Juniata County 2020 Hazard Mitigation Plan

Juniata County Department of Emergency Service

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.***

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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 disasters 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 2015, Juniata County EMA contracted the services of a consulting agency to revise and update the Juniata County Hazard Mitigation Plan. The plan was successfully updated in accordance with the requirements set forth by PEMA and FEMA. The updated Juniata County Hazard Mitigation Plan was adopted by the Juniata County Commissioners in 2015. All seventeen municipalities adopted the 2015 Juniata County Hazard Mitigation Plan as the municipal hazard mitigation plan.

The Juniata County Commissioners secured a grant to complete the 2020 update to the Juniata 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 January 17, 2019.

The planning process for the 2020 Juniata 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. Public meetings were also conducted to provide residents an opportunity to provide input on the HMP. Additionally, a community preparedness survey was dispersed to all members of the community. In total, four surveys were collected and analyzed. The following hazards were identified by the local planning team as presenting the highest risk to the county and its municipalities:

- Emergency Services

- Cyber Security
- Opioid Epidemic
- Pandemic & Epidemic
- Transportation Accidents
- Invasive Species
- Flash Flood
- Drought
- Infectious Disease
- Flood
- Winter Storm
- Dam Failure
- Environmental Hazards – Hazardous Materials
- Terrorism (Agroterrorism)
- Radon Exposure
- Earthquake
- Tornado/Windstorm
- Utility Interruption
- Wildfire
- Ice Jam
- Civil Disturbance

There are a total of eighteen hazards identified in the 2020 Juniata County Hazard Mitigation Plan Update. There were a total of thirteen identified hazards listed in the previous plan update, which took place in 2015. New hazards identified in this plan include emergency services, cyber security, opioid epidemic, invasive species, flash flood, infectious disease, earthquake and ice jam.

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

- Strengthen county and local capabilities to reduce the potential impacts to existing and future public/partner assets, including structures, critical facilities, and technological infrastructure.
- Increase intergovernmental cooperation and build public-private partnerships to implement activities that will reduce the impact of natural, human-caused, and technological hazards.
- Enhance planning and emergency response efforts among state, county, and local emergency management personnel to protect health and safety.
- Maintain and exercise Juniata County's spatial informational resources to strengthen public and private hazard mitigation planning and decision support capabilities.
- Increase public awareness about both the potential impacts of all hazards and mitigation activities.

Mitigation actions are specific projects and activities that help achieve goals. A total of forty-eight actions were developed for this plan update as they pertain to hazards identified by the local planning team. The 2015 Juniata County Hazard Mitigation Plan consisted of forty-six total actions. A total of ten actions were removed from the previous plan update and twelve actions were new for this plan update. The individual objectives and actions that will be implemented are shown in Section 6.4. Each municipality was given the chance submit new project opportunity forms of for this update. A total of three project opportunities were submitted for the 2015 update of which have all been completed. Nineteen project opportunities were submitted for the 2020 update.

The 2020 Juniata County Hazard Mitigation Plan Update is the cornerstone to reducing Juniata 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 hazard mitigation plan is a living document that reflects ongoing hazard mitigation activities and requires monitoring, evaluating, and updating to ensure the mitigations actions are implemented. To facilitate the hazard mitigation planning process and adhere to regulatory requirements, the plan will be reviewed on an annual basis and any major revisions will be incorporated into the five-year update.

1. Introduction

1.1. Background

The Juniata 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 Juniata County and all its seventeen municipalities. The Juniata County Office of Planning and Community Development was charged by the County Board of Commissioners to prepare the 2020 plan. The 2015 HMP has been utilized and maintained during the 5-year life cycle.

The Juniata 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 Juniata County as a sub-grantee. The Juniata County Commissioners assigned the Juniata County Office of Planning and Community Development 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 Juniata County. This updated HMP will provide another solid foundation for the Juniata 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 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 2020 Juniata Hazard Mitigation Plan Update is:

- To protect life, safety and property by reducing the potential for future damages and economic losses that result from natural hazards;
- To qualify for additional grant funding, in both the pre-disaster and the post-disaster environment;
- To speed recovery and redevelopment following future disaster events;
- To demonstrate a firm local commitment to hazard mitigation principles; and
- To comply with both state and federal legislative requirements for local hazard mitigation plans.

1.3. Scope

This 2020 Juniata County Multi-Jurisdictional Hazard Mitigation Plan serves as a framework for saving lives, protecting assets and preserving the economic viability of the seventeen municipalities in Juniata County. The HMP outlines actions designed to address and reduce the impact of a full range of natural hazards facing Juniata County, including drought, earthquakes, flooding, tornados, 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 Juniata 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

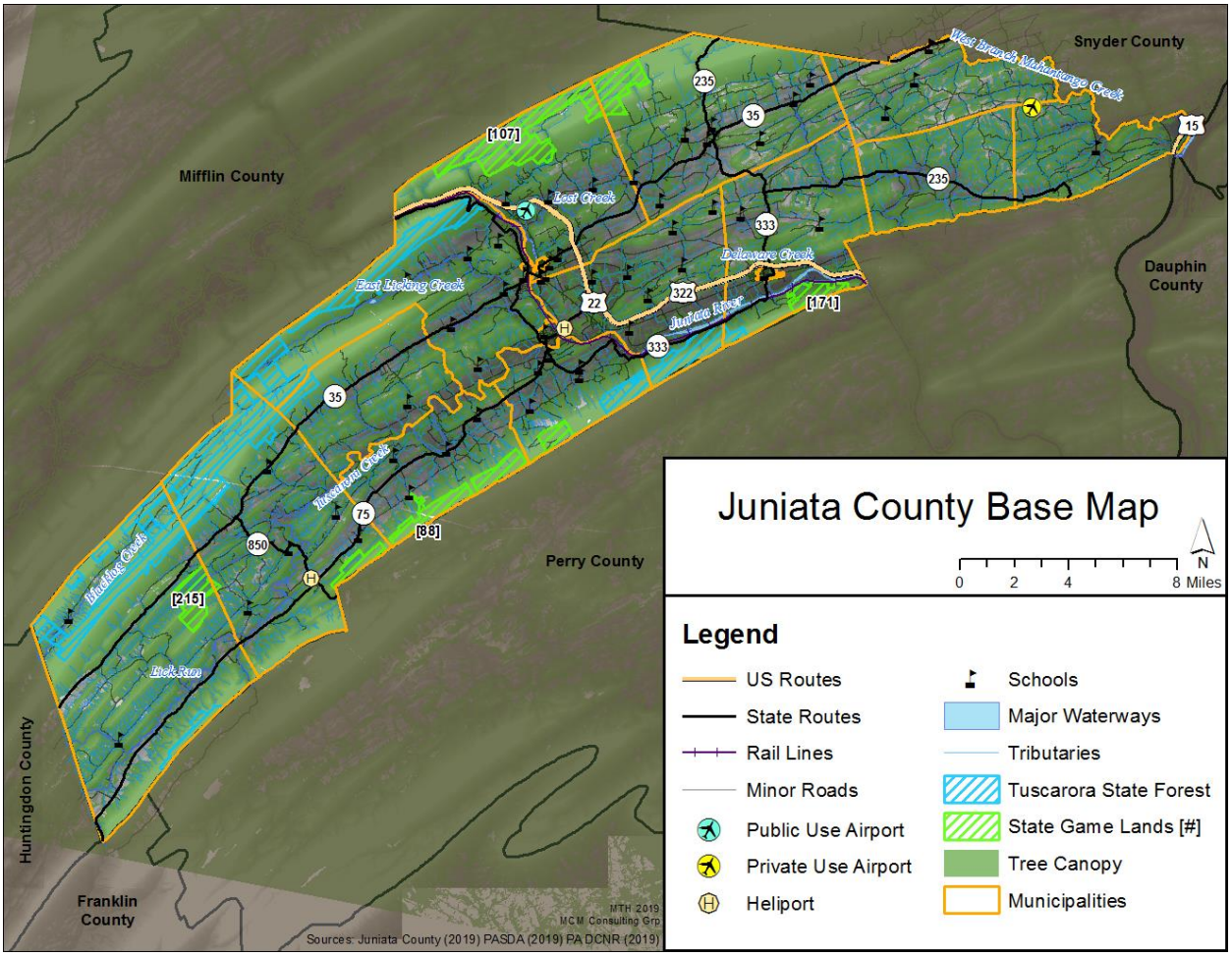
2. Community Profile

2.1. Geography and Environment

Situated in north-central Pennsylvania, Juniata County consists of a scenic landscape characterized by steep slopes, deep river valleys, and abundant forestland. The county also lies within the Susquehanna River Basin, one of four major drainage basins in Pennsylvania. Many of the fertile valleys along the river and its local tributary streams were settled long before land use controls and floodplain regulations were in place.

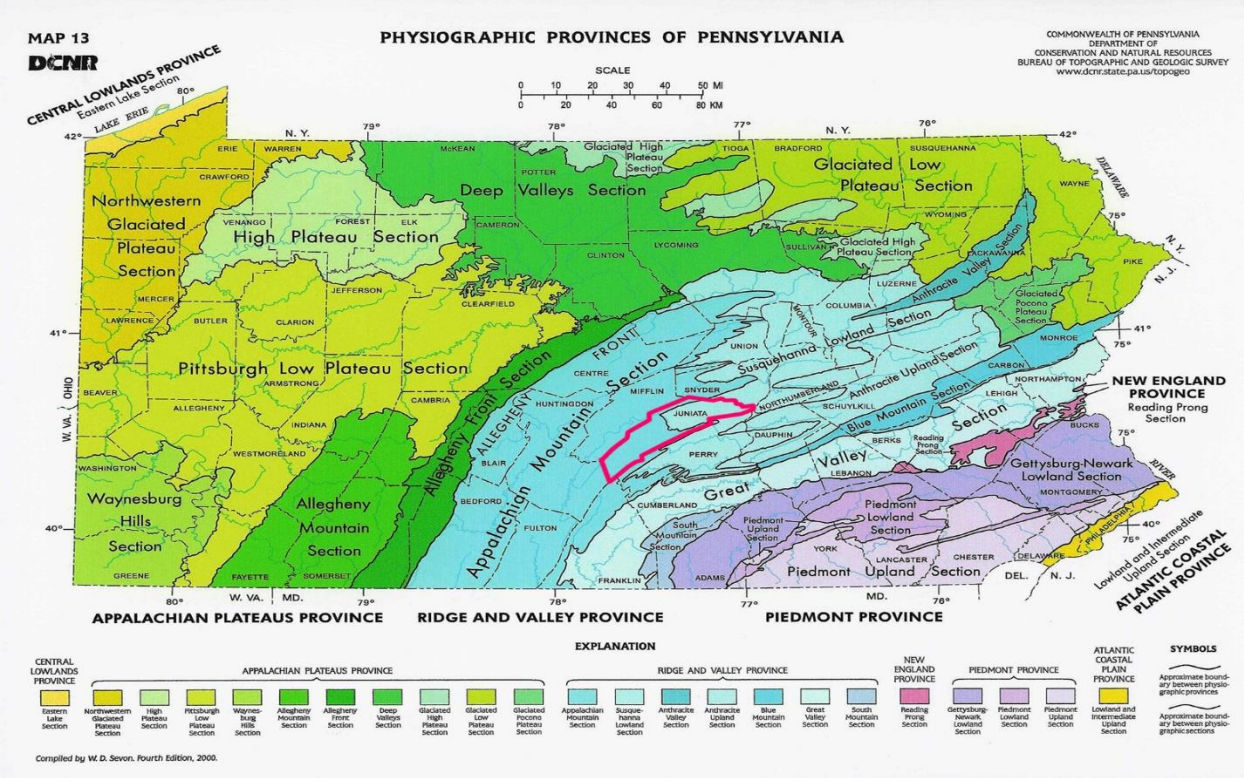
Located in the center of the Commonwealth of Pennsylvania, Juniata County encompasses approximately 392 square miles. Counties boarding Juniata County are Snyder County to the northeast, Mifflin County to the northwest, Northumberland County to the east, Huntingdon County to the west, Perry County to the southeast, and to the south by Franklin County.

Figure 1 - Juniata County Base Map



Juniata County is located within the Appalachian Mountain Section and the Susquehanna Lowland Section of the Ridge and Valley Province, as shown in *Figure 2 - Physiographic Provinces of Pennsylvania*. Juniata County has an elevation range from 295 feet to 1,811 feet above sea level. Juniata County's topography consists of flat areas and hills, with mountains along many of the county's borders. Slopes throughout the county have grades of 15 to 25 percent or more.

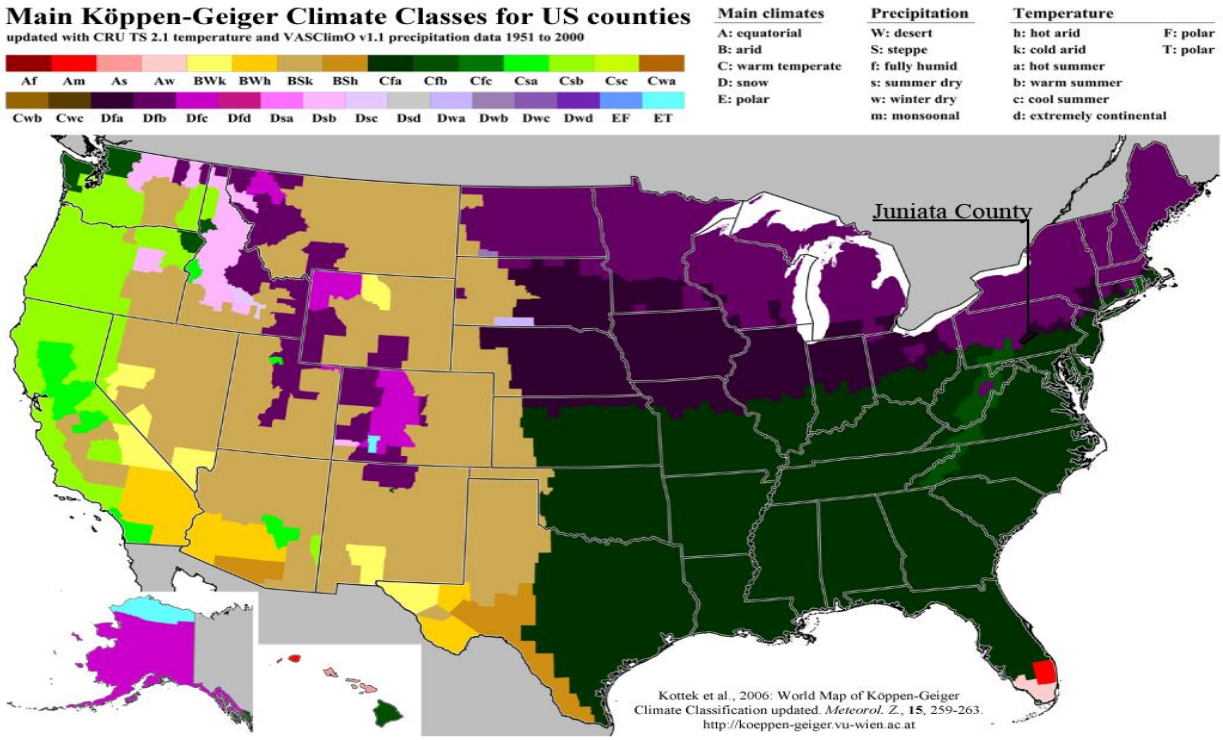
Figure 2 - Physiographic Provinces of Pennsylvania



Approximately one-third of the fifty-one different soil types found in Juniata County are prime farmland.

The Köppen-Geiger system chart classifies Pennsylvania (to include Juniata County) as a continental/micro-thermal climate; with a scheme of warm summer continental climate. Juniata County is located within the humid continental climatic region. *Figure 3 - Pennsylvania Map of Köppen Climate Classification* shows the Pennsylvania map of Köppen climate classification. The weather extremes in Juniata County are primary contributors to many of the natural hazard events within the county; to include flash floods, hurricanes and tropical storms, winter storms, tornadoes, drought, extreme temperatures, and high wind.

Figure 3 - Pennsylvania Map of Köppen Climate Classification



Summers in Juniata County are warm with maximum temperatures reaching in the 80's during the day and lows in the upper 50's in the evenings. Also, it is not uncommon to have several days of temperatures in the 90's. Winter daily maximum temperatures average in the upper 30's, however, Pennsylvania can be affected by a Polar Vortex, with temperatures dropping in the 10's to below 0 for days at a time. Adding in wind chill, this extreme drop in temperatures can be hazardous for humans, animals, and utilities. (All temperatures represent degrees Fahrenheit.)

Weather always plays a large part in disaster response, requiring emergency planning to account for all weather variations, regardless of the event.

2.2. Community Facts

Juniata County, located in the north-central region of Pennsylvania, is primarily a rural county, rich with natural resources. The county generally lies between the Appalachian Mountain ranges of Shade Mountain and Tuscarora Mountain.

Juniata County was created on March 2, 1831, and was taken from a part of Mifflin County, receiving its name from the Juniata River. This river is a tributary of the Susquehanna River and runs ninety miles through central Pennsylvania. The Juniata River runs through the center of Juniata County from east to west, and is the largest tributary of the Susquehanna River, thus playing a key role in the settlement of the area. The "blue waters" of the Juniata brought early settlers to this region. This river formed an early eighteenth-century region in Pennsylvania, and in the nineteenth century, became

a part of the canal system. Mifflintown is set just off the Juniata River, in the heart of Juniata County, and serves as the county seat.

Today, Juniata County is known for its outdoor recreation, including fishing, seasonal small game hunting, swimming, and boating, along with numerous other activities. Juniata County is also home to the Pomeroy-Academia Covered Bridge, which at 278 feet, is the longest remaining covered bridge in Pennsylvania. Built in 1902, this single-lane, double-span bridge crosses Tuscarora Creek and is located between Spruce Hill and Beale Townships, in Juniata County. The bridge was reconstructed as part of a $1,081,000 project in 2009, conducted by the Juniata County Historical Society. The Pomeroy-Academia Covered Bridge is listed on the National Register of Historic Places.

2.3. Places, Populations and Demographics

Population and demographic information provide baseline data about residents. Changes in demographics or populations may be used to identify higher-risk populations. Maintaining up-to-date data on demographics will allow the county to better assess magnitudes of hazards and develop more specific mitigation plans. Provided below is baseline demographic information for Juniata County.

Table 1 - Baseline Demographic Information

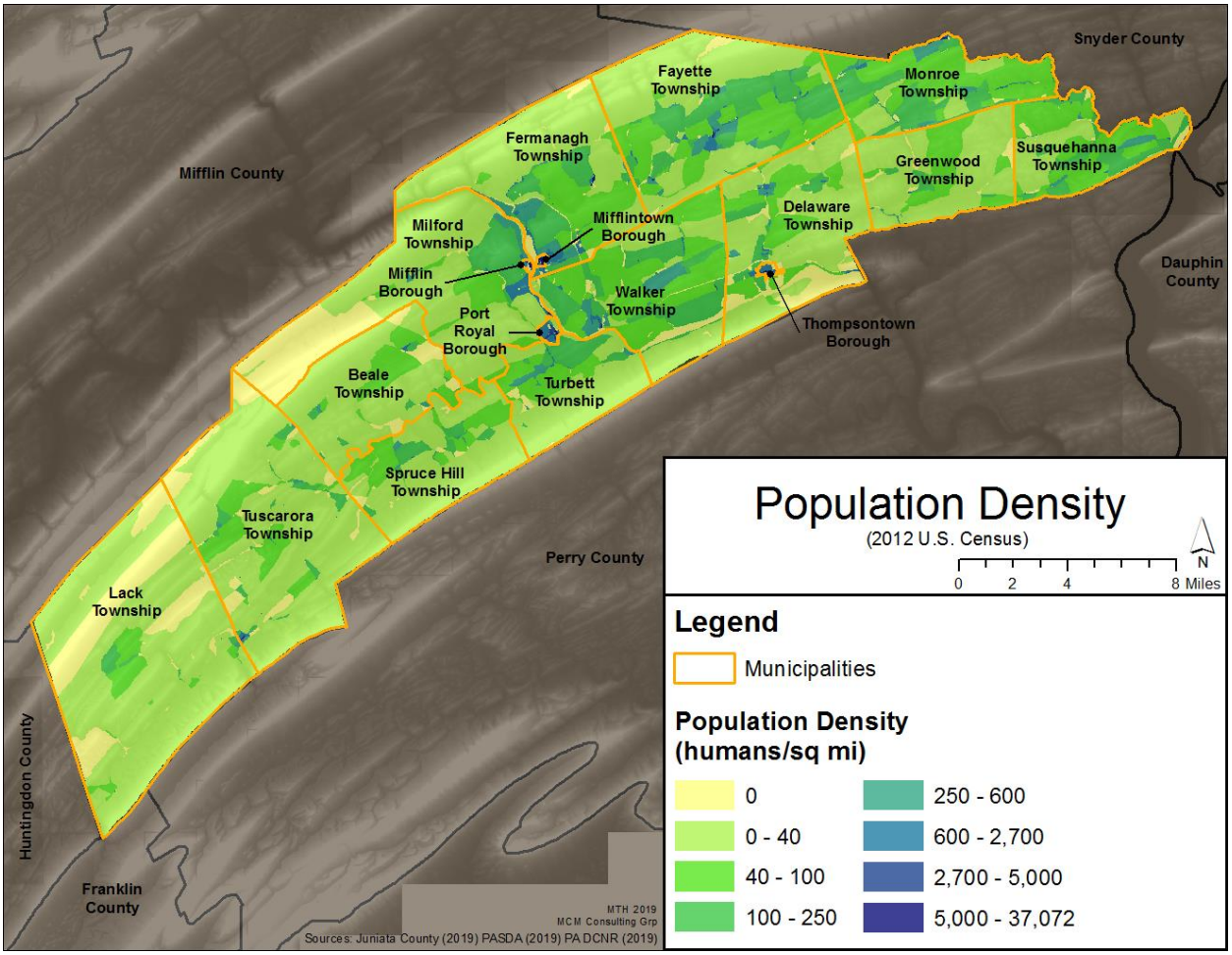
Baseline Demographic Information for Juniata County		
Demographics	**2010 Census**	**2017 Estimates**
Total population	24,636	24,514
Male	50.1%	12,306 (50.2%)
Female	49.9%	12,208 (49.8%)
Median age (years)	40.9	Unavailable
Under 5-years	1,492 *(6.1%)*	1,348 (5.5%)
18 years and over	18,659 *(76.1%)*	19,047 (77.7%)
65-years and over	4,059 *(16.6%)*	4,853 (19.8%)

Source: U.S. Census Bureau, 2010; and population estimates July 1, 2017

Based on figures from the 2010 Census, Juniata County had a population of 24,636 persons, with an estimated 24,514 for 2017. This results in a population density of sixty-three persons per square mile, which is substantially lower than the Pennsylvania statewide average of 283.9 persons per square mile (according to the Center for Rural Pennsylvania, county profile, available online. The population number from the 2010 Census is available at the municipal level and illustrates that the most highly populated municipality in Juniata County is Fayette Township (3,478 persons), with Fermanagh Township (2,811), Walker Township (2,738), Monroe Township (2,237), and Milford

Township (2,088) being the most highly populated of the remaining municipalities in the county.

Figure 4 - Juniata County Population Density



A low population density means people are spread throughout the county rather than clustered in groups. Dispersing information, instructions, and resources in a low-density area is more difficult than in a more densely populated area because individuals are not centralized.

However, a low population density also helps prevent hazards from affecting as many people. For example, diseases may not spread as quickly because there is less contact among people. Similarly, fires are less likely to spread to other structures because of the large distances between them. The magnitude of an event is typically smaller in a less populated area because each event affects fewer people and properties.

The population in the county is aging. The median age in 2015 for Juniata County was 43.2 years; in 2010 the median age was 40.9. Over twenty percent of Juniata County's population is 65-years of age or older. These residents may have access and functional

needs. For example, many may be unable to drive; therefore, special evacuation plans may need to be created for them. They may also have hearing or vision impairments that could make receiving emergency instructions difficult. Both older and younger populations have higher risks for contracting certain diseases. The county's combined populations who are under 5-years of age and over 65-years of age represent approximately twenty-two percent of its total population.

According to the U.S. Census Bureau, people with disabilities in Juniata County include:

- 5.1% hearing difficulty
- 3.0% vision difficulty
- 5.3% cognitive difficulty
- 8.0% ambulatory difficulty
- 3.7% self-care difficulty
- 6.9% independent living difficulty

The table below provides population estimates for each municipality in Juniata County and in the county. Between 2000 and 2010, the county gained eight percent of its population. Expectations are for the population to gradually increase and by the year 2030, it's estimated that the entire county will have a population of approximately 28,600, which is about twenty-five percent higher than the 2000 Census population totals. This means that Juniata County will gain approximately 197 people annually from 2010 to 2030. Many municipalities are expecting to deal with a population increase as well. It is important that the county properly maintains its existing infrastructure and has plans to manage or redevelop vacant properties to ensure adequate housing and facilities for the expected increase in population.

Table 2 - Population by Municipality

Juniata County Population by Municipality						
Municipality Name	**2000 Census**	**2010 Census**	**Population Change 2000-2010**	**2020 Projection***	**2030 Projection***	**Projected Population Change 2000-2030**
Beale Township	726	830	14.3%	930	1,032	42.1%
Delaware Township	1,464	1,547	5.7%	1,596	1,665	13.7%
Fayette Township	3,252	3,478	6.9%	3,718	3,950	21.5%
Fermanagh Township	2,544	2,811	10.5%	3,094	3,368	32.4%
Greenwood Township	548	617	12.6%	678	744	35.8%
Lack Township	750	785	4.7%	821	856	14.1%
Mifflin Borough	627	642	2.4%	630	633	1.0%

Juniata County Population by Municipality						
Municipality Name	**2000 Census**	**2010 Census**	**Population Change 2000-2010**	**2020 Projection***	**2030 Projection***	**Projected Population Change 2000-2030**
Mifflintown Borough	861	936	8.7%	965	1,021	18.6%
Milford Township	1,758	2,088	18.8%	2,417	2,747	56.3%
Monroe Township	2,042	2,237	9.5%	2,459	2,665	30.5%
Port Royal Borough	977	925	-5.3%	983	979	0.2%
Spruce Hill Township	724	834	15.2%	898	989	36.6%
Susquehanna Township	1,261	1,250	-0.9%	1,382	1,432	13.6%
Thompsontown Borough	711	697	-2.0%	765	786	10.5%
Turbett Township	819	981	19.8%	1,073	1,205	47.1%
Tuscarora Township	1,159	1,240	7.0%	1,309	1,385	19.5%
Walker Township	2,598	2,738	5.4%	2,951	3,122	20.2%
JUNIATA COUNTY	**22,821**	**24,636**	**8.0%**	**26,669**	**28,579**	**25.2%**

Source: U.S. Census Bureau, 2000 Census/2010 Census

Table 3 - Race and Ethnicity in Juniata County

Race and Ethnicity in Juniata County		
Race and Ethnicity	**2010**	**2017 estimated**
One race	98.9%	N/A
White	97.5%	97.2%
Black or African American	0.5%	0.9%
American Indian and Alaska Native	0.2%	0.3%
Asian or Pacific Islander	0.4%	0.5%
Some other race	0.3%	N/A
Two or more races	1.1%	1.1%
Foreign born	2.0%	2.1%
Speak a language other than English	3.0%	9.7%
Hispanic or Latino	2.5%	3.6%

Source: U.S. Census Bureau, 2010; 2017 estimates

Just under ten percent of Juniata County's population of persons age 5-years plus speaks a language other than English at home. Languages other than English spoken in Juniata homes are Spanish and Asian and Pacific Islander. Hazard mitigation strategies will need to address language barriers to ensure that all residents can receive emergency instructions.

Table 4 - Housing Characteristics

Housing Characteristics in Juniata County		
Housing Characteristics	**2011 Estimates**	**2017 Estimates**
Total housing units	10,999	11,183
Owner-occupied housing units	7,043	8,465
Renter-occupied housing units	2,060	2,718
Vacant housing units	1,896	1,822
Median value (dollars)	135,900	$143,600

Source: U.S. Census Bureau, 2010; 2017 estimates

Juniata County has over 11,000 residential properties. These properties may be vulnerable to various natural hazards, particularly flooding and windstorms. Damage to residential properties is not only expensive to repair or rebuild, but also devastating to the displaced family.

Approximately sixteen percent of the county's residential properties are vacant. Vacant buildings are particularly vulnerable to arson and criminal activity. In many cases, vacant properties have not been maintained.

Rented housing units in Juniata County account for approximately twenty-four percent of all housing units. Renters are more transient than homeowners; therefore, communicating with renters may be more difficult than communicating with homeowners. According to the U.S. Census there are approximately 68.6 percent of households in Juniata County that have broadband Internet. Similarly, tourists would be a harder population to communicate with during an emergency event. Development of communication strategies would ensure proper notification to these populations.

The employment rate in Juniata County is 57.1 percent, just under the U.S. employment rate of 58.9 percent.

Table 5 - Economic Characteristics in Juniata County

Economic Characteristics in Juniata County		
Economic Characteristics	**2010 Census**	**2017 Estimates**
Median household income	$46,951	$50,571
Median family income	$52,857	N/A
Per capita income	$20,690	$24,068

Source: U.S. Census Bureau, 2010

2.4. Land Use and Development

Juniata County has a strong agricultural presence, however, crop production in 2000 was in the top five of agricultural activities, with poultry and eggs, milk and dairy, hogs and pigs the top three commodities by value of sales. According to the U.S. Department of Agriculture, in 2002 there were 644 farms and in 2007 there were 788, an increase of 22 percent. The average size of farms are 124 acres, with a total of 97,681 acres for the county.

Table 6 - Type of Land in Farms

Type of Land in Farms	
Cropland	60.48%
Woodland	27.65%
Pasture	7.13%
Other uses	4.75%
Source: www.agcensus.usda.gov	

Juniata County has the following major stream water resources:

- Cocolamus Creek
- Juniata River
- Licking Creek
- Lost Creek
- Susquehanna River
- Tuscarora Creek
- West Branch Mahantango Creek.

According to the Penn State Timber Market Report, sixty percent of land use in Juniata County is forestland; and twenty-four percent is cropland and sixteen percent is other use. Juniata County has 250,082 acres of land and forests cover 151,399 acres.

Figure 5 - Stormwater Watersheds

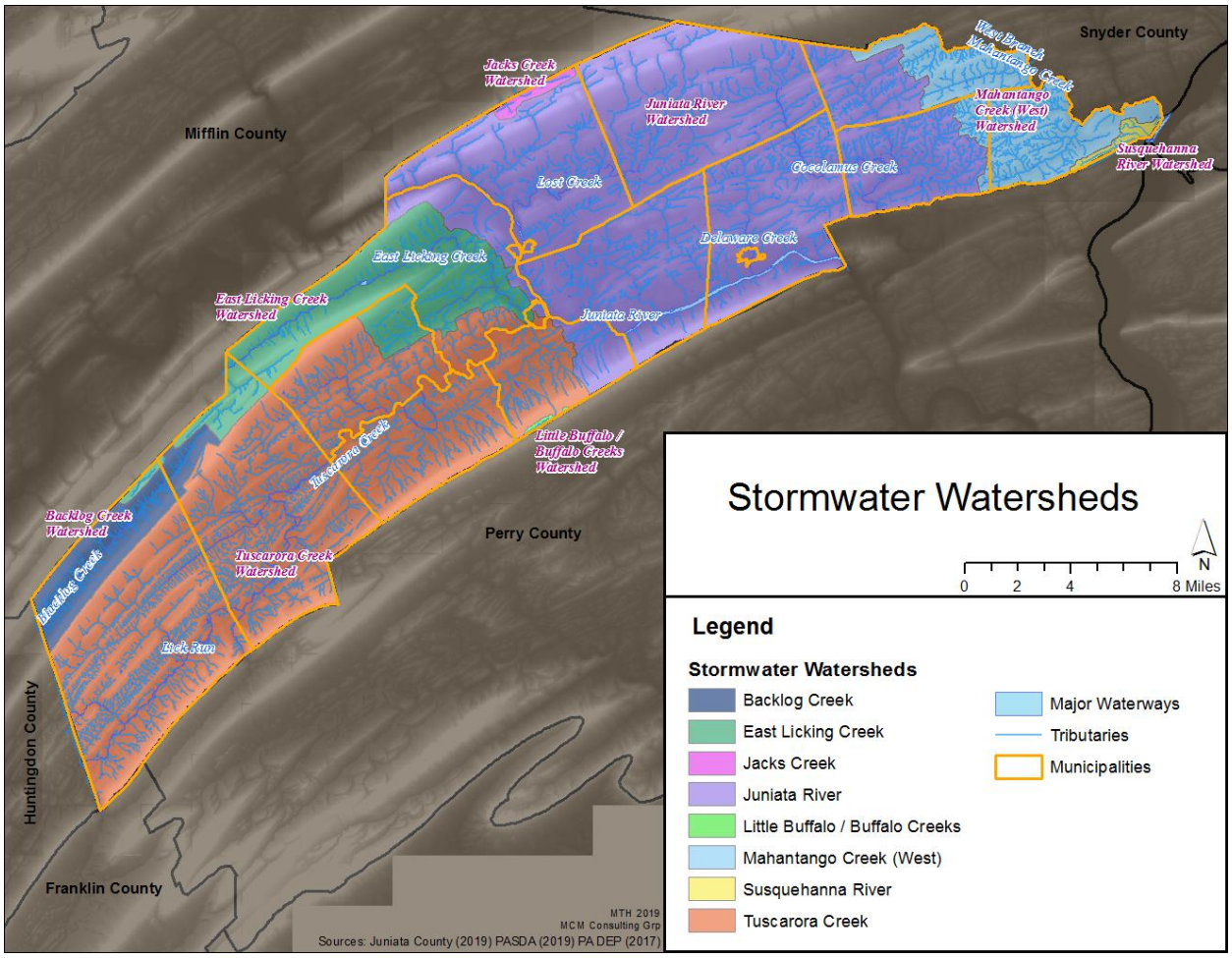


Figure 6 - Land Cover

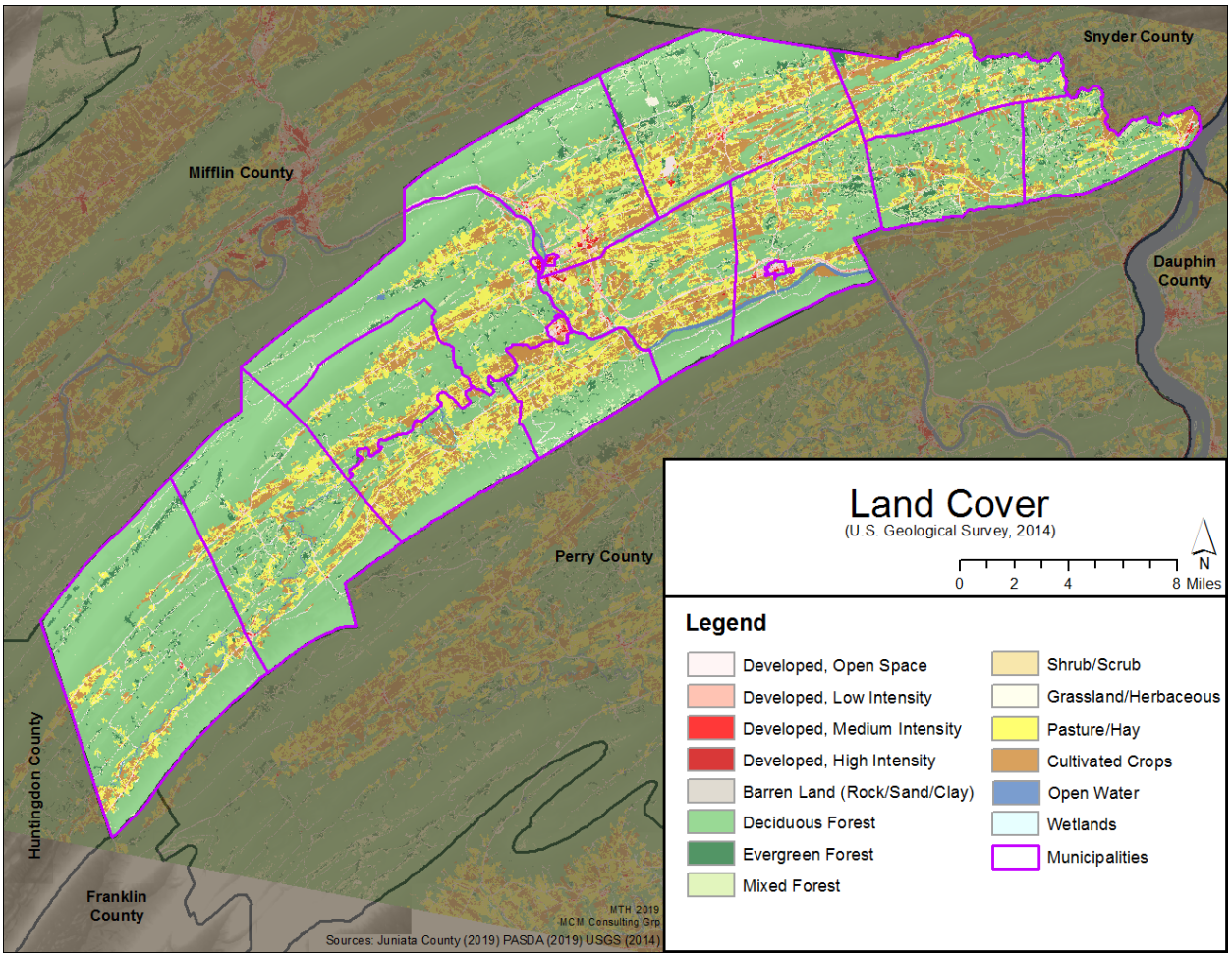
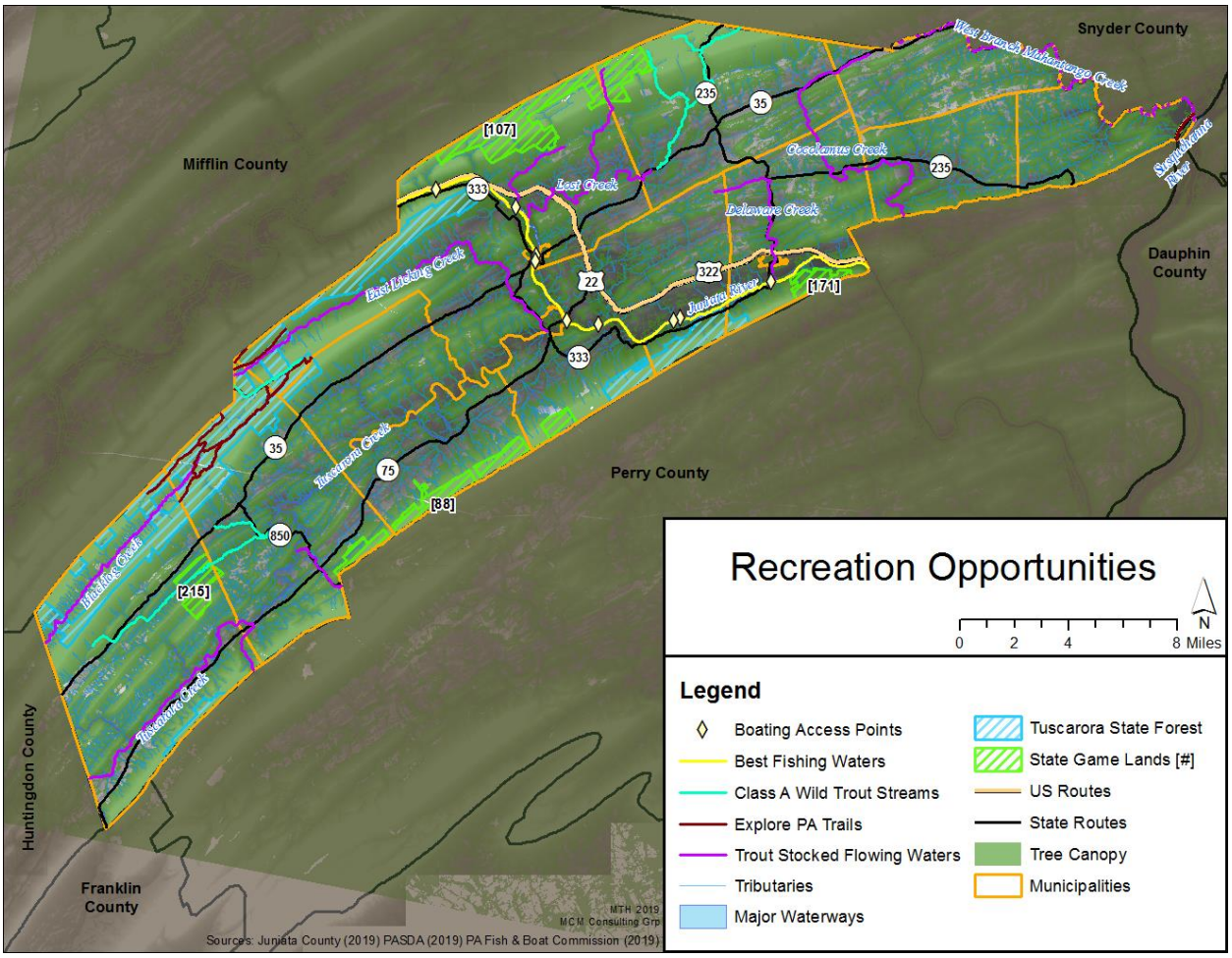


Figure 7 - Recreation Opportunities



3. Planning Process

3.1. Update Process and Participation Summary

The Juniata County Hazard Mitigation Plan update began January 17, 2019. The Juniata County Commissioners were able to secure a hazard mitigation grant to start the process. The Juniata County Office of Planning and Community Development was identified as the lead agency for the Juniata County Hazard Mitigation Plan update. The planning process involved a variety of key decision makers and stakeholders within Juniata County. Juniata 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 Juniata County Office of Planning and Community Development, Juniata County Emergency Management Agency, Juniata County Conservation District 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 Juniata County in coordinating and leading public involvement meetings, local planning team meetings, analysis and the writing of the HMP. The Juniata County Local Planning Team worked closely with MCM in the writing and review of the HMP. MCM conducted project meetings and local planning team meetings throughout the process. 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 Juniata County Local Planning Team and staff. 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. Juniata 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 reviewing 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 Juniata County Board of Commissioners.
- Plan submission to FEMA and PEMA.

The 2020 Juniata County HMP was completed December 3, 2019. The 2020 plan follows an outline developed by PEMA which provides a standardized format for all local HMPs in the Commonwealth of Pennsylvania. The 2020 HMP format is consistent with the PEMA recommended format. The 2020 Juniata 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 2020 Juniata County Hazard Mitigation Plan Update was led by the Juniata County Steering Committee. The Juniata 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 7 – Steering Committee* outlines the individuals that comprised this team.

Table 7 – Steering Committee

Juniata County Hazard Mitigation Plan Update Steering Committee		
Name	**Organization**	**Position**
Allen Weaver	Juniata County Emergency Management Agency	Director
William Hummel	Juniata County Emergency Management Agency	Operations and Training Officer
Brad Kerstetter	Juniata County Office of Planning and Community Development	Director

Juniata County Hazard Mitigation Plan Update Steering Committee		
Name	**Organization**	**Position**
Tammy Casey	Juniata County Office of Planning and Community Development	Associate Planner
Ben Kerstetter	Juniata County Office of Planning and Community Development	Vice Chairman
Chris Snyder	Juniata County Conservation District	District Manager
Alice Gray	Juniata County Commissioner	County Commissioner
Robert Anderson	MCM Consulting Group, Inc.	Senior Consultant
Corbin Snyder	MCM Consulting Group, Inc.	Project Coordinator
Michael Rearick	MCM Consulting Group, Inc.	Project Manager

In order to represent the county, the Juniata 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 2020 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: Juniata County Commissioners, Juniata County Office of Planning and Community Development, Pennsylvania Department of Conservation and Natural Resources (DCNR) – Tuscarora State Forest, PennDOT, Juniata County Conservation District, Juniata County Farm Bureau, Penn State Extension, Juniata County School District, Perry County Emergency Management Agency, Mifflin County Emergency Management Agency and all seventeen municipalities. The invitations for membership of the LPT were disseminated by the Juniata County Emergency Management Agency 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 8 - Local Planning Team* served on the 2020 Juniata 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 8 - Local Planning Team

Juniata County Hazard Mitigation Plan Update Local Planning Team		
Name	**Organization**	**Position**
Allen Weaver	Juniata County EMA	Director
Kaci Blessing	Port Royal Borough Mayor	Elected or Appointed Official
Phil Lucas	Mifflin County EMA	Director
George Shearer	Lack Township Supervisor	Elected or Appointed Official

Juniata County Hazard Mitigation Plan Update Local Planning Team		
Name	**Organization**	**Position**
Leah Fronk	Penn State Extension	Subject Matter Expert
Tammy Casey	Juniata County Office of Planning and Community Development	Associate Planner
Jack Christensen	Greenwood Township EMC	Elected or Appointed Official
Ben Kerstetter	Juniata County Conservation District	Resource Conservation Technician
Mark Heisey	Juniata County PennDot Maintenance	Elected or Appointed Official
Chris Snyder	Juniata County Conservation District	District Manager
Brad Kerstetter	Juniata County Office of Planning and Community Development	Director
William Hummel	Juniata County EMA	Operations and Training Officer
Alice Gray	Juniata County Commissioner	Elected or Appointed Official
Todd Graybill	Juniata County Commissioner	County Commissioner
Mark Partner	Juniata County Commissioner	County Commissioner
Jackie Matter	Juniata County Farm Bureau	Administrative Assistant
Aaron Bennett	Juniata County School District - Tuscarora Jr. High School	Principal
Adam Kling	PA DCNR - Tuscarora State Forest	Elected or Appointed Official
Rich Fultz	Perry County EMA	Director
Cheri Peck	Delaware Township Secretary	Elected or Appointed Official
Sharon Lukens	Fayette Township Secretary	Elected or Appointed Official
Marian Casner	Fermanagh Township Secretary	Elected or Appointed Official
Bria Leister	Greenwood Township Secretary	Elected or Appointed Official
Barb Foster	Lack Township Secretary	Elected or Appointed Official
Brandy Burns	Mifflin Borough Secretary	Elected or Appointed Official
Nancy Zimmerman	Mifflintown Borough Secretary	Elected or Appointed Official
Mary Beth Houtz	Milford Township Secretary	Elected or Appointed Official
Melanie Leister	Monroe Township Secretary	Elected or Appointed Official
Paula Lauver	Port Royal Borough Secretary	Elected or Appointed Official
Tammy Brackbill	Spruce Hill Township Secretary	Elected or Appointed Official
Mandy Nipple	Susquehanna Township Secretary	Elected or Appointed Official
Sue Pontius	Thompsontown Borough Secretary	Elected or Appointed Official
Kathy Saylor	Turbett Township Secretary	Elected or Appointed Official
Ginger Best	Tuscarora Township Secretary	Elected or Appointed Official
Nancy Baillie	Walker Township Secretary	Elected or Appointed Official
Steve Beers	Beale Township Secretary	Elected or Appointed Official
Doug Roush	Delaware Township	Elected or Appointed Official
Kirk Gilbert	Beale Township	Elected or Appointed Official
Joel Love	Lack Township	Elected or Appointed Official
Rich Leitzel	Monroe Township	Elected or Appointed Official
Melissa Fausey	Juniata County Prevention Board	Community Coordinator
Steven Baumgardner	Milford Township	Elected or Appointed Official
Barry Milliker	Tuscarora Township	Elected or Appointed Official
James Fitzgerald	Tuscarora Township	Elected or Appointed Official

Juniata County Hazard Mitigation Plan Update Local Planning Team		
Name	**Organization**	**Position**
Chuk Bryner	Spruce Hill Township	Elected or Appointed Official
Todd Parson	Tuscarora Township	Elected or Appointed Official
Chris Strawser	Fayette Township Secretary	Elected or Appointed Official
Keith Fawver	Susquehanna Township	Elected or Appointed Official
Andrew Lernty	Thompsontown Borough	Elected or Appointed Official
Marty Dreibelbis	Walker Township	Elected or Appointed Official
Tom Wagner	Walker Township	Elected or Appointed Official
Gary Fronk	Greenwood Township	Elected or Appointed Official
John Brofee	Greenwood Township	Elected or Appointed Official
Charles Diem Jr	Delaware Township	Elected or Appointed Official
George Sheaffer	Monroe Township	Elected or Appointed Official
Harold Arnold	Susquehanna Township	Elected or Appointed Official
Jim Fitzgerald	Tuscarora Township	Elected or Appointed Official
Ernie Pyle	Delaware Township	Elected or Appointed Official
Mark Amig	Femanagh Township	Elected or Appointed Official
Roxanne McGinnis	Mifflintown Borough	Elected or Appointed Official
Richard Zimmerman Sr.	Mifflintown Borough	Elected or Appointed Official
W.M. C. Dressler	Milford Township	Elected or Appointed Official

3.3. Meetings and Documentation

Monthly public meetings with local elected officials and the local planning team were held. At each of the public meetings, municipal officials were strongly encouraged to submit hazard mitigation project opportunity forms, complete their respective portions of the capability assessment and review and eventually adopt the multi-jurisdictional HMP. *Table 9 - 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.

A final public meeting was held on November 1, 2019 to present the draft plan and invite public comments. The meeting was advertised in the local newspaper and also made available digitally on the Juniata County web site at https://www.juniataco.org/departments/planning/hazard-mitigation-plan/ The Juniata County website was used to make a digital copy of the draft hazard mitigation plan available.

The public comment period remained open until December 3, 2019. All public comments were submitted in writing to Allen Weaver at the Juniata County Emergency Management Agency. All public comments have been included in this plan in Appendix C.

Table 9 - HMP Process Timeline

Juniata County HMP Process - Timeline		
Date	**Meeting**	**Description**
01/17/19	Juniata 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.
02/19/19	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.
02/19/19	Juniata County Association of Township Officials Meeting	Risk assessment and capability assessment surveys
04/11/19	Local Planning Team WebEx Meeting	Finalization of identified hazards
05/15/19	Local Planning Team Meeting	Risk factor assessment, finalize capability assessment
05/15/19	Juniata County Association of Township Officials Meeting	Review the risk factor assessment and provide municipal assessments.
06/19/19	Public Meeting	Conducted a public meeting to review the draft risk assessment section of the Juniata County Hazard Mitigation Plan update.
07/17/19	Local Planning Team Meeting	Goals, objectives, actions development.
08/21/19	Municipality Meetings	Mitigation Strategy – Project opportunity form development
08/21/19	Local Planning Team Meeting	Mitigation Strategy – Project opportunity form development
09/18/19	Local Planning Team WebEx Meeting	Mitigation Action Evaluation and Prioritization Document Draft 2020 HMP review
11/01/19	Juniata County Hazard Mitigation Plan – Draft Plan Review Public Meeting	An update of the hazard mitigation planning process was delivered. The Draft HMP was reviewed with the municipal representatives and public. Attendees were informed about the timeline and their opportunity to review the entire draft plan and provide written comments for inclusion into the plan.

3.4. Public and Stakeholder Participation

Juniata 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 Juniata 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 non-profit interests.

The tools listed below were distributed with meeting invitations, provided directly to municipalities to complete and return to the Juniata County Emergency Management Agency 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. The previous mitigation actions were provided and reviewed at update meetings. Previous still valid 2015 project opportunities and new 2020 municipal project opportunity forms are located in Appendix G**.**

A schedule that provided appropriate opportunities for public comment was utilized during the review and drafting process. 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.

To increase public input, a community preparedness survey was made available online at surveymonkey.com. In total, four responses were received and then documented in the plan. A summary report on this survey is located in Appendix C.

Juniata County invited all contiguous counties to review the 2020 draft hazard mitigation plan. A letter was sent to the emergency management coordinator in Mifflin, Snyder, Northumberland, Franklin, Perry and Huntingdon Counties on November 4, 2019. Copies of these letters are included in Appendix C.

3.5. Multi-Jurisdictional Planning

Juniata 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 10 - Worksheets, Surveys and Forms Participation* reflects the municipality participation by completing worksheets, surveys and forms.

Table 10 - 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**
Beale Township	X	X	X
Delaware Township	X	X	X
Fayette Township	X	X	X
Fermanagh Township	X	X	X
Greenwood Township	X	X	X
Lack Township	X	X	X
Mifflin Borough	X	X	X
Mifflintown Borough	X	X	
Milford Township	X	X	
Monroe Township	X	X	
Port Royal Borough	X	X	
Spruce Hill Township	X	X	X
Susquehanna Township	X	X	X
Thompsontown Borough	X	X	
Turbett Township	X	X	
Tuscarora Township	X	X	X
Walker Township	X	X	X

All seventeen municipalities within Juniata County have adopted the 2015 Juniata County Hazard Mitigation Plan as the municipal hazard mitigation plan. The Juniata County Local Planning Team goal is 100% participation by municipalities in adopting the 2020 Juniata 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 human caused hazards and describes each hazard in terms of its frequency, severity and county impact. 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 Juniata County risk assessment provides in-depth knowledge of the hazards and vulnerabilities that affect Juniata 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 Juniata County Emergency Operations Plan (EOP), local EOPs and other public and private emergency management plans.

The Juniata 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 Juniata County Local Planning Team reviewed and assessed the change in risk for all natural and human caused hazards identified in the 2015 hazard mitigation plan. The mitigation planning team then identified hazards that were outlined within the Pennsylvania 2018 Hazard Mitigation Plan but not included in the 2015 Juniata County Hazard Mitigation Plan that could impact Juniata County. The team utilized the Hazard Identification and Risk Evaluation worksheet that was provided by the Pennsylvania Emergency Management Agency.

The Juniata County Steering committee met with municipalities and provided guidance on how to complete the municipal hazard identification and risk evaluation worksheet. All seventeen municipalities returned completed worksheets, along with one completed by county officials. 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 human caused 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 Juniata 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 11 - Disaster and Emergency Declarations Affecting Juniata County presents a list of all Presidential and Governor's Disaster Declarations that have affected Juniata County from 1954 through 2019, according to the Pennsylvania Emergency Management Agency.

Table 11 - Disaster and Emergency Declarations Affecting Juniata County

Disaster and Emergency Declarations affecting Juniata County *(PEMA)*		
Date	**Declaration Type**	**Cause**
March, 1963	Gubernatorial Disaster Declaration	Ice Jam on the Susquehanna & Juniata Rivers
September, 1963	Presidential Disaster Declaration	Drought
January, 1966	Gubernatorial Disaster Declaration	Heavy Snow
February, 1972	Gubernatorial Disaster Declaration	Heavy Snow
June, 1972	Presidential Disaster Declaration	Flood (Agnes)
February, 1974	Gubernatorial Disaster Declaration	Truckers Strike
September, 1975	Presidential Disaster Declaration	Flood (Eloise)
October, 1976	Presidential Disaster Declaration	Flood
January, 1978	Gubernatorial Disaster Declaration	Heavy Snow
February, 1978	Gubernatorial Disaster Declaration	Blizzard
March, 1993	Presidential Emergency Declaration	Blizzard
January, 1994	Presidential Disaster Declaration	Severe Winter Storms
January, 1996	Presidential Disaster Declaration	Severe Winter Storms
January, 1996	Presidential Disaster Declaration	Flooding
September, 1996	Presidential Disaster Declaration	Flooding
July, 1999	Gubernatorial Disaster Declaration	Drought
August, 1999	Presidential Disaster Declaration	Flash Flooding

Disaster and Emergency Declarations affecting Juniata County *(PEMA)*		
Date	**Declaration Type**	**Cause**
September, 1999	Presidential Disaster Declaration	Hurricane Floyd
February, 2003	Presidential Emergency Declaration	Severe Winter Storm
September, 2003	Presidential Disaster Declaration	Hurricane Isabel/Henri
September, 2004	Presidential Disaster Declaration	Tropical Depression Ivan
September, 2005	Presidential Emergency Declaration	Hurricane Katrina
September, 2005	Gubernatorial Proclamation of Emergency	Hurricane Katrina
June, 2006	Presidential Disaster Declaration	Flooding
September, 2006	Gubernatorial Proclamation of Emergency	Tropical Depression Ernesto
February, 2007	Gubernatorial Proclamation of Emergency	Severe Winter Storm
February, 2007	Gubernatorial Proclamation of Emergency	Regulations
April, 2007	Gubernatorial Disaster Declaration	Severe Storm
April, 2007	Gubernatorial Proclamation of Emergency	Severe Winter Storm
February, 2010	Gubernatorial Proclamation of Emergency	Severe Winter Storm
April, 2010	Presidential Emergency Declaration	Severe Winter Storm
January, 2011	Gubernatorial Proclamation of Emergency	Severe Winter Storm
August, 2011 (amended September 2011)	Gubernatorial Proclamation of Emergency	Severe Storms and Flooding (Lee/Irene)
September, 2011	Presidential Emergency Declaration	Remnants of Tropical Storm Lee
September, 2011	Presidential Disaster Declaration	Remnants of Tropical Storm Lee
April, 2012	Gubernatorial Proclamation of Emergency	Spring Winter Storms
October, 2012	Presidential Emergency Declaration	Hurricane Sandy
October, 2012	Gubernatorial Proclamation of Emergency	Hurricane Sandy
January 2013	Presidential Disaster Declaration	Hurricane Sandy
June, 2013	Gubernatorial Proclamation of Emergency	High Winds, Thunderstorms, Heavy Rain, Tornado, Flooding
January, 2014	Gubernatorial Proclamation of Disaster Emergency	Extreme Weather, Utility Interruption
February, 2014	Gubernatorial Proclamation of Disaster	Severe Winter Storm
February, 2014	Gubernatorial Proclamation of Disaster	Severe Winter Storm
February, 2014	Gubernatorial Proclamation of Disaster Emergency	Severe Winter Storm
January, 2015	Gubernatorial Proclamation of Emergency	Severe Winter Storms
August, 2015	Gubernatorial Proclamation of Emergency	Severe Storms
January, 2016	Gubernatorial Proclamation of Emergency	Severe Winter Storm
March 2016	Presidential Disaster Declaration	Severe Winter Storm, Snowstorm

Disaster and Emergency Declarations affecting Juniata County *(PEMA)*		
Date	**Declaration Type**	**Cause**
March, 2017	Gubernatorial Proclamation of Emergency	Severe Winter Storm
March, 2017	Gubernatorial Proclamation of Emergency	Severe Winter Storm
January, 2018	Gubernatorial Proclamation of Disaster Emergency	Opioid Crisis

4.2.2. Summary of Hazards

The Juniata County Local Planning Team (LPT) was provided the Pennsylvania Standard List of Hazards to be considered for evaluation in the 2020 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 2020 plan should identify, profile and analyze eighteen hazards. These hazards include all the hazards profiled in the 2015 plan and five newly profiled hazards. The list below contains the hazards that have the potential to impact Juniata County as identified through previous risk assessments, the Juniata County Hazards Vulnerability Analysis and input from those that participated in the 2020 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 prolonged 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 10-20 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).

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 downstream, piling up in narrow passages and near other obstructions such as bridges and dams. All forms of flooding can damage infrastructure.

Invasive Species

An invasive species is a species that is not indigenous to the ecosystem under consideration which thrives in the novel ecosystem. Such species often cause environmental or economic harm. Invasive species can be any type of organism, such as plants, fish, invertebrates, mammals, insects, and even diseases or pathogens. Not all non-native species cause problems, however many can cause agricultural hardships, defoliate and kill native plants and trees and interfere with native ecological systems.

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). Infectious diseases such as West Nile Virus or Lyme disease are also important to monitor and mitigate.

Radon Exposure

Radon is a cancer-causing natural radioactive gas that you can't 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 40% of the

homes in Pennsylvania are believed to have elevated radon levels (Pennsylvania Department of Environmental Protection, 2009).

Tornado, Windstorm

A windstorm can occur during severe thunderstorms, winter storms, coastal storms, or tornados. Straight-line winds such as a downburst have the potential to cause wind gusts that exceed 100 miles per hour. Based on 40 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. Tornados 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 30 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 tornados are a few dozen yards wide and touch down briefly, but even small, short-lived tornados 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. Campgrounds and people staying in tents or mobile campers are also vulnerable to severe windstorms. Waterspouts are weak tornados that form over warm water and are relatively uncommon in Pennsylvania. Each year, an average of over 800 tornados is reported nationwide, resulting in an average of 80 deaths and 1,500 injuries (NOAA, 2002). Based on NOAA Storm Prediction Center Statistics, the number of recorded F3, F4, & F5 tornados 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). Wildfires can also be natural and important parts of some ecosystems.

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 increased 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).

Cyber Security

Cyber-attacks are maliciously intended actions against a person or organization, often for financial or terror-related reasons. They can take many forms ranging from specifically targeting human operators to a broader computer-based attack on entire systems. Often, attacks can last just minutes, but larger events can have lasting impacts on systems and data.

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).

Emergency Services

Emergency medical services (EMS) and Fire Department Services play a crucial role in the emergency response system, and the wellness 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 – Hazardous Materials

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).

Opioid Epidemic

Pennsylvania and the nation at large is experiencing an epidemic of opioid drug addiction. There has been a 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, despite their high risk of addiction and overdose, have made them popular both as formal medical treatments and as recreational 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. It has become more useful to view opioid addiction as a disease rather than an illicit behavior requiring criminal consequences.

The Commonwealth of Pennsylvania, along with other states in the nation has enacted 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 – Agroterrorism

Terrorism is use of force or violence against persons or property with the intent to intimidate or coerce. Acts of terrorism include active shooters, 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). When terrorist intent targets agricultural systems or uses agricultural means to cause disruptions, the event is considered an act of agroterrorism.

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).

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.
- 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 (United 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

Large-scale consumption of fossil fuels and deforestation has caused atmospheric carbon dioxide concentrations to significantly increase, resulting in rapid climate change unparalleled in Earth's history. Human activity has also caused a notable diversity of species to go extinct, and the extinction event is expected to worsen as global climate change proceeds, possibly even reaching the level of mass extinction events that have been observed in Earth's geologic history (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 are starting to be felt for some natural hazards, and as temperatures continue to rise, these effects are expected to become more pronounced.

The most direct impact caused by climate change is regarding extreme temperature. The annual average temperature from 1986 to 2016 is 1.2˚F warmer than the average temperature from 1901 to 1960, and temperatures are expected to continue to rise (Vose et al., 2017). In recent years, record high temperatures have outnumbered low temperatures, and the threat of extreme heat has been amplified (Meehl et al., 2009; 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).

There is also an increased risk of flooding (Section 4.3.3) associated with climate change. 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. Pennsylvania has seen an increase in annual average precipitation of five to ten percent in the last century, with precipitation from extreme storms increasing seventy percent since 1958, and these numbers are expected to continue to rise (EPA, 2016). These changes to precipitation will also impact agriculture and increase the risk of flooding and dam and levee failures. Similarly, winter storms (Section 4.3.9) are expected to become more intense.

Climate change is expected to result in more intense hurricanes and tropical storms. With the rise of atmospheric temperatures, ocean surface temperatures are rising, resulting in warmer and moister conditions which are conducive for the development of stronger, higher energy tropical storms (Stott et al., 2010). It is projected that the Atlantic hurricane season will elongate, and the number of category 4 and 5 hurricanes will increase (Trenberth, 2010). This will further exacerbate the risk of flooding and storm damage in Pennsylvania.

Climate change is likely to also 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. As such, the risk of hydrological and agricultural drought is expected to increase (Sheffield & Wood, 2008; EPA, 2016). Correspondingly this will increase wildfire activity (Section 4.3.8) and result in more intense and long-burning fires (Pechony & Shindell, 2010).

Climate change could increase the prevalence of the West Nile Virus (Section 4.3.5). 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 also contributing to the introduction of new invasive species (Section 4.3.4). 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.

The impacts of climate change are no longer hypothetical concepts set in the future, but rather tangible and hazardous realities. Hurricane Harvey's destruction is an example of the increased hazard of tropical storms. Additionally, wildfires in California are largely believed to be burning faster and hotter due to worsening drought conditions that are being caused by climate change (Cvijanovic et al., 2017). The wildfire season in California in both 2017 and 2018 each broke records for having unprecedentedly devastating fires. The November 2018 Camp Fire in Butte County California burned 153,336 acres, 18,804 structures (including the town of Paradise), and claimed 86 lives (Cal Fire, January 2019). While these specific events were not especially close to Pennsylvania, they are early illustrations of the tangible impact that climate change is having, and they confirm the best available scientific predictions of what is to come. It is important to properly connect these intensifying occurrences to climate change in order to inform future actions for all hazards that climate change will impact.

From the year 2000 to 2015, Pennsylvania had the third most greenhouse gas emissions among states in the nation (EIA, 2018), making the Commonwealth an important state to work towards reducing emissions. On January 8, 2019, Governor Tom Wolf issued

executive order 2019-01, reestablishing the Governor's Green Government Council and setting achievable climate goals for the Commonwealth of Pennsylvania. The climate goals were based on the November 2018 report *Pennsylvania Climate Action Plan* (PA DEP, 2018) and include the following benchmarks for the Commonwealth:

- 26% reduction of net greenhouse gas emissions by 2025 (from 2005 levels).
- 80% reduction of net greenhouse gas emissions by 2050 (from 2005 levels).

These goals are similar to those that over twenty other states have set as targets in the last few years, which are akin to those outlined in the international 2015 Paris climate agreement. The Green Government Council also intends to reduce energy consumption within government agencies and included the following goals for all agencies under the Governor's jurisdiction (Exec. Order No. 2019-01):

- Collectively reduce overall energy consumption by three percent per year, and twenty-one percent by 2025 (from 2017 levels).
- Replace twenty-five percent of the state passenger car fleet with batter electric and plug-in electric hybrid cars by 2025 and evaluate opportunities for the reduction of vehicle miles traveled and incorporation of new technology where appropriate.
- Procure renewable energy to offset at least forty percent of the Commonwealth's annual electricity use and evaluate opportunities to source electricity through Pennsylvania Certified Tier I credits, and/or direct purchase of renewable power generation sited within Pennsylvania.
- Consider green options in any new building construction project with a goal of a ten percent reduction in the energy consumption over ANSI/ASHRAE/IES Standards.

This type of sudden global change is novel to humanity. All research and recent events point to the intensification of the hazards mentioned above, especially if human society does not make swift and significant changes to reduce emissions and species losses. While individuals can work to reduce emissions and support green practices, the most significant reductions are made on a systematic level.

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 Juniata 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 of time without rainfall that has an adverse effect on streams, lakes, and groundwater levels, potentially impacting agriculture.

4.3.1.2 Range of Magnitude

Juniata County is a relatively rural county with over forty-one percent of land use dedicated to agriculture (Comprehensive Plan, 2009). Agricultural activity in Juniata County is one of the main concerns when considering drought preparation in Juniata and represent some of the most at risk areas when a drought occurs. A drought can be a significant financial burden considering the extent of agricultural production in the county.

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.

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. *Table 13 - 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).
- Soil moisture via the Palmer Drought Index (See *Table 12 - Palmer Drought Severity Index*) - a soil moisture algorithm calibrated for relatively homogeneous regions which measures dryness based on recent precipitation and temperature.

Table 12 - 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

Table 13 - 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 Preparation Phases *(PA DEP, 2017)*				
Phase	**General Activity**	**Actions**	**Request**	**Goal**
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: With the approval of the PA Emergency Management Council, local municipalities may 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. Local water rationing can strain the availability of consumable water for the community and can increase the county's vulnerability to other hazards such as severe weather, extreme heat, and public health emergencies.

4.3.1.3 Past Occurrence

Table 14 - Drought Occurrence shows declared drought status for Juniata County from 1980 to February 2019 as reported by the Pennsylvania Department of Environmental Protection (PA DEP) and the table also includes past disaster declarations impacting Juniata County due to drought events. *Figure 8 - History of Declared Drought Emergencies* shows the number of drought emergency declarations that have impacted Juniata County relative to other counties in the Commonwealth. The Pennsylvania Department of Environmental Protection reports that Juniata County has had five to seven drought emergencies from 1980 through 2016. *Figure 9 - Palmer Drought Severity Index History* shows that Juniata County has experienced severe drought (PDSI ≤ -3) between ten and fifteen percent of the time from 1895-1995, which gives a good idea of how often the county has been affected by drought events in the last century.

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.

Another devastating drought occurred throughout the year in 1999, culminating with the governor of Pennsylvania declaring a drought emergency for most of the Commonwealth on July 21, 1999, including Juniata County. Corn crop losses alone were estimated to be approximately $100 million with total crop losses estimated at over $500 million with losses from 70 to 100 percent. There were also losses from the decline of milk production due to the drought (NOAA NCEI, 2011). Other than agricultural losses, the drought resulted in low stream levels which caused some deaths of fishes in abnormally dry streams. The state asked municipal and private water suppliers to cut local water use and use local water rationing. The drought emergency was lifted on September 30, 1999 with the arrival of Hurricane Floyd on the 16th.

As of 2015, there were 6,448 residents and businesses served by municipal water suppliers in Juniata County, all of whom would have been impacted by local water rationing in 1999. The municipal water supplier and number of customers as of 2015 are listed below:

- McAlisterville Area Joint Authority – 385
- Mifflintown Municipal Authority – 4,500
- Port Royal Municipal Authority – 410
- Richfield Area Joint Authority – 230
- Thompsontown Municipal Authority – 923

Based on 2012 USDA Farm Service Agency data, $3,287,667 in crop insurance indemnities have been paid out to farmers throughout Juniata County.

Table 14 - Drought Occurrence

Drought Occurrence ***(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	1 year, 6 months, 18 days
07/24/1991	04/20/1992	Emergency	
04/20/1992	09/11/1992	Warning	
09/11/1992	01/15/1993	Watch	
09/01/1995	11/08/1995	Warning	3 months, 17 days
11/08/1995	12/18/1995	Watch	
07/17/1997	11/13/1997	Watch	3 months, 27 days
12/03/1998	12/14/1998	Watch	1 year, 5 months, 2 days
12/14/1998	03/15/1999	Warning	

Drought Occurrence *(PA DEP, 2019)*			
Start	**End**	**Status**	**Duration**
03/15/1999	06/10/1999	Watch	
06/10/1999	07/20/1999	Warning	
07/20/1999	09/30/1999	Emergency**	
09/30/1999	05/05/2000	Watch	
08/08/2001	12/05/2001	Watch	10 months, 6 days
12/05/2001	06/14/2002	Warning	
08/09/2002	09/05/2002	Watch	2 months, 29 days
09/05/2002	11/07/2002	Warning	
04/11/2006	06/30/2006	Watch	2 months, 19 days
08/06/2007	09/05/2007	Watch	30 days
10/05/2007	02/15/2008	Watch	4 months, 10 days
09/16/2010	11/10/2010	Watch	1 month, 25 days
08/05/2011	09/02/2011	Watch	28 days
06/17/2015	07/10/2015	Watch	23 days
08/02/2016	12/16/2016	Watch	8 months, 4 days
12/16/2016	02/14/2017	Warning	
02/14/2017	04/06/2017	Watch	
**Gubernatorial Disaster Declaration			

Figure 8 - History of Declared Drought Emergencies

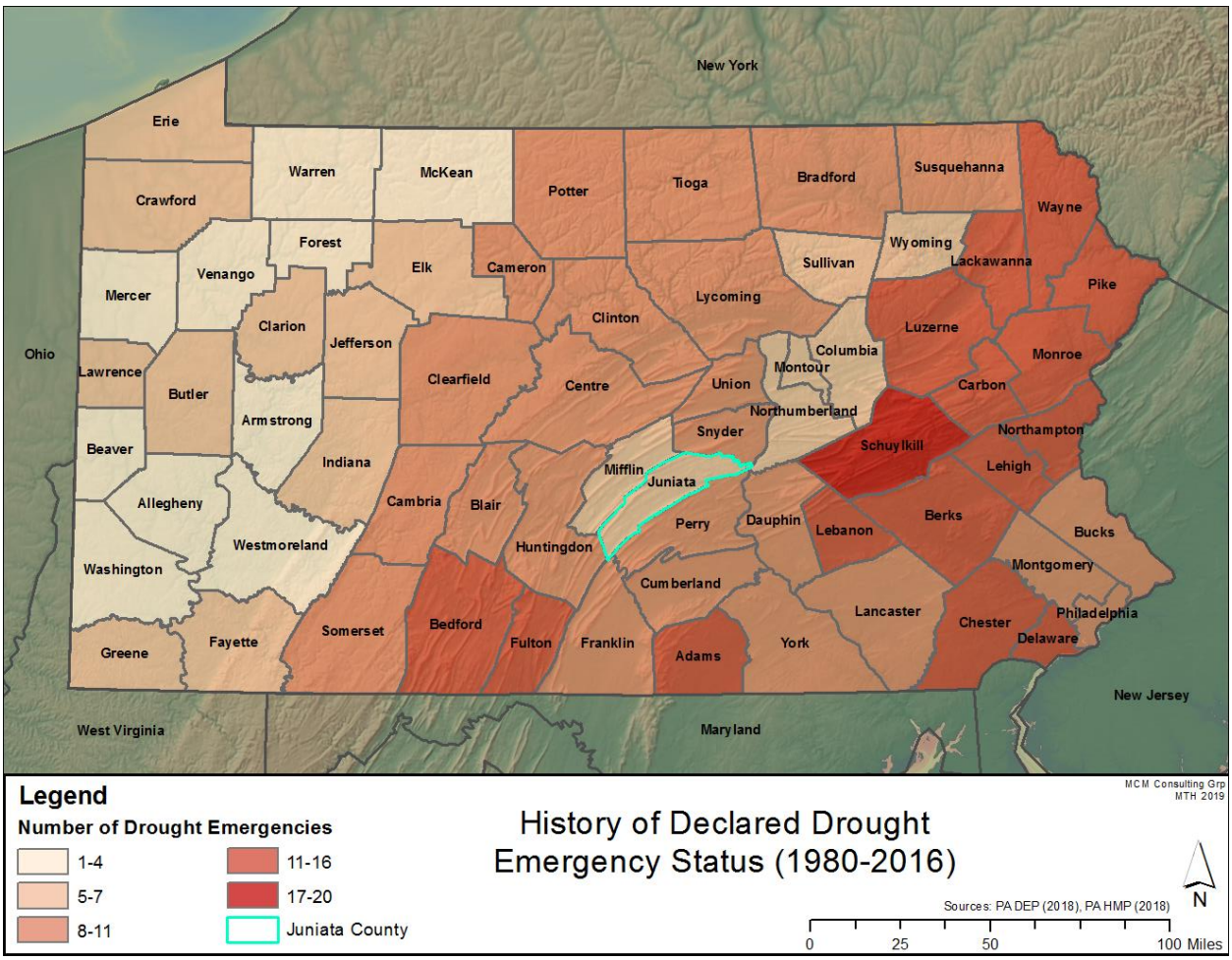
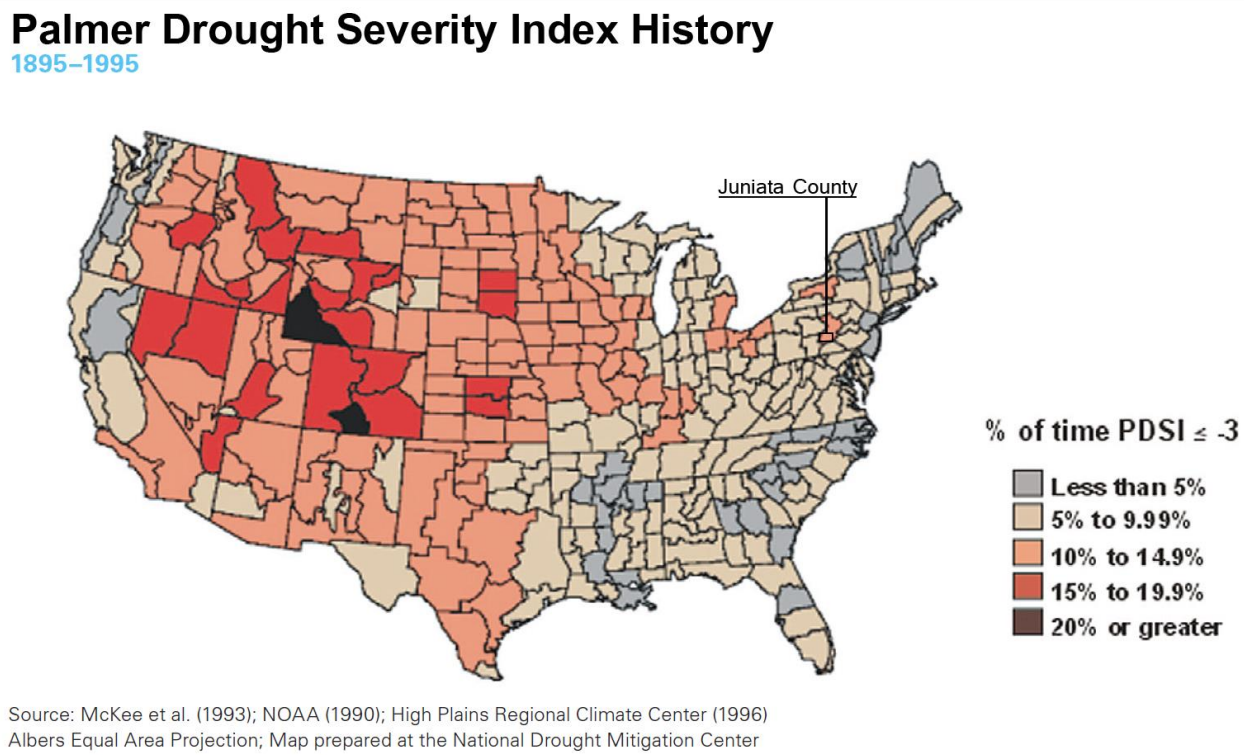


Figure 9 - Palmer Drought Severity Index History



Source: McKee et al. (1993); NOAA (1990); High Plains Regional Climate Center (1996)
Albers Equal Area Projection; Map prepared at the National Drought Mitigation Center

4.3.1.4 Future Occurrence

It is difficult to forecast the exact severity and frequency of future drought events, and 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. Juniata County has experienced severe drought between ten and fifteen percent of the time between 1895 and 1995 (*Figure 9 - Palmer Drought Severity Index History*) which can be used to make a rough estimate of the future probability of drought in Juniata County, although it does not account for uncertainty introduced by climate change. Drought conditions are expected to become more severe with climate change – higher temperatures cause evaporation and transpiration rates to increase resulting in dryer surface conditions (Sheffield & Wood, 2008; EPA, 2016).

Figure 9 - Palmer Drought Severity Index History shows a recent Palmer Drought Severity Index reading for the continental United States and as of February 9, 2019, Juniata County and the surrounding region is experiencing an extremely moist spell, with a PDSI between over 4.0. *Figure 11 - Long-Term Drought Indicator (NOAA, 2019)* shows that Juniata County is currently in the percentile that is least vulnerable to drought events, however this saturation could indicate dangerous conditions for flooding (see section 4.3. Flooding).

Figure 10 - Recent Drought Severity Index

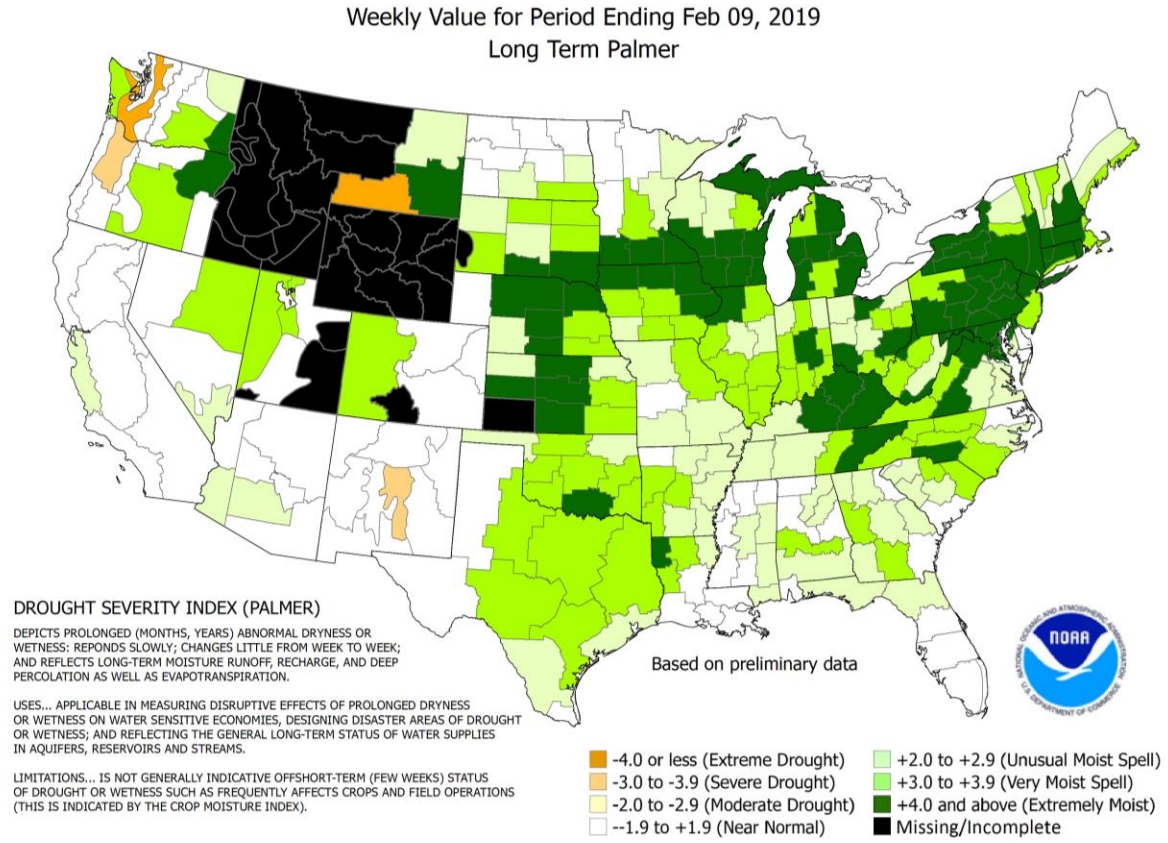
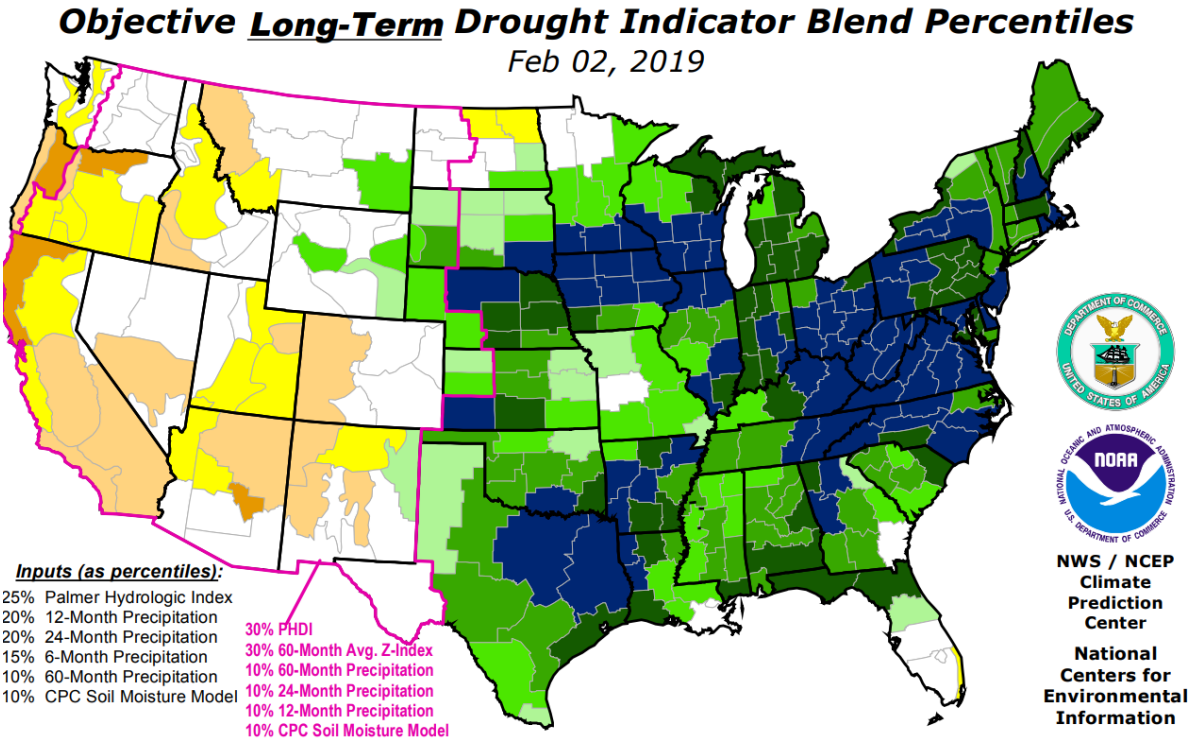


Figure 11 - Long-Term Drought Indicator



4.3.1.5 Vulnerability Assessment

The most significant losses resulting from drought events are typically found in the agriculture sector. The 1999 Gubernatorial Proclamation was issued in 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. As of the 2012 Census of Agriculture, there were an estimated 737 farms in Juniata County, at an average size of 124 acres. Juniata County ranks 20th of 67 counties in the Commonwealth for agricultural production, totaling over $101 million (USDA, 2012). The majority of this production comes from livestock, poultry and their products (~$87 million). The remaining agricultural production comes from crops, including nursery and greenhouse crops (~$14 million).

Water supplies are also vulnerable to the effects of drought. Public water service areas cover 1.7% of land are in the county, including Thompsontown Borough, Port Royal Borough, Mifflin Borough, Mifflintown Borough *(see Figure 12 – Water Supply). Table 15 - Domestic Water Wells & Structures in Public Water Supply Area* shows the number of

addressable structures that are in public water supply areas by municipality. Residential versus commercial designations for these structures was not available at the time of this study. Municipalities that are not listed do not have structures with public water service, and the majority of the county relies on 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, meaning Juniata County residents who use private domestic wells are vulnerable to drought events. *Table 15 - Domestic Water Wells & Structures in Public Water Supply Area* shows the number of wells in each municipality in Juniata 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 Juniata County, it is not comprehensive due to the voluntary nature of the data submission. Not all wells were reported including a location designation.

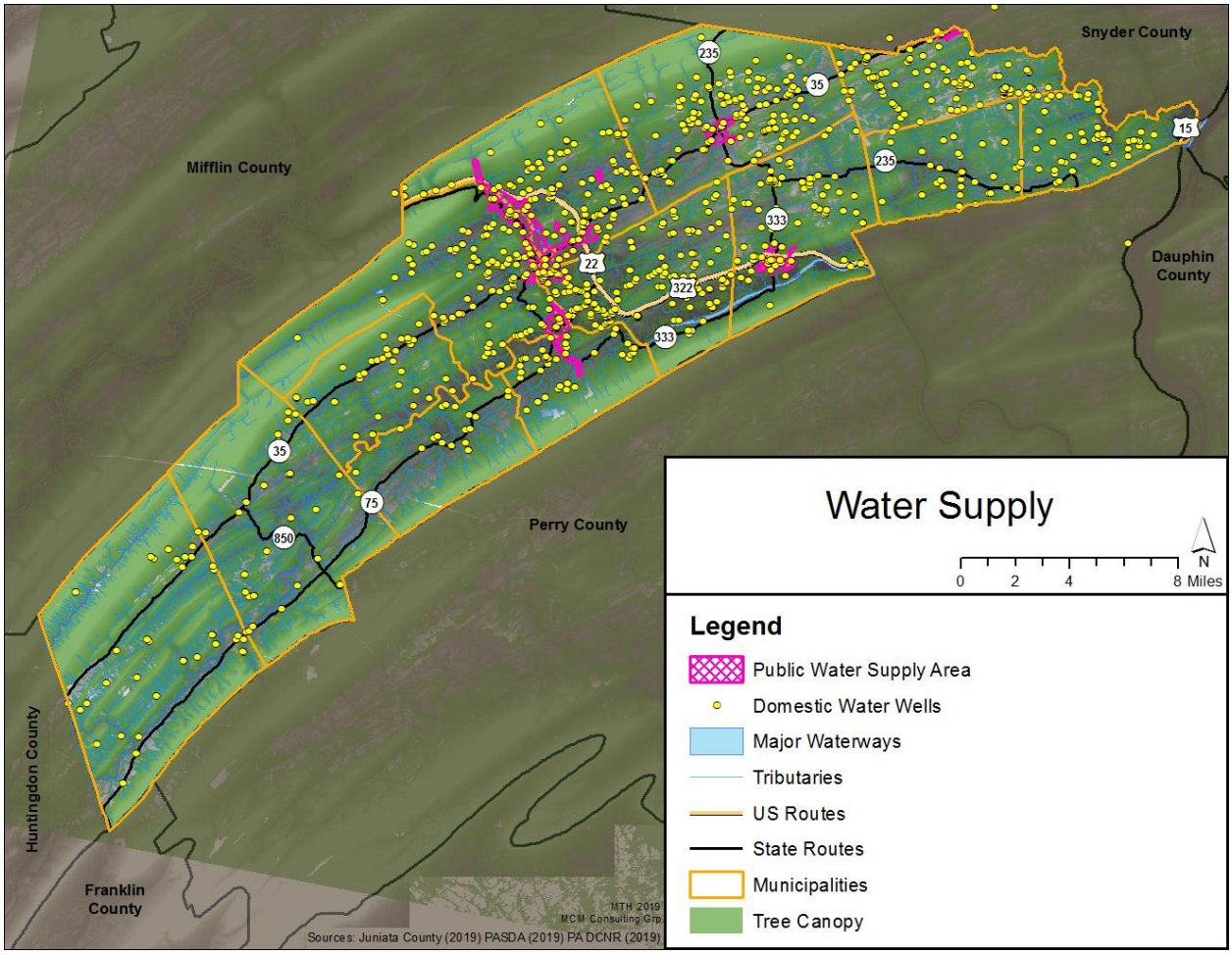
The EPA provides a guide published in October 2017 for water utilities to aid in drought response and recovery. The guide outlines what goes into a good drought response plan, and how to manage water supply and demand during a drought, outlines best practices for communication and partnerships with other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

Table 15 - Domestic Water Wells & Structures in Public Water Supply Area

Domestic Water Wells & Structures in Public Water Supply Area *(PA DEP, 2019; Juniata Co GIS, 2019; PA DEP, 2019)*		
Municipality	**Domestic Water Wells**	**Addressable Structures in PWSA**
Beale Township	56	0
Delaware Township	145	132
Fayette Township	248	455
Fermanagh Township	185	736
Greenwood Township	67	0
Lack Township	82	0
Mifflin Borough	17	271
Mifflintown Borough	12	445
Milford Township	156	355
Monroe Township	204	170
Port Royal Borough	15	453
Spruce Hill Township	39	0
Susquehanna Township	139	0
Thompsontown Borough	4	374
Turbett Township	77	45
Tuscarora Township	71	0

Domestic Water Wells & Structures in Public Water Supply Area *(PA DEP, 2019; Juniata Co GIS, 2019; PA DEP, 2019)*		
Municipality	**Domestic Water Wells**	**Addressable Structures in PWSA**
Walker Township	266	108
Undesignated	6	0
Total	**1,789**	**3,544**

Figure 12 – Water Supply



4.3.2. Earthquake

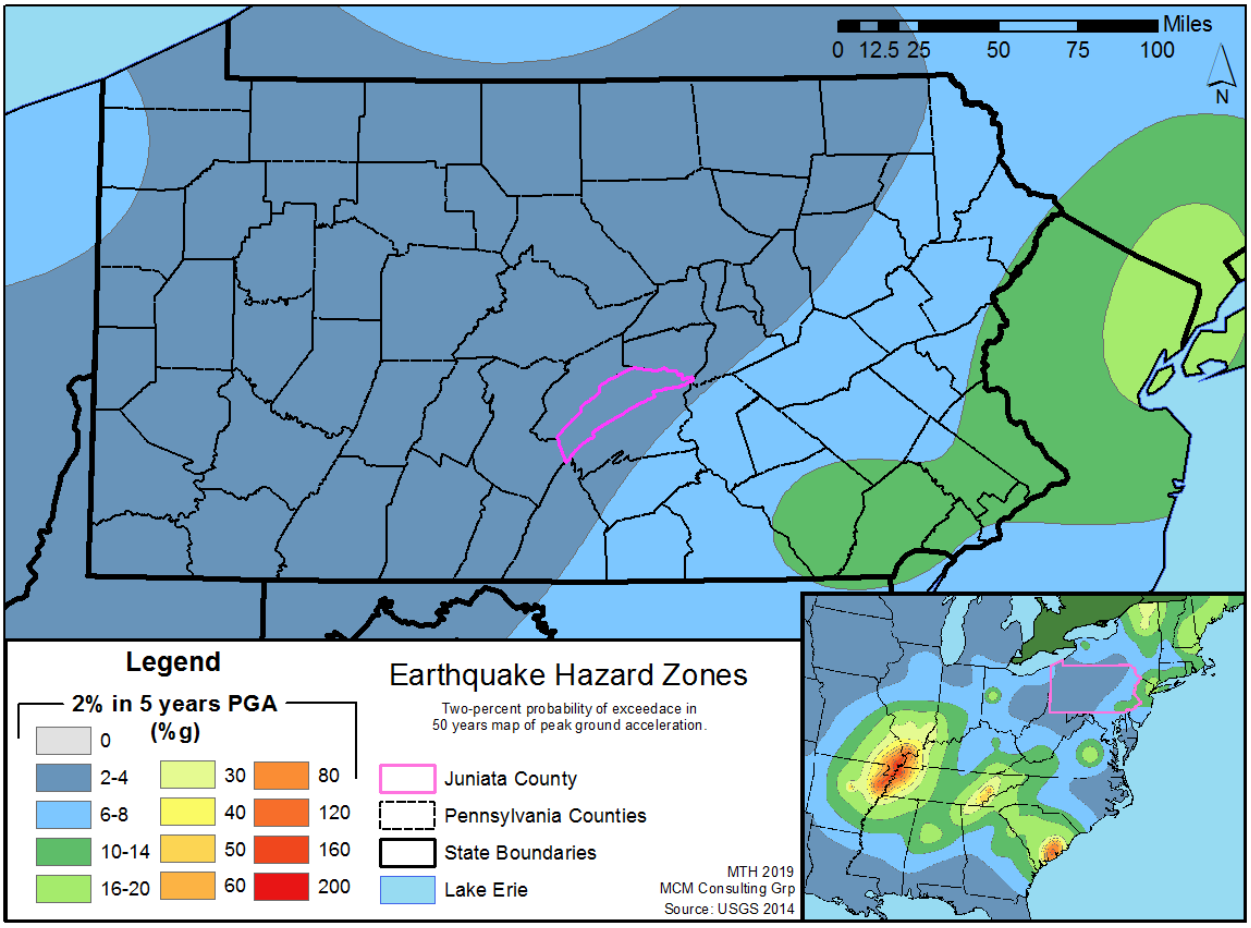
4.3.2.1 Location and Extent

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 Juniata 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 Juniata 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.

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 Juniata County is to conduct a probabilistic earthquake-hazard analysis with the earthquakes that have already happened in and around the county (See *Figure 13 - Earthquake Hazard Zones*).

Figure 13 - 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 16 -*

Richter Scale summarizes Richter Scale magnitudes as they relate to the spatial extent of impacted areas. The Modified Mercalli Intensity Scale (*Table 17 - 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 16 - 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.
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 17 - Modified Mercalli Intensity Scale

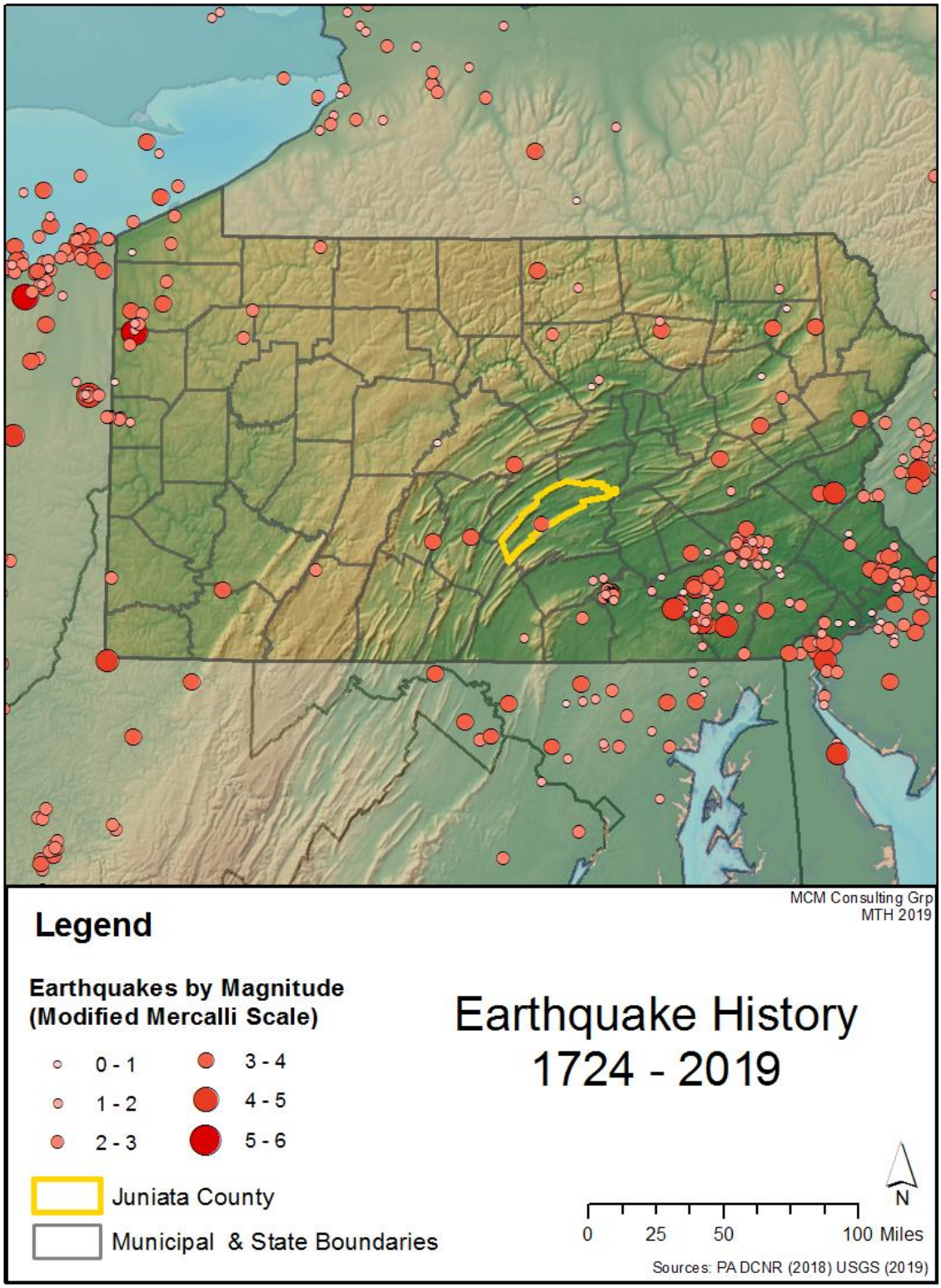
Scale	Intensity	Earthquake Effects	Richter Scale Magnitude
I	**Instrumental**	Detected only on seismographs	<4.2
II	**Feeble**	Some people feel it	
III	**Slight**	Felt by people resting; like a truck rumbling by	
IV	**Moderate**	Felt by people walking	
V	**Slightly Strong**	Sleepers awake; church bells 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 Juniata County from earthquake events that happen around the Commonwealth.

4.3.2.3 Past Occurrence

Only one earthquake has been recorded that originated within Juniata County. The magnitude 3.4 earthquake occurred on June 13, 2019 and the epicenter was located approximately 11 miles south-southwest of Mifflintown Pennsylvania. The earthquake did not cause damage; however, many residents noticed the event. A total of ninety-nine earthquake events occurred within 100 km of Juniata County between 1724 and December 2018 – all events were relatively minor quakes with Modified Mercalli magnitudes less than four. All earthquake events that occurred in the area surrounding Juniata County since 1724 can be seen in *Figure 14 - Earthquake History*.

Figure 14 - Earthquake History



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 13 - Earthquake Hazard Zones* shows that Juniata 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 18 - Recent Earthquake Trends*). 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 (Shirzei et al., 2016). As of December 2018, Juniata County has no active wells (PA DEP, 2018), however Juniata County may still experience increased seismic activity due to the significant presence of hydraulic fracturing of the Marcellus Shale in Pennsylvania. It is also important to note that seismicity can occur even after wells become inactive and injections rates decline (Shirzaei et al., 2016).

Table 18 - Recent Earthquake Trends

Recent Earthquake Trends in Central and Eastern United States (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 Juniata 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 Juniata 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 Juniata County's general public during an earthquake.

While historically the risk of earthquakes in central PA is low (See *Figure 13 - Earthquake Hazard Zones*), the uptick in seismicity due to hydraulic fracturing in the surrounding

region increases the likelihood of Juniata County experiencing an earthquake. Marcellus shale exploration for natural gas is widespread throughout Pennsylvania, meaning there has been widespread hydraulic fracturing. Considering the current knowledge of increased seismicity due to hydraulic fracturing, Juniata County should expect to experience more magnitude 3 and larger earthquakes. The increase lasts even after hydraulic fracturing stops, so the increased seismic risk should be expected to last well into the future. The recent unexpected magnitude 3.4 earthquake near Mifflintown on June 13, 2019 was a possible example of the type of earthquake that Juniata County can expect to experience more of in the future.

4.3.3. Flood, Flash Flood and Ice Jams

4.3.3.1 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 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. Flash floods are the most common type of flooding in Juniata County. 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 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 4.3.3.4. However, in assessing the potential spatial extent of flooding, it is important to know that a floodplain associated with a flood that has a 10% chance of occurring in a given year is smaller than the floodplain associated with a flood that has a 0.2% annual chance of occurring. The National Flood Insurance Program (NFIP) publishes digital flood insurance rate maps (DFIRMs). These maps identify the 1% annual chance of flood area. Special flood hazard area (SFHA) and base flood elevations (BFE) are developed from the 1% annual chance flood event, as seen in *Figure 15 - Flooding and Floodplain Diagram*. Structures located in the SFHA have a 26% chance of flooding in a thirty-year

period. The SFHA serves as the primary regulatory boundary used by FEMA, the Commonwealth of Pennsylvania and Juniata 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 19 - Flood Hazard High Risk Zones*. Appendix D of this hazard mitigation plan includes a flooding vulnerability map for each municipality in Juniata County with vulnerable structures and critical facilities identified using the most current DFIRM data for Juniata County dated 2012.

Juniata County is located within the Susquehanna River basin and has fifteen major natural waterways within its borders, over 2,000 acres of wetlands, and over 1,800 riverine acres. Although the Susquehanna River only runs along a small part of the northeast tip of the county, the close proximity of Juniata County to the Susquehanna River means the river has a significant impact on flooding and flood vulnerability in the county. Other major waterways include Cocolamus Creek, Juniata River, Licking Creek, Lost Creek, Tuscarora Creek, and the West Branch of the Mahantango Creek. Most communities in Juniata County are located along stream and creek valleys throughout the County, many of which are flood prone, and all municipalities in the county have flood prone areas.

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 critical 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 15 - Flooding and Floodplain Diagram

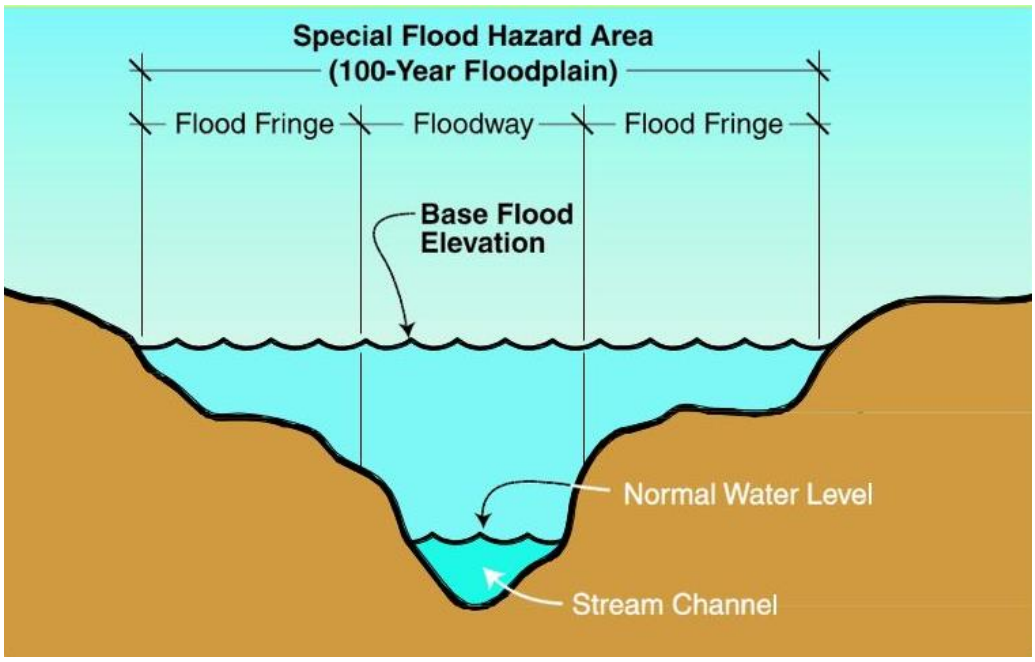


Table 19 - Flood Hazard High Risk Zones

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.
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.

4.3.3.2 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. The mountainous terrain of Juniata County can cause more severe floods as runoff reaches receiving water bodies more rapidly over steep terrain. 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 special 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 Juniata 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 Juniata 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 economic loss from a one-hundred-year flood is expected to be approximately $51.4 million, with 83.7% of that coming from residential homes. After adjusting for business interruption

and extenuating circumstances after a flood event, total economic loss was estimated at $71.6 million. Residential occupancies account for nearly 60% of all flooding related losses as estimated by HAZUS.

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.

4.3.3.3 Past Occurrence

Juniata County has experienced numerous flooding, flash flooding and ice jam flooding events in the past. A majority of the Presidential Disaster and Emergency Declarations affecting Juniata County been in response to hazard events related to flooding. The flooding and flash flooding was caused by a variety of heavy storms, tropical storms and other issues. A summary of flood event history for Juniata County from 1996 until February 2019 is found in *Table 20 - Flood Event History*. Available details for each event appears below each entry in the table. From February 2010 through March 2019, emergency medical services and fire departments were dispatched eighty-four times to respond to flooding events. Significantly, from July 23 to July 26 of 2018, there were twenty-six calls for flooding related help to fire departments in Juniata County.

There are few reports of ice jam flooding in Juniata County, however flooding on the nearby Susquehanna River can often be compounded by ice jam flooding, causing water elevations to rise dramatically. In March of 1963 an ice jam on the Susquehanna and Juniata Rivers resulted in a Gubernatorial Disaster Declaration.

One of the most dramatic and tragic flooding events in Juniata County occurred on January 19, 1996. A flash flood caused the Tuscarora Creek to flood, washing out the bridge from Academic to Pleasant View, leaving four people in three separate cars unable to cross the creek. They attempted to cross the stream on foot but were swept away by the strong floodwaters and all four perished at the hands of the flood. This was the only flooding event in Juniata County with reported fatalities or injuries. The flooding was exacerbated by the snowmelt from a blizzard and another severe snowstorm that had both occurred earlier in the month, saturating the ground and adding to the water levels. The flooding led President Clinton to declare a Presidential Disaster Declaration on January 21, 1996.

On August 20, 1999, a flash flood occurred in the Richfield area of Juniata County where eight to nine inches of rainfall were reported in Richfield. Several trailers were washed away, thirty homes and four businesses were damaged along with a number of

roads and bridges. A plant nursery located near the Mahantango Creek lost about $100,000 worth of plants during the event. In total, the damages incurred in Juniata County totaled approximately $500,000.

The remnants of Tropical Storm Lee in September 2011 caused significant damage across Pennsylvania. In Juniata County there were several reported water rescues in Port Royal and along Route 75 outside of town. Pennsylvania Governor Corbett requested a presidential declaration from President Obama on September 12, 2011 due to the excess of damage throughout the Commonwealth of Pennsylvania. A presidential disaster declaration was issued for individual assistance and public assistance on September 13, 2011.

Table 20 - Flood Event History

Flood Event History (NOAA NCEI, 2019)		
Date	**Type**	**Property Damage**
1/19/1996	Flash Flood	$0
Four deaths occurred in Juniata County as a direct result of the flooding on the evening of Friday the 19th. Two females and two males in three separate cars were unable to cross Tuscarora Creek between Academia and Pleasant View due to a flooded bridge. They attempted to cross the stream on foot and were swept away.		
1/19/1996	Flood	$0
9/6/1996	Flash Flood	$0
Western areas were hard hit with heavy rains. Roads and streams were flooded.		
9/13/1996	Flash Flood	$0
12/13/1996	Flash Flood	$0
9/11/1997	Flash Flood	$0
Between 5 and 7 inches of rain fell from western Adams County due north across Cumberland, Perry, and Juniata Counties. Many areas had flooded roads and basements. Two people were rescued from the water in Perry County. Shermans Creek overflowed its banks cresting at 10.5 feet on the morning of the 11th.		
1/8/1998	Flash Flood	$0
4/19/1998	Flash Flood	$0
1/23/1999	Flash Flood	$5000
8/20/1999	Flash Flood	$500000
Heavy rain fell in a band from eastern Juniata County northeast across Selinsgrove and Lewisburg to Muncy. Rainfall totals of 8 to 9 inches were reported in the Richfield area. Several trailers were washed away, 30 homes and 4 businesses were damaged along with a number of roads and bridges. A nursery lost about $100,000 worth of plants along Mahantango Creek.		
6/20/2001	Flash Flood	$10000
Numerous roads were reported flooded in the town of Walnut, where 4 to 5 inches of rain was observed. 8 to 10 homes had flooded basements. 1 to 2 feet of water was reported on State Route 3019, and Route 35 was closed due to flooding.		
9/17/2004	Flood	$0
3/28/2005	Flood	$0
6/27/2006	Flash Flood	$0

Flood Event History (NOAA NCEI, 2019)		
Date	**Type**	**Property Damage**
Heavy rain associated with a stalled frontal boundary, interacting with the remnants of a weak tropical system, caused flash flooding throughout central and eastern Pennsylvania from June 27 through June 28. While flash flooding ended on the 28th, flood waters continued in some locations until July 1st. In all, the governor signed a Declaration of Disaster Emergency for 46 Pennsylvania counties. 21 Counties were given federal disaster designation status, making them eligible for federal aid. Over 1200 water rescues were performed statewide. Hundreds of roads and bridges were closed during the event. At least 65 bridges were damaged, with an estimated 23 requiring total replacement. The American Red Cross opened 48 shelters statewide which housed more than 2500 people. More than 77,000 meals and snacks through 60 mobile feeding sites were also distributed by the American Red Cross. About 7800 residences were damaged, with between 275,000 and 300,000 voluntary evacuations orders being given. In Juniata County, numerous roads were closed due to flooding.		
3/14/2010	Flood	$0
Heavy rainfall between 1 and 3 inches caused areal flooding at the intersection of Licking Creek, Tuscarora Creek and the Main Stem Juniata River. The flooding was mainly confined to the Port Royal area. The Tuscarora Creek was out of its banks and crested near 14 feet or about 4 feet above flood stage. The flooding closed several secondary roads including Sandbar Road, Locust Grove Road and River Road into Juniata Haven.		
3/10/2011	Flood	$0
West Branch Mahantango Creek flooded Route 35 near Richfield.		
9/9/2011	Flash Flood	$0
Heavy rainfall from the remnants of Tropical Storm Lee produced widespread flooding, flash flooding and river flooding from September 4-10. Several water rescues were reported in Port Royal and along Route 75 outside of town.		
9/27/2011	Flash Flood	$0
Heavy rain caused flash flooding in and around Port Royal. Flooded basements and road closures were reported.		
5/16/2014	Flood	$0
Heavy rainfall in excess of 3 inches produced widespread flooding and multiple road closures. The flooding prompted 2 water rescues for a stranded motorist on Smith Road and individual trapped in camper at Tuscarora Creek Campground. The following roads were closed due to high water or mudslide in Walker, Tuscarora, Turbett, Susquehanna, Spruce Hill, Monroe, Milford, Lack, Fermanagh, Fayette, Delaware and Beale Townships: SR 35 Village of Nook to Walnut, Groninger Valley Road, Route 333 at Goodville Road, Foundry Road, SR 35 (Oakland Mills), SR 35 (Foundry Road), Whitehall Road, Apple Road, Cuba Mills at Horningtown Road, Fermanagh Woodside Road, Patterson Road, Trego Road, Campbell Hollow Road, Rhine Hollow Road, Shearer Hollow Road, Licking Creek Road, Hammer Hollow Road Locust Grove Road, and Dresslers Ridge Road at Quaker Run.		

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 in-creased 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. As of September 30, 2018, there are twenty

repetitive loss properties and zero severe repetitive loss properties in Juniata County. This is the same as the total from 2015 when there were also twenty repetitive loss properties and no severe repetitive loss properties.

All municipalities in Juniata County participate in the NFIP. Information on each participating municipality is located in *Table 22 - Municipal NFIP Policies & Vulnerability*.

Table 21 - Repetitive Loss Properties

Repetitive Loss Properties *(PEMA, September 30 2018)*					
Community Name	**Comm. Num**	**Building Payments**	**Contents Payments**	**Losses**	**Properties**
Delaware Township	421739	$ 18,291.66	$0	2	1 Residential
Fermanagh Township	420517	$ 97,868.78	$ 14,438.75	12	6 Residential
Mifflin Borough	420518	$ 14,111.90	$ 2,072.76	3	1 Residential
Mifflintown Borough	420519	$ 23,431.08	$ 13,007.90	5	1 Residential
Monroe Township	421744	$ 4,009.00	$ 105.00	2	1 Residential
Susquehanna Township	421746	$ 9,744.15	$ 550.00	4	2 Non-Res
Thompsontown Borough	420521	$ 4,621.13	$0	2	1 Residential
Turbett Township	420522	$ 86,501.27	$ 19,524.72	7	3 Residential
Tuscarora Township	422452	$ 13,135.01	$ 4,053.80	4	2 Residential
Walker Township	420523	$ 68,388.69	$ 15,469.02	5	2 Residential
Total		**$340,102.67**	**$69,221.95**	**46**	**18 Residential 2 Non-Res**

Table 22 - Municipal NFIP Policies & Vulnerability

Municipal NFIP Policies & Vulnerability *(PEMA, 2018; Juniata Co. GIS, 2019)*					
Community Name	**Comm. Num.**	**Losses**	**Active Contracts**	**Vulnerable Buildings**	**Vulnerable Critical Facilities**
Beale Township	421738	2	1	0	0
Delaware Township	421739	13	15	49	2
Fayette Township	422629	6	17	180	3
Fermanagh Township	420517	31	32	179	3
Greenwood Township	421741	1	4	28	0
Lack Township	421742	0	1	8	0
Mifflin Borough	420518	19	13	149	3
Mifflintown Borough	420519	4	2	20	0
Milford Township	421743	2	9	62	0
Monroe Township	421744	6	7	58	0
Port Royal Borough	420520	20	6	33	2
Spruce Hill Township	421745	1	2	16	1
Susquehanna Township	421746	9	4	14	0

Municipal NFIP Policies & Vulnerability *(PEMA, 2018; Juniata Co. GIS, 2019)*					
Community Name	**Comm. Num.**	**Losses**	**Active Contracts**	**Vulnerable Buildings**	**Vulnerable Critical Facilities**
Thompsontown Borough	420521	4	3	24	0
Turbett Township	420522	28	8	26	0
Tuscarora Township	422452	15	3	47	0
Walker Township	420523	46	32	110	1
Total		**207**	**159**	**1,003**	**15**

4.3.3.4 Future Occurrence

Table 23 - 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%

Flooding is a frequent problem throughout Pennsylvania. Juniata County will certainly be impacted by flooding events in the future – Juniata 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 storm water culverts and bridge openings. The NFIP recognizes the 1%-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 1%-annual-chance flood is a flood which has a 1% 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 1% 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 23 - Flood Probability Summary*.

4.3.3.5 Vulnerability Assessment

Juniata 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 22 - Municipal NFIP Policies & Vulnerability identifies how many structures located in the special flood hazard area by municipality using county GIS data. Critical facilities are facilities that if damaged would present an immediate threat to life, public health and safety. Appendix D of this hazard mitigation plan includes a flooding vulnerability map for each municipality in Juniata County with vulnerable structures and critical facilities identified. There are fifteen critical facilities within the special flood hazard area, including five SARA Tier II facilities, suggesting hazardous material release is a potential problem in the event of a significant flooding event (see *Table 24 - Flood Vulnerable Critical Facilities*). During the review of the SFHA with each municipality during the municipal mitigation strategy meetings, MCM stressed that mitigation actions and mitigation project opportunities should be developed to decrease the impact of flooding to the critical facilities, functional needs facilities, commercial and residential structures. The municipal flood maps were utilized to assist with this discussion and analysis.

Flash Flooding

Locations that have experienced flash flooding in the past are identified on *Figure 16 - Flooding Vulnerability*. This is not an exhaustive list of regions prone to flash flooding but indicate regions with known susceptibility.

Ice Jam

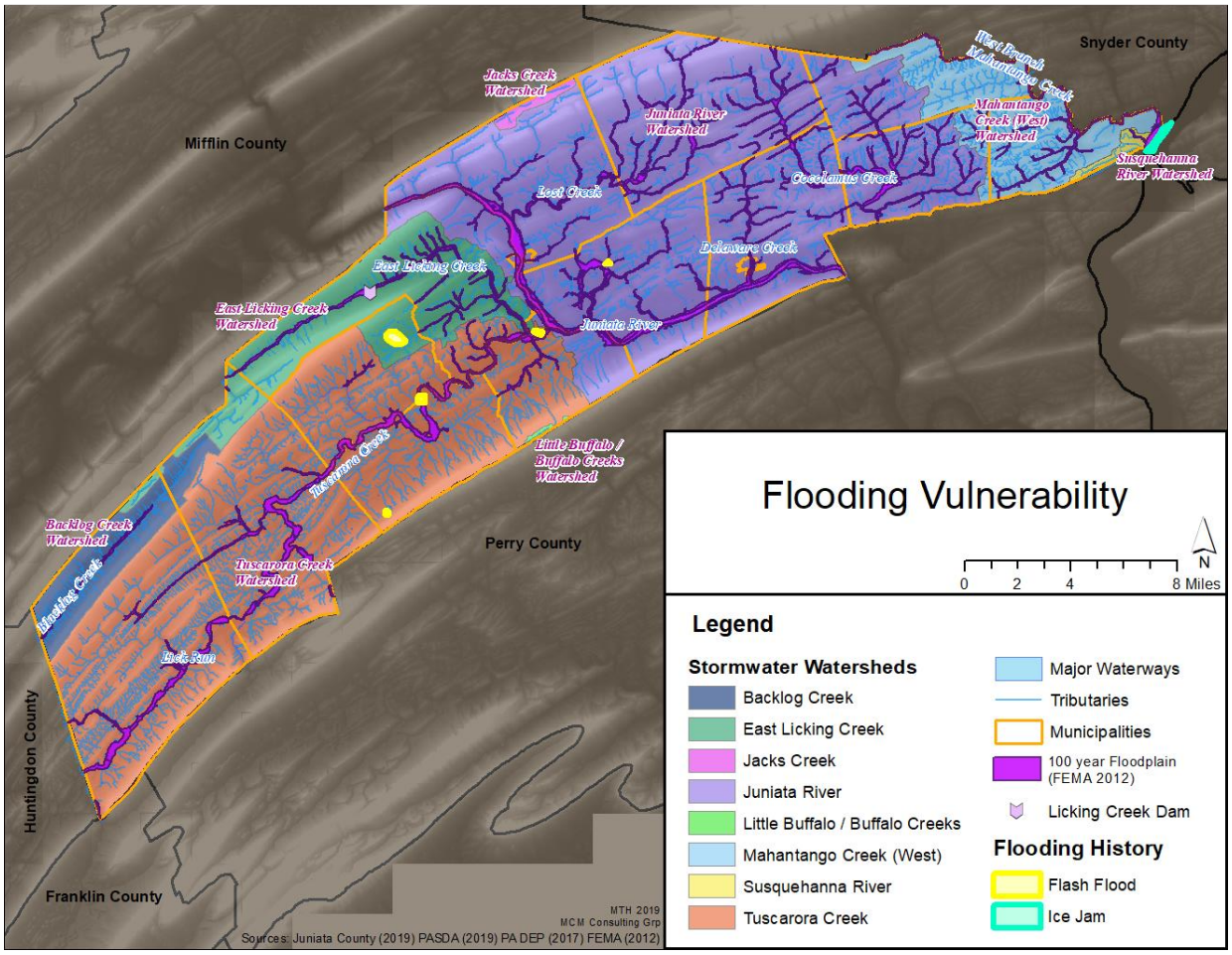
The only notable recorded incident involving ice jam flooding in Juniata County occurred on the Susquehanna River which flows through the eastern tip of the County as seen in *Figure 16 - Flooding Vulnerability*.

Table 24 - Flood Vulnerable Critical Facilities

Flood Vulnerable Critical Facilities ***(PEMA, 2018; Juniata Co. GIS, 2019)***			
Type	**Name**	**Address**	**Municipality**
Fire Department	Delaware Twp Fire & Equip - Thompsontown Fire Company	224 East Salem Rd	Delaware Township
Fire Department	Fayette Fire Company - Mcalisterville	461 Main St	Fayette Township
Fire Department	Mifflin Fire Dept - Mifflin Fire Annex	24 Main St	Mifflin Borough
Health Care Facility	Assisted Living & Retirement Village	92 Village Dr	Fermanagh Township
Heliport	Kint Farm Heliport	26370 Rt 75 N	Walker Township
Large Fueling Station	Dean's Store	28516 Rt 35 N	Fayette Township
SARA Tier II	Thompsontown Municipal Authority	21720 Rt 333	Delaware Township
SARA Tier II	Windstream Paetec Mifflin Switch - Windstream Communications Inc	155 Railroad Ave	Mifflin Borough
SARA Tier II	Twin Boroughs Sanitary Authority	17 River Dr	Mifflin Borough

Flood Vulnerable Critical Facilities *(PEMA, 2018; Juniata Co. GIS, 2019)*			
Type	**Name**	**Address**	**Municipality**
SARA Tier II	Port Royal Municipal Authority - Pennsafe	264 Losch Ln	Port Royal Borough
SARA Tier II	Shipley Energy - Port Royal Bulk Plant	10541 Rt 333	Port Royal Borough
School	Amish School - Fegley William	140 Billyville Rd	Fayette Township
School	Big Run School (Historical)	0 Big Run Rd	Fermanagh Township
School	Arch Rock School	745 Arch Rock Rd	Fermanagh Township
School	Spruce Hill School	20479 Rt 75 S	Spruce Hill Township

Figure 16 - Flooding Vulnerability



4.3.4. Invasive Species

4.3.4.1 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 phenomena 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 the history of the Earth. 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 (PA DOA, 2010):

- 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 25 - Prevalent Invasive Species* lists invasive species that have been found in Juniata County.

4.3.4.2 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 Juniata County, can clog waterways and smother native aquatic plants and animals.

Invasive species can be troubling pests to farmers, and can result in decreased yields, thus posing an economic threat to agriculture production. The brown marmorated stink bug can be a nuisance to those farming fruit trees. Waterhemp is a type of pigweed

native to the Great Lakes region which is not yet found in Juniata County. Waterhemp is a concern for field crop farmers, especially as it displays resistance to common herbicides.

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. The Emerald Ash Borer has already become established in Juniata County and the surrounding region, and there is a high mortality rate for trees associated with this pest. In recent years, hardwood forests in the county have been increasingly negatively impacted due to this invasive species and there have been many ash tree fatalities. The death of these trees can degrade forest health which 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 recent problem species for the region is the spotted lanternfly (*Locroma delicatula*). The pest will feed on many host plants, including pine, oak, walnut, poplar, willow, maple poplar and sycamore trees as well as many fruit trees including apples, peaches and other stone fruits. In addition to damaging plants as a result of feeding on them, the feeding scars can cause the plant to ooze, and the spotted lanternfly also excrete significant amounts of fluid (called honeydew) on their host plants. These fluids attract other pests to the plant, such as other insects and mold (APHIS, 2014). Considering the vulnerability of fruit trees to this pest, the continued spread of the spotted lanternfly could result in economic losses from agriculture in Pennsylvania. There are also a couple wineries and small commercial growers of grapes and hops in Juniata, both of which are also vulnerable to spotted lanternfly infestation. With the threat that the spotted lanternfly poses to tree species, the large timber industry could also suffer if the lanternfly becomes more prominent.

4.3.4.3 Past Occurrence

Invasive species have been entering Pennsylvania since the arrival of European settlers. There are large swatches of forests and other natural areas in Juniata County, including portions of the Tuscarora State Forest and several State Game Lands. There are many invasive plants that are widespread in Juniata County that are common problems throughout the Commonwealth, some of the most problematic include:

- Garlic Mustard
- Japanese Stiltgrass
- Multiflora Rose
- Japanese Barberry
- Mile-A-Minute Vine

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 Juniata 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, and these species are widespread in Juniata County and the surrounding region. 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 – most of the ash trees in Juniata County have already fallen prey to this pest. However, efforts can be made to limit the spread and mitigating the negative impacts of such widespread invasive species. In the case of the Emerald Ash Borer 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 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 25 - Prevalent Invasive Species lists problematic non-native species that are established in Juniata County. While all species listed here are not native to Juniata County and the surrounding region, those species highlighted in green are considered to pose a larger ecological threat than some of the others (see 4.3.4.5. Vulnerability Assessment for additional discussion). For some species such as the Spotted Lanternfly (or Lycorma), Juniata 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 - Vulnerable Species*).

The Spotted Lanternfly is native to Asia and was first detected in Berks County Pennsylvania in September of 2014. The pest has spread quickly, becoming a problem infestation emanating from south-eastern Pennsylvania. On February 7, 2018, the U.S. Department of Agriculture allocated $17.5 million in emergency funding to work towards stopping the spread of the Spotted Lanternfly (USDA, 2018). Initial efforts were focused on reducing populations of spotted lanternfly in the core of the infested area and stopping the spread of that core infestation. Despite efforts, the pest has continued to spread, and from December 2018 to April 2019, the quarantine area has expanded to include neighboring Dauphin County. The spotted lanternfly has been found within Juniata County; however, it is not yet a well-established infestation (see *Figure 17 - Spotted Lanternfly Distribution*). As such the spotted lanternfly is a priority for control in Juniata County.

Table 25 - Prevalent Invasive Species

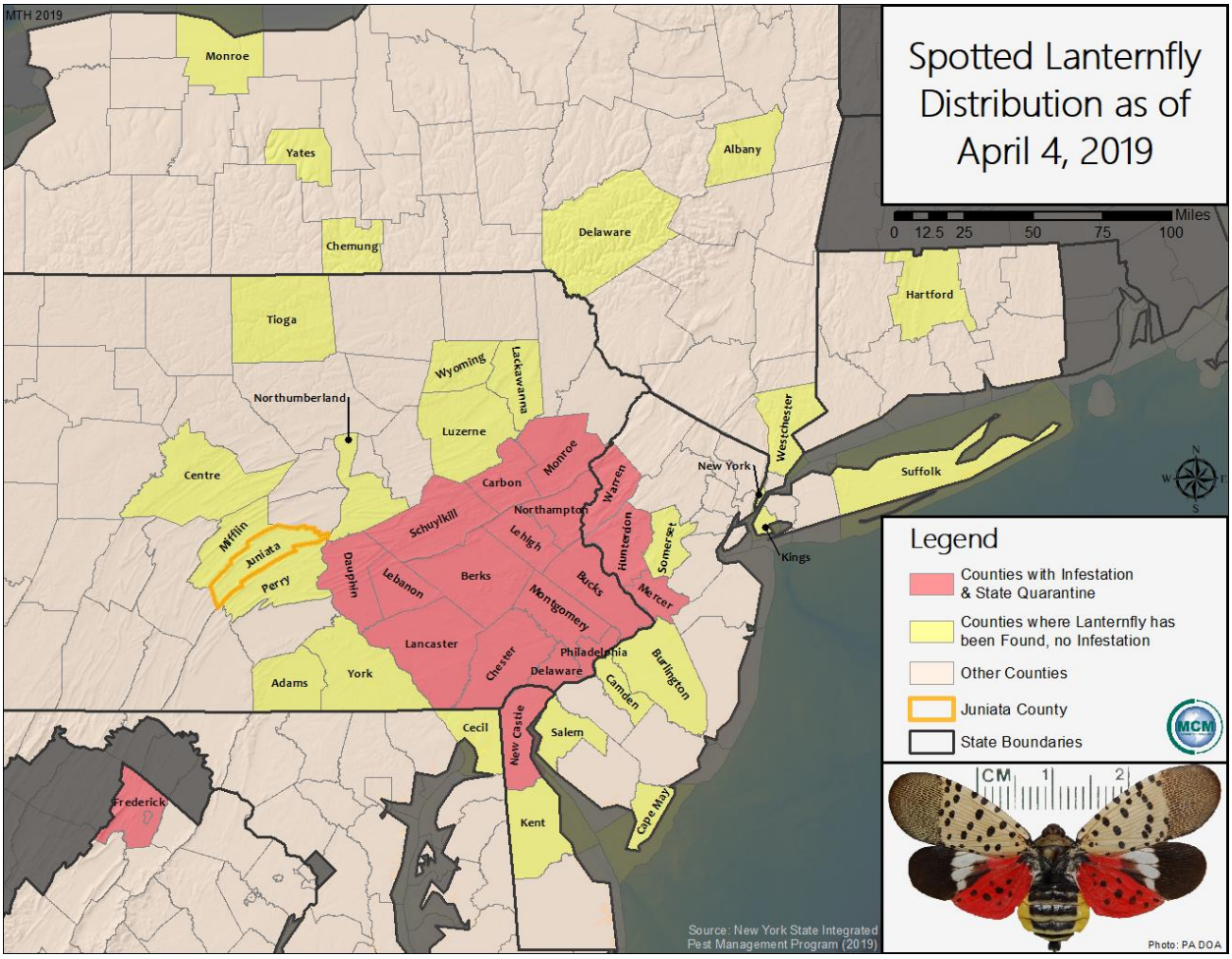
Prevalent Species *(EDDMaps, 2019; PA DCNR, 2019; USDA FS, 2019; iMapInvasives, 2019)*		
Scientific Name	**Common Name**	**Type**
Cyprinus carpio	Common Carp	Aquatic Animal
Etheostoma blennioides	Greenside Darter	Aquatic Animal
Orconectes rusticus	Rusty Crayfish	Aquatic Animal
Corbicula fluminea	Asiatic Clam	Aquatic Animal
Persicaria hydropiper	Marshpepper Knotweed, Smartweed	Aquatic Plant
Mentha aquatica	Water Mint	Aquatic Plant
Potamogeton crispus	Curly-Leaf Pondweed	Aquatic Plant
Nasturtium officinale	Watercress	Aquatic Plant
Cryphonectria parasitica	Chestnut Blight	Disease
Fiorinia externa	Elongate Hemlock Scale	Disease
Sirococcus clavigignenti-juglandacearum	Butternut Canker	Disease

Prevalent Species (EDDMaps, 2019; PA DCNR, 2019; USDA FS, 2019; iMapInvasives, 2019)		
Scientific Name	**Common Name**	**Type**
Discula destructiva	Dogwood Anthracnose	Disease
Ceratocystis fagacearum	Oak Wilt	Disease
Cronartium ribicola	White Pine Blister Rust	Disease
Hylastes opacus	European Bark Beetle (H. Opacus)	Insect
Plagiodera versicolora	Imported Willow Leaf Beetle	Insect
Coleophora laricella	Larch Casebearer	Insect
Halyomorpha halys	Brown Marmorated Stink Bug	Insect
Malacosoma disstria	Forest Tent Caterpillar	Insect
Choristoneura conflictana	Large Aspen Tortrix	Insect
Tomicus piniperda	Pine Shoot Beetle	Insect
Agrilus planipennis	Emerald Ash Borer	Insect
Lymantria dispar	Gypsy Moth	Insect
Popillia japonica	Japanese Beetle	Insect
Lycroma delicatula	Spotted Lanternfly (Lycorma)	Insect
Adelges tsugae	Hemlock Woolly Adelgid	Insect
Agrostis capillaris	Colonial Bentgrass	Plant
Arctium minus	Common Burdock, Lesser Burdock	Plant
Clematis terniflora	Japanese Virgin's-Bower	Plant
Acer platanoides	Norway Maple	Plant
Commelina communis	Asiatic Dayflower	Plant
Bromus racemosus	Bald Brome	Plant
Solanum dulcamara	Bittersweet Nightshade, Climbing Night-shade	Plant
Silene latifolia ssp. alba	Bladder Campion	Plant
Lonicera spp.	Bush Honeysuckles (Exotic)	Plant
Cirsium arvense	Canada Thistle	Plant
Bromus tectorum	Cheatgrass	Plant
Cichorium intybus	Chicory	Plant
Securigera varia	Common Crown-Vetch	plant
Cerastium fontanum	Common Mouse-Ear Chickweed	Plant
Echium vulgare	Common Viper's Bugloss	Plant
Veronica arvensis	Corn Speedwell	Plant
Lysimachia nummularia	Creeping Yellow Loosestrife, Creeping Jen-ney	Plant
Rumex crispus ssp. crispus	Curly Dock	Plant
Bromus arvensis	Field Brome	Plant
Datura stramonium	Jimsonweed	Plant

Prevalent Species (EDDMaps, 2019; PA DCNR, 2019; USDA FS, 2019; iMapInvasives, 2019)		
Scientific Name	**Common Name**	**Type**
Festuca pratensis	Meadow Fescue	Plant
Persicaria perfoliata	Mile-A-Minute Vine	Plant
Lonicera morrowii	Morrow's Honeysuckle	Plant
Hieracium aurantiacum	Orange Hawkweed	Plant
Celastrus orbiculatus	Oriental Bittersweet	Plant
Polygonum posumbu	Oriental Lady's Thumb	Plant
Polygonum lapathifolium	Pale Smartweed	Plant
Conium maculatum	Poison Hemlock	Plant
Capsella bursa-pastoris	Shepherd's-Purse	Plant
Bromus inermis	Smooth Brome	Plant
Centaurea stoebe ssp. micranthos	Spotted Knapweed	Plant
Eragrostis cilianensis	Stinkgrass	Plant
Potentilla recta	Sulfur Cinquefoil	Plant
Hemerocallis fulva	Tawny Daylily	Plant
Dipsacus spp.	Teasel	Plant
Arenaria serpyllifolia	Thymeleaf Sandwort	Plant
Veronica serpyllifolia ssp. serpyllifolia	Thymeleaf Speedwell	Plant
Phleum pratense	Timothy	Plant
Ailanthus altissima	Tree-Of-Heaven	Plant
Sisymbrium altissimum	Tumble Mustard	Plant
Abutilon theophrasti	Velvetleaf	Plant
Hibiscus trionum	Venice Mallow	Plant
Lepidium virginicum	Virginia Pepperweed	Plant
Hylotelephium telephium ssp. telephium	Witch's Moneybags	Plant
Barbarea vulgaris	Yellow Rocket	Plant
Medicago lupulina	Black Medic	Plant
Saponaria officinalis	Bouncingbet	Plant
Rumex obtusifolius	Broadleaf Dock	Plant
Veronica officinalis	Common Speedwell	Plant
Hypericum perforatum	Common St. Johnswort	Plant
Dipsacus fullonum	Common Teasel	Plant
Hesperis matronalis	Dames Rocket	Plant
Alliaria petiolata	Garlic Mustard	Plant
Berberis thunbergii	Japanese Barberry	Plant
Lonicera japonica	Japanese Honeysuckle	Plant

Prevalent Species *(EDDMaps, 2019; PA DCNR, 2019; USDA FS, 2019; iMapInvasives, 2019)*		
Scientific Name	**Common Name**	**Type**
Microstegium vimineum	Japanese Stiltgrass	Plant
Verbascum blattaria	Moth Mullein	Plant
Rosa multiflora	Multiflora Rose	Plant
Lythrum salicaria	Purple Loosestrife	Plant
Rumex acetosella	Red Sorrel	Plant
Phalaris arundinacea	Reed Canarygrass	Plant
Trifolium repens	White Clover	Plant
Melilotus officinalis	Yellow Sweet-Clover	Plant
Linaria vulgaris	Yellow Toadflax	Plant

Figure 17 - Spotted Lanternfly Distribution



4.3.4.4 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 nonnative 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 of 2010, and updated the plan in 2017, re-enacting the council. 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 at invasivespeciescouncil.com.

There are several invasive species that are found near Juniata County but have not yet been detected inside the county (see *Table 26 - 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. Japanese Knotweed, Waterhemp, the Birch Leafminer, Mimosa Webworm and Beech Bark Disease Complex are all widespread and highly problematic in nearby counties but have not been reported in Juniata. Juniata 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 Plants" (PA DCNR, 2016).

Table 26 - 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
Myriophyllum spicatum	Eurasian water-milfoil	Aquatic Plant
Veronica anagallis-aquatica	Water Speedwell	Aquatic Plant
Neonectria (N.) & Cryptococcus fagisuga	Beech Bark Disease Complex	Disease
Ophiostoma novo-ulmi	Dutch Elm Disease	Disease
Carulaspis juniperi	Juniper Scale	Disease

Vulnerable Species (EDDMaps, 2019; PA DCNR, 2019; USDA FS, 2019; iMapInvasives, 2019)		
Scientific Name	**Common Name**	**Type**
Phytophthora cinnamomi	Littleleaf Disease/ Phytophthora Root Rot	Disease
Anoplophora glabripennis	Asian long-horned beetle	Insect
Scolytus schevyrewi	Banded Elm Bark Beetle	Insect
Fenusa pusilla	Birch Leafminer	Insect
Dryocosmus kuriphilus	Chestnut Gall Wasp	Insect
Adelges abietis	Eastern Spruce Gall Adelgid	Insect
Contarinia baeri	European Pine Needle Midge	Insect
Epinotia nanana	European Spruce Needleminer	Insect
Diprion smilis	Introduced Pine Sawfly	Insect
Pristiphora erichsonii	Larch Sawfly	Insect
Homadaula anisocentra	Mimosa Webworm	Insect
Asterolecanium minus	Oak Pit Scale A. Minus	Insect
Lepidosaphes ulmi	Oystershell Scale	Insect
Caliroa cerasi	Pear Sawfly	Insect
Acantholyda erythrocephala	Pine False Webworm	Insect
Sirex noctilio	Sirex Woodwasp	Insect
Scolytus multistriatus	Smaller European Elm Bark Beetle	Insect
Lycroma delicatula	Spotted Lanternfly (lycorma)	Insect
Lonicera maackii	Amur honeysuckle	Plant
Elaeagnus umbellata	Autumn Olive	Plant
Lonicera spp. (species unknown)	Bush Honeysuckle (species unknown)	Plant
Phragmites australis ssp. australis	European common reed	Plant
Heracleum mantegazzianum	Giant Hogweed	Plant
Reynoutria japonica	Japanese Knotweed	Plant
Acorus calamus	Sweetflag, Calamus	Plant
Cardamine impatiens	Touch-me-not Bittercress	Plant
Amaranthus tuberculatus	Waterhemp	Plant
Iris pseudacorus	Yellow Iris	Plant

4.3.4.5 Vulnerability Assessment

Juniata 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 are state forests, and game lands in Juniata County where forest managers can impact invasive species, private lands can provide refuge for invasive species if land-owners are unaware of or apathetic towards the threat.

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

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: 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 green in *Table 25 - Prevalent Invasive Species* and *Table 26 - Vulnerable Species* have been species that have been considered priority species throughout Pennsylvania. Priority species of note for Juniata County include the Spotted Lanternfly, Multiflora Rose, and Japanese Stiltgrass.

Furthermore, 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 Juniata County but are not yet present in the county (priority species in *Table 26 - 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. Juniata 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. Other species that are a priority for prevention include Japanese Knotweed, Waterhemp, the Birch Leafminer, Mimosa Webworm, and the Beech Bark Disease Complex.

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.

4.3.5. Pandemic and Infectious Disease

4.3.5.1 Location and Extent

Pandemic & Epidemic

Pandemic is a widespread outbreak of infectious disease that impacts an extensive region, potentially spanning continents and having global impacts. An epidemic also refers to an outbreak of a rapidly spreading infectious disease but is more regional and less widespread than a pandemic. 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 Juniata County would likely be affected. Strains of influenza, or the flu 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 county 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). For this reason, influenza is a primary concern regarding pandemic and infectious disease in Juniata County.

Studies after the 2009 H1N1 influenza pandemic disproportionately impacted people younger than 24 (CIDRAP, 2010). Schools have potential to become outbreak centers due to their large young adult population, 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.

Infectious Disease

West Nile Virus has been detected in all sixty-seven counties in the Commonwealth at least once in the past ten years, making it a hazard to Juniata County. The disease is commonly spread by ticks or insects such as the mosquito. West Nile causes headaches, high fever, neck stiffness, disorientation, tremors, convulsions, muscle weakness, paralysis, and death in its most serious form. Blacklegged ticks in Juniata County can

also spread Lyme disease, a bacterial disease with symptoms including fever, headaches and a characteristic skin rash (erythema migrans). Untreated, Lyme disease can spread to joints, the heart and the nervous system (CDC, 2016).

The Zika Virus is another infectious disease that is spread by mosquito bites, and 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 public 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.

4.3.5.2 Range of Magnitude

Pandemic

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 worldwide, and many people infected with Swine flu in 2009 have 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. Such high-risk populations are discussed in more detail in Section 4.3.5.5.

Infectious Disease

West Nile Virus originated in regions of East Africa around 1937 but spread globally. In 2012, West Nile Virus caused 286 deaths in the United States. 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.

Each year since 2005, there are consistently well over 3,000 cases of Lyme disease in Pennsylvania, with 6,470 confirmed cases in 2014 (CDC, 2016). While most cases of Lyme disease can be treated with a few weeks of antibiotic use, undetected Lyme disease can seriously damage a body's musculoskeletal and nervous system, sometimes resulting in death. There has been a recent increase in number of annual cases of Lyme disease in Pennsylvania.

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.

4.3.5.3 Past Occurrence

Pandemic & Epidemic

Table 27 - Past Influenza Outbreaks and Pandemics

Past Influenza Outbreaks and Pandemics			
Year/Time Frame	**Common Name**	**Virus Type**	**Geographic Origin**
1889	Russian flu	H2N2 or H3N8	Russia
1918-1920	Spanish flu	H1N1	Germany, Britain, France and the United States
1957-1958	Asian flu	H2N2	China
1968-1969	Hong Kong flu	H3N2	Hong Kong
1976	Swine flu	H1N1	Fort Dix, United States
2006-2008	Avian (Bird) Flu	H5N1	India
2007	Equine flu	H3N8	Australia
2009	Swine Flu	H1N1	Mexico

Influenza outbreaks of Spanish flu, Asian flu, Hong Kong flu and Swine flu caused deaths in the United States and are considered pandemics. The 1918-1920 Spanish flu claimed 50 million lives worldwide and 500,000 in the United States with 350,000 cases in Pennsylvania. The Asian flu caused about 1.5-2 million deaths worldwide with 70,000 deaths in the United States, peaking between September 1957 and March 1958. Approximately fifteen percent of the population of Pennsylvania was affected by Asian flu. The first cases of the Hong Kong flu in the U.S. were detected in September of 1968 with deaths peaking between December 1968 and January 1969 (Global Security, 2009).

The most recent global flu outbreak to impact Juniata County was the 2009 outbreak of Swine flu (H1N1). There were 10,940 cases reported in Pennsylvania resulting in seventy-eight deaths (PA DOH, 2010). There were four confirmed cases of Swine flu in Juniata County.

Infectious Disease

West Nile Virus was first detected in Pennsylvania in the year 2000. The most annual reported cases of West Nile occurred in 2003, with 237 infected Pennsylvanians resulting in nine deaths. Since then, a comprehensive network has been developed in Pennsylvania to detect West Nile Virus, including trapping mosquitoes, collecting dead birds and monitoring horses, people, and in past years, sentinel chickens. West Nile Virus has been detected in fifty-seven of sixty-seven counties in the Commonwealth in 2018, with one human case (PA West Nile Virus Control Program, 2018). West Nile Virus has been detected in Juniata County in twelve of the last eighteen years with one reported human case (See *Table 28 - West Nile Virus Reported Cases*).

Cases of Lyme disease are consistently reported in Juniata County and The Commonwealth at large, and the region has seen a recent spike in cases. Reported cases are summarized in *Table 29 - Lyme Disease Reported Cases* From 2012 to 2016, Juniata County has had an average annual rate of Lyme disease infection of 75 to 150 cases per 100,000 people (see *Table 29 - Lyme Disease Reported Cases*).

From 2015 to May 2018 there have been over 230 cases of Zika virus reported to the Pennsylvania Department of Health (PA DOH). The PA DOH reports that these have been cases where travelers returned from areas where Zika was common, and local transmission of Zika virus has not been identified. Of these cases, 183 were from cases where the symptomatic individual tested positive for Zika virus, 51 cases where asymptomatic individuals tested positive for Zika, and one presumed viremic blood donor case where an individual who had no symptoms at the time of donating blood, but whose blood tested positive for Zika virus (PA HMP, 2018; PA DOH, 2018).

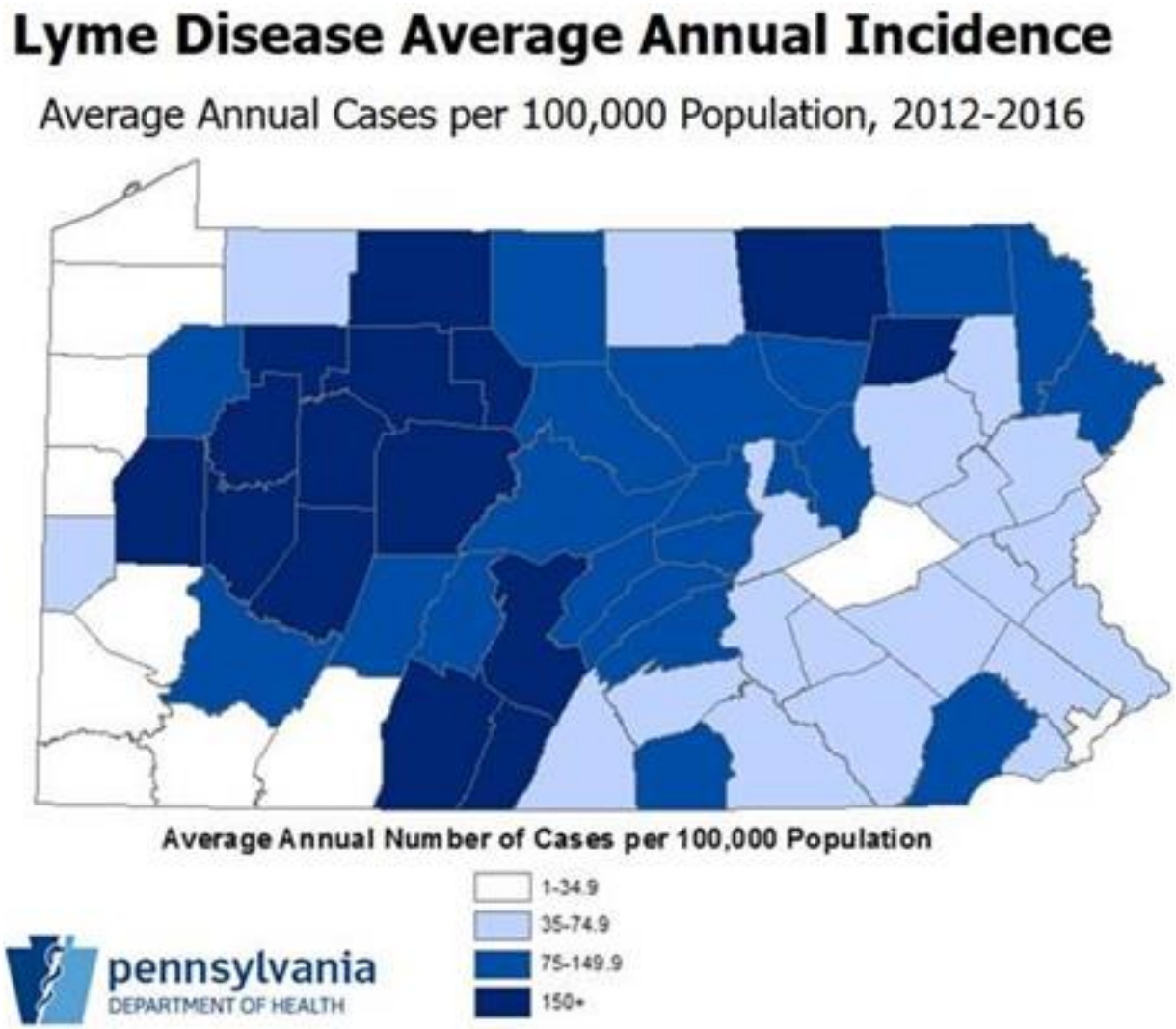
Table 28 - West Nile Virus Reported Cases

West Nile Occurrences *(PAWNVCP, 2018)*							
Year	**Positive Detection**	**Human Cases**	**Deaths**	**Year**	**Positive Detection**	**Human Cases**	**Deaths**
2000				2010			
2001				2011	✓	0	0
2002	✓	0	0	2012	✓	2	0
2003	✓	0	0	2013			
2004	✓			2014	✓		
2005				2015	✓		
2006	✓			2016	✓		
2007				2017	✓		
2008				2018	✓	0	0
2009	✓			**Total**	**12 of 18 years**	**2**	**0**

Table 29 - Lyme Disease Reported Cases

Lyme Disease Reported Cases (CDC, 2019)							
Year	**Number of Cases**	**Year**	**Number of Cases**	**Year**	**Number of Cases**	**Year**	**Number of Cases**
1980	0	1990	4	2000	0	2010	10
1981	0	1991	*	2001	0	2011	24
1982	0	1992	*	2002	*	2012	22
1983	0	1993	*	2003	*	2013	39
1984	0	1994	*	2004	*	2014	31
1985	0	1995	0	2005	0	2015	19
1986	0	1996	0	2006	*	2016	26
1987	0	1997	0	2007	*		
1988	0	1998	0	2008	6		
1989	*	1999	0	2009	14	**Total**	**~215**

Figure 18 - Lyme Disease Average Annual Incidence



4.3.5.4 Future Occurrence

Pandemic & Epidemic

The precise timing of pandemic influenza is uncertain, but occurrences are most likely when the Influenza Type A virus makes a dramatic change, or antigenic shift, that results in a new or "novel" virus to which the population has no immunity. The emergence of a novel virus is the first step towards pandemic, and based on historical events, is expected to occur every eleven to forty-one years. In the event of an influenza pandemic, colleges and universities can plan an integral role in protecting the health and safety of university members as well as the greater community.

In response to the 2009 H1N1 pandemic, the American College Health Association (ACHA) initiated a pandemic influenza surveillance project entitled the College Health Surveillance Network (CHSN) to gain an understanding of the influenza activity on college campuses. Epidemiologic data on novel H1N1 flu suggested significant risk among those in the college setting. Interested institutions of higher education voluntarily submitted data on a weekly basis regarding the number of new cases of influenza-like illnesses, and ACHA began reporting on the availability of the vaccine, along with the success uptake rate. This information was provided to the CDC, public health officials, and other college health professionals in an effort to continue assisting with tracking national vaccine trends. The H1N1 surveillance project was an important milestone for college health. Through the efforts of ACHA's national office and participating schools, the project resulted in an accurate representation of the epidemiology of the H1N1 outbreak on college campuses nationally. The data holds valuable lessons learned from the 2009 H1N1 outbreak.

Infectious Disease

Instances of West Nile Virus have been decreasing due to extensive planning and eradication efforts. The rise of Zika virus has also triggered enhanced mosquito control and general caution around mosquito borne viruses, resulting in generally successful control of Zika in Pennsylvania and fewer cases of West Nile Virus in recent years. The prospect of climate change however could increase the prevalence of mosquito borne viruses. Some studies show increased insect activities in some ecosystems 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, increasing the risk that the disease poses (Harrigan et al., 2014).

Lyme disease has become increasingly prevalent in recent years and is expected to continue this trend. Researchers point to climate change among other factors that bolster tick populations (Templeton, 2017). Ticks often use mice as hosts, and warmer winters have allowed small rodents such as mice to flourish, and in turn tick populations flourish. Human activity has also eliminated natural predators (like coyote) of small rodents, compounding the problem. Human suppression of natural fires may also increase the prevalence of ticks as fires in natural areas kills many insects including ticks, so fewer fires yields more ticks (Templeton, 2017).

4.3.5.5 Vulnerability Assessment

Certain groups are at higher risk of infectious disease infection, including people 65 years and older, children younger than five years, pregnant women, and people with certain chronic medical conditions. Such conditions include but are not limited to diabetes, heart disease, asthma, and kidney disease. Schools, convalescent centers, and

other institutions serving those younger than five years old and older than sixty-five are locations that are conducive to faster transmission of influenza. More generally, areas with higher population densities and places where people gather can be hotspots where influenza can spread more rapidly. *Figure 19 - Pandemic & Infectious Disease Vulnerability* shows the population density according to 2010 census data and locations of schools, daycares and health care facilities, shedding light on areas where the disease may more readily spread. The highest concentration of elevated-transmission risk locations in Juniata County such as schools and medical facilities are found in the Mifflin Borough, Mifflintown Borough and Port Royal Borough areas.

There are no hospitals located within Juniata County, so if an influenza outbreak impacted the county, residents would have to rely on facilities in neighboring Lewistown, State College, Harrisburg or Carlisle. The number of chickens and dairy cows outweigh the human population of Juniata County, therefore any virus that was to gain a foothold in these animals may present a threat to the residents of the county. Additionally, the transportation of animals into and out of the county could present a method of transmission for viruses.

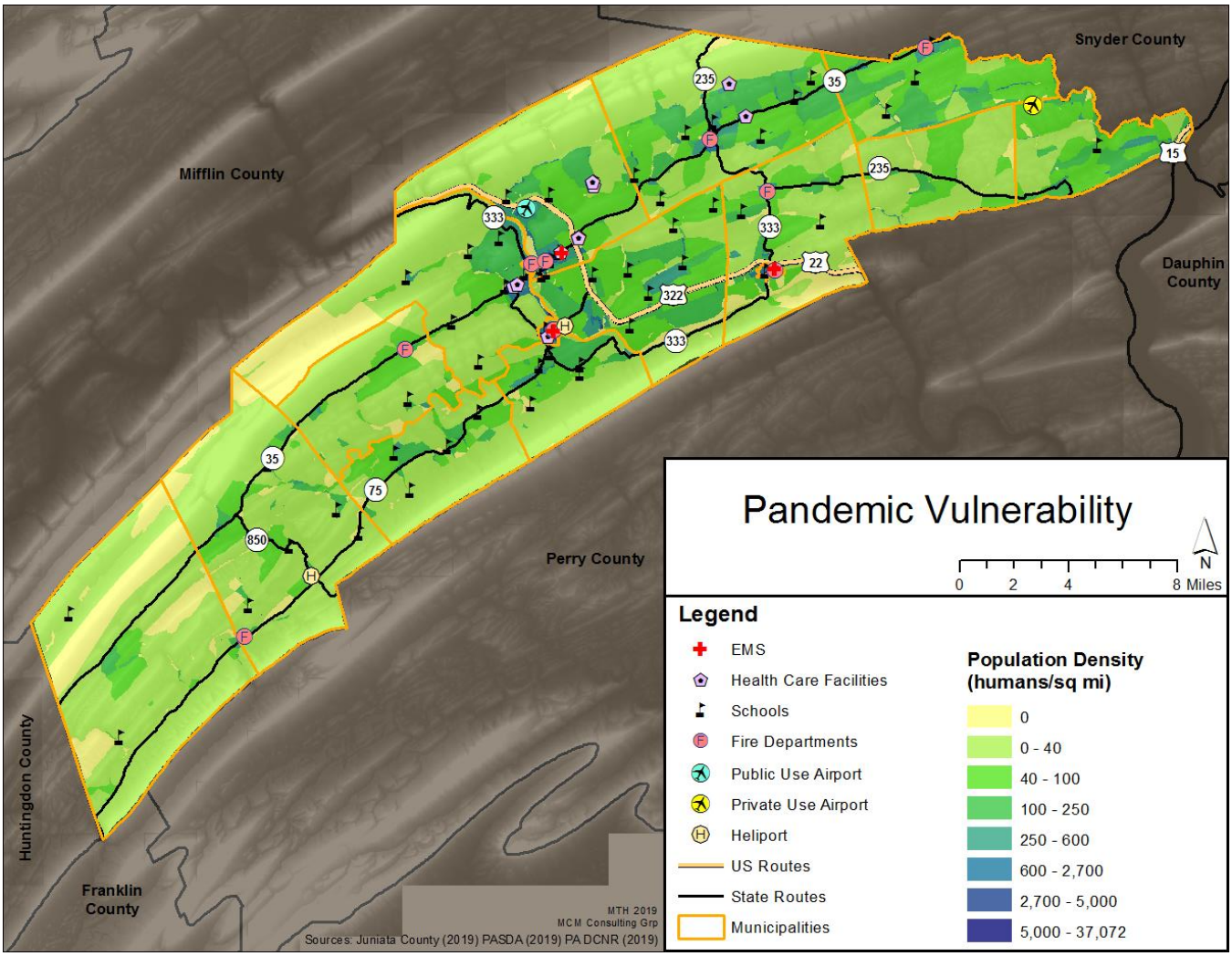
Persons who spend time in wooded areas are most at risk for contracting Lyme disease via tick bite. The application of tick repellent with DEET or permethrin is highly recommended. Residents should conduct thorough tick checks after spending time in woodland areas and keep on the lookout for the characteristic “bulls-eye” rash indicative of a tick bite infected with Lyme disease. Thanks to successful public awareness campaigns and prevention efforts, Zika virus has not become widespread in the United States. While cases the virus has been reported in Pennsylvania, local transmission risk remains rather low.

A pandemic will last much longer than most public health emergencies and may include waves of influenza activity separated by months – it has been typical for a second wave of influenza activity to occur 3 to 12 months after the first wave of cases. The number of healthcare workers and first responders available to work will likely be reduced – they will be at high risk of illness from exposure in the community and in healthcare settings. Some may miss work to care for ill family members, and resources in many locations could become limited, depending on the severity and spread 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 (HHS) supports the pandemic influenza activities in the areas of surveillance (detection), vaccine development and production, strategic stockpiling of antiviral medications, research, and risk communications. In May of 2005, the U.S. Secretary of HHS created a multiagency National Influenza Pandemic Preparedness and Response Task Group. This unified initiative involves the 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.

During a public health emergency, the Pennsylvania Department of Health (PA DOH) opens 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 plan, and preparedness of an Open POD.

Figure 19 - Pandemic & Infectious Disease Vulnerability



4.3.6. Radon Exposure

4.3.6.1 Location and Extent

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 55 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 Juniata 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.

4.3.6.2 Range of 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 nonsmokers. 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 30 - 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 considering fixing a home if the radon level is between 2 pCi/L and 4 pCi/L.

Table 30 - Radon Risk

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
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 between 2 and 4 pCi/L

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
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 cancer	(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	
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.*			

4.3.6.3 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 59% 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 Juniata 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 over-represent 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 Juniata 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 PA DEP records all the tests they receive and categorize them in a searchable database by zip code. *Table 31 - Radon Level Test Results* shows there are nine zip codes in Juniata County where sufficient tests were reported for the PA DEP to report their findings. The highest average radon levels were reported from the 17045 zip code which covers the eastern portion of Susquehanna Township with maximum and average readings of 187 and 20.1 pCi/L respectively. All reporting zip codes in Juniata 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 14.2 pCi/L, and the only reported first floor reading is 17.7 pCi/L in the 17045 zip code.

Table 31 - Radon Level Test Results

Radon Level Test Results ***(PA DEP, 2018)***				
Zip Code	**Location**	**Num of Tests**	**Max Result pCi/L**	**Avg Result pCi/L**
17045	BASEMENT	190	187	20.1
	FIRST FLOOR	37	105.2	17.7
17049	BASEMENT	125	280.4	14.3
17058	BASEMENT	65	33.4	8.8
17059	BASEMENT	335	438.2	15.3
17062	BASEMENT	198	296.5	17.9
17082	BASEMENT	142	86.6	9.4
17086	BASEMENT	56	166.1	12.7
17094	BASEMENT	93	265	16
17853	BASEMENT	60	107	13.6

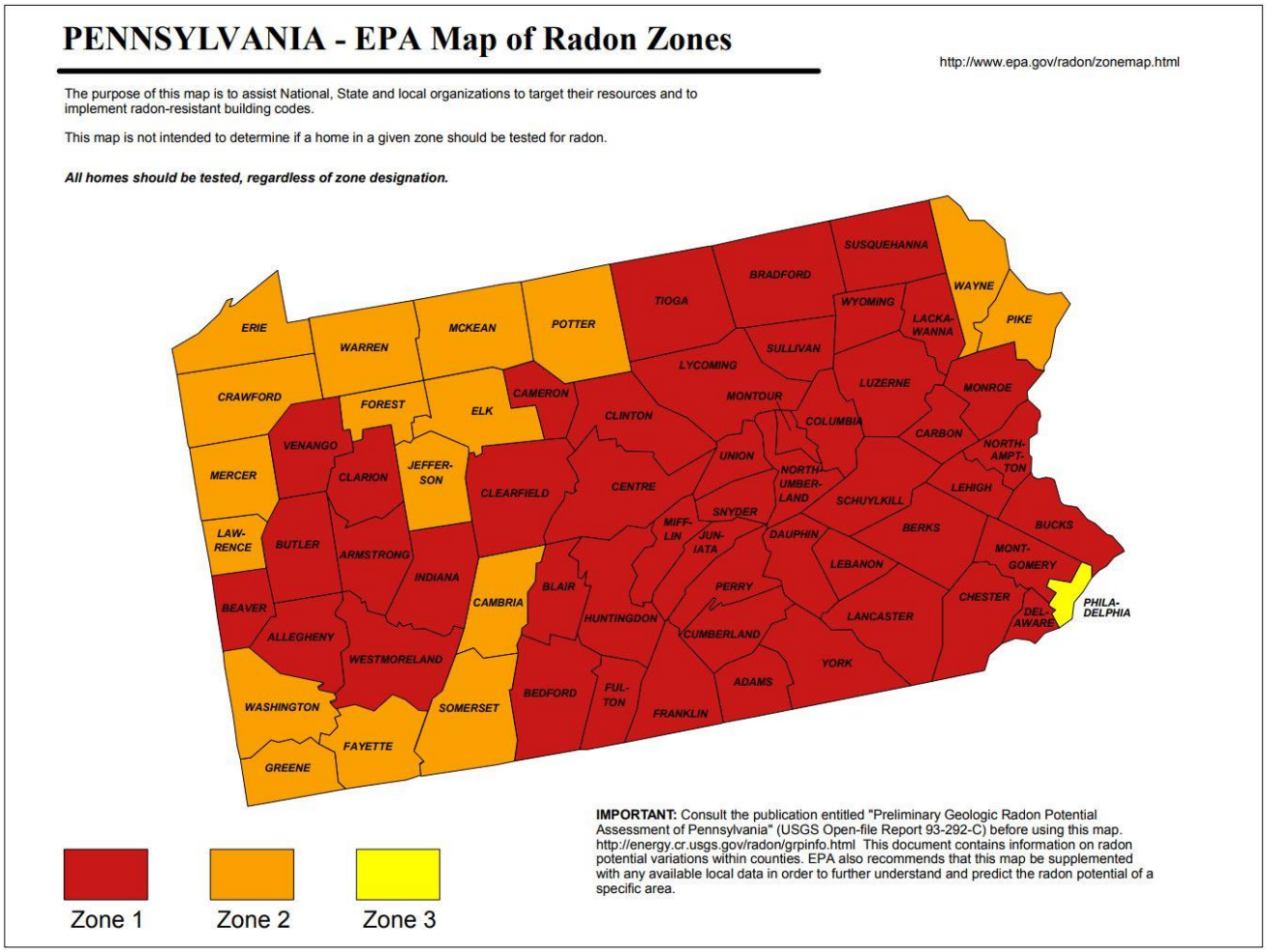
4.3.6.4 Future Occurrence

Radon exposure is inevitable given the geologic and geomorphic conditions in Juniata 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 20 – Radon Zones* (EPA, 2017). Each zone reflects the average short-term measurement of radon that can be expected in a building without radon controls. Juniata County is located within Zone 1, with a high potential for radon.

1. Zone 1 has the highest potential and readings can be expected to exceed the 4 pCi/L recommended limit.

2. Zone 2 has a moderate potential for radon with levels expected to be between 2 and 4 pCi/L and
3. Zone 3 has a low potential with levels expected to be less than 2 pCi/L.

Figure 20 – Radon Zones (EPA, 2017)

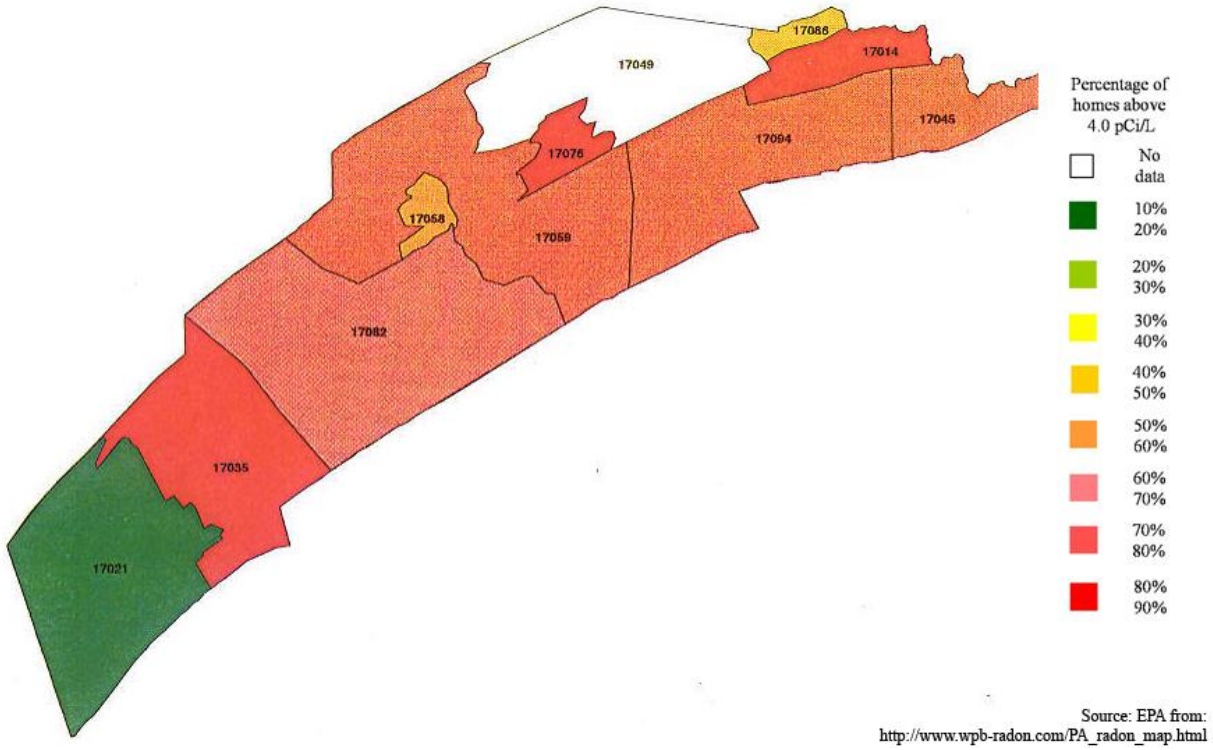


4.3.6.5 Vulnerability Assessment

Juniata County is in the EPA radon hazard zone 1, meaning there is a high 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 20 – 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 Juniata 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 10,842 buildings in Juniata 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 2,168 buildings) would be $2,602,080.

Figure 21 - Radon Vulnerability



4.3.7. Tornado, Windstorm

4.3.7.1 Location and Extent

Tornados 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 67 years, records show that 826 tornados have been reported in all 67 counties in Pennsylvania during the period of 1950 - January 2017 (NOAA NCEI, 2017). The National Weather Service estimates that the Commonwealth will experience ten tornados annually. According to the National Centers for Environmental Information (NCEI), wind speeds in tornados 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 tornados are often confined to extremely small areas and vary tremendously over short distances." This is the reason that one house will be completely demolished by a tornado and the house next to it might be untouched. The width of tornados can vary greatly, from 100 feet wide to over a mile, and the forward motion of tornados can range from speeds between 0 and 50 miles per hour.

Windstorms may be caused by thunderstorms, hurricanes and tornadoes, but the most frequent cause of windstorms in Northeastern Pennsylvania are thunderstorms. Straight-line winds and windstorms are experienced on a more regional scale. While such winds usually also accompany tornados, 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 40 mph or greater, lasting for at least one hour, or simply winds of 58 mph or greater for any duration. 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 100 mph. Wind shear is defined as a difference in wind speed and direction over a relatively short distance in the atmosphere.

Figure 22 - Microburst

The air moves downward until at ground level. It then spreads outward in all directions.

4.3.7.2 Range of Magnitude

Each year, tornados account for $1.1 billion in damages and cause over 80 deaths nationally. 2011 was the second worst year on record for deadly tornados, the worst being 1936. The number of tornado reports has increased by 14% 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.

Rotational wind speeds can range from 100 mph to more than 250 mph. In addition, a tornado's speed of forward motion can range from 0 to 50 mph. Therefore, some estimates place the maximum velocity (combination of ground speed, wind speed, and upper winds) of tornados 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 tornados have rotating winds of 250 miles per hour or more and are capable of causing extreme destruction and turning normally harmless objects into deadly missiles.

Damages and deaths can be especially significant when tornados move through populated, developed areas. The destruction caused by tornados ranges from light to inconceivable depending on the intensity, size and duration of the storm. Typically, tornados 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 tornados into six intensity categories, as shown in, based upon the estimated maximum winds occurring within the wind vortex (*Table 32 - 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 tornados based upon damage to buildings and structures. Previously recorded tornadoes are reported with the older F-Scale values, but *Table 32 - Enhanced Fujita Scale* shows F-Scale categories with corresponding EF-Scale wind speeds.

Figure 23 - Wind Zones described 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. Juniata County falls within Zone III, meaning shelters and critical facilities should be designed to withstand a 3-second gust of up to 200 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 tornados.

Tornados 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.

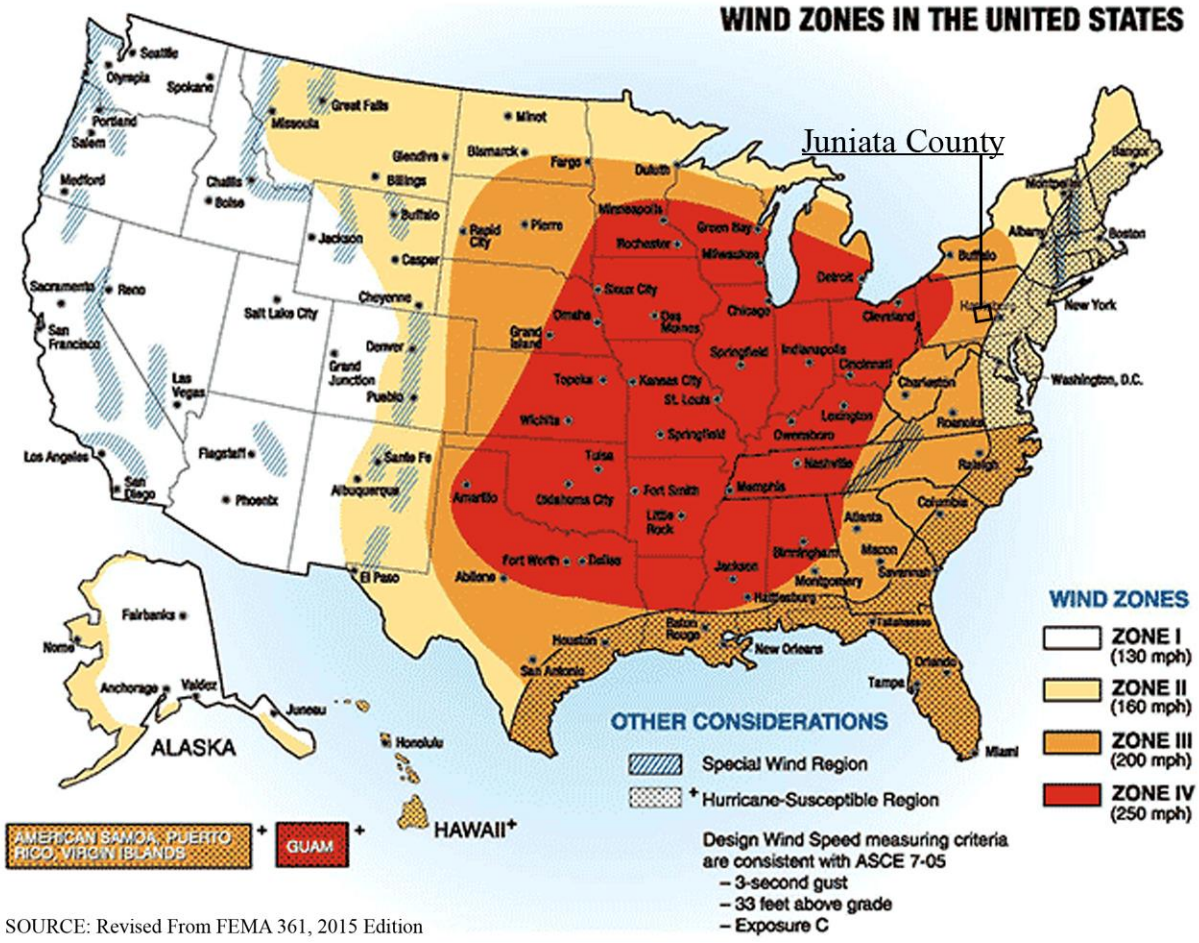
Windstorms of all types have caused the following problems within Juniata County:

- Power failures lasting 4 hours or longer
- Loss of communications networks lasting 4 hours or more
- Residents requiring evacuation or provision of supplies or temporary shelter
- Severe crop loss and or damage

Table 32 - Enhanced Fujita Scale

Enhanced Fujita Scale ***(Sheldus, 2013)***			
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 tornados with no reported damage (i.e., those that remain in open fields) are always rated EF0.
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 missiles generated.
EF5	>200	F3-F6	**Extreme damage**: Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m (300 ft.); steel reinforced concrete structure badly damaged; high-rise buildings have significant structural deformation.

Figure 23 - Wind Zones



4.3.7.3 Past Occurrence

Juniata County has experienced six tornados from 1954 through 2018, none of which reportedly caused any injuries or deaths. Each tornado is listed in *Table 33 - Tornado History* followed by a description of the event. One of the deadliest tornado events in Pennsylvania occurred on May 31, 1985, with a total of twenty-one tornados in the Ohio and Northwest Pennsylvania region (none of which tracked through Juniata County). These tornados resulted in seventy-six deaths, upwards of 1000 injuries, and hundreds of millions of dollars in property damage.

One of the worst tornados to impact Juniata Count in recent history occurred on May 23, 2011 when a storm caused an EF2 tornado that killed seven dairy cows when a concrete silo was toppled onto a cow barn. Fortunately, the event incurred no human deaths or injuries. The storm produced an approximate 4.7-mile-long stretch of damage, peak winds were estimated to be between 115 mph and 130 mph and the total property damage was estimated at $50,000 (NOAA, 2018).

Between April 27, 2011 and May 23, 2011, there were a total of six tornados throughout Pennsylvania in the most significant outbreak of tornados in Pennsylvania since 2005. As part of this outbreak, Juniata County experienced an EF1 tornado in the early hours of April 28, 2011. The tornado resulted in damage on the east side of East Waterford, then moving northeast along State Route 75, causing sporadic damage along a well-defined path from Honey Grove to Seven Pines in Spruce Hill Township. Estimated property damage was $25,000 (NOAA, 2018), and the damage indicators were consistent with a maximum wind speed between 105 mph and 110 mph, putting the tornado in the upper range of the EF1 rating category.

Aside from tornados, Juniata County has ninety-five severe wind reports from 1959 through 2018 causing a total of ~$177,490 dollars in property damage and $4,000 in crop damage (NOAA NCEI, 2019). Most often these are the result of intense thunderstorms, which may fell trees, damaging power lines and cause power outages for upwards of four days in some areas. Detailed information for each severe wind report in Juniata County can be found in NOAA's Storm Events Database (www.ncdc.noaa.gov/stormevents).

On February 12, 2009, damaging non-thunderstorm wind gusts between 50 mph and 65 mph were recorded across central Pennsylvania following the passage of a strong cold front. The high winds produced significant damage across the region, toppling numerous trees and electrical wires. Several homes and other building structures also sustained moderate to major damage. Property damage in Juniata County was estimated at $10,000, and there were isolated power outages throughout the county. The Public Utility Commission reported that utility crews restored power to over 400,000 customers who had lost power. Allegheny Power, whose coverage area includes areas of Pennsylvania, West Virginia and Maryland reported that the power outage event was the largest in the company's history. Overall, the estimated property damage sustained throughout central Pennsylvania was nearly $1 million (NOAA, 2019).

Figure 24 - Tornado History 1950-2018

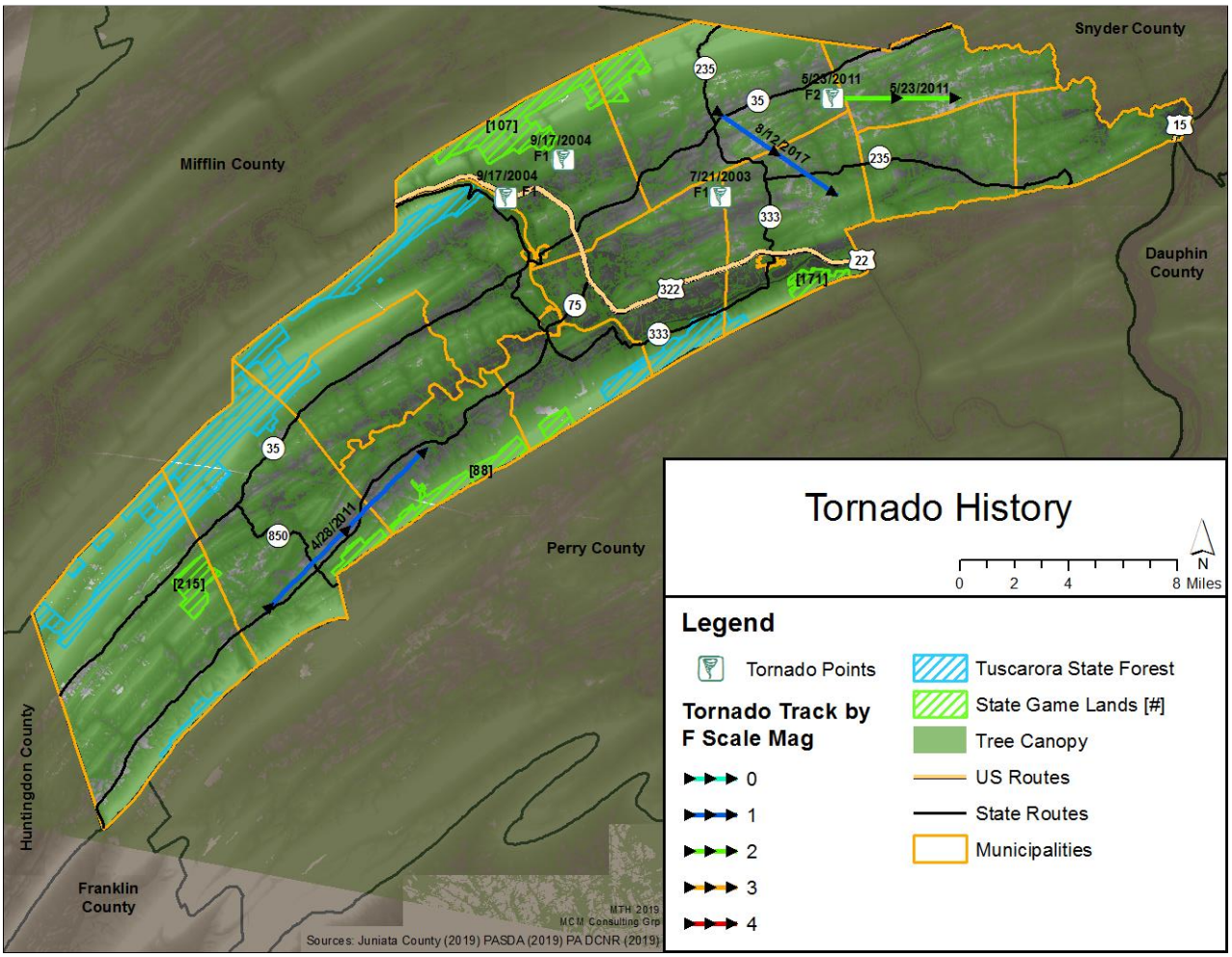


Table 33 - Tornado History

Tornado History *(NOAA NCEI, 2019)*					
Date	**Location**	**Mag.**	**Property Damage**	**Length (mi)**	**Width (feet)**
7/21/2003	East Salem	F1	$ 20,000	3	200
The National Weather Service in State College and Juniata county emergency management officials surveyed storm damage and interviewed residents in central Juniata county. The team determined that an F1 tornado with peak winds of up to 80 mph touched down in central Juniata county near East Salem from about 5:00 pm to 5:05 pm Monday July 21, 2003. Extensive tree damage occurred along the tornado path. The roof of a home was lifted off as well as partial damage to roofs of several barns. In one location a tree limb was driven into a barn door. Eyewitnesses described a roaring horizontal wind with blinding visibility lasting only a minute or so at the time damage occurred. The tornado appeared to first touch-down in western Delaware Township just less than two miles southwest of East Salem. The tornado continued east-northeastward across Route 333 for about another mile before dissipating. The tornado path was about 3 miles long and several hundred yards wide with peak winds to 80 mph based on visible damage.					
9/17/2004	Mifflintown	F1	$ -	1	75
A tornado touched down near the town of Denholm and was likely influenced by the steep terrain of the area. The damage, in the form of downed trees, could be easily seen from Route 333. About 100 trees were knocked down with this tornado. The path was approximately 1 mile long and about 75 yards wide. The tornado occurred around 905 pm EDT and lifted at 907 pm EDT. This tornado was rated F1 on the Fujita scale with winds approaching 85 mph.					
9/17/2004	Mifflintown	F1	$ -	4.5	100
A tornado touched down near the town of Arch Rock. It downed trees which were visible along Township Road 527. The length of the tornado was approximately 4.5 miles and the width was about 100 yards. In addition to the tornado, downburst winds were also observed in a much wider swath. Damage was mainly confined to trees being knocked down, however several structures had minor damage and several corn fields were flattened. The tornado touched down at approximately 910 pm EDT and lasted until approximately 913 pm EDT. The tornado was rated F1 on the Fujita scale with winds estimated at 85 mph.					
4/28/2011	East Waterford to Academia	EF1	$ 25,000	8.46	100
The NWS in State College confirmed an EF1 tornado near East Waterford in Juniata County. The tornado occurred between 0253 and 0300 AM EDT on 28 April 2011. The EF1 tornado first produced damage on the east side of East Waterford, then skirted northeast along SR 75 producing sporadic damage along a well-defined path from Honey Grove to Seven Pines in Spruce Hill Township. The Hancock farm in Honey Grove sustained the most significant damage, as the farmhouse roof and several barns and farm sheds were destroyed. Numerous tree damage was observed along the tornado track which covered approximately 8 miles. Two barns were also damaged along Laurel Run near SR 850 at Burnt Church Road. Additional barns along SR 75 suffered minor to moderate roof damage, with roof debris scattered up to 200 yards away from its source location. The damage indicators, primarily those observed at the Hancock farm, were consistent with a maximum wind speed between 105 to 110 mph, putting the tornado in the upper-bound of the EF1 rating category.					
5/23/2011	Cocolamus to Richfield	EF2	$ 50,000	4.71	250

Tornado History *(NOAA NCEI, 2019)*					
Date	**Location**	**Mag.**	**Property Damage**	**Length (mi)**	**Width (feet)**
The NWS State College confirmed an EF2 tornado near Kellerville in Juniata County. The tornado touched down around 1723 EDT about 1/4 mile west of 1332 Kellerville Road and traveled east approximately 5 miles before lifting just east of 7 Stars Road around 1731 EDT. The tornado laid a pattern in a hay field before crossing Kellerville Road where it toppling a concrete silo which fell on and obliterated a cow barn, killing 7 dairy cows. The house south of the barn at 1332 Kellerville Road had the entire roof and attic portion blown off and was shifted on its foundation. Several outbuildings and sheds on the property were also obliterated. The debris and tornado moved southeastward with visible tree damage on the hill. The tornado did considerable damage to a hamlet along Evendale Hill Road. A house at 3009 Evendale Hill Road lost its entire roof and attic and was shifted about 6 inches to north causing the north facing basement wall to bulge out. Roof materials and personal items from the attic were blown into trees and up the road to the north. The tornado ripped up and snapped virtually all trees along the hill behind the house and farm. Several outbuildings were damaged, and a neighboring house was damaged. The tornado continued to the east, snapping trees and causing minor to moderate damage to other houses and outbuildings along the path. Older sheds and farm outbuildings along this track sustained major damage or were destroyed. Near the end of its track, the tornado tore apart a garage attached to a recently built house at 2787 Seven Stars Road. The house itself was also shifted on its foundation. The resident of this home heard a loud noise and witnessed the tornado in the valley heading towards him and took cover. The tornado dissipated to the east of this home, in a wooded area to the west of Peanut Road. Overall, this tornado produced an approximate 4.7-mile-long swath of nearly continuous damage. The damage indicators were consistent with peak winds between 115 and 130 mph. Overall, a total of 7 homes sustained damage ranging from minor to major, and 15 barns and outbuildings either severely damaged or destroyed.					
8/12/2017	McAlisterville to Maze	EF1	$ 500,000	5.53	200
The tornado touched down on the northeast side of Mcalisterville, PA, near the Juniata Mennonite School. Damage included a flipped tractor trailer, snapped pine trees, and a long swatch of snapped and uprooted trees. The main school building roof was lifted off its base. There was sporadic tree damage all the way to Dunn Valley Road. Along Dunn Valley Road there was a flipped travel trailer, damaged trees, and a damaged house. Farther along the track, it damaged a bus shed and a tool shed. There was also sporadic tree damage in this area. Further to the south and east, along Maze and Blackdog Roads, there was focused swaths of tree damage along the north side of the road. Near the end of the road the tree damage became less evident. Peak winds were estimated at 105 mph, giving it an EF1 rating.					

4.3.7.4 Future Occurrence

It is possible for a disastrous tornado to hit Juniata County. While the chance of being hit by a tornado is somewhat small, the damage that results when the tornado arrives can be devastating. 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 100 pounds per square foot of surface area. This is a "wind load" that exceeds the design limits of most buildings.

Based on tornado activity information from 950 to 2006, Juniata County lies within an area that typically experiences fewer than one EF3 or greater tornado per year (see *Figure 25 - Annual Tornado Activity*). Additionally, based on historic patterns, tornados 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 over fifty knots indicates that annual chance of a windstorm is higher.

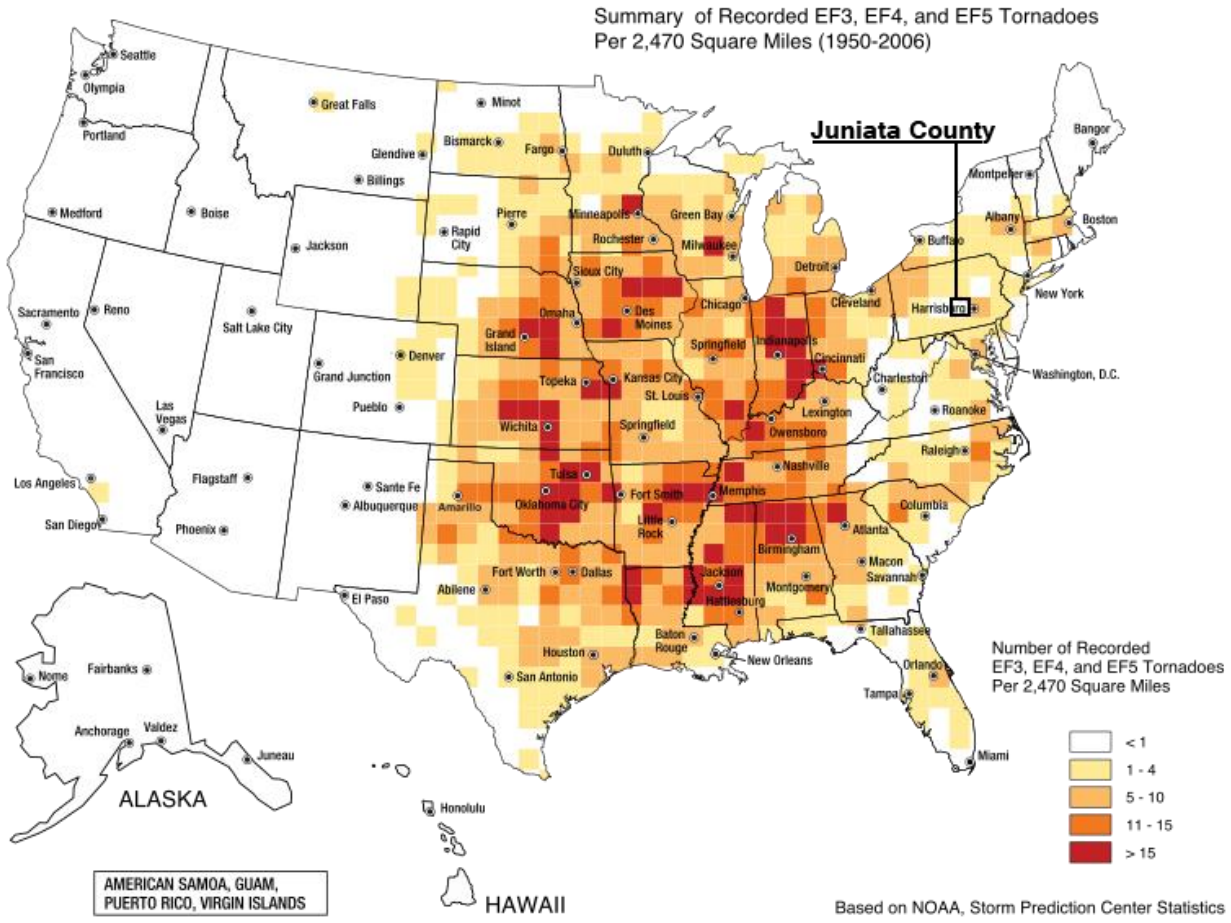
According to FEMA, there is high probability (~92%) each year that Juniata County will experience winds of 45-77 mph, however there is under a 10% chance of winds of 78-118 mph.

Table 34 - Annual Probability of Wind Speeds

Annual Probability of Wind Speeds ***(FEMA, 2000)***		
Wind Speed (mph)	**Enhanced Fujita Scale**	**Annual Probability of Occurrence (%)**
45-77	EF0	91.59
78-118	EF0, EF1, EF2	8.32
119-138	EF2, EF3	.0766
139-163	EF3	.0086
164-194	EF3, EF4	.00054
195+	EF4, EF5	.00001

There have been some changes in typical tornado behavior is recent years. The number of days when tornados occur in the United States have decreased, however there has been an increase in the number of tornados on those active days. The tornado season has also been lengthening, with the season starting earlier than it has historically. 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 wind storms, however there is somewhat low confidence in these conclusions and there is still much uncertainty (Kossin et al., 2017).

Figure 25 - Annual Tornado Activity



4.3.7.5 Vulnerability Assessment

Tornados can occur at any time of the year, though they're more likely during peak months, which are during the summer for the northern part of the United States. Tornados 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 tornados make them one of the most destructive natural hazards. There can be many secondary impacts of tornados 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 tornados:

- Flash floods – with 146 deaths annually nationwide
- Lightning – 75 to 100 deaths annually nationwide

- Damaging straight-line winds – reaching 140 mph wind speed
- Large hail – can reach the size of a grapefruit and causes several hundred million dollars in damages annually to property and crops.

Critical facilities are highly vulnerable to windstorms. While many severe storms can cause exterior damage to structures, tornados can also destroy structures, along with their surrounding infrastructure, abruptly halting operations. Severe storms and their secondary effects often accompanying tornados and can be just as threatening to the critical facilities within the county. 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 are vitally at risk when faced with tornados. Without assistance to evacuate, 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 tornados and windstorms. State Forests in Juniata County which have designated camping locations where visitors pitch tents and can be vulnerable to severe windstorms. GIS locations of mobile home parks in Juniata County were not available at the time of this report.

The local economy can also be crippled by tornados 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.

4.3.8. Wildfire

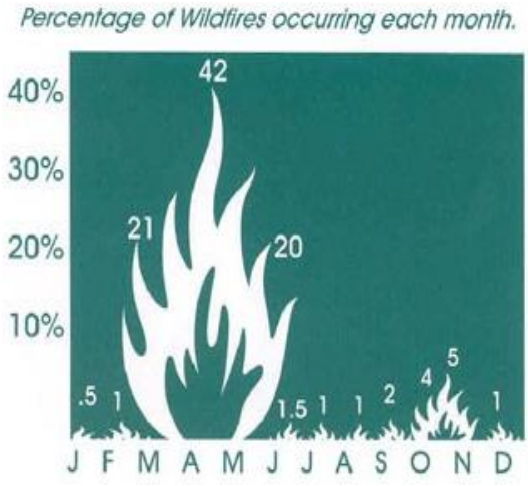
4.3.8.1 Location and Extent

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 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 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 and increasing wildfire vulnerability. In the fall, the surplus of dried leaves are fuel for fires. *Figure 26 - Seasonal Wildfire Percentage* shows the wildfire percentage occurrence during each month occurring in Pennsylvania.

Juniata County falls within the Tuscarora Forest District (D-3), and approximately nine percent of Juniata County is designated as non-commercial forest (Juniata Comprehensive Plan, 2009), containing parts of State Game Lands 88, 107, 215, and the Tuscarora State Forest. However other than these locations, there are abundant woodlands, and about sixty three percent of Juniata County is considered to be wooded (Juniata County, 2009).

Figure 26 - Seasonal Wildfire Percentage



4.3.8.2 Range of Magnitude

Forested areas, croplands and properties that are at the interface between wild lands and human development are most at risk for being impacted by and causing wildfires. If an urban fire or wildfire is not contained, secondary impacts such as power outages may result. Other negative impacts of wildfires include killing people, livestock, fish and wildlife, destroying valuable property, timber, forage, recreational and scenic values. Wildfires can also cause severe erosion, silting of stream beds and reservoirs, and flooding due to a loss of ground cover.

The United States Forest Service utilizes the Forest Fire Assessment System to classify the dangers of wildfire. *Table 35 - Wildland Fire Assessment System* identifies each threat classification and provides a description of the level.

Table 35 - 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.

4.3.8.3 Past Occurrences

From February 2010 to March 2018, emergency services in Juniata County were called upon 345 times to address wildfire concerns, with an average of thirty-eight occurring each year. There was also a total of fifty-six agriculture related fire reports during the same time periods. Detailed accounts for each incident was not available at the time of this report.

Juniata County is located in the Tuscarora Forest District, and *Table 36 - Wildfires in the Tuscarora District* summarizes the history of wildfires in the Tuscarora District from 2000 to 2012.

In April of 2012, a wildfire likely caused by someone burning trash in neighboring Perry County called upon the response of firefighters from over two dozen fire companies in Perry, Juniata and Cumberland Counties. The fire resulted in fifteen to twenty acres of state forest burning and the response cost an approximate $10,000.

In recent years, the number of prescribed burns in Pennsylvania have been increasing. This corresponds to an embrace of the need for fire in many natural ecosystems and management strategies for reducing vulnerability to wildfires in Pennsylvania. *Table 37 - Pennsylvania Prescribed Burns* lists two prescribed burns conducted by the PA Game Commission. Several prescribed burns have been conducted in State Game Lands 107 in Juniata County. In 2014 a total of 109 acres were burned near Suloff Run Road in the southern portion of the game lands. In 2015 two locations were burned - a forty-three-acre area near Little Roundtop, and a 213-acre area along Macedonia Run. In 2017, an area of 135 acres was burned, and in 2018 an area of 237 acres was burned at the north eastern tip of the game lands (PA Prescribed Fire Council, 2018). *Table 37 - Pennsylvania Prescribed Burns* shows prescribed burn data for Pennsylvania from 2010 to 2015. Statewide data for prescribed burns was not available after 2015.

Table 36 - Wildfires in the Tuscarora District

Wildfires in the Tuscarora Forest District 2000-2012 *(2015 HMP; PA DCNR BOF, 2013)*				
Year of Wildfire	**Fires in Tuscarora Forest District (D-3)**	**Number of Fires % of Statewide**	**Acres Burned in Tuscarora Forest District (D-3)**	**Acres % of Statewide**
2012	15	2.1%	50.8	1.6%
2011	10	5.0%	41.7	7.2%
2010	15	2.6%	25.6	0.8%
2009	8	1.3%	37.5	0.6%
2008	5	0.7%	1	0.0%
2007	13	2.4%	24.1	2.1%
2006	17	1.9%	72.3	0.9%
2005	9	1.1%	13.5	0.3%
2004	1	0.5%	0.1	0.0%
2003	5	1.2%	13.7	0.7%
2002	2	0.3%	0.7	0.0%
2001	9	1.1%	7	0.1%
2000	8	1.1%	22	0.5%

Table 37 - Pennsylvania Prescribed Burns

Pennsylvania Prescribed Burns *(PA DCNR, 2018)*				
Year	**All Agencies and Organizations - Number of Prescribed Fires**	**All Agencies and Organizations - Number of Prescribed Fire Acres**	**DCNR - Number of Prescribed Fires**	**DCNR - Number of Prescribed Fire Acres**
2010	56	2737	12	186
2011	70	6301	11	189
2012	96	4133	10	208
2013	142	8058	35	866
2014	161	7094	26	338
2015	244	14553	47	1317

4.3.8.4 Future Occurrence

Annual occurrences of urban and wildfires in Juniata 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 dry 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 Juniata County Emergency Management Agency coordinates countywide 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. Juniata County Emergency Management Agency disseminates all red flag warnings. There are two planned prescribed burns in Juniata County in 2019, both in State Game Lands 107.

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 and 2018, 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 is expected to decrease the surface soil moisture because of an increase in evaporation (Wehner et al., 2017), resulting in more wildfire prone conditions in the summer and fall (Shortle et al., 2015).

4.3.8.5 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. Firefighters and other first responders can encounter life threatening situations due to forest fires. Traffic accidents during a response and then the impacts of fighting the fire once on scene are examples of the 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 areas 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). Pennsylvania is among the states with the largest area of WUI and the most housing units in a WUI designated area. WUI locations in Juniata County can be seen in *Figure 28 - Wildland Urban Interface Locations*.

Table 38 - Buildings in High Wildfire Hazard Areas shows the total addressable structures and critical facilities that are located in state game lands, state parks and 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 that have a "0" entry had zero vulnerable addressable structures or critical facilities according to this analysis – there were no critical facilities within State Forest or State Game Lands areas.

The Pennsylvania Bureau of Forestry conducted an independent wildfire hazard risk assessment for municipalities in Juniata County in 2010, and the results appear in *Figure 27 - Wildfire Hazard Areas* The wildfire hazard was defined based on conditions that affect wildfire ignition and/or behavior such as fuel, topography, and local weather. Based on this assessment, a majority of the county has a medium vulnerability to wildfires. Fermanagh and Lack Townships are classified as having high wildfire hazard, despite neither having the highest number of reported fires in the study period of 2002 and 2008. Fayette Township which had the most events between 2002 and 2008 is classified as having a medium wildfire hazard potential, along with Beale, Milford, Tuscarora, Spruce Hill, and Turbett Townships. Mifflin, Thompsontown, Port Royal and Mifflintown Boroughs, as well as Delaware, Greenwood, Monroe, Susquehanna, and Walker Townships have low vulnerability to wildfires (PA DCNR, 2010; Juniata County HMP, 2015).

There are nine fire departments that cover Juniata County which can be seen in *Table 39 - Fire Departments*. Each fire department conducts its own schedule of in-house training sessions for their members.

Table 38 - Buildings in High Wildfire Hazard Areas

Buildings in High Wildfire Hazard Areas *(Juniata Co. GIS, 2019; WUI from Radeloff et al., 2016)*				
Municipality	**Wildland Urban Interface & Intermix**		**State Forest & Game Lands**	
	Addressable Structures	**Critical Facilities**	**Addressable Structures**	**Critical Facilities**
Beale Township	42	1	1	0
Delaware Township	151	1	0	0
Fayette Township	479	3	0	0
Fermanagh Township	393	4	0	0
Greenwood Township	22	0	0	0
Lack Township	22	0	7	0
Mifflin Borough	257	1	0	0
Mifflintown Borough	0	0	0	0
Milford Township	278	1	15	0
Monroe Township	240	3	0	0
Port Royal Borough	435	7	0	0
Spruce Hill Township	11	0	0	0
Susquehanna Township	13	0	0	0
Thompsontown Borough	364	1	0	0
Turbett Township	65	0	3	0
Tuscarora Township	138	1	10	0
Walker Township	70	0	3	0
Total	**2,980**	**23**	**39**	**0**

Table 39 - Fire Departments

Fire Departments *(Juniata Co GIS, 2019)*		
Name	**Address**	**Municipality**
Friendship Fire Company	212 W Fourth St	Port Royal Borough
Mifflin Fire Department	24 Main St	Mifflin Borough
Thompsontown Fire Company	55 State St	Thompsontown Borough
Mifflintown Hose Company	510 Washington Ave	Mifflintown Borough
Delaware Township Fire & Equipment	224 East Salem Rd	Delaware Township
Richfield Fire Company	38146 Rt 35 N	Monroe Township
Fayette Fire Company	461 Main St	Fayette Township
Beale Township Fire Department	2051 Cider Press Rd	Beale Township

Fire Departments *(Juniata Co GIS, 2019)*		
Name	**Address**	**Municipality**
East Waterford Fire Company/Town Hall & Fire Company	9607 Rt 75 S	Tuscarora Township

Figure 27 - Wildfire Hazard Areas

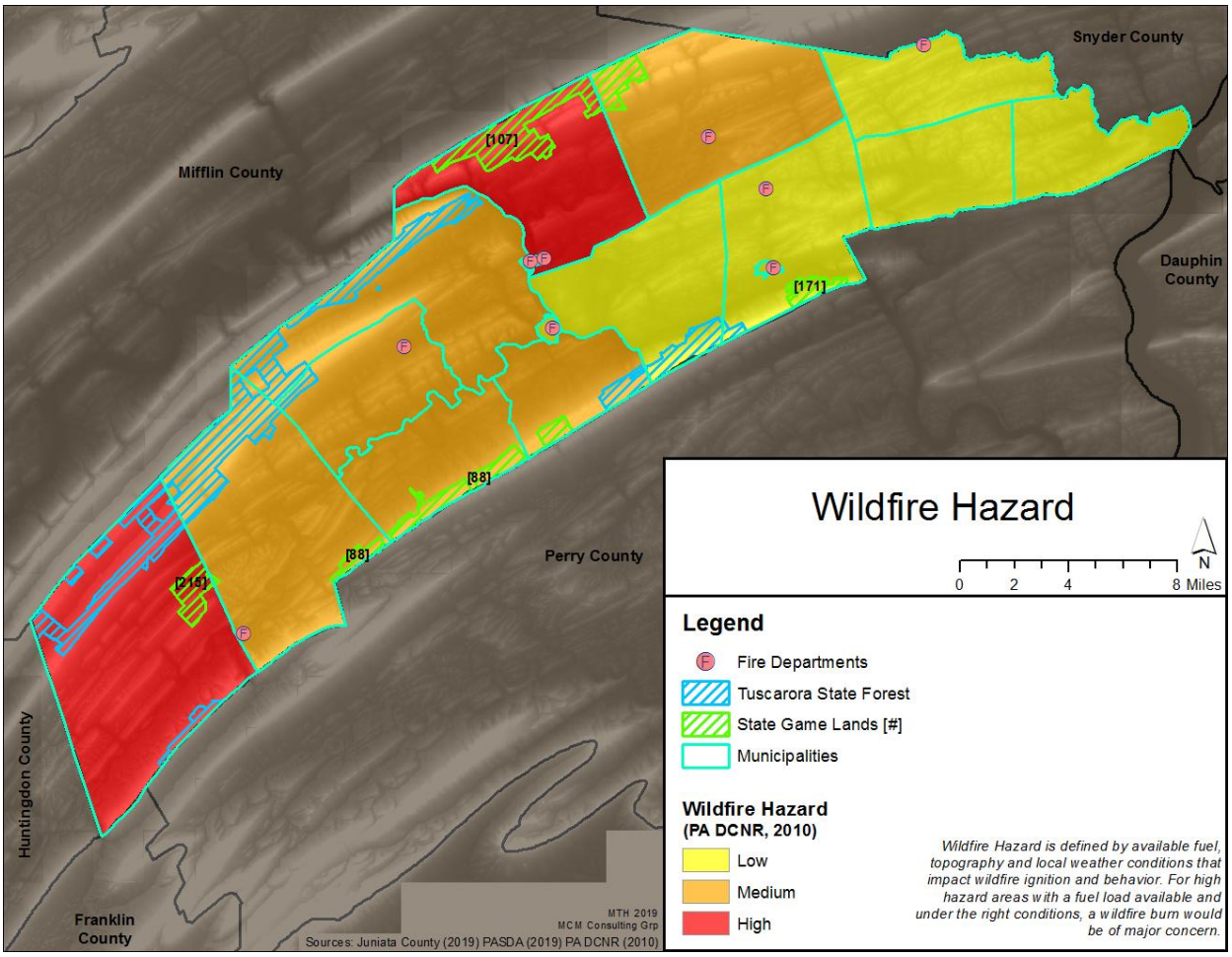
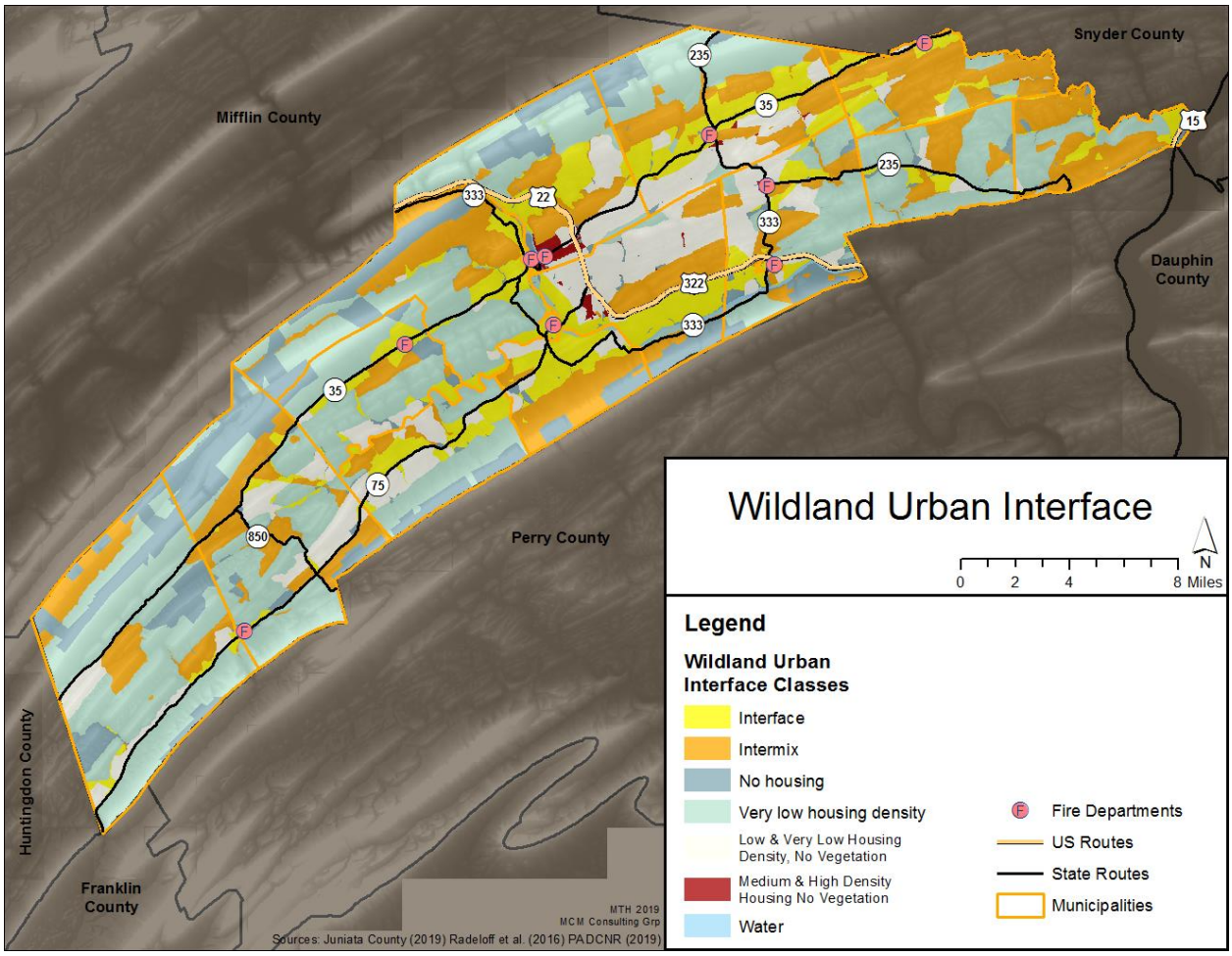


Figure 28 - Wildland Urban Interface Locations



4.3.9. Winter Storms

4.3.9.1 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 Juniata 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.

On occasion Juniata 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 Poconos), 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).

4.3.9.2 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 40 - Winter Weather Events*. In severe cases, secondary effects of winter storms involve flooding, disruption to traffic, emergency 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 then breaks the ice into large chunks and can result in ice jams when the ice begins to flow. The ice jams can act as a dam and result in flooding. Environmental 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 recharge, high temperatures following a heavy snowfall can cause rapid surface water runoff and severe flooding. *Figure 29 - Pennsylvania Annual Snowfall 1981-2010* shows mean annual snowfall in Juniata County to be between twenty-one to forty inches. *Table 41 - Recent Annual Snowfall by Snow Station* summarizes annual snowfall accumulation for recent years not covered in *Figure 29 - Pennsylvania Annual Snowfall 1981-2010* as recorded in the weather station closest to Juniata County in Lewistown.

Table 40 - 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 35 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 45 miles per hour, temperatures of 10 degrees Fahrenheit or lower, a high density of blowing snow with visibility frequently measured in feet prevailing over an extended period time.

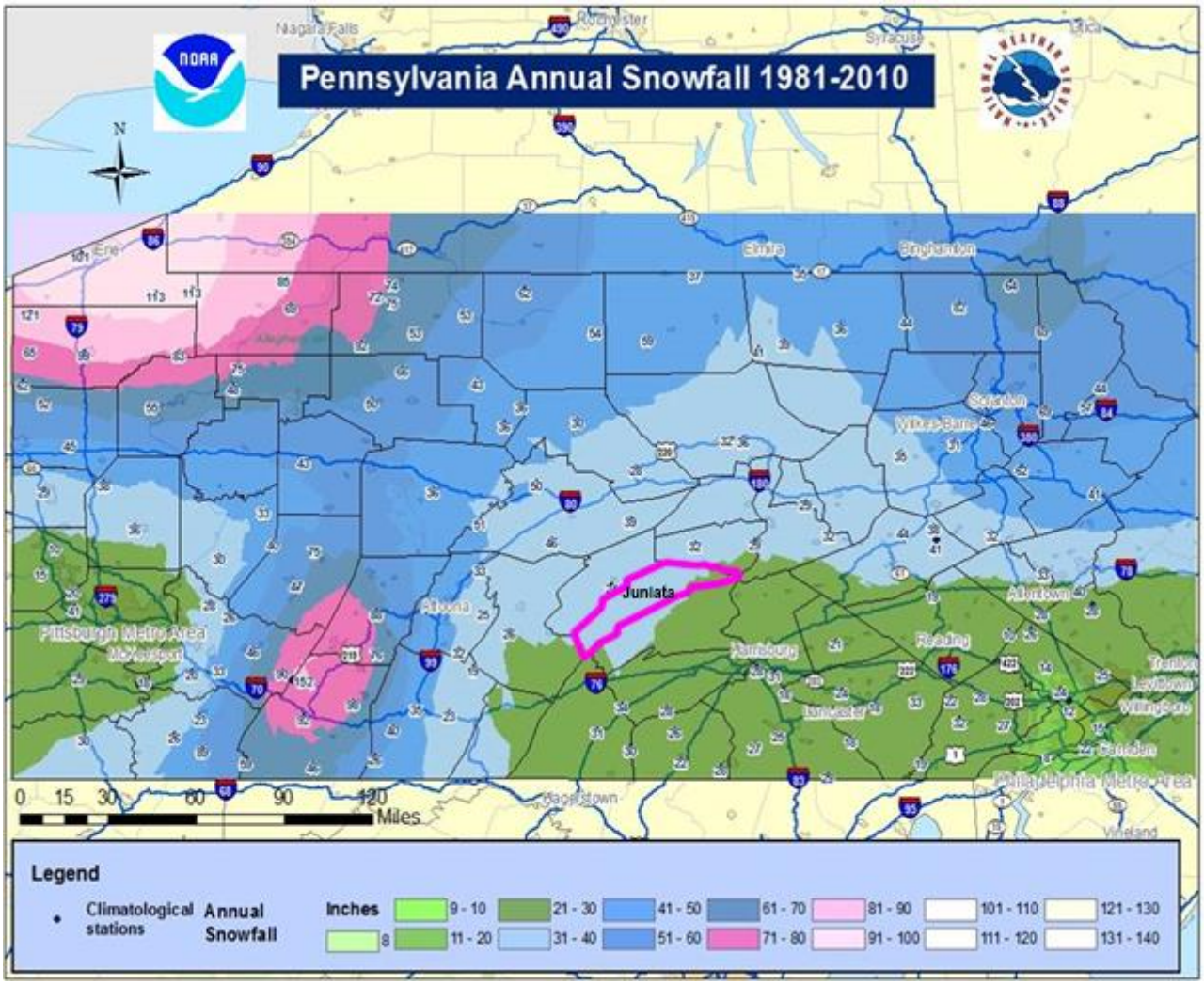
Table 41 - Recent Annual Snowfall by Snow Station

Recent Annual Snowfall by Snow Station *(NOAA, 2019)*	
Winter Season	**Lewistown**
2010-2011	22.8”
2011-2012	12.1”
2012-2013	26.6”
2013-2014	38.8”
2014-2015	37.3”
2015-2016	19.4”
2016-2017	25.6”
2017-2018	36.1”

Table 42 - Monthly Snowfall Average by Snow Station

Monthly Snowfall Average By Snow Station 1981-2010 *(NOAA, 2019)*	
Month	**Lewistown**
January	8.7"
February	6.1"
March	4.1"
April	0.3"
May	0"
June	0"
July	0"
August	0"
September	0"
October	0"
November	0.5"
December	4.6"
Annual	**24.3"**

Figure 29 - Pennsylvania Annual Snowfall 1981-2010



4.3.9.3 Past Occurrence

Historically, winter storms have occurred on the average of five times a year in Juniata County. One of the most severe winter events 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 repairs. 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 locations 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 15-30 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 thousands 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.

All recorded winter weather events in Juniata County from 1960 - 2018 are summarized in *Table 40 - Winter Weather Events*. No direct deaths or injuries were reported for the following winter weather events in Juniata. Events occurring before 1993 were compiled by SHELDUS, with those after 1993 originating from NOAA's Storm Events Database. The SHELDUS database does not include data for the years from 1979 through 1990, so those years are not represented in the below *Table 43 - Winter Storm History*. Detailed reports of each event after 1993 can be found on NOAA's Storm Events Database (www.ncdc.noaa.gov/stormevents). It should be noted that the property damage numbers reported by events found in the SHELDUS database are calculated by dividing the total losses associated with an event by the number of communities experiencing damages, and they should be treated as a rough estimate.

These winter 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 (US Routes 322, 22 and a small portion of 15/11, PA Routes 35, 75, 235, 333 and 850) are normally the opened immediately for emergency traffic, but secondary roads can remain impassable for days. The snowstorm on March 20, 2018 brought eight to fourteen inches of snowfall across the county in a twenty-four-hour period (NOAA NCEI, 2019).

Table 43 - Winter Storm History

Winter Storm History *(NOAA NCEI, 2019; 2015 HMP)*					
Date	**Type**	**Property Damage**	**Date**	**Type**	**Property Damage**
02/13/1960	Winter Weather	$15	01/27/1994	Ice	$50,000
02/18/1960	Wind - Winter Weather	$75	03/02/1994	Heavy Snow/Blizzard/Avalanche	$5,000,000
03/03/1960	Winter Weather	$75	03/10/1994	Ice	$500,000
12/11/1960	Winter Weather	$75	01/04/1995	Heavy Snow	$0
01/19/1961	Winter Weather	$1,020	01/07/1995	Ice	$0
02/03/1961	Winter Weather	$746	11/01/1995	Record Snow/Cold	$0
03/06/1962	Severe Storm/Thunderstorm - Wind - Winter Weather	$746	11/14/1995	Winter Storm	$0
12/06/1962	Wind - Winter Weather	$1,316	12/19/1995	Winter Storm	$0
12/29/1962	Wind - Winter Weather	$74,657	01/07/1996	Blizzard	$0
01/12/1964	Winter Weather	$75	01/12/1996	Heavy Snow	$0
03/05/1965	Winter Weather	$16,129	11/28/1996	Heavy Snow	$0
01/30/1966	Winter Weather	$7,463	02/13/1997	Winter Storm	$0
01/14/1968	Wind - Winter Weather	$152	03/14/1997	Ice Storm	$0
11/12/1968	Wind - Winter Weather	$746	11/14/1997	Heavy Snow	$0
12/05/1968	Wind - Winter Weather	$746	12/29/1997	Heavy Snow	$0
12/25/1969	Winter Weather	$1,429	01/15/1998	Ice Storm	$0
03/12/1970	Winter Weather	$294	02/23/1998	Heavy Snow	$0
01/26/1971	Wind - Winter Weather	$29,412	01/02/1999	Winter Storm	$0
01/26/1971	Lightning - Wind - Winter Weather	$1,515	01/08/1999	Winter Storm	$0
01/26/1971	Lightning - Wind - Winter Weather	$1,515	01/14/1999	Winter Storm	$0
01/27/1971	Wind - Winter Weather	$746	03/14/1999	Heavy Snow	$0
03/04/1971	Wind - Winter Weather	$185	01/25/2000	Heavy Snow	$0
04/06/1971	Wind - Winter Weather	$75	01/30/2000	Heavy Snow	$0
11/25/1971	Winter Weather	$75	02/13/2000	Ice Storm	$0
02/18/1972	Wind - Winter Weather	$746	02/18/2000	Winter Storm	$0
12/16/1973	Winter Weather	$152	12/13/2000	Winter Storm	$150,000
12/20/1973	Severe Storm/Thunderstorm - Winter Weather	$1,515	03/04/2001	Heavy Snow	$5,000

Winter Storm History *(NOAA NCEI, 2019; 2015 HMP)*					
Date	**Type**	**Property Damage**	**Date**	**Type**	**Property Damage**
01/02/1974	Winter Weather	$152	01/06/2002	Heavy Snow	$0
01/09/1974	Winter Weather	$152	12/05/2002	Heavy Snow	$0
01/18/1974	Winter Weather	$152	12/10/2002	Ice Storm	$0
02/08/1974	Winter Weather	$152	12/25/2002	Heavy Snow	$0
03/29/1974	Winter Weather	$1,515	02/16/2003	Heavy Snow	$0
01/06/1975	Winter Weather	$156	12/05/2003	Heavy Snow	$0
01/12/1975	Winter Weather	$156	02/03/2004	Heavy Snow	$0
01/18/1975	Winter Weather	$156	02/06/2004	Ice Storm	$0
01/19/1975	Winter Weather	$1,515	03/16/2004	Heavy Snow	$0
02/12/1975	Winter Weather	$2	03/19/2004	Heavy Snow	$0
03/14/1975	Winter Weather	$29	01/05/2005	Winter Storm	$0
04/03/1975	Wind - Winter Weather	$15,152	01/08/2005	Ice Storm	$0
01/01/1976	Winter Weather	$29	02/24/2005	Heavy Snow	$0
01/07/1976	Winter Weather	$156	03/01/2005	Heavy Snow	$0
01/11/1976	Winter Weather	$2	12/09/2005	Heavy Snow	$0
01/20/1976	Winter Weather	$16	12/16/2005	Winter Storm	$0
01/26/1976	Flooding - Winter Weather	$156	02/05/2007	Extreme Cold/Wind Chill	$0
02/02/1976	Wind - Winter Weather	$1,515	02/05/2007	Extreme Cold/Wind Chill	$0
02/05/1976	Winter Weather	$16	02/13/2007	Winter Storm	$0
03/09/1976	Winter Weather	$16	03/16/2007	Heavy Snow	$0
01/06/1977	Winter Weather	$2	02/01/2008	Winter Storm	$0
01/09/1977	Wind - Winter Weather	$16	02/10/2008	Extreme Cold/Wind Chill	$0
03/22/1977	Severe Storm/Thunderstorm - Wind - Winter Weather	$1,515	02/12/2008	Ice Storm	$0
10/16/1977	Lightning - Severe Storm/Thunderstorm - Wind - Winter Weather	$15,152	01/06/2009	Ice Storm	$0
12/17/1977	Severe Storm/Thunderstorm - Wind - Winter Weather	$15,152	02/05/2010	Winter Storm	$0
01/13/1978	Wind - Winter Weather	$15,152	02/09/2010	Winter Storm	$0
01/16/1978	Severe Storm/Thunderstorm - Winter Weather	$1,515	02/01/2011	Winter Storm	$0
01/19/1978	Wind - Winter Weather	$15,152	10/29/2011	Heavy Snow	$0
02/05/1978	Wind - Winter Weather	$1,515	12/14/2013	Winter Storm	$0
02/13/1978	Winter Weather	$15	02/04/2014	Winter Storm	$0

Winter Storm History *(NOAA NCEI, 2019; 2015 HMP)*					
Date	**Type**	**Property Damage**	**Date**	**Type**	**Property Damage**
03/25/1978	Severe Storm/Thunderstorm - Winter Weather	$1,515	02/13/2014	Heavy Snow	$0
12/20/1978	Winter Weather	$2	11/25/2014	Heavy Snow	$0
01/11/1991	Winter Weather	$15	02/15/2015	Extreme Cold/Wind Chill	$0
12/10/1992	Winter Weather	$74,627	01/22/2016	Winter Storm	$0
02/16/1993	Winter Weather	$17	02/08/2017	Winter Storm	$0
03/13/1993	Blizzard	$5,000,000	03/13/2017	Winter Storm	$0
01/04/1994	Heavy Snow	$5,000,000	02/17/2018	Winter Storm	$0
01/17/1994	Heavy Snow	$500,000	03/20/2018	Winter Storm	$0

4.3.9.4 Future Occurrence

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). While 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 shows that the region surrounding Juniata County has experienced a significant decrease in the amount of snowfall relative to the amount of rainfall, with a change of up to -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 Juniata County and should be considered highly likely. Approximately thirty-five winter storm events occur across Pennsylvania annually and about five of which are estimated to significantly impact Juniata County each year.

4.3.9.5 Vulnerability Assessment

Winter storms are a frequent event in the county. Detrimental impacts 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 increases 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 Juniata County, however thirty-one percent of residential structures were built prior to 1950 countywide (2015 HMP).

4.3.10. Civil Disturbance

4.3.10.1 - 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.

4.3.10.2 - 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 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.

Typically, government facilities, landmarks, prisons, and universities are common sites where crowds or mobs may gather. Juniata County does not have many local, state and federal facilities which could attract unruly crowds, except for and the county seat of Mifflintown Borough where there is also a relative concentration of critical facilities and population.

4.3.10.3 - Past Occurrence

There have not been any recent major civil disorders and riots in Juniata County, however there are a few isolated acts of vandalism that have occurred. In 2002, a break-in occurred at the McAlisterville Cave and the gate was destroyed. In 2009, the Pomeroy Academia Covered Bridge was vandalized twice in one week – first a fire was set scorching some of the oak support timbers that cover the bridge, then the interior was tagged with graffiti. Longstanding restoration efforts for the covered bridge had recently finished, and the repair cost due to the vandalism was over $150,000. In August 2012, someone stole two wheels and four hubcaps from a minivan belonging to the Tuscarora Intermediate Unit in McVeytown in nearby Mifflin County.

The Juniata County Prison closed on July 25, 2012. All prisoners were transferred to the Mifflin County Correctional Facility in Lewistown, Pennsylvania. The lack of this prison in the county reduces the likelihood of civil disturbance from incarcerated populations.

4.3.10.4 - Future Occurrence

While unlikely, civil disturbances may occur in Juniata 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 thirty years or less in Juniata County. Sporting events at one of the colleges in the Commonwealth may result in gatherings of large crowds. Local law enforcement should anticipate these types of events and be prepared to handle a crowd so that peaceful gatherings are prevented from turning into unruly public disturbances.

4.3.10.5 - Vulnerability Assessment

All municipalities in Juniata 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 attractors of for civil disturbance events, and as locations to keep secure during such events. Maps showing critical facilities by municipality can be found in *Appendix D (Municipal Flood Maps)*.

4.3.11. Cyber Attacks

4.3.11.1 Location and Extent

Cyber-attacks are malicious activities intended to damage or disrupt vital computer systems often for financial or terror reasons. These acts can range from taking control of a host website to using networked resources to directly cause destruction and harm. Attacks can take many forms, from specifically targeting human operators to broader attacks on entire systems. Protection of databases and infrastructure are the main goals for a safe cyber environment. Attacks often last just minutes, but pervasive attacks can have lasting impacts on systems and data. Common types of cyber-attacks and vulnerabilities include:

- Ransomware: a type of malicious software that holds data or systems hostage, demanding a financial ransom in order for the user or organization to gain access back to their system.
- Phishing and spear-phishing: often use e-mail to trick a user into giving a third-party access to a computer system. Spear phishing is a targeted attack on a specific user.
- Viruses, Trojans, worms and keyloggers: malicious software that can damage or cause unwanted behavior in computer systems.
- Weak password practices making systems easy to exploit.
- Outdated software: companies issues patches to fix security vulnerabilities in their software. Leaving these updates uninstalled can leave a system vulnerable to attacks.
- Unknown devices such as flash drives can be used to implant malicious code to vulnerable systems.

The types of threats that these vulnerabilities include vary depending on the perpetrator's motive. Threats generally include erasure of entire systems, altering files, stealing confidential information and "high jacking" of PC's and systems to attack others. The spectrum of these attacks is quite wide, and can have extreme effects on individuals, communities, organizations and even national threats. 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.

4.3.11.2 Range of Magnitude

The extent, nature, and timing of cyber incidents are difficult to predict as there may not be any warning. Some cyber incidents take a long time (weeks, months or even years) to be discovered and identified (FEMA 2013). The magnitude of severity of an incident will vary greatly based on the extent and duration of the impact. The extent will also vary based upon which specific system is affected by an attack, the warning time, and the ability to preempt an attack. The below Gibson Index is a useful ranking system for the relative severity of cyber-attacks. It ranges from 0 to 7, with 7 being the most severe class of attack (resulting in multiple intentional deaths and/or extreme financial/economic damage).

Table 44 - The Gibson Index for Severity of Cyber Attacks

The Gibson Index for Severity of Cyber Attacks	
Gibson Level	**Description**
0	Causes little or no disruption/damage or is the result of a mitigating circumstance.
1	Some small real-world consequences, but can often have non-malicious explanations; typically, such an event would only target one website or computer network
2	Has a clear malicious intent and can result in longer outages, more significant privacy issues.
3	Minor financial damages and moderate privacy implications, generally stemming from a partial penetration of systems.
4	Major financial damages or privacy implications. Well-defined systems breached by vulnerability, with a clear intention of theft or destruction.
5	Systematic, coordinated, broad penetration of a multitude of networks, likely perpetrated by a well-funded large team or nation-state.
6	Remain mostly theoretical. They consist of attacks that manifest themselves in real-world, targeted, intentional damage.
7	Would result in mass casualties from intentional, targeted efforts.

4.3.11.3 Past Occurrence

To date, there are no recorded major cyber security breaches in Juniata County, however research and surveys show that cyber-attacks on local governments occur daily (The Conversation US, 2018). There have been several significant cyber security incidents within Pennsylvania in recent history.

In 2015, a computer in the Allegheny County District Attorney's office was infected with ransomware and the organization paid an equivalent of $1,400 ransom in the cryptocurrency bitcoin in order to unlock the computer and regain control of the system. The attack was found to be perpetrated by the international cybercrime network known as Avalanche who has since been dismantled by U.S. authorities (Ward, 2016).

In March 2017, members of the Democratic State Senate and staff were the target of a ransomware attack where the perpetrators demanded for a ransom of ~$30,000 to release the infected systems (Freed, 2018). Members of the affected offices were locked out of their computer systems and reverted to conducting business via landlines and pen and paper. Instead of paying the ransom and thus incentivizing future attacks, the organization paid Microsoft over $700,000 in their effort to regain control of their machines and recover their data. The department had extensive back-ups of their data which were not compromised in the attack (Freed, 2018).

In February 2018, Allentown's computer systems were infiltrated by malware known as the Emotet program that uses keystroke recording to steal financial and confidential information. The program was able to breach the city's 185-camera surveillance network. The program could be found in corrupted Microsoft Word documents which were

attached to emails posing as payment vouchers or other general documents. Unsuspecting employees in Allentown opened the attachments and unknowingly infected their computers with the malicious program. The breach was difficult to detect as the program is polymorphic, meaning it was able to morph and evade detection. Total recovery efforts were estimated to cost over $1.2 million (Opilo, 2018).

4.3.11.4 Future Occurrence

Cyber threats and attacks are often difficult to identify and can include a range of dangers that include: viruses erasing entire systems, intruders breaking into systems and altering files, using one computer or device to attack others, stealing confidential information, or holding data hostage and demanding a ransom.

Ransomware and Trojans have recently been the most damaging threat to cyber security in local government and for individuals. According to FEMA, the spectrum of cyber risks is limitless and threats can have a wide-range of effects on an individual, community, organizational, and national level (FEMA 2016). With the extent of cyberattacks throughout recent history and the gravity towards digitizing once analog systems, Juniata County, its businesses and residents should be prepared to ward off future breaches to their computer systems.

4.3.11.5 Vulnerability Assessment

All assets in the county (population, structures, and critical facilities) that use computer systems connected to the internet are considered vulnerable to cyber security breaches. All individuals in Juniata County are vulnerable, although certain types of attacks would impact specific segments of the population. Most common attacks can be avoided by training employees and individuals to observe good cyber security practices. Identifying and avoiding suspicious emails can go a long way to prevent severe cyber-attacks. In events such as the Allentown Emotet incident, errors made by employees opening infected attachments cost the city over $1.2 million – an expense that could have been avoided with proper cyber security training.

As illustrated by the past occurrence section, economic impacts from cyber-attacks can be severe, depending on the nature of the attack and the preparedness of the systems affected. Critical facilities and institutions that provide essential services while utilizing computer systems are also considered vulnerable. If systems like CAD and 911 systems were infected, the fallout could be devastating, limiting emergency service's ability to respond. If computer systems at utility companies were compromised, individuals with medical needs could be impacted the greatest (see 4.3.18 Utility Interruption).

4.3.12. Dam Failure

Due to security issues the Dam Failure profile can be found as Appendix I.

4.3.13. Emergency Services

4.3.13.1 Location and Extent

Emergency medical services (EMS) and the fire services in Juniata County play a crucial role in the emergency response system, providing services ranging from emergency and medical transport for the sick and injured each year as well as fire and rescue responses. As stated in the Senate of Pennsylvania House of Representatives Final Senate Resolution 6 (SR6) Report, both EMS and fires services are in crisis due to the lack of funding and number of volunteers available to assume critical roles.

The citizens and visitors of the Commonwealth of Pennsylvania benefit daily from the services, knowledge and skills of the emergency services providers described below. Prehospital EMS encompasses a range of related activities, including 911 dispatch, response to the scene by ambulance, treatment and triage by EMS personnel, and transport to a care facility via ground and/or air ambulance. Importantly, it also includes medical direction provided through preestablished medical protocols or a direct link to a hospital or physician. EMS may encompass multiple levels of medical response, depending on how the system is configured in the community. EMS represents the first stage in a full continuum of emergency care that also includes hospital emergency departments (EDs), trauma systems/centers, inpatient critical care services, and interfacility transport.

Fire services consist of fire suppression and other rescue type services within their local jurisdictions. Communities have depended on volunteers and unfortunately the number of volunteer firefighters continues to decline. The services provided by these dedicated volunteers require education and certification which equates to hundreds of hours of time that many working individuals are unable to commit to resulting in an extreme difficulty to recruit. The current reality is that fewer trained personnel are responding to requests for the emergency services.

Acknowledgements have been made to suggest resolutions to legislation to aid communities in overcoming these obstacles. Communities continue to search for funding solutions in an already heavily taxed society.

Rural EMS and fire services often travel longer distances per incident due to the larger service areas and lower population density in rural areas. This results in higher average costs per trip for the agency as compared to their urban counterparts that more often accrue costs due to a higher number of trips.

The EMS system has a number of notable strengths. Prehospital EMS is far more sophisticated and far more capable than it was forty years ago. The 911 emergency notification system is available to virtually all Pennsylvanians and is regarded as highly responsive and reliable. The system enables rapid response to medical emergencies and facilitates crucial lifesaving care. In addition, the broad availability of cell phones has expanded 911 access to emergency and trauma scenes where no help was available

before. The development of automatic crash notification technology has also become more widely available, further improving emergency response. This innovation provides immediate and increasingly detailed crash information to dispatchers automatically, even before anyone on scene places a call.

In general, Pennsylvanians have access to rapid services in emergency situations. While there are many glaring exceptions, first responders in urban and suburban areas are generally able to arrive on scene within minutes of notification, with ambulance and fire service crews close behind. Moreover, with greater emphasis now being placed on by-stander care and prearrival instructions provided by dispatchers, care to patients can be initiated even more rapidly.

Emergency Services (EMS and fire combined) personnel form the backbone of the pre-hospital care and fire services system despite working under conditions that are stress-ful and at times dangerous. The sophisticated equipment now at the disposal of many emergency services providers, such as automated external defibrillators (AEDs) and 12-lead electrocardiographs (ECGs), as well as more effective medications, fire equipment and apparatus allow them to provide a much broader array of services than was avail-able in years past.

Response times vary widely depending on the location where an incident occurs. Across the large, sparsely populated terrain of rural areas, emergency services response times are significantly increased compared with those in urban areas. These prolonged re-sponse times occur at each step-in activation and response, including time to notifica-tion, time from notification to arrival at the scene, and time from arrival on the scene to hospital arrival.

4.3.13.2 Range of Magnitude

Finances, changing political climates, poor leadership, or a significant high-profile event can all trigger a system to be declared as "failed." 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 finance troubles are often blamed on poor leadership, they actually have many root causes. Labor rates, benefits, poor productivity, operational design, insurance reim-bursements and market regulation all have a significant direct impact on the financial viability of an organization. EMS is often underfunded and poorly reimbursed, and the lack of dedicated and stable funding sources will continue to challenge EMS systems. Fire services continue to struggle for membership as the number of volunteers as pre-viously defined continue to diminish at alarming rates. Fire services typically do not receive reimbursements for services. Fire departments depend on community donations and fund drives all of which are driven by the efforts of the volunteers. Without the efforts of volunteers, it becomes an extreme challenge to provide the services within their community.

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

Private insurance typically pays based on negotiated rates or will pay full charges to a point, occasionally by sending the payment directly to the patient, thus making it difficult for the provider to collect. This is done as a way to strong-arm the provider into a lower negotiated rate.

More important to understand is that governmental and commercial EMS reimbursement rates aren't tied to local EMS market conditions, competition, regulations or EMS operational system design, and therefore have a set cost assumption. Demand for EMS services within a particular market place (a county for example) doesn't flow based on price and availability of EMS service, as a normal market would, but rather is influenced by uncontrollable things like population demographics and size, socioeconomics, population health, education and outside influences such as seasonality or things like influenza.

Given this, there's essentially a set amount of dollars that are available in the marketplace, and how these dollars are spent or divided among competitive providers can affect long-term financial stability. Marketplaces where more than one EMS provider exists yields a diseconomy of scale; things like dispatch, administrative, billing, fleet and other EMS functions are duplicated, thus driving up costs without an equal rise in dollars available to meet these expenses. In addition, competition often drives prices down in things like facility-paid, nonemergency work or loss-leader wheelchair work in order to move market share from one provider's pocket to another, thus shrinking the pool of dollars available toward the lower band in the marketplace.

4.3.13.3 Past Occurrence

Most EMS agencies are private organizations that lack local funding and exist based on reimbursements received from insurance companies and self-pay users of the system. The fires services depend on fund raising efforts by the volunteers and community donations. Due to the decreased reimbursements as described previously and the decrease in call volumes and the increase in number of treat-no transport call responses EMS agencies are failing. Similarly, fire services are experiencing decreased funds due to the correlation of a lack of volunteers to raise funds. If left unattended the effect may have devastating effects on communities.

Legislative attempts are being made but require time to draft and implement. Without financial support from the communities emergency services may not be able to remain in operation to serve the residents they have served for decades.

4.3.13.4 Future Occurrence

Volunteerism has been a significant component of the fire services. Most, if not all, members of our community fire departments are volunteers. Front and center it is commonly a problem retaining and recruiting 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.

According to an article published in the NY Times "*The Disappearing Volunteer Firefighter*" (August 16, 2014) there are twice the number of volunteers compared to career firefighters. Most notably though is the number of volunteers that continue to drop by around 11% since the 1980s. With that trend it is suggested that the number of paid firefighters continues to grow.

Today, it is difficult for small communities to have a paid service therefore requiring the use of volunteers. The trend has devastating effects. With a decreased number of volunteers to not only perform the tasks associated with fires and rescue operations it is imperative to facilitate fundraising. If there is a decreased number of 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 have to 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 able.

Fire departments perform many tasks, just not 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.

4.3.13.5 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 fact that ambulance 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 the operation. The statistics, response times and all times associated with all units dispatched are easily obtainable from the local 911 centers.

It is typical for fire services to have greater response times during the day or during most business hours. Most 911 centers have orders from various departments to dispatch additional services during the day due to the decreased numbers of volunteers available during the day, resulting in longer response times.

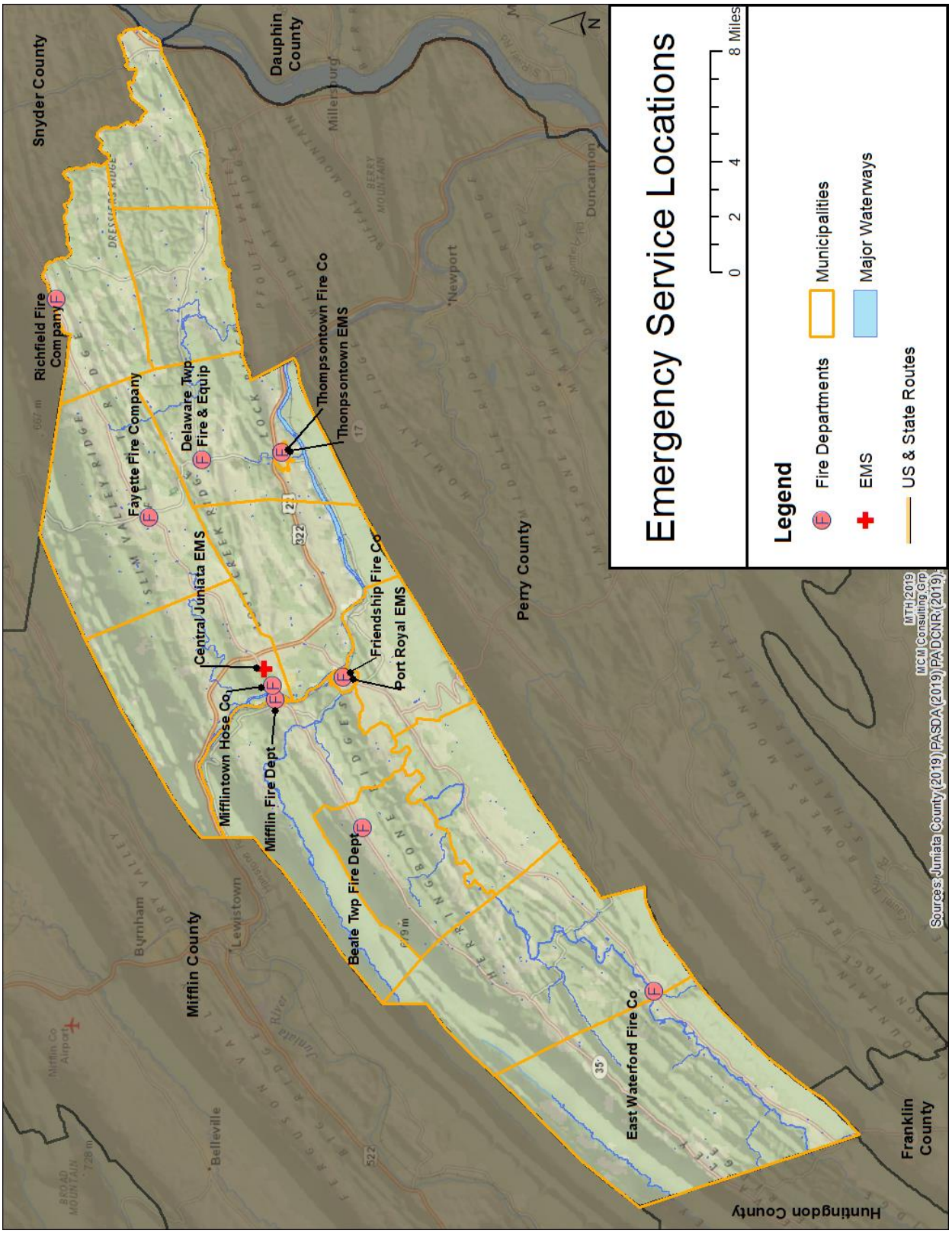
These departments must be supported to create and or discover new ways to not only recruit but to also retain volunteers. If left unattended the issues will continue and the lack of responses will grow, leaving the community more vulnerable to loss of life and loss of property.

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.

Table 45 - Emergency Responders

Emergency Responders *(Juniata Co. GIS, 2019)*			
Name	**Type**	**Address**	**Municipality**
Friendship Fire Company	Fire Department	212 W Fourth St	Port Royal Borough
Mifflin Fire Department	Fire Department	24 Main St	Mifflin Borough
Thompsontown Fire Company	Fire Department	55 State St	Thompsontown Borough
Mifflintown Hose Company	Fire Department	510 Washington Ave	Mifflintown Borough
Delaware Township Fire & Equip	Fire Department	224 East Salem Rd	Delaware Township
Richfield Fire Company	Fire Department	38146 Rt 35 N	Monroe Township
Fayette Fire Company	Fire Department	461 Main St	Fayette Township
Beale Township Fire Department	Fire Department	2051 Cider Press Rd	Beale Township
East Waterford Fire Company/Town Hall & Fire Company.	Fire Department	9607 Rt 75 S	Tuscarora Township
Port Royal EMS	EMS	316 Milford St	Port Royal Borough
Thompsontown EMS	EMS	100 State St	Thompsontown Borough
Central Juniata EMS	EMS	47 CJEMS Ln	Fermanagh Township

Figure 30 - Emergency Service Locations



4.3.14. Environmental Hazards

4.3.14.1 Location and Extent

Chemicals for industrial use and petroleum products can pose an environmental hazard when such materials are manufactured, extracted, used, stored or transported. Most hazardous materials incidents are unintentional, however hazardous materials could also be released in a criminal or terrorist act. A release can result in injury or death and may contaminate air, water and/or soils. Hazardous materials incidents can be generally broken down into the subcategories of transportation and fixed facility.

Tanker trucks, tractor trailers and rail cars often are used to transport hazardous materials. When there are transportation incidents involving these type of vehicles, hazardous materials can be released in significant quantities. *Figure 31 - Hazardous Material Locations* includes the major transportation routes through Juniata County, including US Route 322/ 22, as well as State Routes 35, 75, 235, 333 and 850.

In Pennsylvania, facilities that use, manufacture, or store hazardous materials must comply with Title III of the federal Superfund Amendments and Reauthorization Act (SARA), and the Commonwealth's reporting requirements under the Hazardous Materials Emergency Planning and Response Act (1990-165), as amended. There are twenty-six SARA Tier II facilities in Juniata County (Juniata Co. GIS, 2019). A location summary of these facilities by municipality can be seen blow in *Table 48 – Municipal Summary of Hazardous Material Locations*, and a detailed report of these facilities can be found in Appendix E – Critical Facilities.

Fixed facilities are also monitored by the Environmental Protection Agency (EPA). The EPA has identified hazardous materials sites, not regulated by SARA Title III, and are known as Toxic Release Inventory (TRI) sites. Facilities which employ ten or more full-time employees and which manufacture or process more than 25,000 pounds (or use more than 10,000 pounds) of any SARA Section 313-listed toxic chemical in the course of a calendar year are required to report TRI information to the EPA, the federal enforcement agency for SARA Title III and PEMA. As of February 2019, there are three locations that handle a total of ten TRI regulated chemicals in Juniata County (see *Table 48 – Municipal Summary of Hazardous Material Locations*).

Figure 31 - Hazardous Material Locations identifies locations that consume, store or release potentially hazardous materials and wastes. The map also shows land recycling cleanup locations, which are locations that fall into the jurisdiction of the Hazardous Sites Cleanup Act (HSCA) and are locations where the department of environmental protection (DEP) provides funding and the authority to conduct cleanup actions because of hazardous substances have been released. The DEP also has the authority to force the persons responsible for the release to conduct cleanup actions or to repay public funds spent on a DEP funded cleanup action.

Natural gas pipelines are often at higher capacity during cold winter months when people are utilizing natural gas for heating more. There are numerous pipeline groups that run through Juniata County that deal with natural gas and other products. For locations of all pipelines in Juniata County, see *Figure 31 - Hazardous Material Locations*

Dominion Energy Transmission, INC: Dominion Energy operates a natural gas pipeline that runs north/south through Juniata County, running through State Game Lands 215. Contact information for general inquiries is Frank Mack at (804) 771-3141, frank.mack@dom.com, or at 707 East Main Street in Richmond Virginia, 23219.

Texas Eastern Transmission, LP: Texas Eastern Transmission is a Spectra Energy Partner, and they operate a natural gas pipeline that runs east/west through the southern portion of Juniata County, cutting just south of East Waterford. Contact information for general inquiries is Dwayne Teschendorf at (713) 627-5573, Dwayne.Teschendorf@enbridge.com, or at 5400 Westheimer Ct in Houston Texas, 77056.

Enterprise Products Operating LLP: Enterprise operates a pipeline that runs across the southern portion of Juniata County that crosses just south of East Waterford. The line is part of their Teppco Norther Region system and transports liquefied petroleum gas like butane, isobutene and propane through the county. Contact information for general inquiries is at (888) 806-8152, PublicAwareness@eprod.com, or at P.O. Box 4324 in Houston Texas, 77210.

Sunoco Pipeline LP: Sunoco operates a pipeline that cuts across the southern tip of Juniata County. This pipeline transports other highly volatile products, not natural gas. Contact information for general inquiries is Todd Nardozzi at (713) 989-7126, todd.nardozzi@energytransfer.com or at 1300 Main St, 2nd Floor in Houston Texas, 7702.

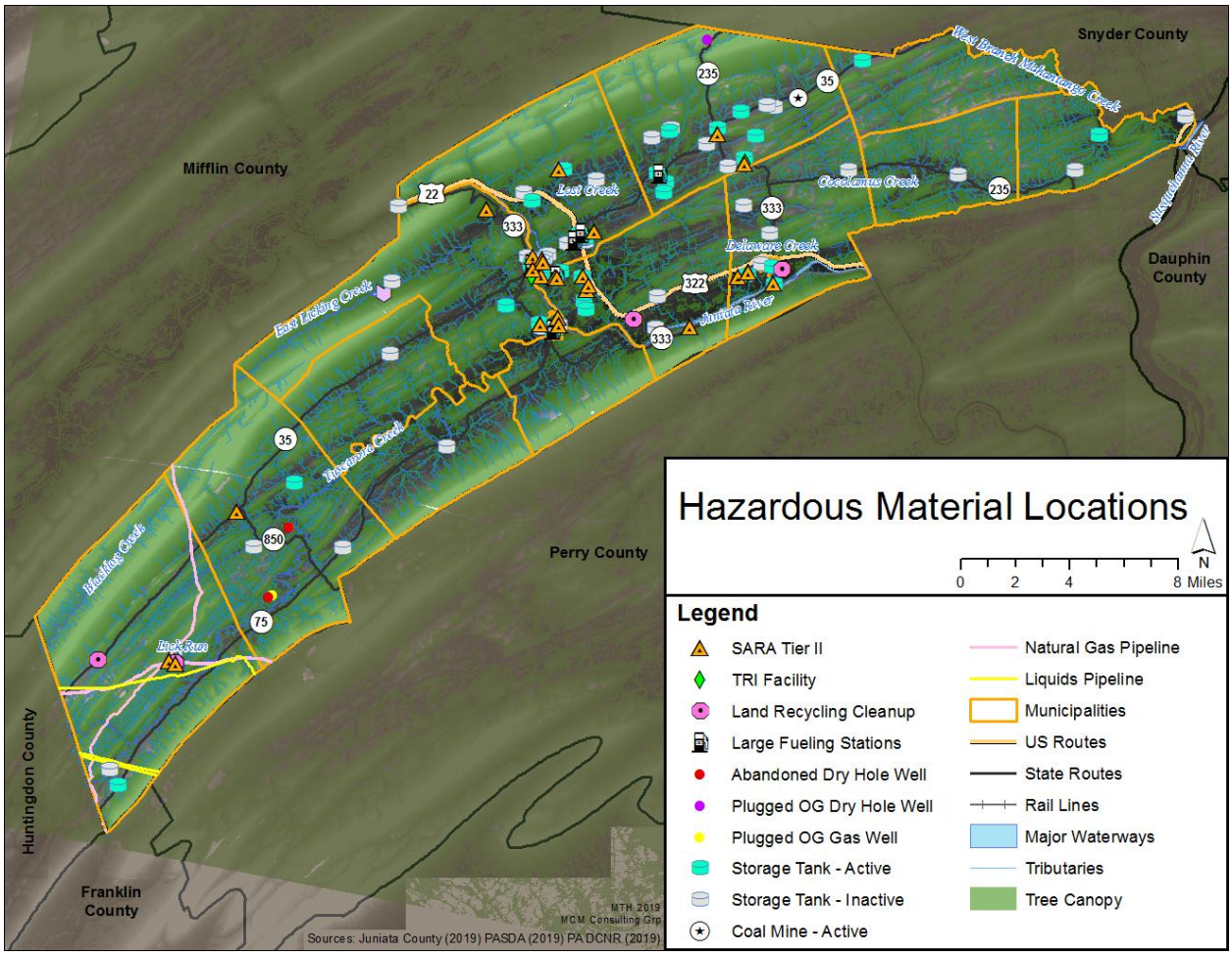
Buckeye Partners, LP: Buckeye operates a pipeline that cuts roughly parallel to the Sunoco Pipeline across the southern tip of Juniata County. This pipeline transports multiple non-highly volatile products. Contact information for general inquiries is Claudia Pankowski at (610) 904-4113, CPankowski@buckeye.com, or at 5 TEK Park 9999 Hamilton Blvd in Breinigsville PA, 18031.

Oil and gas extraction facilities can also be sources of hazardous material release. There are currently no active oil or gas wells within Juniata County, however there is significant natural gas extraction from the Marcellus Shale formation elsewhere in Pennsylvania. The closest major natural gas operations to Juniata County is to the north in Centre, Clinton and Lycoming Counties.

The extraction process of Marcellus Shale natural gas is different from that of traditional natural gas extraction. Vertical and horizontal well drilling is usually necessary to access the Marcellus Shale. When horizontal drilling is necessary, hydraulic fracturing or fracking is often used. Fracking involves pumping millions of gallons of water into the well with other components and chemicals mixed in the brine. Usually some type of fracturing process is implemented so that once the fracture is in place, the fluid assists

the gas to excrete more easily. There are significant environmental concerns related to the methods used to extract natural gas from the Marcellus Shale, including water contamination from fracking fluids or methane gas, and fires at well sites. Juniata County is not in close proximity to major natural gas extraction efforts; however, it is still prudent to be aware of the hazard they can pose to the surrounding region.

Figure 31 - Hazardous Material Locations



4.3.14.2 Range of Magnitude

Hazardous material releases can contaminate air, water and soil, and can possibly cause injuries, poisonings, or deaths. Hazardous materials fall into nine hazard classes:

Class 1 - Explosives
Class 2 - Gases (flammable, non-flammable, non-toxic, and toxic)
Class 3 - Flammable and combustible liquids
Class 4 - Flammable solids (spontaneously combustible materials, and dangerous when wet materials/water-reactive substances)
Class 5 - Oxidizing substance and organic peroxides
Class 6 - Toxic substances and infectious substances
Class 7 - Radioactive materials
Class 8 - Corrosive substances
Class 9 - Miscellaneous hazardous materials/products, substances or organisms.

All nine hazard classes can be found being transported and stored at fixed facilities. Certain conditions can exacerbate release incidents:

- Weather conditions affect how the hazard occurs (e.g. transportation accidents) and develops (dispersion can take place rapidly when transported by water and/ or wind). Release can be a secondary impact of natural hazards such as tornadoes or flooding.
- Micro-meteorological effects of buildings and terrain: alters dispersion of hazardous materials
- Proximity to surface and ground water sources
- Compliance with applicable codes (e.g. building or fire codes) and maintenance failures (e.g. fire protection and containment features) can substantially increase the damage to the facility itself and to surrounding buildings

The type of material released, distance and related response time of emergency responders also significantly impact the severity and scope of hazardous material releases and clean-up efforts. Areas most proximal to the release are usually at greatest risk, but depending on the material, a release can travel great distances or remain present in the environment for long periods of time (e.g. centuries or millennia for some radioactive materials) resulting in chronic and extensive impacts on people and the environment.

Whether or not a hazardous material fixed facility site (such as SARA Title III facilities) are in the special flood hazard area is also a concern. Flood vulnerable hazardous material sites have the potential for large-scale water contamination during a flood event if the storage and protection of the hazardous materials is compromised in the flood.

Oil and gas well drilling can have a variety of detrimental effects on the environment. The fluid used in hydraulic fracturing contains numerous chemicals that are harmful to the environment and health of people. The fluid that is recovered is referred to as frac fluid and it must be appropriately disposed of. Not all injected fracking fluids can be recovered and disposed of, and they can often enter the local environment. Surface waters and soil are sometimes polluted by a salty wastewater product of oil and gas well drilling (brine) and from oil spills occurring at the drilling site or from a pipeline breach. This can spoil public drinking water supplies and be particularly detrimental to vegetation and aquatic animals, making water safety an important factor in oil and gas extraction (Gregory et al., 2011). In some cases, associated with fracking, methane has been found contaminating drinking water in surrounding areas (Osborn et al., 2011).

Abandoned oil, gas, coal and other types of wells and mines can contaminate groundwater and consequently drinking water wells when not properly plugged or remediated. Acid Mine Drainage (or AMD) is a term referring to the acidic and environmentally hazardous run-off that comes from abandoned mines.

4.3.14.3 Past Occurrence

The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) holds detailed accounts of hazardous material incident records associated with transportation. PHMSA has six reported incidents occurring in Juniata County between 1974 and August 2018 (see *Table 46 - Pipeline and Hazardous Materials Safety Administration Incidents*). Detailed reports can be found by looking up the report

number at PHMSA's incident search page: hazmatonline.phmsa.dot.gov/IncidentReportsSearch.

There are several known incidents that are not recorded in the PHMSA database: On December 9, 2001, a tractor trailer traveling westbound on Route 322 near Millerstown carrying 100 gallons of diesel oil struck a deer and then swerved into a ditch. The tank was punctured in the incident and oil spilled out of the saddle tanks.

Another significant event occurred in March of 2011 in Fayette Township when a transformer fell into a small creek during a storm. A contractor discovered the fallen transformer and reported that five gallons of mineral oil was released into the stream.

In December 2011, when there were reports of repeated dumping and burning of hazardous materials such as old car batteries, plastic piping, DDT, and harmful acids at a property located along Cider Press Road across from the Walnut Fire House. The property was due to be sold to the township, and the incidents complicated the legal climate for the sale (National Response Center, 2013).

Emergency services in Juniata County responded to forty-six hazardous material incidents between February 2010 and March 2019, many of which occurred on major transportation routes. *Table 47 – Hazardous Material Dispatches* reports the list of incidents, with dates and incident locations. Specific details of each account were not available at the time of this report.

There is one active coal mine in Juniata County located in the eastern portion of Fayette Township (see *Figure 31 - Hazardous Material Locations*). As of February 2019, the PA DEP identifies ten Land Recycling Cleanup Locations in Juniata County. Each appears on *Figure 31 - Hazardous Material Locations*.

Table 46 - Pipeline and Hazardous Materials Safety Administration Incidents

Pipeline and Hazardous Materials Safety Administration Incidents *(PHMSA, 2019)*					
Report Number	**Date**	**Incident City**	**Location Details**	**UN Num.**	**Quantity Released (LGA)**
I-1974070153	06/19/1974	Mifflintown	Highway	UN1075	0
I-1985100012	09/12/1985	Mount Pleasant	Highway	UN1866	15
I-1991090809	09/16/1991	Port Royal	In Transit on 4th Street	UN2672	1
I-1995080171	07/12/1995	Millerstown	In Transit on Rt 322-22 West	UN3257	5000
	Description:	Rollover accident, vehicular crash or accident damage. Total of $113,000 in damages.			
I-1998061517	06/14/1998	Richfield	Unloading at 2977 Brecksville Rd	UN1263	1
	Description:	Improper Preparation for Transportation; Inadequate Blocking and Bracing; Too Much Weight on Package			
I-2000070467	06/29/2000	Mifflintown	In Transit on Rt 322	UN2735	55
	Description:	Inadequate Blocking and Bracing. Total of $5,000 in damages.			
E-2008070485	06/28/2008	Mount Pleasant	Unloading	UN1263	0.25
	Description:	Inadequate Blocking and Bracing			

Table 47 – Hazardous Material Dispatches

Hazardous Material Dispatches ***(Juniata County EMS, 2019)***	
Event Location	**Date**
145 Railroad Ave	03/16/2010
537 Arch Rock Rd	04/01/2010
24578 Rt 35 N	09/18/2010
S Main St	04/25/2011
18560 Rt 322 W	05/03/2012
438 Oakhurst Ln	08/19/2012
1733 Jericho Rd	12/19/2012
24578 Rt 35 N	03/06/2013
9 Stop Plaza Dr	06/20/2014
17 Main St	07/31/2014
24578 Rt 35 N	09/27/2014
10821 Licking Creek Rd	03/09/2015
33 Stop Plaza Dr	06/25/2015
24578 Rt 35 N	07/14/2015
24578 Rt 35 N	07/14/2015
1005 Smokey Hollow Rd	07/24/2015
551 Main St	08/25/2015
10178 Rt 322 W	09/14/2015
19655 Rt 322 W, Delaware Township	11/03/2015
11 N Third St, Mifflintown Borough	11/20/2015

Hazardous Material Dispatches *(Juniata County EMS, 2019)*	
Event Location	**Date**
24578 Rt 35 N, Fermanagh Township	04/27/2016
Rt 322 E, Delaware Township	05/12/2016
William Penn Hwy / Arch Rock Rd	08/08/2016
153 Mountain View Rd, Walker Township	10/10/2016
11203 Route 35, West Perry Township	01/11/2017
Rt 322 At Millerstown W/B Exit	04/14/2017
454 Industrial Park Rd, Walker Township	04/27/2017
152 Oakhurst Ln, Delaware Township	09/19/2017
27449 Rt 35 N, Fermanagh Township	10/25/2017
Rt 322 E, Fermanagh Township	01/03/2018
9 Stop Plaza Dr, Fermanagh Township	01/18/2018
322 Thompsontown Off Ramp W	03/22/2018
1806 William Penn Hwy, Fermanagh Township	06/19/2018
9905 Rt 322 E, Walker Township	06/29/2018
10173 Rt 322 E, Walker Township	06/29/2018
57 Port Royal On E Ramp, Walker Township	06/29/2018
112 Port Royal On E Ramp, Walker Township	06/29/2018
103 Port Royal On E Ramp, Walker Township	06/29/2018
54 Port Royal On E Ramp	06/29/2018
Black Dog Rd / Maze Rd, Delaware Township	08/04/2018
Doe Run Rd / Cedar Springs Rd	09/03/2018
Moore Rd, Delaware Township	11/06/2018
Rt 322 W, Fermanagh Township	11/26/2018
Rt 35 N, Fayette Township	12/09/2018
24578 Rt 35 N, Fermanagh Township	01/29/2019
20145 Rt 322 W, Delaware Township	02/19/2019

4.3.14.4 Future Occurrence

Hazardous material release incidents are generally difficult to predict, but the presence and use of such known dangerous materials warrants preparation for release events. Emergency response in Juniata County should be prepared to handle the types of hazardous materials housed and used in the SARA Title III facilities, TRI facilities, and pipelines that are located in the county. The federal Superfund Amendments and Reauthorization Act (SARA) is also known as the Emergency Planning and Community Right-to-Know Act (EPCRA), and local emergency planning committees (LEPCs) are designed by EPCRA to ensure that state and local communities are prepared to respond to potential chemical accidents.

4.3.14.5 Vulnerability Assessment

A hazardous material spill can be a secondary effect of a natural hazard such as flooding, other severe weather, or an earthquake. Due to the agricultural industry and traffic on transportation routes, Juniata County can be susceptible to manure and chemical fertilizer spills. The Juniata River is a significant tributary to the Susquehanna River, and a release of hazardous materials into the river has the potential to not only impact Juniata County residents, but also those in neighboring Perry County and other downstream communities. SARA Title III sites, TRI sites, and transportation routes are considered the most likely locations in Juniata County to experience hazardous material spills. For more information on transportation incidents, see Section 4.3.17 – Transportation Incidents.

According to GIS data available from the PA DEP as of February 2019, there are no active oil or gas wells in Juniata County. *Figure 31 - Hazardous Material Locations* shows the locations of four oil and gas facilities; one plugged gas well, one plugged dry hole well, and two abandoned dry hole wells. The below *Table 48 – Municipal Summary of Hazardous Material Locations* shows a summary of SARA facilities, TRI facilities, Land Recycling Cleanup Locations and domestic water wells.

Private water supplies such as domestic drinking water wells in the vicinity of oil and gas wells are at risk of contamination from brine and other pollutants, including methane which can pose a fire and explosive hazard. Ideally, vulnerability of private drinking well owners would be established by comparing the distance of drinking water wells to known oil and gas well locations, but this extensive detailed data is not readily available at this time. Private drinking water is largely unregulated and information on these wells is voluntarily submitted to the Pennsylvania Topographic and Geologic Survey by water well drillers, and the existing data is largely incomplete and/or not completely accurate.

Table 48 – Municipal Summary of Hazardous Material Locations

Municipal Summary of Hazardous Material Locations *(PA DEP, 2019; PA GWIS, 2019; EPA, 2017; Juniata Co. GIS, 2019)*				
Municipality	**Domestic Water Wells**	**SARA Tier II**	**TRI**	**Land Recycling Cleanup**
Beale Township	35	0	0	0
Delaware Township	87	3	5	1
Fayette Township	173	2	3	0
Fermanagh Township	140	3	0	0
Greenwood Township	43	0	0	0
Lack Township	50	2	0	7
Mifflin Borough	17	2	0	0
Mifflintown Borough	3	1	0	0

Municipal Summary of Hazardous Material Locations *(PA DEP, 2019; PA GWIS, 2019; EPA, 2017; Juniata Co. GIS, 2019)*				
Municipality	**Domestic Water Wells**	**SARA Tier II**	**TRI**	**Land Recycling Cleanup**
Milford Township	121	1	2	0
Monroe Township	137	0	0	0
Port Royal Borough	15	4	0	0
Spruce Hill Township	19	0	0	0
Susquehanna Township	66	0	0	0
Thompsontown Borough	4	0	0	0
Turbett Township	47	0	0	0
Tuscarora Township	31	1	0	0
Walker Township	173	7	0	2
Undesignated	31	0	0	0
Total	**1192**	**26**	**10**	**10**

4.3.15. Opioid Epidemic

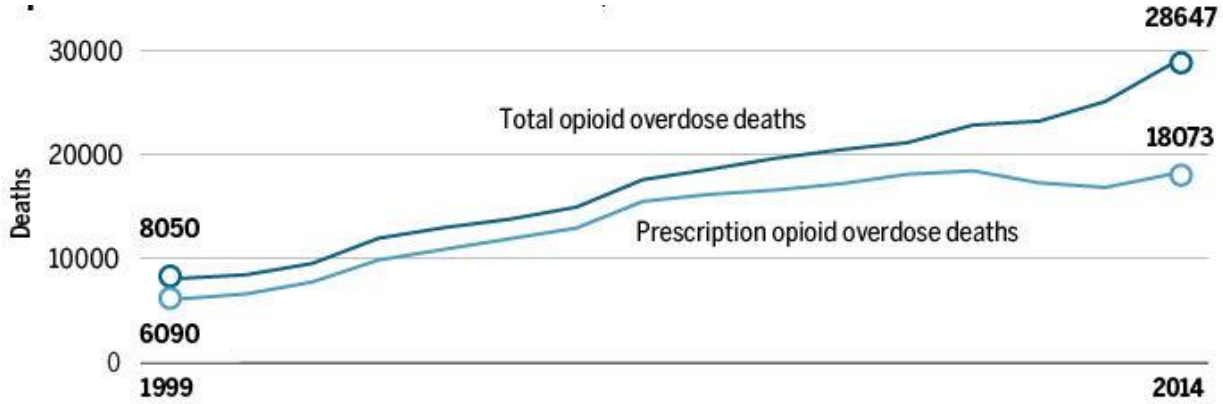
4.3.15.1 Location and Extent

Pennsylvania and the Nation at large has 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 (see *Figure 32 - US Opioid Deaths 1999-2014*). *Figure 33 - Opioid Death Changes 2013-2017* shows that out of States in the United States, Pennsylvania has had the third highest rate of opioid related deaths, and that while they are not accounted for in *Figure 32 - US Opioid Deaths 1999-2014*, overdose rates have continued to rise after 2014.

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.

The opioid crisis was declared to be a public health emergency 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.

Figure 32 - US Opioid Deaths 1999-2014



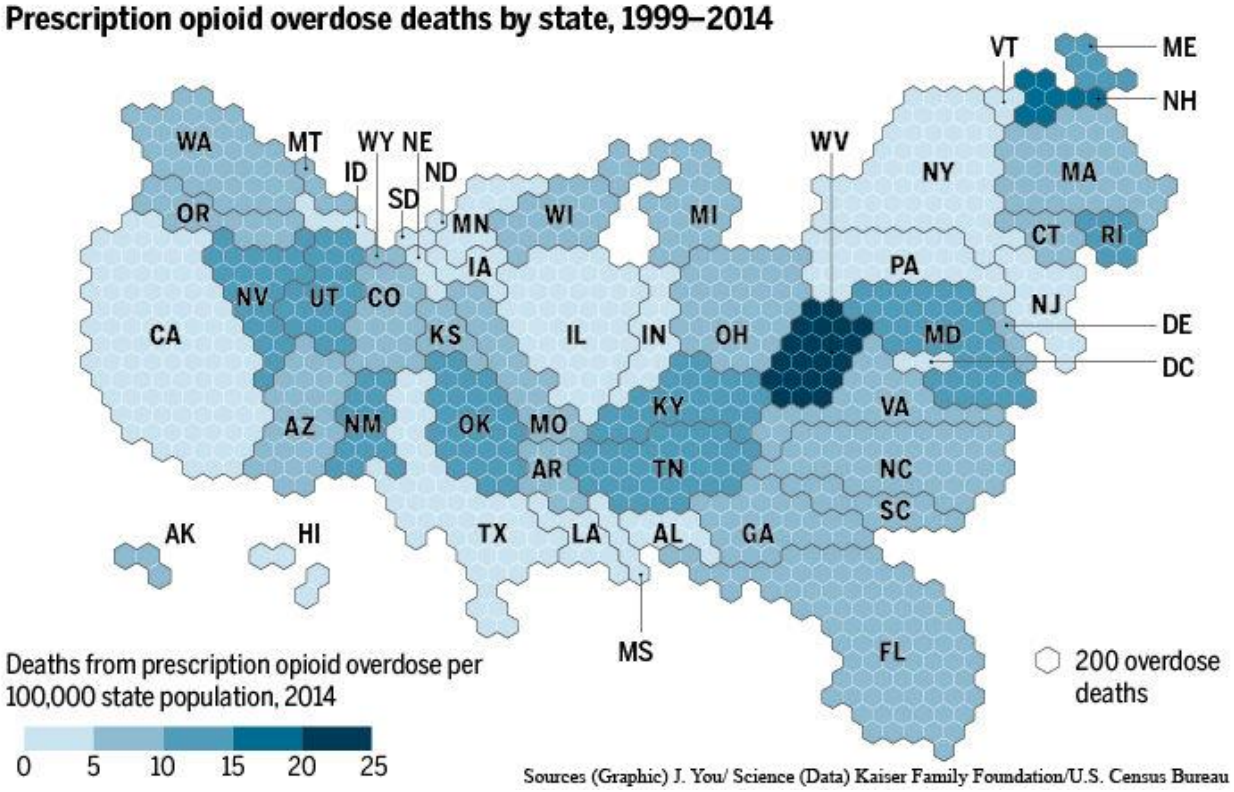
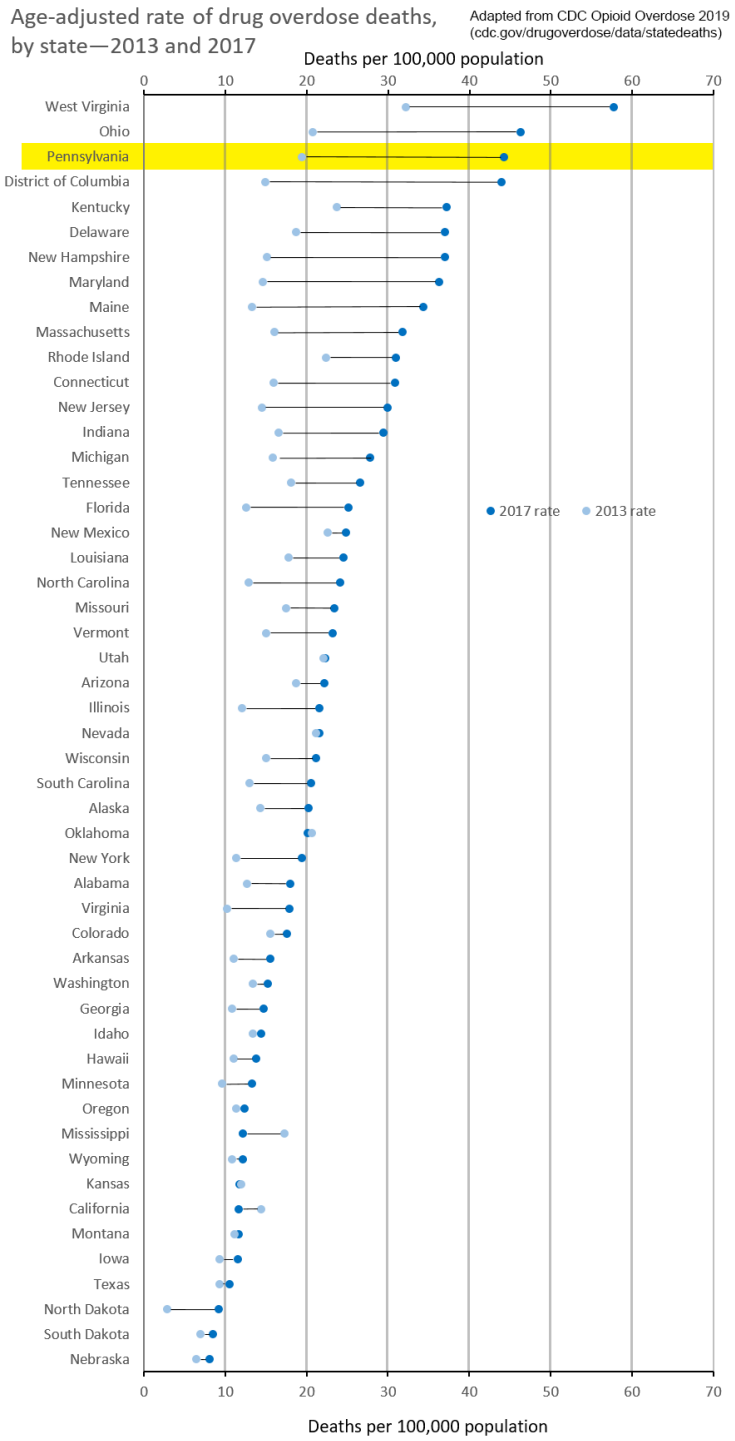


Figure 33 - Opioid Death Changes 2013-2017



4.3.15.2 Range of Magnitude

According to the CDC, more than 140 Americans die every day from an opioid overdose. In 2014, 2,742 overdose deaths were reported across Pennsylvania, increasing to 3,376 reported overdose deaths in 2015, an increase of 23.4 percent (DEA, 2015). Reported overdose deaths increased again in 2016 to 4,642, an increase of thirty-seven percent from 2015 (DEA & PITT, 2017), then again to a total of 5,456 deaths in 2017. From 2015 to 2017, the reported drug related overdose deaths in Pennsylvania increased 65 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).

4.3.15.3 Past Occurrence

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. From 2015 to 2016, opioid related overdose deaths per 100,000 people in Juniata County increased from approximately four to approximately sixteen, then dropped to eight in 2017. From 2015 through 2017 there have been seven reported opioid related overdose deaths in Juniata County. This death data comes from the PA Coroner's office and Overdose Free PA, and is summarized in *Table 49 - Pennsylvania Overdose Death History* along with comparisons to statewide rates. Data from 2018 was not available from the Juniata County Coroner's office at the time of this report. *Figure 34 - Pennsylvania Opioid Overdose Deaths 2015-2017* shows overdose deaths per 100,000 people from 2015 to 2017 for Pennsylvania by county.

Heroin was the most common drug present in opioid drug-related overdose deaths that occurred in Juniata County in 2017. However, from 2014 to 2017, there has been a significant increase in the abuse of Fentanyl in Pennsylvania, to the point where now Fentanyl is the most prevalent opioid drug trafficked, abused and overdosed on in Pennsylvania, found in 67% of overdose victims in 2017 in Pennsylvania (see *Table 50 - Drugs Present in 2017 PA Overdose Deaths*).

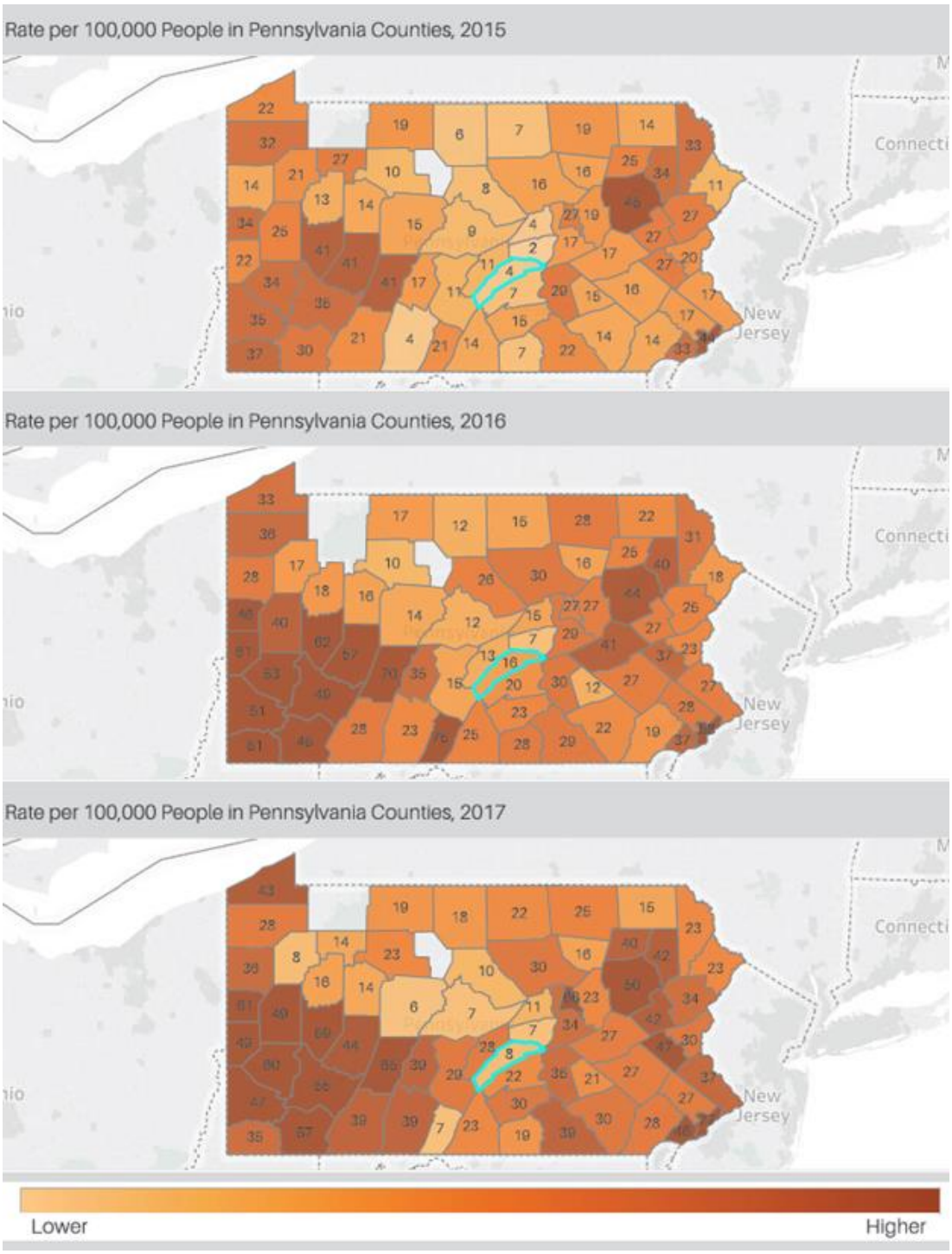
Table 49 - Pennsylvania Overdose Death History

Pennsylvania Overdose Death History *(PA Coroner's Office, Juniata County Coroner, 2019)*			
Year	**Overdose Deaths**	**Overdose Deaths / 100,000 People**	**Overdose Deaths / 100,000 People PA Wide**
2014	No Reports	Not Applicable	21.9
2015	1	4.04	26.7
2016	4	16.2	36.5
2017	2	8	42.5

Table 50 - Drugs Present in 2017 PA Overdose Deaths

Drugs Present in 2017 PA Overdose Deaths ***(DEA & Pitt, 2018)***	
Drug Category	**Percent Reported Among 2017 Decedents**
Fentanyl	67%
Heroin	38%
Cocaine	32%
Benzodiazepines	31%
Prescription Opioids	20%
Ethanol	19%
FRSs & NPSOs	18%
Other Illicit Drugs	11%

Figure 34 - Pennsylvania Opioid Overdose Deaths 2015-2017



4.3.15.4 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 during 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 however 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 (DEA & PITT, 2018). As of April, 2016, medical marijuana is legal in Pennsylvania, and can be prescribed to those with severe chronic or intractable pain and even to those who have *"opioid use disorder for which conventional therapeutic interventions are contraindicated or ineffective, or for which adjunctive therapy is indicated in combination with primary therapeutic interventions"* (PA DOH, 2019).

Research suggests that in states where medical marijuana has been permitted, overdose deaths from opioids have decreased about twenty-five percent, with the effect strengthening after five to six years of the legalized alternative medicine (Bachhuber et al., 2014). In those states where medical cannabis is permitted, each physician prescribed an average of 1,826 fewer doses of pain medication each year (Bradford & Bradford, 2016), suggesting that medical cannabis could help prevent patients from ever being exposed to addicting opioids (Miller, 2016). These trends suggest that the legalization of medical marijuana in 2016 in Pennsylvania could be a positive move for Pennsylvania in the effort to lessen hold that opioids have in the region.

Another possible alternative pain treatment comes from hemp extracted cannabidiol, or CBD. Unlike THC (the psychoactive constituent of cannabis) CBD in 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.

4.3.15.5 Vulnerability Assessment

Deaths from prescription opioid drugs like oxycodone, hydrocodone, and methadone have increased by more than four-fold since 1999. 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 through brief skin contact or the drug becoming airborne. These reports are disputed by many toxicologists and doctors, as the overdose reports were not verified by toxicology and are scientifically unsubstantiated and threaten to cause undue fear of opioid drugs (Faust & Boyer, 2018; O'Neill & Wheeler, 2018).

The American College of Medical Toxicology (ACMT) and the American Academy of Clinical Toxicology (AACT) published a position paper that debunks the risk that fentanyl poses to responders, suggesting that "the risk of clinically significant exposure to emergency responders is extremely low" (Moss et al., 2017). They continue to 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).

The January 10, 2018 gubernatorial disaster declaration was accompanied by thirteen initiatives in three areas of focus which illustrate the current status of the opioid crisis in the Commonwealth as of January 2018:

Enhancing Coordination and Data Collection to Bolster State and Local Response

- **Establishes and Opioid Command Center located at the Pennsylvania Emergency Management Agency (PEMA)**, which will house the Unified Opioid Coordination Group that will meet weekly during the disaster declaration to monitor implementation and progress of the initiatives in the declaration.
- **Expands Access to Prescription Drug Monitoring Program (PDMP) to Other Commonwealth Entities for Clinical Decision-Making Purposes** to improve treatment outcomes and better monitor compliance among prescribers. Since 2016, 90,000 physicians have conducted more than 1 million searches on the PDMP.
- **Adds Overdoses and Neonatal Abstinence Syndrome (NAS) as Reportable Conditions in Title 28, Chapter 27** to the DOH in order to increase data collection and improve outcomes in both areas.
- **Authorizes Emergency Purchase Under Procurement Code for Hotline Contract with Current Vendor,** giving DDAP further emergency purchase authorization to allow the department to enter into a contract with the current drug and

alcohol hotline vendor to ensure uninterrupted services. To date, the 24/7 helpline, 1-800-662-HELP, has received more than 18,000 calls to connect those suffering from substance use disorder with treatment.

Improving Tools for Families, First Responders, and Others to Save Lives

- **Enables Emergency Medical Services providers to leave behind naloxone** by amending the current Standing Order to include dispensing by first responders, including Emergency Medical Technicians (EMTs). The existing naloxone standing order and funding for naloxone to first responders has allowed for more than 5,000 lives to be saved so sufferers can be linked to treatment for substance use disorder.
- **Allows Pharmacists to Partner with Other Organizations to Increase Access to Naloxone** by waiving regulations to allow pharmacists to partner with other organizations, including prisons and treatment programs to make naloxone available to at-risk individuals upon discharge from these facilities.
- **Allows for the immediate temporary rescheduling of all fentanyl derivatives to align with the federal DEA schedule** while working toward permanent rescheduling.
- **Authorizes emergency purchasing under Section 516 of the Procurement Code** to allow for an emergency contract to expand the advanced body scanner pilot program currently in place at Wernersville that is used on re-entrants returning to the facility. This would prevent the program from lapsing.

Speeding Up and Expanding Access to Treatment

- **Waive the face-to-face physician requirement for Narcotic Treatment Program (NTP) admissions** to allow initial intake review by a Certified Registered Nurse Practitioner (CRNP) or Physician Assistant (PA) to expedite initial intakes and streamline coordination of care when an individual is most in need of immediate attention.
- **Expand access to medication-assisted treatment (MAT)** by waiving the regulatory provision to permit dosing at satellite facilities even though counseling remains at the base NTP. This allows more people to receive necessary treatments at the same location, increasing their access to all the care and chances for recovery.
- **Waive annual licensing requirements for high-performing drug and alcohol treatment facilities** to allow for bi-annual licensure process which streamlines licensing functions and better allocates staff time. DDAP will request that facilities seek a waiver by filing exception requests to the annual licensing requirement.
- **Waive the fee provided for in statute for birth certificates for individuals who request a good-cause waiver by attesting that they are affected by OUD**. This is of particular importance to individuals experiencing homelessness and other vulnerable populations who often cannot obtain copies of their birth certificates in order to access treatment and other benefits due to the financial requirements.

- **Waive separate licensing requirements for hospitals and emergency departments to expand access to drug and alcohol treatment** to allow physicians to administer short-term MAT consistent with DEA regulations without requiring separate notice to DDAP.

4.3.16. Terrorism

4.3.16.1 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 though, the origin of the terrorist or person causing the hazard is far less relevant to mitigation planning than the hazard itself and its consequences. It is important to consider however, 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
- Food Systems

Agroterrorism is the direct, intentional, generally covert contamination of food supplies or introduction of pests and/or disease agent to crops and livestock (FEMA, 2002). The ultimate target of the terrorist act is the local or regional economy and population. Juniata County is particularly vulnerable as it is a primarily rural county with approximately forty-one percent of its land dedicated to agricultural uses (Comprehensive Plan, 2009).

4.3.16.2 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, however, there are many variations. Particularly in the area of biological and chemical weapons, there are a wide variety of agents and ways for them to be disseminated. Terrorist methods can take many forms, including:

- Active Shooter
- Agroterrorism
- Arson/incendiary attack
- Armed attack
- Assassination
- Biological agent
- Chemical agent
- Cyber-terrorism (discussed in Section 4.3.11)
- Conventional bomb or bomb threat
- Hijackings
- Hazardous material release (intentional)
- Kidnapping
- Nuclear bomb
- Radiological agent

Impacts of an agroterrorism attack can vary greatly depending on the method of the attack. Animals and humans are more susceptible than crops to disease. If animals were infected with a zoonotic disease like anthrax or plague, the disease could then be spread to humans. Infecting animals with disease that does not impact humans can still create a major disruption and harm the local economy. An attack involving diseases

or pests could impact a wide expanse of land and spread rapidly, whereas food contamination will likely only impact a small population.

Agroterrorism can employ biological agents such as organisms or toxins that cause illnesses in people, livestock or crops. Some agents are difficult to detect, and they may only become active over time, so it can be difficult to diagnose a biological attack until victims are already displaying symptoms. Other agents have more apparent and immediate impacts. Individuals affected by a biological agent often require immediate attention from professional medical personnel, and in some cases require the victim to be quarantined. A worst-case scenario for agroterrorism in Juniata County could be the contamination of a major food and cash crop such as corn.

4.3.16.3 Past Occurrence

Active shooter, as defined by the US Department of Homeland Security, is an individual 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 2018, there were a total of 340 active shooter 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 27, 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. At the time of this report, no specific terrorist incidents occurring within Juniata County were available to profile here.

Another high-profile shooting occurred at the Pulse Nightclub in Orlando, Florida on June 12, 2016 where the LGBTQ community was targeted – forty-nine people were killed and fifty-three were wounded. 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).

The FBI regularly tabulates and reports statistics from active shooter incidents in the United States, and their data shows that there has been a significant recent increase in frequency of active shooter incidents since the year 2000, and the vast majority of the shooters were male (FBI, 2019). 277 incidents occurred from 2000-2018, with the highest number of shootings occurring in 2017 and 2018 with 30 and 27 incidents respectively. Of the 277 incidents that have occurred from 2000-2018, 43.7% took place in commercial environments, 20.6% took place in an educational environment, and the remaining 26.2% took place at other locations such as open spaces, military and other

government properties, residential locations, houses of worship, and health care facilities (FBI, 2019). Figure 35 - Active Shooter Incidents 2000-2018 (FBI, 2019) and *Figure 36 - Active Shooter Incidents per Year* summarizes the FBI's data on active shooters.

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. Juniata County has not been directly impacted by any significant international terrorist incidents.

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 real life 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 in one way or another been a part of domestic terrorism in different forms.

Figure 35 - Active Shooter Incidents 2000-2018 (FBI, 2019)

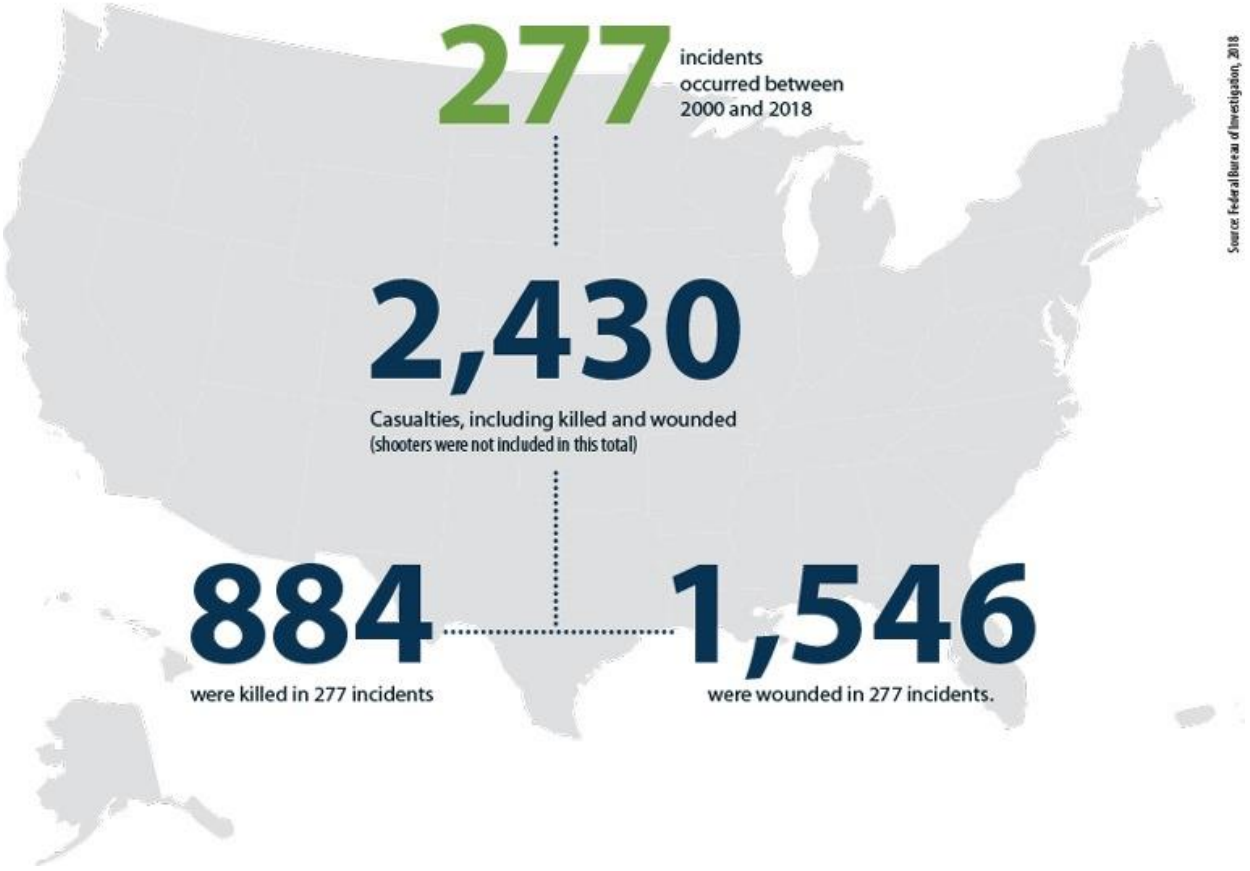
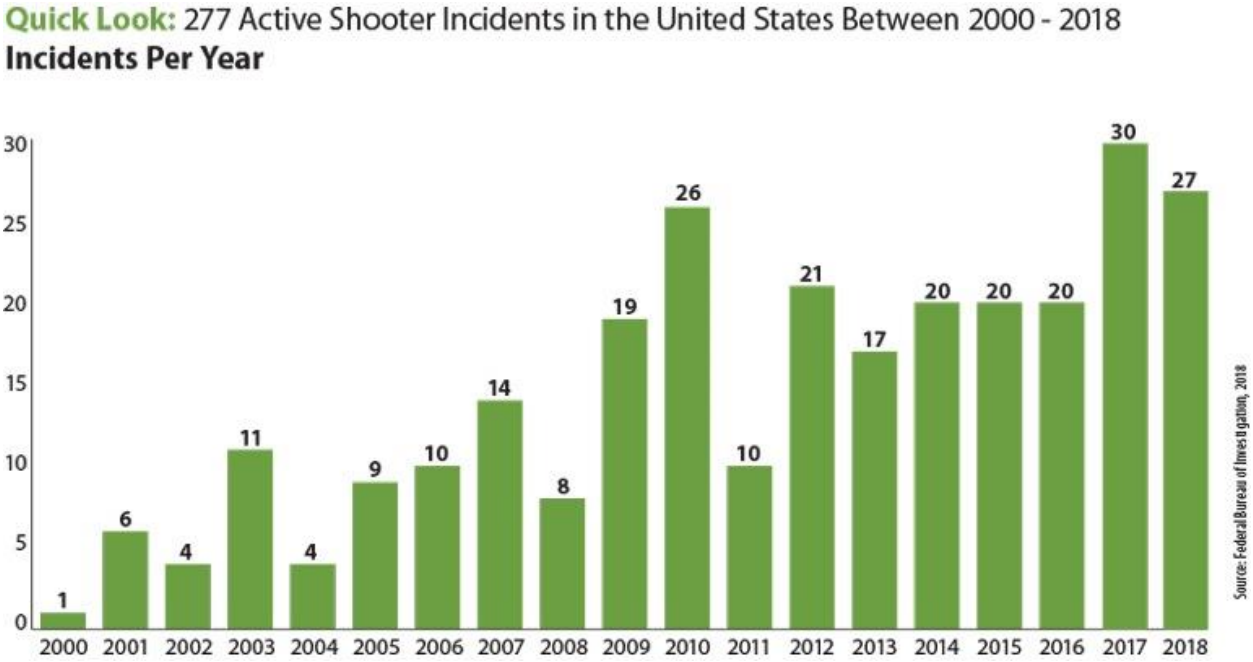


Figure 36 - Active Shooter Incidents per Year



4.3.16.4 Future Occurrence

The likelihood of Juniata County being a primary target for a major international terrorist attack is somewhat small. More likely terrorist activity in Juniata County are events such as bomb threats, other incidents at schools, or threats to agriculture. Juniata County has two public school districts – the Juniata County School District, and Greenwood School District. There are twelve private schools in Juniata County, many of which are Amish or otherwise church related, and there are no institutions of higher learning within the county.

4.3.16.5 Vulnerability Assessment

Agriculture consists of over 41% of land cover in Juniata County, and the tables below show the number of cattle, chickens and total number of farms in the county. Top crops in the county include corn, soybeans, oats, and forage land. Considering the widespread farming taking place in the county, despite the lack of past occurrences Juniata County should be prepared to handle agroterrorism incidents. It is important to note that the use and exposure to biological agents can remain unknown for sever 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.

Table 51 - Juniata County Cattle & Chicken Inventory

Juniata County Cattle & Chicken Inventory *(USDA National Agricultural Statistics Service)*			
Year	**All Cattle**	**Milk Cattle**	**Chicken Population**
1974	19,109	8,325	No Data
1978	18,227	8,267	173,032
1982	20,796	8,934	363,536
1987	20,040	8,111	305,206
1992	20,356	8,082	391,727
1997	20,211	7,963	393,895
1998	No Data	No Data	362,800
1999	No Data	No Data	380,100
2002	19,531	7,882	351,582
2007	19,282	8,200	241,345
2012	21,165	7,473	106,391

Table 52 - Juniata County Farmland History

Juniata County Farmland History (USDA National Agricultural Statistics Service)			
Year	**Land in Farms (acres)**	**Acres Per Farm**	**Number of Farms**
1997	86,740	142	611
2002	86,203	134	644
2007	97,681	124	788
2012	91,032	124	737

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 identify their vulnerabilities relative to known potential threats.

While terrorist activity in Juniata County is somewhat unlikely, all communities in should are considered vulnerable on some level, directly or indirectly, to a terrorist attack. Communities in Juniata County where critical facilities are concentrated such as Mifflin, Mifflintown and Port Royal Boroughs. It is also possible that Juniata County could experience the secondary effects of a terrorist attack if a significant nearby location was impacted. This could include the Susquehanna Steam Electric Station in Luzerne County and Three Mile Island in Dauphin County.

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 with regard to adjacent land uses?
- 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 lightning 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?

4.3.17. Transportation Accidents

4.3.17.1 Location and Extent

Transportation accidents are a daily occurrence across Pennsylvania and include incidents involving road, air and rail travel. Juniata County is served by one U.S. highway (U.S. Route 322/ 22), and Pennsylvania state routes including 35, 75, 235, 333 and 850. U.S. Highway 15/ 11 cuts through the very northeast tip of Juniata County for just over a mile. There are approximately 384 miles of U.S. and state routes running throughout the county, in addition to more miles of locally maintained roads. Transportation accidents are directly impacted by hazardous weather events such as winter weather, heavy rainfall, and extreme temperatures. Juniata County serves as a major transportation corridor and is heavily traveled by various motorists. Hazardous materials are transported through Juniata County on a daily basis *Figure 37 - Major Transportation Routes* shows the transportation system in Juniata County along with the annual average daily traffic volume by number of vehicles.

There are two privately-owned airports in the county and three heliports, with Mifflintown Airport open for public use. For more details see *Table 53 - Airports* and *Figure 37 - Major Transportation Routes*. The Pennsylvanian is an Amtrak passenger rail line that runs daily from Pittsburgh to New York City and passes through Juniata County,

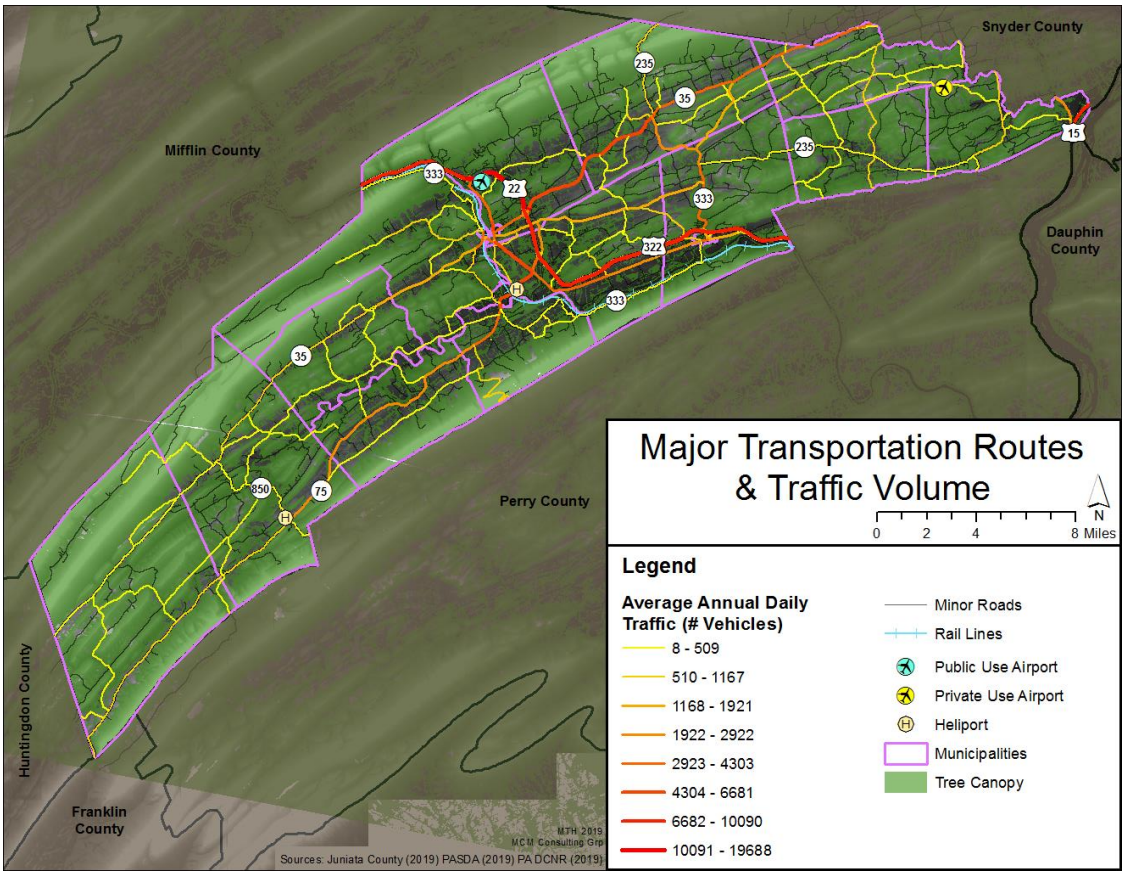
roughly parallel to US Route 322/ 22. The train does not stop in Juniata County, with the nearest stops in Lewistown (Mifflin County) and Harrisburg (Dauphin County).

Juniata County provides public transportation services through a program called "CARS" (Call-A-Ride-Service). The CARS initiative is a shared-ride program provided by the Mifflin-Juniata Area Agency on Again (MJAA). Senior citizens may use the service for free, but anyone may pay to use the service provided they pre-register with the CARS program (MJAA, 2013).

Table 53 - Airports

Airports in Juniata County ***(Federal Aviation Administration, 2019)***				
Facility Name	**City**	**Ownership**	**Use**	**Activation Date**
Stottle Memorial Heliport (02P)	Honey Grove	Private	Public	12/1/2001
Mifflintown Airport (P34)	Mifflintown	Private	Public	02/1/1977
Kint Farm Heliport (PN70)	Port Royal	Private	Private	07/1/2003
Jansen Vineyards Airport (PN71)	Richfield	Private	Private	07/1/2003
Richfield Station Heliport (0PA0)	Richfield	Private	Private	08/1/2018

Figure 37 - Major Transportation Routes



4.3.17.2 Range and Magnitude

Transportation accidents can result in death or serious injury and extensive property loss or damage. In the United States, over 37,000 people die in road crashes annually (ASIRT, 2017). Inclement weather and higher traffic volume and speed increase the risk for automobile accidents. Road and railway accidents in particular have a potential to result in hazardous material releases. Accidents involving hazardous materials can pose an environmental hazard and potentially contaminate the air, water and or soil. Hazardous material release is covered in more detail in Section 4.3.14 Environmental Hazards.

Aviation incidents most often occur near landing or take-off sites; the five-mile radius around each airport in Juniata County, especially the public use Mifflintown Airport, is considered high-risk areas for aircraft incidents.

4.3.17.3 Past Occurrence

The most serious transportation concerns in Juniata County involves U.S. route 322/22, the small portion of U.S. route 15 that runs through Juniata County, and state route 35 as they are the most highly traveled highways in the county. From March 2010 until March 2019, there were a total of 2,515 motor vehicle accidents where emergency services were dispatched. This is an average of approximately 282 events a year where Juniata County emergency services are required for assistance in highway transportation incidents (See *Table 54 - CAD and Fire Department MVA Dispatches*).

Table 54 - CAD and Fire Department MVA Dispatches

CAD and Fire Department MVA Dispatches ***(Juniata Co EMA, 2019)***	
Year	**MVA Incidents**
2010	190
2011	246
2012	226
2013	248
2014	253
2015	286
2016	354
2017	350
2018	291
2019	71
Total	**2,515**

Table 56 - PennDOT Juniata County Crash Report shows crash statistics recorded by the Pennsylvania Department of Transportation for Juniata County between 2008 and 2017. Over this ten-year period, incidents have occurred at a relatively consistent rate, with typically 20-30 significant crashes in Juniata reported by PennDOT each year. In those ten years, there were seven fatalities caused by motor vehicle accidents. Information was gathered from PennDOT Crash Information Tool (crashinfo.penndot.gov).

A significant rail accident occurred on January 14, 1988 when westbound Conrail freight train TV-61 collided with eastbound Conrail freight train UBT-506 near Thompsontown Pennsylvania. The engineers and brakemen on both trains were fatally injured, and the conductors received minor injuries, with damages to the trains estimated at over $6 million.

The likely cause of the crash was negligence on the part of engineers and crewmembers due to being overly sleep-deprived (NTSB, 2019). More information on this crash can be found using the Accident ID "DCA88MR003" or the National Transportation Safety Board (NTSB) Number "RAR-89-02." No other rail accident related fatalities are recorded in Juniata County, but there are two records of injuries occurring: on August 9 2005, a contractor working on maintenance got an object in his eye, and on March 17 2018, someone sustained bruising to their skull during a highway/rail collision incident.

According to the National Transportation Safety Board, Juniata County has experienced four aviation accidents between 1969 and February 2019. The most recent incident was an accident that occurred during takeoff of an airplane at the Mifflintown Airport on June 30, 2002 where the aircraft sustained substantial damages. Two people experienced minor injuries. Possibly the worst single recorded transportation incident in Juniata County occurred on September 4, 1969 when a plane crashed into a mountain after taking off from the Bellefonte Skyport, killing all four people on board. Heavy fog on the day of the incident impaired the pilot's vision and led to the crash. More information can be seen in *Table 55 - Aircraft Incidents*, and by looking up the accident number in the National Transportation Safety Board Aviation Accident Database.

Table 55 - Aircraft Incidents

Aircraft Incidents *(National Transportation Safety Board, 2019)*					
Accident Number	**Date**	**Location**	**Injury Severity**	**Make**	**Type of Operation**
IAD02LA064	06/30/2002	Mifflintown Airport (P34)	2 Minor Injuries	Stinson 108-3	Noncommercial, Pleasure/ Personal Transport
NYC80DA062	07/27/1980	Mifflintown, PA	No Reported Injuries	Cessna 172	General Aviation
NYC77FGT06	12/18/1976	Mifflintown, PA	No Reported Injuries	Cessna 177B	General Aviation
NYC70A0031	09/04/1969	Port Royal, PA	4 Fatalities	Piper PA-30	General Aviation

Table 56 - PennDOT Juniata County Crash Report

PennDOT Juniata County Crash Report *(PennDOT, 2019)*											
Year -->	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**Total**
Crash Summary By Severity Levels											
Fatal Injury	2	1	0	0	2	1	1	0	0	0	**7**
Suspected Serious Injury	2	3	1	1	1	2	0	1	3	1	**15**
Suspected Minor Injury	0	0	5	5	3	3	1	1	8	7	**33**
Possible Injury	6	6	8	9	10	10	8	8	2	1	**68**
Unknown Severity	0	0	0	1	1	1	2	1	5	2	**13**

PennDOT Juniata County Crash Report *(PennDOT, 2019)*											
Year -->	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**Total**
Unknown If Injured	0	1	0	0	0	1	1	0	0	2	**5**
Property Dmg Only	13	12	6	19	12	14	9	13	12	18	**128**
Total	**23**	**23**	**20**	**35**	**29**	**32**	**22**	**24**	**30**	**31**	**269**
Crash Summary By Description Types											
Angle	14	13	13	18	18	22	8	12	10	13	**141**
Head On	1	0	1	1	3	2	2	0	6	2	**18**
Hit Fixed Object	3	5	2	12	6	3	7	7	8	10	**63**
Non Collision	2	1	0	0	0	2	2	1	1	0	**9**
Opp Direction Sideswipe	1	0	0	0	0	2	0	1	0	0	**4**
Pedestrian	0	1	0	0	1	0	0	0	1	0	**3**
Rear End	2	2	4	3	0	1	3	3	3	4	**25**
Same Direction Sideswipe	0	1	0	1	0	0	0	0	1	1	**4**
Unknown Type	0	0	0	0	1	0	0	0	0	1	**2**
Total	**23**	**23**	**20**	**35**	**29**	**32**	**22**	**24**	**30**	**31**	**269**

4.3.17.4 Future Occurrence

Automobile accidents occur frequently, and typically occur more frequently than rail or aviation accidents. The most traveled roadways in Juniata County are U.S. Route 322/22, and State Route 35 (see *Figure 37 - Major Transportation Routes*). Additionally, these roadways are also the most traveled by heavy freight vehicles which can often carry hazardous materials.

The average rate of aviation accidents occurs at a rate of one per 1.2 million flights; with the chances of dying in a plane crash at one in eleven million. The likelihood of an aviation incident in Juniata County is considered low, however past events show that they are not impossible. While they are infrequent, railroad accidents are considered more likely to affect a larger population and/or the environment.

The probability of transportation accidents is characterized as highly likely as defined by the risk factor methodology probability criteria. An overall risk factor of 3.1 has been determined by the local planning team using this methodology.

4.3.17.5 Vulnerability Assessment

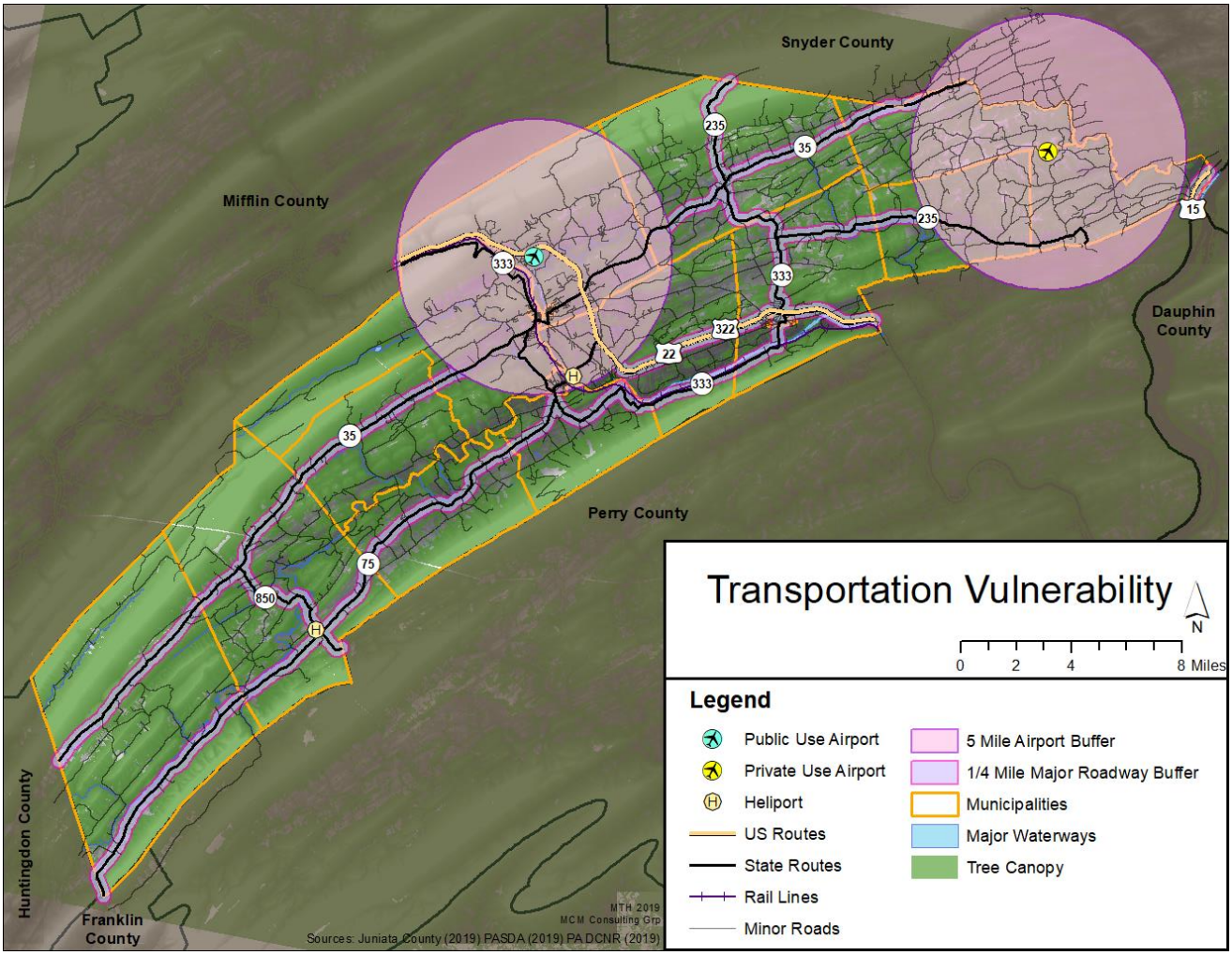
The combination of high traffic volume and severe winter weather in the county increase the chances of traffic accidents occurring. Vulnerability for highway accidents falls within a ¼ mile of roadways. Juniata County is also prone to aviation incidents near municipalities in close proximity to airports including the Harrisburg International Airport in Dauphin County.

Table 57 - Transportation Vulnerability shows the number of vulnerable addressable structures and critical facilities by municipality. Roadways included in this analysis were U.S. route 322/ 22 and 15/11, and state routes 35, 75, 235, 333 and 850. Airports included in the analysis were the Mifflintown and Jansen Vineyards Airports. *Figure 38 - Transportation Vulnerability* shows the locations of these vulnerable areas on a map of Juniata County.

Table 57 - Transportation Vulnerability

Transportation Vulnerability ***(Juniata Co. GIS, 2019)***				
Municipality	**1/4 Mi of Major Roads**		**5 Mi of Airports**	
	Addressable Structures	**Critical Facilities**	**Addressable Structures**	**Critical Facilities**
Beale Township	173	1	0	0
Delaware Township	475	4	0	0
Fayette Township	815	9	134	4
Fermanagh Township	717	11	1,562	22
Greenwood Township	81	0	184	0
Lack Township	224	0	0	0
Mifflin Borough	271	4	271	4
Mifflintown Borough	445	2	445	2
Milford Township	460	8	832	11
Monroe Township	281	2	677	3
Port Royal Borough	427	7	449	9
Spruce Hill Township	109	2	0	0
Susquehanna Township	85	0	499	1
Thompsontown Borough	333	3	0	0
Turbett Township	215	3	0	0
Tuscarora Township	405	9	0	0
Walker Township	311	11	589	11
Total	**5,827**	**76**	**5,642**	**67**

Figure 38 - Transportation Vulnerability



4.3.18. Utility Interruptions

4.3.18.1 Location and Extent

Utility interruptions include any damage to electricity, natural gas, telecommunications, and water infrastructure. Energy interruptions can be caused by severe solar storms, regional or national fuel or resource shortages, an electromagnetic pulse, public works failure, transmission facility accidents, and other major utility failures. Juniata County has utility services for electric, water, fuel and telecommunications, all of which can experience interruptions for several different reasons.

Often, utility interruptions are a secondary impact of other hazards such as severe thunderstorms, windstorms, tornados, winter storms and even traffic accidents. Heat waves

may also result in rolling blackouts causing electric to not be available for an extended period of time. All municipalities within the county have a probability of experiencing a utility interruption.

Utility interruptions can be caused by disruptions in service to pipeline transmission lines. In 2008, a low-pressure natural gas (LNG) pipeline was constructed to bring gas from Virginia to the Perulack Compressor Station in Juniata County. Additional pipeline was also added northward to the Leidy Hub complex in Clinton County (Energy Information Administration, 2009). There are also many miles of residential pipelines connecting houses to larger pipelines carrying water, gas and other liquids. Lines can be damaged by cold temperatures, causing cracks in lines resulting in disruptions to service.

Public water service can also be impacted by dam failures. The Raystown Hydroelectric Project and William F. Matson Generating Station in Huntingdon Pennsylvania provide service to individuals in Juniata County. A dam failure or other equipment failure at either facility could result in utility interruptions in Juniata County and the surrounding region.

Solar flares are concentrated releases of magnetic energy that emanate from sunspots and can last for minutes or hours. Solar flares can also cause coronal mass ejections (CME) from the outer solar atmosphere which are large clouds of plasma and magnetic field which induce geomagnetic currents when they reach the surface of Earth. A combination of these events can be referred to as solar storms or solar weather. Solar weather only impacts Earth when it occurs on the side of the sun that is actively facing Earth. A severe solar storm can have a geographically wide-ranging impact that can last for days or weeks (NASA, 2016). Most significantly, a severe solar storm has the potential to disrupt power grids, resulting is rolling blackouts.

Minor solar flares have no negative impacts on Earth thanks to the protection afforded by Earth's magnetic field and atmosphere. In fact, minor solar flares cause beautiful visual displays known as the Northern Lights or Aurora Borealis. However, severe solar storms can cause an electromagnetic pulse (EMP) that is able to break through Earth's magnetic field and send current to Earth's surface, inducing geomagnetic currents. Geomagnetic ally induced currents (GICs) impact the electrical grid and can cause transformers to burn and fail, potentially knocking out wide swatches of electricity infrastructure resulting in blackouts (Phillips, 2009).

Table 58 - Utility Providers

Utility Providers *(Juniata Co. HMP, 2015)*		
Type of Utility	**Main Companies Providing Service**	**Description**
Electric	Pennsylvania Power and Light (PPL)	
	Valley Rural Electric (REC)	

Utility Providers *(Juniata Co. HMP, 2015)*		
Type of Utility	**Main Companies Providing Service**	**Description**
	Pennsylvania Electric Company (Penelec)	PPL provides electric service to the majority of the County. REC and Penelec also provide service.
Water/Sewer	Beale Township Sewer Authority	The municipalities listed provide services to the majority of the County. Many residents also rely on well water and septic systems.
	East Waterford Sewer Authority	
	Fermanagh Township Sewer Authority	
	McAlisterville Area Joint Authority	
	Mifflintown Municipal Authority	
	Port Royal Municipal Authority	
	Richfield Area Joint Authority	
	Thompsontown Municipal Authority	
	Twin Boroughs Sanitary Authority	
	East Salem Sewer Authority	
Gas/Oil	UGI	Natural gas service is unavailable within the County. Independent providers also operate in Juniata County.
	Shipley Energy	
Communications	DPI Teleconnect	The companies listed are the main providers of phone and Internet service within the County. A few small, independent providers also operate in Juniata.
	Metro Teleconnect Companies	
	Century Link	
	Nittany Media	
	Verizon	
	AT&T	
	Sprint	

4.3.18.2 Range of Magnitude

At a minimum, energy emergencies can cause short term disruption in the daily operation of business, government, healthcare, and private citizens. A loss of energy and other utility services can have numerous impacts including, losing perishable foods and medicines, loss of functionality at health care and emergency medical facilities, limited water distribution capabilities, losing heating and air conditioning, losing telecommunication and internet services, basement flooding (sump pump failure), and lack of lighting. Energy emergencies can be most troubling when temperatures are at extremes due to the loss of heating or cooling capabilities and the added hazard that extreme heat and extreme cold present. Fuel shortages can result in increased cost of automotive gasoline, long lines at gas stations, disruptions in freight traffic, and shortage of heating fuels. On a small scale, these hazards can be a nuisance, but impacts can be devastating when an energy emergency has a large scope and impacts wide areas and a large population. Severe energy emergencies are often regional or national events.

Potential secondary effects of utility interruptions include an inadequate emergency response due to loss of communication and water supply. 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.

4.3.18.3 Past Occurrence

The OPEC oil embargo of 1973 – 1974 caused fuel shortages and long lines at gasoline pumps nationwide. Government actions were taken to ensure that fuels and power were available for emergency and priority users. Between 1976 and 1977 there was a rapid increase in fuel prices accompanied by a severe winter resulting in a similar less extreme fuel shortage. Those two events as well as the national gasoline shortage in 1979 emphasized the vulnerability of all residents in Juniata County to energy emergencies.

One of the worst recent utility interruptions in Juniata County occurred in January 2005 when an ice storm caused major power outages that took over a week to restore due to damage to equipment. Minor outages of electric and phone services occur annually, usually once or twice a year. Recorded utility interruptions appear in *Table 59 - Utility Interruptions* and not be considered an all-inclusive list of past interruptions, but a sample of significant events.

Table 59 - Utility Interruptions

Utility Interruptions ***(NOAA NCEI, 2019; Juniata Co. HMP, 2015)***		
Date	**Type**	**Description**
01/27/1994	Ice	Numerous power outages
01/15/1998	Ice Storm	Spotty power outages
01/02/1999	Winter Storm	Some outages
12/10/2002	Ice Storm	51,000 people statewide without power
12/25/2002	Heavy Snow	50,000 customers out of power in the Lower Susquehanna Valley
09/18/2003	Tropical Storm	Pennsylvania felt the remnants of Hurricane Isabel. Sustained winds of 30 mph on average accompanied Isabel as it tracked northward, but damaging gusts of between 50 and 60 mph occurred over a wide area. After a summer of above-normal rainfall, creating soft soils and with trees still in full bloom, the gusty winds resulted in hundreds of reports of trees or tree limbs being knocked down. These took down utility poles and power lines in many parts of the CWA, causing numerous power outages as well as property damage. Significant tree and power line damage was reported in 29 of State College's CWA counties, with the most significant damage over the lower Susquehanna region. Statewide, 1.4 million people lost power. The peak wind gust recorded was 73 mph in Lancaster County. One death (Lancaster County) was attributed to the storm, when a car struck a downed tree.
01/05/2005	Winter Storm (Ice)	Tens of thousands of people lost power; took a week to restore

Utility Interruptions *(NOAA NCEI, 2019; Juniata Co. HMP, 2015)*		
Date	**Type**	**Description**
06/08/2007	Thunderstorm Wind	An intense squall line produced widespread wind damage across Central Pennsylvania during the evening hours on June 8, 2007. Numerous trees and power lines were downed causing several power outages and other sporadic damage. Law Enforcement & the Juniata County Emergency Manager reported several trees and wires down in Honey Grove, Walnut and McAlisterville.
01/06/2009	Ice Storm	A prolonged period of freezing rain resulted in a significant ice accumulation across much of Central Pennsylvania. Many locations received one quarter to one half inch of ice accumulation. The icing caused sporadic power outages and brought down several tree limbs. Ice accumulation of one quarter to one half inch was reported across Juniata County.
02/12/2009	High Wind	Non-thunderstorm wind gusts between 50 and 60 mph toppled numerous trees and power lines across Juniata County. The high winds caused isolated power outages.
10/29/2011	Heavy Snow	An early season, high-impact winter storm. Snow accumulations ranged from 3 to 6 inches in Juniata County. In most locations in central Pennsylvania, observed snowfall accumulations set all-time daily and monthly snowfall records for October. The heavy, wet snow produced widespread damage to trees and utility wires. This resulted in more than a half-million (520,000) power outages state-wide at the height of the storm. Warming shelters were opened to accommodate the power outages. Several secondary roads were closed due to the downed trees and wires. The weight of the snow (snow to liquid ratios generally less than 10:1) along with remaining leaf foliage contributed to the significant tree damage.
10/29/2012	High Wind	High winds and rain in Juniata County were caused by remnants of Hurricane Sandy. The high winds knocked down several trees with widespread power outages reported county-wide. The storm was so damaging in Pennsylvania that there was a Gubernatorial disaster emergency issued after the storm, followed by a Presidential Emergency Declaration on October 29, 2012.
02/04/2014	Winter Storm	Snow accumulations ranged from 2 to 4 inches. Ice accumulations from sleet and heavy freezing rain were between 0.25-0.30 inch. The storm also downed several trees and utility lines creating widespread power outages. At the height of the storm nearly 850,000 customers statewide were without power (primarily in the southeastern PA). The State EOC maintained activation throughout the storm. Shelters and warming centers were opened throughout the southeast region. Governor Tom Corbett declared a disaster emergency for York and Lancaster counties to make state resources, including the National Guard, available to support county and local recovery operations.

4.3.18.4 Future Occurrence

Minor, short-term outage events may occur several times a year for any given area in Juniata County, while major, widespread and long-term events are significantly less common. Utility interruptions are most often by-products of severe weather events, so when citizens prepare for severe weather, they should include the possibility for utility interruption in their preparation.

As utility infrastructure ages, interruption events could occur more frequently. Utility providers can reduce Juniata County's vulnerability to power outages by implementing improvements.

4.3.18.5 Vulnerability Assessment

All municipalities in Juniata County are vulnerable to utility interruptions. Critical facilities such as emergency medical facilities, retirement homes and senior centers are particularly vulnerable to power outages. While back-up generators are often used at these facilities, loss of electricity accompanied by temperature extremes can be dangerous for elderly and other high-risk populations. Extreme temperatures can disrupt fuel and electricity supplies, with extreme cold weather triggering a higher demand for heating oil and natural gas as well as causing low gas pressure, and extreme hot weather possibly overloading electrical grids resulting in blackouts.

Electric

Pennsylvania Power and Lighting implemented a dispatch communications system called Mobile Operations Management (MOM). This system links every Pennsylvania power and lighting crew to a central emergency response coordination center. This technology has reduced average outage times in Pennsylvania from an average of 108 minutes between 2004 and 2008 to seventy-one minutes in 2009. According to the 2008-2010 American Community Survey, 21.9% of Juniata County households use electricity, and 46.7% use fuel oil as their primary heating source. In extended winter power outages, these residents would have difficulty effectively heating their homes.

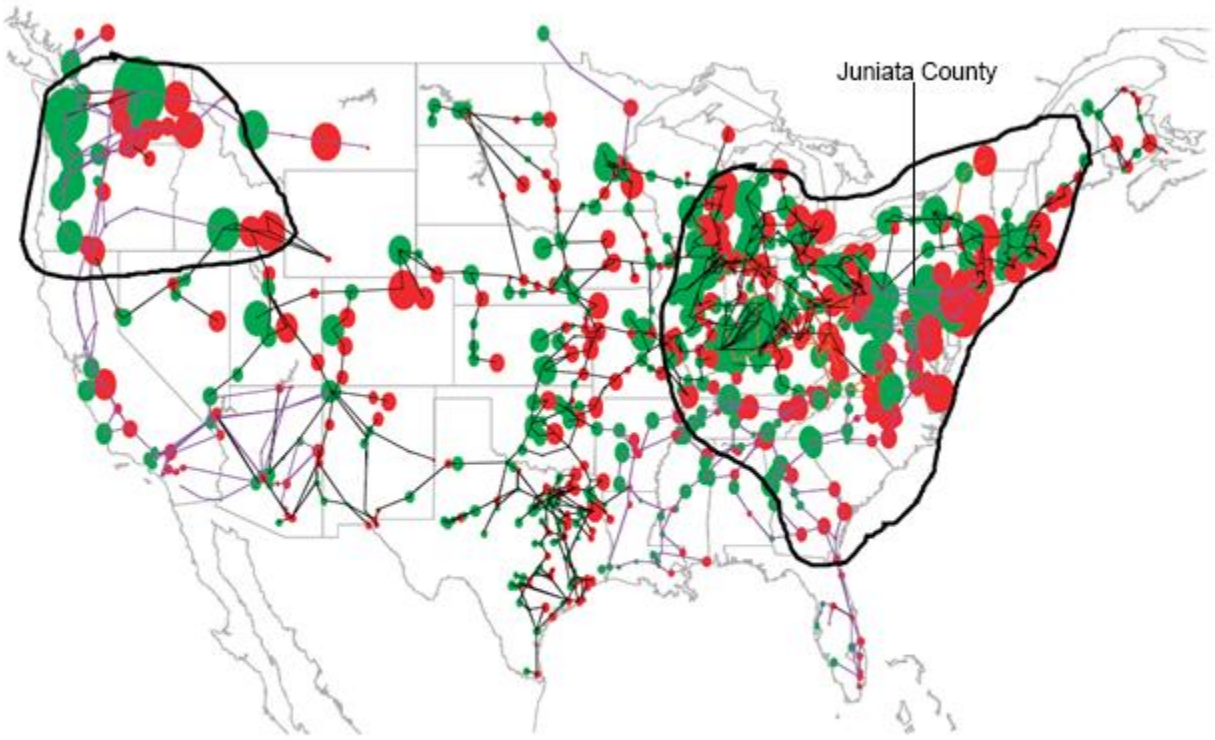
The National Oceanic and Atmospheric Administration (NOAA) monitors solar activity from the Space Weather Prediction Center (SWPC) and can alert power grid operators of the impending geomagnetic storm so they may make efforts to protect the grid from GICs (Baker et al., 2008). Events such as the 1989 Hydro-Quebec blackout have illuminated the hazard that solar storms pose to electricity infrastructure, however modern power grids are more vulnerable than ever. Power grids have become increasingly interconnected, improving efficiency in many ways, but also making them more vulnerable to wide ranging rolling failures as illustrated in *Figure 39 - Potential Electricity Grid Failure* (Baker et al., 2008).

Geomagnetic storms can cause permanent damage to transformers that could result in much longer restoration times than experienced in the 1989 Hydro-Quebec outage. Transformer damage occurs when GICs cause excessive internal heating resulting in melting and burning of many large-amperage copper windings and leads. Such damage cannot be repaired, and the damaged transformer must be replaced. Transformers are extremely large and heavy apparatuses, and replacement can be a long process, suggesting that efforts should be taken to protect resident transformers from GICs. A workshop held by the Committee on the Societal and Economic Impacts of Severe Space Weather Events offered solutions to mitigating negative impacts of GICs, suggesting that

supplemental transformer neutral ground resistors should be installed because they are relatively inexpensive, have low engineering trade-offs, and can produce sixty to seventy percent reduction of GIC levels during severe solar storms (Baker et al., 2008).

The Department of Homeland Security (DHS) has a Solar Storm Mitigation effort, which "aims to provide owners and operators of the electricity grid with advanced and actionable information about anticipated GCI current levels in the event of a solar storm" (US GAO, 2017). According to the DHS, when provided with accurate solar storm warnings, utility operators can "make operational decisions to mitigate the impacts from solar storms. This can range from canceling maintenance work to temporarily shutting down vulnerable grid components and preventing permanent damage" (DHS, 2015).

Figure 39 - Potential Electricity Grid Failure



Scenario showing effects of a 4800 nT/min geomagnetic field disturbance at 50° geomagnetic latitude scenario. The regions outlined are susceptible to system collapse due to the effects of the GIC disturbance; the impacts would be of unprecedented scale and involve populations in excess of 130 million. SOURCE: J. Kappenman, Metatech Corp., "The Future: Solutions or Vulnerabilities?," presentation to the space weather workshop, May 23, 2008.

Water

Water contamination can occur naturally, by human error, or intentionally. Occasionally, releases of manure and milk into the water supply can also 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 material 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. Because Juniata County is a relatively rural county, a majority of the residential water comes from wells. Well contamination or water shortages due to drought pose a significant risk.

Communications

Interruptions to telephone communications (landline and/or cellular) may cause a delay in summoning emergency services. Loss of internet connection can cause interruptions to businesses and inconvenience to the general population. Many homes and businesses are switching to internet-based phone services, meaning that a loss of internet increasingly impacts phone communications. Cellular communications and coverage can be sporadic in more rural portions the county. Drastic elevation changes, topography issues and lack of cellular towers and large natural areas in the county lead to a decreased ability to use cellular communications. Cellular communications infrastructure has grown over the past ten years but is still somewhat limited.

Gas

As of the 2008-2010 American Community Survey, less than two percent of homes in Juniata County use a gas utility as a source of heat. Around five percent use bottled, tank, or propane gas to heat their homes. Considering the limited number of gas users in Juniata County, the effects of a gas shortage are more minimal compared to electricity or fuel oil.

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 60 - 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 60 - 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 60 - 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 61 - Risk Factor Assessment Hazard Ranking* lists the risk factor calculated for each of the eighteen potential hazards identified in the 2020 HMP. *It should be noted that ice jam flooding, flash flooding and flooding were ranked individually instead of together, and Pandemic & Epidemic were similarly ranked separately from Infectious Disease, meaning a total of twenty-one hazards were given risk factor numbers.* 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. Hazards that appear with a light blue background are natural hazards, while those with beige backgrounds are human-caused hazards.

Table 61 - Risk Factor Assessment Hazard Ranking

Risk Factor Assessment Hazard Ranking							
Hazard Risk	**Hazard**	**Probability**	**Impact**	**Spatial Extent**	**Warning Time**	**Duration**	**Risk Factor**
High	Emergency Services	4	4	4	1	4	**3.7**
	Cyber Security	3	3	4	4	4	**3.4**
	Opioid Epidemic	4	4	1	1	4	**3.1**
	Pandemic & Epidemic	2	4	4	1	4	**3.1**
	Transportation Accidents	4	3	2	4	2	**3.1**
	Invasive Species	4	2	3	1	4	**2.9**
	Flash Flood	3	3	2	4	3	**2.9**
	Drought	2	3	4	1	4	**2.8**
	Infectious Disease	2	3	4	1	4	**2.8**
	Flood	2	3	3	1	4	**2.6**
	Winter Storm	3	2	4	1	2	**2.6**
Moderate	Dam Failure	1	4	2	1	4	**2.4**
	Environmental Hazards Hazardous Materials	2	2	2	4	3	**2.3**
	Terrorism (Agroterrorism)	2	2	2	4	3	**2.3**
	Radon Exposure	2	1	4	1	4	**2.2**
	Earthquake	2	1	4	4	1	**2.2**
	Tornado/Windstorm	2	3	1	4	1	**2.2**
Low	Utility Interruption	2	1	2	4	2	**1.9**
	Wildfire	2	1	1	4	3	**1.8**
	Ice Jam	2	1	1	1	4	**1.6**
	Civil Disturbance	1	1	1	4	1	**1.3**

Based on these results, there are eleven *high* risk hazards, six *moderate* risk hazards and four *low* risk hazards in Juniata County. Mitigation actions were developed for all high, moderate and low risk hazards (see Section 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 62 - Countywide Risk Factor by Hazard* shows the different municipalities in Juniata 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 4.3.18. The hazards are listed by determined Risk Factor value and appear with designations for natural and human caused hazards - “N” and “H” respectively. Fourteen of seventeen municipalities completed this comparison, and Milford Township, Port Royal Borough, and Turbett Township gave no response and their rows in *Table 62 - Countywide Risk Factor by Hazard* appear greyed out. Section 4.4.2 Earthquakes was an added hazard later in the planning process and thus municipalities did not have a chance to rate their relative risk for that hazard. As such, the column appears greyed out.

Table 62 - 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 (H)	Cyber Security (H)	Opioid Epidemic (H)	Pandemic & Epidemic (N)	Transportation Accidents (H)	Invasive Species (H)	Flash Flood (N)	Drought (N)	Infectious Disease (N)	Flood (N)	Winter Storm (N)
	3.7	**3.4**	**3.1**	**3.1**	**3.1**	**2.9**	**2.9**	**2.8**	**2.8**	**2.6**	**2.6**
Beale Township	=	=	=	=	=	>	=	=	=	=	=
Delaware Township	=	=	=	=	=	=	=	=	=	=	=
Fayette Township	=	=	>	<	=	=	=	<	<	=	=
Fermanagh Township	=	=	=	=	=	>	=	=	>	=	=
Greenwood Township	=	>	>	=	>	>	=	=	=	=	=
Lack Township	=	<	=	=	>	>	=	=	=	=	>
Mifflin Borough	=	<	<	<	>	<	>	<	<	>	>
Mifflintown Borough	=	=	=	=	<	=	=	<	=	=	=
Milford Township											
Monroe Township	=	=	=	=	=	=	=	=	=	=	=
Port Royal Borough											
Spruce Hill Township	=	<	<	=	<	=	=	>	=	=	=
Susquehanna Township	=	<	=	=	=	=	>	>	=	=	=
Thompsontown Borough	=	<	=	=	=	=	=	=	=	=	=
Turbett Township											
Tuscarora Township	=	=	=	=	=	=	=	=	=	=	=
Walker Township	=	=	=	=	=	=	=	=	=	=	=

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk										
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR										
JURISDICTION	Dam Failure (H)	Environmental Hazards Hazardous Materials (H)	Terrorism - Agroterrorism (H)	Radon Exposure (N)	Earthquake (H)	Tornado/Windstorm (N)	Utility Interruption (H)	Wildfire (N)	Ice Jam (N)	Civil Disturbance (H)
	2.4	**2.3**	**2.3**	**2.2**	**2.2**	**2.2**	**1.9**	**1.8**	**1.6**	**1.3**
Beale Township	=	=	=	=	=	=	=	=	=	=
Delaware Township	=	=	=	=	=	=	=	=	=	=
Fayette Township	<	=	=	=	=	=	=	=	<	<
Fermanagh Township	<	>	=	=	=	=	>	>	=	=
Greenwood Township	>	=	=	=	=	=	=	=	>	>
Lack Township	<	=	=	=	=	>	=	=	=	=
Mifflin Borough	<	>	<	<	=	>	>	<	>	<
Mifflintown Borough	<	=	=	=	=	<	=	=	=	=
Milford Township					=					
Monroe Township	=	=	=	=	=	=	=	=	=	=
Port Royal Borough					=					
Spruce Hill Township	<	=	<	=	=	=	=	=	=	=
Susquehanna Township	<	=	<	=	=	>	>	=	<	=
Thompsontown Borough	=	=	=	=	=	=	=	=	=	=
Turbett Township					=					
Tuscarora Township	=	=	=	=	=	=	=	=	=	=
Walker Township	=	=	=	=	=	=	=	=	=	=

4.4.3. Potential Loss Estimates

Based on various kinds of available data, potential loss estimates were established for flood, flash flood and ice jam 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.

The parcel data used in this plan includes building values provided in the county tax assessment database. These values are representative of replacement value alone; content loss, functional loss, and displacement cost are not included.

Flooding Loss Estimation:

Flash flooding is a high-risk natural hazard in Juniata 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.

MCM Consulting Group conducted a county wide 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 Juniata County are estimated to equal $51,510,000. Residential occupancies make up 83.7% of the total estimated building-related losses, and agriculture make up 1.4%. Total economic loss, including replacement value, content loss, functional loss and displacement cost, from a countywide 1%-annual-chance flood are estimated to equal $73,620,000.

4.4.4. Future Development and Vulnerability

Risk and vulnerability to natural and human-caused hazard events are not static. Risk will increase or decrease as counties and municipalities see changes in land use and

development as well as changes in population. Juniata County is expected to experience a variety of factors that will, in some areas, increase vulnerability to hazards while in other areas, vulnerability may stay static or even be reduced.

As of the 2009 Juniata Comprehensive Plan, land use in Juniata County was 41.3% Agriculture, 20.6% Residential, 34.7% Undeveloped Land (including State Game Lands, and State Forests), and 1.3% Transportation, Communication, Utilities, Trade and Services. Forest and agriculture are the reported leading use of land in Juniata County.

The total population in Juniata County has remained relatively consistent in the last ten years, with a slight decreasing trend in 2017. The estimated population of Juniata County as of July 2017 was 24,448, lower from the 2016 estimate by 363 people. A full history of population trends in Juniata County can be found in *Table 63 - Countywide Population Trends*. Median value of Juniata County owner occupied housing units from 2013-2017 is estimated at $143,600.

Table 63 - Countywide Population Trends

Countywide Population Trends *(US Census Estimates, 2018)*			
Year	**Population**	**# Change (from previous row)**	**% Change (from previous row)**
2017	24,448	-363	-1.46%
2016	24,811	-18	-0.07%
2015	24,829	36	0.15%
2014	24,793	56	0.23%
2013	24,737	73	0.30%
2012	24,664	225	0.92%
2011	24,439	54	0.22%
2010	24,385	-	-

5. Capability Assessment

5.1. Update Process Summary

The capability assessment is an evaluation of Juniata 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 Juniata 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 seventeen 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 Juniata County and its municipalities have the capacity to do and provides an understanding of what must be changed to mitigate loss.

Juniata 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

All seventeen municipalities within Juniata 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 in compliance 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 storm water 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 Juniata 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 Pennsylvania 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 Juniata County adhere to the standards of the Pennsylvania Uniform Construction Code (Act 45). All seventeen municipalities in Juniata 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. Six of the seventeen municipalities provide their own zoning enforcement.

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 ordi-

nance. Subdivision and land development ordinances provide for the division and improvement of land. Fifteen of the seventeen municipalities in Juniata County have a subdivision and land development ordinance in place. There is currently no subdivision and land development ordinance in place at the county.

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. There are currently no municipalities in Juniata County that have a 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 MPC 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 giving consideration to storm drainage and floodplain management.

Juniata County last updated their comprehensive plan and officially adopted it on June 30, 2009.

Article III of the MPC enables municipalities to prepare a comprehensive plan; however, development of a comprehensive plan is voluntary. Four municipalities in Juniata County have adopted their own comprehensive plan. The remaining thirteen fall under the county 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. There are currently no municipalities in Juniata County that have a capital improvement plan 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 five percent for Class 9 communities up to forty-five percent 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.

All seventeen municipalities that reside in Juniata 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. The NFIP survey was provided to the municipalities in Juniata County. The results of the NFIP survey are located in appendix C.

5.2.2. Administrative and Technical Capability

There are thirteen townships and four boroughs within Juniata 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 Planning Department

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 Juniata County Office of Planning and 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 municipality. Four municipalities employ a municipal engineer on an as needed basis. This is usually a subcontracted service.

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 Juniata County GIS Department. There are currently no members of the Juniata County GIS Department that have 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 Juniata County and its municipalities to have an emergency management coordinator.

The Juniata County Department of Emergency Services 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. The next update to the EOP is scheduled for January 2020. All seventeen municipalities have adopted the county EOP.

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, thirteen of the municipalities completed this section with a numerical response. *Table 64 - Juniata County Community Political Capability* summarizes the results of political capability.

Table 64 - Juniata County Community Political Capability

Juniata County Community Political Capability						
Municipality Name	**Capability Ranking**					
	0	**1**	**2**	**3**	**4**	**5**
Beale Township		X				
Delaware Township				X		
Fayette Township						X
Fermanagh Township	Section not completed by municipality					
Greenwood Township						X
Lack Township	Section not completed by municipality					
Mifflin Borough						X
Mifflintown Borough	Section not completed by municipality					
Milford Township			X			
Monroe Township				X		
Port Royal Borough						X
Spruce Hill Township	X					
Susquehanna Township			X			
Thompsontown Borough						X
Turbett Township						X
Tuscarora Township	Section not completed by municipality					
Walker Township				X		

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 65 - Capability Self-Assessment Matrix* summarizes the results of the self-assessment survey.

Table 65 - Capability Self-Assessment Matrix

Juniata County Capability Self-Assessment Matrix				
Municipality Name	**Capability Category**			
	Planning and Regulatory Capability	**Administrative and Technical Capability**	**Fiscal Capability**	**Community Political Capability**
Beale Township	L	L	L	L
Delaware Township	M	M	M	M
Fayette Township	M	M	M	M
Fermanagh Township	Section not completed by municipality			
Greenwood Township	H	M	M	M
Lack Township	X	X	M	M
Mifflin Borough	L	M	M	H
Mifflintown Borough	Section not completed by municipality			
Milford Township	Section not completed by municipality			
Monroe Township	M	M	M	M
Port Royal Borough	H	M	M	H
Spruce Hill Township	M	L	L	L
Susquehanna Township	M	M	L	M
Thompsontown Borough	H	H	L	H
Turbett Township	M	M	M	M
Tuscarora Township	Section not completed by municipality			
Walker Township	H	M	M	M

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 municipality 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 are 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

Juniata County has a limited education and outreach program. The Juniata County Department of Emergency Services conducts some 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 Juniata 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 Juniata County.

Education and outreach on the NFIP is necessary. With new regulations in flood-plain management, updated digital flood insurance rate maps and new rate for insurance policies, education and outreach on the NFIP would assist the program. The Juniata County Local Planning Team will identify actions necessary to complete this.

5.2.5. Plan Integration

There are numerous existing regulatory and planning mechanisms in place at the state, county and municipal level of government which support hazard mitigation planning efforts. These tools included the 2013 Commonwealth of Pennsylvania Standard All-Hazard Mitigation Plan, local floodplain management ordinances, the Juniata County Comprehensive Plan, Juniata County Emergency Operations Plan, local emergency operation plans, local zoning ordinances, local subdivision and land development ordinances.

Information from several of these documents has been incorporated into this plan and mitigation actions have been developed to further integrate these planning mechanisms into the hazard mitigation planning process. Floodplain management ordinance information was used to aid in the establishment of local capabilities in addition to participation in the National Flood Insurance Program (NFIP).

The Juniata County Comprehensive Plan, the Juniata County Emergency Operations Plan, and various municipal regulatory tools as identified in the capability assessment section of this plan, require alignment with this updated hazard mitigation plan. The county comprehensive plan was updated in 2009. This plan is very limited on the amount of hazard mitigation principles that are incorporated into the plan. Discussions on specific hazard areas within municipalities that may be used for future development must be addressed. Municipalities should also identify mitigation projects that could decrease the impact of hazards in these specific areas in the annual municipal capital improvement plan.

Stormwater management plans have not been implemented in the county and should strongly be considered and encouraged in the future. In the event that these plans are implemented, Juniata County officials will ensure that hazard mitigation data and principles are implemented as appropriate.

Juniata County is a small county with a limited amount of resources to appropriately ensure and implement hazard mitigation principles into all regulatory tools. Juniata County will continue to explore options to further enhance the implementation of these principles utilizing already multi-tasked staff and resources. Juniata County will review

other local and state plans that could be impacted with hazard mitigation principles over the next five-year planning period.

Pennsylvania All-Hazard Mitigation Plan

The Pennsylvania All-Hazard Mitigation Plan (PAHMP) is the baseline document for all county hazard mitigation plans in the Commonwealth of Pennsylvania. During the 2020 Juniata County HMP update, the local planning team and steering committee reviewed and utilized the various sections of the PAHMP to provide information specific to the same sections of the Juniata County HMP. As an example, the PAHMP Risk Assessment section provided copious amounts of past occurrence and vulnerability data for every hazard profile that was updated or developed new in the 2020 Juniata County HMP. The PAHMP also provided information and data on contiguous counties to Juniata County within the Commonwealth. Contiguous counties to Juniata County are Mifflin, Snyder, Northumberland, Franklin, Perry and Huntingdon Counties. Information on past occurrences of hazards and mitigation actions and opportunities were utilized.

The PAHMP was also utilized to ensure that the updated Juniata County mitigation strategy was aligned with the PAHMP mitigation strategy. High priority mitigation strategies in the PAHMP (like removal of repetitive loss and severe repetitive loss properties from the floodplain) were considered with the Juniata County HMP mitigation strategy development. The local planning team consulted the PAHMP as they developed new actions and project opportunities.

National Flood Insurance Program and Municipal Floodplain Ordinance

The National Flood Insurance Program provided specific information that was incorporated into the flooding profile (section 4.3.3) and the capability assessment findings (section 5.2). Specifically, the amount of active insurance policies per municipality, repetitive loss properties and severe repetitive loss properties were used in the vulnerability assessment section of the flooding profile. This afforded the local planning team specific vulnerability information that was then used to develop mitigation actions and municipal mitigation project opportunity forms. Numerous municipalities identified flooding, flash flooding and ice jam flooding project opportunities that would decrease the loss of life and property damage when completed. These opportunities are identified in Appendix G.

A GIS dataset of the 1% annual chance floodplain as identified by FEMA Digital Flood Insurance Rate Maps (DFIRM) from 2012 was used to identify structures and critical facilities that fall within the floodplain in Juniata County for the vulnerability assessment of the flooding profiles (section 4.3.3). While DFIRM maps are a useful tool and important to integrate into this planning process, it should also be noted that these are not completely accurate and are estimates and models of vulnerability. A map of these floodplains for each municipality in Juniata County can be found in Appendix D.

In the future, Juniata County should ensure that all floodplain ordinance updates have integrated hazard mitigation principles by participation in NFIP programs and integrating the NFIP program data into any applicable hazard mitigation sections.

Juniata County Comprehensive Plan

Article III of the Pennsylvania Municipalities Planning code (Act 247 of 1968, as reenacted and amended) requires all Pennsylvania counties (except Philadelphia) to adopt a comprehensive plan and update it at least every ten years. The Juniata County Commissioners adopted the Juniata County Comprehensive Plan in 2009.

The Juniata County Office of Planning and Community Development is responsible for maintaining and updating the Juniata County Comprehensive Plan and many other regulatory tools. Technical assistance on community planning matters is provided to the Juniata County Board of Commissioners through the Juniata County Office of Planning and Community Development. The Office of Planning and Community Development administers the Juniata County Comprehensive Plan. The Juniata County Office of Planning and Community Development also performs technical reviews of municipal subdivision and land development plans, municipal floodplain ordinances and other community planning and development matters.

The Juniata County Comprehensive Pan was utilized for various sections of the 2020 Juniata County HMP update. Chapter 2 – Natural, Water, and Historic Resources provided useful information on county history, topography, climate and geology which was utilized in the community profile section. Additionally, Chapter 4 – Housing was used in section 2.3 Places, Populations and Demographics and provided information on general housing characteristics. Chapter 5 – Land Use was utilized when developing section 2.4 in the community profile which provided valuable information on land use trends in Juniata County. Chapter 5 – Community Facilities and Historic Resources was used in section 4.3.5.5 Infectious Disease Vulnerability Assessment which provided information on healthcare facilities and emergency services.

The Juniata County Comprehensive Plan, Chapter 9 identified a ten-year implementation plan for various projects and actions that supported updates and growth for programs identified in the comprehensive plan. This ten-year plan was an important chapter from the comprehensive plan that provided numerous actions and projects that were integrated into the 2020 HMP mitigation strategy. The following are some of the goals and actions from the 2009 comprehensive plan, followed by the 2020 HMP mitigation actions that were developed or supported by the goals and actions from the 2009 comprehensive plan:

- Objective 2.9 of the county comprehensive plan identified the importance of volunteerism at local emergency services. The 2020 HMP local planning team developed mitigation action 3.1.3 which identified the need for working in conjunction

with local school districts to increase trained personnel at local emergency services.

- Objective 2.12 of the county comprehensive plan identified the need for supporting the Pennsylvania State Police. The 2020 HMP local planning team developed mitigation action 3.1.4 which acknowledges the importance of supporting local emergency service personnel.
- Objective 4.1 of the county comprehensive plan discusses encouraging municipalities to protect sensitive environmental features by means of subdivision and land development ordinances. The 2020 HMP local planning team developed mitigation action 1.2.5 which encourages municipalities to develop subdivision and land development ordinances that are consistent with the Commonwealth Erosion and Sedimentation Control and Post Construction Stormwater Management (PCSM) requirements. Additionally, objective 6.4 of the county comprehensive plan discusses subdivision and land development ordinances development by municipalities.
- Objective 4.4 of the county comprehensive plan incorporates strategies for innovative approaches to stormwater management. The 2020 HMP local planning team developed mitigation action 1.2.6 which encourages the development of stormwater management ordinances consistent with Act 167 Stormwater Management Plans.

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 2020 Juniata County HMP. 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 2020 hazard mitigation principals and data into the next updated county comprehensive plan was needed in the 2020 Juniata County Hazard Mitigation Plan. Action 3.2.2 identifies this.

Juniata County Emergency Operations

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). Juniata 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 biennially. 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 2020 Juniata 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.

EMA will consider the 2020 Juniata County Hazard Mitigation Plan during its biennial review of the county EOP. Recommended changes to the HMP will then be coordinated with the hazard mitigation local planning team.

Other Resources and Interconnectivity

Other resources utilized in the planning process include the PA DEP 2015 Oil and Gas Annual Report, which provided valuable information about Pennsylvania and Juniata County in the Environmental Hazards Profile (section 4.3.16). The USDA 2012 Census of Agriculture was referenced in the Drought Profile (section 4.3.1) to provide community information about Juniata County. The PA West Nile Control Program, a collaboration between the PA DEP, PA DOH & the PA DOA, was a valuable resource for the Pandemic and Infectious Diseases Profile (4.3.9), providing background information and detailed past occurrence data for West Nile Virus in Juniata County. The Governor's Order from January 9, 2019 titled Commonwealth Leadership in Addressing Climate Change and Promoting Energy Conservation and Sustainable Governance was used in the climate change section (4.2.3). Additionally, Pennsylvania Department of Environmental Protection's Action Plan from November 18, 2018 was also utilized in the climate change section. An article published by the Drug Enforcement Administration from September 2018 titled The Opioid Threat in Pennsylvania was used in the Opioid Epidemic profile (4.3.15). And finally, the Penn State Extension Office in Juniata County was used in the Invasive Species profile (4.3.4).

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, Juniata 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. Juniata 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 five goals and eighteen objectives identified in the 2015 hazard mitigation plan. The 2020 Juniata County Hazard Mitigation Plan Update has five goals and fourteen objectives. Objectives have been added and arranged in order to associate them with the most appropriate goal. These changes are noted in *Table 66 - 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 66 - 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-six 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 Actions 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 66 - 2015 Mitigation Goals and Objectives Review

2015 Mitigation Goals and Objectives Review		
GOAL Objective	**Description**	**Review**
GOAL 1	Strengthen County and local capabilities to reduce the potential impact of flooding on existing and future public/partner assets, including structures, critical facilities, and technological hazards.	Strengthen County and local capabilities to reduce the potential impacts to existing and future public/partner assets, including structures, critical facilities, and technological hazards.

2015 Mitigation Goals and Objectives Review		
GOAL Objective	**Description**	**Review**
Objective 1.1	Protect existing structures from damage that can be caused by hazards	Protect existing structures including critical facilities from damage that can be caused by hazards.
Objective 1.2	Promote management and regulatory procedures that would reduce the impacts of hazards on public and private property	Keep
Objective 1.3	Develop local structural projects to reduce the impacts of natural and human-caused hazards on public and private property	Keep
Objective 1.4	Maintain streams and culverts to reduce backup and flooding	Keep
Objective 1.5	Protect critical facilities from the impacts of natural and human-caused hazards	Remove.
GOAL 2	Develop regulations limiting development in hazard-prone areas	Keep
Objective 2.1	Develop regulations limiting development in hazard-prone areas	Remove
Objective 2.2	Lessen impacts on natural resources and open space from natural and human-caused hazards	Lessen impacts on natural resources and open space by enforcing existing regulations limiting development and directing planned growth away from hazard-prone areas.
Objective 2.3	Direct new growth away from hazard-prone areas	*Remove*
Objective 2.4	Develop open lines of communication with County schools	Develop open lines of communication with all public entities.
GOAL 3	Enhance planning and emergency response efforts among state, county, and local emergency management personnel to protect public health and safety	Keep
Objective 3.1	Improve coordination and communication between departments	Remove
Objective 3.2	Ensure adequate training and resources for those involved in emergency response, services, relief, or hazard mitigation	Keep
Objective 3.3	Ensure adequacy of equipment and technology	*Keep*
Objective 3.4	Ensure that residents receive relief and are evacuated as quickly as possible in the event of a disaster	Keep

2015 Mitigation Goals and Objectives Review		
GOAL Objective	**Description**	**Review**
GOAL 4	Build Juniata County's spatial informational resources to strengthen public and private hazard mitigation planning and decision support capabilities	Maintain and exercise Juniata County's….
Objective 4.1	Develop data management policies to ensure adequate data management	Enhance and maintain data management….
Objective 4.2	Develop and update detailed databases related to hazards and hazard mitigation	Enhance and maintain detailed….
GOAL 5	Increase public awareness on both the potential impacts of natural hazards and activities to reduce those hazards	Why not say all hazards instead of just natural? Increase public awareness on both the potential impacts of all-natural hazards and activities to reduce those hazards
Objective 5.1	Develop public education and outreach programs on hazards and hazard mitigation	Social media reference in one of these objectives?? Promote and utilize public education and outreach programs on hazards and hazard mitigation.
Objective 5.2	Educate property owners in hazard-risk areas regarding their risks and the precautions they can take	Remove
Objective 5.3	Encourage property owners in the 1 percent-chance floodplain to purchase flood insurance	Educate residents on floodplain management and risks.

Table 67 - 2015 Mitigation Actions Review

2015 Juniata County Mitigation Actions Review Worksheet						
Existing Mitigation Actions	**Status**					**Review Comments**
	No Progress / Unknown	**In Progress / Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
1.1.1 Regularly inspect and encourage the routine maintenance of bridges			X			Inspect and encourage the routine maintenance for long span bridges during odd years and for short span bridges during even years
1.1.2 Maintain open methods of communication with dam owners to ensure all of the County's dams are structurally sound			X			Maintain dam plans with dam owners to ensure all the county's dam plans are implemented.
1.2.1 Prepare and enact stormwater management ordinances consistent with Act 167 Stormwater Management Plans	X					No changes.
1.2.2 Collect and analyze data on the specific locations and damages caused by flooding in each of the municipalities in Juniata County to include in the 5-year update of the HMP		X				Collaborate with municipal officials to collect, analyze, and organize property damage for all hazards to include in the 5-year update of the HMP.
1.2.3 Adopt a Countywide post-disaster recovery and reconstruction ordinance using the model ordinance included in the APA/FEMA PAS Report No. 483/484	X					Adopt a countywide post-disaster recovery and reconstruction plan.
1.2.4 Ensure county and municipal subdivision and land development ordinances are consistent with Chapter 102 Erosion and Sedimentation Control Requirements		X				Encourage municipal subdivision and land development ordinances to be consistent with the Commonwealth Erosion and Sedimentation Control and Post Construction Stormwater Management (PCSM) Requirements.

2015 Juniata County Mitigation Actions Review Worksheet						
Existing Mitigation Actions	***Status***					***Review Comments***
	No Progress / Unknown	**In Progress / Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
1.3.1 Ensure county and municipal subdivision and land development ordinances are consistent with Chapter 102 Erosion and Sedimentation Control Requirements			**X**			Roll forward.
1.4.1 Work with municipalities to regularly inspect culverts		**X**				Encourage municipalities to regularly inspect culverts.
1.4.2 Work with municipalities to create and maintain a Countywide database of streams prone to backup and flooding			**X**			Work with municipalities to maintain and update a countywide database of streams prone to backup and flooding.
1.5.1 Conduct a thorough critical facilities vulnerability assessment and impact analysis using the HMP's GIS-based critical infrastructure history	**X**					Conduct a thorough critical facilities vulnerability assessment and impact analysis using the HMP's GIS-based critical infrastructure history.
1.5.2 Prepare and implement a Continuity of Government Plan for Juniata County government		**X**				Prepare and implement a Continuity of Government Plan for Juniata County government
1.5.3 Conduct analysis on the future demand for expanded infrastructure and critical facilities in Juniata County		**X**				Conduct analysis on the future demand for expanded infrastructure and critical facilities in Juniata County
2.1.1 Encourage the development of safety buffers between industrial facilities and the population	**X**					Roll forward.
2.1.2 Encourage the requirement of special use permits for hazard-prone areas					**X**	Remove this action.

2015 Juniata County Mitigation Actions Review Worksheet						
Existing Mitigation Actions	***Status***					***Review Comments***
	No Progress / Unknown	**In Progress / Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
2.2.1 Encourage the review of planned infrastructure to ensure that it will be developed outside of hazard-prone areas		**X**				Encourage the review of future planned development to ensure that it will be developed outside of hazard-prone areas.
2.3.1 Evaluate and refine the County's repetitive loss structures list by ranking properties based on the number of losses and the value of the claims paid and target the priority properties for buyout opportunities			**X**			Evaluate and refine the County repetitive loss structures list by ranking properties based on the number of losses and the value of the claims paid and target the priority properties for buyout opportunities
2.3.2 Coordinate with the municipal zoning boards to limit growth in the floodplain			**X**			Coordinate with municipal officials to discourage growth in the floodplain.
3.1.1 Implement a County Coalition program to staff and fund a full-time County engineer that would be shared by both County and participating municipalities to provide technical reviews and inspections					**X**	Remove this action. No longer applicable.
3.1.2 Continue to work with PA DOH and PEMA to implement an SNS Plan for Juniata County and the SCMRTF			**X**			Maintain a relationship with PA DOH and PEMA to implement the Mass Distribution of Medical Counter Measures (MDMC) Plan for Juniata County and the SCMRTF.

2015 Juniata County Mitigation Actions Review Worksheet						
Existing Mitigation Actions	***Status***					***Review Comments***
	No Progress / Unknown	**In Progress / Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
3.1.3 Integrate the 5-year maintenance cycle of the HMP with both the 10-year and biennial review and maintenance cycles of the County's Comprehensive Plan and the County's Regional EOP, respectively			**X**			Integrate the current Juniata County Hazard Mitigation Plan with the current county comprehensive plan and the current county and municipal emergency operation plans.
3.2.1 Update the County's Regional EOP to be consistent with the National Response Plan			**X**			Update the county and municipal emergency operation plans to be consistent with the National Response Plan.
3.2.2 Work with the County's agricultural community to develop and implement the County Animal Response Team (CART) to strengthen the County's comprehensive emergency management program		**X**				Work with the county's agricultural community to develop and implement the county animal response team (CART) to strengthen the County's comprehensive emergency management program
3.2.3 Continue to encourage multi-jurisdictional exercises and drills			**X**			Continue to encourage multi-jurisdictional exercises and drills
3.3.1 Maintain an inventory of equipment used for emergency response			**X**			Maintain an inventory of equipment used for emergency response
3.4.1 Maintain a web-based inventory of the County's at-risk populations to strengthen emergency response and evacuations			**X**			Maintain a web-based inventory of the county's at-risk populations to strengthen emergency response and evacuations

2015 Juniata County Mitigation Actions Review Worksheet						
Existing Mitigation Actions	***Status***					***Review Comments***
	No Progress / Unknown	**In Progress / Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
3.5.1 Maintain a list of repetitive loss structures from the Governor's Center for Local Government Service's NFIP Coordinator and incorporate the data into the County's HMP					**X**	Remove this action.
3.5.2 Continue to work with municipalities to identify and incorporate hazard mitigation Project Opportunity Forms to include in the 5-year update of the HMP			**X**			Roll forward.
3.5.3 Collect and analyze data on the specific impacts severe winter weather has on Juniata County and its municipalities to include in the 5-year update of the HMP					**X**	Remove this action.
3.5.4 Collect and analyze data on the specific impacts droughts have on Juniata County and its municipalities to include in the 5-year update of the HMP					**X**	Remove this action.
3.5.5 Collect and analyze data on the specific impacts severe temperatures have on Juniata County and its municipalities to include in the 5-year update of the HMP					**X**	Remove this action.

2015 Juniata County Mitigation Actions Review Worksheet						
Existing Mitigation Actions	***Status***					***Review Comments***
	No Progress / Unknown	**In Progress / Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
3.5.6 Collect and analyze data on the specific impacts dam failures have on Juniata County and its municipalities to include in the 5-year update of the HMP					**X**	Remove this action.
3.5.7 Collect and analyze data on the specific impacts transportation incidents have on Juniata County and its municipalities and identify areas in need of safety improvements to include in the 5-year update of the HMP					**X**	Remove this action.
3.5.8 Collect and analyze data on the specific impacts utility failure has on Juniata County and its municipalities to include in the 5-year update of the HMP					**X**	Remove this action.
3.5.9 Encourage the development of county/municipal ordinances that require radon testing and mitigation actions in new construction and major renovation projects.			**X**			Roll forward.
4.1.1 Implement a Countywide electronic damage assessment management tool to increase the efficiency of County and municipal damage survey and reporting		**X**				Roll forward.

2015 Juniata County Mitigation Actions Review Worksheet						
Existing Mitigation Actions	***Status***					***Review Comments***
	No Progress / Unknown	**In Progress / Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
4.2.1 Create a GIS dataset of the locations of the SARA facilities in Juniata County to analyze their vulnerability to potential hazards			**X**			Maintain a GIS dataset of the locations of the SARA facilities in Juniata County to analyze their vulnerability to potential hazards.
4.2.2 Review and approve the Juniata County DFIRM information and incorporate the data into the County GIS		**X**				Roll forward.
5.1.1 Cooperate with local media to produce regular public service announcements or news releases on hazard risk, safety, and the importance of mitigation. Materials should be in English and Spanish			**X**			Roll forward.
5.2.1 Disseminate informational pamphlets in English and Spanish and include information on the County's website for residents that explains the risks of hazards, outlines precautionary measures that can be taken to help reduce impacts of disasters to themselves and their property, and emphasizes the value of hazard mitigation		**X**				Disseminate information in English and Spanish and include information on the currently used media outlets for residents that explains the risks of hazards, outlines precautionary measures that can be taken to help reduce impacts of disasters to themselves and their property, and emphasizes the value of hazard mitigation

2015 Juniata County Mitigation Actions Review Worksheet						
Existing Mitigation Actions	***Status***					***Review Comments***
	No Progress / Unknown	**In Progress / Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
5.3.1 Conduct outreach to municipalities to ensure compliance with NFIP. Outreach materials should be developed in English and Spanish			**X**			Conduct outreach to municipalities to encourage compliance with NFIP.
5.3.2 Develop informational workshops in English and Spanish on risk and mitigation for property owners in areas prone to flooding	**X**					Develop informational workshops in English and Spanish on risk and mitigation for property owners in areas prone to flooding.
6.1.1 Work with the school district to establish a Voice Over Internet Protocol (VOIP) communication system				**X**		Remove this action.
6.1.2 Work with the school district to develop a watershed awareness program			**X**			Work with the school district to develop an environmental awareness program.
6.2.1 Regularly reach out to municipal leaders regarding risk, severity, and preparedness tips for seasonal hazards			**X**			Regularly reach out to municipal leaders regarding risk, severity, and preparedness tips for seasonal hazards
6.2.2 Develop Memorandum of Understanding/Memorandum of Agreement (MOUs/MOAs) with neighboring counties and jurisdictions regarding information sharing, resource allocation, and COOP locations for use during times of disaster			**X**			Maintain Memorandum of Understanding/ Memorandum of Agreement (MOUs/MOAs) with neighboring counties.

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 five goals and fourteen corresponding objectives was developed. *Table 68 - 2020 Goals and Objectives* details the mitigation goals and objectives established for the 2020 Juniata County Hazard Mitigation Plan.

Table 68 - 2020 Goals and Objectives

2020 Juniata County Goals and Objectives	
GOAL Objective	***Description***
GOAL 1	***Strengthen county and local capabilities to reduce the potential impacts to existing and future public/partner assets, including structures, critical facilities, and technological infrastructure.***
Objective 1.1	Protect existing structures including critical facilities from damage that can be caused by hazards.
Objective 1.2	Promote management and regulatory procedures that would reduce the impacts of hazards on public and private property.
Objective 1.3	Develop local structural projects to reduce the impacts of natural and human-caused hazards on public and private property.
Objective 1.4	Maintain bridges and culverts to reduce backup and flooding.
Objective 1.5	Acquire, elevate, demolish or demolish/reconstruct flood prone properties to remove or mitigate risks to homeowners and property.
GOAL 2	***Increase intergovernmental cooperation and build public-private partnerships to implement activities that will reduce the impact of natural, human-caused, and technological disasters.***
Objective 2.1	Lessen impacts on natural resources and open space by enforcing existing regulations limiting development and directing planned growth away from hazard-prone areas.
Objective 2.2	Develop open lines of communication with all public entities.
GOAL 3	***Enhance planning and emergency response efforts among state, county, and local emergency management personnel to protect public health and safety.***
Objective 3.1	Ensure adequate training and resources for those involved in emergency response, services, relief, or hazard mitigation.
Objective 3.2	Ensure adequacy and maintain plans, equipment and technology.
Objective 3.3	Ensure that residents receive relief and are evacuated as quickly as possible in the event of a disaster.

2020 Juniata County Goals and Objectives	
GOAL 4	***Maintain and exercise Juniata County's spatial informational resources to strengthen public and private hazard mitigation planning and decision support capabilities.***
Objective 4.1	Enhance and maintain data management policies to ensure adequate data management.
Objective 4.2	Enhance and maintain detailed databases related to hazards and hazard mitigation.
GOAL 5	***Increase public awareness about both the potential impacts of all hazards and mitigation activities.***
Objective 5.1	Utilize public education and outreach programs to promote hazard mitigation planning.
Objective 5.2	Educate residents on floodplain management and risks.

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:

- Local plans and regulations
- Structure and infrastructure
- Natural systems protection
- Education and awareness

Local Plans 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 local plans 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 aug-

ment 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 69 - 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 70 - 2020 Mitigation Action Plan*.

Table 69 - Mitigation Strategy Technique Matrix

Juniata County Mitigation Strategy Technique Matrix				
HAZARD	**MITIGATION TECHNIQUE**			
	Local Plans and Regulations	**Structural and Infra-structure**	**Natural Systems Protection**	**Education and Awareness**
Drought	X		X	X
Earthquake	X			X
Flooding, Flash Flood & Ice Jam	X	X	X	X
Invasive Species (Spotted Lantern Fly)	X		X	X
Pandemic, Epidemic, In-fectious Disease	X		X	X
Radon Exposure	X	X		X
Tornado/Windstorm	X	X		X
Wildfires	X	X		X
Winter Storms	X	X		X
Civil Disturbance	X			X
Cyber Security	X	X		X
Dam Failure	X			X
Emergency Services	X			X
Environmental Hazard: Hazardous Materials	X	X		X
Opioid Epidemic	X			X
Terrorism (Agroterrorism)	X			X
Transportation Accidents	X	X		X
Utility Interruptions	X	X		X

6.4. Mitigation Action Plan

The Juniata County Hazard Mitigation Local Planning Team (LPT) immediately began work on the mitigation strategy section of the 2020 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 at the Juniata County Emergency Management Agency. 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.

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 2020 Juniata County HMP are listed in the mitigation action plan. *Table 70 - 2020 Mitigation Action Plan* is the 2020 Juniata County Mitigation Action Plan. This plan outlines mitigation actions and projects that comprise a strategy for Juniata 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 - Municipal Hazard Mitigation Actions Checklist* is a matrix that identifies the county and/or municipalities responsible for mitigation actions in the new mitigation action plan. The local champion for each action item is identified in the responsibility column of Table 70 and the municipalities that have responsibility for each action are identified in Table 71. Also, the municipal mitigation opportunity forms for the 2020 HMP are located in appendix G.

Table 70 - 2020 Mitigation Action Plan

Juniata County 2020 Mitigation Action Plan									
Action Number	Mitigation Actions			Prioritization			Implementation		
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Responsibility
1.1.1	Local Plans and Regulations	Maintain dam plans with owners to ensure all the county's dam plans are implemented.	Flooding, dam failure		x		2020 -2024	Local	Juniata County EMA

Juniata County 2020 Mitigation Action Plan									
Action Number	Mitigation Actions			Prioritization			Implementation		
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Responsibility
1.1.2	Structure and infrastructure	Inspect long span and short span bridges on an alternating biennial cycle. Encourage yearly routine maintenance of bridges.	Flooding		**x**		2020 -2024	Local	Juniata County Planning Office
1.2.1	Local Plans and Regulations	Conduct a thorough critical facilities vulnerability assessment and impact analysis using the HMP's GIS-based critical infrastructure history.	All hazards			**x**	2020 -2024	Local	Juniata County GIS/EMA and municipalities
1.2.2	Local Plans and Regulations	Prepare and implement a Continuity of Government Plan for Juniata County government.	All hazards			**x**	2020 -2024	Local	Juniata County EMA/Juniata County Government Offices
1.2.3	Structure and Infrastructure	Conduct analysis on the future demand for expanded infrastructure and critical facilities in Juniata County.	All hazards			**x**	2020 -2024	Local	Juniata County EMA/Planning
1.2.4	Local Plans and Regulations	Maintain Memorandum of Understanding/Memorandum of Agreement (MOUs/MOAs) with neighboring counties	All hazards		**x**		2020 -2024	Local	Juniata County EMA

Juniata County 2020 Mitigation Action Plan									
Action Number	Mitigation Actions			Prioritization			Implementation		
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Responsibility
1.2.5	Local Plans and Regulations	Encourage municipal subdivision and land development ordinances to be consistent with the Commonwealth Erosion and Sedimentation Control and Post Construction Stormwater Management (PCSM) Requirements.	All hazards		**X**		2020 -2024	Local	Planning/Municipalities
1.2.6	Local Plans and Regulations	Prepare and enact stormwater management ordinances consistent with Act 167 Stormwater Management Plans	Flooding		**X**		2020 -2024	Local	Planning/EMA
1.2.7	Education and Outreach	Continue the use of dropbox locations and other community programs throughout the county to return prescription drugs to ensure that abuse is decreased.	Opioid Epidemic		**X**		2020 -2024	Local	Juniata County Probation and Parole
1.2.8	Education and Awareness	Promote the use of counteractive medications to support and protect emergency personnel.	Opioid Epidemic		**X**		2020 -2024	Local	County-level agencies, Juniata County Commissioners and Juniata County EMS Council
1.3.1	Structure and Infrastructure	Continue to work with municipalities to identify and incorporate hazard mitigation Project Opportunity Forms to include in the 5-year update to the HMP.	All hazards		**X**		2020 -2024	PDM, HMGP and Local	Juniata County EMA

Juniata County 2020 Mitigation Action Plan									
Action Number	Mitigation Actions			Prioritization			Implementation		
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Responsibility
1.3.2	Structure and Infrastructure	Continue to remove dead ash trees from municipal and state right of ways to decrease the danger of falling trees and limbs.	Invasive Species	**x**			2020 -2024	Local	Municipalities/PennDOT
1.4.1	Structure and Infrastructure	Encourage municipalities to regularly inspect culverts.	Flooding		**x**		2020 -2024	Local	Juniata County EMA/Municipalities
1.5.1	Structure and Infrastructure	Encourage the acquisition, demolition, reconstruction, and elevation of structures in the hazard-prone area.	All hazards		**x**		2020 -2024	PDM/FMA Funds	Juniata County EMA/Planning
2.1.1	Planning and Regulations	Encourage the review of future planned growth to ensure that it will be developed outside of hazard-prone areas.	All hazards		**x**		2020 -2024	Local	Juniata County EMA/Planning and municipalities
2.1.2	Structure and Infrastructure	Encourage the development of safety buffers between industrial facilities and the population.	All hazards		**x**		2020 -2024	Local	Juniata County EMA
2.2.1	Planning and Regulations	Coordinate with municipal officials to discourage growth in the floodplain.	Flooding		**x**		2020 -2024	Local	Juniata County EMA/Municipalities
2.2.2	Local Plans and Regulations	Encourage the development of county/municipal ordinances that require radon testing and mitigation actions in new construction and major renovation projects.	Radon			**x**	2020 -2024	Local	Juniata County EMA/Municipalities

Juniata County 2020 Mitigation Action Plan									
Action Number	Mitigation Actions			Prioritization			Implementation		
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Responsibility
2.2.3	Education and Awareness	Coordinate with local media to produce regular public service announcements or news releases on hazard risk, safety, and the importance of mitigation. Materials should be in English and Spanish.	All hazards	**X**			2020 -2024	Local	Juniata County EMA
3.1.1	Local Plans and Regulations	Work with the county's agricultural community to develop and implement the county animal response team (CART) to strengthen the County's comprehensive emergency management program.	All hazards	**X**			2020 -2024	Local	Juniata County EMA/County Animal Response Team/Juniata County Conservation District
3.1.2	Education and Awareness	Continue to encourage multi-jurisdictional exercises and drills.	All hazards	**X**			2020 -2024	Local	Juniata County EMA
3.1.3	Education and Awareness	Collaborate with school district to continue school co-op program.	Emergency Services	**X**			2020 -2024	Local	Juniata County EMA and School District
3.1.4	Education and Awareness	Juniata County EMA will support and acknowledge emergency service personnel to provide community safety programs (i.e. stop the bleed).	Emergency Services		**X**		2020 -2024	Local	Juniata County EMA
3.1.5	Education and Awareness	Implement cyber security training for both staff members and administration.	Cyber Security		**X**		2020 -2024	Local	Juniata County IT

Juniata County 2020 Mitigation Action Plan									
Action Number	Mitigation Actions			Prioritization			Implementation		
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Responsibility
3.2.1	Local Plans and Regulations	Adopt a countywide post-disaster recovery and reconstruction plan.	All hazards	x			2020 -2024	Local	Juniata County EMA
3.2.2	Local Plans and Regulations	Coordinate the current Juniata County Hazard Mitigation Plan with the current county comprehensive plan and the current county and municipal emergency operations plan.	All hazards		x		2020 -2024	Local	Juniata County EMA
3.2.3	Local Plans and Regulations	Maintain a relationship with PA DOH and PEMA to implement the Mass Distribution of Medical Countermeasures (MDMC) Plan for Juniata County and the SCMRTF.	All hazards		x		2020 -2024	Local, HSGP	Juniata County EMA
3.2.4	Local Plans and Regulations	Maintain an inventory of equipment used for emergency response.	All hazards		x		2020 -2024	Local	Juniata County EMA
3.2.5	Local Plans and Regulations	Update the county and municipal emergency operations plan to be consistent with the National Response Plan.	All hazards		x		2020 -2024	Local	Juniata County EMA
3.2.6	Education and Awareness	Promote the utilization of new technology such as the use of drones to support emergency responders.	Emergency Services	x			2020 -2024	Local	Juniata County EMA
3.2.7	Structure and Infrastructure	Juniata County will coordinate with IT vendor to identify network deficiencies.	Cyber Security		x		2020 -2024	Local	Juniata County IT

Juniata County 2020 Mitigation Action Plan									
Action Number	Mitigation Actions			Prioritization			Implementation		
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Responsibility
3.2.8	Structure and Infrastructure	Implement new fire walls to decrease the impact of cyber-attacks.	Cyber Security		**X**		2020 -2024	Local	Juniata County IT
3.2.9	Planning and Regulations	Evaluate current network for cyber security threats.	Cyber Security		**X**		2020 -2024	Local	Juniata County IT
3.2.10	Education and Awareness	Make available threat analysis programs for churches, educational institutions, and businesses.	Cyber Security		**X**		2020 -2024	Local	Juniata County EMA
3.3.1	Local Plans and Regulations	Maintain a web-based inventory of the county's at-risk populations to strengthen emergency response and evacuations.	All hazards		**X**		2020 -2024	Local	Juniata County EMA
4.1.1	Local Plans and Regulations	Implement a Countywide electronic damage assessment management tool to increase the efficiency of County and municipal damage survey and reporting.	All hazards		**X**		2020 -2024	Local	Juniata County EMA
4.1.2	Local Plans and Regulations	Maintain a GIS dataset of the locations of the SARA facilities in Juniata County to analyze their vulnerability to potential hazards.	All hazards	**X**			2020 -2024	Local, Act 165, HMEP	County GIS
4.1.3	Local Plans and Regulations	Review and approve Juniata County DFIRM information and incorporate the data in the County GIS.	Flooding		**X**		2020 -2024	Local	County Planning and municipalities

Juniata County 2020 Mitigation Action Plan									
Action Number	**Mitigation Actions**			**Prioritization**			**Implementation**		
	Category	**Description/ Action Items**	**Hazard Vulnerability**	**High**	**Medium**	**Low**	**Schedule**	**Funding**	**Responsibility**
4.2.1	Local Plans and Regulations	Collaborate with municipal officials to collect, analyze, and organize property damage for all hazards to include in the 5-year update of the HMP.	All hazards		**X**		2020 -2024	Local	Juniata County EMA/Municipalities
4.2.2	Structure and Infrastructure	Evaluate and refine the County repetitive loss structures list by ranking properties based on the number of losses and the value of the claims paid and target the priority of properties eligible for the buyout opportunity.	Flooding		**X**		2020 -2024	Local, FMA, PDM	Juniata County EMA
4.2.3	Local Plans and Regulations	Work with municipalities to maintain and update a countywide database of streams prone to backup and flooding.	Flooding		**X**		2020 -2024	Local	Juniata County EMA, GIS and municipalities
5.1.1	Education and Awareness	Disseminate information in English and Spanish and include information on the currently used media outlets for residents that explains the risks of hazards, outlines precautionary measures that can be taken to help reduce impacts of disasters to themselves and their property, and emphasize the value of hazard mitigation.	All hazards		**X**		2020 -2024	Local	Juniata County EMA

Juniata County 2020 Mitigation Action Plan									
Action Number	Mitigation Actions			Prioritization			Implementation		
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Responsibility
5.1.2	Education and Awareness	Work with the school district to develop an environmental awareness program.	All hazards		**x**		2020 -2024	Local	Juniata County EMA and School District
5.1.3	Education and Awareness	Regularly reach out to municipal leaders regarding risk, severity, and preparedness tips for seasonal hazards.	All hazards			**x**	2020 -2024	Local	Juniata County EMA and Municipalities
5.1.4	Education and Awareness	Collaborate with partnering agencies to promote awareness of invasive species (i.e. spotted lantern fly).	Invasive Species	**x**			2020 -2024	Local	Juniata County Conservation District
5.1.5	Education and awareness	Continue to collaborate with the Juniata Prevention Board to identify and promote public awareness of substance abuse.	Opioid Epidemic		**x**		2020 -2024	Local	Juniata County Prevention Board
5.2.1	Local Plans and Regulations	Conduct outreach to municipalities to encourage compliance with NFIP.	Flooding		**x**		On-going	Local, FMA	Juniata County EMA
5.2.2	Education and awareness	Develop informational workshops in English and Spanish on risk and mitigation for property owners in areas prone to flooding.	Flooding	**x**			2020 -2024	Local	Juniata County EMA

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

Table 71 - 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**	**1.2.6**	**1.2.7**	**1.2.8**
Beale Township		X	X				X	X	X	X
Delaware Township		X	X				X	X	X	X
Fayette Township		X	X				X	X	X	X
Fermanagh Township		X	X				X	X	X	X
Greenwood Township		X	X				X	X	X	X
Lack Township		X	X				X	X	X	X
Mifflin Borough		X	X				X	X	X	X
Mifflintown Borough		X	X				X	X	X	X
Milford Township		X	X				X	X	X	X
Monroe Township		X	X				X	X	X	X
Port Royal Borough		X	X				X	X	X	X
Spruce Hill Township		X	X				X	X	X	X
Susquehanna Township		X	X				X	X	X	X
Thompsontown Borough		X	X				X	X	X	X
Turbett Township		X	X				X	X	X	X
Tuscarora Township		X	X				X	X	X	X
Walker Township		X	X				X	X	X	X
Juniata County	X	X	X	X	X	X	X	X	X	X

Municipal Hazard Mitigation Actions Checklist										
Municipality	**1.3.1**	**1.3.2**	**1.4.1**	**1.5.1**	**2.1.1**	**2.1.2**	**2.2.1**	**2.2.2**	**2.2.3**	**3.1.1**
Beale Township	X	X		X	X	X		X		X
Delaware Township	X	X		X	X	X		X		X
Fayette Township	X	X		X	X	X		X		X
Fermanagh Township	X	X		X	X	X		X		X
Greenwood Township	X	X		X	X	X		X		X
Lack Township	X	X		X	X	X		X		X
Mifflin Borough	X	X		X	X	X		X		X
Mifflintown Borough	X	X		X	X	X		X		X
Milford Township	X	X		X	X	X		X		X
Monroe Township	X	X		X	X	X		X		X
Port Royal Borough	X	X		X	X	X		X		X
Spruce Hill Township	X	X		X	X	X		X		X
Susquehanna Township	X	X		X	X	X		X		X
Thompsontown Borough	X	X		X	X	X		X		X
Turbett Township	X	X		X	X	X		X		X
Tuscarora Township	X	X		X	X	X		X		X
Walker Township	X	X		X	X	X		X		X
Juniata County	X	X	X	X	X	X	X	X	X	X

Municipal Hazard Mitigation Actions Checklist										
Municipality	**3.1.2**	**3.1.3**	**3.1.4**	**3.1.5**	**3.2.1**	**3.2.2**	**3.2.3**	**3.2.4**	**3.2.5**	**3.2.6**
Beale Township	X	X			X	X			X	X
Delaware Township	X	X			X	X			X	X
Fayette Township	X	X			X	X			X	X
Fermanagh Township	X	X			X	X			X	X
Greenwood Township	X	X			X	X			X	X
Lack Township	X	X			X	X			X	X
Mifflin Borough	X	X			X	X			X	X
Mifflintown Borough	X	X			X	X			X	X
Milford Township	X	X			X	X			X	X
Monroe Township	X	X			X	X			X	X
Port Royal Borough	X	X			X	X			X	X
Spruce Hill Township	X	X			X	X			X	X
Susquehanna Township	X	X			X	X			X	X
Thompsontown Borough	X	X			X	X			X	X
Turbett Township	X	X			X	X			X	X

Municipal Hazard Mitigation Actions Checklist										
Municipality	**3.1.2**	**3.1.3**	**3.1.4**	**3.1.5**	**3.2.1**	**3.2.2**	**3.2.3**	**3.2.4**	**3.2.5**	**3.2.6**
Tuscarora Township	X	X			X	X			X	X
Walker Township	X	X			X	X			X	X
Juniata County	X	X	X	X	X	X	X	X	X	X

Municipal Hazard Mitigation Actions Checklist										
Municipality	**3.2.7**	**3.2.8**	**3.2.9**	**3.2.10**	**3.3.1**	**4.1.1**	**4.1.2**	**4.1.3**	**4.2.1**	**4.2.2**
Beale Township					X	X			X	X
Delaware Township					X	X			X	X
Fayette Township					X	X			X	X
Fermanagh Township					X	X			X	X
Greenwood Township					X	X			X	X
Lack Township					X	X			X	X
Mifflin Borough					X	X			X	X
Mifflintown Borough					X	X			X	X
Milford Township					X	X			X	X
Monroe Township					X	X			X	X
Port Royal Borough					X	X			X	X
Spruce Hill Township					X	X			X	X
Susquehanna Township					X	X			X	X
Thompsontown Borough					X	X			X	X
Turbett Township					X	X			X	X
Tuscarora Township					X	X			X	X
Walker Township					X	X			X	X
Juniata County	X	X	X	X	X	X	X	X	X	X

Municipal Hazard Mitigation Actions Checklist										
Municipality	**4.2.3**	**5.1.1**	**5.1.2**	**5.1.3**	**5.1.4**	**5.1.5**	**5.2.1**	**5.2.2**		
Beale Township	X			X	X		X	X		
Delaware Township	X			X	X		X	X		
Fayette Township	X			X	X		X	X		
Fermanagh Township	X			X	X		X	X		
Greenwood Township	X			X	X		X	X		
Lack Township	X			X	X		X	X		

Municipal Hazard Mitigation Actions Checklist										
Municipality	**4.2.3**	**5.1.1**	**5.1.2**	**5.1.3**	**5.1.4**	**5.1.5**	**5.2.1**	**5.2.2**		
Mifflin Borough	X			X	X		X	X		
Mifflintown Borough	X			X	X		X	X		
Milford Township	X			X	X		X	X		
Monroe Township	X			X	X		X	X		
Port Royal Borough	X			X	X		X	X		
Spruce Hill Township	X			X	X		X	X		
Susquehanna Township	X			X	X		X	X		
Thompsontown Borough	X			X	X		X	X		
Turbett Township	X			X	X		X	X		
Tuscarora Township	X			X	X		X	X		
Walker Township	X			X	X		X	X		
Juniata County	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 Juniata 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 Juniata County HMP Local Planning Team decided to alter the current maintenance procedures. The 2020 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 2020 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 Juniata County is a responsibility of all levels of government (i.e., county and local), as well as the citizens of the county. The Juniata 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 Juniata 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 2020 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 Juniata County Department of Emergency Services will maintain a copy of these records and place them in Appendix I of this plan. Juniata 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 Juniata County Department of Emergency Services will ensure that the 2020 Juniata County Hazard Mitigation Plan is posted and maintained on the Juniata County website and will continue to encourage public review and comment on the plan. The Juniata County website that the plan will be located at is as follows: https://www.juniataco.org/departments/planning/hazard-mitigation-plan/

The public will have access to the 2020 HMP through their local municipal office, the Juniata County Planning Department, or the Juniata County Department of Emergency Services. 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 Juniata County are encouraged to submit their comments to elected officials and/or members of the Juniata County HMP Local Planning Team. To promote public participation, the Juniata 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 Juniata 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 2020 Juniata 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: 2020 Mitigation Project Opportunities
APPENDIX H: 2020 Mitigation Action Evaluation & Prioritization
APPENDIX I: Dam Failure Profile
APPENDIX J: Annual Review Documentation
APPENDIX K: Juniata County & Municipal Adoption Resolutions