	New Beaver Borough	Unknown	09/04/2009
Bomb Threat	Ellwood City Borough	Unknown	09/16/2009
Bomb Threat	Union High School – Union Township	Education	11/05/2009
Barricaded Man with gun	New Castle City	Unknown	12/22/2009
Suspicious Package	New Castle City	Unknown	05/13/2010
Bomb Threat	Mohawk High School – North Beaver Township	Education	10/28/2010
Barricaded Individual	New Castle City	Unknown	04/24/2011
Suspicious Package	New Castle City	Unknown	06/02/2011
Assist LE Tactical	New Castle City	Unknown	07/19/2011
Suspicious Activity	New Castle City	Unknown	10/13/2011
Hostage Situation	New Castle City	Unknown	12/16/2011
Barricaded Individual	Shenango Township	Unknown	02/25/2012
Barricaded Robbery Suspect	New Castle City	Unknown	06/02/2012
Shooting	New Castle City	Unknown	08/03/2012
Hostage Situation	New Castle City	Unknown	10/12/2012
Suicidal w/gun	Shenango Township	Unknown	11/03/2012
Shooting	New Castle City	Unknown	11/10/2012
Lock Down	Jameson Hospital - New Castle City	Unknown	11/12/2012
Suspicious Package	Wampum Borough	Unknown	01/23/2013
Barricaded Individual	North Beaver Township	Unknown	02/24/2013
Explosive Device	Unknown	Unknown	04/07/2013
Bomb Threat	New Castle City	Unknown	04/27/2013
Suspicious Device	Union Township	Unknown	05/19/2013
Bomb Threat	New Castle City	Unknown	06/18/2013
Bomb Threat	New Castle City	Unknown	06/19/2013
Bomb Threat	Shenango Township	Unknown	10/10/2013
Shooting – Multiple Victims	Unknown	Unknown	10/18/2013
Shooting	Unknown	Unknown	11/16/2013
Shooting	Unknown	Unknown	11/17/2013
Bomb Threat	Butler Community College	Education	04/29/2014
Bomb Threat	Hospital – Ellwood City Borough	Medical	05/20/2014
Suspicious Device	Mahoning Township	Unknown	09/30/2014

Terrorist Activity History *(Knowledge Center, 2020)*			
Title	**Location**	**Location Type**	**Date**
Possible Barricaded	Unknown	Unknown	07/07/2015
Bomb Threat	Union Township	Unknown	09/25/2015
Bomb Threat	New Castle City	Unknown	10/10/2015
Bomb Threat	New Castle City	Unknown	10/27/2015
Possible Barricaded Suspect	Ellwood City Borough	Unknown	01/05/2016
Pipe Bomb Found	Wayne Township	Unknown	05/01/2016
Possible Barricaded Suspect	New Castle City	Unknown	05/18/2016
Strong Arm Robbery	Pulaski Township	Unknown	05/28/2016
Possible Barricaded Suspect	New Castle City	Unknown	11/26/2016
Possible Barricaded Suspect	New Castle City	Unknown	11/26/2016
Shooting	New Castle City	Unknown	01/21/2017
Possible Barricaded Suspect	Union Township	Unknown	03/08/2017
Possible Barricaded Suspect	New Castle City	Unknown	07/21/2017
Barricaded Individual	Unknown	Unknown	09/05/2017
Possible Barricaded Suspect	Ellport Borough	Residence	11/18/2017
Barricaded Individual	Unknown	Unknown	11/28/2017
Bomb Threat	Union Township	Unknown	12/01/2017
Bomb Threat	Ellwood City Borough	Unknown	12/04/2017
Threats	School Shooter – Union Township	Education	02/23/2018
Bank Robbery	PNC – Shenango Township	Commercial	03/02/2018
High Risk Search Warrant	New Castle City	Unknown	03/07/2018
Possible Barricaded Suspect	New Castle City	Unknown	03/28/2018
Shooting at Police	Wilmington Township	Unknown	04/05/2018
Shooting	Shenango Township	Unknown	04/07/2018
Possible Barricaded Suspect	New Castle City	Unknown	07/03/2018
Possible Barricaded Suspect	New Castle City	Unknown	07/04/2018
Pursuit Shoots Fired	Unknown	Unknown	08/19/2018
Bank Robbery	Neshannock Township	Commercial	10/24/2018
Shooting	Unknown	Unknown	11/01/2018
Shooting	Unknown	Unknown	11/19/2018
High Risk Search Warrant	New Castle City	Unknown	01/05/2019
Armed Robbery	New Castle City	Commercial	01/06/2019
High Risk Search Warrant	New Castle City	Unknown	05/13/2019
Shooting Threat	North Beaver Township	Unknown	09/20/2019
Bank Robbery	New Castle City	Commercial	11/06/2019

Figure 48 - Active Shooter Incidents 2000-2013 (FBI, 2014)



4.3.22.4 Future Occurrence

The likelihood of Lawrence County being a primary target for a major international terrorist attack is somewhat small. More likely terrorist activities in Lawrence County are bomb threats or other incidents at schools. Lawrence County has ten public school districts and seven institutions of higher education. Despite the lack of recent events reported in *Table 54 - Terrorist Activity History*, bomb threats at schools are typically experienced at least once a year across the county.

4.3.22.5 Vulnerability Assessment

Lawrence County should be prepared for terrorism type incidents. With the existence of industrial commerce, interstate highways and railroad activity create soft targets that could be used to interfere with the focus of day to day life that the county enjoys. It is important to note that the use and exposure to biological agents can remain unknown for several days until the infected person(s), livestock, or crops begin to experience symptoms. Often such agents are contagious, and the infected person must be quarantined, livestock culled, and/or crops destroyed.

The probability of terrorist activity is more difficult to quantify than some other hazards. Instead of considering likelihood of occurrence, vulnerability is assessed in terms of specific assets. By identifying potentially at-risk terrorist targets in a community, planning efforts can be put in place to reduce the risk of attack.

Planning should work towards identifying potentially at-risk critical facilities and systems in the community, prioritizing those assets and locations, and identifying their vulnerabilities relative to known potential threats.

All communities in Lawrence County are vulnerable on some level, directly or indirectly, to a terrorist attack. However, communities with schools and government infrastructure like the county seat of New Castle City should be considered more likely to attract terrorist activity.

Also consider incidents that could fall over into the county. With Youngstown, Ohio being a close neighbor, are there any prevailing wind or evacuation issues to Lawrence County, if they become vulnerable to an incident?

Site-specific assessments should be based on the relative importance of a particular site to the surrounding community or population, threats that are known to exist, and vulnerabilities, including:

Inherent vulnerability:

- Visibility – How aware is the public of the existence of the facility?
- Utility – How valuable might the place be in meeting the objectives of a potential terrorist?
- Accessibility – How accessible is the place to the public?
- Asset mobility – is the asset's location fixed or mobile?
- Presence of hazardous materials – Are flammable, explosive, biological, chemical, and/or radiological materials present on site? If so, are they well secured?
- Potential for collateral damage – What are the potential consequences for the surrounding area if the asset is attacked or damaged?
- Occupancy – What is the potential for mass casualties based on the maximum number of individuals on-site at a given time?

Tactical vulnerability:

Site Perimeter:

- Site planning and landscape design – Is the facility designed with security in mind – both site-specific and regarding adjacent land use?
- Parking security – Are vehicle access and parking managed in a way that separates vehicles and structures?

Building Envelope:

- Structural engineering – Is the building's envelope designed to be blast-resistant? Does it provide collective protection against chemical, biological, and radiological contaminants?

Facility Interior:

- Architectural and interior space planning – Does security screening cover all public and private areas?
- Mechanical engineering – Are utilities and HVAC systems protected and/or backed up with redundant systems?
- Electrical engineering – Are emergency power and telecommunications available? Are alarm systems operational? Is lighting sufficient?
- Fire protection engineering – Are the building's water supply and fire suppression systems adequate, code-compliant, and protected? Are on-site personnel trained appropriately? Are local first responders aware of the nature of the operations at the facility?

- Electronic and organized security – Are systems and personnel in place to monitor and protect the facility?

4.3.23. Transportation Accidents

4.3.23.1 Location and Extent

Transportation accidents will claim more lives annually and cause more injuries than any other hazard. With rail, air and highway transportation available all over Pennsylvania, every county in the Commonwealth is susceptible to this hazard. Lawrence County is served by three Interstate Highways (I-76, I-79 and I-376); three U.S. Highways (U.S. Routes 19, 224 and 422) and PA State Routes 18, 65, 108, 168, 351, 388 and 551. There are 465.5 miles of state-maintained highways and nearly 712 miles of locally owned roads within Lawrence County. Hazardous materials travel through the county daily. The New Castle Area Transit Authority offers public transit for local and long-distance services.

According to the Federal Railroad Administration, there are four railroads operating in Lawrence County: CSX Transportation, Norfolk Southern Railroad, AMTX National Railroad Passenger Corp. and New Castle Industrial Railroad. There are two railcar repair facilities in Lawrence County, Kasgro Rail Corp, and The Hill Railroad Car Company Inc.; both located in New Castle near the CSX line.

The county is served by the New Castle Municipal Airport in Union Township (which does not see significant cargo shipments). The annual passenger load for the airport is 30,188. The airport has forty-six T-hangars, three conventional hangars, and tie-down areas which house more than sixty-five aircraft. A total of 75 percent of the general flights are for business or transportation related. (http://www.newcastlepa.org/Transportation).

Pipelines comprise an element of Lawrence County's commodity flow infrastructure. Most pipelines in the county are gas transmission lines. According to the National Pipeline Mapping System (NPMS), these lines are located on the western side of the county (generally to the west of I-376), the eastern side of the county (generally to the east of SRs 168 and 388) and the southern portion of the county, well south of US 422 (https://www.npms.phmsa.dot.gov/). There is also a "hazardous liquid pipeline" in the southwestern corner of the county. This line is owned by Sunoco Pipeline L.P. and is on its "Region 03 Inkster" system. According to the NPMS, the line carries "non-Highly Volatile Liquid (HVL) products". Companies owning and operating pipelines within Lawrence County are Columbia Gas of Pennsylvania; Dominion Energy Transmission, Inc.; Hilcorp Energy Company/Harvest Midstream; MarkWest Liberty PA; National Fuel Gas Supply Corporation; Peoples Natural Gas; Sunoco Pipeline L.P.; TC Energy/Columbia Gas Transmission; Tennessee Gas Pipeline – Kinder Morgan; Tucker Energy Solutions, LLC; UGI Energy Services; and Williams

4.3.23.2 Range of Magnitude

In terms of transportation, the maximum threat to Lawrence County is when the incident occurs in or near a heavily populated area. Each mode of public transit experiences accidents on an annual basis. Each of these incidents can occur on both small and large scales, depending on the number of vehicles involved.

Automobile accidents can occur on any roadway. These traffic accidents are most common during periods of inclement weather. Significant pipeline accidents are not very common. The most vulnerable areas are

those with pipelines running through or along hillsides. Mudslides and falling rocks can cause pipeline breaks. Hazardous material spills are the most common secondary effect of transportation accidents.

4.3.23.3 Past Occurrence

Table 55 - Automotive Crashes outlines Lawrence County automobile crash data to include the total number of crashes both in Lawrence County and Pennsylvania, the number of fatal crashes in the county and the total number of fatalities each year for both the county and the state.

Table 55 - Automotive Crashes

Year	Total crashes		Total Fatalities	
	Lawrence County	State	Lawrence County	State
2007	829	130,675	8	1,491
2008	838	125,327	12	1,468
2009	777	121,242	8	1,256
2010	773	121,312	11	1,324
2011	782	125,395	13	1,286
2012	740	124,092	11	1,310
2013	748	124,149	7	1,208
2014	741	121,317	10	1,195
2015	740	127,127	11	1,200
2016	780	129,395	10	1,188
2017	728	128,188	9	1,137
2018	770	128,420	17	1,190

The percent of those involved in reported accidents in Lawrence County using seat belts over the past six years are: (Source: Pennsylvania Department of Transportation)

- 2013, 76%
- 2014, 67%
- 2015, 76%
- 2016, 80%
- 2017, 77%
- 2018, 77%

Between 2013 and 2018 the Pennsylvania Department of Transportation reported there was one train versus vehicle crash in Lawrence County, this was in 2015 and there were no deaths related. There was a railroad incident on May 28, 2016 where a railroad contractor, employed by Progress Rail, was injured while loading a rail car at the New Castle Junction Yard. The rail car became uncoupled and struck the contractor. CSX reported on May 29, 2016 the contractor died of his injuries.

Table 56 - Transportation Accidents/Incidents in Lawrence County lists the transportation accidents/incidents in Lawrence County between January 2013 and February 2020, as identified on Knowledge Center™ for all modes of transportation.

Table 56 - Transportation Accidents/Incidents in Lawrence County

Transportation Accidents/Incidents in Lawrence County			
Classification	**Date**	**Location**	**Information**
Vehicle	1/4/2013	Pulaski Township	Vehicle accident with a water rescue
Vehicle	1/16/2013	Lawrence	Vehicle accident with a road closure
Vehicle	1/30/2020	Lawrence	Vehicle accident
Vehicle	2/24/2013	Pulaski Township	Vehicle accident with a fatality
Vehicle	3/10/2013	New Beaver Borough	Vehicle accident with entrapment
Vehicle	4/4/2013	Shenango Township	Vehicle accident with a road closure
Commercial	4/20/2013	Lawrence	Tri-axle rollover
Vehicle	5/2/2013	New Castle City	Vehicle accident
Commercial	5/10/2013	Lawrence	Semi vs pedestrian accident
Vehicle	6/5/2013	New Castle City	Accident involving police vehicle
Commercial	8/1/2013	Perry Township	Accident involving hazmat
Vehicle	8/19/2013	Shenango Township	Vehicle accident involving an ambulance
Vehicle	10/24/2013	Lawrence	Vehicle accident with entrapment
Vehicle	1/11/2014	Lawrence	Vehicle accident with entrapment and a possible fatality
Vehicle	1/29/2014	North Beaver Township	Vehicle accident with a fatality
Vehicle	3/13/2014	New Castle City	Vehicle accident involving an ambulance
Aviation	5/13/2014	Union Township	Small plan made an emergency landing
Vehicle	8/4/2014	Lawrence	Accident involving police vehicle
ATV	8/10/2014	New Beaver Borough	ATV rollover
Vehicle	8/10/2014	New Castle City	Vehicle into a structure
Vehicle	8/28/2014	Wayne Township	Vehicle rollover
Aviation	9/26/2014	Wayne Township	Ultra-lite airplane accident requiring search and rescue
Vehicle	10/28/2014	New Castle City	Vehicle accident with downed utility pole
Vehicle	12/3/2014	Lawrence	Vehicle accident with a road closure
Vehicle	12/11/2014	Lawrence	Vehicle vs pedestrian accident
Vehicle	4/18/2015	Taylor Township	Vehicle accident
Railroad	5/2/2015	Lawrence	Train vs car
Vehicle	7/11/2015	Lawrence	Vehicle accident
Vehicle	7/11/2015	Lawrence	Vehicle accident with entrapment
Commercial	8/3/2015	Union Township	Tractor-trailer rollover
Vehicle	9/15/2015	Little Beaver Township	Vehicle accident with a fatality
Vehicle	10/17/2015	Wayne Township	Vehicle accident
Vehicle	10/18/2015	Enon Valley Borough	Vehicle accident
Aviation	12/20/2015	Union Township	Aircraft accident
Vehicle	1/4/2016	Lawrence	Vehicle accident with entrapment
Vehicle	1/29/2016	New Castle City	Vehicle accident with a fatality
Vehicle	3/29/2016	Washington Township	Vehicle rollover
Vehicle	5/27/2016	Wampum Borough	Motorcycle accident
Railroad	5/28/2016	New Castle Borough	Train vs pedestrian
Railroad	5/28/2016	New Castle City	An uncoupled railcar struck a contractor
Vehicle	6/19/2016	Lawrence	Vehicle accident
Vehicle	7/22/2016	Ellwood City Borough	Vehicle vs bicycle
Vehicle	8/24/2016	Lawrence	Vehicle accident involving an ambulance
Vehicle	8/24/2016	Wilmington Township	Vehicle rollover
Vehicle	9/12/2016	Slippery Rock Township	Vehicle accident with a spill
Vehicle	9/12/2016	Slippery Rock Township	Vehicle accident with injuries

Transportation Accidents/Incidents in Lawrence County			
Classification	**Date**	**Location**	**Information**
Vehicle	9/22/2016	New Castle City	Vehicle accident involving an ambulance
Vehicle	9/27/2016	Scott Township	Vehicle accident with entrapment
Vehicle	10/29/2016	Mahoning Township	Vehicle accident in a construction zone
Vehicle	12/5/2016	Bessemer Borough	Vehicle accident with entrapment
Vehicle	12/5/2016	North Beaver Township	Vehicle rollover
Vehicle	12/29/2016	Washington Township	Vehicle accident with a road closure
Vehicle	5/23/2017	Pulaski Township	Vehicle accident with a road closure
Vehicle	6/6/2017	Wayne Township	Vehicle accident with a transformer down
Vehicle	7/1/2017	Lawrence	Vehicle accident with entrapment
Vehicle	7/9/2017	Slippery Rock Township	Vehicle accident with injuries
Vehicle	7/23/2017	North Beaver Township	Vehicle accident
Vehicle	7/26/2017	North Beaver Township	Vehicle accident involving a motorcycle
Vehicle	8/4/2017	Perry Township	Vehicle accident with injuries
Vehicle	8/9/2017	Ellwood City Borough	Vehicle accident with entrapment
Vehicle	8/9/2017	Ellwood City Borough	Vehicle accident involving a motorcycle
Vehicle	8/11/2017	Neshannock Township	Vehicle accident involving a police officer
ATV	8/11/2017	Lawrence County	ATV accident
Vehicle	8/12/2017	Mahoning Township	Vehicle accident with injuries
Vehicle	8/14/2017	Wilmington Township	Motorcycle accident with a backhoe
Vehicle	8/17/2017	Taylor Township	Vehicle accident
ATV	8/19/2017	New Beaver Borough	ATV accident
Vehicle	8/22/2017	Scott Township	Vehicle accident with entrapment
Vehicle	8/23/2017	New Beaver Borough	Vehicle accident with entrapment
Vehicle	8/25/2017	Ellwood City Borough	Vehicle vs pedestrian
Vehicle	8/29/2017	Wayne Township	Vehicle accident
Commercial	8/29/2017	North Beaver Township	Tri-axle roll-over
Vehicle	9/5/2017	Neshannock Township	Vehicle accident involving an ambulance
Vehicle	9/7/2017	New Wilmington Borough	Vehicle vs Amish buggy
Vehicle	9/7/2017	North Beaver Township	Vehicle roll-over
Vehicle	9/12/2017	Neshannock Township	Vehicle accident with injuries
Vehicle	9/15/2017	New Castle City	Vehicle vs pedestrian
ATV	9/16/2017	New Beaver Borough	ATV roll-over with injuries
Vehicle	9/16/2017	Neshannock Township	Motorcycle accident with injuries
Vehicle	9/20/2017	New Castle City	Vehicle accident with injuries
Vehicle	9/21/2017	North Beaver Township	Vehicle accident with injuries
Vehicle	9/23/2017	Lawrence County	Vehicle accident
Vehicle	10/5/2017	Lawrence County	Vehicle roll-over with ejection
Vehicle	10/10/2017	Mahoning Township	Vehicle accident with entrapment
Vehicle	10/18/2017	Union Township	Vehicle accident with injuries
Vehicle	10/23/2017	Pulaski Township	Vehicle accident with injuries
Vehicle	10/23/2017	North Beaver Township	Vehicle roll-over
Vehicle	10/24/2017	Hickory Township	Vehicle roll-over
Vehicle	10/25/2017	North Beaver Township	Vehicle accident with entrapment
Vehicle	10/28/2017	New Castle City	Vehicle accident into a creek
Vehicle	11/6/2017	Washington Township	Vehicle accident with a road closure
Vehicle	11/10/2017	Ellwood City Borough	Vehicle accident involving an ambulance
Vehicle	11/12/2017	Neshannock Township	Vehicle accident
Vehicle	11/18/2017	Lawrence	Vehicle accident
Vehicle	11/18/2017	Lawrence	Vehicle accident with injuries
Vehicle	11/28/2017	Lawrence	Vehicle accident with injuries
Vehicle	11/30/2017	Wampum Borough	Vehicle accident
Vehicle	12/3/2017	Lawrence	Vehicle accident with fire
Vehicle	12/9/2017	Taylor Township	Vehicle accident
Vehicle	12/13/2017	Ellwood City Borough	Vehicle accident with injuries

Transportation Accidents/Incidents in Lawrence County			
Classification	**Date**	**Location**	**Information**
Vehicle	12/16/2017	Mahoning Township	Vehicle accident
Vehicle	12/17/2017	Neshannock Township	Vehicle accident
Vehicle	12/19/2107	Neshannock Township	Vehicle accident involving three vehicles
Vehicle	12/23/2017	Hickory Township	Vehicle accident with road closure
Vehicle	1/2/2018	New Castle City	Vehicle accident involving a fire truck
Vehicle	1/2/2018	New Castle City	Accident involving an ambulance
Vehicle	1/11/2018	Slippery Rock Township	Vehicle accident
Vehicle	1/11/2018	Mahoning Township	Vehicle accident
Vehicle	1/17/2018	Shenango Township	Vehicle accident involving a school bus
Vehicle	2/1/2018	New Castle City	Vehicle accident
Vehicle	2/15/2018	Union Township	Vehicle accident
Vehicle	2/17/2018	New Castle City	Vehicle accident involving a fire truck
Vehicle	2/22/2018	Union Township	Vehicle accident with a rollover
Vehicle	2/27/2018	New Castle City	Vehicle accident involving a police cruiser
Vehicle	3/4/2018	New Castle City	Vehicle accident with road closure
Vehicle	3/7/2018	Wilmington Township	Vehicle accident with injuries
Vehicle	3/9/2018	Union Township	Vehicle accident with a rollover
Vehicle	3/13/2018	Wayne Township	Vehicle accident with entrapment
Vehicle	3/18/2018	Hickory Township	Vehicle accident with ejection
Vehicle	3/19/2018	North Beaver Township	Vehicle accident with ejection
Vehicle	3/21/2018	New Castle City	Vehicle accident with injuries
Vehicle	3/21/2018	Mahoning Township	Vehicle accident with a rollover
Vehicle	3/26/2018	Wilmington Township	Vehicle accident with entrapment
Vehicle	3/31/2018	Neshannock Township	Vehicle accident with injuries
Vehicle	4/1/2018	Union Township	Vehicle accident
Vehicle	4/2/2018	New Beaver Borough	Vehicle vs pole with injuries
Vehicle	4/5/2018	Slippery Rock Township	Vehicle accident with unknown injuries
Vehicle	4/5/2018	Slippery Rock Township	Vehicle accident with injuries
Vehicle	4/19/2018	Union Township	Vehicle accident with injuries
Vehicle	4/25/2018	Neshannock Township	Vehicle accident with injuries
Vehicle	4/28/2018	Union Township	Vehicle accident
ATV	5/6/2018	North Beaver Township	ATV accident
Vehicle	5/9/2018	Taylor Township	Vehicle accident with injuries
Vehicle	5/12/2018	Hickory Township	Vehicle accident involving EMS
Vehicle	5/22/2018	New Beaver Borough	Vehicle accident with a fatality
ATV	5/26/2018	Mahoning Township	ATV accident
Vehicle	6/11/2018	Neshannock Township	Vehicle accident with injuries
Vehicle	6/20/2018	Shenango Township	Vehicle accident with injuries
Vehicle	6/25/2018	Wilmington Township	Vehicle accident with injuries
Vehicle	6/28/2018	Union Township	Vehicle accident with injuries
Vehicle	7/4/2018	Slippery Rock Township	Vehicle accident
Vehicle	7/5/2018	Union Township	Vehicle accident
Vehicle	7/7/2018	Ellwood City Borough	Vehicle accident with injuries
Vehicle	7/8/2018	Mahoning Township	Vehicle vs ATV accident
Vehicle	7/9/2018	Shenango Township	Vehicle accident with a construction worker struck.
Vehicle	7/18/2018	Ellwood City Borough	Vehicle accident with injuries
Vehicle	8/9/2018	Mahoning Township	Vehicle accident with injuries
Vehicle	8/9/2018	Pulaski Township	Vehicle accident with injuries
Vehicle	8/14/2018	Hickory Township	Vehicle accident with injuries
Vehicle	8/15/2018	Wayne Township	Vehicle accident with injuries
Vehicle	8/18/2018	Lawrence	Vehicle accident with injuries
Vehicle	8/21/2018	Union Township	Vehicle accident with entrapment
Vehicle	8/24/2018	Ellwood City Borough	Motorcycle accident
Vehicle	8/31/2018	Union Township	Vehicle accident

Transportation Accidents/Incidents in Lawrence County			
Classification	**Date**	**Location**	**Information**
Vehicle	8/31/2018	Neshannock Township	Vehicle struck a pedestrian
Vehicle	9/9/2018	Taylor Township	Vehicle accident with injuries
Vehicle	9/24/2018	Union Township	Vehicle accident
Vehicle	9/25/2018	Slippery Rock Township	Vehicle accident with injuries
ATV	9/29/2018	New Beaver Borough	ATV rollover
Vehicle	10/5/2018	Mahoning Township	Motorcycle accident
Vehicle	10/9/2018	Wilmington Township	Vehicle accident
Vehicle	10/9/2018	New Castle City	Vehicle accident with road closure
Vehicle	10/12/2018	Pulaski Township	Vehicle accident with road closure
Vehicle	10/21/2018	Slippery Rock Township	Vehicle accident
Vehicle	11/2/2018	Lawrence	Vehicle accident with rollover
Vehicle	11/2/2018	New Castle City	Police pursuit - police involved in accident
Vehicle	11/9/2018	Lawrence	Vehicle accident with entrapment
Vehicle	11/15/2018	Wilmington Township	Vehicle struck a pedestrian
Vehicle	11/16/2018	Wayne Township	Vehicle accident with entrapment
Vehicle	11/19/2018	Lawrence	Vehicle accident with fire and injury
Vehicle	11/27/2018	Union Township	Vehicle into the water
Vehicle	11/29/2018	Slippery Rock Township	Vehicle accident with entrapment
Vehicle	12/7/2018	Perry Township	Vehicle accident
Vehicle	12/9/2018	Slippery Rock Township	Vehicle accident into a building
Vehicle	12/17/2018	New Castle City	Vehicle accident with entrapment
Vehicle	12/21/2018	Lawrence	Vehicle accident with multiple injuries
Vehicle	12/22/2018	North Beaver Township	Vehicle accident with entrapment
Vehicle	12/23/2018	Hickory Township	Vehicle accident
Vehicle	12/30/2018	Perry Township	Vehicle accident with rollover
Vehicle	1/1/2019	Taylor Township	Vehicle in between tracks
Vehicle	1/11/2019	Mahoning Township	Vehicle accident with entrapment
Vehicle	1/16/2019	Ellwood City Borough	Vehicle accident rollover with injuries
Vehicle	1/21/2019	North Beaver Township	Vehicle accident with entrapment
Vehicle	1/29/2019	Mahoning Township	Vehicle accident with unknown injuries
Vehicle	1/31/2019	Shenango Township	Vehicle accident with injuries
Vehicle	2/3/2019	Hickory Township	Vehicle accident with injuries
Vehicle	2/3/2019	Taylor Township	Vehicle accident with entrapment
Vehicle	2/4/2019	Union Township	Vehicle accident involving a police unit
Vehicle	2/25/2019	Lawrence	Vehicle accident rollover
ATV	3/12/2019	Perry Township	ATV accident
Vehicle	3/13/2019	Hickory Township	Vehicle accident with entrapment
Vehicle	3/15/2019	Lawrence	Vehicle accident with unknown injuries
Vehicle	4/5/2019	Scott Township	Vehicle accident with injuries
Vehicle	4/7/2019	Shenango Township	Vehicle accident rollover
Vehicle	4/9/2019	New Castle City	Vehicle accident with multiple injuries
Commercial	4/9/2019	Lawrence	Tractor-trailer over an embankment
Vehicle	4/13/2019	Scott Township	Vehicle accident with injuries
Vehicle	4/19/2019	Neshannock Township	Vehicle accident with injuries
Vehicle	4/20/2019	Slippery Rock Township	Vehicle accident with unknown injuries
Vehicle	4/27/2019	Union Township	Vehicle accident with road closure
Vehicle	4/28/2019	North Beaver Township	Motorcycle accident with injuries
Vehicle	4/29/2019	Taylor Township	Vehicle accident with entrapment
Vehicle	5/1/2019	Hickory Township	Vehicle accident with entrapment
Vehicle	5/3/2019	Wayne Township	Vehicle accident with injuries
Vehicle	5/9/2019	New Castle City	Vehicle struck a pedestrian
Vehicle	5/15/2019	New Castle City	Vehicle accident with injuries
Vehicle	5/18/2019	Lawrence	Vehicle accident with entrapment
Vehicle	5/19/2019	Wilmington Township	Vehicle accident with unknown injuries

Transportation Accidents/Incidents in Lawrence County			
Classification	**Date**	**Location**	**Information**
Vehicle	5/22/2019	Ellwood City Borough	Vehicle struck a child
Vehicle	5/23/2019	New Castle City	Vehicle struck a pedestrian
Railroad	6/10/2019	New Beaver Borough	Vehicle accident involving a train
Vehicle	6/14/2019	Mahoning Township	Vehicle accident with injuries
Vehicle	6/18/2019	New Castle City	Vehicle accident with a pole
Vehicle	6/18/2019	New Castle City	Vehicle accident with injuries
Vehicle	6/18/2019	Neshannock Township	Vehicle accident with entrapment
ATV	6/18/2019	Mahoning Township	ATV accident
Vehicle	6/20/2019	Lawrence	Vehicle accident with unknown injuries
Vehicle	6/21/2019	New Castle City	Vehicle accident with unknown injuries
Vehicle	6/24/2019	New Castle City	Vehicle accident with injuries
Vehicle	6/24/2019	Shenango Township	Vehicle accident with injuries
Vehicle	6/24/2019	Slippery Rock Township	Vehicle accident with entrapment
Vehicle	6/27/2019	Shenango Township	Vehicle accident with injuries
ATV	7/6/2019	Mahoning Township	ATV accident
Vehicle	7/20/2019	Neshannock Township	Vehicle accident with injuries
Vehicle	7/22/2019	Neshannock Township	Vehicle accident with injuries
Vehicle	7/31/2019	Slippery Rock Township	Vehicle accident with road closure
Vehicle	8/2/2019	Slippery Rock Township	Vehicle accident with entrapment
ATV	8/3/2019	New Beaver Borough	ATV rollover
Vehicle	8/6/2019	Union Township	Vehicle accident with entrapment
Vehicle	8/10/2019	Slippery Rock Township	Vehicle accident with farm equipment
Vehicle	8/16/2019	Lawrence	Vehicle accident with road closure
Vehicle	8/18/2019	Neshannock Township	Vehicle into a structure
Vehicle	8/21/2019	Slippery Rock Township	Vehicle accident with unknown injuries
Vehicle	8/28/2019	New Castle City	Vehicle accident with injuries
Vehicle	8/30/2019	Scott Township	Vehicle accident with multiple injuries
Vehicle	9/4/2019	North Beaver Township	Vehicle accident involving a school bus
Vehicle	9/5/2019	North Beaver Township	Motorcycle accident
ATV	9/7/2019	New Beaver Borough	ATV accident
Vehicle	9/7/2019	Wayne Township	Vehicle accident with entrapment
Vehicle	9/9/2019	North Beaver Township	Vehicle accident with entrapment
Vehicle	9/13/2019	Wilmington Township	Vehicle accident with entrapment
Vehicle	9/19/2019	New Castle City	Vehicle accident with a pole
Vehicle	9/21/2019	Slippery Rock Township	Vehicle accident with entrapment
Vehicle	9/24/2019	New Castle City	Vehicle accident with a pole
Vehicle	9/30/2019	Shenango Township	Vehicle accident
Vehicle	10/6/2019	Scott Township	Vehicle accident with unknown injuries
Vehicle	10/6/2019	North Beaver Township	Vehicle accident with entrapment and injuries
Vehicle	10/7/2019	Lawrence	Vehicle accident with entrapment
Vehicle	10/10/2019	Lawrence	Vehicle accident with entrapment
Vehicle	10/11/2019	Ellwood City Borough	Vehicle struck a pedestrian
Vehicle	10/16/2019	Lawrence	Vehicle accident rollover
Vehicle	10/20/2019	New Castle City	Vehicle accident with unknown injuries
Vehicle	10/21/2019	Wilmington Township	Vehicle accident with injuries
Vehicle	10/21/2019	Lawrence	Vehicle accident with entrapment
Vehicle	10/22/2019	Wilmington Township	Vehicle accident with entrapment
Vehicle	10/24/2019	New Castle City	Vehicle accident with injuries
Vehicle	11/4/2019	Shenango Township	Vehicle accident
Vehicle	11/9/2019	Shenango Township	Vehicle accident with injuries
Vehicle	11/17/2019	Pulaski Township	Vehicle accident with entrapment
Vehicle	11/27/2019	North Beaver Township	Vehicle accident with injuries
Vehicle	12/4/2019	Slippery Rock Township	Vehicle accident
Vehicle	12/6/2019	Union Township	Vehicle accident with entrapment

Transportation Accidents/Incidents in Lawrence County			
Classification	**Date**	**Location**	**Information**
Vehicle	12/6/2019	Union Township	Vehicle struck a pedestrian
Vehicle	12/7/2019	Lawrence	Vehicle accident involving a police cruiser
Commercial	12/9/2019	Union Township	Tractor-trailer rollover
Vehicle	12/11/2019	Washington Township	Vehicle rollover
Vehicle	12/11/2019	North Beaver Township	Vehicle over an embankment
Vehicle	12/14/2019	Union Township	Vehicle accident with entrapment
Vehicle	12/19/2019	New Castle City	Vehicle rollover
Vehicle	12/27/2019	Mahoning Township	Vehicle rollover
Vehicle	12/30/2019	Union Township	Vehicle rollover
Vehicle	1/17/2020	Wampum Borough	Vehicle accident with entrapment
Vehicle	1/20/2020	Scott Township	Vehicle accident with entrapment
Vehicle	1/24/2020	Neshannock Township	Vehicle accident with a fatality
Vehicle	1/26/2020	Lawrence	Vehicle accident with unknown injuries
Vehicle	2/5/2020	Perry Township	Vehicle accident with injuries
Vehicle	2/7/2020	New Castle City	Vehicle accident
Vehicle	2/7/2020	New Castle City	Vehicle accident
Vehicle	2/7/2020	Hickory Township	Vehicle accident
Vehicle	2/12/2020	Wayne Township	Vehicle accident with a fatality
Vehicle	2/12/2020	Lawrence	Vehicle accident with unknown injuries
Vehicle	2/15/2020	North Beaver Township	Vehicle rollover with unknown injuries
Vehicle	2/24/2020	New Castle City	Vehicle accident with injuries
Vehicle	2/27/2020	New Castle City	Vehicle accident involving an ambulance
Vehicle	2/28/2020	Little Beaver Township	Vehicle accident rollover
Vehicle	2/28/2020	Mahoning Township	Vehicle accident
Vehicle	2/28/2020	Ellwood City Borough	Vehicle accident
Vehicle	2/29/2020	New Castle City	Vehicle accident with unknown injuries
Vehicle	2/29/2020	Wilmington Township	Vehicle accident with injuries

4.3.23.4 Future Occurrence

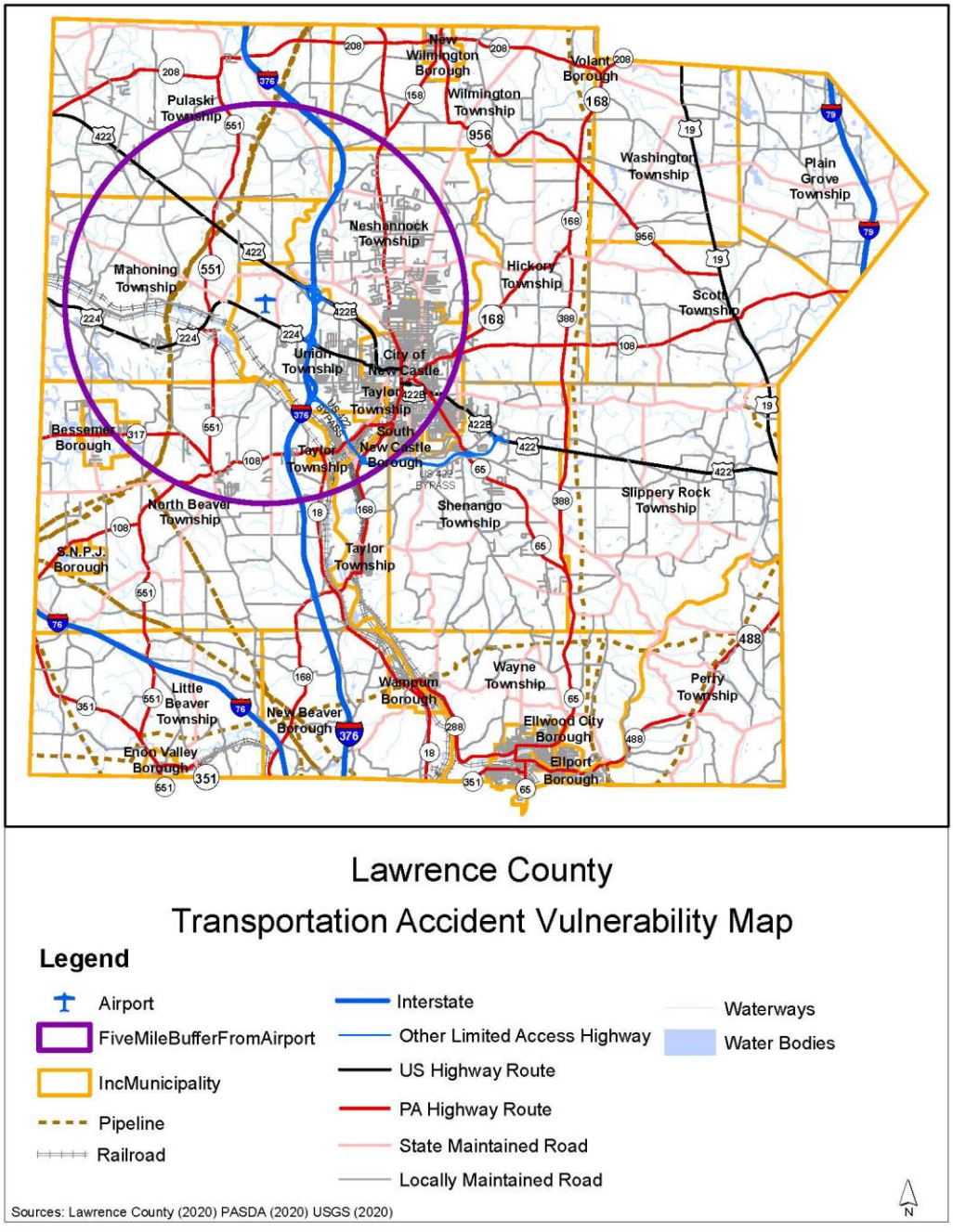
The probability of a transportation accident is highly likely. Automobile accidents, ranging from minor to fatal, will occur more frequently than a pipeline, railway, or aviation accident. Roadway accidents occur annually, often with limited impact. The exploration and extraction of natural gas in Lawrence County may lead to an increase of truck and heavy equipment traffic in Lawrence County.

During the seven years identified in past occurrences there have been two trains vs. motor vehicle accidents, one train vs. pedestrian and one instance where a railcar became uncoupled and struck a contractor. Also, during that same time frame there were two aviation accidents and one emergency landing identified.

4.3.23.5 Vulnerability Assessment

The vulnerability for a highway accident is directly related to the population and traffic density of that area. The more populated an area the more vulnerable it is to an accident. Interstate Highways (I-76, I-79 and I-376); three U.S. Highways (U.S. Routes 19, US 224 and US 422) and PA State Routes 18, 65, 108, 168, 351, 388 and 551.

Figure 49 - Transportation Accidents/Incidents in Lawrence County



4.3.24. Urban Fire and Explosions

4.3.24.1 Location and Extent

An urban fire involves a structure or property within an urban or developed area. A primary concern is a major urban fire involving large buildings and/or multiple properties. Minor to significant property damage, loss of life, and residential or business displacement are the effects of a major urban fire. Urban fires spread easily from building to building in denser areas. In areas with a significant proportion of building over fifty-years of age, urban fires are a significant threat.

Explosions are extremely rapid releases of energy that usually generate high temperatures and often lead to fire. Careful management of flammable and explosive hazardous materials could reduce the risk of severe explosions.

Urban fires and explosions are often a result of other hazards, particularly storms, lightning strikes, drought, transportation accidents, hazardous materials releases, utility emergencies, criminal activity (arson), and terrorism. In denser populated areas, fires can easily spread from building to building.

4.3.24.2 Range of Magnitude

Of the twenty-seven municipalities in Lawrence County, sixteen are townships, ten are boroughs, and one is a city. There are twenty-one fire departments providing fire coverage to the county, *Table 57 - Fire Coverage Providers by Municipality* shows the breakdown.

Table 57 - Fire Coverage Providers by Municipality

Fire Coverage Providers by Municipality	
Municipality	**Fire Coverage Provider/s**
Bessemer Borough	Bessemer Borough Vol. Fire Department (400)
City of New Castle	New Castle Fire Department (2400)
Ellwood City Borough	Ellwood City Vol. Fire Department (2300)
Hickory Township	Hickory Township Vol. Fire Department (300)
Enon Valley Borough	Enon Valley Vol. Fire Department (2100)
Mahoning Township	Mahoning Volunteer Fire Department (200)
Neshannock Township	Neshannock Volunteer Fire Department (100)
New Beaver Borough	New Beaver Vol. Fire Department (1600)
New Wilmington Borough	New Wilmington Vol. Fire Department (1100)
North Beaver Township	North Beaver Vol. Fire Department (700)
Pulaski Township	Pulaski Township Vol. Fire Department and Ambulance (500)
Scott Township	Scott Township Vol. Fire Department (1500)
Shenango Township	Shenango Area Fire District (1200)
Slippery Rock Township	Slippery Rock Township Vol. Fire Department (1400)
Taylor Township	Taylor Township Vol. Fire Department (800)

Fire Coverage Providers by Municipality	
Municipality	**Fire Coverage Provider/s**
Union Township	Union Township Vol. Fire Department (1300)
Volant Borough	Volant Vol. Fire Company (600)
Wampum Borough	Chewton Volunteer Fire Department (1800)
Wampum Borough	Wampum Borough. Vol Fire Department (1700)
Wayne Township	Wayne Township Vol. Fire Department (1900)
Wurtemburg/Perry Townships	Wurtemburg-Perry Vol. Fire Department (2200)

Severe urban fires result in extensive damage to residential, commercial, and/or public property. Damages range from minor smoke and/or water damage to the destruction of buildings. Following a fire or explosion, people can be displaced for several months to years depending on the magnitude of the event. Urban fires and explosions can also cause injuries and death.

Economic consequences related to urban fires and explosions could be:

- Lost wages due to temporary or permanent closure of businesses;
- Destruction and damage to business and personal assets;
- Loss of tax base;
- Recovery costs;
- Lost investments on destroyed property.

Secondary effects of urban fire and explosion events relates to the ability of public, private, and non-profit entities to provide post-incident relief.

4.3.24.3 Past Occurrence

Lawrence County has not had any Presidential or Gubernatorial disaster emergency declarations or proclamations for urban fires and explosions, nor has received Small Business Administration Loan Assistance for fires. *Table 58 - Fires and Explosions in Lawrence County* lists all the structure fires and explosions within Lawrence County as identified on Lawrence County Computer Aided Dispatch (CAD) system between January 2010 and July 2020.

Severe urban fires result in extensive damage to residential, commercial, and/or public property. Damages range from minor smoke and/or water damage to the destruction of buildings. Following a fire or explosion, people can be displaced for several months to years depending on the magnitude of the event. Urban fires and explosions can also cause injuries and death.

Economic consequences related to urban fires and explosions could be:

- Lost wages due to temporary or permanent closure of businesses;
- Destruction and damage to business and personal assets;
- Loss of tax base;
- Recovery costs;
- Lost investments on destroyed property.

Secondary effects of urban fire and explosion events relates to the ability of public, private, and non-profit entities to provide post-incident relief.

Table 58 - Fires and Explosions in Lawrence County

Year	Total # of Structure Fires	Commercial Buildings	Residential	Multi-Family Residential	Other Structure Fires	Fatalities/ Injuries
2010	235	39	176	17	3	0
2011	246	34	183	14	15	1 Fatality 1 injury
2012	275	34	169	34	38	1 Fatality 1 injury
2013	272	32	198	19	23	0
2014	253	35	161	34	23	Unknown
2015	264	35	162	19	28	Unknown
2016	188	20	119	20	29	Unknown
2017	232	11	175	24	22	Unknown
2018	242	25	160	33	24	Unknown
2019	303	32	230	22	19	2 Fatalities
2020	152	11	120	10	11	Unknown

One recent event took place on July 11, 2019 Neshannock Township Volunteer Fire Department was called to a structure fire with possible entrapment. Volunteer fire departments were called from New Wilmington Borough and Mahoning Township to assist. Unfortunately, it was too late by the time crews arrived and two fatalities occurred as a result.

4.3.24.4 Future Occurrence

It is difficult to predict urban fires or explosions. Lawrence County is likely to experience an urban fire or explosion; however, minor events are more likely to happen than major fires or explosions.

4.3.24.5 Vulnerability Assessment

Urban fires are a significant threat in denser areas with a significant proportion of buildings over fifty years of age. Lawrence County Comprehensive Plan Update adopted October 2016 reflects that more than forty percent of all housing in Bessemer Borough, Ellwood City Borough, Enon Valley Borough, New Castle City, Wampum Borough and Volant Borough was built prior to 1940.

The U.S. Census Bureau reports there are fourteen municipalities within the county with over 2,000 residents. The U.S. Census published this data on July 1, 2019 in the Annual Estimates of Resident Population for Minor Civil Divisions (MCD) in Pennsylvania. These estimates are:

- Ellwood City Borough 6,703
- Hickory Township 2,384
- Mahoning Township 2,858
- Neshannock Township 9,207
- New Castle City 21,618
- New Wilmington Borough 2,197
- North Beaver Township 3,935
- Pulaski Township 3,230

- Scott Township 2,201
- Shenango Township 7,118
- Slippery Rock Township 3,082
- Union Township 4,852
- Wayne Township 2,537
- Wilmington Township 2,567

The fourteen municipalties listed are at a higher risk for urban fire and explosion hazards due to the density and proximity of buildings.

4.3.25. Utility Interruptions

4.3.25.1 Location and Extent

Utility interruptions in Lawrence County include disruptions in fuel, water, electric and telecommunications capabilities in the county. Utility interruptions are often a secondary impact of another hazard like severe storms, tornados, winter storms or tropical storms. Severe thunderstorms, tornados and winter storms can lead to more regional utility interruptions, while localized outages can be caused by traffic accidents or wind damage. Heat waves may also result in rolling blackouts where power may not be available for an extended period. Additional utility interruptions may be caused by traffic accidents. Utility interruptions have the potential to take place throughout the county.

Lawrence County Municipal Utility Provider Summary:

Electric

Penn Power
Pennsylvania Power Company

Water

Aqua America, Shenango Division
Bessemer Borough Water Department
Brent Water Association
Mahoning Township
New Wilmington Borough Water Department
Pennsylvania American Water Co Ellwood City
Pennsylvania American Water Co New Castle
Volant Borough Water Department
Wampum Borough Water Department

Sanitary Sewer

New Castle Sanitation Authority
Bessemer Sewage Authority
Ellport Sewer Authority
Ellwood City Sewage Department
Wampum Sewage Disposal Plant
Wilmington Township Sewer

Telephone

Verizon

CenturyLink
Windstream

Internet

Armstrong
CenturyLink
Comcast
Toast.net
USA Choice
Verizon
Windstream
Cable & Satellite
Armstrong Cable
First Choice
Dish Network

Pipelines

Columbia Gas of Pennsylvania
Dominion
Hilcorp Energy Company
Mark West Liberty Midstream & Resources, LLC
National Fuel Gas Supply Corporation
Peoples Natural Gas
Sunoco Logistics
TC Energy/Columbia Gas Transmission
Tennessee Gas Pipeline – Kinder Morgan
Tucker Energy Solutions, LLC
UGI Energy Services
Williams

4.3.25.2 Range of Magnitude

The special needs population would be at maximum threat, posed by a utility failure in Lawrence County. Loss of resources, such as electricity, communications, gas and water supply could have a serious effect on the health, safety and general welfare of the citizenry. The special needs population can be vulnerable to loss of heat or air conditioning during extreme weather months. The county must account for its special needs' population during times of extended utility failure.

Severe utility interruptions would be regional or widespread power and telecommunications outages. Most often these are short-term outages. The possibility of a large storm hindering the repair of power lines could cause power outages that last several days.

One potential secondary effect of a loss of communications and water is an inadequate emergency response. Efficient and effective communications and adequate portable water supply are critical resources for first responders. A loss of electricity and gas can have a negative impact on first responders, as well. However, the most critical secondary effect would be the loss of heating compounded by periods of severe cold temperatures.

4.3.25.3 Past Occurrence

It is commonly known that utility failures occur at numerous times annually. The continued documentation of these failures may provide opportunities for the county to mitigate such service failures. *Table 59 - Utility Outages* outlines documented utility outages that have occurred from January 2009 to February 2020.

Table 59 - Utility Outages

Utility Outages in Lawrence County		
Utility (reason-if known)	**Date(s) of outage**	**Municipality**
Phone lines out of service	02-25-2009 to 02-26-2009	New Castle City
Phone outage	03-24-2009	Lawrence County
Power outage	03-27-2009	Lawrence County
Phone outage	04-13-2009	Neshannock Twp.
Sprint & Nextel Cellular 9-1-1- outage	06-29-2009 to 06-30-2009	Lawrence County
9-1-1/Admin phone line outage	07-23-2009 to 07-24-2009	Lawrence County
Power outage	08-22-2009	New Castle City
Phone outage	08-26-2009	New Castle City
Power outage	09-20-2009	New Castle City
9-1-1 Phone outage	10-03-2009 to 10-05-2009	New Castle City
Municipal water supply outage	10-23-2009 to 11-06-2009	Volant Borough
Water main break	11-26-2009 to 11-27-2009	Ellwood City Borough
Temporary 9-1-1 outage	12-13-2009	Lawrence County
Power outage	02-06-2010 to 03-03-2010	Lawrence County
Power outage	02-08-2010	Mahoning/Union Twp.
Power outage	03-07-2010	Neshannock Twp.
Cellular phone outage	03-12-2010	Lawrence County
Dispatch radio	04-21-2010	Lawrence County
Planned power outage	05-19-2010 to 05-20-2010	New Castle City
Boil water advisory	05-25-2010 to 06-01-2010	New Castle City
Power outage	06-23-2010	Lawrence County
Power outage	06-27-2010	Union Twp.
Power and phone outage	07-09-2010	Neshannock Twp.
Water main break	07-22-2010	New Castle City
Power outage (semi struck lines)	12-20-2010 to 12-27-2010	Little Beaver Twp.
Phone outage	01-02-2011 to 01-06-2011	Lawrence County
Power outage	02-12-2011	Neshannock Twp.
Power outage	03-30-2011	New Castle City
Power outage	04-12-2011	Wilmington Twp.
Power outage	05-09-2011	New Castle City
Water supply contamination	06-25-2011 to 08-03-2011	Pulaski Twp.
Phone outage	11-12-2011 to 11-21-2011	New Wilmington Borough
Power outage	01-29-2012	Ellwood City Borough
Power outage	02-09-2012	New Beaver Borough
Natural gas smell	02-28-2012 to 03-11-2012	New Castle City
Power outage	02-29-2012 to 03-01-2012	Ellwood City Borough
Power outage	03-10-2012	Union Twp.
Power outage	05-28-2012 to 05-29-2012	Wayne Twp.
Power outage	06-01-2012	North Beaver Twp.
Power outage	06-09-2012	Shenango Twp.
Power outage	06-14-2012	Ellwood City Borough
Planned power outage–Jameson Hospital	06-30-2013 to 07-02-2012	New Castle City
Power outage	07-09-2012 to 07-10-2012	Pulaski Twp.
Planned power outage-Jameson Hospital	07-27-2012 to 08-13-2012	New Castle City
Planned power outage-Jameson Hospital	11-17-2012	New Castle City
Widespread power outage	12-02-2012	Lawrence County

Utility Outages in Lawrence County		
Utility (reason-if known)	**Date(s) of outage**	**Municipality**
Smell of fuel oil in waterway	12-11-2012 to 12-13-2012	Neshannock Twp.
Phone outage	01-18-2013 to 01-19-2013	Ellwood City Borough
Power outage	02-07-2013	Pulaski Twp.
Power outage	06-23-2013 to 06-24-2013	Ellwood City Borough
Hospital without water	07/02/13	Ellwood City Borough
Tower light out	07/21/13 to 08/07/13	Lawrence County
Power outage	07-25-2013	Lawrence County
Power outage – large scale	08-06-202013	Lawrence County
Gas leak	09-25-2013	Lawrence County
Water leak- fire system- nursing home	11-26-2013	Neshannock Twp.
Power outage – nursing home	01-08-2014	Lawrence County
Power outage	01-22-2014	Bessemer Borough
Power outage	01-28-2014 to 01-29-2014	Lawrence County
Power outage	02-2-2014	New Castle City
Gas leak	04-18-2014	Lawrence County
Power outage	05-06-2014 to 05-09-2014	New Castle City
Power outage	07-31-2014	Wayne Township
Power outage	08-02-2014 to 08-03-2014	New Castle City
9-1-1 phone outage	08-14-2014 to 08-19-2014	Wampum Borough
9-1-1 phone outage	01-04-2015	Lawrence County
Power outage	01-15-2015	Ellwood City Borough
Boil water advisory	01-26-2015 to 02-11-2015	North Beaver Township
Boil water advisory	02-17-2015 to 02-24-2015	Pulaski Township
Power outage	03-08-2015 to 03-09-2015	Lawrence County
9-1-1 phone outage	04-09-2015	Lawrence County
Widespread power outage	05-17-2015	Lawrence County
Power outage	08-10-2015 to 08-11-2015	New Castle and Neshannock Township
Boil water advisory	01-14-2017 to 01-19-2017	Bessemer Borough
Radio outage, brief	04-25-2017	Lawrence County
Power outage, widespread	05-13-2017	New Castle City
Power outage	05-18-2017	New Castle City
Telephone pole broken with lines down	07-04-2017	New Castle City
Water main break	07-04-2017 to 07-05-2017	New Castle City
Water main break	07-05-2017 to 07-10-2017	Ellwood City Borough
Stadium light pole collapse	08-19-2017	Ellwood City Borough
911 phone outage	08-22-2017 to 08-23-2017	Lawrence County
Water line break	09-13-2017	Ellwood City Borough
Phone system outage	09-28-2017	Lawrence County
Phone outage	06-29-2018	Lawrence County
Power outage	07-12-2018 to 07-13-2018	New Wilmington Borough
Boil water advisory	07-21-2018 to 07-30-2018	Bessemer Borough
Gas line struck	08-23-2018	New Castle City
County-wide power outages	11-16-2018 to 11-19-2018	Lawrence County
Water main break	01-29-2019 to 01-30-2019	Ellwood City Borough
Power outage	01-31-2019	Washington Township
Water main break at UPMC	06-02-2019 to 06-04-2019	New Castle City
Gas line struck	09-09-2019	New Castle City
Gas leak	09-29-2019	Volant Borough
Natural gas issue with evacuation	10-30-2019	New Castle City
Water line break	02-22-2020	Ellwood City Borough
Source: Knowledge Center™ Lawrence County Event Log		

A worst-case scenario would be to lose 911 services, which occurred between August 14, 2014 and August 19, 2014 in Wampum Borough.

4.3.25.4 Future Occurrence

The probability of a large-scale and extended utility failure is highly likely. Utility interruptions are difficult to predict. Most utility interruptions are secondary to severe weather. Citizens should always be prepared for these hazards. An aging infrastructure also poses a threat to potential utility interruptions. Constant wear and tear of the service deteriorates equipment. There is often a mix of new and old equipment along the line, as total replacement is not a feasible solution for any utility company.

4.3.25.5 Vulnerability Assessment

Electric
Severe weather is one of the largest causes of power loss. Snow, ice, high winds and lightning can damage the electric power grid infrastructure. Worker strikes have not been known to cause major power outages, however, in some cases, minor power failures have occurred. Other causes of power outages include flooding, falling tree limbs, vehicle accidents involving utility poles and small animals climbing the lines and shorting out the power supply.

When power shortages or failures do occur, they are typically on a regional scale, not simply in a single county. Causes and potential causes include infrastructure failure, sabotage, human error and worker strikes. Also, power outages are often a secondary effect of severe weather. Power outages can damage both homes and businesses. Often, power outages will result in spoiled refrigerated inventories, affecting both residences and businesses.

Water
Water contamination can occur naturally, by human error, or intentionally. Occasionally, releases of manure and milk into the water supply can cause contamination. Overflows from sewage systems and lagoons on farms can also cause contamination of groundwater and drinking water. There are also times when accidental spills and releases of hazardous materials contaminate water. Water supplies along transportation routes may be affected by hazardous materials spills.

Water distribution can be affected in three ways: the amount of water available; the quality of the water; and the viability of the physical components of the distribution systems. The quantity of water depends on nature. Humans, on the other hand, are primarily responsible for the maintenance of water quality. Since Lawrence County is a rural county, much of the residential water comes from wells. Well contamination or water shortages due to drought would pose a high vulnerability.

Gas and liquid pipelines
Interruptions to natural gas distribution could be affected by several means: the deterioration of lines and facilities; puncturing the distribution lines by humans (either intentional or accidental); coastal and winter storms; extreme heat or cold events; or transportation accidents. *Table 60 - Pipeline Products* outlines the products that could be transported through Lawrence County.

Table 60 - Pipeline Products

Pipeline Products	
Pipeline Company	**Products Transported via Pipelines, DOT Guidebook ID #**
Columbia Gas of Pennsylvania	Natural Gas, 1971
Dominion	Natural Gas, 1971 Propane, 1075
Hilcorp Energy Company	Carbon Dioxide, 1013 Crude Oil, 1267 Natural Gas, 1971
Mark West Liberty Midstream & Resources, LLC	Natural Gas, 1971 Liquid Natural Gas, 1972
National Fuel Gas Supply Corporation	Natural Gas, 1971
Peoples Natural Gas	Natural Gas, 1971
Sunoco Pipeline L.P.	Butane, 1011 Ethane, 1035 Fuel Oil, 1993 Fuel, Aviation, Turbine Engine, 1863 Gasoline, 1203 Light Cycle Oil, 1993 Propane, 1075 Ultra Low Sulfur Diesel, 1993 Ultra Low Sulfur Kerosene, 1223
TC Energy/Columbia Gas Transmission	Natural Gas, 1971 Liquid Natural Gas, 1972
Tennessee Gas Pipeline – Kinder Morgan	Natural Gas, 1971
Tucker Energy Solutions, LLC	Natural Gas, 1971
UGI Energy Services	Natural Gas, 1971
Williams	Natural Gas, 1971
**2019 Coordinated Response Exercise for First Responders Emergency Response Manual*	

Communications

Cellular communication coverage is sporadic in the county. Drastic elevation changes, topography issues and a lack of cellular towers in the county lead to a decreased ability to use cellular communications. Cellular communications infrastructure has grown over the past seven years with additional towers being erected but is still limited.

The primary carrier for land line communications is Verizon. Verizon provides service to most of the municipalities within Lawrence County. Windstream and CenturyLink also service part of the county.

4.4. Hazard Vulnerability Summary

4.4.1. Methodology

Ranking hazards helps communities set goals and priorities for mitigation based on their vulnerabilities. A risk factor (RF) is a tool used to measure the degree of risk for identified hazards in a particular planning area. The RF can also assist local community officials in ranking and prioritizing hazards that pose the most significant threat to a planning area based on a variety of factors deemed important by the planning team and other stakeholders involved in the hazard mitigation planning process. The RF system relies mainly on historical data, local knowledge, general consensus from the planning team and information collected through development of the hazard profiles included in Section 4.3. The RF approach produces numerical

values that allow identified hazards to be ranked against one another; the higher the RF value, the greater the hazard risk.

RF values were obtained by assigning varying degrees of risk to five categories for each of the hazards profiled in the HMP update. Those categories include *probability*, *impact*, *spatial extent*, *warning time and duration*. Each degree of risk was assigned a value ranging from one to four. The weighting factor agreed upon by the planning team is shown in *Table 61 - Risk Factor Approach Summary*. To calculate the RF value for a given hazard, the assigned risk value for each category was multiplied by the weighting factor. The sum of all five categories equals the final RF value, as demonstrated in the following example equation:

Risk Factor Value =
[(Probability x .30) + (Impact x .30) +(Spatial Extent x .20) + (Warning Time x .10) + (Duration x .10)]

Table 61 - Risk Factor Approach Summary summarizes each of the five categories used for calculating a RF for each hazard. According to the weighting scheme applied, the highest possible RF value is 4.0.

Table 61 - Risk Factor Approach Summary

Summary of Risk Factor Approach Used to Rank Hazard Risk.					
RISK ASSESSMENT CATEGORY	**DEGREE OF RISK**				**WEIGHT VALUE**
	LEVEL	**CRITERIA**		**INDEX**	
PROBABILITY *What is the likelihood of a hazard event occurring in a given year?*	**UNLIKELY**	LESS THAN 1% ANNUAL PROBABILITY		1	30%
	POSSIBLE	BETWEEN 1 & 10% ANNUAL PROBABILITY		2	
	LIKELY	BETWEEN 10 &100% ANNUAL PROBABILITY		3	
	HIGHLY LIKELY	100% ANNUAL PROBABILTY		4	
IMPACT *In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?*	**MINOR**	VERY FEW INJURIES, IF ANY. ONLY MINOR PROPERTY DAMAGE & MINIMAL DISRUPTION ON QUALITY OF LIFE. TEMPORARY SHUTDOWN OF CRITICAL FACILITIES.		1	30%
	LIMITED	MINOR INJURIES ONLY. MORE THAN 10% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE DAY.		2	
	CRITICAL	MULTIPLE DEATHS/INJURIES POSSIBLE. MORE THAN 25% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE WEEK.		3	
	CATASTROPHIC	HIGH NUMBER OF DEATHS/INJURIES POSSIBLE. MORE THAN 50% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR 30 DAYS OR MORE.		4	
SPATIAL EXTENT *How large of an area could be impacted by a hazard event? Are impacts localized or regional?*	**NEGLIGIBLE**	LESS THAN 1% OF AREA AFFECTED		1	20%
	SMALL	BETWEEN 1 & 10% OF AREA AFFECTED		2	
	MODERATE	BETWEEN 10 & 50% OF AREA AFFECTED		3	
	LARGE	BETWEEN 50 & 100% OF AREA AFFECTED		4	
WARNING TIME *Is there usually some lead time associated with the hazard event? Have warning measures been implemented?*	**MORE THAN 24 HRS**	SELF-DEFINED	*(NOTE: Levels of warning time and criteria that define them may be adjusted based on hazard addressed.)*	1	10%
	12 TO 24 HRS	SELF-DEFINED		2	
	6 TO 12 HRS	SELF-DEFINED		3	
	LESS THAN 6 HRS	SELF-DEFINED		4	
DURATION *How long does the hazard event usually last?*	**LESS THAN 6 HRS**	SELF-DEFINED	*(NOTE: Levels of warning time and criteria that define them may be adjusted based on hazard addressed.)*	1	10%
	LESS THAN 24 HRS	SELF-DEFINED		2	
	LESS THAN 1 WEEK	SELF-DEFINED		3	
	MORE THAN 1 WEEK	SELF-DEFINED		4	

4.4.2. Ranking Results

Using the methodology described in Section 4.4.1, *Table 62 - Risk Factor Assessment* lists the risk factor calculated for each of the twenty-five potential hazards identified in the 2021 HMP. *It should be noted that the tornado hazard and windstorm hazard were ranked individually instead of together. Additionally, so were flash flooding, flooding, and ice jam flooding as well as environmental hazards – transportation and fixed facility.* Hazards identified as *high* risk have risk factors greater than 2.5. Risk factors ranging from 2.0 to 2.4 were deemed *moderate* risk hazards. Hazards with risk factors 1.9 and less are considered *low* risk.

Table 62 - Risk Factor Assessment

Lawrence County Hazard Ranking Based on RF Methodology.							
HAZARD RISK	HAZARD NATURAL(N) OR MANMADE(M)	RISK ASSESSMENT CATEGORY					RISK FACTOR (RF)
		PROBABILITY	ECONOMIC IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	
HIGH	Emergency Services (M)	4	4	4	1	4	**3.7**
	Invasive Species (N)	4	3	4	1	4	**3.4**
	Opioid Epidemic (M)	4	3	4	1	4	**3.4**
	Pandemic and Infectious Disease (M)	3	3	4	1	4	**3.1**
	Winter Storms (N)	4	2	4	1	3	**3**
	Flood (N)	3	3	3	1	4	**2.9**
	Tornado/Windstorm (N)	3	2	2	4	3	**2.6**
	Transportation Accidents (M)	4	2	1	4	2	**2.6**
	Drought (N)	1	3	4	1	4	**2.5**
	Radon Exposure (N)	3	1	4	1	4	**2.5**
MODERATE	Flash Flood (N)	3	3	2	1	1	**2.4**
	Drowning (M)	3	2	1	4	3	**2.4**
	Disorientation (M)	4	1	1	4	2	**2.3**
	Environmental Hazards – Transportation (M)	2	2	2	4	2	**2.2**
	Wildfire (N)	2	2	2	4	2	**2.2**
	Lightning Strikes (N)	4	1	1	4	1	**2.2**
	Urban Fire and Explosions (M)	4	1	1	4	1	**2.2**
	Earthquake (N)	1	2	4	4	1	**2.2**
	Environmental Hazards - Fixed Facility (M)	2	2	1	4	3	**2.1**
	Nuclear (M)	2	2	2	4	1	**2.1**
	Dam Failure (M)	2	2	2	1	3	**2**
LOW	Hurricane/Tropical Storm (N)	1	1	4	1	2	**1.7**
	Ice Jam Flooding (N)	2	1	1	2	3	**1.6**
	Landslides (N)	2	1	1	4	1	**1.6**
	Terrorism (M)	2	1	1	4	1	**1.6**
	Civil Disturbance (M)	2	1	1	2	2	**1.5**

Based on these results, there are ten high risk hazards, eleven moderate risk hazards and five low risk hazards in Lawrence County. Mitigation actions were developed for all high, moderate, and low risk hazards (see sections 6.4). The threat posed to life and property for moderate and high-risk hazards is considered significant enough to warrant the need for establishing hazard-specific mitigation actions. Mitigation actions related to future public outreach and emergency service activities are identified to address low risk hazard events.

A risk assessment result for the entire county does not mean that each municipality is at the same amount of risk to each hazard. *Table 63 - Countywide Risk Factor by Hazard* shows the different municipalities in Lawrence County and whether their risk is greater than (>), less than (<), or equal to (=) the risk factor assigned to the county as a whole. This table was developed by the consultant based on the findings in the hazard profiles located in sections 4.3.1 through 4.3.25.

Table 63 - Countywide Risk Factor by Hazard

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk										
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR										
JURISDICTION	Emergency Services (M)	Invasive Species (N)	Opioid Epidemic (M)	Pandemic and Infectious Disease (M)	Winter Storms (N)	Flooding (N)	Tornado/Windstorm (N)	Transportation Accidents (M)	Drought (N)	Radon Exposure (N)
	3.7	*3.4*	*3.4*	*3.1*	*3*	*2.9*	*2.6*	*2.6*	*2.5*	*2.5*
City of New Castle	=	=	=	=	=	>	<	=	<	=
Bessemer Borough	=	<	=	=	=	=	=	=	=	=
Ellport Borough	=	=	=	=	=	=	=	=	=	=
Ellwood City Borough	=	=	>	=	=	>	=	=	<	>
Enon Valley Borough	Not completed by municipality									
Hickory Township	=	<	<	=	=	>	=	<	<	<
Little Beaver Township	Not completed by municipality									
Mahoning Township	<	>	=	<	<	=	=	=	=	=
Neshannock Township	Not completed by municipality									
New Beaver Borough	=	=	=	=	=	>	=	=	=	=
New Wilmington Borough	Not completed by municipality									
North Beaver Township	=	>	>	=	=	=	>	=	=	<
Perry Township	=	=	=	=	=	=	=	=	=	=
Plain Grove Township	>	<	>	=	<	=	>	>	<	>
Pulaski Township	>	<	<	<	<	>	>	=	<	>
Scott Township	=	=	=	=	=	=	=	=	=	=
Shenango Township	=	<	=	=	=	=	=	>	<	<

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk										
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR										
JURISDICTION	Emergency Services (M)	Invasive Species (N)	Opioid Epidemic (M)	Pandemic and Infectious Disease (M)	Winter Storms (N)	Flooding (N)	Tornado/Windstorm (N)	Transportation Accidents (M)	Drought (N)	Radon Exposure (N)
	3.7	*3.4*	*3.4*	*3.1*	*3*	*2.9*	*2.6*	*2.6*	*2.5*	*2.5*
Slippery Rock Township	=	=	=	=	=	=	=	=	=	=
S.N.P.J Borough	Not completed by municipality									
South New Castle Borough	=	=	=	=	=	=	=	=	=	=
Taylor Township	=	=	=	=	=	=	=	=	=	=
Union Township	Not completed by municipality									
Volant Borough	=	=	=	=	=	=	=	=	=	=
Wampum Borough	=	=	=	=	=	=	=	=	=	=
Washington Township	=	=	=	<	=	=	=	=	>	=
Wayne Township	=	=	=	=	=	=	=	=	=	=
Wilmington Township	=	>	=	>	=	>	=	=	=	=

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk													
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR													
JURISDICTION	Flash Flooding (N)	Drowning (M)	Disorientation (M)	Environmental Hazards – Transportation (M)	Wildfire (N)	Lightning Strikes (N)	Urban Fire and Explosions (M)	Earthquake (N)	Environmental Hazards – Fixed Facility (M)	Nuclear (M)	Dam Failure (M)	Hurricane/Tropical Storm (N)	Ice Jam Flooding (N)	Landslides (N)
	2.4	*2.4*	*2.3*	*2.2*	*2.2*	*2.2*	*2.2*	*2.2*	*2.1*	*2.1*	*2*	*1.7*	*1.7*	*1.6*
City of New Castle	>	=	=	>	<	=	>	=	>	=	=	=	=	>
Bessemer Borough	=	>	=	>	=	=	=	=	>	=	<	=	=	=

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk														
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR														
JURISDICTION	Flash Flooding (N)	Drowning (M)	Disorientation (M)	Environmental Hazards – Transportation (M)	Wildfire (N)	Lightning Strikes (N)	Urban Fire and Explosions (M)	Earthquake (N)	Environmental Hazards – Fixed Facility (M)	Nuclear (M)	Dam Failure (M)	Hurricane/Tropical Storm (N)	Ice Jam Flooding (N)	Landslides (N)
	2.4	***2.4***	**2.3**	**2.2**	***2.2***	***2.2***	***2.2***	***2.2***	***2.1***	***2.1***	***2***	***1.7***	***1.7***	***1.6***
Ellport Borough	=	=	=	=	=	=	=	=	=	=	=	=	=	=
Ellwood City Borough	>	>	=	>	<	=	=	=	>	=	<	=	=	=
Enon Valley Borough	Not completed by municipality													
Hickory Township	>	<	<	=	<	<	<	<	=	=	=	=	>	>
Little Beaver Township	Not completed by municipality													
Mahoning Township	<	=	=	=	=	=	=	=	=	=	=	=	=	=
Neshannock Township	Not completed by municipality													
New Beaver Borough	>	=	=	=	=	=	<	=	>	>	<	=	<	<
New Wilmington Borough	Not completed by municipality													
North Beaver Township	=	=	=	=	=	=	>	=	>	=	>	>	=	>
Perry Township	<	=	=	=	=	=	=	<	<	<	<	<	<	>
Plain Grove Township	=	>	>	<	=	<	>	=	>	<	>	=	>	>
Pulaski Township	>	=	=	=	=	=	=	=	>	<	>	=	<	>
Scott Township	=	=	=	=	=	=	=	=	=	=	=	=	=	=
Shenango Township	=	=	=	=	=	=	<	<	=	=	<	=	<	<
Slippery Rock Township	=	=	=	=	=	=	=	=	=	=	=	=	=	=
S.N.P.J Borough	Not completed by municipality													
South New Castle Borough	=	=	=	=	=	=	=	=	=	=	=	=	=	=
Taylor Township	=	=	=	=	=	=	=	=	=	=	=	=	=	=
Union Township	Not completed by municipality													
Volant Borough	=	=	=	=	=	=	=	=	=	=	=	=	=	=
Wampum Borough	=	=	=	=	=	=	=	=	=	=	=	=	=	=
Washington Township	=	=	<	=	=	=	=	=	=	=	<	=	=	=
Wayne Township	=	=	=	=	=	=	=	=	=	=	=	=	=	=
Wilmington Township	>	=	=	=	=	=	=	=	=	=	=	=	=	=

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk														
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR														
JURISDICTION	Terrorism (M)	Civil Disturbance(M)												
	1.6	*1.5*												
City of New Castle	=	>												
Bessemer Borough	=	=												
Ellport Borough	=	=												
Ellwood City Borough	=	=												
Enon Valley Borough	Not completed by municipality													
Hickory Township	=	=												
Little Beaver Township	Not completed by municipality													
Mahoning Township	=	=												
Neshannock Township	Not completed by municipality													
New Beaver Borough	<	<												
New Wilmington Borough	Not completed by municipality													
North Beaver Township	>	>												
Perry Township	=	=												
Plain Grove Township	>	>												
Pulaski Township	=	=												
Scott Township	=	=												
Shenango Township	=	=												
Slippery Rock Township	=	=												
S.N.P.J Borough	Not completed by municipality													
South New Castle Borough	=	=												
Taylor Township	=	=												
Union Township	Not completed by municipality													
Volant Borough	=	=												
Wampum Borough	=	=												
Washington Township	=	=												
Wayne Township	=	=												
Wilmington Township	=	=												

4.4.3. Potential Loss Estimates

Based on various kinds of available data, potential loss estimates were established for flooding. Estimates provided in this section are based on HAZUS-MH, version MR4, geospatial analysis, and previous events. Estimates are considered *potential* in that they generally represent losses that could occur in a countywide hazard scenario. In events that are localized, losses may be lower, while regional events could yield higher losses.

Potential loss estimates have four basic components, including:

Replacement Value: Current cost of returning an asset to its pre-damaged condition, using present-day cost of labor and materials.
Content Loss: Value of building's contents, typically measured as a percentage of the building replacement value.
Functional Loss: The value of a building's use or function that would be lost if it were damaged or closed.
Displacement Cost: The dollar amount required for relocation of the function (business or service) to another structure following a hazard event.

Flooding Loss Estimation:

Flooding is a high-risk natural hazard in Lawrence County. The estimation of potential loss in this assessment focuses on the monetary damage that could result from flooding. The potential property loss was determined for each municipality and for the entire county. The quantity of commercial and residential structures in each Lawrence County municipality is outlined in section 4.3.4 of the flooding hazard profile.

MCM Consulting Group, Inc. conducted a countywide flood study using the Hazards U.S. Multi-Hazard (HAZUS-MH) software that is provided by the Federal Emergency Management Agency. This software is a standardized loss estimation software deriving economic loss, building damage, content damage and other economic impacts that can be used in local flood mitigation planning activities.

Using HAZUS-MH, total building-related losses from a 1%-annual-chance flood in Lawrence County are estimated to equal $219.07 million with $47.08 million of that coming from residential homes. Total economic loss, including replacement value, content loss, functional loss, and displacement cost, from a countywide 1%-annual-chance flood are estimated to equal $460.41 million.

4.4.4. Future Development and Vulnerability

Total population in Lawrence County decreased 3.6% between 2000 and 2010 from 94,546 to 91,108. The 2019 estimated population for Lawrence County is 85,512 which is 5,596 less than the 2010 census. There was an overall decrease of 6.1% in population based on the estimate. All municipalities, with the exception of one, have seen population decreases in the period between 2010 and the 2019 estimate as identified in *Table 64 - 2010-2019 Population Change*.

Table 64 - 2010-2019 Population Change

Population Change in Lawrence County from 2010-2019				
Municipality	**2010 Census**	**2015 Estimates**	**2019 Estimates**	**Percent of Change 2010-2019 Estimate**
City of New Castle	23,273	22,429	21,618	-7.1%
Bessemer Borough	1,111	1,064	1,051	-5.4%
Ellport Borough	1,180	1,134	1,103	-6.5%
Ellwood City Borough	7.289	6,962	6,703	-8.0%
Enon Valley Borough	306	297	284	-7.1%
Hickory Township	2,470	2,446	2,384	-3.5%
Little Beaver Township	1,411	1,375	1,330	-5.7%
Mahoning Township	3,083	2,963	2,858	-7.3%
Neshannock Township	9,609	9,325	9,207	-4.2%
New Beaver Borough	1,502	1,471	1,421	-5.4%
New Wilmington Borough	2,466	2,237	2,197	-1.1%
North Beaver Township	4,121	4,030	3,935	-4.5%
Perry Township	1,938	1,904	1,847	-4.7%
Plain Grove Township	813	784	758	-6.8%
Pulaski Township	3,452	3,343	3,230	-6.4%
Scott Township	2,347	2,285	2,201	-6.2%
Shenango Township	7,479	7,305	7,118	-4.8%
Slippery Rock Township	3,283	3,177	3,082	-6.1%
S.N.P.J Borough	19	19	19	0
South New Castle Borough	709	688	664	-6.3%
Taylor Township	1,052	1,005	969	-7.9%
Union Township	5,190	5,016	4,852	-6.5%
Volant Borough	168	157	151	-1.0%
Wampum Borough	717	682	658	-8.2%
Washington Township	799	788	768	-3.8%
Wayne Township	2,606	2,608	2,537	-2.6%
Wilmington Township	2,715	2,628	2,567	-5.4%
TOTAL	**91,108**	**88,122**	**85,512**	**-6.1%**

5. Capability Assessment

5.1. Update Process Summary

The capability assessment is an evaluation of Lawrence County's governmental structure, political framework, legal jurisdiction, fiscal status, policies and programs, regulations and ordinances and resource availability. Each category is evaluated for its strengths and weaknesses in responding to, preparing for, and mitigating the effects of the profiled hazards. A capability assessment is an integral part of the hazard mitigation planning process. Here, the county and municipalities identify, review, and analyze what they are currently doing to reduce losses and identify the framework necessary to implement new mitigation actions. This information will help the county and municipalities evaluate alternative mitigation actions and address shortfalls in the mitigation plan.

A capabilities assessment survey was provided to the municipalities during the planning process at meetings held with Lawrence County officials. These meetings were designed to seek input from key county and municipal stakeholders on legal, fiscal, technical, and administrative capabilities of all jurisdictions. As such, the capabilities assessment helps guide the implementation of mitigation projects and will help evaluate the effectiveness of existing mitigation measures, policies, plans, practices, and programs.

Throughout the planning process, the mitigation local planning team considered the county's twenty-seven municipalities. Pennsylvania municipalities have their own governing bodies, pass and enforce their own ordinances and regulations, purchase equipment and manage their own resources, including critical infrastructure. These capability assessments, therefore, consider the various characteristics and capabilities of municipalities under study.

The evaluation of the following categories – political framework, legal jurisdiction, fiscal status, policies and programs and regulations and ordinances – allows the mitigation planning team to determine the viability of certain mitigation actions. The capability assessment analyzes what Lawrence County and its municipalities have the capacity to do and provides an understanding of what must be changed to mitigate loss.

Lawrence County has a number of resources it can access to implement hazard mitigation initiatives including emergency response measures, local planning and regulatory tools, administrative assistance and technical expertise, fiscal capabilities and participation in local, regional, state and federal programs. The presence of these resources enables community resiliency through actions taken before, during and after a hazardous event. While the capability assessment serves as a good instrument for identifying local capabilities, it also provides a means for recognizing gaps and weaknesses that can be resolved through future mitigation actions. The results of this assessment lend critical information for developing an effective mitigation strategy.

5.2. Capability Assessment Findings

Twenty-one of the twenty-seven municipalities in Lawrence County completed and submitted a capability assessment survey. The results of the survey were collected, aggregated, and analyzed.

5.2.1. Planning and Regulatory Capability

Municipalities have the authority to govern more restrictively than state and county minimum requirements as long as they are compliant with all criteria established in the Pennsylvania Municipalities Planning Code

(MPC) and their respective municipal codes. Municipalities can develop their own policies and programs and implement their own rules and regulations to protect and serve their local residents. Local policies and programs are typically identified in a comprehensive plan, implemented through a local ordinance, and enforced by the governmental body or its appointee.

Municipalities regulate land use via the adoption and enforcement of zoning, subdivision, and land development, building codes, building permits, floodplain management and/or stormwater management ordinances. When effectively prepared and administered, these regulations can lead to an opportunity for hazard mitigation. For example, the National Flood Insurance Program (NFIP) established minimum floodplain management criteria. Adoption of the Pennsylvania Floodplain Management Act (Act 166 of 1978) established higher standards. A municipality must adopt and enforce these minimum criteria to be eligible for participation in the NFIP. Municipalities have the option of adopting a single-purpose ordinance or incorporating these provisions into their zoning, subdivision and land development, or building codes; thereby mitigating the potential impacts of local flooding. This capability assessment details the existing Lawrence County and municipal legal capabilities to mitigate the profiled hazards. It identifies the county's and the municipalities' existing planning documents and their hazard mitigation potential. Hazard mitigation recommendations are, in part, based on the information contained in the assessment.

Building Codes

Building codes are important in mitigation because they are developed for a region of the country in respect to the hazards existing in that area. Consequently, structures that are built according to applicable codes are inherently resistant to many hazards, such as strong winds, floods, and earthquakes; and can help mitigate regional hazards, such as wildfires. In 2003, Pennsylvania implemented the Uniform Construction Code (UCC) (Act 45), a comprehensive building code that establishes minimum regulations for most new construction, including additions and renovations to existing structures.

The code applies to almost all buildings, excluding manufactured and industrialized housing (which are covered by other laws), agricultural buildings and certain utility and miscellaneous buildings. The UCC has many advantages. It requires builders to use materials and methods that have been professionally evaluated for quality and safety, as well as inspections to ensure compliance.

The initial election period, during which all of Pennsylvania's 2,565 municipalities were allowed to decide whether the UCC would be administered and enforced locally, officially closed on August 7, 2004. The codes adopted for use under the UCC are the 2003 International Codes issued by the International Code Council (ICC). Supplements to the 2003 codes have been adopted for use over the years since.

If a municipality has "opted in", all UCC enforcement is local, except where municipal (or third party) code officials lack the certification necessary to approve plans and inspect commercial construction for compliance with UCC accessibility requirements. If a municipality has "opted out", the PA Department of Labor and Industry is responsible for all commercial code enforcement in that municipality; and all residential construction is inspected by independent third-party agencies selected by the owner. The department also has sole jurisdiction for all state-owned buildings no matter where they are located. Historical buildings may be exempt from such inspections and Act 45 provides quasi-exclusion from UCC requirements.

The municipalities in Lawrence County adhere to the standards of the Pennsylvania Uniform Construction Code (Act 45). Fourteen municipalities in Lawrence County have opted-in on building code enforcement.

Zoning Ordinance

Article VI of the Municipalities Planning Code (MPC) authorizes municipalities to prepare and enact zoning to regulate land use. Its regulations can apply to the permitted use of land; the height and bulk of structures; the percentage of a lot that may be occupied by buildings and other impervious surfaces; yard setbacks; the density of development; the height and size of signs; the parking regulations. A zoning ordinance has two parts, including the zoning map that delineates zoning districts and the text that sets forth the regulations that apply to each district. Nineteen of the twenty-seven municipalities in Lawrence County have their own zoning regulations.

Subdivision Ordinance

Subdivision and land development ordinances include regulations to control the layout of streets, the planning of lots and the provision of utilities and other site improvements. The objectives of a subdivision and land development ordinance are to: coordinate street patterns; assure adequate utilities and other improvements are provided in a manner that will not pollute streams, wells and/or soils; reduce traffic congestion; and provide sound design standards as a guide to developers, the elected officials, planning commissions and other municipal officials. Article V of the Municipality Planning Code authorizes municipalities to prepare and enact a subdivision and land development ordinance. Subdivision and land development ordinances provide for the division and improvement of land. All municipalities in Lawrence County utilize some form of land use and land development regulation. The Lawrence County Subdivision and Land Development Ordinance provides regulatory guidance for nine of the twenty-seven municipalities.

Stormwater Management Plan/Stormwater Ordinance

The proper management of storm water runoff can improve conditions and decrease the chance of flooding. Pennsylvania's Storm Water Management Act (Act 167) confers on counties the responsibility for development of watershed plans. The Act specifies that counties must complete their watershed storm water plans within two years following the promulgation of these guidelines by the DEP, which may grant an extension of time to any county for the preparation and adoption of plans. Counties must prepare the watershed plans in consultation with municipalities and residents. This is to be accomplished through the establishment of a watershed plan advisory committee. The counties must also establish a mechanism to periodically review and revise watershed plans, so they are current. Plan revisions must be done every five years or sooner, if necessary.

Municipalities have an obligation to implement the criteria and standards developed in each watershed storm water management plan by amending or adopting laws and regulation for land use and development. The implementation of storm water management criteria and standards at the local level are necessary since municipalities are responsible for local land use decisions and planning. The degree of detail in the ordinances depends on the extent of existing and projected development. The watershed storm water management plan is designed to aid the municipality in setting standards for the land uses it has proposed. Municipalities within rapidly developing watersheds will benefit from the watershed storm water management plan and will use the information for sound land use considerations. A major goal of the watershed plan and the attendant municipal regulations is to prevent future drainage problems and avoid the aggravation of existing problems. All municipalities in Lawrence County have adopted the county's stormwater management plan.

Comprehensive Plan

A comprehensive plan is a policy document that states objectives and guides the future growth and physical development of a municipality. The comprehensive plan is a blueprint for housing, transportation, community facilities, utilities, and land use. It examines how the past led to the present and charts the community's future path. The Pennsylvania Municipalities Planning Code (MPC Act 247 of 1968, as reauthorized and amended) requires counties to prepare and maintain a county comprehensive plan. In addition, the MPC requires counties to update the comprehensive plan every ten years.

With regard to hazard mitigation planning, Section 301.a(2) of the Municipality Planning Code requires comprehensive plans to include a plan for land use, which, among other provisions, suggests that the plan give consideration to floodplains and other areas of special hazards and other similar uses. The MPC also requires comprehensive plans to include a plan for community facilities and services and recommends considering storm drainage and floodplain management.

Lawrence County recently updated their comprehensive plan in 2016.

Article III of the MPC enables municipalities to prepare a comprehensive plan; however, development of a comprehensive plan is voluntary. Fifteen municipalities in Lawrence County have adopted their own comprehensive plan.

Capital Improvements Plan

The capital improvements plan is a multi-year policy guide that identifies needed capital projects and is used to coordinate the financing and timing of public improvements. Capital improvements relate to streets, storm water systems, water distribution, sewage treatment and other major public facilities. A capital improvements plan should be prepared by the respective county's planning department and should include a capital budget. This budget identifies the highest priority projects recommended for funding in the next annual budget. The capital improvements plan is dynamic and can be tailored to specific circumstances. Lawrence County does not have any capital improvement plans in place.

Participation in the National Flood Insurance Program (NFIP)

Floodplain management is the operation of programs or activities that may consist of both corrective and preventive measures for reducing flood damage, including but not limited to such things as emergency preparedness plans, flood control works and flood plain management regulations. The Pennsylvania Floodplain Management Act (Act 166) requires every municipality identified by the Federal Emergency Management Agency (FEMA) to participate in the National Flood Insurance Program (NFIP) and permits all municipalities to adopt floodplain management regulations. It is in the interest of all property owners in the floodplain to keep development and land usage within the scope of the floodplain regulations for their community. This helps keep insurance rates low and makes sure that the risk of flood damage is not increased by property development.

The Pennsylvania DCED provides communities, based on their CFR, Title 44, Section 60.3 level of regulations, with a suggested ordinance document to assist municipalities in meeting the minimum requirements of the NFIP along with the Pennsylvania Flood Plain Management Act (Act 166). These suggested or model ordinances contain provisions that are more restrictive than state and federal requirements. Suggested provisions include, but are not limited to:

1. Prohibiting manufactured homes in the floodway.
2. Prohibiting manufactured homes within the area measured fifty feet landward from the top-of bank of any watercourse within a special flood hazard area.
3. Special requirements for recreational vehicles within the special flood hazard area.
4. Special requirement for accessory structures.
5. Prohibiting new construction and development within the area measured fifty feet landward from the top-of bank of any watercourse within a special flood hazard area.
6. Providing the county conservation district an opportunity to review and comment on all applications and plans for any proposed construction or development in any identified floodplain area.

Act 166 mandates municipal participation in and compliance with the NFIP. It also establishes higher regulatory standards for new or substantially improved structures which are used for the production or storage of dangerous materials (as defined by Act 166) by prohibiting them in the floodway. Additionally, Act 166 establishes the requirement that a special permit be obtained prior to any construction or expansion of any manufactured home park, hospital, nursing home, jail and prison if said structure is located within a special flood hazard area.

The NFIP's Community Rating System (CRS) provides discounts on flood insurance premiums in those communities that establish floodplain management programs that go beyond NFIP minimum requirements. Under the CRS, communities receive credit for more restrictive regulations; acquisition, relocation, or flood-proofing of flood-prone buildings; preservation of open space; and other measures that reduce flood damages or protect the natural resources and functions of floodplains.

The CRS was implemented in 1990 to recognize and encourage community floodplain management activities that exceed the minimum NFIP standards. Section 541 of the 1994 Act amends Section 1315 of the 1968 Act to codify the Community Rating System in the NFIP. The section also expands the CRS goals to specifically include incentives to reduce the risk of flood-related erosion and to encourage measures that protect natural and beneficial floodplain functions. These goals have been incorporated into the CRS and communities now receive credit toward premium reductions for activities that contribute to them.

Under the Community Rating System, flood insurance premium rates are adjusted to reflect the reduced flood risk resulting from community activities that meet a minimum of three of the following CRS goals:

1. Reduce flood losses
2. Protect public health and safety
3. Reduce damage to property
4. Prevent increases in flood damage from new construction
5. Reduce the risk of erosion damage
6. Protect natural and beneficial floodplain functions
7. Facilitate accurate insurance rating
8. Promote the awareness of flood insurance

There are ten Community Rating System classes. Class 1 requires the most credit points and gives the largest premium reduction; Class 10 receives no premium reduction. CRS premium discounts on flood insurance range from 5% for Class 9 communities up to 45% for Class 1 communities. The CRS recognizes

eighteen credible activities, organized under four categories: Public Information, Mapping and Regulations, Flood Damage Reduction and Flood Preparedness.

FEMA Region III makes available to communities, an ordinance review checklist which lists required provisions for floodplain management ordinances. This checklist helps communities develop an effective floodplain management ordinance that meets federal requirements for participation in the NFIP. The Pennsylvania Department of Community and Economic Development (DCED) provides communities, based on their 44 CFR 60.3 level of regulations, with a suggested ordinance document to assist municipalities in meeting the minimum requirements of the NFIP and the Pennsylvania Flood Plain Management Act (Act 166). Act 166 mandates municipal participation in and compliance with the NFIP. It also establishes higher regulatory standards for hazardous materials and high-risk land uses. As new Digital Flood Insurance Rate Maps (DFIRMs) are published, the Pennsylvania State NFIP Coordinator at DCED works with communities to ensure the timely and successful adoption of an updated floodplain management ordinance by reviewing and providing feedback on existing and draft ordinances.

Twenty-six of the twenty-seven municipalities that reside in Lawrence County have floodplain regulations in place that meet requirements set forth by the NFIP. Currently, no municipalities have completed or started to complete the CRS program. Additional research will be conducted on the CRS program and mitigation actions will be developed in support of the CRS.

In an effort to spread awareness as well as capture participation levels, all municipalities were instructed to complete an NFIP survey provided by the Federal Emergency Management Agency. In total, twenty municipalities submitted an NFIP survey. These surveys can be found in Appendix C of this plan.

5.2.2. Administrative and Technical Capability

There are ten boroughs, sixteen townships, and one city within Lawrence County. Each of these municipalities conducts its daily operations and provides various community services according to local needs and limitations. Some of these municipalities have formed cooperative agreements and work jointly with their neighboring municipalities to provide services such as police protection, fire and emergency response, infrastructure maintenance and water supply management. Others choose to operate on their own. Municipalities vary in staff size, resource availability, fiscal status, service provision, constituent population, overall size and vulnerability to the profiled hazards.

County Department of Planning & Community Development

In Pennsylvania, planning responsibilities traditionally have been delegated to each county and local municipality through the Municipalities Planning Code (MPC). A planning agency acts as an advisor to the governing body on matters of community growth and development. A governing body may appoint individuals to serve as legal or engineering advisors to the planning agency. In addition to the duties and responsibilities authorized by Article II of the MPC, a governing body may, by ordinance, delegate approval authority to a planning agency for subdivision and land development applications. A governing body has considerable flexibility, not only as to which powers and duties are assigned to a planning agency, but also as to what form an agency will possess. A governing body can create a planning commission, a planning department, or both. The Lawrence County Department of Planning & Community Development assists all municipalities in the county as needed. The county employs a county planner on an annual basis.

Municipal Engineer

A municipal engineer performs duties as directed in the areas of construction, reconstruction, maintenance and repair of streets, roads, pavements, sanitary sewers, bridges, culverts, and other engineering work. The municipal engineer prepares plans, specifications and estimates of the work undertaken by the township. All municipalities, with the exception of one, employ a municipal engineer on an as-needed basis.

Personnel Skilled in GIS or FEMA HAZUS Software

A geographic information system (GIS) is an integrated, computer-based system designed to capture, store, edit, analyze, and display geographic information. Some examples of uses for GIS technology in local government are land records management, land use planning, infrastructure management and natural resources planning. A GIS automates existing operations such as map production and maintenance, saving a great deal of time and money. The GIS also includes information about map features such as the capacity of a municipal water supply or the acres of public land. GIS data is managed, maintained and developed by the Lawrence County Department of Planning & Community Development. There is one member of the Lawrence County GIS Department that has completed Basic HAZUS-MH.

Emergency Management Coordinator

Emergency management is a comprehensive, integrated program of mitigation, preparedness, response, and recovery for emergencies/disasters of any kind. No public or private entity is immune to disasters and no single segment of society can meet the complex needs of a major emergency or disaster on its own.

A municipal emergency management coordinator is responsible for emergency management – preparedness, response, recovery, and mitigation within his/her respective authority having jurisdiction (AHJ). The responsibilities of the emergency management coordinator are outlined in PA Title 35 §7503:

- Prepare and maintain a current disaster emergency management plan
- Establish, equip, and staff an emergency operations center
- Provide individuals and organizational training programs
- Organize and coordinate all locally available manpower, materials, supplies, equipment, and services necessary for disaster emergency readiness, response, and recovery
- Adopt and implement precautionary measures to mitigate the anticipated effects of a disaster
- Cooperate and coordinate with any public and private agency or entity
- Provide prompt information regarding local disaster emergencies to appropriate Commonwealth and local officials or agencies and the general public
- Participate in all tests, drills and exercises, including remedial drills and exercises, scheduled by the agency or by the federal government

Title 35 requires Lawrence County and its municipalities to have an emergency management coordinator.

The Lawrence County Department of Public Safety coordinates countywide emergency management efforts. Each municipality has a designated local emergency management coordinator who possesses a unique knowledge of the impact hazard events have on their community.

The Emergency Management Services Code (PA Title 35) requires that all municipalities in the Commonwealth have a local emergency operations plan (EOP) which is updated every two years. All twenty-seven

municipalities have adopted the county EOP. The notification and resource section of the plan was developed individually by each municipality.

Political Capability

One of the most difficult capabilities to evaluate involves the political will of a jurisdiction to enact meaningful policies and projects designed to mitigate hazard events. The adoption of hazard mitigation measures may be seen as an impediment to growth and economic development. In many cases, mitigation may not generate interest among local officials when compared with competing priorities. Therefore, the local political climate must be considered when designing mitigation strategies, as it could be the most difficult hurdle to overcome in accomplishing the adoption or implementation of specific actions.

The capability assessment survey was used to capture information on each jurisdiction's political capability. Survey respondents were asked to identify examples of political capability, such as guiding development away from hazard areas, restricting public investments or capital improvements within hazard areas, or enforcing local development standards that go beyond minimum state or federal requirements (i.e. building codes, floodplain management ordinances, etc.). These examples were used to guide respondents in scoring their community on a scale of "unwilling" (0) to "very willing" (5) to adopt policies and programs that reduce hazard vulnerabilities. Of the municipalities that responded, none of the municipalities completed this section with a numerical response. *Table 65 - Lawrence County Community Political Capability* summarizes the results of political capability.

Table 65 - Lawrence County Community Political Capability

Lawrence County Community Political Capability						
Municipality Name	**Capability Ranking**					
	0	**1**	**2**	**3**	**4**	**5**
City of New Castle						X
Bessemer Borough				X		
Ellport Borough						X
Ellwood City Borough				X		
Enon Valley Borough				X		
Hickory Township				X		
Little Beaver Township	Not completed by municipality					
Mahoning Township				X		
Neshannock Township	Not completed by municipality					
New Beaver Borough				X		
New Wilmington Borough				X		
North Beaver Township					X	
Perry Township				X		
Plain Grove Township					X	
Pulaski Township	Not completed by municipality					
Scott Township			X			
Shenango Township						X
Slippery Rock Township				X		

Lawrence County Community Political Capability						
Municipality Name	Capability Ranking					
	0	1	2	3	4	5
S.N.P.J Borough	Not completed by municipality					
South New Castle Borough	Not completed by municipality					
Taylor Township				X		
Union Township	Not completed by municipality					
Volant Borough	Not completed by municipality					
Wampum Borough					X	
Washington Township				X		
Wayne Township	Not completed by municipality					
Wilmington Township	Not completed by municipality					

Self-Assessment

In addition to the inventory and analysis of specific local capabilities, the capability assessment survey required each local jurisdiction to conduct its own self-assessment of its capability to effectively implement hazard mitigation activities. As part of this process, county and municipal officials were encouraged to consider the barriers to implementing proposed mitigation strategies in addition to the mechanisms that could enhance or further such strategies. In response to the survey questionnaire, local officials classified each of the capabilities as either "L = limited" "M = moderate" or "H = high." *Table 66 - Capability Self-Assessment Matrix* summarizes the results of the self-assessment survey. Nineteen municipalities returned this section of the assessment completed.

Table 66 - Capability Self-Assessment Matrix

Lawrence County Capability Self-Assessment Matrix				
Municipality Name	Capability Category			
	Planning and Regulatory Capability	Administrative and Technical Capability	Fiscal Capability	Community Political Capability
City of New Castle	H	H	L	H
Bessemer Borough	M	L	L	M
Ellport Borough	Not completed by municipality			
Ellwood City Borough	M	M	M	M
Enon Valley Borough	L	L	L	L
Hickory Township	M	L	L	M
Little Beaver Township	Not completed by municipality			
Mahoning Township	M	M	L	M
Neshannock Township	Not completed by municipality			
New Beaver Borough	M	M	L	M
New Wilmington Borough	M	M	L	L
North Beaver Township	M	M	M	M

Lawrence County Capability Self-Assessment Matrix				
Municipality Name	Capability Category			
	Planning and Regulatory Capability	Administrative and Technical Capability	Fiscal Capability	Community Political Capability
Perry Township	L	L	L	L
Plain Grove Township	M	M	L	L
Pulaski Township	L	L	L	L
Scott Township	L	L	H	L
Shenango Township	L	H	M	H
Slippery Rock Township	L	L	L	L
S.N.P.J Borough	Not completed by municipality			
South New Castle Borough	L	L	L	L
Taylor Township	M	M	M	M
Union Township	Not completed by municipality			
Volant Borough	Not completed by municipality			
Wampum Borough	M	M	L	M
Washington Township	L	M	L	M
Wayne Township	M	M	M	M
Wilmington Township	L	L	L	L

Existing Limitations

Funding has been identified as the largest limitation for a municipality to complete mitigation activities. The acquisition of grants is the best way to augment this process for the municipalities. The county and municipalities representatives will need to rely on regional, state, and federal partnerships for future financial assistance. Development of intra-county regional partnerships and intra-municipality regional partnerships will bolster this process.

5.2.3. Financial Capability

Fiscal capability is significant to the implementation of hazard mitigation activities. Every jurisdiction must operate within the constraints of limited financial resources. The following information pertains to various financial assistance programs relevant to hazard mitigation.

State and Federal Grants

During the 1960s and 1970s, state and federal grants-in-aid were available to finance a large number of municipal programs, including streets, water and sewer facilities, airports, parks, and playgrounds. During the early 1980s, there was a significant change in federal policy, based on rising deficits and a political philosophy that encouraged states and local governments to raise their own revenues for capital programs. The result has been a growing interest in “creative financing”.

Capital Improvement Financing

Because most capital investments involve the outlay of substantial funds, local governments can seldom pay for these facilities through annual appropriations in the annual operating budget. Therefore, numerous techniques have evolved to enable local government to pay for capital improvements over a time period exceeding one year. Public finance literature and state laws governing local government finance classify techniques that are used to finance capital improvements. The techniques include: revenue bonds; lease-purchase, authorities and special district; current revenue (pay-as-you-go); reserve funds; and tax increment financing. Most municipalities have very limited local tax funds for capital projects. Grants and other funding is always a priority.

Indebtedness through General Obligation Bonds

Some projects may be financed with general obligation bonds. With this method, the jurisdiction's taxing power is pledged to pay interest and principal to retire debt. General obligation bonds can be sold to finance permanent types of improvements, such as schools, municipal buildings, parks, and recreation facilities. Voter approval may be required.

Municipal Authorities

Municipal authorities are most often used when major capital investments are required. In addition to sewage treatment, municipal authorities have been formed for water supply, airports, bus transit systems, swimming pools and other purposes. Joint authorities have the power to receive grants, borrow money and operate revenue generating programs. Municipal authorities are authorized to sell bonds, acquire property, sign contracts and take similar actions. Authorities are governed by authority board members, who are appointed by the elected officials of the member municipalities.

Sewer Authorities

Sewer authorities include multi-purpose authorities with sewer projects. They sell bonds to finance acquisition of existing systems or for construction, extension, or system improvement. Sewer authority operating revenues originate from user fees. The fee frequently is based on the amount of water consumed and payment is enforced by the ability to terminate service or by the imposition of liens against real estate. In areas with no public water supply, flat rate charges are calculated on average use per dwelling unit.

Water Authorities

Water authorities are multi-purpose authorities with water projects, many of which operate both water and sewer systems. The financing of water systems for lease back to the municipality is among the principal activities of the local government facilities' financing authorities. An operating water authority issues bonds to purchase existing facilities or to construct, extend, or improve a system. The primary source of revenue is user fees based on metered usage. The cost of construction or extending water supply lines can be funded by special assessments against abutting property owners. Tapping fees also help fund water system capital costs. Water utilities are also directly operated by municipal governments and by privately owned public utilities regulated by the Pennsylvania Public Utility Commission. The Pennsylvania Department of Environmental Protection has a program to assist with consolidating small water systems to make system upgrades more cost effective.

Circuit Riding Program (Engineer)

The Circuit Riding Program is an example of intergovernmental cooperation. This program offers municipalities the ability to join together to accomplish a common goal. The circuit rider is a municipal engineer who serves several small municipalities simultaneously. These are municipalities that may be too small to hire a professional engineer for their own operations yet need the skills and expertise the engineer offers. Municipalities can jointly obtain what no one municipality could obtain on its own.

5.2.4. Education and Outreach

Lawrence County conducts an education and outreach program. The Lawrence County Department of Public Safety conducts public outreach at public events to update the citizens and visitors of the county on natural and human-caused hazards. The county conservation district also conducts outreach on various activities and projects in the county. Many of these projects are related to or directly impact hazard mitigation projects.

Educational activities that directly impact hazard mitigation in Lawrence County predominantly revolve around the first responders. Providing fire, medical and search and rescue training and education enhances the response and recovery capabilities of response agencies in the county. Additional training is always a goal within Lawrence County.

Education and outreach on the NFIP are necessary. With new regulations in flood-plain management, updated digital flood insurance rate maps and new rates for insurance policies, education, and outreach on the NFIP would assist the program. The Lawrence County Local Planning Team will identify actions necessary to complete this.

5.2.5. Plan Integration

The Lawrence County Comprehensive Plan was utilized for various sections of the 2021 Lawrence County HMP Update. Vision and Principles as well as the snapshot sections provided useful information on historical context, population and housing, land use, economic development, transportation, facilities, and utilities. The overview section within Vision and Principles was utilized in the development of the community profile section. Additionally, the future land use plan was utilized when developing section 2.4 of the community profile which provided valuable information on land use trends in Lawrence County. The Core Communities section within Vision and Principles was used in section 2.3 places, populations and demographics and provided information on general economics. The Connecting Communities and Healthy Communities section within Vision and Principles was used in section 2.2 community facts which provided information on healthcare facilities and school districts.

The Lawrence County Comprehensive Plan consists of four vision areas, each of which is accompanied by a set of guiding principles and subsequent recommendations for various projects and actions that support updates and growth for programs identified in the comprehensive plan. Identified goals and actions in the comprehensive plan ranged from immediate, short-term, mid-term, long-term, and continuing. Each guiding principle from this plan provided numerous actions and projects that were integrated into the 2021 HMP mitigation strategy. The following are some of the goals and actions from the 2016 comprehensive plan, followed by the 2021 HMP mitigation actions that were developed or supported by the goals and actions from the 2016 comprehensive plan:

- An identified goal in the county comprehensive plan mentions developing a plan to address invasive species. The 2021 HMP local planning team developed mitigation action 1.2.3 which identifies the need for conducting public outreach in reference to the spotted lantern fly.
- An identified goal of the county comprehensive plan mentions the creation of a regionalized Community Emergency Response Team. The 2021 HMP local planning team developed mitigation action 1.4.2 which mentions developing a strategy to complete regionalization of emergency management services, fire services, and law enforcement.
- An identified goal of the county comprehensive plan mentions prioritizing water and sewer system investments that bring local infrastructure up to federal standards. The 2021 HMP local planning team developed mitigation action 1.2.1 which encourages cleaning and separating sewer systems and storm drains to alleviate flooding in Lawrence County.
- An identified goal of the county comprehensive plan mentions encouraging municipal officials to attend educational workshops and sessions. The 2021 HMP local planning team developed mitigation action 4.3.3 which identifies the need to conduct a workshop to educate municipalities on mitigation projects to reduce the impacts of radon.

Although specific portions of the comprehensive plan outlined projects, actions or specific planning items that would support hazard mitigation, the information will be more comprehensive with the integration of new hazard mitigation principals and data from the 2021 Lawrence County HMP Update. During discussions with county planning personnel as part of this hazard mitigation plan update, discussions about the importance of hazard mitigation integration during the next comprehensive plan update was expressed. Specifically, the risk assessment section and mitigation strategy section hold vital information that requires integration into the next plan update. Identification of hazard areas, vulnerable structures and developments and future risk is critical in the determination of and management of economic growth and development areas in the county. Numerous mitigation opportunity forms have been received during the planning period and would provide beneficial information for the next comprehensive plan update as well. The local planning team determined that an action to integrate 2021 hazard mitigation principals and data into the next updated county comprehensive plan was needed in the 2021 Lawrence County Hazard Mitigation Plan. Action 1.3.5 identifies this.

Lawrence County Emergency Operations Plan

The Pennsylvania Emergency Management Services Code, 35 PA C.S. Sections 7701-7707, as amended, requires each county and municipality to prepare, maintain and keep current an Emergency Operations Plan (EOP). Lawrence County Department of Emergency Services is responsible for preparing and maintaining the county's EOP, which applies to both the county and municipal emergency management operations and procedures.

The EOP is reviewed at least annually. Whenever portions of the plan are implemented in an emergency event or training exercise, a review is performed, and changes are made where necessary. These changes are then distributed to the county's municipalities.

The complete risk assessment section, mitigation actions and mitigation project opportunities identified in the Lawrence County Hazard Mitigation Plan will assist with decreasing hazard specific risk and vulnerability. Understanding the risks and vulnerability in the county and municipalities will allow for emergency management and other response agencies to better direct planning, response, and recovery aspects.

Lawrence County Department of Public Safety will consider the Lawrence County Hazard Mitigation Plan during its annual review of the county EOP. Recommended changes to the HMP will then be coordinated with the hazard mitigation local planning team.

Plan Interrelationships

Ensuring consistency between these planning mechanisms is critical. In fact, Section 301 (4.1) of the Pennsylvania Municipalities Planning Code requires that comprehensive plans include a discussion of the interrelationships among their various plan components, "which may include an estimate of the environmental, energy conservation, fiscal, economic development and social consequences on the environment."

To that end, Lawrence County and its municipalities must ensure that the components of the hazard mitigation plan are integrated into existing community planning mechanisms and are generally consistent with goals, policies, and recommended actions. Lawrence County and the hazard mitigation planning team will utilize the existing maintenance schedule of each plan to incorporate the goals, policies and recommended actions as each plan is updated.

6. Mitigation Strategy

6.1. Update Process Summary

Mitigation goals are general guidelines that explain what the county wants to achieve. Goals are usually expressed as broad policy statements representing desired long-term results. Mitigation objectives describe strategies or implementation steps to attain the identified goals. Objectives are more specific statements than goals; the described steps are usually measurable and can have a defined completion date. There were four goals and sixteen objectives identified in the 2015 hazard mitigation plan. The 2021 Lawrence County Hazard Mitigation Plan Update also has four six goals and sixteen objectives. Objectives have been added and arranged in order to associate them with the most appropriate goal. These changes are noted in *Table 67 - 2015 Mitigation Goals and Objectives Review.* A list of these goals and objectives as well as a review summary based on comments received from stakeholders who participated in the HMP update process is included in *Table 67 - 2015 Mitigation Goals and Objectives Review*. These reviews are based on the five-year hazard mitigation plan review worksheet, which includes a survey on existing goals and objectives completed by the local planning team. Municipal officials then provided feedback on the changes to the goals and objectives via a mitigation strategy update meeting. Copies of these meetings and all documentation associated with the meetings are located in Appendix C.

Actions provide more detailed descriptions of specific work tasks to help the county and its municipalities achieve prescribed goals and objectives. There were forty-three actions identified in the 2015 mitigation strategy. A review of the 2015 mitigation actions was completed by the local planning team. The results of this review are identified in *Table 67 - 2015 Mitigation Goals and Objectives Review*. Actions were evaluated by the local planning team with the intent of carrying over any actions that were not started or continuous for the next five years.

Table 67 - 2015 Mitigation Goals and Objectives Review

2015 Mitigation Goals and Objectives Review		
GOAL Objective	**Description**	**Review**
GOAL 1	***Direct county and local governments to help protect life and property from natural and manmade disasters.***	Change man-made to human caused.
Objective 1.1	Improving enforcement of floodplain regulations within the county.	Change to "Improve enforcement…".
Objective 1.2	The county and its municipalities will continue sewer and storm drain management.	Action based item. Change to "Conduct projects and maintenance programs to decrease the impact of all hazards".
Objective 1.3	The county and its municipalities will prepare for post disaster events.	
Objective 1.4	Continue to support Region 13 efforts for a fusion center for threat intelligence and law enforcement.	This would be a better action. Change to "Coordinate and collaborate with other federal state and local agencies to enhance mitigation efforts".
Objective 1.5	County will work with municipalities and municipality first responders to encourage regionalization to provide better public safety services	This is an action-based item. Remove.
GOAL 2	***Take measures that will reduce vulnerability to hazards identified in this hazard mitigation plan.***	
Objective 2.1	Inform public to elevate and protect all systems vital to their operation.	Change to "Conduct continuity of operations planning, training, and exercise".
Objective 2.2	Develop warning devices to notify public in a hazard emergency.	Update to the following: "Enhance public warning and information dissemination capabilities".

GOAL Objective	Description	Review
Objective 2.3	Work with public and private utility providers to maintain aging infrastructure.	
Objective 2.4	Acquisition/relocation of property in the floodplain.	This objective needs to be updated to say "Complete actions and projects to acquire, elevate, demolish or demolish/reconstruct repetitive loss properties".
Objective 2.5	Stream bank/bed management and restoration will be implemented to reduce flooding in certain areas of the county.	
Objective 2.6	Assist public safety agencies in reducing the impacts to the public after a hazard event has occurred.	
Objective 2.7	Mitigate damage to roads, drainage, and utilities by requiring that reconstruction be built to standard.	
GOAL 3	***To improve tracking of hazards and mitigation actions.***	Change to "Conduct an annual hazard mitigation maintenance and annual report program".
Objective 3.1	Use GIS and existing technologies to cost effectively track mitigation projects.	New objective 3.2: "Improve tracking of hazard mitigation actions and project opportunities".
GOAL 4	***Generate more public involvement in the hazard mitigation plan maintenance and update process.***	Change to "Increase public awareness about both the potential impacts of all hazards and mitigation activities".
Objective 4.1	Educate the residents on the National Flood Insurance Program.	
Objective 4.2	Provide access to emergency preparedness guides.	
Objective 4.3	Conduct workshops and seminars for all high hazards.	

Table 68 - 2015 Mitigation Actions Review

Lawrence County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2015 HMP)*	***Status***					***Review Comments***
	No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
Action 1.1.1 – Lawrence County and the municipalities will keep development away from vacant parcels in the floodplain.			**X**			County can only encourage municipalities to keep development out of flood plain. – LCDPS
Action 1.1.2 – Lawrence County to arrange with PEMA/FEMA/DCED to hold training sessions with County and municipalities on the NFIP requirements.		**X**				Need to hold "town hall" style meetings with municipalities. – LCDPS
Action 1.2.1 – Clear and separate sewer systems and storm drains to alleviate flooding in the county.	**X**					County can only encourage. – LCDPS

Lawrence County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2015 HMP)*	***Status***					***Review Comments***
	No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
Action 1.3.1 – Designated Coordination Centers will be created in each township and borough, and be supplied with generators, water, food, and supplies for post disaster recovery efforts.		**X**				The LC LPT reviewed this action and determined the action should remain in the 2021 HMP Update
Action 1.3.2 - Municipalities will develop evacuation plans for municipal buildings and sporting events.		**X**				The LC LPT reviewed this action and determined the action should remain in the 2021 HMP Update
Action 1.3.3 - The county will continue to develop and maintain the pandemic emergency plan for all municipalities.			**X**			The LC LPT reviewed this action and determined the action should remain in the 2021 HMP Update
Action 1.3.4 - Lawrence County will collect and analyze dam inundation maps to determine which communities are at risk of a dam failure.			**X**			The LC LPT reviewed this action and determined the action should remain in the 2021 HMP Update
Action 1.3.5 - Lawrence County will recommend ways to integrate the hazard mitigation plan with other municipal plans.			**X**			County looks to integrate plans. – LC Planning
Action 1.4.1 - Lawrence County to determine agencies involved, databases needed, and investigate resources for a fusion center (currently in process through Region 13).			**X**			Ample training available for agencies to participate. - LCDPS
Action 1.5.1 - Develop a strategy to complete regionalization of emergency management services.		**X**				Several municipalities are combining for EMC/agreements needs to be formalized. - LCDPS
Action 1.5.2 - Develop a strategy to complete regionalization of fire services.	**X**					Good action. Keep as-is.
Action 1.5.3 - Develop a strategy to complete regionalization of law enforcement.	**X**					Good action. Keep as-is.
Action 1.5.4 - Develop a strategy to complete regionalization of emergency medical services.	**X**					Good action. Keep as-is.
Action 2.1.1 - Use GIS to develop addresses for structures in flood plains and send educational brochures.			**X**			The LC LPT reviewed this action and determined the action should remain in the 2021 HMP Update

Lawrence County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2015 HMP)*	***Status***					***Review Comments***
	No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
Action 2.2.1 - Acquire funding for public warning system and sirens for all critical facilities, municipalities, and educate households within the County.	**X**					The LC LPT reviewed this action and determined the action should remain in the 2021 HMP Update
Action 2.2.2 - Install early warning flood gages upstream to notify emergency services.		**X**				1 gage currently installed. – LCDPS Installing one gage on Neshannock. – LC Planning
Action 2.3.1 - Create a council with local utility providers and county planners to locate aging infrastructure of utilities.	**X**					Work with all utility providers to establish response. - LCDPS
Action 2.3.2 - Replace/rehab aging sewer lines or install lines where none exist.	**X**					Work with all utility providers to establish response. - LCDPS
Action 2.3.3 - Replace aging water lines.	**X**					Work with all utility providers to establish response. - LCDPS
Action 2.3.4 - Cut trees away from power lines.	**X**					Work with all utility providers to establish response. - LCDPS
Action 2.3.5 - Develop a database in existing GIS system of all utility networks, noting age and condition of infrastructure.	**X**					Work with all utility providers to establish response. – LCDPS Utility companies unwilling to share data. – LC Planning
Action 2.4.1 - Acquisition or relocation of properties located in flood prone areas.			**X**			Good action. Keep as-is.
Action 2.4.2 - Construct flood walls to decrease the risk to flooding.			**X**			Good action. Keep as-is.
Action 2.5.1 - Dredge waterways to decrease flooding.			**X**			Good action. Keep as-is.
Action 2.5.2 - Conduct stream bank and stream bed restoration to decrease flooding.			**X**			Good action. Keep as-is.
Action 2.5.3 - Complete and maintain watershed conservation plans.			**X**			Plans for all watersheds are complete. – LC Planning
Action 2.6.1 - Increase the access points to various bodies of water to increase emergency services response and recovery capabilities.			**X**			Planning always working to establish launch areas. - LCDPS
Action 2.6.2 - Install, maintain and repair fire hydrants in local municipalities.	**X**					Good action. Keep as-is.

Lawrence County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2015 HMP)*	***Status***					***Review Comments***
	No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
Action 2.6.3 - Improve the emergency communication systems so they can withstand all hazards identified in the mitigation plan.			**X**			Good action. Keep as-is.
Action 2.6.4 - Increase emergency planning capabilities as it pertains to missing persons and search and rescue in recreation areas.			**X**			Organize teams involving participants from all areas. - LCDPS
Action 2.7.1 - Encourage adoption and enforcement of the Uniform Construction Code.			**X**			Good action. Keep as-is.
Action 2.7.2 - Continue roadside storm water drainage upgrades.			**X**			Municipal responsibility
Action 3.1.1 - Develop a database in existing GIS system of all natural resource areas including maps to be used in future mitigation activities.			**X**			Good action. Keep as-is.
Action 3.1.2 - Collect more information on critical facilities so that future mitigation plan updates can distinguish vulnerability on building characteristics.			**X**			LEPC staff actively working on plans. - LCDPS
Action 3.1.3 - Improve municipal project status updating process.			**X**			Good action. Keep as-is.
Action 4.1.1 - Create a "How To" Mitigation brochure for use at public events that would include information and pictures like that contained in FEMA's publications: Retrofitting for Homeowners Guide, Elevating Your Flood Prone Home, Elevating Residential Structures, and Information on NFIP.			**X**			The LC LPT reviewed this action and determined the action should remain in the 2021 HMP Update
Action 4.1.2 - Provide Flood Insurance Rate Map (FIRM) information to people who inquire and publicize this service.			**X**			The LC LPT reviewed this action and determined the action should remain in the 2021 HMP Update

Lawrence County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2015 HMP)*	***Status***					***Review Comments***
	No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
Action 4.2.1 - Provide the local public libraries and public websites with all available resources, as well as a number of FEMA publications, and a final copy of the Lawrence County Hazard Mitigation Plan to make all available informational resources readily accessible to the public.			**X**			The LC LPT reviewed this action and determined the action should remain in the 2021 HMP Update
Action 4.2.2 - Create displays for children's programs that teach safety. Examples of information used would be similar to that on the FEMA for Kids CD or for Sparky Fire Safety Program.			**X**			The LC LPT reviewed this action and determined the action should remain in the 2021 HMP Update
Action 4.2.3 - Develop and disseminate emergency guides on sheltering in place procedures.			**X**			The LC LPT reviewed this action and determined the action should remain in the 2021 HMP Update
Action 4.3.1 - Target owners of properties within identified hazards areas for additional outreach regarding mitigation and disaster preparedness.			**X**			The LC LPT reviewed this action and determined the action should remain in the 2021 HMP Update
Action 4.3.2 - Conduct outreach and educational programs to increase vigilance and potential impacts on invasive species of Lawrence County.			**X**			The LC LPT reviewed this action and determined the action should remain in the 2021 HMP Update
Action 4.3.3 - Conduct a workshop to educate municipalities and residents on mitigation projects to reduce the impact of radon.			**X**			The LC LPT reviewed this action and determined the action should remain in the 2021 HMP Update

6.2. Mitigation Goals and Objectives

Based on results of the goals and objectives evaluation exercise and input from the local planning team, a list of four goals and sixteen corresponding objectives was developed. *Table 69 - 2021 Goals and Objectives* details the mitigation goals and objectives established for the 2021 Lawrence County Hazard Mitigation Plan.

Table 69 - 2021 Goals and Objectives

2021 Lawrence County Goals and Objectives	
GOAL Objective	***Description***
GOAL 1	***Direct county and local governments to help protect life and property from natural and human-caused disasters.***
Objective 1.1	Improve enforcement of floodplain regulations within the county.
Objective 1.2	Conduct projects and maintenance programs to decrease the impact of all hazards.
Objective 1.3	The county and its municipalities will prepare for post disaster events.
Objective 1.4	Coordinate and collaborate with other federal, state, and local agencies to enhance mitigation efforts.
GOAL 2	***Take measures that will reduce vulnerability to hazards identified in this hazard mitigation plan.***
Objective 2.1	Conduct continuity of operations planning, training, and exercises.
Objective 2.2	Enhance public warning and information dissemination capabilities.
Objective 2.3	Work with public and private utility providers to maintain aging infrastructure.
Objective 2.4	Complete actions and projects to acquire, elevate, demolish, or demolish/reconstruct repetitive loss properties.
Objective 2.5	Stream bank/bed management and restoration will be implemented to reduce flooding in certain areas of the county.
Objective 2.6	Assist public safety agencies in reducing the impacts to the public after a hazard event has occurred.
Objective 2.7	Mitigate damage to roads, drainage, and utilities by requiring that reconstruction be built to standard.
GOAL 3	***Conduct an annual hazard mitigation maintenance and annual report program.***
Objective 3.1	Use GIS and existing technologies to cost effectively track mitigation projects.
Objective 3.2	Improve tracking of hazard mitigation action and project opportunities.
GOAL 4	***Increase public awareness about both the potential impacts of all hazards and mitigation activities.***
Objective 4.1	Educate the residents on the National Flood Insurance Program.
Objective 4.2	Provide access to emergency preparedness guides.
Objective 4.3	Conduct workshops and seminars for all high hazards.

6.3. Identification and Analysis of Mitigation Techniques

This section includes an overview of alternative mitigation actions based on the goals and objectives identified in Section 6.2. There are four general mitigation strategy techniques to reducing hazard risks:

- Planning and regulations
- Structure and infrastructure

- Natural systems protection
- Education and awareness

Planning and Regulations: These actions include government authorities, policies or codes that influence the way land and buildings are developed and built. The following are some examples:

- Comprehensive plans
- Land use ordinances
- Subdivision regulations
- Development review
- Building codes and enforcement
- National Flood Insurance Program and Community Rating System
- Capital improvement programs
- Open space preservation
- Stormwater management regulations and master plans

The planning and regulations technique will protect and reduce the impact of specific hazards on new and existing buildings by improving building code standards and regulating new and renovation construction. The improved building codes will decrease the impact of risk hazards. Subdivision and land development enhancements will also augment this process. Ensuring that municipalities participate in the National Flood Insurance Program and encourage participation in the Community Rating System will decrease the impact as well.

Structure and infrastructure implementation: These actions involve modifying existing structures and infrastructure or constructing new structures to reduce hazard vulnerability. The following are examples:

- Acquisitions and elevations of structures in flood prone areas
- Utility undergrounding
- Structural retrofits
- Floodwalls and retaining walls
- Detention and retention structures
- Culverts
- Safe rooms

Structure and infrastructure implementation is a technique that removes or diverts the hazard from structures or protects the structure from a specific hazard. The new or renovated structures are therefore protected or have a reduced impact of hazards.

Natural Resource Protection: These are actions that minimize damage and losses and also preserve or restore the functions of natural systems. They include the following:

- Erosion and sediment control
- Stream corridor restoration
- Forest management
- Conservation easements
- Wetland restoration and preservation

Natural resource protection techniques allow for the natural resource to be used to protect or lessen the impact on new or renovated structures through the management of these resources. Utilization and implementation of the examples above will protect new and existing buildings and infrastructure.

Education and Awareness: These are actions to inform and educate citizens, elected officials and property owners about hazards and potential ways to mitigate them and may also include participation in national programs. Examples of these techniques include the following:

- Radio and television spots
- Websites with maps and information
- Real estate disclosure
- Provide information and training
- NFIP outreach
- StormReady
- Firewise Communities

The education and awareness technique will protect and reduce the impact of specific hazards on new and existing buildings through education of citizens and property owners on the impacts that specific hazards could have on new or renovated structures. This information will allow the owner to make appropriate changes or enhancements that will lessen or eliminate the impact of hazards.

Table 70 - Mitigation Strategy Technique Matrix provides a matrix identifying the mitigation techniques used for all low, moderate, and high-risk hazards in the county. The specific actions associated with these techniques are included in *Table 71 - 2021 Mitigation Action Plan*.

Table 70 - Mitigation Strategy Technique Matrix

Lawrence County Mitigation Strategy Technique Matrix				
HAZARD	**MITIGATION TECHNIQUE**			
	Local Plans and Regulations	**Structural and Infrastructure**	**Natural Systems Protection**	**Education and Awareness**
Drought	X		X	X
Earthquake	X			X
Landslides	X	X		X
Flooding, Flash Flood and Ice Jam	X	X	X	X
Invasive Species	X		X	X
Pandemic, Epidemic, Infectious Disease	X		X	X
Radon Exposure	X	X		X
Tornado/Wind Storm	X	X		X
Wildfires	X	X	X	X
Winter Storms	X	X		X
Hurricane/Tropical Storm	X	X		X
Hailstorm	X	X		X
Subsidence and Sinkholes	X			X
Levee/Dam Failure	X		X	X
Emergency Services	X			X

HAZARD	MITIGATION TECHNIQUE			
	Local Plans and Regulations	Structural and Infrastructure	Natural Systems Protection	Education and Awareness
Environmental Hazard: Hazardous Materials/Transportation	X	X		X
Opioid Epidemic	X			X
Terrorism	X			X
Transportation Accidents	X	X		X
Utility Interruptions	X	X		X

6.4. Mitigation Action Plan

The Lawrence County Hazard Mitigation Local Planning Team (LPT) immediately began work on the mitigation strategy section of the 2021 hazard mitigation plan (HMP) update after the risk assessment section was completed. The LPT started this section by reviewing the 2015 HMP mitigation strategy section. A review of the previous goals, objectives, actions and project opportunities documented in the 2015 HMP was conducted. The next step the LPT completed was the brainstorming of possible new actions based on new identified risks. The LPT compiled all this information for presentations to the municipalities.

MCM Consulting Group, Inc. completed municipality meetings at various time periods via conference calls due to COVID-19. During all these meetings, an overview of mitigation strategy was presented, and the municipalities were informed that they needed to have at least one hazard-related mitigation action for their municipality. All municipalities were invited to attend these meetings. Municipalities that were not able to join conference calls were contacted individually.

The municipalities were notified of draft mitigation actions and encouraged to provide new mitigation actions that could be incorporated into the plan. Municipalities were provided copies of their previously submitted mitigation opportunity forms and asked to determine if the projects were still valid. Municipalities were solicited for new project opportunities as well. All agendas, sign in sheets and other support information from these meetings is included in Appendix C.

Mitigation measures for the 2021 Lawrence County HMP are listed in the mitigation action plan. *Table 71 - 2021 Mitigation Action Plan* is the 2021 Lawrence County Mitigation Action Plan. This plan outlines mitigation actions and projects that comprise a strategy for Lawrence County. The action plan includes actions, a benefit and cost prioritization, a schedule for implementation, any funding sources to complete the action, a responsible agency or department and an estimated cost. All benefit and cost analysis were completed using the Pennsylvania Emergency Management Agency recommended analysis tool. The completed analysis is located in Appendix H. *Table 71 - 2021 Mitigation Action Plan* is a matrix that identifies the county and/or municipalities responsible for mitigation actions in the new mitigation action plan.

Table 71 - 2021 Mitigation Action Plan

Lawrence County 2021 Mitigation Action Plan									
Action Number	Mitigation Actions			Prioritization			Implementation		
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Local Champion
1.1.1	Planning and Regulations	Lawrence County and the municipalities will keep development away from vacant parcels in the floodplain.	Flooding		X		2021 - 2025	Local	Lawrence County LCDPCD
1.1.2	Education and Awareness	Lawrence County to arrange with PEMA/FEMA/DCED to hold training sessions with County and municipalities on the NFIP requirements.	Flooding		X		2021 - 2025	Local	Lawrence County DPS
1.2.1	Structure and Infrastructure	Clean and separate sewer systems and storm drains to alleviate flooding in the county.	Flooding		X		2021 - 2025	Local	Lawrence County Municipalities
1.2.2	Planning and Regulations	Use GIS to develop addresses for structures in flood plains and send educational brochures.	Flooding		X		2021 - 2025	Local	Lawrence County DPS/ LCDPCD
1.2.3	Education and Awareness	Conduct public outreach in reference to the spotted lantern fly via social media platforms.	Invasive Species		X		2021 - 2025	Local	Lawrence County Conservation District
1.2.4	Education and Awareness	Distribute "Until Help Arrives" program fliers to Lawrence County residents.	All-Hazards		X		2021 - 2025	Local	Lawrence County DPS
1.2.5	Planning and Regulations	Conduct a county-wide hazardous material commodity flow study.	Environmental Hazards		X		2021 - 2025	HMEP and LEPC	Lawrence County DPS
1.2.6	Planning and Regulations	Research recruitment and retention grants to assist first responders in Lawrence County.	Emergency Services		X		2021 - 2025	Local	Lawrence County DPS
1.3.1	Structure and Infrastructure	Designated Coordinate Centers will be created in each township and borough, and be supplied with generators, water, food, and supplies for post disaster recovery efforts.	All-Hazards		X		2021 - 2025	Local	LCDPCD
1.3.2	Planning and Regulations	Municipalities will develop evacuation plans for municipal buildings and sporting events.	All-Hazards		X		2021 - 2025	Local	Lawrence County Municipalities
1.3.3	Planning and Regulations	The county will continue to develop and maintain the Pandemic Emergency plan for all municipalities.	Pandemic and Infectious Disease		X		2021 - 2025	Local	Lawrence County DPS
1.3.4	Planning and Regulations	Lawrence County will collect and analyze dam inundation maps to determine which communities are at risk of a dam failure.	Dam Failure		X		2021 - 2025	EMPG	Lawrence County DPS
1.3.5	Planning and Regulations	Lawrence County will recommend ways to integrate the hazard mitigation plan with other municipal plans.	All-Hazards		X		2021 - 2025	Local	LCDPCD
1.4.1	Structure and Infrastructure	Lawrence County to determine agencies involved, databases needed, and investigate resources for a fusion center (currently in process through Region 13).	All-Hazards		X		2021 - 2025	EMPG	Lawrence County DPS
1.4.2	Planning and Regulations	Develop a strategy to complete regionalization of emergency management services, fire services, and law enforcement.	Emergency Services		X		2021 - 2025	Local	Lawrence County DPS
1.4.3	Planning and Regulations	Continue to participate in Region 13 meetings on current/existing hazards.	All-Hazards	X			2021 - 2025	Local	Lawrence County DPS
2.1.1	Planning and Regulations	Continue development of Continuity of Operations Plan in response to COVID-19.	Pandemic and Infectious Disease	X			2021 - 2025	Local	Lawrence County DPS
2.1.2	Planning and Regulations	Develop a pandemic plan in response to COVID-19.	Pandemic and Infectious Disease		X		2021 - 2025	Local	Lawrence County DPS
2.1.3	Planning and Regulations	Develop a distribution management plan that follows PEMA guidance.	All-Hazards	X			2021 - 2025	Local	Lawrence County DPS

Lawrence County 2021 Mitigation Action Plan									
Action Number	Mitigation Actions			Prioritization			Implementation		
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Local Champion
2.1.4	Education and Outreach	Identify training programs and seek funding that will assist first responders in Lawrence County.	All-Hazards		X		2021 - 2025	Local	Lawrence County DPS
2.2.1	Structure and Infrastructure	Acquire funding for public warning system and sirens for all critical facilities, municipalities, and educate households within the county.	All-Hazards			X	2021 - 2025	FMA/ PDM	Lawrence County DPS
2.2.2	Structure and Infrastructure	Install early warning flood gages upstream to notify emergency services.	Flooding			X	2021 - 2025	Local	Lawrence County DPS
2.3.1	Structure and Infrastructure	Create a council with local utility providers and county planners to locate aging infrastructure of utilities.	All-Hazards		X		2021 - 2025	EMPG /Local	Lawrence County Municipalities
2.3.2	Structure and Infrastructure	Replace/rehab again sewer lines or install lines where none exist.	Flooding		X		2021 - 2025	LOCAL/FMA/PDM	Lawrence County Municipalities
2.3.3	Structure and Infrastructure	Replace aging water lines.	All-Hazards		X		2021 - 2025	CDBG	Lawrence County Municipalities
2.3.4	Structure and Infrastructure	Cut trees away from power lines.	Transportation Accidents		X		2021 - 2025	Local/PDM	Lawrence County Municipalities
2.3.5	Planning and Regulations	Develop a database in existing GIS system of all utility networks, noting age and condition of infrastructure.	All-Hazards		X		2021 - 2025	Local	LCDPCD/ Lawrence County DPS
2.4.1	Planning and Regulations	Acquisition, relocation, demolition/reconstruction of properties located in the flood zone.	Flooding		X		2021 - 2025	HMGP	Lawrence County DPS
2.4.2	Structure and Infrastructure	Construct flood walls to decrease the risk to flooding.	Flooding		X		2021 - 2025	PDM/ HMGP	Lawrence County Municipalities
2.5.1	Structure and Infrastructure	Dredge waterways to decrease flooding.	Flooding		X		2021 - 2025	Local	Lawrence County Municipalities
2.5.2	Structure and Infrastructure	Conduct stream bank and stream bed restoration to decrease flooding.	Flooding		X		2021 - 2025	PDM/ FMA/ HMGP	LCDPCD
2.5.3	Planning and Regulations	Complete and maintain watershed conservation plans.	All-Hazards	X			2021 - 2025	PDM/ FMA/ HMGP	LCDPCD
2.6.1	Structure and Infrastructure	Increase the access points to various bodies of water to increase emergency services response and recovery capabilities.	All-Hazards		X		2021 - 2025	CDBG	Lawrence County Municipalities
2.6.2	Structure and Infrastructure	Install, maintain, and repair fire hydrants in local municipalities.	All-Hazards		X		2021 - 2025	Local	Lawrence County Municipalities
2.6.3	Structure and Infrastructure	Improve the emergency communication systems so they can withstand all hazards identified in the mitigation plan.	All-Hazards			X	2021 - 2025	Local	Lawrence County DPS
2.6.4	Planning and Regulations	Increase emergency planning capabilities as it pertains to missing persons and search and rescue in recreation areas.	Disorientation		X		2021 - 2025	EMPG	Lawrence County DPS/Lawrence County Municipalities
2.7.1	Planning and Regulations	Encourage adoption and enforcement of the Uniform Construction Code.	All-Hazards		X		2021 - 2025	Local	LCDPCD

Lawrence County 2021 Mitigation Action Plan									
Action Number	Mitigation Actions			Prioritization			Implementation		
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Local Champion
2.7.2	Structure and Infrastructure	Continue roadside stormwater drainage upgrades.	Flooding			**X**	2021 - 2025	FMA/ HMGP /CDBG	Lawrence County Municipalities
3.1.1	Planning and Regulations	Develop a database in existing GIS system of all-natural resource areas including maps to be used in future mitigation activities.	All-Hazards			**X**	2021 - 2025	Local	LCDPCD
3.1.2	Structure and Infrastructure	Collect more information on critical facilities so that future mitigation plan updates can distinguish vulnerability on building characteristics.	All-Hazards		**X**		2021 - 2025	Local	Lawrence County DPS and LCDPCD
3.1.3	Planning and Regulations	Improve municipal project status updating process.	All-Hazards		**X**		2021 - 2025	EMPG	Lawrence County DPS
3.1.4	Planning and Regulations	Use GIS to develop addresses for structures in flood plains and send educational brochures.	Flooding		**X**		2021 - 2025	Local	Lawrence County DPS and LCDPCD
4.1.1	Education and Outreach	Create a "how to" mitigation brochure for use at public events that would include information and pictures like that contained in FEMA's publications: Retrofitting for Homeowners Guide, Elevating Your Flood Prone Home, Elevating Residential Structures, and information on NFIP.	Flooding		**X**		2021 - 2025	PDM/ EMPG /local	Lawrence County DPS and LCDPCD
4.1.2	Education and Outreach	Provide Flood Insurance Rate Map (FIRM) information to people who inquire and publicize this service.	Flooding		**X**		2021 - 2025	PDM/ EMPG /FMA	Lawrence County DPS and LCDPCD
4.1.3	Education and Outreach	Educate municipalities about the Community Rating System.	All-Hazards		**X**		2021 - 2025	Local	Lawrence County DPS
4.2.1	Education and Outreach	Provide the local public libraries and public websites with all available resources, as well as a number of FEMA publications, and a final copy of Lawrence County Hazard Mitigation Plan to make all available informational resources readily accessible to the public.	All-Hazards		**X**		2021 - 2025	Local	Lawrence County DPS and LCDPCD
4.2.2	Education and Outreach	Create displays for children's programs that teach safety. Examples of information used would be similar to that on the FEMA for Kids CD or for Sparky Fire Safety Programs	All-Hazards	**X**			2021 - 2025	Local	Lawrence County DPS and LCDPCD
4.2.3	Education and Outreach	Develop and disseminate emergency guides on sheltering in place procedures.	All-Hazards		**X**		2021 - 2025	EMPG	Lawrence County DPS and LCDPCD
4.3.1	Education and Outreach	Target owners of properties within identified hazard areas for additional outreach regarding mitigation and disaster preparedness.	All-Hazards		**X**		2021 - 2025	EMPG	Lawrence County DPS and LCDPCD
4.3.2	Education and Awareness	Conduct outreach and educational programs to increase vigilance and potential impacts of invasive species of Lawrence County.	Invasive Species		**X**		2021 - 2025	EMPG	Lawrence County DPS and LCDPCD
4.3.3	Education and Awareness	Conduct a workshop to educate municipalities and residents on mitigation projects to reduce the impacts of radon.	Radon Exposure		**X**		2021 - 2025	EMPG	Lawrence County DPS and LCDPCD

Funding acronym definitions:

FMA: Flood Mitigation Assistance Grant Program, administered by the Federal Emergency Management Agency

HMGP: Hazard Mitigation Grant Program, administered by the Federal Emergency Management Agency

PDM: Pre-Disaster Mitigation Grant, administered by the Federal Emergency Management Agency

EMPG: Emergency Management Performance Grant, administered by the Federal Emergency Management Agency

HSGP: Homeland Security Grant Program, administered by the Federal Emergency Management Agency

HMEP: Hazardous Material Emergency Planning Grant, administered by the Pennsylvania Emergency Management Agency

HMRF: Hazardous Material Response Fund, administered by the Pennsylvania Emergency Management Agency

HMERP: Hazard Mitigation Emergency Response Program by the Pennsylvania Emergency Management Agency

HHPD: High-hazard potential dam by the Federal Emergency Management Agency

Table 72 - Municipal Hazard Mitigation Actions Checklist

Municipal Hazard Mitigation Actions Checklist										
Municipality	**1.1.1**	**1.1.2**	**1.2.1**	**1.2.2**	**1.2.3**	**1.2.4**	**1.2.5**	**1.3.1**	**1.3.2**	**1.3.3**
City of New Castle	X	X	X					X	X	
Bessemer Borough	X	X	X					X	X	
Ellport Borough	X	X	X					X	X	
Ellwood City Borough	X	X	X					X	X	
Enon Valley Borough	X	X	X					X	X	
Hickory Township	X	X	X					X	X	
Little Beaver Township	X	X	X					X	X	
Mahoning Township	X	X	X					X	X	
Neshannock Township	X	X	X					X	X	
New Beaver Borough	X	X	X					X	X	
New Wilmington Borough	X	X	X					X	X	
North Beaver Township	X	X	X					X	X	
Perry Township	X	X	X					X	X	
Plain Grove Township	X	X	X					X	X	
Pulaski Township	X	X	X					X	X	
Scott Township	X	X	X					X	X	
Shenango Township	X	X	X					X	X	

Municipal Hazard Mitigation Actions Checklist										
Municipality	**1.1.1**	**1.1.2**	**1.2.1**	**1.2.2**	**1.2.3**	**1.2.4**	**1.2.5**	**1.3.1**	**1.3.2**	**1.3.3**
Slippery Rock Township	X	X	X					X	X	
S.N.P.J Borough	X	X	X					X	X	
South New Castle Borough	X	X	X					X	X	
Taylor Township	X	X	X					X	X	
Union Township	X	X	X					X	X	
Volant Borough	X	X	X					X	X	
Wampum Borough	X	X	X					X	X	
Washington Township	X	X	X					X	X	
Wayne Township	X	X	X					X	X	
Wilmington Township	X	X	X					X	X	
Lawrence County	X	X	X	X	X	X	X			X

Municipal Hazard Mitigation Actions Checklist										
Municipality	**1.3.4**	**1.3.5**	**1.4.1**	**1.4.2**	**1.4.3**	**2.1.1**	**2.1.2**	**2.1.3**	**2.2.1**	**2.2.2**
City of New Castle				X					X	X
Bessemer Borough				X					X	X
Ellport Borough				X					X	X
Ellwood City Borough				X					X	X
Enon Valley Borough				X					X	X
Hickory Township				X					X	X
Little Beaver Township				X					X	X
Mahoning Township				X					X	X
Neshannock Township				X					X	X
New Beaver Borough				X					X	X
New Wilmington Borough				X					X	X
North Beaver Township				X					X	X
Perry Township				X					X	X
Plain Grove Township				X					X	X
Pulaski Township				X					X	X
Scott Township				X					X	X
Shenango Township				X					X	X
Slippery Rock Township				X					X	X
S.N.P.J Borough				X					X	X
South New Castle Borough				X					X	X
Taylor Township				X					X	X
Union Township				X					X	X

Municipal Hazard Mitigation Actions Checklist										
Municipality	**1.3.4**	**1.3.5**	**1.4.1**	**1.4.2**	**1.4.3**	**2.1.1**	**2.1.2**	**2.1.3**	**2.2.1**	**2.2.2**
Volant Borough				X					X	X
Wampum Borough				X					X	X
Washington Township				X					X	X
Wayne Township				X					X	X
Wilmington Township				X					X	X
Lawrence County	X	X	X	X	X	X	X	X	X	X

Municipal Hazard Mitigation Actions Checklist										
Municipality	**2.3.1**	**2.3.2**	**2.3.3**	**2.3.4**	**2.3.5**	**2.4.1**	**2.4.2**	**2.5.1**	**2.5.2**	**2.5.3**
City of New Castle	X	X	X	X		X	X	X	X	X
Bessemer Borough	X	X	X	X		X	X	X	X	X
Ellport Borough	X	X	X	X		X	X	X	X	X
Ellwood City Borough	X	X	X	X		X	X	X	X	X
Enon Valley Borough	X	X	X	X		X	X	X	X	X
Hickory Township	X	X	X	X		X	X	X	X	X
Little Beaver Township	X	X	X	X		X	X	X	X	X
Mahoning Township	X	X	X	X		X	X	X	X	X
Neshannock Township	X	X	X	X		X	X	X	X	X
New Beaver Borough	X	X	X	X		X	X	X	X	X
New Wilmington Borough	X	X	X	X		X	X	X	X	X
North Beaver Township	X	X	X	X		X	X	X	X	X
Perry Township	X	X	X	X		X	X	X	X	X
Plain Grove Township	X	X	X	X		X	X	X	X	X
Pulaski Township	X	X	X	X		X	X	X	X	X
Scott Township	X	X	X	X		X	X	X	X	X
Shenango Township	X	X	X	X		X	X	X	X	X
Slippery Rock Township	X	X	X	X		X	X	X	X	X
S.N.P.J Borough	X	X	X	X		X	X	X	X	X
South New Castle Borough	X	X	X	X		X	X	X	X	X
Taylor Township	X	X	X	X		X	X	X	X	X
Union Township	X	X	X	X		X	X	X	X	X
Volant Borough	X	X	X	X		X	X	X	X	X
Wampum Borough	X	X	X	X		X	X	X	X	X
Washington Township	X	X	X	X		X	X	X	X	X
Wayne Township	X	X	X	X		X	X	X	X	X
Wilmington Township	X	X	X	X		X	X	X	X	X

Municipal Hazard Mitigation Actions Checklist										
Municipality	**2.3.1**	**2.3.2**	**2.3.3**	**2.3.4**	**2.3.5**	**2.4.1**	**2.4.2**	**2.5.1**	**2.5.2**	**2.5.3**
Lawrence County	X	X	X	X	X	X	X	X	X	X

Municipal Hazard Mitigation Actions Checklist										
Municipality	**2.6.1**	**2.6.2**	**2.6.3**	**2.6.4**	**2.7.1**	**2.7.2**	**3.1.1**	**3.1.2**	**3.1.3**	**3.1.4**
City of New Castle	X	X				X			X	
Bessemer Borough	X	X				X			X	
Ellport Borough	X	X				X			X	
Ellwood City Borough	X	X				X			X	
Enon Valley Borough	X	X				X			X	
Hickory Township	X	X				X			X	
Little Beaver Township	X	X				X			X	
Mahoning Township	X	X				X			X	
Neshannock Township	X	X				X			X	
New Beaver Borough	X	X				X			X	
New Wilmington Borough	X	X				X			X	
North Beaver Township	X	X				X			X	
Perry Township	X	X				X			X	
Plain Grove Township	X	X				X			X	
Pulaski Township	X	X				X			X	
Scott Township	X	X				X			X	
Shenango Township	X	X				X			X	
Slippery Rock Township	X	X				X			X	
S.N.P.J Borough	X	X				X			X	
South New Castle Borough	X	X				X			X	
Taylor Township	X	X				X			X	
Union Township	X	X				X			X	
Volant Borough	X	X				X			X	
Wampum Borough	X	X				X			X	
Washington Township	X	X				X			X	
Wayne Township	X	X				X			X	
Wilmington Township	X	X				X			X	
Lawrence County	X	X	X	X	X	X	X	X	X	X

Municipal Hazard Mitigation Actions Checklist										
Municipality	**4.1.1**	**4.1.2**	**4.1.3**	**4.2.1**	**4.2.2**	**4.2.3**	**4.3.1**	**4.3.2**	**4.3.3**	
City of New Castle	X	X		X	X	X	X	X	X	
Bessemer Borough	X	X		X	X	X	X	X	X	
Ellport Borough	X	X		X	X	X	X	X	X	
Ellwood City Borough	X	X		X	X	X	X	X	X	
Enon Valley Borough	X	X		X	X	X	X	X	X	
Hickory Township	X	X		X	X	X	X	X	X	
Little Beaver Township	X	X		X	X	X	X	X	X	
Mahoning Township	X	X		X	X	X	X	X	X	
Neshannock Township	X	X		X	X	X	X	X	X	
New Beaver Borough	X	X		X	X	X	X	X	X	
New Wilmington Borough	X	X		X	X	X	X	X	X	
North Beaver Township	X	X		X	X	X	X	X	X	
Perry Township	X	X		X	X	X	X	X	X	
Plain Grove Township	X	X		X	X	X	X	X	X	
Pulaski Township	X	X		X	X	X	X	X	X	
Scott Township	X	X		X	X	X	X	X	X	
Shenango Township	X	X		X	X	X	X	X	X	
Slippery Rock Township	X	X		X	X	X	X	X	X	
S.N.P.J Borough	X	X		X	X	X	X	X	X	
South New Castle Borough	X	X		X	X	X	X	X	X	
Taylor Township	X	X		X	X	X	X	X	X	
Union Township	X	X		X	X	X	X	X	X	
Volant Borough	X	X		X	X	X	X	X	X	
Wampum Borough	X	X		X	X	X	X	X	X	
Washington Township	X	X		X	X	X	X	X	X	
Wayne Township	X	X		X	X	X	X	X	X	
Wilmington Township	X	X		X	X	X	X	X	X	
Lawrence County	X	X	X	X	X	X	X	X	X	

7. Plan Maintenance

7.1. Update Process Summary

Monitoring, evaluating, and updating this plan, is critical to maintaining its value and success in Lawrence County's hazard mitigation efforts. Ensuring effective implementation of mitigation activities paves the way for continued momentum in the planning process and gives direction for the future. This section explains who will be responsible for maintenance activities and what those responsibilities entail. It also provides a methodology and schedule of maintenance activities including a description of how the public will be involved on a continued basis. The Lawrence County HMP Local Planning Team decided to alter the current maintenance procedures. The 2021 HMP update establishes a review of the plan within thirty days of a disaster event in addition to continuing with an annual plan evaluation. This HMP update also defines the municipalities' role in updating and evaluating the plan. Finally, the 2021 HMP update encourages continued public involvement and how this plan may be integrated into other planning mechanisms in the county.

7.2. Monitoring, Evaluating and Updating the Plan

Hazard mitigation planning in Lawrence County is a responsibility of all levels of government (i.e., county and local), as well as the citizens of the county. The Lawrence County Local Planning Team will be responsible for maintaining this multi-jurisdictional HMP. The local planning team will meet annually and following each emergency declaration to review the plan. Every municipality that has adopted this plan will also be afforded the opportunity to provide updated information or information specific to hazards encountered during an emergency or disaster. Each review process will ensure that the hazard vulnerability data and risk analysis reflect current conditions of the county, that the capabilities assessment accurately reflects local circumstances and that the hazard mitigation strategies are updated based on the county's damage assessment reports and local mitigation project priorities. The HMP must be updated on a five-year cycle. An updated HMP must be completed and approved by the end of the five-year period. The monitoring, evaluating, and updating of the plan every five years will rely heavily on the outcomes of the annual HMP planning team meetings.

The Lawrence County Local Planning Team will complete a hazard mitigation progress report to evaluate the status and accuracy of the multi-jurisdictional HMP and record the local planning team's review process. The following items will be completed during the annual review and reporting process:

- Review the risk assessment section and identify occurrences of hazards within the last year. Identify date, time, damage, fatalities and other specific information of the events. Also identify any new hazards that have occurred or increased risk within the county.
- Complete a review and update of capability assessment section. Identify any capability weaknesses.
- Complete a review of the mitigation strategy section. Review the goals and objectives identified in the 2021 HMP and determine if any updates are needed. Provide all mitigation actions and opportunities to the county and municipalities that are applicable. Have all entities complete an action review matrix and document all results in the report. Also, add any new actions that are identified.

Complete a review of each mitigation opportunity and identify the status of each opportunity on the opportunity review spreadsheet. All information will be included in the annual review report.

The Lawrence County Department of Public Safety will maintain a copy of these records and place them in Appendix I of this plan. Lawrence County will continue to work with all municipalities regarding hazard mitigation projects, especially those municipalities that did not submit projects for inclusion in this plan.

7.3. Continued Public Involvement

The Lawrence County Department of Public Safety will ensure that the 2021 Lawrence County Hazard Mitigation Plan is posted and maintained on the Lawrence County website and will continue to encourage public review and comment on the plan. The Lawrence County website that the plan will be located at is as follows: www.co.Lawrence.pa.us/

The public will have access to the 2021 HMP through their local municipal office, the Lawrence County Department of Planning & Community Development, or the Lawrence County Department of Public Safety. Information on upcoming events related to the HMP or solicitation for comments will be announced via newsletters, newspapers, mailings, and the county website.

The citizens of Lawrence County are encouraged to submit their comments to elected officials and/or members of the Lawrence County HMP Local Planning Team. To promote public participation, the Lawrence County Local Planning Team will post a public comment form as well as the Hazard Mitigation Project Opportunity Form on the county's website. These forms will offer the public various opportunities to supply their comments and observations. All comments received will be maintained and considered by the Lawrence County Hazard Mitigation Planning Team.

8. Plan Adoption

8.1. Resolutions

In accordance with federal and state requirements, the governing bodies of each participating jurisdiction must review and adopt by resolution, the 2021 Lawrence County Hazard Mitigation Plan. Copies of the adopting resolutions are included in this plan in Appendix J. FEMA Region III in Philadelphia is the final approval authority for the Hazard Mitigation Plan. PEMA also reviews the plan before submission to FEMA.

9. Appendices

APPENDIX A: References
APPENDIX B: FEMA Local Mitigation Review Tool
APPENDIX C: Meetings and Support Documents
APPENDIX D: Municipal Flood Maps
APPENDIX E: Critical and Special Needs Facilities
APPENDIX F: 2020 HAZUS Reports
APPENDIX G: 2021 Mitigation Project Opportunities
APPENDIX H: 2021 Mitigation Action Evaluation & Prioritization
APPENDIX I: Annual Review Documentation
APPENDIX J: Lawrence County & Municipal Adoption Resolutions