



# LUZERNE COUNTY 2020

## HAZARD MITIGATION PLAN UPDATE

PREPARED FOR:

*Luzerne County  
Department of Planning & Zoning  
20 N. Pennsylvania Avenue  
Wilkes-Barre, Pennsylvania 18711*

PREPARED BY:

*Michael Baker International, Inc.  
1818 Market Street, Suite 3110  
Philadelphia, Pennsylvania 19103*



***Certification of Annual Review Meetings***

The Luzerne County Hazard Mitigation Planning Team (HMPT) has reviewed this Hazard Mitigation Plan. See Section 8 for further details regarding this form. The director of the HMPT hereby certifies the review.

YEAR	DATE OF MEETING	PUBLIC OUTREACH ADDRESSED? *	SIGNATURE
2015	--		
2016	--		
2017	--		
2018	--		
2019			
2020			
2021			
2022			
2023			

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

**Record of Changes**

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

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

# TABLE OF CONTENTS

Certification of Annual Review Meetings .....	ii
Record of Changes.....	iii
<b>1. Introduction.....</b>	<b>1</b>
<b>1.1. Background.....</b>	<b>1</b>
<b>1.2. Purpose.....</b>	<b>3</b>
<b>1.3. Scope .....</b>	<b>3</b>
<b>1.4. Authority and References.....</b>	<b>3</b>
<b>2. Community Profile .....</b>	<b>6</b>
<b>2.1. Geography and Environment.....</b>	<b>6</b>
<b>2.2. Community Facts.....</b>	<b>10</b>
<b>2.3. Population and Demographics .....</b>	<b>10</b>
<b>2.4. Land Use and Development.....</b>	<b>16</b>
<b>2.5. Data Sources and Limitations .....</b>	<b>19</b>
<b>3. Planning Process .....</b>	<b>22</b>
<b>3.1. Update Process Summary .....</b>	<b>22</b>
<b>3.2. The Planning Team .....</b>	<b>22</b>
<b>3.3. Meetings and Documentation.....</b>	<b>25</b>
<b>3.4. Public &amp; Stakeholder Participation.....</b>	<b>27</b>
<b>3.5. Multi-Jurisdictional Planning.....</b>	<b>28</b>
<b>4. Risk Assessment .....</b>	<b>29</b>
<b>4.1. Update Process Summary .....</b>	<b>29</b>
<b>4.2. Hazard Identification .....</b>	<b>30</b>
4.2.1. Table of Presidential Disaster Declarations .....	30
4.2.2. Summary of Hazards.....	33
<b>4.3. Hazard Profiles and Vulnerability Analysis .....</b>	<b>37</b>
4.3.1. Drought.....	37
4.3.1.1. Location and Extent .....	37
4.3.1.2. Range of Magnitude.....	37
4.3.1.3. Past Occurrence .....	39

4.3.1.4.	Future Occurrence.....	42
4.3.1.5.	Vulnerability Assessment .....	42
<b>4.3.2.</b>	<b>Earthquake .....</b>	<b>45</b>
4.3.2.1.	Location and Extent .....	45
4.3.2.2.	Range of Magnitude.....	46
4.3.2.3.	Past Occurrence .....	47
4.3.2.4.	Future Occurrence.....	49
4.3.2.5.	Vulnerability Assessment .....	49
<b>4.3.3.</b>	<b>Flood, Flash Flood, Ice Jam.....</b>	<b>50</b>
4.3.3.1.	Location and Extent .....	50
4.3.3.2.	Range of Magnitude.....	54
4.3.3.3.	Past Occurrence .....	55
4.3.3.4.	Future Occurrence.....	71
4.3.3.5.	Vulnerability Assessment .....	72
4.3.3.6.	Flood Vulnerability and Historic Resources.....	82
<b>4.3.4.</b>	<b>Hailstorm.....</b>	<b>86</b>
4.3.4.1.	Location and Extent .....	86
4.3.4.2.	Range of Magnitude.....	86
4.3.4.3.	Past Occurrence .....	87
4.3.4.4.	Future Occurrence.....	90
4.3.4.5.	Vulnerability Assessment .....	90
<b>4.3.5.</b>	<b>Hurricane, Tropical Storm, Nor'easter.....</b>	<b>91</b>
4.3.5.1.	Location and Extent .....	91
4.3.5.2.	Range of Magnitude.....	94
4.3.5.3.	Past Occurrence .....	95
4.3.5.4.	Future Occurrence.....	98
4.3.5.5.	Vulnerability Assessment .....	98
<b>4.3.6.</b>	<b>Landslide .....</b>	<b>98</b>
4.3.6.1.	Location and Extent .....	98
4.3.6.2.	Range of Magnitude.....	101
4.3.6.3.	Past Occurrence .....	101
4.3.6.4.	Future Occurrence.....	102
4.3.6.5.	Vulnerability Assessment .....	102
<b>4.3.7.</b>	<b>Pandemic and Infectious Disease.....</b>	<b>107</b>
4.3.7.1.	Location and Extent .....	107
4.3.7.2.	Range of Magnitude.....	108
4.3.7.3.	Past Occurrence .....	109
4.3.7.4.	Future Occurrence.....	110
4.3.7.5.	Vulnerability Assessment .....	110
<b>4.3.8.</b>	<b>Radon Exposure.....</b>	<b>112</b>
4.3.8.1.	Location and Extent .....	112
4.3.8.2.	Range of Magnitude.....	116

4.3.8.3.	Past Occurrence .....	117
4.3.8.4.	Future Occurrence .....	119
4.3.8.5.	Vulnerability Assessment .....	119
<b>4.3.9.</b>	<b>Subsidence, Sinkhole .....</b>	<b>120</b>
4.3.9.1.	Location and Extent .....	120
4.3.9.2.	Range of Magnitude .....	120
4.3.9.3.	Past Occurrence .....	123
4.3.9.4.	Future Occurrence .....	123
4.3.9.5.	Vulnerability Assessment .....	123
<b>4.3.10.</b>	<b>Tornado, Windstorm .....</b>	<b>130</b>
4.3.10.1.	Location and Extent .....	130
4.3.10.2.	Range of Magnitude .....	131
4.3.10.3.	Past Occurrence .....	132
4.3.10.4.	Future Occurrence .....	140
4.3.10.5.	Vulnerability Assessment .....	140
<b>4.3.11.</b>	<b>Wildfire .....</b>	<b>144</b>
4.3.11.1.	Location and Extent .....	144
4.3.11.2.	Range of Magnitude .....	144
4.3.11.3.	Past Occurrence .....	145
4.3.11.4.	Future Occurrence .....	147
4.3.11.5.	Vulnerability Assessment .....	147
<b>4.3.12.</b>	<b>Winter Storm .....</b>	<b>153</b>
4.3.12.1.	Location and Extent .....	153
4.3.12.2.	Range of Magnitude .....	155
4.3.12.3.	Past Occurrence .....	156
4.3.12.4.	Future Occurrence .....	157
4.3.12.5.	Vulnerability Assessment .....	158
<b>4.3.13.</b>	<b>Cyber-Terrorism .....</b>	<b>161</b>
4.3.13.1.	Location and Extent .....	161
4.3.13.2.	Range of Magnitude .....	163
4.3.13.3.	Past Occurrence .....	163
4.3.13.4.	Future Occurrence .....	164
4.3.13.5.	Vulnerability Assessment .....	165
<b>4.3.14.</b>	<b>Dam Failure .....</b>	<b>165</b>
<b>4.3.15.</b>	<b>Hazardous Materials Release .....</b>	<b>166</b>
4.3.15.1.	Location and Extent .....	166
4.3.15.2.	Range of Magnitude .....	170
4.3.15.3.	Past Occurrence .....	171
4.3.15.4.	Future Occurrence .....	171
4.3.15.5.	Vulnerability Assessment .....	171
<b>4.3.16.</b>	<b>Levee Failure .....</b>	<b>175</b>
4.3.16.1.	Location and Extent .....	175

4.3.16.2.	Range of Magnitude .....	179
4.3.16.3.	Past Occurrence .....	179
4.3.16.4.	Future Occurrence .....	180
4.3.16.5.	Vulnerability Assessment .....	181
<b>4.3.17.</b>	<b>Nuclear Incident.....</b>	<b>188</b>
4.3.17.1.	Location and Extent .....	188
4.3.17.2.	Range of Magnitude .....	190
4.3.17.3.	Past Occurrence .....	192
4.3.17.4.	Future Occurrence .....	193
4.3.17.5.	Vulnerability Assessment .....	194
<b>4.3.18.</b>	<b>Opioid Addiction .....</b>	<b>195</b>
4.3.18.1.	Location and Extent .....	195
4.3.18.2.	Range of Magnitude .....	196
4.3.18.3.	Past Occurrence .....	197
4.3.18.4.	Future Occurrence .....	197
4.3.18.5.	Vulnerability Assessment .....	198
<b>4.4.</b>	<b>Hazard Vulnerability Summary .....</b>	<b>199</b>
4.4.1.	Methodology.....	199
4.4.2.	Ranking Results .....	201
4.4.3.	Potential Loss Estimates.....	208
4.4.4.	Future Development and Vulnerability.....	211
<b>5.</b>	<b>Capability Assessment.....</b>	<b>214</b>
<b>5.1.</b>	<b>Update Process Summary .....</b>	<b>214</b>
<b>5.2.</b>	<b>Capability Assessment Findings.....</b>	<b>216</b>
5.2.1.	Planning and Regulatory Capability .....	216
5.2.1.2.	Community Political Capability .....	222
5.2.1.3.	Participation in the National Flood Insurance Program .....	222
5.2.2.	Administrative and Technical Capability.....	235
5.2.3.	Financial Capability .....	239
5.2.4.	Education and Outreach.....	240
5.2.5.	Plan Integration.....	242
<b>6.</b>	<b>Mitigation Strategy.....</b>	<b>245</b>
<b>6.1.</b>	<b>Update Process Summary .....</b>	<b>245</b>
<b>6.2.</b>	<b>Mitigation Goals and Objectives.....</b>	<b>270</b>
<b>6.3.</b>	<b>Identification and Analysis of Mitigation Techniques.....</b>	<b>271</b>
<b>6.4.</b>	<b>Mitigation Action Plan.....</b>	<b>272</b>

7. Plan Maintenance .....339

    7.1. Update Process Summary .....339

    7.2. Monitoring, Evaluating, and Updating the Plan .....339

    7.3. Continued Public Involvement .....340

8. Plan Adoption .....341

Appendix A Bibliography

Appendix B Local Plan Review Tool

Appendix C Meeting and Other Participation Documentation\*

Appendix D Community Flood Vulnerability Maps\*

Appendix E Critical Facilities\*

Appendix F Hazus Report

Appendix G West Pittston Historic Resources and Risk  
Reduction Report

Appendix H Dam Failure Hazard Profile\*

*\*Sensitive Information - Not for public distribution*



Table of Acronyms			
ACRONYM	FULL NAME	ACRONYM	FULL NAME
CFR	Code of Federal Regulations	NFPA	National Fire Protection Association
CKCOG	Central Keystone Council of Governments	NHC	National Hurricane Center
CRS	Community Ratings System	NIDIS	National Integrated Drought Information System
DCED	Department of Community and Economic Development	NOAA	National Oceanic and Atmospheric Association
DCNR	Department of Conservation and Natural Resources	NWS	National Weather Service
DCNR-BOF	Department of Conservation and Natural Resources- Bureau of Forestry	PEIRS	Pennsylvania Emergency Incident Reporting System
DMA	Disaster Mitigation Act	PA DEP	Pennsylvania Department of Environmental Protection
EOP	Emergency Operations Plan	PaGWIS	Pennsylvania Groundwater Information System
EOC	Emergency Operations Center	PASDA	Pennsylvania Spatial Data Access
EMC	Emergency Management Coordinator	PDM	Pre-Disaster Mitigation Assistance Program
EPA	Environmental Protection Agency	PDSI	Palmer Drought Severity Index
FEMA	Federal Emergency Management Agency	PEMA	Pennsylvania Emergency Management Agency
FIRM	Flood Insurance Rate Map	PennDOT	Pennsylvania Department of Transportation
FMA	Flood Mitigation Assistance Program	RF	Risk Factor
HMGP	Hazard Mitigation Grant Program	SALDO	Subdivision and Land Development Ordinance
HMPT	Hazard Mitigation Planning Team	SEDA-COG	Susquehanna Economic Development Association and Council of Governments
HMPU	Hazard Mitigation Plan Update	SFHA	Special Flood Hazard Area

Table of Acronyms			
ACRONYM	FULL NAME	ACRONYM	FULL NAME
HVA	Hazards Vulnerability Analysis	SOG	Standard Operating Guide
ICC	International Code Council	UCC	Universal Construction Code
IBC	International Building Code	US DOT	United States Department of Transportation
LC/PZST	Luzerne County and/or Department of Planning and Zoning Staff Time	USACE	United States Army Corps of Engineers
NCDC	National Climatic Data Center	USDA	United States Department of Agriculture
NDIS	National Drought Information System	USGS	United States Geological Survey
NDMC	National Drought Mitigation Center	WYO	Write Your Own
NFIP	National Flood Insurance Program		

# 1. Introduction

## 1.1. Background

Hazard Mitigation is defined by the Federal Emergency Management Agency (FEMA) as “sustained action taken to reduce or eliminate long-term risk to people and property from hazards and their effects”. The hazard mitigation planning process involves the coordination of actions taken to reduce injuries, deaths, property damage, economic losses, and degradation of natural resources caused by natural and man-made disasters. Hazard mitigation is considered one of four phases in the emergency management cycle. Others include emergency preparedness, emergency response, and recovery.

- Hazard mitigation activities involve actions that reduce or eliminate the probability of an occurrence or reduce the impact of a disaster. The goal of the mitigation phase is to make communities more resistant to disasters and thereby decrease the need for a response. Mitigation occurs long before a disaster.
- Preparedness activities include planning and preparing for when a disaster strikes and includes response capability actions to ensure an effective and efficient use of resources and efforts to minimize damage. Preparedness occurs just before a disaster.
- Emergency response activities include providing emergency assistance to victims and minimizing property loss. The response phase begins during or immediately after the onset of a disaster.
- Recovery activities include short and long-term activities that help return individuals and communities to normalcy as soon as possible. Recovery actions involve clean-up efforts, temporary housing, and replacement of infrastructure. Recovery activities typically commence several days or weeks after a disaster and are long-term.

### **2009 Hazard Mitigation Plan**

The initial Hazard Mitigation Plan (HMP) for Luzerne County was completed in 2009 as a Bi-County Mitigation Plan for Luzerne and Lackawanna Counties and their 76 and 40 municipalities, respectively. A total of 67 of Luzerne County’s 76 municipalities participated in the planning process via



**Luzerne County  
Department of  
Planning & Zoning  
and Emergency  
Management  
Agency have taken  
an all-hazards  
approach to this  
Hazard Mitigation  
Plan Update.**

questionnaires, meetings and identification of mitigation projects. The 2009 Plan identified the Bi-County region as being susceptible to a range of natural hazards including floods, high wind, winter storms, mine related hazards, and drought.

### ***2014 Plan Update***

The 2014 Plan Update consists of a review of the 2009 Plan, which was used as a base document. Each chapter in the 2014 HMP has been updated as necessary. A summary is included at the beginning of each chapter to indicate how this Plan was updated from the 2009 version. The Plan Update involves the review of data on potential hazards and reprioritization of these hazards in terms of frequency and severity. The Plan Update includes a review of mitigation actions, which were revised, deleted, or modified to address the high priority hazards as well as a Plan Maintenance section.

### ***2020 Plan Update***

The 2020 Plan Update is intended to enable the County and its municipalities to effectively reduce the potential risks of identified hazards to the health, safety and property of the residents. The Plan Update will also allow Luzerne County municipalities to be eligible for a range of financial assistance following hazard events.

The 2020 Plan Update consists of a thorough review and evaluation of the 2014 Plan. Each chapter in the 2020 HMP has been updated as necessary. A summary is included at the beginning of each chapter to indicate how this Plan was updated from the 2014 version. The Plan Update involves the review of data on potential hazards and reprioritization of these hazards in terms of frequency and severity. The Plan Update includes a review of mitigation actions, which were revised, deleted, or modified to address the high priority hazards as well as a Plan Maintenance section that describes how the Plan will be updated and maintained during the next five-year cycle.

The 2020 Hazard Mitigation Plan Update comprises seven chapters. Chapter 1 includes the prerequisites of the Plan including letters of adoption by the County Commission and the individual municipalities. Chapter 2 introduces the plan update process and includes an overview of the socio-economic and demographic characteristics. Chapter 3 discusses the planning process. Chapter 4 comprises the hazard identification and risk assessment and examines vulnerability and the potential losses from the top priority hazards. Chapter 4 also includes a historic profile of hazard types and associated losses, and a vulnerability assessment, which analyzes the potential for future damages due to the hazards identified. Chapter 5 contains a capability assessment including a review of existing plans and ordinances from the counties and municipalities. Chapter 6 discusses the mitigation strategy including updated mitigation goals and objectives, mitigation actions, and the method for prioritization and implementation of mitigation actions. Chapter 7 outlines how Luzerne County and its municipalities will implement the Plan once it is adopted and ways to monitor progress and ensure continued public involvement.

## **1.2. Purpose**

This plan was developed for the purpose of:

- Providing a blueprint for reducing property damage and saving lives from the effects of future natural and human-made hazards in Luzerne County;
- Complying with state and federal legislative requirements for County mitigation in order for the County to be eligible for federal and technical assistance from State and Federal hazard mitigation programs;
- Identifying, introducing, and implementing cost-effective hazard mitigation measures in order to accomplish County goals and objectives and to raise awareness and acceptance of hazard mitigation; and
- Improving community resiliency following a disaster event.

Adoption of this plan ensures that Luzerne County and participating jurisdictions continue to be eligible to apply for and receive certain federal grant funds that are administered by the Commonwealth of Pennsylvania for FEMA. This plan complies with the requirements of the Disaster Mitigation Act of 2000 and its implementing regulations published in Title 44 of the Code of Federal Regulations (CFR) Section 201.6.

## **1.3. Scope**

In April of 2019, Luzerne County contracted with Michael Baker International, Inc. to support HMP Update development in compliance with the requirements of the Disaster Mitigation Act of 2000. The HMP Update was funded by Hazard Mitigation Assistance (HMA) funds from FEMA and administered by the Pennsylvania Emergency Management Agency (PEMA). The Plan Update is a multi-jurisdictional plan that covers Luzerne County and its 76 municipalities. Lackawanna County will be performing its plan update under a separate contract.

It should be noted that future funding for mitigation projects will be contingent upon having each jurisdiction in Luzerne County adopt the plan after the County adopts the Update. Any jurisdiction that does not adopt the 2020 Plan Update will become ineligible for pre- and post-disaster mitigation funds.

The Luzerne County 2020 Hazard Mitigation Plan Update has been prepared to meet requirements set forth by FEMA and PEMA in order for the County to be eligible for funding and technical assistance from state and federal hazard mitigation programs. It will be updated and maintained to continually address hazards determined to be of significant risk to the County and/or its local municipalities. Review will take place annually and following significant disasters, and a full Plan Update will occur, as required, every five years.

## **1.4. Authority and References**

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;

- CFR, Title 44, Parts 201 and 206;
- Disaster Mitigation Act of 2000, Public Law 106-390, as amended; and
- 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; and
- Pennsylvania Stormwater Management Act of October 4, 1978. P.L. 864, No. 167.

The following 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 Mitigation Planning Handbook*. March 2013.
- FEMA: *Local Mitigation Plan Review Guide*. October 2011.
- FEMA: *National Fire Incident Reporting System 5.0: Complete Reference Guide*. January 2008.
- FEMA: *Hazard Mitigation Assistance Unified Guidance*. February 2015.
- FEMA: *Integrating Hazard Mitigation into Local Planning: Case Studies and Tools for Community Officials*. March 2013
- 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 2009.
- PEMA: *Pennsylvania's Hazard Mitigation Planning Standard Operating Guide*. October 2013.

The following additional guidance document produced by the National Fire Protection Association (NFPA) was used to update this plan:

- NFPA 1600: *Standard on Disaster/Emergency Management and Business Continuity Programs*. 2007.

## 2. Community Profile

This section includes a profile of Luzerne County and its municipalities. Information on the County's geographic profile, climate, demographic profile, and employment and industry profile are included below. While some information such as the study area boundaries and geography have remained unchanged, and derived from the 2014 Plan, other information such as the demographic and employment and industry information has been developed using the latest U.S. Census, the Comprehensive Regional Plan, and other recent Economic Development Strategy and Planning documents.

### 2.1. *Geography and Environment*

Luzerne County is located in the northeastern region of Pennsylvania and consists of 76 municipalities (36 townships, 36 boroughs, and 4 cities) and is bordered by Wyoming County to the north, Lackawanna County to the northeast, a small portion of Monroe County to the east, Carbon County to the southeast, Schuylkill County to the south, Columbia County to the west, and Sullivan County to the northwest (see Figure 2.1-1: Luzerne County Base Map). Luzerne County is 906 square miles, or about 580,000 acres, and consists mostly of wooded and cultivated land. There are four state parks located fully or partially in Luzerne County; Frances Slocum, Lehigh Gorge, Nescopeck, and Ricketts Glen.

The majority of Luzerne County is in the Upper Susquehanna-Lackawanna portion of the Susquehanna River Watershed. Figure 2.1-2 shows the locations of watersheds throughout the county. Three major rivers flow through Luzerne County. The Susquehanna River runs for approximately 44 miles in a southwest direction through Luzerne County. The Lackawanna River runs for about 31 miles in a southwest direction through Lackawanna County and continues for approximately 2.5 miles through Luzerne County before its confluence with the Susquehanna River near the City of Pittston. The Lehigh River flows in a southwest direction for approximately 14 miles along the southern border of Lackawanna County and continues for about 22 miles along a portion of Luzerne County's eastern border. The mountains bordering this river valley are significant with elevations over 2,000 feet above sea level in some sections. They form distinctive ridgelines that are visible for miles from the developed valley areas. The most notable mountains and ridgetops in Luzerne County are Penobscot Mountain and Wilkes-Barre Mountain east of the Susquehanna River, and Shickshinny Mountain and Larksville Mountain west of the Susquehanna River, and North Mountain near Ricketts Glen State Park in the northern portion of the county.

US Route 11 runs through Luzerne County along the Susquehanna River. Interstate 81 runs near the Susquehanna River before veering South by Hanover Township. Interstate 80 runs across the Southern portion of Luzerne County by the City of Hazleton. Additionally, Interstate 476 runs through the eastern part of the County, entering by the City of Pittston and exiting in Bear Creek Township. The locations of highways, boroughs, townships, and cities are provided on the map below.



Luzerne County experiences an average annual temperature of about 49 degrees Fahrenheit and an average annual precipitation of approximately 36 inches. During the winter months (December through February), the average temperature is around 27° F, and the average precipitation is about 6.7 inches in which fluctuations during dry and wet years are not noticeably extreme. Spring months (March through May) bring moderate average temperatures of 48° F and precipitation levels of 9.4 inches. Average summer (June through August) temperatures are 70° F and average precipitation values are about 10.6 inches. As the year enters the fall season (September through November), moderate temperatures and precipitation levels are prevalent. The average temperature is 52° F and the average precipitation is 9.7 inches.

Figure 2.1-1 Base map of Luzerne County

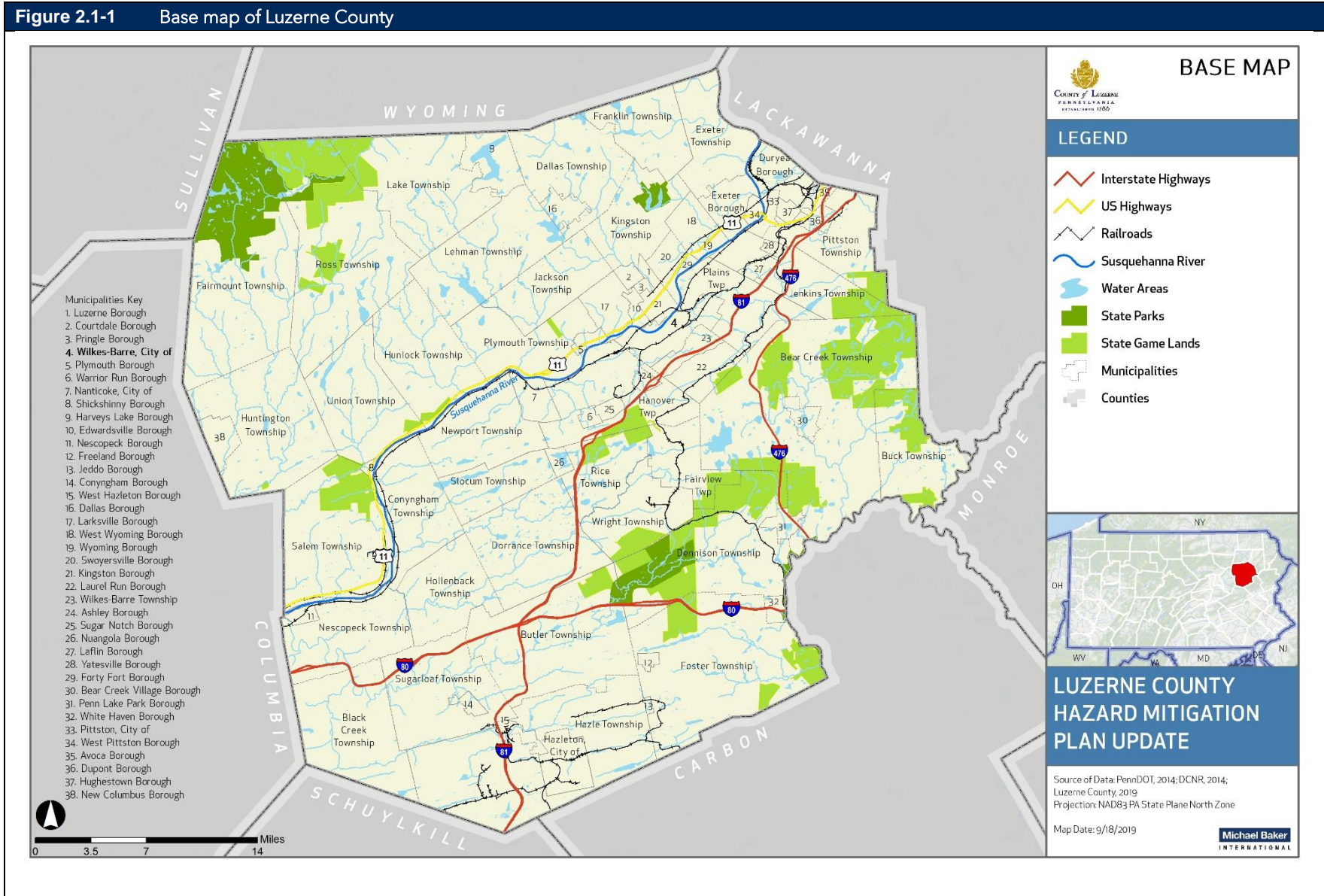
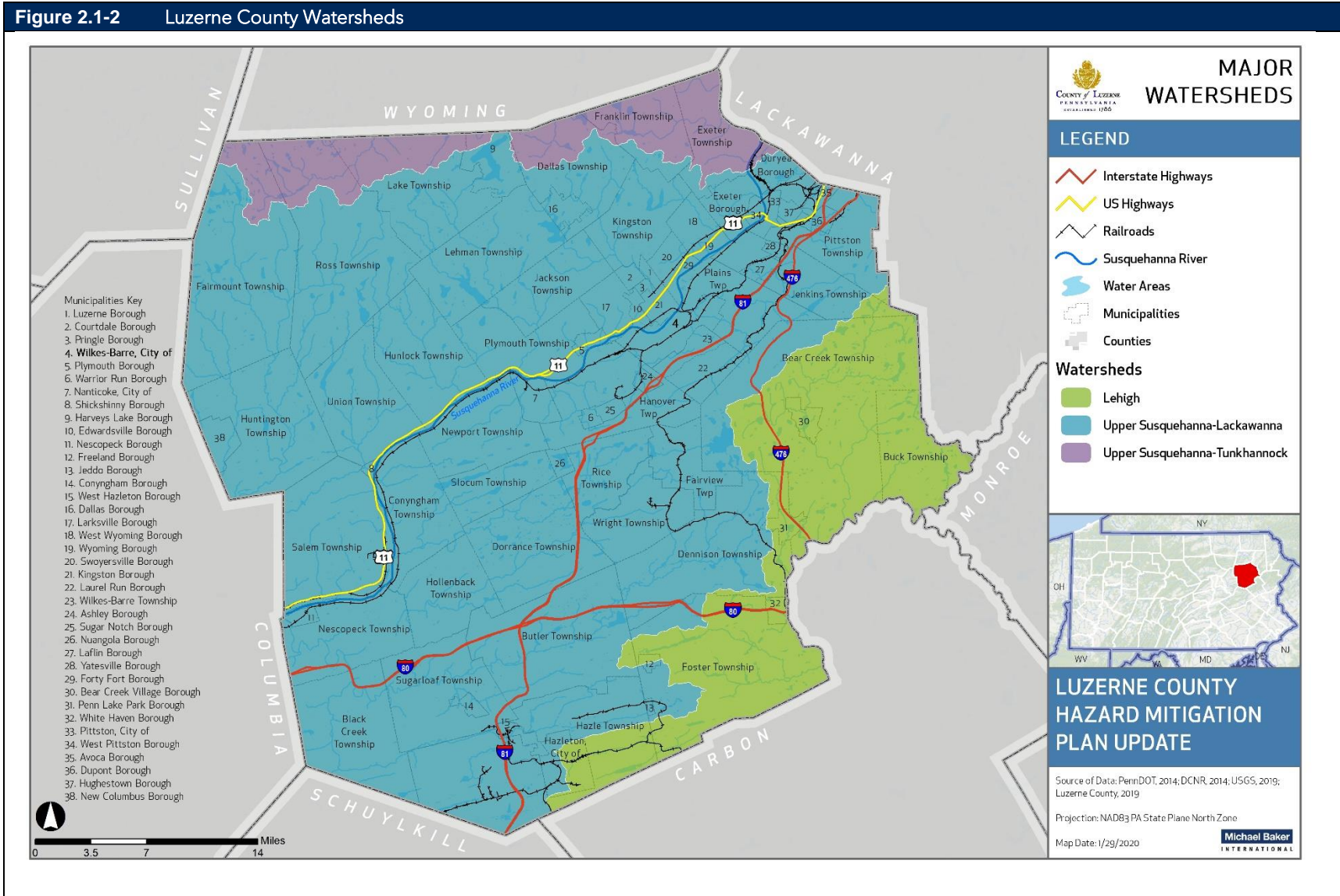


Figure 2.1-2 Luzerne County Watersheds



**2.2. Community Facts**

Luzerne County was formed on September 25, 1786 from part of Northumberland County and named for the Chevalier de la Luzerne, French minister to the United States. Wilkes-Barre, the county seat, was laid out in 1772 and named for two members of the English Parliament, John Wilkes and Isaac Barré, both advocates of American rights. It was incorporated as a borough on March 17, 1806 and as a city on May 4, 1871. There are eleven public school districts throughout the County: Crestwood, Dallas, Greater Nanticoke Area, Hanover Area, Hazleton Area, Lake-Lehman, Northwest Area, Pittston Area, Wilkes-Barre Area, Wyoming Area School District, and Wyoming Valley West School Districts. The County is also home to eight colleges and universities: King’s College Pennsylvania, Lackawanna College, Luzerne County Community College, McCann School of Business & Technology, Misericordia University, Penn State Hazleton, Penn State Wilkes-Barre, and Wilkes University.

**2.3. Population and Demographics**

The demographics of a community - population, labor force, employment, and housing reflect how a community has evolved in the past and has a direct bearing on how and where a community wants to develop in the future. The past population trends and projections as well as the employment characteristics help us to better understand the socio-economic characteristics that have and will continue to shape the future of this county. Some of Luzerne County’s demographic characteristics have been examined to provide an insight on how the community has changed over the last 40-45 years.

According to the U.S. Census, the population of Luzerne County in 2017 estimated at 318,222. The following table provides a distribution of County population by municipality obtained from the U.S. Census Bureau’s American Community Survey (ACS). As shown in the table below, the population decreased by 0.3% between 2010 and 2017. Five municipalities had decreases greater than 18%; Dennison Township, Hunlock Township, Nuangola Borough, Penn Lake Park Borough, and Shickshinny Borough. Six municipalities had population increases greater than 18%; Bear Creek Village Borough, Buck Township, Conyngham Township, Hollenback Township, Jeddo Borough, and Laurel Run Borough. Jeddo Borough had a 139% population increase from 108 to 259 people however the Department of Planning and Zoning feels this estimate is inaccurate and too high based on the number of residential structures in Jeddo Borough. Note that prior to the completion of this HMP update 2018 American Community Survey 5-year population estimate data was made available by the U.S. Census but was not incorporated. A comparison showed little change in the overall population estimates with a total of 318,222 in 2017 and 317,884 in 2018. 2020 10-yr census data will be available and applied to the 2025 HMP update.

**Table 2.3-1** Population in Luzerne County by municipality (U.S. Census Bureau, 2017)

MUNICIPALITY	2010 POPULATION	2017 POPULATION	PERCENT CHANGE (%)
Ashley Borough	2,792	2,737	-2.0%
Avoca Borough	2,677	2,636	-1.5%
Bear Creek Township	2,726	2,753	1.0%
Bear Creek Village Borough	258	308	19.4%
Black Creek Township	1,947	1,837	-5.6%
Buck Township	302	368	21.9%
Butler Township	8,806	9,580	8.8%
Conyngam Borough	1,811	1,881	3.9%
Conyngam Township	1,325	1,563	18.0%
Courtdale Borough	741	617	-16.7%
Dallas Borough	2,765	2,779	0.5%
Dallas Township	8,808	9,201	4.5%
Dennison Township	1,225	1,005	-18.0%
Dorrance Township	1,961	2,085	6.3%
Dupont Borough	2,704	2,682	-0.8%
Duryea Borough	4,844	4,886	0.9%
Edwardsville Borough	4,801	4,734	-1.4%
Exeter Borough	5,686	5,614	-1.3%
Exeter Township	2,231	2,170	-2.7%
Fairmount Township	1,356	1,337	-1.4%
Fairview Township	4,412	4,470	1.3%
Forty Fort Borough	4,255	4,144	-2.6%
Foster Township	3,423	3,433	0.3%
Franklin Township	1,847	1,767	-4.3%
Freeland Borough	3,535	3,478	-1.6%
Hanover Township	11,105	10,938	-1.5%
Harveys Lake Borough	2,769	2,781	0.4%
Hazle Township	9,380	9,549	1.8%
Hazleton City	24,877	24,882	0.0%
Hollenback Township	1,031	1,307	26.8%
Hughestown Borough	1,330	1,525	14.7%
Hunlock Township	2,860	2,261	-20.9%

**Table 2.3-1** Population in Luzerne County by municipality (U.S. Census Bureau, 2017)

MUNICIPALITY	2010 POPULATION	2017 POPULATION	PERCENT CHANGE (%)
Huntington Township	2,086	2,083	-0.1%
Jackson Township	4,581	4,637	1.2%
Jeddo Borough	108	259	139.8%
Jenkins Township	4,447	4,458	0.2%
Kingston Borough	13,244	12,959	-2.2%
Kingston Township	6,999	6,944	-0.8%
Laflin Borough	1,530	1,542	0.8%
Lake Township	2,052	2,357	14.9%
Larksville Borough	4,516	4,414	-2.3%
Laurel Run Borough	491	582	18.5%
Lehman Township	3,472	3,481	0.3%
Luzerne Borough	2,853	2,822	-1.1%
Nanticoke City	10,492	10,296	-1.9%
Nescopeck Borough	1,665	1,532	-8.0%
Nescopeck Township	1,120	1,225	9.4%
New Columbus Borough	225	212	-5.8%
Newport Township	5,287	5,378	1.7%
Nuangola Borough	994	812	-18.3%
Penn Lake Park Borough	339	278	-18.0%
Pittston City	7,774	7,682	-1.2%
Pittston Township	3,364	3,379	0.4%
Plains Township	10,066	9,817	-2.5%
Plymouth Borough	6,012	5,863	-2.5%
Plymouth Township	1,738	1,701	-2.1%
Pringle Borough	938	953	1.6%
Rice Township	3,158	3,502	10.9%
Ross Township	2,886	2,912	0.9%
Salem Township	4,208	4,224	0.4%
Shickshinny Borough	868	708	-18.4%
Slocum Township	925	1,030	11.4%
Sugarloaf Township	4,049	4,072	0.6%
Sugar Notch Borough	1,089	905	-16.9%

**Table 2.3-1** Population in Luzerne County by municipality (U.S. Census Bureau, 2017)

MUNICIPALITY	2010 POPULATION	2017 POPULATION	PERCENT CHANGE (%)
Swoyersville Borough	5,061	4,982	-1.6%
Union Township	2,179	1,992	-8.6%
Warrior Run Borough	642	616	-4.0%
West Hazleton Borough	4,410	4,523	2.6%
West Pittston Borough	4,886	4,783	-2.1%
West Wyoming Borough	2,735	2,688	-1.7%
White Haven Borough	1,049	1,227	17.0%
Wilkes-Barre City	41,595	40,887	-1.7%
Wilkes-Barre Township	3,004	2,915	-3.0%
Wright Township	5,617	5,625	0.1%
Wyoming Borough	3,082	3,029	-1.7%
Yatesville Borough	694	628	-9.5%
<b>TOTAL</b>	<b>319,120</b>	<b>318,222</b>	<b>-0.3%</b>

The population of Luzerne County is concentrated around the Susquehanna River and the surrounding municipalities. There are also greater concentrations around each of the four cities in Luzerne County. Luzerne County has historically experienced varying increases and decreases of persons per decade since 1920. The greatest increase was 54,000 people from 1920 to 1930. The greatest population decreased was 49,000 people from 1950 to 1960. The Luzerne County Department of Planning and Zoning has projected potential population increases and decreases in the upcoming decades, depending on different study regions.

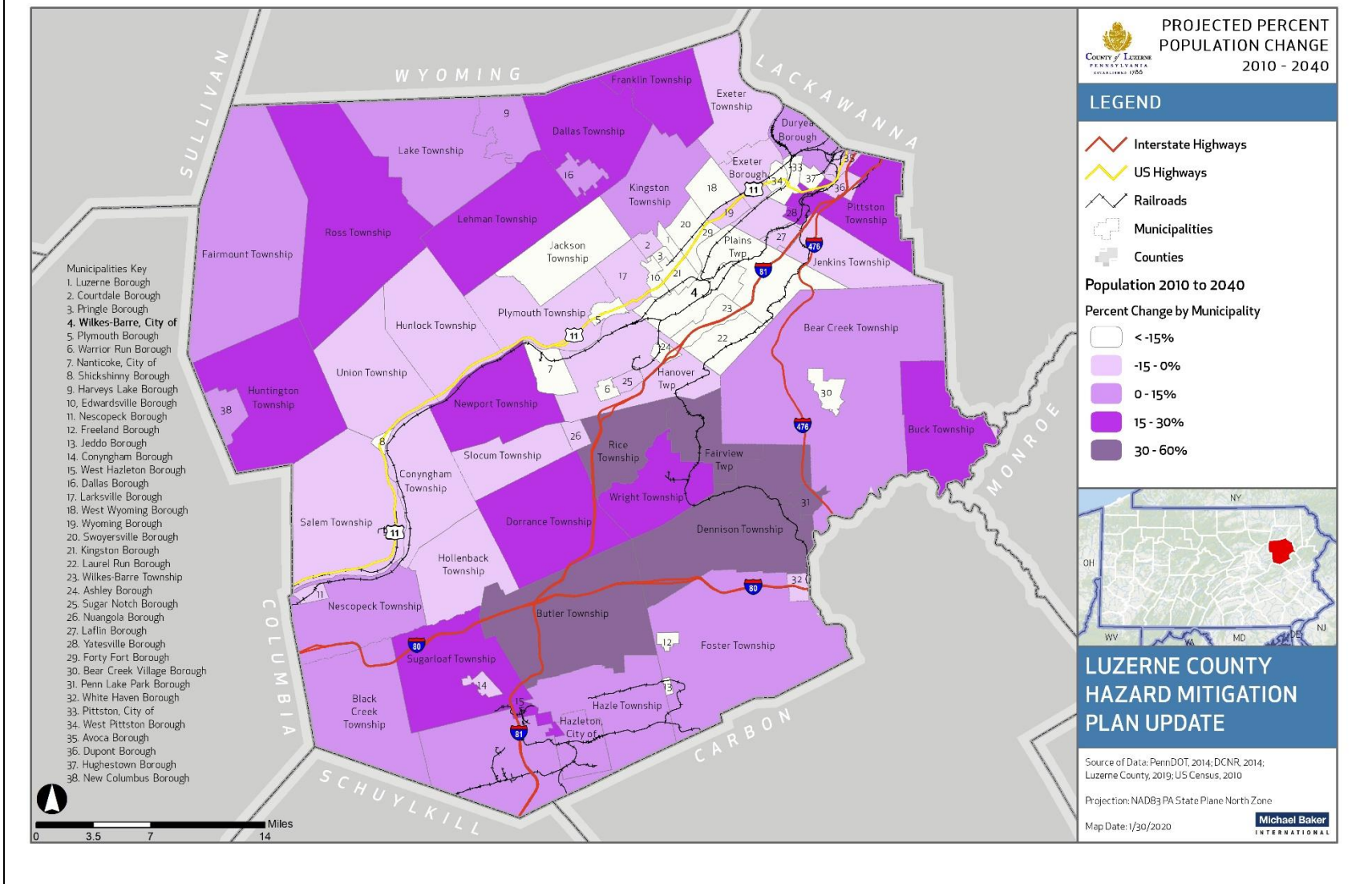
The median income of households in Luzerne County is \$49,290. This is approximately \$8,300 less than the national median household income and \$10,155 less than the median household income in Pennsylvania. However just over 11% of the Luzerne County population lives in poverty compared to 12.2% of Pennsylvania’s population. In Luzerne County 26.1% of children under 18 are below the poverty line, compared with 8.5% of people 65 years or older. The median age of the County population is 43 years with 19.5% of the population under 18 years of age and 19.1% of the population aged 65 years or older. Approximately 77.5% of housing units in the County are single-unit structures, 19.5% are multi-unit structures, and 3.0% are mobile homes. The median monthly housing costs are \$1,221 for mortgaged homeowners and \$486 for non-mortgaged owners and the median rent is \$742 per month whereas Pennsylvania averages \$1,474 and \$915 respectively. The majority, 89.2%, of the County population is White compared to 81.6% across Pennsylvania. In Luzerne County, 4.3% of the

population is African American, 10.1% is Hispanic, and 1.2% is Asian. The top five reported ancestries are: Polish, Irish, Italian, German, and English.

Figure 2.3-1 shows the projected population change in Luzerne County from 2010 to 2040. The greatest population change is expected to be seen in the Southern portion of the county in Butler Township, Dennison Township, Fairview Township, Penn Lake Park Borough, and Rice Township. Projections show that these municipalities could see population increases from 30-60%. Note that in the last decade Dennison Township has seen a significant decrease in population, contrary to the 30-year U.S. Census projections while Hollenback Township has seen a population increase of more than 25% over the last 10 years with 30-year projections showing a 15% decrease. The lowest population increases are expected to be seen in already populated areas of the County, like Plains Township and the City of Wilkes-Barre.



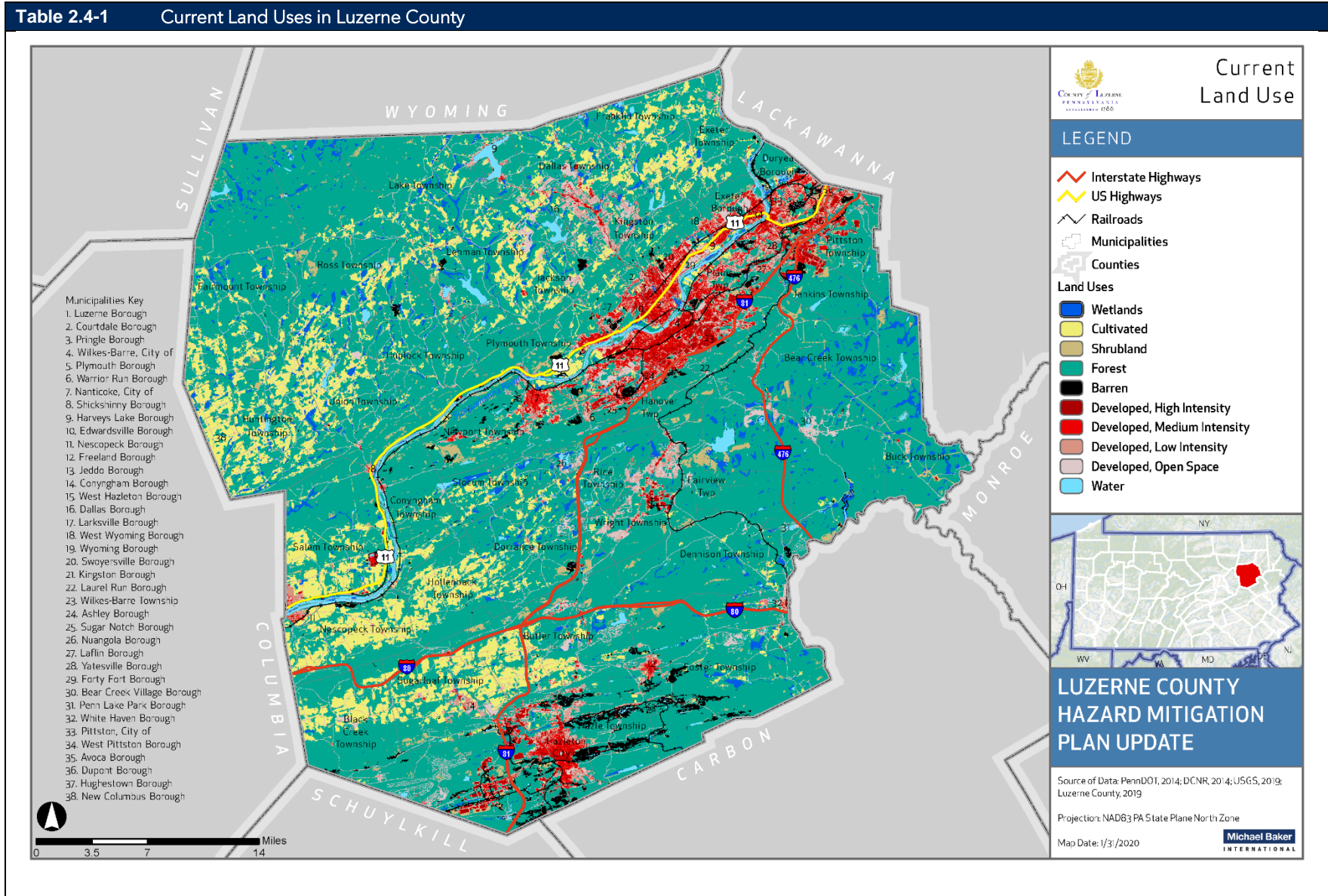
Figure 2.3-1 Projected Population Change in Luzerne County from 2010 to 2040



## **2.4. *Land Use and Development***

Land use in the County is classified as barren, cultivated, developed, forested, shrubland, wetlands, and water. The majority of land in Luzerne County is forested. Most development is concentrated along the Susquehanna River, which runs southwest through the County, entering near the City of Pittston. Figure 2.4-1 illustrates the existing general land use in the County.

Table 2.4-1 Current Land Uses in Luzerne County



The Lackawanna-Luzerne Regional Plan lays out a Land Use Plan to guide development and redevelopment in the bi-county region through the year 2035. This plan is based on the projection of moderate growth in population by about 35,000 people and a net gain of 24,000 housing units. These projections are for both Lackawanna and Luzerne Counties, so these predictions are less when only considering Luzerne County. The Land Use Plan identifies priority, infill, and conservation areas for future County development. Priority Areas are targeted for growth and revitalization, Infill Areas are to be used for additional growth, and Conservation Areas are for agricultural, recreation, and open space uses. The goal of creating these targeted growth areas is to support existing centers, minimize sprawl, and promote the conservation of natural resources. The plan identified Priority Areas as city centers (The Cities of Hazleton and Wilkes-Barre), select Borough and Township Centers, and Transit Villages (Shavertown Station in Kingston Township). Infill Areas are identified as mixed and low-density areas surrounding Priority Areas. These are generally located in the valleys of the Susquehanna River. Conservation Areas are identified as public parks and conserved lands, game lands, 2004 Open Space Plan Conservation Areas, and additional agricultural and wooded areas where development is generally discouraged. This plan identifies low, medium, and high priority areas for open space conservation. Additionally, four conservation areas are proposed for the bi-county region. These have been classified as highlands, natural areas, agrarian lands, or greenways. In Luzerne County, the plan proposes a total of over 253,000 new acres of conservation areas. In addition to the 99,000 existing acres, this would leave the county with over 353,000 acres of conservation areas.



The Land Use Plan described above recommends using specific land uses in each of the three growth areas. Commercial uses are to be primarily concentrated in Priority Areas, like those in cities and in more populated municipalities. The plan strongly discourages expanding

businesses, especially commercial office parks, into undeveloped areas. Industrial development is planned to follow a similar course, being focused to occur near existing industrial parks. Improved public transportation will help to connect commercially and industrially developed areas in the future. A housing plan is detailed in conjunction with the Regional plan. This plan creates similar priority and infill housing areas. The goals of this plan are to maintain existing neighborhood characters, reduce urban vacancy rates, and to continue to conserve open space from development. Priority housing areas identify specific Cities, Boroughs, and Townships in Luzerne County that should be used for residential development. This plan aims to move towards higher density residential areas to create more sustainability in the region.

An additional discussion of future land development and how it interacts with hazards is provided in Section 4.4.4.

**2.5. Data Sources and Limitations**

Gathering and analyzing new data about natural hazards and the community was critical to the process of updating the plan. The Luzerne County GIS/Mapping Department provided the following spatial data sources used in the plan:

- Selected critical facilities, including schools, day cares, nursing homes, and hazardous material locations (SARA Title III facilities)
- Structures
- Parcels
- Transportation routes, including streets and active railways
- Zoning

Luzerne County’s Effective Flood Insurance Rate Map (FIRM) (issued on November 2, 2012) was downloaded in September 2019 from FEMA’s Flood Map Service Center. This data provides flood frequency and elevation information used in the flood hazard risk assessment. Additional base map data was provided by PA Game Commission, PA DCNR, and PennDOT. Also, population data from the 2010 Census and 2017 estimated populations were obtained from the U.S. Census Bureau (2017). Additional information used to complete the risk assessment for this plan was taken from various government agency and non-government agency sources. Those

**Luzerne County considers sixteen types of facilities critical; or essential to the health and welfare of the community:**

- \* Airports
- \* Bridges
- \* Chemical Facilities
- \* Communication Facilities
- \* Dams
- \* Day Cares
- \* Emergency Operation Center
- \* Fire Stations
- \* Hospitals
- \* Mohegan Sun Arena
- \* Nuclear Power Plants
- \* Personal Care and Nursing Homes
- \* Pipelines
- \* Police Stations
- \* Schools
- \* Water Facilities
- \* Wyoming Valley Flood Risk Management System

sources are cited where appropriate throughout the plan and on each map with full references listed in **Appendix A – Bibliography**.

In order to assess the vulnerability of different jurisdictions to the hazards, hazard data from the National Centers for Environmental Information (NCEI) database was utilized. NCEI is a division of the US Department of Commerce’s National Oceanic and Atmospheric Administration (NOAA). Information on hazard events is compiled by NCEI from data gathered by the National Weather Service (NWS), another division of NOAA. NCEI then presents it on its website in various formats. The data used for this plan came from the U.S. Storm Events database, which “documents the occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce” (NOAA, 2019). The database currently contains hazard event data from January 1950 to May 2019. Other federal datasets came from USGS, the National Hurricane Center, and NOAA’s Storm Prediction Center. High Hazard Potential Dam (HHPD) data was collected from PA DEP and USACE’s National Dam Inventory (NDI) and incorporated into the Dam Failure profile (Appendix H). PA DEP provides information from Emergency Action Plans including risk and population vulnerability.

Hazus is a powerful risk assessment methodology for analyzing potential losses from floods, hurricane winds, and earthquakes. In Hazus, current scientific and engineering knowledge is coupled with the latest GIS technology to produce estimates of hazard-related damage before or after a disaster occurs. Version 4.0 of this software was used to estimate losses for floods in Luzerne County. For more information about the methodology employed to prepare the Hazus model and estimate losses, see **Appendix F**.

This 2020 HMP Update evaluates the vulnerability of the County’s critical facilities. For the purposes of this plan, critical facilities are those entities that are essential to the health and welfare of the community. The list of critical facilities was developed in conjunction with the Luzerne County Emergency Management Agency, Luzerne County Planning Department, and Luzerne County GIS Department. Critical facilities have been identified in Luzerne County to include sixteen types of facilities essential to the health and welfare of the community. Table 2.5-1 summarizes the critical facilities in Luzerne County by type and data source. For a complete listing of critical facilities, please see **Appendix E**.

Several critical facility GIS datasets were obtained from the Department of Homeland Security’s (DHS) Homeland Infrastructure Foundation-Level Data (HIFLD) Open data portal, and FEMA’s Comprehensive Data Management System (CDMS). The HIFLD Open data portal aggregates data from hundreds of regional and local data providers to compile national datasets of essential assets and infrastructure. As of 2019, this data portal provided access to over 330 national geospatial data layers within the open public domain (DHS HIFLD, 2019). FEMA’s CDMS was used to gather geospatial data for the few types of critical facilities not available through the HIFLD Open Data portal. A component of FEMA’s Hazus software, the CDMS allows users to export the default geospatial data that Hazus uses to estimate potential

losses. This default geospatial data includes national data for essential facilities, high potential loss facilities, selected transportation and lifeline systems, agriculture, vehicles, and demographics. More information on the sources for the Hazus default data can be found at <https://www.fema.gov/summary-databases-hazus-multi-hazard>.

TYPE	NUMBER IN COUNTY	DATA SOURCE
Airports	15	HIFLD
Bridges	915	PennDOT
Chemical Facilities	192	County
Communication Facilities	29	CDMS
Dams	109	PA DEP
Day Cares	138	County
Emergency Operation Center	1	HIFLD
Fire Stations	109	HIFLD
Hospitals	38	County
Mohegan Sun Arena	1	County
Nuclear Power Plants	1	CDMS
Personal Care Homes and Nursing Homes	45	County
Pipelines	2	EIA
Police Stations	55	HIFLD
Schools	101	County
Water Facilities	26	CDMS
Wyoming Valley Flood Risk Management System	1	County

### 3. Planning Process

#### 3.1. Update Process Summary

This Luzerne County HMP was originally developed in 2009 and then updated and adopted for implementation in 2014. The 2009 Plan, 2014 Plan, and this updated 2020 Luzerne County HMP represent the work of citizens, government officials, business leaders, and volunteers of non-profit organizations in developing a blueprint for protecting community assets, preserving the economic viability of the community, and saving lives. The current update to the 2014 HMP was initiated in April 2019. Michael Baker International assisted the County and its municipalities throughout the update process. The Luzerne County 2020 HMP Update was completed in June 2020.

The 2020 HMP follows the Pennsylvania Hazard Mitigation Model Plan Outline developed by PEMA in 2013 which provides a standardized format for all multi-jurisdictional HMPs in the Commonwealth of Pennsylvania. The Plan Update was led by the Hazard Mitigation Plan Steering Committee (HMPSC) and informed by the Hazard Mitigation Planning Team (HMPT). Community leaders and other agency and organizational stakeholders were invited by the Luzerne County Department of Planning & Zoning, and the Luzerne County Emergency Management Agency, to participate in the Plan Update process.

#### 3.2. The Planning Team

Members of the HMPSC are listed below in Table 3.2-1. The HMPSC met April 26, 2019 to discuss the plan update process including FEMA and PEMA requirements and guidance, a schedule for deliverables and meetings, participation and contacts for the HMPT, and currently available data and documentation to inform the 2020 update.

PARTICIPANT	TITLE
<b>Heath Eddy, AICP</b>	Executive Director, Luzerne County Department of Planning & Zoning
<b>Lucy Morgan</b>	Director, Luzerne County Emergency Management Agency
<b>Eddie O'Neill</b>	Division Head, Luzerne County Division of Operational Services
<b>Dan Reese</b>	Director, Luzerne County GIS/Mapping Department
<b>Chris Belleman</b>	Director, Luzerne County Flood Protection Authority

**The 2020 Luzerne County Hazard Mitigation Planning Team included:**

- **Municipal Officials**
- **Five Luzerne County Departments and Agencies**
- **Luzerne County Flood Protection Authority**
- **Luzerne County Conservation District**
- **Luzerne County Historical Society**
- **Susquehanna River Basin Commission**
- **Lackawanna-County Regional Planning Commission**



The HMPT was organized by the County, with assistance from consultant Mitigation Planner, to plan meetings, collect information, and conduct outreach. The HMPT included municipal officials, Luzerne County government representatives, non-profit organizations, and other stakeholders such as regional police departments and regional government councils. Adjacent county representatives from all seven neighboring counties (Carbon, Columbia, Lackawanna, Monroe, Schuylkill, Sullivan, and Wyoming) were invited to participate. Lackawanna County attended meetings and provided documentation. Other stakeholders that were part of the HMPT are listed at the end of Table 3.2-2 below. Stakeholder and other participation documentation is provided in **Appendix C - Meeting and Other Participation Documentation**.

Stakeholders participated by attending meetings and submitting valuable input and feedback to inform the planning process in form of completed surveys, questionnaires or verbal comment. Letters, email, and telephone, along with the project website, were utilized to coordinate and communicate with the HMPT. A brief description of each meeting that was held is provided in Section 3.3. In addition, detailed meeting minutes describing events of each meeting are available in **Appendix C - Meeting and Other Participation Documentation**.

Sixty-seven of 76 municipalities participated the hazard mitigation planning process. Those highlighted in gray in the following table did not participate. The participants listed in Table 3.2-2 served on the 2020 countywide HMPT and actively participated in the planning process.

<b>MUNICIPALITY/ORGANIZATION</b>	<b>PARTICIPANT(S)</b>
Ashley Borough	
Avoca Borough	Paul Pasonick
Bear Creek Township	Paula Weihbrecht
Bear Creek Village Borough	Charles Katcavage, Walter Mitchell
Black Creek Township	Steven Motil
Buck Township	Bonnie Weed
Butler Township	Jennifer Pecora
Conyngham Borough	Allison Stark Yourechko, Charles Pedri
Conyngham Township	Sandy Walp
Courtdale Borough	Jill Dietrick
Dallas Borough	Tracey Carr, Harry Vivian, Martin Barry
Dallas Township	Martin Barry, Carl Alber, Alan Pugh
Dennison Township	Chris Zweibel
Dorrance Township	Gary Zane
Dupont Borough	Daniel Lello
Duryea Borough	Keith Moss, Tim Holden
Edwardsville Borough	Cathy Soprano, David Saraka, Tim Holden
Exeter Borough	John Morgan, Dominic Pepe, Debra Serbin
Exeter Township	Dan Fetch
Fairmount Township	David Keller, Lyle Harvey
Fairview Township	John Doddo, David Yefko
Forty Fort Borough	Jim Brozena
Foster Township	Tom Barna

<b>Table 3.2-2 Hazard Mitigation Planning Process Participation</b>	
<b>MUNICIPALITY/ORGANIZATION</b>	<b>PARTICIPANT(S)</b>
Franklin Township	Richard "Rick" Melvin
Freeland Borough	
Hanover Township	Mike Mazur
Harvey's Lake Borough	Maureen Oremus
Hazle Township	Frances Calarco, Scott Kostician
Hazleton City	Alan Wufsus, Charles Pedri
Hollenback Township	
Hughestown Borough	Wayne Quick Jr., Gerald Lynch, Tim Holden
Hunlock Township	Richard Davis, Eugene Lucas, Stephen Pall, Kimberly Piestrak
Huntington Township	Karen Hilley
Jackson Township	Joe Stager
Jeddo Borough	Dawn Kaschak
Jenkins Township	Tim Holden
Kingston Borough	Thomas McTague
Kingston Township	Bill Eck
Lafin Borough	Charles Boyd
Lake Township	J Carlene Price
Larksville Borough	
Laurel Run Borough	
Lehman Township	James Welby
Luzerne Borough	James Keller
City of Nanticoke	
Nescopeck Borough	Paul Nye, Bill Smith
Nescopeck Township	Jim Brozena
New Columbus Borough	
Newport Township	Joe Hillan, Jason Kowalski, Peter Wanchisen, Tim Holden
Nuangola Borough	Jim Stook
Penn Lake Park Borough	Chris Zweibel
Pittston City	John Ankenbrand
Pittston Township	Tim Holden
Plains Township	Charles Krommes
Plymouth Borough	Holly Speece
Plymouth Township	Curt Dzugan
Pringle Borough	
Rice Township	Jeffrey Beck
Ross Township	Miralie Cappucci
Salem Township	Tim Beller
Shickshinny Borough	Jim Brozena
Slocum Township	Charles Herring
Sugar Notch Borough	
Sugarloaf Township	Joe DiSabella, Thomas Mundie
Swoyersville Borough	Tim Holden
Union Township	Anita Swank
Warrior Run Borough	Paul Pasonick, Tom D. Shypulefski
West Hazleton Borough	Charles Pedri, Scott Herring
West Pittston Borough	Alan Brezinski, James Brozena, Jim Butera, Ellen Quinn
West Wyoming Borough	Tim Holden
White Haven Borough	Chris Zweibel

<b>MUNICIPALITY/ORGANIZATION</b>	<b>PARTICIPANT(S)</b>
Wilkes-Barre City	Jay Delaney, William Harris
Wilkes-Barre Township	John Jablowski, Ron Smith, Mary Waskevich, Tim Holden
Wright Township	Stanley Gutkowski III, Pamela Heard, Don Zampetti
Wyoming Borough	Mary Sabol, Dan Zavada, Tim Holden
Yatesville Borough	Lorraine Rodegheiero
Luzerne County GIS/Mapping	Rachael Grube
Luzerne County Historical Society	Aimee Newell
Luzerne Conservation District	Josh Longmore
Lackawanna County Regional Planning Commission	Mary Liz Donato
Susquehanna River Basin Commission	Ben Pratt

### **3.3. Meetings and Documentation**

The following meetings were held during the plan update process. Invitations, agendas, sign-in sheets, and minutes for these meetings are included in **Appendix C**.

**April 26, 2019 – Steering Committee Kick-Off Meeting** was attended by County representatives and the consultant to go over the planning process and major milestones including the schedule for HMPT meetings and anticipated HMP submission dates. The group also discussed planning requirements, relevant stakeholders, and the availability of geospatial data and other plans and documentation for integration.

**June 6, 2019 – Planning Team Kick-Off Meeting** held at the Luzerne County Emergency Management Agency to discuss project scope, schedule, goals, the planning process, participation and engagement, and next steps. Hazards from the 2014 plan were reviewed with the HMPT at the kick-off. Afternoon and evening sessions were offered to maximize opportunities for participation. During these meetings, county staff, municipal representatives, and interested stakeholders provided vital information on changes in hazard risk and local capabilities to mitigate those risks since the last HMP update. Municipal attendees completed an “Evaluation of Hazards and Risk Form” to identify their jurisdictional risk to each hazard. Capability Assessment Surveys were also completed by municipal attendees.

**August 7, 2019 – Steering Committee Review Meeting** was attended by County representatives and the consultant to discuss new hazards being profiled, municipal participation to date and to conduct a comprehensive review of Mitigation Strategy Goals and Objectives.

**October 21, 2019 – Risk Assessment and Mitigation Solutions Workshop** held at the Luzerne County Emergency Management Agency to discuss Luzerne County’s hazard vulnerability and new hazards to be profiled in the 2020 HMP. Morning, afternoon and evening sessions were offered to provide additional opportunity for participation. Participants discussed progress of

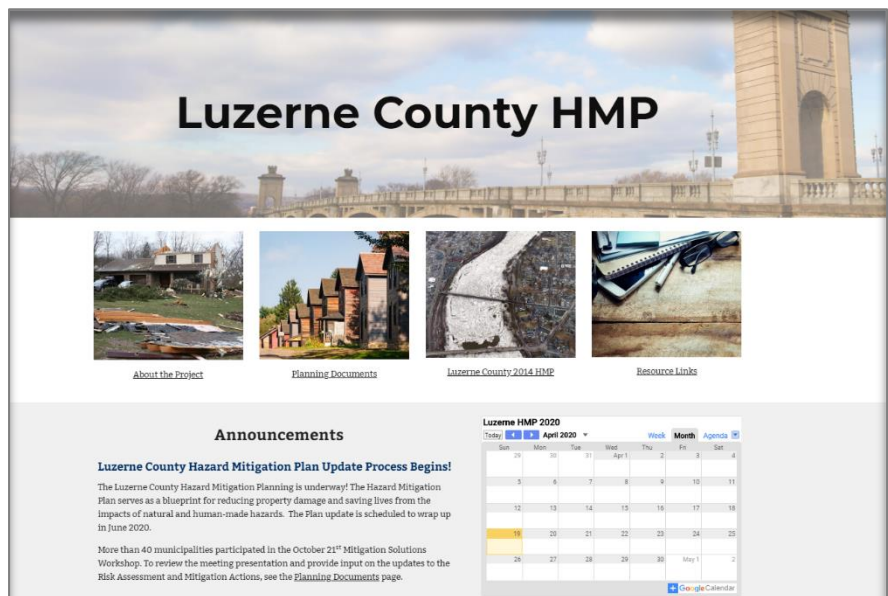
mitigation actions from the 2014 Plan Update and identified additional mitigation actions that would help reduce or eliminate potential losses

**January 22, 2020 - Steering Committee Review Meeting** was attended by County representatives to discuss the finalization of critical facilities data and a review of mitigation actions and mitigation progress.

**April 22, 2020 - Draft Plan Review Meeting** held via webinar due to mandated government requirements related to the Covid-19 response. The purpose of this final HMPT meeting was to provide information about the update process, evaluation, and general findings in the Luzerne County HMP. Additionally, instructions about when and how to review the Draft HMP were covered as well as a final timeline for the review and submission of the HMP to PEMA and FEMA. Morning and evening webinars were offered and attended.

**May 1, 2020 - Virtual Open House** was posted to the project website on May 1, 2020 so the public could obtain information about the Draft HMP, review the HMP and ask questions or provide comments and feedback. The availability of planning materials and Draft HMP review were advertised in the *Times Leader*. Additionally, notice was posted to the Luzerne County website and Facebook page. The Virtual Open House included a pre-recorded video presentation about the

HMP, a citizen's questionnaire, and question/comment form were also made available. The HMPT utilized a variety of online tools and methods in order to provide ample opportunity for public participation and awareness of the HMP to accommodate public safety recommendations and government mandates related to the Covid-19 response.



**May 21, 2020 - Planning and Participation Webinar** was scheduled specifically for municipalities that had not yet been able to participate in the planning process. Each non-participating municipality was sent an email invitation to this meeting and also invited via telephone/voicemail. The meeting was intended to provide an overview of the HMP, review 2015 mitigation actions and develop new mitigation actions if applicable.

In order to obtain information from municipalities and other stakeholders, forms and surveys were distributed and collected throughout the planning process. Some forms were completed

during planning meetings while others were sent via email and mail and were posted to the plan website (image below), [www.pennsylvaniiahmp.com/luzerne-county-hmp](http://www.pennsylvaniiahmp.com/luzerne-county-hmp), for download. Forms and questionnaires were completed and returned in between scheduled meetings. Sign-in sheets, meeting agendas, and presentations for HMPT meetings are provided in **Appendix C – Meeting and Other Participation Documentation** along with completed forms and surveys.

### **3.4. Public & Stakeholder Participation**

Each municipality was given multiple opportunities to participate in the plan update process through invitation to above outlined meetings, review of risk assessment results and mitigation actions, and an opportunity to comment on a final draft of the 2020 Hazard Mitigation Plan Update. The tools listed below were distributed with meeting invitations, at meetings, and on the plan update website to solicit information, data, and comments from both local municipalities and other key stakeholders in Luzerne County. Responses to these worksheets and surveys are included in **Appendix C: Meeting and Other Participation Documentation**.

- **Capability Assessment Survey:** Collects information on local planning, regulatory, administrative, technical, fiscal, political, and resiliency capabilities that can be included in the plan’s Capability Assessment section.
- **Evaluation of Hazards and Risk Form:** Collects information from the HMPT regarding whether there have been changes to the frequency of occurrence, magnitude of impact, or geographic extent of hazards identified in the 2014 plan. In addition, the form asks members of the HMPT to select any additional hazards they believe should be considered for inclusion in the 2020 plan.
- **Mitigation Progress Report:** This form was specific to each jurisdiction and included all actions for that jurisdiction in the 2015 HMP with space to provide the current status of each action and document any progress made.
- **New Mitigation Action Form:** This form was provided to communities that wanted to include a new action in the HMP. The purpose was to collect details about the action, including priority, responsible parties, potential partners, potential funding sources, implementation timeframe, and more.

Public and stakeholder participation and comment was encouraged throughout the planning process, particularly through the project website, [www.pennsylvaniiahmp.com/luzerne-county-hmp](http://www.pennsylvaniiahmp.com/luzerne-county-hmp). This site was created and made publicly available at the very beginning of the planning process and acted as a repository for the entire planning process and housed presentations, agendas, minutes, and worksheets from each meeting as well as promulgating meeting dates, times, and important announcements. The website hosted a Community Mitigation Survey which gathered information about how the public preferred to receive information about risk and hazards as well as data about financial risk protection and interest in continuing education. The site was made publicly available and linked to the County’s website. Since the site was published in April 2019, it has received a total of 288 pageviews.

Luzerne County posted the 2020 Draft Hazard Mitigation Plan Update on the plan update website ([www.pennsylvaniahmp.com/luzerne-county-hmp](http://www.pennsylvaniahmp.com/luzerne-county-hmp)) for review and comment on May 1, 2020. In addition, an invitation to the public to review and comment on the draft plan was posted on the home page of the project website, in the local newspaper, and on the County's website. Comments were to be submitted via the online comment form or in writing to Heath Eddy of the Luzerne County Department of Planning and Zoning and/or to Taryn Murray of Michael Baker International by mail or email.

One comment was received via the online comment form from a municipal official that suggested having a fillable form for annual reviews would be helpful. The HMPSC received 11 responses to the Community Hazard Mitigation Survey. Comments and survey responses received were used to inform the mitigation strategy and resulted in new mitigation actions.

### **3.5. Multi-Jurisdictional Planning**

This HMP was developed using a multi-jurisdictional approach. Though County level departments have resources such as technical expertise and data which local jurisdictions may lack; involvement from local municipalities is critical to the collection of local knowledge related to hazard events. Local municipalities also have the legal authority to enforce compliance with land use planning and development issues. The Steering Committee was committed to garnering municipal participation. Table 3.2-2 lists jurisdictional participation in the 2020 HMP. Sixty-nine of Luzerne County's 76 municipalities participated in the plan update, resulting in 89% participation across the County.

The Kick-off Meeting and Risk Assessment Summary/Mitigation Solutions Workshop were both held in-person with daytime and evening meeting sessions offered to maximize participation. The Draft Plan Review meeting was held virtually due to COVID-19 restrictions; morning and afternoon sessions were offered and attended. Each municipality was emailed and mailed invitations and reminders to all meetings. Surveys and forms were provided at meetings, posted to the project website, or emailed to jurisdictions (in advance of virtual meetings) with a link to online materials.

An interim webinar was scheduled specifically for communities that had not yet participated in the planning process and each municipality received email notice and phone calls. This webinar was not attended. Throughout the planning process one-on-one calls and email correspondence with municipal officials was crucial to gathering feedback and information related to local capabilities and mitigation progress in particular. This was especially important during the final weeks of the planning process when travel and gatherings were restricted during the pandemic.

## 4. Risk Assessment

### 4.1. Update Process Summary

To reduce the potential for damage due to hazards, it is necessary to identify hazards that may affect the County. This risk assessment provides a factual basis for activities proposed by the County in its mitigation strategy. Hazards that may affect Luzerne County are identified and defined in terms of location and geographic extent, magnitude of impact, previous events and

**Hazard profiles in the 2020 HMP include the following Natural and Human-Made Hazards:**

- Drought
- Earthquake
- Flood, Flash Flood, Ice Jam
- Hailstorm
- Hurricane, Tropical Storm, Nor'easter
- Landslide
- Pandemic
- Radon Exposure
- Subsidence, Sinkhole
- Tornado and Windstorm
- Wildfire
- Winter Storm
- Cyber-Terrorism
- Dam Failure
- Hazardous Materials Release
- Levee Failure
- Nuclear Release

likelihood of future occurrence. All information from the previous plan has been included or updated in the 2020 Luzerne County HMP Update, unless otherwise indicated. The Luzerne County HMPT reviewed the hazards profiled in the 2014 Luzerne County HMP Update during the June 6, 2019 Kick-Off Meeting. The HMPT determined that all the existing hazards should be carried over into the 2020 plan update and decided that four additional hazards should be profiled in the 2020 plan update: Cyber-Terrorism, Hailstorms, Levee Failure, and Opioid Addiction. The Wind Events hazard profile has also been separated into two hazard profiles: Tornado, Windstorm, and Hurricane, Tropical Storm, Nor'easter. The hazards selected by the HMPT were then reviewed at the October 21, 2019 Risk Assessment and Mitigation Solutions Workshop. The municipalities completed an Evaluation of Hazards and Risk Form to indicate their jurisdictional risk to each hazard that would be profiled in the 2020 plan.

Hazard profiles were then developed in order to define the characteristics of each hazard as it applies to Luzerne County. This process was completed using published information and web sites that address hazards globally, nationally, within Pennsylvania, or specifically within Luzerne County as well as anecdotal information provided by members of the HMPT.

Following hazard identification and profiling, a vulnerability assessment was performed to identify the impact of natural hazard events on people, buildings, infrastructure, and the community. Each natural hazard is discussed in terms of its potential impact on individual communities in Luzerne County, including the types of parcels and critical facilities that may be at risk. The assessment allows the County and its municipalities to focus mitigation efforts on areas most likely to be damaged or most likely to require early response to a hazard event. A vulnerability analysis was performed which identifies structures, critical facilities, or people that may be impacted by hazard events and describes what those events can do to physical, social, and economic assets. Depending upon

data availability, assessment results consist of an inventory of vulnerable structures or populations.

## 4.2. Hazard Identification

### 4.2.1. Table of Presidential Disaster Declarations

In the past, natural hazards have led to costly disasters in Luzerne County resulting in a Presidential Declaration of Major Disaster or a Gubernatorial Proclamation of Extreme Emergency. Presidential Disaster and Emergency Declarations are issued when it has been determined that State and local governments need assistance in responding to a disaster event (Source 8). Table 4.2.1-1 identifies Presidential Disaster and Emergency Declarations issued between 1955 through 2019 that have affected Luzerne County. Additional declarations beyond March 2020 can be found on the FEMA website at: <https://www.fema.gov/disasters/grid/state-tribal-government/44>.

DECLARATION NUMBER	DATE	EVENT
4506	3/30/2020	Covid-19 Pandemic
3356	10/29/2012	Hurricane Sandy
4030	09/12/2011	Tropical Storm Lee
3340	09/08/2011	Emergency Declaration - Remnants of Tropical Storm Lee
4025	09/03/2011	Major Disaster Declaration - Hurricane Irene
3339	08/29/2011	Emergency Declaration - Hurricane Irene
1684	02/23/2007	Major Disaster Declaration - Severe storms and flooding
1649	06/30/2006	Major Disaster Declaration - Severe storms, flooding, and mudslides
3235	09/10/2005	Hurricane Katrina
1587	04/14/2005	Major Disaster Declaration - Severe storms and flooding
1555	09/19/2004	Major Disaster Declaration - Severe storms and flooding associated with Tropical Depression Frances
1557	09/19/2004	Tropical Depression Ivan
1093	01/21/1996	Major Disaster Declaration - Severe storms and flooding
1085	01/31/1996	Major Disaster Declaration - Blizzard of '96
1015	03/10/1994	Major Disaster Declaration - Severe winter storms
3105	03/16/1993	Emergency Declaration - Severe snowfall and winter storm
745	10/08/1985	Hurricane Gloria
3026	01/29/1977	Emergency Declaration - Snowstorms



**Table 4.2.1-1 Presidential Disaster and Emergency Declarations affecting Luzerne County.**

DECLARATION NUMBER	DATE	EVENT
523	10/20/1976	Major Disaster Declaration - Severe storms and flooding
485	09/26/1975	Major Disaster Declaration - Severe storms, heavy rains, and flooding
340	06/23/1972	Tropical Storm Agnes

In addition to these Presidentially declared events, 35 events warranted Gubernatorial Disaster Declarations or Proclamations. Table 4.2.1-2 lists Gubernatorial Disaster Declarations or Proclamations that have been issued for Luzerne County between 1955 and 2018.

**Table 4.2.1-2 Gubernatorial Disaster Declarations or Proclamations affecting Luzerne County.**

DATE	EVENT
March 6, 2020	Proclamation of Disaster Emergency - Coronavirus (COVID-19)
August, 2018	Proclamation of Disaster Emergency--Rapid, Heavy Rainfall Resulting in Flash Floods
March, 2018	Proclamation of Emergency-- Opioid Crisis, Severe Winter Storms
January, 2018	Proclamation of Disaster Emergency--Opioid Crisis
March, 2017	Proclamation of Emergency-- Severe Winter Storm
March, 2017	Proclamation of Emergency-- Severe Winter Storm
January, 2016	Proclamation of Emergency--Severe Winter Storm
August, 2015	Proclamation of Emergency-- Severe Storms
January, 2015	Proclamation of Emergency-- Severe Winter Storms
February, 2014	Proclamation of Disaster--Severe Winter Storm
February, 2014	Proclamation of Disaster--Severe Winter Storm
February, 2014	Proclamation of Disaster Emergency--Severe Winter Storm
January, 2014	Proclamation of Disaster Emergency--Extreme Weather, Utility Interruption
June, 2013	Proclamation of Emergency - High Winds, Thunderstorms, Heavy Rain, Tornado, Flooding
October, 2012	Proclamation of Emergency - Hurricane Sandy
April, 2012	Proclamation of Emergency - Spring Winter Storms
August 2011 (amended September 2011)	Proclamation of Emergency - Severe Storms and Flooding (Lee/Irene)
January, 2011	Proclamation of Emergency - Severe Winter Storm
February, 2010	Proclamation of Emergency - Severe Winter Storm
April, 2007	Severe Storm
February, 2007	Proclamation of Emergency - Severe Winter Storm
February, 2007	Proclamation of Emergency - Regulations
April, 2007	Proclamation of Emergency - Severe Winter Storm
September, 2006	Proclamation of Emergency - Tropical Depression Ernesto
September, 2005	Proclamation of Emergency - Hurricane Katrina

**Table 4.2.1-2** Gubernatorial Disaster Declarations or Proclamations affecting Luzerne County.

<b>DATE</b>	<b>EVENT</b>
July, 1999	Drought
April, 1997	Snowstorm
September, 1995	Drought
November, 1980	Drought Emergency
January, 1978	Heavy Snow
February, 1978	Blizzard
February, 1974	Truckers Strike
February, 1972	Heavy Snow
January, 1966	Heavy Snow
August, 1962	Refuse Bank Fire
September, 1955	Drought

Luzerne County has also received Small Business Administration (SBA) Assistance for a number of disaster events. A Small Business Administration Disaster Declaration qualifies communities for access to affordable, timely, and accessible financial assistance. The nine County events receiving Small Business Administration disaster-related loan assistance are listed below.

**Table 4.2.1-3** Small Business Administration Disaster Declarations affecting Luzerne County

<b>DATE</b>	<b>EVENT</b>
August, 2018	Flooding
July, 2018	Flooding
October, 2009	Fire
August, 2007	Hail
December, 2006	Severe Storms and Tornadoes
November, 2006	Severe Storms and Flooding
July, 1991	Drought
January, 1988	Fire
September, 1985	Flood

**4.2.2. Summary of Hazards**

The table below summarizes hazards identified in the 2014 Luzerne County HMP Update.

Table 4.2.2-1 Natural hazards identified in the Luzerne County 2014 Mitigation Plan Update.		
HAZARDS		
Flooding	Winter Weather	Wind Events
Drought and Crop Failure	Landslides	Wildfires
Nuclear Release	Earthquakes	Hazardous Material Release
Land Subsidence	Dam Failure	Radon

All hazards identified in 2014 plan were included in the 2020 HMP update. The hazards were reviewed by the HMPT at the June 6, 2019 Kick-Off Meeting. Each municipal attendee was provided with an *Evaluation of Hazards and Risk Form* and the PEMA Standard List of Hazards which is a comprehensive list of all hazards to be considered for evaluation in the 2020 plan.

Following review of this hazards list and completion of the *Evaluation of Hazards and Risk Form*, the HMPT determined that four new hazards would be included in the 2020 HMP Update: Cyber-Terrorism, Hailstorm, Levee Failure, and Opioid Addiction. Additionally, the consultant split the existing Wind Events category into two separate hazard profiles; Tornado, Windstorm, and Hurricane, Tropical Storm, Nor'easter. Table 4.2.2-2 contains a complete list of all potential hazards in Luzerne County identified through the risk assessments and planning meetings. Hazard profiles are included in Section 4.3 for each of these hazards.



Table 4.2.2-2 List and description of natural and manmade hazards profiled in the 2020 Hazard Mitigation Plan Update. (PA 2018 Standard Operating Guide)	
HAZARD	HAZARD DESCRIPTION
<b>NATURAL HAZARDS</b>	
 <p><b>Drought</b></p>	<p>Drought is defined as a deficiency of precipitation experienced over an extended period of time, usually a season or more. Droughts increase the risk of other hazards, like wildfires, flash floods, and landslides or debris flows. This hazard is of particular concern in Pennsylvania due to the prevalence of farms and other water-dependent industries, water-dependent recreation uses, and residents who depend on wells for drinking water. (National Drought Mitigation Center, 2018; Ready.gov 2018).</p>
 <p><b>Earthquake</b></p>	<p>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. (Ready.gov, 2018).</p>






Table 4.2.2-2 List and description of natural and manmade hazards profiled in the 2020 Hazard Mitigation Plan Update. (PA 2018 Standard Operating Guide)	
HAZARD	HAZARD DESCRIPTION
	<p>Flooding is the temporary condition of partial or complete inundation of normally dry land, and it is the most frequent and costly of all natural hazards in Pennsylvania (PEMA, 2018). 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. (FEMA, 2018). 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. (NESEC, 2018).</p>
	<p>Hailstorms occur when ice crystals form within a low-pressure front due to the rapid rise of warm air into the upper atmosphere and the subsequent cooling of the air mass. Frozen droplets gradually accumulate on the ice crystals until, having developed sufficient weight, they fall as precipitation in the form of balls or irregularly shaped masses of ice greater than 0.75 inches in diameter. Hailstorms can cause significant damage to homes, vehicles, livestock, and people. (FEMA, 2018; NOAA, 2018).</p>
	<p>Hurricanes, tropical storms, and nor'easters are classified as cyclones and are any closed circulation developing around a low-pressure center in which the winds rotate counterclockwise (in the Northern Hemisphere) and whose diameter averages 10-30 miles across. Potential threats from hurricanes include powerful winds, heavy rainfall, storm surges, coastal and inland flooding, rip currents, tornadoes, and landslides. The Atlantic hurricane season runs from June 1 to November 30. (NOAA, 2018; Ready.gov, 2018).</p>
	<p>In a landslide, masses of rock, earth or debris move down a slope. Landslides can be caused by a variety of factors, including earthquakes, storms, fire, and human modification of land. Areas that are prone to landslide hazards include previous landslide areas, areas on or at the base of slopes, areas in or at the base of drainage hollows, developed hillsides with leach field septic systems, and areas recently burned by forest or brush fires. (PA DCNR, 2018 and USGS, 2018).</p>
	<p>A pandemic is a global outbreak of disease that occurs when a new virus emerges in the human population, spreading easily in a sustained manner, and causing serious illness. An epidemic describes a smaller-scale infectious outbreak, within a region or population, that emerges at a disproportional rate. Infectious disease outbreaks may be widely dispersed geographically, impact large numbers of the population, and could arrive in waves lasting several months at a time. (FEMA, 2018).</p>







Table 4.2.2-2 List and description of natural and manmade hazards profiled in the 2020 Hazard Mitigation Plan Update. (PA 2018 Standard Operating Guide)	
HAZARD	HAZARD DESCRIPTION
	<p>Radon is a radioactive gas produced by the breakdown of uranium in soil and rock that can lead to lung cancer in people exposed over a long period of time. Most exposure comes from breathing in radon gas that enters homes and buildings through foundation cracks and other openings. According to the DEP, approximately 40% of Pennsylvania homes have elevated radon levels. (DEP, 2018 and American Cancer Society, 2018).</p>
	<p>Land subsidence is a gradual settling or sudden sinking of the ground surface due to the movement of subsurface materials. A sinkhole is a subsidence feature resulting from the sinking of surficial material into a pre-existing subsurface void. Subsidence and sinkholes are geologic hazards that can impact roadways and buildings and disrupt utility services. Subsidence and sinkholes are most common in areas underlain by limestone and can be exacerbated by human activities such as water, natural gas, and oil extraction. (USGS, 2018 and PA DCNR, 2018).</p>
	<p>A tornado is a narrow, violently rotating column of air that extends from the base of a thunderstorm to the ground. About 1,250 tornadoes hit the U.S. each year, with about 16 hitting Pennsylvania. Damaging winds exceeding 50-60 miles per hour can occur during tornadoes, severe thunderstorms, winter storms, or coastal storms. These winds can have severe impacts on buildings, pulling off the roof covering, roof deck, or wall siding and pushing or pulling off the windows. (FEMA, 2014 and NOAA, 2018).</p>
	<p>A wildfire is an unplanned fire that burns in a natural area. Wildfires can cause injuries or death and can ruin homes in their path. Wildfires can be caused by humans or lightning, and can happen anytime, though the risk increases in period of little rain. In Pennsylvania, 98% of wildfires are caused by people (Ready.gov, 2018 and PA DCNR, 2018).</p>
	<p>A winter storm is a storm in which the main types of precipitation are snow, sleet, or freezing rain. 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. Most deaths from winter storms are not directly related to the storm itself, but result from traffic accidents on icy roads, medical emergencies while shoveling snow, or hypothermia from prolonged exposure to cold. (NOAA, 2018).</p>
<b>HUMAN MADE HAZARDS</b>	
	<p>Cyber terrorism refers to acts of terrorism committed using computers, networks, and the Internet. The most widely cited definition comes from Denning's Testimony before the Special Oversight Panel on Terrorism: "Cyberterrorism...is generally understood to mean unlawful attacks and threats of attack against computers, networks, and the information stored therein when done to intimidate or coerce a government or its people in furtherance of political or social objectives. Further, to qualify as cyberterrorism, an attack should result in violence against persons or property, or at least cause enough harm to generate fear." (Denning, 2000).</p>

Table 4.2.2-2 List and description of natural and manmade hazards profiled in the 2020 Hazard Mitigation Plan Update. (PA 2018 Standard Operating Guide)	
HAZARD	HAZARD DESCRIPTION
 <p><b>Dam Failure</b></p>	<p>Dam failure is the uncontrolled release of water (and any associated wastes) from a dam. This hazard often results from a combination of natural and human causes, and can follow other hazards such as hurricanes, earthquakes, and landslides. The consequences of dam failures can include property and environmental damage and loss of life. (ASDSO, 2018).</p>
 <p><b>Hazardous Materials</b></p>	<p>Hazardous material releases can contaminate air, water, and soils and have the potential to cause injury or death. Dispersion can take place rapidly when transported by water and wind. While often accidental, releases can occur as a result of human carelessness, intentional acts, or natural hazards. When caused by natural hazards, these incidents are known as secondary events.</p>
 <p><b>Levee Failure</b></p>	<p>A levee is a human-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water to provide protection from temporary flooding (FEMA, 2016). A levee failure or breach occurs when a levee fails to prevent flooding on the landside of the levee. The consequences of a sudden levee failure can be catastrophic, with the resulting flooding causing loss of life, emergency evacuations, and significant property damage. (USACE, 2018).</p>
 <p><b>Nuclear Incidents</b></p>	<p>Nuclear explosions can cause significant damage and casualties from blast, heat, and radiation. The primary concern following a nuclear accident or nuclear attack is the extent of radiation, inhalation, and ingestion of radioactive isotopes which can cause acute health effects (e.g. death, burns, severe impairment), chronic health effects (e.g. cancer), and psychological effects. (EPA, 2018; Ready.gov, 2018).</p>
 <p><b>Opioid Addiction</b></p>	<p>Opioid addiction occurs when an individual becomes physically dependent on opioids, which include opiates and narcotics. Opioids are a synthetic substance found in certain prescription pain medications: morphine, codeine, methadone, oxycodone, hydrocodone, fentanyl, and hydromorphone, and street drugs like heroine. Opioids block the body's ability to feel pain and can create a sense of euphoria. Individuals often build a tolerance to opioid drugs, which leads them to take more of the medication than originally prescribed. (HHS, 2018).</p>

### 4.3. Hazard Profiles and Vulnerability Analysis

#### NATURAL HAZARDS

##### 4.3.1. Drought



##### 4.3.1.1. Location and Extent

Drought is defined as the consequence of a natural reduction in the amount of precipitation expected over an extended period, usually a season or more in length. Droughts are regional climatic events, so they typically impact all communities in a relatively uniform fashion with only minor localized variations in rainfall events. Droughts often occur across county boundaries, affecting large areas of Pennsylvania at the same time. Therefore, a drought would affect all of Luzerne County, with the largest impact being on areas of the County with extensive agriculture uses.

Locations of droughts nationwide are monitored continuously by USGS, and the PA DEP monitors conditions throughout the state. Maps showing locations currently experiencing drought conditions are posted on various websites (including <http://waterwatch.usgs.gov>) and show locations where stream flow is below normal and where drought conditions exist or are emerging. As this plan was being developed between June 2019 and April 2020, no locations in Pennsylvania were experiencing a drought.

##### 4.3.1.2. Range of Magnitude

Droughts can have varying effects, depending upon what month they occur, severity, duration and location. Some droughts have their greatest impact on agriculture and even short-term droughts, when coupled with extreme temperatures can be devastating. Others may impact water supply or other water use activities such as recreation. Most droughts cause direct impacts to aquatic resources. Drought events are defined by rainfall amounts, vegetation conditions, soil-moisture conditions, water levels in reservoirs, stream flow, agricultural productivity, or economic impacts.

The Palmer Drought Severity Index (PDSI) is used to describe abnormally wet to abnormally dry conditions. Zero represents normal rainfall and temperature conditions; drought condition indices are described in the table below.

INDEX	DESCRIPTION OF CONDITIONS
4.0 or more	Extremely moist
3.0 to 3.9	Very moist spell
2.0 to 2.9	Unusual Moist Spell
-1.9 to 1.9	Near normal
-2.0 to -2.9	Moderate drought
-3.0 to -3.9	Severe drought
-4.0 or less	Extreme drought

Data provided by Cornell University shows that drought conditions in the Pocono Mountains region of Pennsylvania have resulted in Palmer Drought Severity Index level as low as -5.47. This was during a drought that lasted for twenty-one months from 1964 - 1966. In the Luzerne County area, the average Palmer Drought Severity Index level for droughts is -3.9 and the average duration of a drought is 4 months (Cornell University, 2014).

Phases of drought preparedness in Pennsylvania in order of increasing severity are:

- Drought Watch: A period to alert government agencies, public water suppliers, water users, and the public regarding the potential for future drought-related problems. Drought Watches are invoked when three or more drought indicators are present for a county or group of counties. The focus is on increased monitoring, awareness, and preparation for response if conditions worsen. A request for voluntary water conservation is made. The objective of voluntary water conservation measures during a drought watch is to reduce water use by five percent in the affected areas. Due to varying conditions, individual water suppliers or municipalities may determine more stringent conservation actions.
- Drought Warning: This phase involves a coordinated response to imminent drought conditions and potential water supply shortages through concerted voluntary conservation measures to avoid or reduce shortages, relieve stressed sources, develop new sources, and if possible, forestall the need to impose mandatory water use restrictions. The objective of voluntary water conservation measures during a drought warning is to reduce overall water use by 10-15 percent in the affected areas. As with a Drought Watch, varying conditions may cause individual water suppliers or municipalities to determine more stringent conservation actions.
- Drought Emergency: This stage is a phase of concerted management operations to marshal all available resources to respond to actual emergency conditions, to avoid depletion of water sources, to assure at least minimum water supplies to protect public health and safety, to support essential and high priority water uses, and to avoid unnecessary economic dislocations. It is possible during this phase to impose mandatory restrictions on non-essential water uses that are provided in the Pennsylvania Code (Chapter 119), if deemed necessary and if ordered by the Governor of Pennsylvania. The objective of water use restrictions (mandatory or voluntary) and other conservation measures during this phase is to reduce consumptive water use in the affected area by fifteen percent, and to reduce total use to the extent necessary to preserve public water system supplies, to avoid or mitigate local or area shortages, and to assure equitable sharing of limited supplies.
- Local Water Rationing: Although not a drought phase, local municipalities may, with the approval of the PA Emergency Management Council, implement local water rationing to share a rapidly dwindling or severely depleted water supply in designated water supply service areas. These individual water rationing plans, authorized through provisions of the Pennsylvania 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 (Pennsylvania Code: Chapter 120, 2018).

Environmental impacts of drought include:

- Hydrologic effects - lower water levels in reservoirs, lakes, and ponds; reduced streamflow; loss of wetlands; estuarine impacts; groundwater depletion and land subsidence; effects on water quality such as increases in salt concentration and water temperature.
- Damage to animal species - lack of feed and drinking water; disease; loss of biodiversity; migration or concentration; and reduction and degradation of fish and wildlife habitat.
- Damage to plant communities - loss of biodiversity; loss of trees from urban landscapes and wooded conservation areas.
- Increased number and severity of fires.
- Reduced soil quality.
- Air quality effects - dust and pollutants.
- Loss of quality in landscape.
- Loss of water for navigation and recreation.
- Increase in nitrate levels which can have health impacts on pregnant women and children.

**4.3.1.3. Past Occurrence**

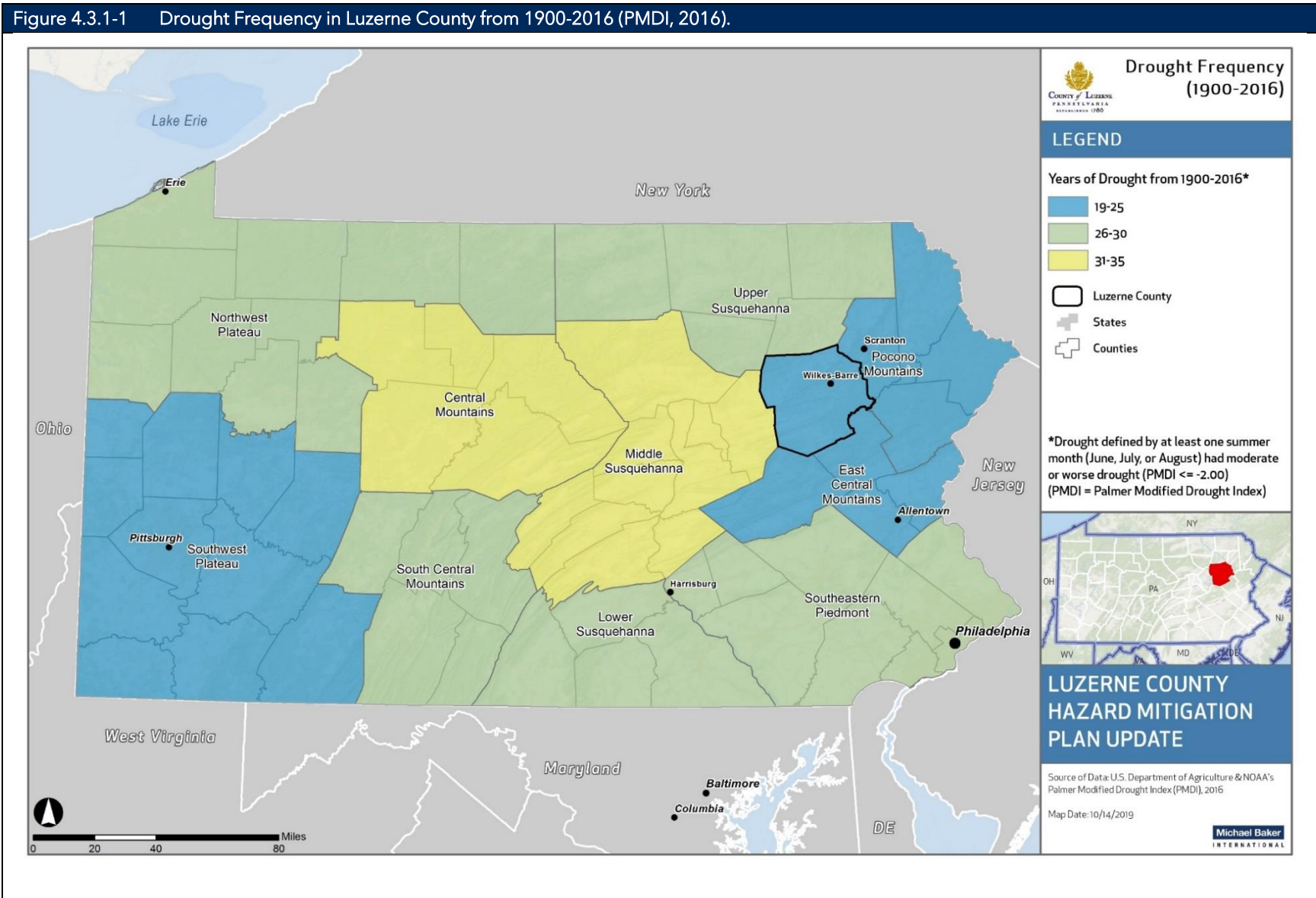
On July 20, 1999, the Governor of Pennsylvania declared a drought emergency in almost all of Pennsylvania including, Luzerne County, following extended dry weather through much of the summer. Precipitation deficits for the months of May through July averaged between five and seven inches. Precipitation departures for the 365-day period ending in mid-July were more than one foot below normal in many places. This is about one-third of total annual normal precipitation in most areas. Streams were empty, wells dried up, and the Susquehanna River hit record low flows. Table 4.3.1-2 lists periods of drought in the Luzerne County area showing a total of 27 droughts between 1980 and 2017.

<b>Table 4.3.1-2 Luzerne County Declared Drought Status from 1980 to 2019 (PADEP, 2020).</b>	
<b>DATE</b>	<b>DROUGHT STATUS</b>
11/06/1980 - 04/20/1982	Emergency
11/10/1982 - 03/28/1983	Warning
01/23/1985 - 04/26/1985	Warning
04/26/1985 - 10/22/1985	Watch and Emergency (Southeast)
10/22/1985 - 12/19/1985	Emergency
07/07/1988 - 12/12/1988	Watch

<b>Table 4.3.1-2 Luzerne County Declared Drought Status from 1980 to 2019 (PADEP, 2020).</b>	
<b>DATE</b>	<b>DROUGHT STATUS</b>
03/03/1989 - 05/15/1989	Warning
06/28/1991 - 07/24/1991	Warning
07/24/1991 - 04/20/1992	Emergency
04/20/1992 - 06/23/0992	Warning
09/01/1995 - 09/20/1995	Warning
09/20/1995 - 11/08/1995	Emergency
11/08/1995 - 12/18/1995	Warning
07/17/1997 - 10/27/1997	Watch
10/27/1997 - 01/16/1998	Warning
12/03/1998 - 12/14/1998	Watch
12/14/1998 - 03/15/1999	Warning
03/15/1999 - 06/10/1999	Watch
06/10/1999 - 06/20/1999	Warning
06/20/1999 - 09/30/1999	Emergency
09/30/1999 - 05/05/2000	Watch
12/05/2001 - 11/07/2002	Watch
04/11/2006 - 06/30/2006	Watch
08/06/2007 - 01/11/2008	Watch
09/16/2010 - 11/10/2010	Warning
03/24/2015 - 07/10/2015	Watch
11/03/2016 - 11/14/2017	Watch

# LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

Figure 4.3.1-1 Drought Frequency in Luzerne County from 1900-2016 (PMDI, 2016).



#### **4.3.1.4. Future Occurrence**

It is difficult to forecast the severity and frequency of future drought events. Based on data from 1895 to 1995, Pennsylvania can be divided into ten PDSI areas (see Figure 4.3.1-1). Each of these areas have been assigned a percent of time PDSI values are less than or equal to three, a value equivalent to a drought warning or drought emergency in Pennsylvania. Historically, Luzerne County is under a drought warning or emergency between 10 and 15 percent of the time or every three to five years. This is equivalent to a PDSI value less than or equal to -3. The future occurrence of drought in Luzerne County can be considered *possible* as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

According to the PEMA uncertainty regarding the future occurrence of droughts exists due to the potential impacts of climate change. The Pennsylvania Climate Impacts Assessment 2015 Update suggests that the likelihood for drought will *decrease* by the middle of the 21st century as months with above normal precipitation increase but drying of surface soil across the coterminous United States in all seasons is still projected due to enhanced evapotranspiration due to higher temperatures.

#### **4.3.1.5. Vulnerability Assessment**

A drought in Luzerne County can have significant detrimental effects on the domestic water supply, especially for well-water, agriculture, and water-dependent recreational activities. Economic effects in Luzerne County would include crop loss. No structural damage due to drought is anticipated in Luzerne County.

Negative impacts of drought would be experienced by agricultural interests, and the community would need to reduce its usage of water. Prolonged drought would affect the 451 farms located in Luzerne County, which sold approximately \$17,793,000 in agricultural products in 2017 (USDA, 2017a). The major crops in Luzerne County are grains, oilseeds, and dry beans, and dry peas, which totaled \$4,483,000 in sales (USDA, 2017b). According to the USDA 2017 Census of Agriculture, most sales to date have come from crop sales, totaling \$13,287,000 (75%). Livestock sales made up the remaining 25%. Figure 2.4-1 in the Community Profile shows land uses across Luzerne County. This map shows that most cultivated areas in the county are in the Western portion of the County. There are also some areas extending in the Northern and Southern Areas of the County.

Luzerne County residents that use private domestic wells are also vulnerable to droughts because their wells can dry up. There are 8,800 domestic wells in Luzerne County. Table 4.3.1-3 shows the number of domestic wells per municipality as collected by the Pennsylvania Groundwater Information System (PaGWIS). According to this dataset, twenty-nine municipalities have over 100 domestic wells. Residents in Butler Township are the most vulnerable to water supply issues related to droughts because of the highest number of wells that are reported there in the county. It is important to note, however, that the well data

collected by PaGWIS relies on voluntary submissions of well record data by well drillers; therefore, it is not a complete database of all domestic wells in the County.

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

<b>Table 4.3.1-3</b> Number of reported domestic wells in Luzerne County (PaGWIS, 2019).			
<b>MUNICIPALITY</b>	<b>NUMBER OF REPORTED DOMESTIC WELLS</b>	<b>MUNICIPALITY</b>	<b>NUMBER OF REPORTED DOMESTIC WELLS</b>
Ashley Borough	0	Lake Township	193
Avoca Borough	2	Larksville Borough	27
Bear Creek Village Borough	3	Laurel Run Borough	49
Bear Creek Township	400	Lehman Township	243
Black Creek Township	90	Luzerne Borough	3
Buck Township	66	City of Nanticoke	7
Butler Township	831	Nescopeck Borough	55
Conyngam Borough	60	Nescopeck Township	133
Conyngam Township	69	New Columbus Borough	0
Courtdale Borough	5	Newport Township	87
Dallas Borough	252	Nuangola Borough	92
Dallas Township	178	Penn Lake Park Borough	5
Dennison Township	217	City of Pittston	111
Dorrance Township	542	Pittston Township	39
Dupont Borough	21	Plains Township	57
Duryea Borough	21	Plymouth Borough	29
Edwardsville Borough	61	Plymouth Township	35
Exeter Borough	117	Pringle Township	0
Exeter Township	40	Rice Township	263
Fairmount Township	80	Ross Township	194
Fairview Township	77	Salem Township	345
Forty Fort Borough	5	Shickshinny Borough	15
Foster Township	498	Slocum Township	201
Franklin Township	103	Sugarloaf Township	380
Freeland Borough	17	Sugar Notch Borough	0
Hanover Township	123	Swoyersville Borough	1
Harveys Lake Borough	98	Union Township	127
Hazle Township	294	Warrior Run Borough	0
City of Hazleton	235	West Hazelton Borough	31

**Table 4.3.1-3** Number of reported domestic wells in Luzerne County (PaGWIS, 2019).

MUNICIPALITY	NUMBER OF REPORTED DOMESTIC WELLS	MUNICIPALITY	NUMBER OF REPORTED DOMESTIC WELLS
Hollenback Township	153	West Pittston Borough	14
Hughestown Borough	0	West Wyoming Borough	0
Hunlock Township	145	White Haven Borough	33
Huntington Township	107	City of Wilkes-Barre	153
Jackson Township	213	Wilkes-Barre Township	7
Jeddo Borough	2	Wright Township	193
Jenkins Township	25	Wyoming Borough	5
Kingston Borough	244	Yatesville Borough	0
Kingston Township	70	Municipal Location Unknown	195
Lafin Borough	12	<b>Total</b>	<b>8,800</b>

### 4.3.2. Earthquake



#### 4.3.2.1. Location and Extent

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. They can also result from human activity like mine blasts and nuclear experiments. The closest fault line that might contribute to an earthquake in Luzerne County is the Mid-Atlantic Ridge, which is approximately 2,000 miles to the east of Pennsylvania. As regional hazards, an earthquake would affect all of Luzerne County. Earthquakes can cause damage to buildings and other rigid superstructures, depending on factors like earthquake magnitude, distance of local areas to the earthquake epicenter, and local geologic conditions. It remains incredibly difficult to predict when and where an earthquake will occur in the northeast U.S. and Pennsylvania.

Earthquake events in Pennsylvania typically do not impact areas greater than 100 km (62 miles) from the epicenter, and earthquake epicenters in Luzerne County are rare. The area is generally not known for seismicity, and USGS downgraded the probabilistic seismic hazard for much of Pennsylvania in 2014. Figure 4.3.2-1 shows the earthquake hazard in Pennsylvania and Luzerne County, expressed as the two-percent probability of exceedance in 50 years of peak ground acceleration (g). The following map was digitized from the National Seismic Hazard report. Luzerne County is split between the 0.04 zone and the 0.06 zone, indicating that the hazard is slight to moderate. However, earthquakes originating outside Pennsylvania

can affect Luzerne County, though they are not expected to cause significant damage. This was the most current data available when updating this plan.

**4.3.2.2. Range of Magnitude**

There are several different ways of describing the magnitude of an earthquake. One method measures peak ground acceleration. Peak ground acceleration is the maximum horizontal ground acceleration measured in centimeters per second per second (cm/sec<sup>2</sup>). Peak ground acceleration can range from zero for an earthquake that is noticed by very few people to 350, which would be categorized as a catastrophic event. A peak ground acceleration of 10 cm/sec<sup>2</sup> means that the shaking is equivalent to about one percent of the acceleration due to gravity. Generally, ground acceleration must exceed 15 cm/sec<sup>2</sup> for significant damage to occur.

Earthquake magnitude is also often measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake. Table 4.3.2-1 below summarizes Richter Scale Magnitudes as they relate to the spatial extent of impacted areas. Pennsylvania has not experienced any earthquakes with a magnitude greater than 6.0.

<b>RICHTER MAGNITUDES</b>	<b>EARTHQUAKE EFFECTS</b>
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.

The Richter Scale does not give any indication of the impact or damage of an earthquake, although it can be inferred that higher magnitude events cause more damage. Therefore, another way of measuring the intensity of an earthquake is the Modified Mercalli Intensity Scale. Measures on this scale range from I, an earthquake that is not generally noticeable, to XII, an earthquake that causes complete destruction. The table below summarizes Modified Mercalli Intensity Scale impacts of earthquake events, measured in terms of earthquake intensity.



**Table 4.3.2-2 Modified Mercalli Intensity Scale with associated impacts (ABAG)**

SCALE	INTENSITY	DESCRIPTION OF EFFECTS	CORRESPONDING RICHTER SCALE MAGNITUDE
I	Instrumental	Detected only on seismographs	<4.2
II	Feeble	Some people feel it	<4.2
III	Slight	Felt by people resting; like a truck rumbling by	<4.2
IV	Moderate	Felt by people walking	<4.2
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	<6.9
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

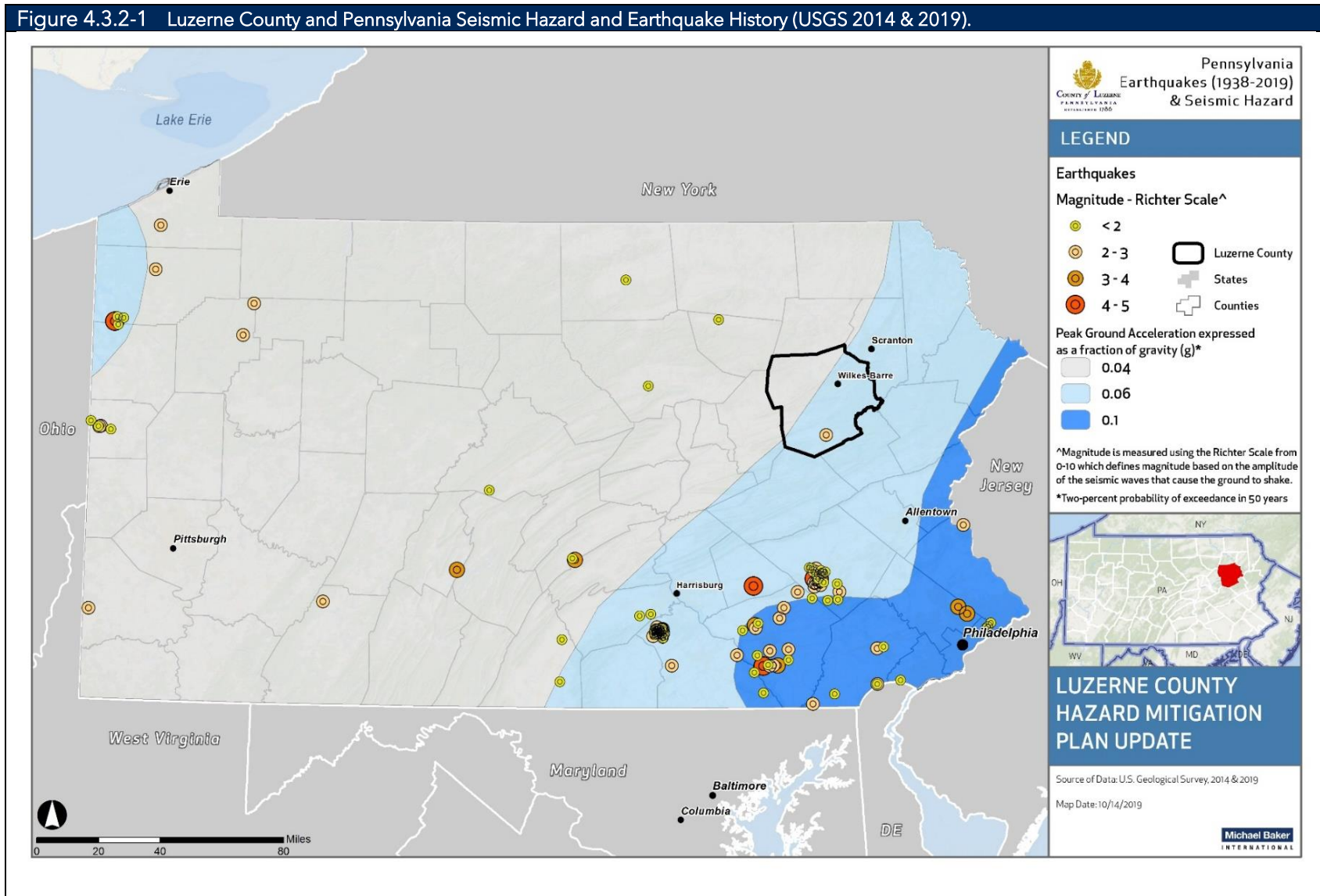
Recent earthquakes in Pennsylvania have been measured from IV to VI on the Modified Mercalli Intensity Scale. However, since the worst earthquake recorded in Pennsylvania was a magnitude 5.2, a worst-case scenario for this hazard would be if an earthquake of similar magnitude occurred in or around Luzerne County near a populated area.

**4.3.2.3. Past Occurrence**

According to records maintained by the Pennsylvania Department of Conservation and Natural Resources (DCNR), there has been one earthquake recorded with its epicenter in Luzerne County. This was a minor earthquake occurring in 1974, with a magnitude of 2-3 on the Richter Scale. However, parts of the county have likely experienced shock waves from some minor earthquakes that have occurred around the region shown on Figure 4.3.2-1.

# LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

Figure 4.3.2-1 Luzerne County and Pennsylvania Seismic Hazard and Earthquake History (USGS 2014 & 2019).



#### 4.3.2.4. *Future Occurrence*

The probability of an earthquake event occurring in Luzerne County is very low. Luzerne County does not sit on any fault lines; therefore, it is reasonable to believe that the County will not experience earthquake damage anytime soon. The future occurrence of earthquakes can be considered *unlikely* as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

#### 4.3.2.5. *Vulnerability Assessment*

All structures and infrastructure in Luzerne County are equally at risk of experiencing an earthquake. However, in a mild earthquake of the magnitude typically experienced in Pennsylvania, no structural damage is anticipated. In other cases, damages are expected to be limited, and examples of anticipated damages are broken dishes and windows and toppled file cabinets.

However, for earthquakes, the available history covers a period of less than 300 years, which is a relatively short period of time for an examination of earthquakes. Large earthquakes may only affect a location every several centuries or millennia. Environmental impacts of earthquakes can be numerous, widespread and devastating, particularly if indirect impacts are considered. Some secondary hazards caused by earthquakes may include fire, hazardous material release, landslides, flash flooding, avalanches, tsunamis, and dam failure. These secondary events could also result in disruptions to natural ecosystems, poor water quality, damage to vegetation, and the release of toxic materials and sewage. Impacts to infrastructure could include train derailments, pipeline failures, and utility interruptions. A very large earthquake affecting Luzerne County might cause structural damage in dilapidated structures or structures that do not meet current building codes. Thus, the impact of an earthquake might range from negligible to catastrophic. Based on historical data for Luzerne County, damage is likely to be minimal.

Structures identified as potentially at risk of damage due to an earthquake are older structures. All existing buildings have the potential to experience an earthquake. Given no history of damage in Luzerne County due to earthquake, damages are estimated to be limited to the more dilapidated structures and structures with unreinforced masonry. The number of structures that are at least 50 years old in Luzerne County is 68,544 (U.S. Census Bureau, 2017).

All future structures will also have the potential to experience an earthquake. However, given that new structures must meet current building codes and given the expected magnitude of earthquakes in the County, no property damages are anticipated.

**4.3.3. Flood, Flash Flood, Ice Jam**



**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 natural hazards in Pennsylvania. Flooding occurs when excess water from snowmelt or rainfall fills a stream, causing it to overflow onto the stream banks and adjacent floodplains. Floodplains are lowlands adjacent to rivers, streams, and creeks that are subject to recurring floods.

**Flash flood** conditions can result from a large amount of rainfall over a short time span. Though, a small amount of rain can also result in floods in locations where the soil is frozen or saturated from a previous wet period or if the rain is concentrated in an area of impervious surfaces such as large parking lots, paved roadways, or other densely developed areas.

Snow melt combined with heavy rains can cause frozen rivers to swell, which can break the ice layer on top of a river. If this occurs, large chunks can float downstream, piling up in narrow passages and near other obstructions such as bridges and dams causing an **ice jam**. One record of a flood event caused by ice jams along the Susquehanna River in Luzerne County occurred in January 2018.

Luzerne County lies within the drainage basin of the Susquehanna River, which is the largest basin on the Atlantic Seaboard of the United States (PACD, 2019). The Susquehanna River drains directly into the Chesapeake Bay. Most of the County is in the Upper Susquehanna-Lackawanna portion of the Watershed as illustrated in the Watersheds Map in Section 2, Figure 2.1-2. The County seat, the City of Wilkes-Barre, is located along the East Branch of the Susquehanna River in the northern central part of Luzerne County. According to the Pennsylvania Association of Conservation Districts, the Susquehanna River Watershed is one of the most flood prone areas in the United States, covering over half of Pennsylvania, and regions in New York and Maryland (PACD, 2019).

The various tributary streams and creeks generally flow towards the central valley in Luzerne County, towards the Susquehanna River. Large tributaries in the County include Mill Creek, Nescopeck Creek, Solomon Creek, and Toby Creek (PACD, 2019).

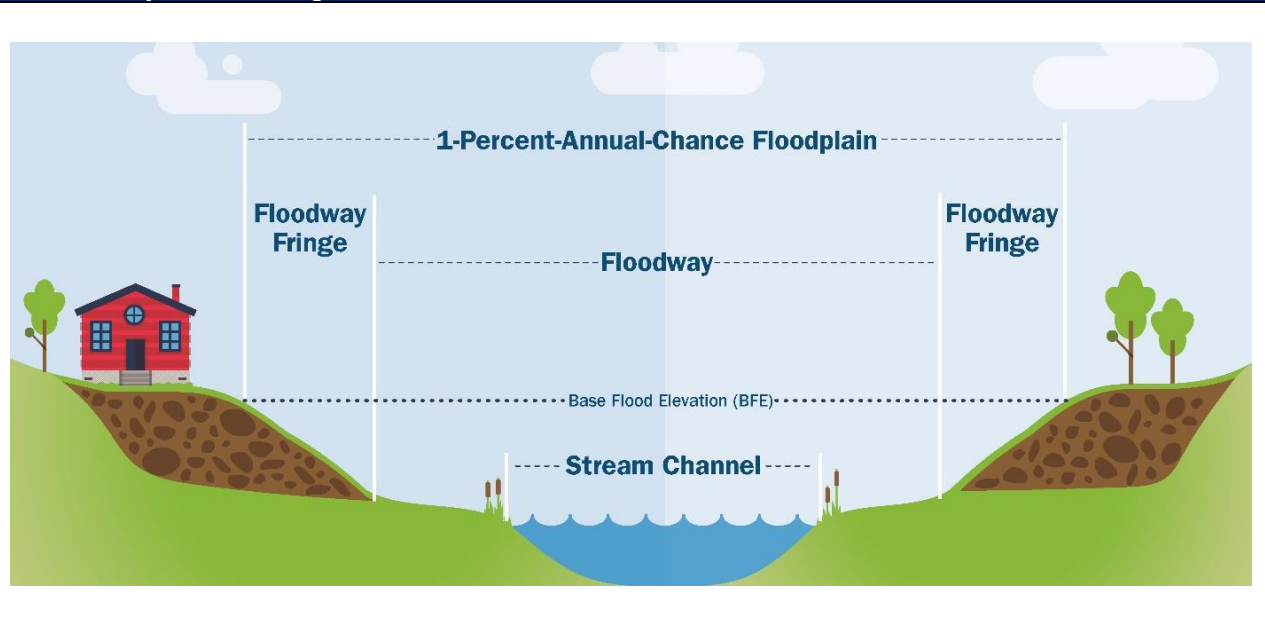
Of the 76 municipalities within Luzerne County, those located along the Susquehanna River are at greatest risk to flooding. For example, Forty Fort Borough, Plymouth Township, and the City of Wilkes-Barre have all suffered severe damage from flooding due to extensive development within the floodplain and its proximity to the Susquehanna River and its tributaries.

Luzerne County’s Act 167 Stormwater Management Plan identifies and prioritizes “general” and “detailed” flooding problem areas (LCDPZ, 2010). The Problem Area Inventory identifies 254 problem area in Luzerne County. While stormwater problems exist throughout the entire

County, the highest concentrations of problem areas were identified in areas with more urbanization. Types of problems include flooding, deficient bridge/culvert, erosion, sedimentation, water/groundwater pollution, and other. Each problem areas includes a photograph of the location of concern, a description of the problem including probable causes if identified, and suggested solutions. Several problems require further investigation to determine optimal solutions and associated costs; these areas are noted accordingly in the plan.

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 10-percent-annual chance of occurring in a given year is smaller than the floodplain associated with a flood that has a 0.2-percent-annual chance of occurring. The National Flood Insurance Program (NFIP), for which Flood Insurance Rate Maps (FIRM) are published, identifies the risk associated with the 1-percent-annual chance flood. This 1-percent-annual chance flood event is used to delineate the *Special Flood Hazard Area* (SFHA) and to identify *Base Flood Elevations* (BFE). Figure 4.3.3-1 illustrates these terms. The SFHA serves as the primary regulatory boundary used by FEMA, the Commonwealth of Pennsylvania, and Luzerne County when determining risk associated with flooding.

**Figure 4.3.3-1** Diagram identifying Special Flood Hazard Area, 1% annual chance (100-Year) floodplain, floodway and flood fringe.



The current countywide FIRM and Flood Insurance Study (FIS) report were published for Luzerne County on November 2, 2012 (FEMA, 2012). This best available flood hazard data, which was used to update this flood hazard profile, included current effective FIRM data and

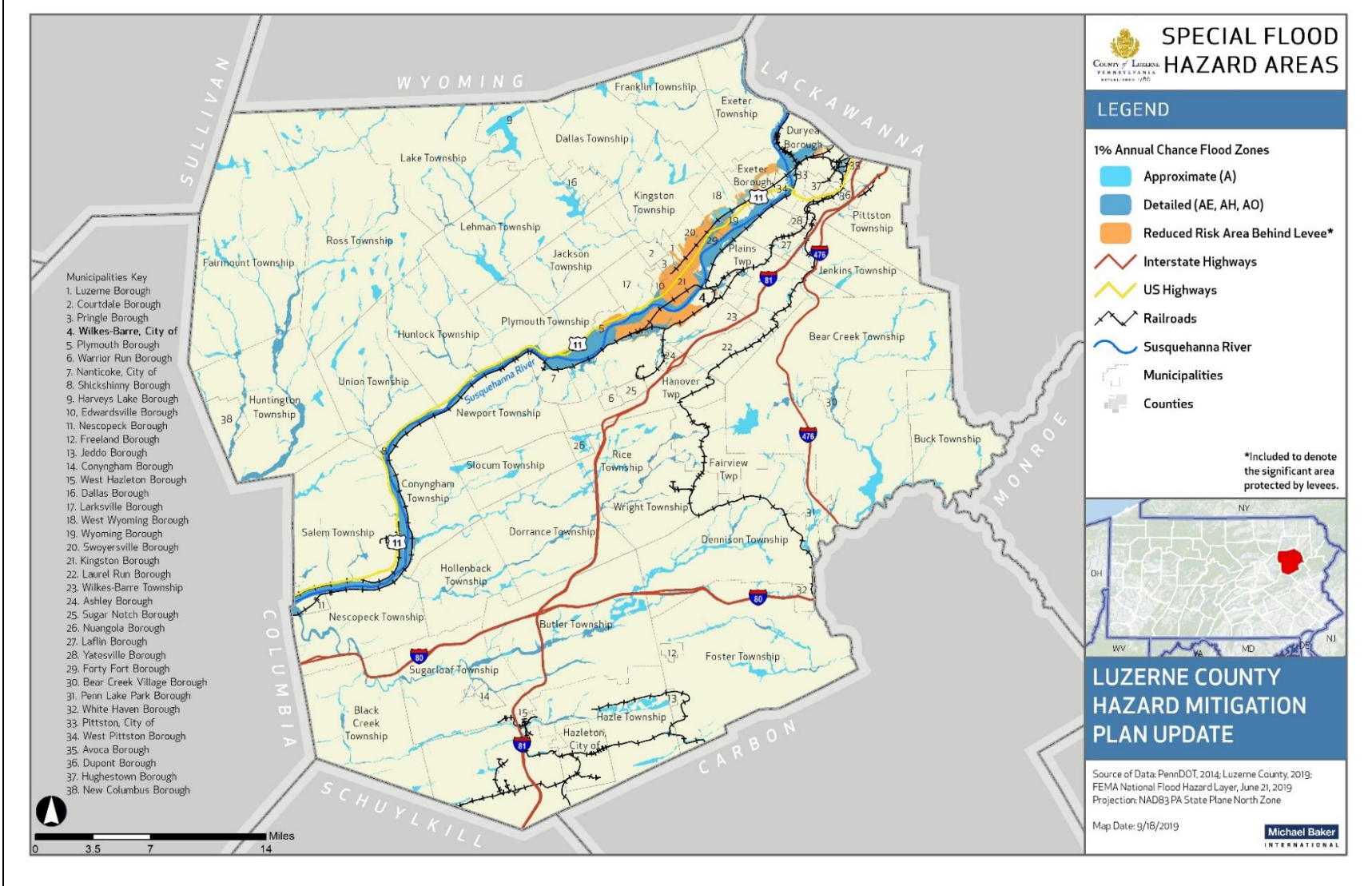
incorporated Letters of Map Revision (LOMRs). The FIRM and FIS for the entire county can be obtained from the FEMA Map Service Center (<http://www.msc.fema.gov>) and can be used to identify the expected spatial extent and elevation of flooding from a 1-percent and 0.2-percent-annual chance event. All but seven municipalities in the County have identified special flood hazard areas (SFHAs). The following municipalities do not have identified SFHAs: Freeland, Hughestown, Jeddo, Sugar Notch, Warrior Run, and Yatesville Boroughs and the City of Hazelton. (FEMA, 2012). Figure 4.3.3-2 shows the location of watercourses and flood zones in Luzerne County. The location of approximate and detailed (which include BFEs) SFHAs (1-percent-annual chance zones) are shown.

A new Preliminary FIRM and FIS are expected to be issued for Luzerne County in September 2020. The revised flood hazard information will focus on river communities and changes to base-flood elevations are expected which would impact flood insurance and development.

It should also be noted that flooding is not only caused by heavy rain events. Additionally, as described in the Dam Failure Hazard Profile (Appendix H), there are 34 state regulated, high-hazard dams located within the County and eight federally owned, high hazard dams in or upstream of the County. If any one of these dams were to fail, there could be loss of life and property damage resulting from flooding within the dam inundation areas. Flood risk is also associated with levee failure. As part of the Wyoming Valley Levee System, the County operates a Susquehanna River Warning System based on the United States Army Corps of Engineers (USACE) model for the Susquehanna River. The system details which structures in the River communities are impacted by various flood stages on the River. Additional information on levees can be found in Section 4.3.15.

# LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

Figure 4.3.3-2 Map showing the location of watercourses and flood zones throughout Luzerne County



**4.3.3.2. *Range of Magnitude***

Flooding in Luzerne County has mainly been caused by heavy rainfall. Some areas have experienced rain events bringing more than three to as many as eight inches of rain to the area within a day. In 2011, the Susquehanna River was measured at almost twice its flood stage, with a record-breaking crest of 42.66 feet (NOAA, 2019). Flooding in the County can be exacerbated when heavy rain occurs in late winter by accelerating the melting of snow. Flooding can also be exacerbated locally by the presence of impermeable surfaces due to increased development of buildings and pavement or lack of appropriately sized flood water detention basins.

Flooding in Luzerne County can be worsened if the flow of water is obstructed in some way such as by an undersized culvert. If undersized culverts trap debris they can create a dam, which would increase flooding in upstream municipalities. Flooding can also be worsened by bridge washouts, like those seen in Bear Creek Township in 2000 and 2002 (NOAA, 2019). Both culvert and bridge washouts can cause damage to transportation infrastructure, making response and recovery actions more difficult.

Hurricanes and Tropical Storms can also contribute to flooding in the County. One of the worst flooding events occurred in June 1972, when Hurricane Agnes inundated levees along the Susquehanna River and caused widespread flooding throughout the County. In June 2006, Luzerne County experienced its worst flooding since Hurricane Agnes. Multiple days of rain resulted in over \$110,000,000 in damage. This event damaged 150 roads and over 1,000 homes, destroyed 2 businesses, and triggered a city-wide evacuation in the City of Wilkes-Barre. Due to the evacuation, most of the city proper was left okay, however there were 3 deaths in other parts of the County. Another, more recent severe flood event occurred in June 2011 when slow moving thunderstorms dumped 5-6 inches of rain, causing flash flooding. More than 200 structures were impacted by flooding. (NOAA, 2019).

Although floods can cause damage to property and loss of life, floods are naturally occurring events that benefit riparian systems. Such benefits include groundwater recharge and the introduction of nutrient rich sediment improving soil fertility. However, the destruction of riparian buffers through development, changes to land use and land cover throughout a watershed, and the introduction of chemical or biological contaminants which often accompany human presence cause environmental harm when floods occur. Hazardous material facilities are potential sources of contamination during flood events. Other negative environmental impacts of flooding include water-borne diseases, heavy siltation, damage or loss of crops, and drowning of both humans and animals.

Dams, levees, and reservoirs act as flood protection measures in Luzerne County. There have been some instances of levee inundation in the past. The Luzerne County Flood Protection Authority (LCFPA) was organized in 1996 to maintain five of County's levees (LCFPA, 2019). Please see section 4.3.15. for more information on levees. There are 106 state regulated dams



in Luzerne County and seven reservoirs upstream of Luzerne County along the Susquehanna River and its tributaries that provide some flood control and reduce flood hazards within the Susquehanna River watershed; four are in Pennsylvania in Susquehanna and Tioga Counties, and three are in New York. Please see Appendix H: Dam Failure hazard profile for additional data and information on dam hazards in Luzerne County.

**4.3.3.3. Past Occurrence**

Luzerne County has a long history of flooding problems. The Susquehanna River runs through the central portion of the County, with several tributary streams, creeks, and runs traversing the surrounding areas. This topography has contributed to numerous major floods and localized flash flooding (FEMA, 2012). Table 4.3.3.-1 lists flooding events in Luzerne County since 1993. Estimated property damages include every loss to any type of facility (residential, commercial, agricultural, or industrial) and include structure, content, and crop damages. Not included in this listing are severe flood events that occurred prior to 1993. Two events to note are flooding caused by Hurricane Agnes in June 1972 and Hurricane Eloise in September 1975. The Hurricane Agnes flood was a major historical disaster that many community members recall today. Due to widespread damage, it remains one of the worst flood events that Luzerne County has ever experienced.

<b>Table 4.3.3-1 Flood and flash flood events impacting Luzerne County from 1996-2019 (NOAA, 2019). Note that property damage values are estimates based on best available information from NOAA's database. "Countywide" indicates several locations in the County were affected.</b>		
DATE	LOCATION & DESCRIPTION	REPORTED DAMAGE (\$)*
01/19/1996	Countywide; Significant flooding and flash flooding was caused by snowmelt combined with unseasonal rainfall.	\$21,300,000
11/08/1996-11/09/1996	Countywide; Flooding was caused by widespread heavy rains and thunderstorms. The ground was already saturated from previous rainfall, leading to localized flash flooding. Multiple creeks and streams exceeded their banks, washing out bridges and closing roads. Lowland flooding was experienced along the Susquehanna from Towanda to Wilkes-Barre.	\$25,000
12/02/1996	Countywide; Flooding was caused by heavy rains combined with already saturated soils across the region. This led streams to exceed their banks and several bridge and road washouts. Minor lowland flooding also occurred.	<i>not provided</i>
12/13/1996	Fairmount Springs; Flash flooding was caused by heavy rains from a slow-moving storm system. This resulted in isolated small stream flooding along Kitchen and Fairmount Creeks.	<i>not provided</i>
01/08/1998	Countywide; none provided.	\$50,000
01/24/1999	Countywide; Minor flooding was caused by heavy rainfall and snowmelt. This resulted in road closures. Because flooding was minor, this event only impacted minor lowlands and floodplains.	<i>not provided</i>

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

**Table 4.3.3-1** Flood and flash flood events impacting Luzerne County from 1996-2019 (NOAA, 2019). Note that property damage values are estimates based on best available information from NOAA's database. "Countywide" indicates several locations in the County were affected.

DATE	LOCATION & DESCRIPTION	REPORTED DAMAGE (\$)*
08/13/1999	Wilkes-Barre; Flooding was caused by scattered torrential thunderstorms. Strong wind gusts downed several trees and powerlines. Water ponding was noticed in many areas. Runoff from the storms blocked storm drains leading to flooded and closed roads. Water depths were estimated to be as high as 3 feet.	\$50,000
09/16/1999	Countywide; Flash flooding was caused as remnants of Hurricane Floyd moved across the region. 4-7 inches of rain were recorded in Northeastern PA. Prior drought during the summer left the county very dry, allowing heavy amounts of rain to be efficiently absorbed into the topsoil. Due to this, there was only minor flooding. The county experienced small stream flooding, and ponding and flooding in poor drainage areas, like basements. Some flooded streets approached water depths of 3 feet.	<i>not provided</i>
02/27/2000	Countywide; Flooding was caused by considerable snowmelt followed by heavy rainfall. The weather led area creeks, small streams, and rivers to overflow their banks. There were several road and highway closures. There were also cases of interior flooding, and driveways and backyards were filled with rushing runoff.	<i>not provided</i>
06/06/2000	Wilkes-Barre; Flooding was caused by heavy thunderstorm rains. This led to significant ponding of water on several streets. There were also cases of interior flooding.	<i>not provided</i>
07/15/2000	Hanover; Flash flooding was caused by heavy thunderstorm rains. This led to road flooding.	<i>not provided</i>
07/30/2000	Wilkes-Barre; Extensive flash flooding was caused by heavy thunderstorm rains. This led to numerous road closings in the suburbs of Wilkes-Barre as a result of mudslides and water ponding. Extensive interior flooding was reported across the area. Several construction projects were disrupted as storm water washed away piping and other materials. Additionally, a bridge was washed out in Bear Creek.	<i>not provided</i>
08/01/2000	Hazleton; Flooding was caused by thunderstorm rains. This resulted in extreme ponding of water on several roadways. Parts of RT 309 sustained erosion from the storm.	<i>not provided</i>
11/25/2001	Wilkes-Barre; Street flooding was caused by heavy rainfall. Damaging winds coupled the storm, resulting in multiple cases of trees, wires, and telephone poles to fall.	<i>not provided</i>

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

<b>Table 4.3.3-1 Flood and flash flood events impacting Luzerne County from 1996-2019 (NOAA, 2019). Note that property damage values are estimates based on best available information from NOAA's database. "Countywide" indicates several locations in the County were affected.</b>		
DATE	LOCATION & DESCRIPTION	REPORTED DAMAGE (\$)*
05/13/2002	Glen Lyon; Flooding was caused by two days of heavy rainfall. The rain fell on already saturated grounds. Runoff washed out areas under train tracks that was 120 feet wide and 40 feet deep. This led to a freight train derailling in Newport Township along the Susquehanna River. Around 5,000 gallons of diesel fuel escaped into the river. Train workers were trapped for eight hours before rescue.	\$500,000
05/28/2002	Bear Creek; Massive flash flooding was caused by heavy rainfall from stationary thunderstorms along Bear Creek. About 6 inches of rain fell in less than 4 hours. This resulted in mudslides and flooding along roadways and closures along the Northeast Extension of the PA Turnpike. Multiple homes were flooded as water rapidly engulfed them. Evacuations and water rescues were needed, some from the roofs of homes. School busses were stranded by flood waters, and students had to return to school for shelter. Bear Creek dam began to spill over, flooding RT 115. The dam break also removed a 2-acre private pond. Floodwaters washed out multiple culverts, carried cars downstream, and damaged over 100 structures. There was also danger of bridge collapse in Bear Creek. The PA National Guard was brought in to help with rescues and clean up in flood damaged areas.	\$5,000,000
03/21/2003	Countywide; Minor to moderate flooding was caused by rainfall combined with snow melt runoff. The Susquehanna River extended over its flood stages at several forecast points.	\$50,000
06/14/2003	Parsons; Flash flooding was caused by thunderstorms with heavy rainfall. Rain fell at about 1-2 inches per hour. Shoulders along SR 315 were flooded. Several apartment buildings and cars were damaged in Wilkes-Barre.	\$50,000
08/06/2003	White Haven; Flash flooding was caused by heavy rainfall. A state of emergency was declared in White Haven. Between 4 and 6 feet of floodwaters covered roads. 26 homes and 1 business had minor flooding. 16 cars were damaged.	\$1,000,000
08/16/2003	Kingston; Flash flooding was caused by several thunderstorms with heavy rain. Flood waters exceeded creek banks, flooding basements and covering roadways. Kingston faced worse flooding as their 30-year-old pump system was overwhelmed with runoff.	\$20,000
05/26/2004	Fairmount Springs; Flash flooding was caused by heavy rain. Many creeks exceeded their banks due to flood waters. Numerous roads were washed out.	\$200,000

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

**Table 4.3.3-1** Flood and flash flood events impacting Luzerne County from 1996-2019 (NOAA, 2019). Note that property damage values are estimates based on best available information from NOAA's database. "Countywide" indicates several locations in the County were affected.

DATE	LOCATION & DESCRIPTION	REPORTED DAMAGE (\$)*
09/18/2004	Countywide; Major flash flooding was caused by heavy rain amounts from remnants of Hurricane Ivan. Almost all streams and creeks exceeded their banks. The Susquehanna River caused major flooding in Wilkes-Barre, causing businesses to close and people to evacuate. Over 4,000 buildings were damaged. The river crested at 35 feet; the third highest crest on record.	\$5,000,000
11/28/2004	Countywide; Flash flooding was caused by a slow-moving storm over the region. The rain fell onto already saturated grounds from recent storms leading to flooding. Floods closed roads in many locations.	\$10,000
01/14/2005	Countywide; The Susquehanna River exceeded its flood stage due to 1-1.5 of rain in combination with around 1 inch of water from snow melt. The River crested at 24.8 feet at Wilkes-Barre.	<i>not provided</i>
03/29/2005	Countywide; Flooding and flash flooding was caused by heavy rainfall between 1 and 3 inches. Snowmelt led to elevated river flows before the rain started, and the combined runoff led rivers and streams to exceed their banks. The Susquehanna River crested at 26.05 feet. Flood impacts included road closures, a building collapse, and a sinkhole forming in a residence.	\$120,000
04/02/2005- 04/03/2005	Countywide; Significant flooding was caused by a slow-moving storm. The Susquehanna River already had high flows due to a rainstorm and proceeding snow melt on March 28 <sup>th</sup> . The river crested at 30.94 feet and led over 100 buildings to experience flooding. Roads and bridges were also damaged.	\$1,500,000
06/26/2006- 06/28/2006	Countywide; Major flooding was caused by heavy rainstorms on the Susquehanna River. This has been deemed the worst flash flooding event in the county since Hurricane Agnes in 1972. The river crested at 34.09 feet, the 5 <sup>th</sup> highest flood crest on record for Wilkes-Barre. Between 6 and 10 inches of rain fell during this multi-day episode. Over 1,000 homes were affected; 33 had major damage. Two businesses were destroyed. Over 150 roads were damaged, and over 100 people had to be rescued. Toby's Creek has some of the most significant flooding. There was a city-wide evacuation in Wilkes-Barre due to concern of floodwaters breaching the levee. While the City Proper held no significant problems, the event resulted in three deaths across the county.	\$110,035,000
07/11/2006	Countywide; Flash flooding was caused by heavy rain from thunderstorms. Many roads were covered with running water.	\$2,000

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

**Table 4.3.3-1** Flood and flash flood events impacting Luzerne County from 1996-2019 (NOAA, 2019). Note that property damage values are estimates based on best available information from NOAA's database. "Countywide" indicates several locations in the County were affected.

DATE	LOCATION & DESCRIPTION	REPORTED DAMAGE (\$)*
11/16/2006	Countywide; Significant flash flooding was caused by a squall line of thunderstorms that passed over the region. Rainfalls ranged from 1.5-3.5 inches in 3 hours. Water runoff resulted in mudslides and debris flows in more populated valley areas. In more urban areas, rainfall resulted in road washouts, highway closures, and entirely flooded parking lots. Cars were seen floating down the street in Wilkes-Barre. Some homes were evacuated.	\$37,000
03/16/2007	Wilkes-Barre; Flooding was caused by widespread rainfall that melted the existing snowpack. This caused many rivers and creeks to exceed flood stage; generally, by 0.5 to 2 feet above flood stage. This resulted in minor flooding in many locations. Flooding occurred on the Susquehanna River in Wilkes-Barre.	<i>not provided</i>
03/05/2008	Forty Fort; Flooding was caused by heavy rainfall combined with runoff from the existing snowpack. Six houses were flooded along Toby Creek.	\$40,000
03/08/2008	Huntsville; Flash flooding was caused by heavy rainfall from 1-2 inches combined with melting snowfall. This resulted in road closures, interior flooding, and cases of agricultural lands flooding.	\$25,000
07/03/2009	Countywide; Flash flooding was caused by isolated showers and thunderstorms. Heavy rainfall resulted in a mudslide, several road closures, and some interior flooding.	\$23,000
09/30/2010	Stoddartsville; Flash flooding was caused as the remnants of Tropical Storm Nicole dropped 2-7 inches of rain over the region. Heavy rain resulted in flooding issues and PA Route 115 was closed.	\$10,000
03/10/2011	Albert; Flash flooding was caused by heavy rainfall which combined with melting snow, adding to the water runoff. Several roads were closed due to flooding, and a few homes experienced flood damage.	\$50,000
04/26/2011	Edwardsville; Flash flooding was caused by severe rainstorms coupled with severe wind damage and hail. Flash flooding occurred on several roads leading to road closures.	\$95,000
04/28/2011	Nanticoke; Flash flooding was caused by severe thunderstorms with damaging winds and heavy rain. This resulted in structural damage to several buildings and opened a sinkhole in South Wilkes-Barre.	\$380,000

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

**Table 4.3.3-1** Flood and flash flood events impacting Luzerne County from 1996-2019 (NOAA, 2019). Note that property damage values are estimates based on best available information from NOAA's database. "Countywide" indicates several locations in the County were affected.

DATE	LOCATION & DESCRIPTION	REPORTED DAMAGE (\$)*
07/03/2011	Larksville; Flash flooding was caused by multiple bouts of torrential rain from slow-moving thunderstorms. Estimated rainfall is 5-6 inches for the combined events. Rains fell over the Coal Creek Basin and quickly exceeded its banks. Over 200 businesses and homes were impacted by flooding in the area.	\$1,500,000
07/25/2011	Countywide; Flash flooding was caused by thunderstorms in the region. Some of the storms became severe and produced damaging winds. There were multiple road closures due to flood issues.	\$15,000
08/26/2011- 08/28/2011	Countywide; Severe flooding was caused by Hurricane Irene which resulted in 2-5 inches of rainfall over one day. High winds from the storm knocked over trees and powerline resulting in power outages across the region. The Hurricane caused many cases of interior flooding and road closures.	\$210,000
09/07/2011- 09/08/2011	Countywide; Flash flooding and flooding was caused by the remnants of Tropical Storm Lee stalling over the county while drawing moisture from nearby Hurricane Katia. This resulted in 6-8 inches of rainfall over a two-day period, leading to record breaking flooding on small streams, creeks, and the Susquehanna River and its larger tributaries. The Susquehanna River crested at 42.66 feet on September 8 <sup>th</sup> , breaking its previous record of 40.91 feet during the Hurricane Agnes flood in 1972. This event caused widespread urbanized flooding with necessity for evacuations.	\$45,000,000
09/27/2011- 09/28/2011	Countywide; Flash flooding was caused by heavy rainfall brought by a slow-moving, low pressure system. This resulted in road closures and interior flooding. Water rescues and evacuations took place in some parts of the county. Additionally, flooding caused a mine subsidence, collapsing a street in Drums.	\$35,000
06/27/2013	Countywide; Flash flooding was caused by strong, severe rainfall. This resulted in roof collapses in multiple townships, where evacuations and swift water rescue were necessary. Many streets were flooded or washed out.	\$105,000
06/30/2013	Mountain Top; Flash flooding was caused by severe thunderstorms resulting in road flooding.	\$5,000
07/17/2017	Sugar Notch; Flash Flood caused by multiple torrential rainstorms in the region. Extensive urban flooding developed resulting in multiple road closures. Water was documented rushing from storm drains to small, channelized streams.	\$20,000

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

**Table 4.3.3-1** Flood and flash flood events impacting Luzerne County from 1996-2019 (NOAA, 2019). Note that property damage values are estimates based on best available information from NOAA's database. "Countywide" indicates several locations in the County were affected.

DATE	LOCATION & DESCRIPTION	REPORTED DAMAGE (\$)*
07/20/2017	Wilkes-Barre; Flash flooding caused by a small-scale complex of thunderstorms. This resulted in overwhelmed urban streams and storm drains leading to widespread street flooding.	\$20,000
01/23/2018-01/24/2018	Countywide; Minor to moderate flood impacts caused by several days of mid-January thaw combined with 1-2 inches of rainfall which loosened river ice. Road flooding was caused by ice jams in several creeks across the county.	<i>not provided</i>
07/25/2018	Countywide; Significant flash flooding developed as a result of numerous thunderstorms over a two-day period. Impacts included flooded creeks, interior flooding, road closures, and trapped vehicles.	\$170,000
08/14/2018	Newtown; Severe flash flooding was caused by several rounds of thunderstorms. The Susquehanna River at Wilkes-Barre exceeded the Moderate flood stage with a crest of 28.77 feet.	<i>not provided</i>
05/29/2019	Wilkes-Barre; Flooding resulting in road closures was caused by heavy rain producing thunderstorms in a stationary front.	\$1,000
07/06/2019	Countywide; Flash flooding was caused by several hours of slow moving, conglomerated thunderstorms that led to excessive runoff in streams and drainage systems. This event resulted in interior flooding, road and vehicle flooding, and new sink holes in several parts of the county.	\$885,000
08/15/2019	Nescopeck; Flash flooding was caused by clusters of slow-moving thunderstorms across the region. This resulted in road closures that left motorists stranded on the Berwick Highway.	\$10,000

*\*Reported damages may be underestimated and do not necessarily reflect total loss.*

In addition to the past flood events, the NFIP identifies properties that experience frequent flooding and can be used to determine areas of higher risk. These properties are identified through the NFIP when they receive more than one payment for flood damages. The NFIP defines a **Repetitive Loss (RL)** property as "any insurable building for which two or more claims of more than \$1,000 were paid by the NFIP within any rolling ten-year period, since 1978". The RL data provided in Table 4.3.3-2 represents the NFIP's definition of RL.

Under FEMA's Hazard Mitigation Assistance (HMA), in regard to mitigation grant funding, RL is defined as a structure that:

- a) Is covered by a contract for flood insurance made available under the NFIP; and

- b) Has incurred flood-related damage on two occasions, in which the cost of the repair, on the average, equaled or exceeded 25 percent of the market value of the structure at the time of each such flood event; and
- c) At the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage (ICC). (Note: Homes are eligible for ICC coverage after the first loss, however the cost for ICC is part of all policies.)

A **Severe Repetitive Loss** property is a structure that:

- a) Is covered under a contract for flood insurance made available under the NFIP; and
- b) Has incurred flood related damage (i) For which four or more separate claims payments have been made under flood insurance coverage with the amount of each such claim exceeding \$5,000, and with the cumulative amount of such claims payments exceeding \$20,000; or (ii) For which at least two separate claims payments have been made under such coverage, with the cumulative amount of such claims exceeding the market value of the insured structure.

Table 4.3.3-2 displays repetitive loss and severe repetitive loss properties by jurisdiction and type in Luzerne County. The County has 513 repetitive loss properties and 69 repetitive loss properties that have been mitigated. The City of Wilkes-Barre has the most repetitive loss properties (84). Plains Township and Plymouth Township have the most mitigated repetitive loss properties (11 properties each). Of these 513 repetitive loss structures properties in the County, the most are single family homes (358). There are 19 SRL properties in Luzerne County: six in West Pittston Borough, three in Plymouth Township, two in Plains Township, two in Shickshinny Borough, and one each in Hunlock Township, Jenkins Township, Nescopeck Township, the City of Pittston, the City of Wilkes-Barre, and Wright Township.



## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

**Table 4.3.3-2** Total and mitigated Repetitive Loss and Severe Repetitive Loss properties in Luzerne County. Data from PA RL and SRL Inventory (January 2018).

MUNICIPALITY	SINGLE FAMILY		2-4 FAMILY		ASSMD CONDO		OTHER RESID		NON RESIDNT		TOTAL	
	TOTAL	MIT	TOTAL	MIT	TOTAL	MIT	TOTAL	MIT	TOTAL	MIT	TOTAL	MIT
Ashley Borough	2	0	0	0	0	0	0	0	0	0	2	0
Avoca Borough	3	0	0	0	0	0	0	0	1	0	4	0
Bear Creek Village Borough	0	0	0	0	0	0	0	0	0	0	0	0
Bear Creek Township	0	0	0	0	0	0	0	0	0	0	0	0
Black Creek Township	1	0	0	0	0	0	0	0	0	0	1	0
Buck Township	0	0	0	0	0	0	0	0	0	0	0	0
Butler Township	14	1	0	0	0	0	0	0	0	0	14	1
Conyngam Borough	0	0	0	0	0	0	0	0	0	0	0	0
Conyngam Township	13	8	2	0	0	0	0	0	1	0	16	8
Courtdale Borough	0	0	0	0	0	0	0	0	0	0	0	0
Dallas Borough	1	0	0	0	0	0	0	0	0	0	1	0
Dallas Township	1	0	0	0	0	0	0	0	0	0	1	0
Dennison Township	0	0	0	0	0	0	0	0	0	0	0	0
Dorrance Township	0	0	0	0	0	0	0	0	0	0	0	0
Dupont Borough	0	0	0	0	0	0	0	0	0	0	0	0

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

Table 4.3.3-2 Total and mitigated Repetitive Loss and Severe Repetitive Loss properties in Luzerne County. Data from PA RL and SRL Inventory (January 2018).												
MUNICIPALITY	SINGLE FAMILY		2-4 FAMILY		ASSMD CONDO		OTHER RESID		NON RESIDNT		TOTAL	
	TOTAL	MIT	TOTAL	MIT	TOTAL	MIT	TOTAL	MIT	TOTAL	MIT	TOTAL	MIT
Duryea Borough	1	0	0	0	0	0	0	0	0	0	1	0
Edwardsville Borough	0	0	0	0	0	0	0	0	0	0	0	0
Exeter Borough	7	0	0	0	1	0	0	0	3	0	11	0
Exeter Township	4	1	0	0	0	0	0	0	2	1	6	2
Fairmount Township	2	0	0	0	0	0	0	0	0	0	2	0
Fairview Township	0	0	0	0	0	0	0	0	0	0	0	0
Forty Fort Borough	0	0	0	0	0	0	0	0	0	0	0	0
Foster Township	0	0	0	0	0	0	0	0	0	0	0	0
Franklin Township	0	0	0	0	0	0	0	0	0	0	0	0
Freeland Borough	0	0	0	0	0	0	0	0	0	0	0	0
Hanover Township	5	0	0	0	0	0	0	0	3	0	8	0
Harveys Lake Borough	1	0	0	0	0	0	0	0	0	0	1	0
Hazle Township	0	0	0	0	0	0	0	0	1	0	1	0
City of Hazleton	1	0	0	0	0	0	0	0	0	0	1	0
Hollenback Township	0	0	0	0	0	0	0	0	0	0	0	0

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

**Table 4.3.3-2** Total and mitigated Repetitive Loss and Severe Repetitive Loss properties in Luzerne County. Data from PA RL and SRL Inventory (January 2018).

MUNICIPALITY	SINGLE FAMILY		2-4 FAMILY		ASSMD CONDO		OTHER RESID		NON RESIDNT		TOTAL	
	TOTAL	MIT	TOTAL	MIT	TOTAL	MIT	TOTAL	MIT	TOTAL	MIT	TOTAL	MIT
Hughestown Borough	0	0	0	0	0	0	0	0	0	0	0	0
Hunlock Township	10	0	0	0	0	0	0	0	3	0	13	0
Huntington Township	0	0	0	0	0	0	0	0	0	0	0	0
Jackson Township	0	0	0	0	0	0	0	0	0	0	0	0
Jeddo Borough	0	0	0	0	0	0	0	0	0	0	0	0
Jenkins Township	28	7	6	1	2	0	0	0	2	0	38	8
Kingston Borough	4	4	0	0	0	0	0	0	0	0	4	4
Kingston Township	2	0	0	0	0	0	0	0	1	0	3	0
Lafin Borough	0	0	0	0	0	0	0	0	0	0	0	0
Lake Township	1	0	0	0	0	0	0	0	0	0	1	0
Larksville Borough	0	0	0	0	0	0	0	0	0	0	0	0
Laurel Run Borough	0	0	0	0	0	0	0	0	0	0	0	0
Lehman Township	0	0	0	0	0	0	0	0	0	0	0	0
Luzerne Borough	3	1	0	0	0	0	0	0	1	0	4	1
City of Nanticoke	6	1	2	0	0	0	0	0	1	0	9	1
Nescopeck Borough	1	0	1	1	0	0	0	0	1	0	3	1

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

**Table 4.3.3-2** Total and mitigated Repetitive Loss and Severe Repetitive Loss properties in Luzerne County. Data from PA RL and SRL Inventory (January 2018).

MUNICIPALITY	SINGLE FAMILY		2-4 FAMILY		ASSMD CONDO		OTHER RESID		NON RESIDNT		TOTAL	
	TOTAL	MIT	TOTAL	MIT	TOTAL	MIT	TOTAL	MIT	TOTAL	MIT	TOTAL	MIT
Nescopeck Township	14	2	0	0	0	0	0	0	1	0	15	0
New Columbus Borough	0	0	0	0	0	0	0	0	0	0	0	0
Newport Township	0	0	0	0	0	0	0	0	0	0	0	0
Nuangola Borough	0	0	0	0	0	0	0	0	0	0	0	0
Penn Lake Park Borough	0	0	0	0	0	0	0	0	0	0	0	0
City of Pittston	5	0	2	1	0	0	0	0	1	0	8	1
Pittston Township	1	0	0	0	0	0	0	0	0	0	1	0
Plains Township	24	9	7	1	3	1	0	0	9	0	43	11
Plymouth Borough	3	0	0	0	0	0	0	0	0	0	3	0
Plymouth Township	40	11	3	0	0	0	1	0	10	0	54	11
Pringle Borough	0	0	0	0	0	0	0	0	0	0	0	0
Rice Township	0	0	0	0	0	0	0	0	0	0	0	0
Ross Township	0	0	0	0	0	0	0	0	0	0	0	0
Salem Township	9	0	0	0	0	0	0	0	1	0	10	0
Shickshinny Borough	46	7	13	1	0	0	0	0	10	1	69	9
Slocum Township	0	0	0	0	0	0	0	0	0	0	0	0

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

**Table 4.3.3-2** Total and mitigated Repetitive Loss and Severe Repetitive Loss properties in Luzerne County. Data from PA RL and SRL Inventory (January 2018).

MUNICIPALITY	SINGLE FAMILY		2-4 FAMILY		ASSMD CONDO		OTHER RESID		NON RESIDNT		TOTAL	
	TOTAL	MIT	TOTAL	MIT	TOTAL	MIT	TOTAL	MIT	TOTAL	MIT	TOTAL	MIT
Sugarloaf Township	0	0	0	0	0	0	0	0	0	0	0	0
Sugar Notch Borough	0	0	0	0	0	0	0	0	0	0	0	0
Swoyersville Borough	2	0	0	0	0	0	0	0	0	0	2	0
Union Township	0	0	0	0	0	0	0	0	0	0	0	0
Warrior Run Borough	0	0	0	0	0	0	0	0	0	0	0	0
West Hazelton Borough	0	0	0	0	0	0	0	0	0	0	0	0
West Pittston Borough	50	6	14	1	2	0	0	0	5	0	71	7
West Wyoming Borough	0	0	0	0	0	0	0	0	0	0	0	0
White Haven Borough	0	0	0	0	0	0	0	0	0	0	0	0
City of Wilkes-Barre	48	1	28	0	0	0	0	0	8	1	84	2
Wilkes-Barre Township	0	0	0	0	0	0	1	0	0	0	1	0
Wright Township	5	0	1	0	0	0	0	0	1	0	7	0
Wyoming Borough	0	0	0	0	0	0	0	0	0	0	0	0
Yatesville Borough	0	0	0	0	0	0	0	0	0	0	0	0
<b>TOTAL</b>	<b>358</b>	<b>59</b>	<b>79</b>	<b>6</b>	<b>8</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>66</b>	<b>3</b>	<b>513</b>	<b>69</b>

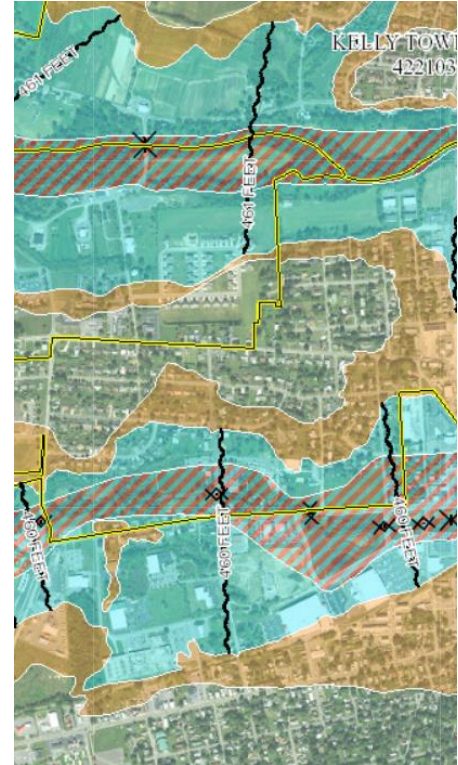
Floods are the most common and costly natural catastrophe in the United States. In terms of economic disruption, property damage, and loss of life, floods are “nature’s number-one disaster” (FEMA, 2019). For that reason, flood insurance is a critical way for citizens to protect their property against flood loss. Home and business owners can purchase flood insurance through private insurers or through the National Flood Insurance Program.

Congress established the NFIP in 1968 to help control the growing cost of federal disaster relief (FEMA, 2019). The NFIP, administered through FEMA, offers federally backed flood insurance at discounted rates when communities adopt and enforce effective floodplain management ordinances to reduce future flood losses based on flood maps. The NFIP is based on voluntary participation of communities but is required for communities to receive federal disaster relief funding.

Table 4.3.3-3 lists the Luzerne County municipalities participating in the NFIP.

The minimum floodplain management requirements to be a community in good standing in the NFIP include:

- Review and permit all development in the Special Flood Hazard Area (SFHA);
- Elevate new and substantially improved residential structures above the Base Flood Elevation;
- Elevate or dry floodproof new and substantially improved non-residential structures;
- Limit development in floodways;
- Locate or construct all public utilities and facilities to minimize or eliminate flood damage; and
- Anchor foundation or structure to resist floatation, collapse, or lateral movement.



Luzerne County’s flood zones can be viewed on FEMA’s National Flood Hazard Layer:  
<https://www.fema.gov/national-flood-hazard-layer-nfhl>

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

**Table 4.3.3-3 Luzerne County Municipal Participation in the National Flood Insurance Program (FEMA, 2020).**

COMMUNITY	PARTICIPATION STATUS	CID	INITIAL FIRM IDENTIFIED	CURRENT EFFECTIVE MAP DATE
Ashley Borough	PARTICIPATING	420596	09/30/1980	11/02/2012
Avoca Borough	PARTICIPATING	420597	07/16/1981	11/02/2012
Bear Creek Village Borough	PARTICIPATING	422756	11/02/2012	11/02/2012
Bear Creek Township	PARTICIPATING	421136	09/29/1978	11/02/2012
Black Creek Township	PARTICIPATING	420958	09/03/1980	11/02/2012
Buck Township	PARTICIPATING	421842	04/15/1981	11/02/2012
Butler Township	PARTICIPATING	420599	12/16/1980	11/02/2012
Conyngham Borough	PARTICIPATING	420992	07/16/1980	11/02/2012
Conyngham Township	PARTICIPATING	420600	02/16/1977	11/02/2012
Courtdale Borough	PARTICIPATING	420601	06/01/1979	11/02/2012
Dallas Borough	PARTICIPATING	421825	01/02/1981	11/02/2012
Dallas Township	PARTICIPATING	420602	04/01/1988	11/02/2012
Dennison Township	PARTICIPATING	422271	04/15/1981	11/02/2012
Dorrance Township	PARTICIPATING	421826	08/15/1980	11/02/2012
Dupont Borough	PARTICIPATING	422250	06/15/1981	11/02/2012
Duryea Borough	PARTICIPATING	420603	06/18/1980	11/02/2012
Edwardsville Borough	PARTICIPATING	420604	04/15/1977	11/02/2012
Exeter Borough	PARTICIPATING	420605	05/16/1977	11/02/2012
Exeter Township	PARTICIPATING	420606	09/15/1983	11/02/2012
Fairmount Township	PARTICIPATING	421827	04/01/1981	11/02/2012
Fairview Township	PARTICIPATING	420993	06/01/1979	11/02/2012
Forty Fort Borough	PARTICIPATING	420607	04/01/1977	11/02/2012
Foster Township	PARTICIPATING	421828	04/01/1981	11/02/2012
Franklin Township	PARTICIPATING	421829	05/19/1981	11/02/2012
Freeland Borough	PARTICIPATING	422637	11/02/2012	11/02/2012
Hanover Township	PARTICIPATING	420608	05/16/1977	11/02/2012
Harveys Lake Borough	PARTICIPATING	420609	12/02/1980	11/02/2012
Hazle Township	PARTICIPATING	421830	04/01/1981	11/02/2012
City of Hazleton	PARTICIPATING	421203	11/02/2012	11/02/2012
Hollenback Township	PARTICIPATING	421831	09/17/1980	11/02/2012
Hughestown Borough	PARTICIPATING	422626	11/02/2012	11/02/2012
Hunlock Township	PARTICIPATING	420994	04/01/1980	11/02/2012
Huntington Township	PARTICIPATING	421832	04/15/1981	11/02/2012
Jackson Township	PARTICIPATING	420610	09/17/1980	11/02/2012
Jeddo Borough	PARTICIPATING	422269	11/02/2012	11/02/2012
Jenkins Township	PARTICIPATING	420611	05/16/1977	11/02/2012

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

**Table 4.3.3-3 Luzerne County Municipal Participation in the National Flood Insurance Program (FEMA, 2020).**

COMMUNITY	PARTICIPATION STATUS	CID	INITIAL FIRM IDENTIFIED	CURRENT EFFECTIVE MAP DATE
Kingston Borough	PARTICIPATING	420612	06/01/1977	11/02/2012
Kingston Township	PARTICIPATING	420613	01/02/1981	11/02/2012
Laflin Borough	PARTICIPATING	420995	12/02/1980	11/02/2012
Lake Township	PARTICIPATING	421833	09/03/1980	11/02/2012
Larksville Borough	PARTICIPATING	420614	04/01/1977	11/02/2012
Laurel Run Borough	PARTICIPATING	421818	09/01/1987	11/02/2012
Lehman Township	PARTICIPATING	420615	12/02/1980	11/02/2012
Luzerne Borough	PARTICIPATING	420616	04/15/1977	11/02/2012
City of Nanticoke	PARTICIPATING	420617	04/15/1977	11/02/2012
Nescopeck Borough	PARTICIPATING	420618	02/01/1980	11/02/2012
Nescopeck Township	PARTICIPATING	420619	08/01/1980	11/02/2012
New Columbus Borough	PARTICIPATING	421819	03/16/1981	11/02/2012
Newport Township	PARTICIPATING	421822	12/02/1980	11/02/2012
Nuangola Borough	PARTICIPATING	422272	09/28/1979	11/02/2012
Penn Lake Park Borough	PARTICIPATING	422645	12/05/1980	11/02/2012
City of Pittston	PARTICIPATING	420620	05/02/1977	11/02/2012
Pittston Township	PARTICIPATING	421834	06/15/1981	11/02/2012
Plains Township	PARTICIPATING	420621	05/16/1977	11/02/2012
Plymouth Borough	PARTICIPATING	420622	04/01/1977	11/02/2012
Plymouth Township	PARTICIPATING	420623	04/15/1977	11/02/2012
Pringle Borough	PARTICIPATING	420624	05/02/1977	11/02/2012
Rice Township	PARTICIPATING	420996	01/02/1981	11/02/2012
Ross Township	PARTICIPATING	421835	04/15/1981	11/02/2012
Salem Township	PARTICIPATING	420625	03/18/1980	11/02/2012
Shickshinny Borough	PARTICIPATING	420626	12/31/1976	11/02/2012
Slocum Township	NOT PARTICIPATING	422712	11/02/2012	11/02/2012
Sugarloaf Township	PARTICIPATING	420997	07/02/1980	11/02/2012
Sugar Notch Borough	PARTICIPATING	421820	11/02/2012	11/02/2012
Swoyersville Borough	PARTICIPATING	420627	06/15/1977	11/02/2012
Union Township	PARTICIPATING	421836	09/30/1980	11/02/2012
Warrior Run Borough	PARTICIPATING	422270	06/25/1976	11/02/2012
West Hazelton Borough	PARTICIPATING	421821	11/02/2012	11/02/2012
West Pittston Borough	PARTICIPATING	420628	04/15/1977	11/02/2012
West Wyoming Borough	PARTICIPATING	420629	04/15/1977	11/02/2012



**Table 4.3.3-3 Luzerne County Municipal Participation in the National Flood Insurance Program (FEMA, 2020).**

COMMUNITY	PARTICIPATION STATUS	CID	INITIAL FIRM IDENTIFIED	CURRENT EFFECTIVE MAP DATE
White Haven Borough	PARTICIPATING	420630	08/01/1977	11/02/2012
City of Wilkes-Barre	PARTICIPATING	420631	09/30/1977	11/02/2012
Wilkes-Barre Township	PARTICIPATING	421823	12/02/1980	11/02/2012
Wright Township	PARTICIPATING	420632	01/16/1981	11/02/2012
Wyoming Borough	PARTICIPATING	420633	11/16/1977	11/02/2012
Yatesville Borough	PARTICIPATING	420634	11/02/2012	11/02/2012

**4.3.3.4. Future Occurrence**

In this plan, the term “Special Flood Hazard Area” is used rather than floodplain to clarify that the area under consideration is identified on the FIRM as having at least a 1-percent chance of flooding in any given year. Historically, the area with a 1-percent chance of flooding in any given year has been called the “100-year floodplain” or the “base flood” and the area with a 0.2-percent chance of flooding in any given year has been called the “500-year floodplain.” As these terms can be misleading by suggesting that there will be a flood only every 100 or 500 years respectively, they are not used in this plan. The 1- and 0.2 percent-annual-chance-floods are delineated on the Luzerne County FIRM. Areas subject to 2 percent- and 10 percent-annual-chance-events are not shown on FIRMs, however, water surface elevations associated with these events are included in the flood source profiles contained in the FIS Report. The most recent FIS for each county in Pennsylvania is available from the FEMA Map Service Center (<http://www.msc.fema.gov>)

The table below shows a range of flood recurrence intervals and associated probabilities of occurrence.

**Table 4.3.3-4 Recurrence intervals and associated probabilities of occurrence (FEMA, 2007).**

RECURRENCE INTERVAL	CHANCE OF OCCURRENCE IN ANY GIVEN YEAR (%)
10 year	10
50 year	2
100 year	1
500 year	0.2

In Luzerne County, flooding occurs commonly and can occur during any season. However, the possibility of flooding is greatly reduced during the winter months. Although most severe floods are attributable to rainfall alone, the spring floods can be compounded by snowmelt and moving ice. The major floods in the late summer and fall are often associated with tropical storms moving up the Atlantic coastline.

As heavy precipitation events often lead to flooding events, changes to precipitation rates due to climate change can be precursors to changes in flood frequency and intensity. According to PEMA Luzerne County experienced more than a 10% increase in precipitation between 1901 and 2016. The trend of increased precipitation (in the form of heavy rainfall) is expected to continue as is a corresponding increase in flood events. Additionally, there has been an increase in North Atlantic hurricane activity over the last several decades due to natural variability and climate change which in turn magnifies the intensity of tropical cyclones. These tropical storms often result in flood events in Pennsylvania and Luzerne County.

Some increase in the severity and frequency of flooding may also result due to planned or recent development within the floodplains of the various streams, as well as increased intensity and frequency of rain events. Therefore, the future occurrence of floods in Luzerne County can be characterized as *likely* as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

#### **4.3.3.5. Vulnerability Assessment**

Flooding can lead to property loss as well as to loss of life. Flooding damages structures, including homes and businesses, vehicles, and infrastructure, including roadways. People who are surrounded by flood waters may at some point require evacuation, placing their lives and the lives of rescuers in danger. Flooding can disrupt the operation of businesses and schools. Recovery from flood damages can be time consuming and costly.

Flood vulnerability is described in terms of what community assets, structures, and infrastructure are situated in locations where flooding is anticipated. For purposes of assessing vulnerability, this plan focuses on those that are located within the SFHA. Please note that while other floods are possible, information about the extent and depths for the flood frequencies likely to be seen in this floodplain are available for all municipalities countywide, thus providing a consistent basis for analysis. Flood vulnerability maps for each applicable local municipality, showing the SFHA, addressable structures, critical facilities and transportation routes within it, are included in **Appendix D**. These maps were created using FEMA Countywide data from the current effective FIRMS.

Table 4.3.3-5 displays the 2010 population per municipality that lives within the SFHA. The City of Wilkes-Barre has the most people living in the SFHA (2,255). Shickshinny Borough has the largest percentage of people living in the SFHA (33.29%).

Some structures and infrastructure in each jurisdiction with SFHAs are at risk of flood damage. Table 4.3.3.5 also displays the total number of structures and critical facilities located within the SFHA. Approximately 2.4% of all addressable structures (3,484 structures) in Luzerne County are located within the SFHA and are most vulnerable to flood losses. The City of Wilkes-Barre also has the most structures located in the SFHA (958), and Shickshinny Borough also has the highest percentage of structures located in the SFHA (30%) and are therefore

most vulnerable to the 1%-annual-chance flood event. Most municipalities in Luzerne County have 5% or less of their structures located in the SFHA. Municipalities with more than 5% of their structures in the SFHA are Ashley Borough, Conyngham Township, Dennison Township, Hanover Township, Harveys Lake Borough, Hunlock Township, Nescopeck Township, Penn Lake Park Borough, Plymouth Township, Shickshinny Borough, West Pittston Borough, and the City of Wilkes-Barre.

Several critical facilities are located within flood-prone areas. These include fire stations, police stations, and municipal buildings. Structures like medical facilities may also require special attention during times of flooding for evacuation purposes are also located in flood-prone areas. Table 4.3.3.5 also shows the number of critical facilities located in the SFHA. Out of 1,774 critical facilities identified throughout Luzerne County, 310 are in the 1%-annual-chance floodplain. Huntington Township has the most critical facilities located in the 1%-annual-chance floodplain with 17. Several municipalities have over a third of their critical facilities in the SFHA. These are Bear Creek Village Borough, Dorrance Township, Fairmount Township, Harveys Lake Borough, Hollenback Township, Hunlock Township, Huntington Township, Luzerne Borough, Nescopeck Township, Plymouth Township, Ross Township, and Shickshinny Borough. These municipalities may be more vulnerable during flood events if many of their critical facilities were impacted. A complete listing of critical facilities is in Appendix E.

In 2019, there were 6,147 NFIP policies in force. A total of 3,993 NFIP claims for flood damages have been made since 1978 for these structures. Cumulative NFIP payments for flood damages have exceeded \$90 million (Source: PA HMP).

Historic resources including landmark buildings, historic structures and sites, commercial and residential districts, rural resources, archaeological and cultural sites, and the historic environment can be impacted by disaster events. Historic and cultural resources can have unique vulnerabilities to hazard events. Depending on the resource, vulnerability to certain hazards may be greater and/or less than that of other assets in the County. For example, historic paper documents may not be impacted by an earthquake or severe winter storms, but historic properties have the potential to be more significantly impacted by these events than newer structures constructed to comply with modern building codes and development regulations. Similarly, flooding may have a more significant impact on a historic property than other properties, but there may be less of an impact on historic sites such as monuments or cemeteries.

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

Table 4.3.3-5 Community Flood Vulnerability for Luzerne County (Luzerne County GIS 2019, U.S. Census 2010, FEMA NFHL 2012).									
MUNICIPALITY	TOTAL STRUCTURES IN MUNICIPALITY	STRUCTURES IN SFHA*	PERCENT OF STRUCTURES IN SFHA	TOTAL CRITICAL FACILITIES IN MUNICIPALITY	TOTAL CRITICAL FACILITIES IN SFHA	PERCENT CRITICAL FACILITIES IN SFHA	TOTAL 2010 POPULATION	2010 POPULATION IN SFHA†	PERCENT POPULATION IN SFHA
Ashley Borough	1,278	73	5.71%	17	3	17.65%	2,790	81	2.90%
Avoca Borough	1,185	54	4.56%	18	5	27.78%	2,661	129	4.85%
Bear Creek Village Borough	165	3	1.82%	46	10	21.74%	257	40	15.56%
Bear Creek Township	1,467	3	0.20%	5	3	60.00%	2,777	56	2.02%
Black Creek Township	1,217	32	2.63%	22	6	27.27%	2,016	46	2.28%
Buck Township	270	1	0.37%	6	0	0.00%	391	38	9.72%
Butler Township	4,332	102	2.35%	62	12	19.35%	9,275	345	3.72%
Conyngham Borough	816	1	0.12%	6	1	16.67%	1,914	0	0.00%
Conyngham Township	736	65	8.83%	22	6	27.27%	1,453	249	17.14%
Courtdale Borough	336	1	0.30%	5	0	0.00%	732	0	0.00%
Dallas Borough	1,306	25	1.91%	14	2	14.29%	2,807	63	2.24%
Dallas Township	3,584	17	0.47%	52	7	13.46%	8,991	48	0.53%
Dennison Township	583	42	7.20%	18	4	22.22%	1,128	29	2.57%
Dorrance Township	1,004	5	0.50%	40	14	35.00%	2,188	126	5.76%

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

**Table 4.3.3-5 Community Flood Vulnerability for Luzerne County (Luzerne County GIS 2019, U.S. Census 2010, FEMA NFHL 2012).**

MUNICIPALITY	TOTAL STRUCTURES IN MUNICIPALITY	STRUCTURES IN SFHA*	PERCENT OF STRUCTURES IN SFHA	TOTAL CRITICAL FACILITIES IN MUNICIPALITY	TOTAL CRITICAL FACILITIES IN SFHA	PERCENT CRITICAL FACILITIES IN SFHA	TOTAL 2010 POPULATION	2010 POPULATION IN SFHA†	PERCENT POPULATION IN SFHA
Dupont Borough	1,370	60	4.38%	18	2	11.11%	2,715	179	6.59%
Duryea Borough	2,228	10	0.45%	20	3	15.00%	4,917	91	1.85%
Edwardsville Borough	1,911	14	0.73%	12	3	25.00%	4,816	100	2.08%
Exeter Borough	2,584	23	0.89%	15	1	6.67%	5,652	224	3.96%
Exeter Township	1,034	31	3.00%	23	1	4.35%	2,378	163	6.85%
Fairmount Township	755	15	1.99%	30	11	36.67%	1,276	63	4.94%
Fairview Township	1,864	4	0.21%	17	2	11.76%	4,520	167	3.69%
Forty Fort Borough	1,965	21	1.07%	12	0	0.00%	4,214	481	11.41%
Foster Township	1,986	26	1.31%	37	5	13.51%	3,467	67	1.93%
Franklin Township	793	3	0.38%	18	4	22.22%	1,757	0	0.00%
Freeland Borough	1,660	0	0.00%	4	0	0.00%	3,531	0	0.00%
Hanover Township	5,306	353	6.65%	90	10	11.11%	11,069	839	7.58%
Harveys Lake Borough	2,083	394	18.92%	15	5	33.33%	2,796	200	7.15%
Hazle Township	5,226	35	0.67%	72	8	11.11%	9,534	85	0.89%
City of Hazleton	10,316	0	0.00%	57	0	0.00%	25,340	0	0.00%

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

**Table 4.3.3-5 Community Flood Vulnerability for Luzerne County (Luzerne County GIS 2019, U.S. Census 2010, FEMA NFHL 2012).**

MUNICIPALITY	TOTAL STRUCTURES IN MUNICIPALITY	STRUCTURES IN SFHA*	PERCENT OF STRUCTURES IN SFHA	TOTAL CRITICAL FACILITIES IN MUNICIPALITY	TOTAL CRITICAL FACILITIES IN SFHA	PERCENT CRITICAL FACILITIES IN SFHA	TOTAL 2010 POPULATION	2010 POPULATION IN SFHA†	PERCENT POPULATION IN SFHA
Hollenback Township	683	33	4.83%	11	5	45.45%	1,196	9	0.75%
Hughestown Borough	665	0	0.00%	5	0	0.00%	1,392	0	0.00%
Hunlock Township	1,072	99	9.24%	29	14	48.28%	2,443	205	8.39%
Huntington Township	994	5	0.50%	45	17	37.78%	2,248	236	10.50%
Jackson Township	1,082	5	0.46%	19	4	21.05%	4,646	82	1.76%
Jeddo Borough	54	0	0.00%	1	0	0.00%	98	0	0.00%
Jenkins Township	2,107	34	1.61%	27	3	11.11%	4,442	166	3.74%
Kingston Borough	5,502	0	0.00%	44	0	0.00%	13,182	0	0.00%
Kingston Township	3,141	65	2.07%	35	9	25.71%	6,999	82	1.17%
Laflin Borough	664	12	1.81%	13	3	23.08%	1,487	35	2.35%
Lake Township	919	10	1.09%	24	6	25.00%	2,049	13	0.63%
Larksville Borough	1,972	12	0.61%	14	1	7.14%	4,480	0	0.00%
Laurel Run Borough	267	0	0.00%	3	0	0.00%	500	0	0.00%
Lehman Township	1,669	0	0.00%	33	6	18.18%	3,503	55	1.57%
Luzerne Borough	1,331	1	0.08%	10	4	40.00%	2,845	0	0.00%

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

Table 4.3.3-5 Community Flood Vulnerability for Luzerne County (Luzerne County GIS 2019, U.S. Census 2010, FEMA NFHL 2012).									
MUNICIPALITY	TOTAL STRUCTURES IN MUNICIPALITY	STRUCTURES IN SFHA*	PERCENT OF STRUCTURES IN SFHA	TOTAL CRITICAL FACILITIES IN MUNICIPALITY	TOTAL CRITICAL FACILITIES IN SFHA	PERCENT CRITICAL FACILITIES IN SFHA	TOTAL 2010 POPULATION	2010 POPULATION IN SFHA†	PERCENT POPULATION IN SFHA
City of Nanticoke	4,745	18	0.38%	26	4	15.38%	10,465	2	0.02%
Nescopeck Borough	704	1	0.14%	5	0	0.00%	1,583	8	0.51%
Nescopeck Township	511	31	6.07%	25	9	36.00%	1,138	116	10.19%
New Columbus Borough	105	3	2.86%	4	1	25.00%	225	12	5.33%
Newport Township	2,051	8	0.39%	19	3	15.79%	5,374	11	0.20%
Nuangola Borough	408	10	2.45%	2	0	0.00%	679	110	16.20%
Penn Lake Park Borough	249	15	6.02%	4	1	25.00%	308	53	17.21%
City of Pittston	3,514	8	0.23%	41	2	4.88%	7,739	0	0.00%
Pittston Township	1,637	4	0.24%	14	2	14.29%	3,364	0	0.00%
Plains Township	4,696	157	3.34%	58	6	10.34%	9,961	361	3.62%
Plymouth Borough	2,903	1	0.03%	18	0	0.00%	5,951	0	0.00%
Plymouth Township	890	101	11.35%	20	8	40.00%	1,812	177	9.77%
Pringle Borough	459	0	0.00%	7	1	14.29%	979	0	0.00%
Rice Township	1,427	22	1.54%	33	7	21.21%	3,335	338	10.13%

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

<b>Table 4.3.3-5 Community Flood Vulnerability for Luzerne County (Luzerne County GIS 2019, U.S. Census 2010, FEMA NFHL 2012).</b>									
MUNICIPALITY	TOTAL STRUCTURES IN MUNICIPALITY	STRUCTURES IN SFHA*	PERCENT OF STRUCTURES IN SFHA	TOTAL CRITICAL FACILITIES IN MUNICIPALITY	TOTAL CRITICAL FACILITIES IN SFHA	PERCENT CRITICAL FACILITIES IN SFHA	TOTAL 2010 POPULATION	2010 POPULATION IN SFHA†	PERCENT POPULATION IN SFHA
Ross Township	1,413	7	0.50%	36	12	33.33%	2,937	437	14.88%
Salem Township	1,909	33	1.73%	39	9	23.08%	4,269	261	6.11%
Shickshinny Borough	345	104	30.14%	8	4	50.00%	838	279	33.29%
Slocum Township	534	1	0.19%	9	2	22.22%	1,115	1	0.09%
Sugarloaf Township	1,747	9	0.52%	4	0	0.00%	4,205	322	7.66%
Sugar Notch Borough	468	0	0.00%	39	7	17.95%	989	0	0.00%
Swoyersville Borough	2,438	5	0.21%	12	1	8.33%	5,062	60	1.19%
Union Township	959	18	1.88%	24	6	25.00%	2,042	38	1.86%
Warrior Run Borough	281	0	0.00%	3	0	0.00%	584	0	0.00%
West Hazelton Borough	1,936	0	0.00%	21	0	0.00%	4,561	0	0.00%
West Pittston Borough	2,177	188	8.64%	6	1	16.67%	4,868	558	11.46%
West Wyoming Borough	1,299	44	3.39%	8	1	12.50%	2,725	189	6.94%
White Haven Borough	561	0	0.00%	8	1	12.50%	1,097	0	0.00%
City of Wilkes-Barre	16,308	958	5.87%	35	1	2.86%	41,489	2,255	5.44%



## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

<b>Table 4.3.3-5 Community Flood Vulnerability for Luzerne County (Luzerne County GIS 2019, U.S. Census 2010, FEMA NFHL 2012).</b>									
<b>MUNICIPALITY</b>	<b>TOTAL STRUCTURES IN MUNICIPALITY</b>	<b>STRUCTURES IN SFHA*</b>	<b>PERCENT OF STRUCTURES IN SFHA</b>	<b>TOTAL CRITICAL FACILITIES IN MUNICIPALITY</b>	<b>TOTAL CRITICAL FACILITIES IN SFHA</b>	<b>PERCENT CRITICAL FACILITIES IN SFHA</b>	<b>TOTAL 2010 POPULATION</b>	<b>2010 POPULATION IN SFHA†</b>	<b>PERCENT POPULATION IN SFHA</b>
Wilkes-Barre Township	1,895	9	0.47%	109	15	13.76%	2,983	0	0.00%
Wright Township	2,376	10	0.42%	36	4	11.11%	5,648	59	1.04%
Wyoming Borough	1,504	30	1.99%	13	2	15.38%	3,073	101	3.29%
Yatesville Borough	288	0	0.00%	2	0	0.00%	607	0	0.00%
<b>TOTAL</b>	<b>144,219</b>	<b>3,484</b>	<b>2.42%</b>	<b>1,774</b>	<b>310</b>	<b>17.47%</b>	<b>320,877</b>	<b>10,540</b>	<b>3.28%</b>
<p>* Calculated by overlaying Luzerne County GIS structure data and FEMA's SFHA. Note that following the 2011 flood event approximately 300 structures were acquired and demolished in the SFHA which may not be reflected in the structure dataset.</p> <p>† Calculated by selecting the 2010 census block centroids that intersect the SFHAs in order to provide an approximation of populations living near the SFHA.</p>									

Table 4.3.3-6 shows the number of mobile homes located in the SFHA in each municipality. Mobile homes are more vulnerable to flood risk because they can be washed out if the proper protection measures are not taken. FEMA recommends anchoring or elevation techniques to protect mobile homes from flood risk. More information for these techniques can be found online: <https://www.fema.gov/manufactured-mobile-home>. Rice Township has the greatest number of mobile homes in the SFHA (18). Laflin Borough has the highest percentage of mobile homes in the SFHA; however, the municipality only has one mobile home, so it does not have as high as risk as municipalities with larger numbers of mobile homes. There are seven municipalities with greater than 10% of their mobile homes within the SFHA; making them more vulnerable to flood damages. These are Avoca Borough, Dupont Borough, Laflin Borough, Nescopeck Township, Plymouth Township, Rice Township, and West Wyoming Borough.

**Table 4.3.3-6 Mobile Home Flood Vulnerability in Luzerne County**

MUNICIPALITY	TOTAL MOBILE HOMES	TOTAL MOBILE HOMES IN SFHA	PERCENT MOBILE HOMES IN SFHA	MUNICIPALITY	TOTAL MOBILE HOMES	TOTAL MOBILE HOMES IN SFHA	PERCENT MOBILE HOMES IN SFHA
Ashley Borough	174	0	0.00%	Laflin Borough	1	1	100.00%
Avoca Borough	32	4	12.50%	Lake Township	114	1	0.08%
Bear Creek Village Borough	0	0	0.00%	Larksville Borough	84	1	1.19%
Bear Creek Township	12	0	0.00%	Laurel Run Borough	117	0	0.00%
Black Creek Township	37	3	8.11%	Lehman Township	116	0	0.00%
Buck Township	14	0	0.00%	Luzerne Borough	16	0	0.00%
Butler Township	70	3	4.29%	City of Nanticoke	3	0	0.00%
Conyngham Borough	0	0	0.00%	Nescopeck Borough	21	0	0.00%
Conyngham Township	49	0	0.00%	Nescopeck Township	38	4	10.53%
Courtdale Borough	7	0	0.00%	New Columbus Borough	18	1	5.56%
Dallas Borough	2	0	0.00%	Newport Township	10	0	0.00%
Dallas Township	195	0	0.00%	Nuangola Borough	6	0	0.00%
Dennison Township	50	0	0.00%	Penn Lake Park Borough	0	0	0.00%
Dorrance Township	65	0	0.00%	City of Pittston	19	0	0.00%
Dupont Borough	39	6	15.38%	Pittston Township	84	0	0.00%
Duryea Borough	28	1	3.57%	Plains Township	162	5	3.09%
Edwardsville Borough	9	0	0.00%	Plymouth Borough	8	0	0.00%
Exeter Borough	248	6	2.42%	Plymouth Township	24	3	12.50%

**Table 4.3.3-6 Mobile Home Flood Vulnerability in Luzerne County**

MUNICIPALITY	TOTAL MOBILE HOMES	TOTAL MOBILE HOMES IN SFHA	PERCENT MOBILE HOMES IN SFHA	MUNICIPALITY	TOTAL MOBILE HOMES	TOTAL MOBILE HOMES IN SFHA	PERCENT MOBILE HOMES IN SFHA
Exeter Township	21	1	4.76%	Pringle Borough	8	0	0.00%
Fairmount Township	57	0	0.00%	Rice Township	117	18	15.38%
Fairview Township	1	0	0.00%	Ross Township	105	0	0.00%
Forty Fort Borough	1	0	0.00%	Salem Township	129	1	0.78%
Foster Township	128	0	0.00%	Shickshinny Borough	3	0	0.00%
Franklin Township	111	0	0.00%	Slocum Township	20	0	0.00%
Freeland Borough	27	0	0.00%	Sugarloaf Township	38	1	2.63%
Hanover Township	85	3	3.53%	Sugar Notch Borough	1	0	0.00%
Harveys Lake Borough	57	1	1.75%	Swoyersville Borough	15	0	0.00%
Hazle Township	140	0	0.00%	Union Township	45	0	0.00%
City of Hazleton	132	0	0.00%	Warrior Run Borough	4	0	0.00%
Hollenback Township	45	0	0.00%	West Hazelton Borough	2	0	0.00%
Hughestown Borough	7	0	0.00%	West Pittston Borough	0	0	0.00%
Hunlock Township	83	5	6.02%	West Wyoming Borough	13	2	15.38%
Huntington Township	98	0	0.00%	White Haven Borough	46	0	0.00%
Jackson Township	9	0	0.00%	City of Wilkes-Barre	10	0	0.00%
Jeddo Borough	0	0	0.00%	Wilkes-Barre Township	15	0	0.00%
Jenkins Township	299	0	0.00%	Wright Township	15	0	0.00%
Kingston Borough	2	0	0.00%	Wyoming Borough	3	0	0.00%
Kingston Township	138	0	0.00%	Yatesville Borough	2	0	0.00%
				<b>Total</b>	3,904	71	1.82%

Luzerne County is also vulnerable to flood risk on Toxic Release Inventory facilities. Section 4.3.14 describes Luzerne’s County risk to Hazardous Materials Release in depth.

Additional information on flood vulnerability and losses in Luzerne County, including the 1%-annual-chance flood event results from Hazus, FEMA’s loss estimation software, is provided in Section 4.4.3: Potential Loss Estimates.

#### **4.3.3.6. *Flood Vulnerability and Historic Resources***

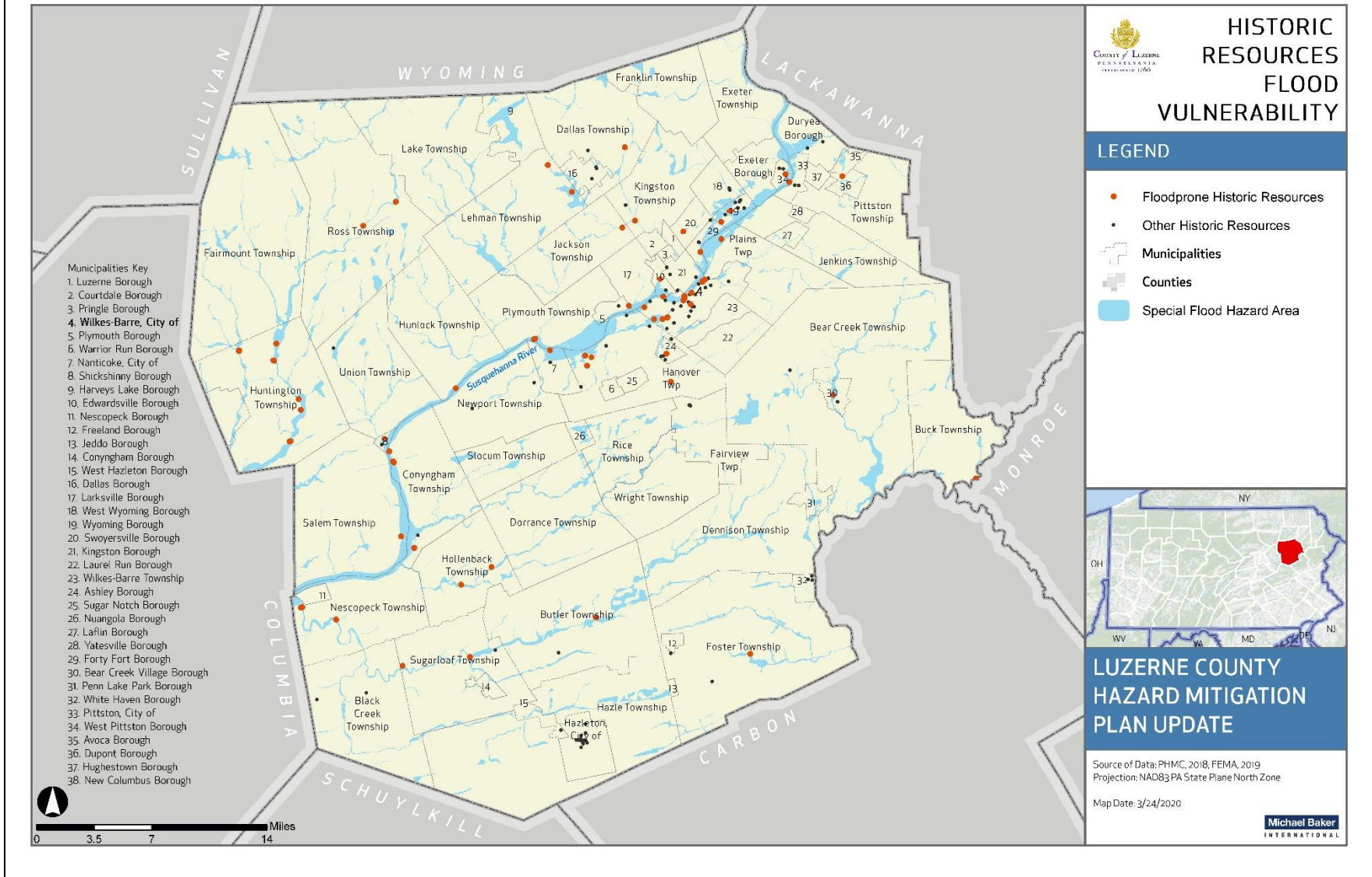
Flood vulnerability is described in terms of what community assets, structures, and infrastructure are situated in locations where flooding is anticipated. For purposes of assessing vulnerability, this plan focuses on assets that are in the Special Flood Hazard Area (SFHA), or the area that would be flooded by a 1-percent-annual-chance flood. This flood frequency was chosen because information about the extent and depth of the 1-percent-annual-chance flood is available for all municipalities countywide, thus providing a consistent basis for analysis.

Luzerne County's older and historic places make important contributions to its communities' overall quality of life, economy, and sense of place. In the wake of several disasters in recent years including hurricanes Sandy and Irene and Tropical Storm Lee, the Pennsylvania State Historic Preservation Office (PA SHPO) and the Pennsylvania Emergency Management Agency (PEMA) are encouraging counties to integrate historic preservation considerations into local hazard mitigation plans. By prioritizing historic resources for mitigation, local officials and hazard mitigation planners can help preserve communities' historic built environments—and sense of place—for many years to come.

The Pennsylvania Historical and Museum Commission (PHMC) has been collecting information on historic resources in Pennsylvania for the greater part of a century. According to the PHMC's Cultural Resources Geographic Information System, Luzerne County has 41 historic resources listed in the National Register of Historic Places and 175 historic resources that are eligible to be listed. The National Register of Historic Places is the nation's official list of properties recognized for their significance in American history, architecture, archeology, engineering and culture. To be eligible, a property typically must be at least 50 years old, retain a high degree of integrity, and have some level of historic significance. To be officially listed, a property must be documented and evaluated according to uniform criteria established by the National Park Service.

Not surprisingly given the County's historic dependence on water for energy and transportation, many of the historic resources in Luzerne County are in floodprone areas. Currently, Luzerne County has 66 eligible or listed historic resources in the SFHA, including 33 structures, 17 buildings, 11 districts, four sites, and one object. Figure 4.3.3.3 shows the location of historic resources while Table 4.3.3-7 lists the number and type of Floodprone historic resources in each municipality. The City of Wilkes-Barre and Huntington Township have the most vulnerable historic resources, with eleven and nine, respectively.

Figure 4.3.3-3 Map showing the location of floodprone historic resources throughout Luzerne County



Historic districts may be of interest for hazard mitigation, since they typically include a cluster of historic resources in a community. Luzerne County has three listed districts in the SFHA, including the Bear Creek Village Historic District in Bear Creek Village Borough, the River Street Historic District in the City of Wilkes-Barre, and the Stoddartsville Historic District in Bucks Township. Luzerne County also has eight eligible districts in the SFHA, including Hillside Farms, Lehigh Valley Railroad (Allentown to Wilkes-Barre), Lehigh Valley Railroad (Wilkes-Barre), Loomis Colliery, Loomis Park, West End Coal Company Worker Housing: Italy Street Historic District, West End Coal Company Worker Housing: Main Street Historic District, and West Pittston Historic District.

In a Historic Resources and Risk Reduction Report (**Appendix G**) prepared for the Borough of West Pittston by FEMA Region III in 2019, flood events were confirmed as the greatest threat to historic resources in West Pittston. The report is meant to serve as an example for other communities interested in historic property mitigation. Based on a review of the history of flooding in West Pittston and the way that historic resources shape the character of the community, the report assesses the impact of four possible mitigation strategies - acquisition and demolition, relocation, elevation, and floodproofing. The report summarizes the impact of each strategy on flood risk and on historic resources and finds that there is often a tradeoff - with the strategies that provide the most reduction in risk also having the greatest impact on historic resources. The information in the report can help local stakeholders weigh these tradeoffs and make informed decisions about which properties to prioritize for mitigation and which strategies to pursue.

**Table 4.3.3-7** Number of Flood-Prone Historical Resources by Municipality

MUNICIPALITY	Buildings	Districts	Sites	Structures	TOTAL
Ashley Borough	1	0	0	0	1
Bear Creek Village Borough	0	1	0	0	1
Buck Township	0	1	0	0	1
Butler Township	0	0	0	1	1
Conyngham Township	2	2	0	0	4
Dallas Township	1	0	0	0	1
Dupont Borough	0	0	0	1	1
Edwardsville Borough	0	0	0	2	2
Forty Fort Borough	1	0	0	0	1
Foster Township	0	0	0	1	1
Hanover Township	1	2	1	0	4
Hollenback Township	0	0	0	3	3
Huntington Township	0	0	0	9	9

<b>Table 4.3.3-7 Number of Flood-Prone Historical Resources by Municipality</b>					
<b>MUNICIPALITY</b>	<b>Buildings</b>	<b>Districts</b>	<b>Sites</b>	<b>Structures</b>	<b>TOTAL</b>
Jackson Township	0	1	0	0	1
Kingston Township	1	0	0	0	1
Lehman Township	1	0	1	0	2
City of Nanticoke	0	0	0	1	1
Nescopeck Township	1	0	0	2	3
Newport Township	0	0	0	1	1
Plains Township	1	0	0	0	1
Plymouth Borough	1	0	0	0	1
Plymouth Township	0	0	0	2	2
Ross Township	0	0	0	2	2
Salem Township	0	0	0	1	1
Shickshinny Borough	1	0	0	0	1
Sugarloaf Township	0	0	0	2	2
Swoyersville Borough	1	0	0	0	1
West Pittston Borough	0	1	0	1	2
City of Wilkes-Barre	4	2	1	4	11
Wyoming Borough	0	0	1	0	1
Multiple	0	1	0	0	1
<b>TOTAL</b>	<b>17</b>	<b>11</b>	<b>4</b>	<b>33</b>	<b>65</b>

**4.3.4. Hailstorm**



**4.3.4.1. Location and Extent**

Hailstorm events can occur in all areas of Luzerne County. Neither the duration of the storm nor the extent of the area affected by such an occurrence can be predicted. Hail precipitation is often produced at the front of a severe thunderstorm or in conjunction with a tornado event. Hailstorms occur when ice crystals form within a low pressure front due to the rapid rise of warm air into the upper atmosphere and the subsequent cooling of the air mass. Frozen droplets gradually accumulate on the ice crystals until, having developed sufficient weight, they fall as precipitation in the form of balls or irregularly shaped masses of ice. Hailstones are formed most commonly in thunderstorms with intense updraft, high liquid water content, large vertical extent, large water droplets, and cloud layers below freezing (NOAA NSSL, 2020).

**4.3.4.2. Range of Magnitude**

Hail is described qualitatively and quantitatively by its size and can range from 0.2 inches to 4.5 inches; as shown in Table 4.3.4-1. The size of hail is dependent on the strength of the upward air movement along the front of a thunderstorm, called the updraft. Hailstone nuclei are buoyed or lifted by the updraft and increase in size the longer the stone is held aloft. Weaker updrafts create smaller hailstones while strong updrafts provide a longer amount of time for hailstone nuclei to grow in diameter (NOAA NSSL, 2020). Luzerne County has experienced hail ranging in size from 0.75 to 2.08 inches in diameter (NOAA NCEI, 2019).

**Table 4.3.4-1 Hailstone size and relationship to updraft speed (NOAA NSSL, 2020).**

HAILSTONE SIZE	MEASUREMENT (INCHES)	UPDRAFT SPEED (MPH)
BB	< 0.25	< 24
Pea	0.25	24
Marble	0.50	35
Dime	0.70	38
Penny	0.75	40
Nickel	0.88	46
Quarter	1.00	49
Half Dollar	1.25	54
Walnut	1.50	60
Golf Ball	1.75	64
Hen Egg	2.00	69
Tennis Ball	2.50	77
Baseball	2.75	81
Teacup	3.00	84
Grapefruit	4.00	98
Softball	4.50	103

Hailstorms can cause significant damage to crops, livestock and property, depending on the size, duration, and intensity of hail precipitation. Automobiles and aircraft are particularly



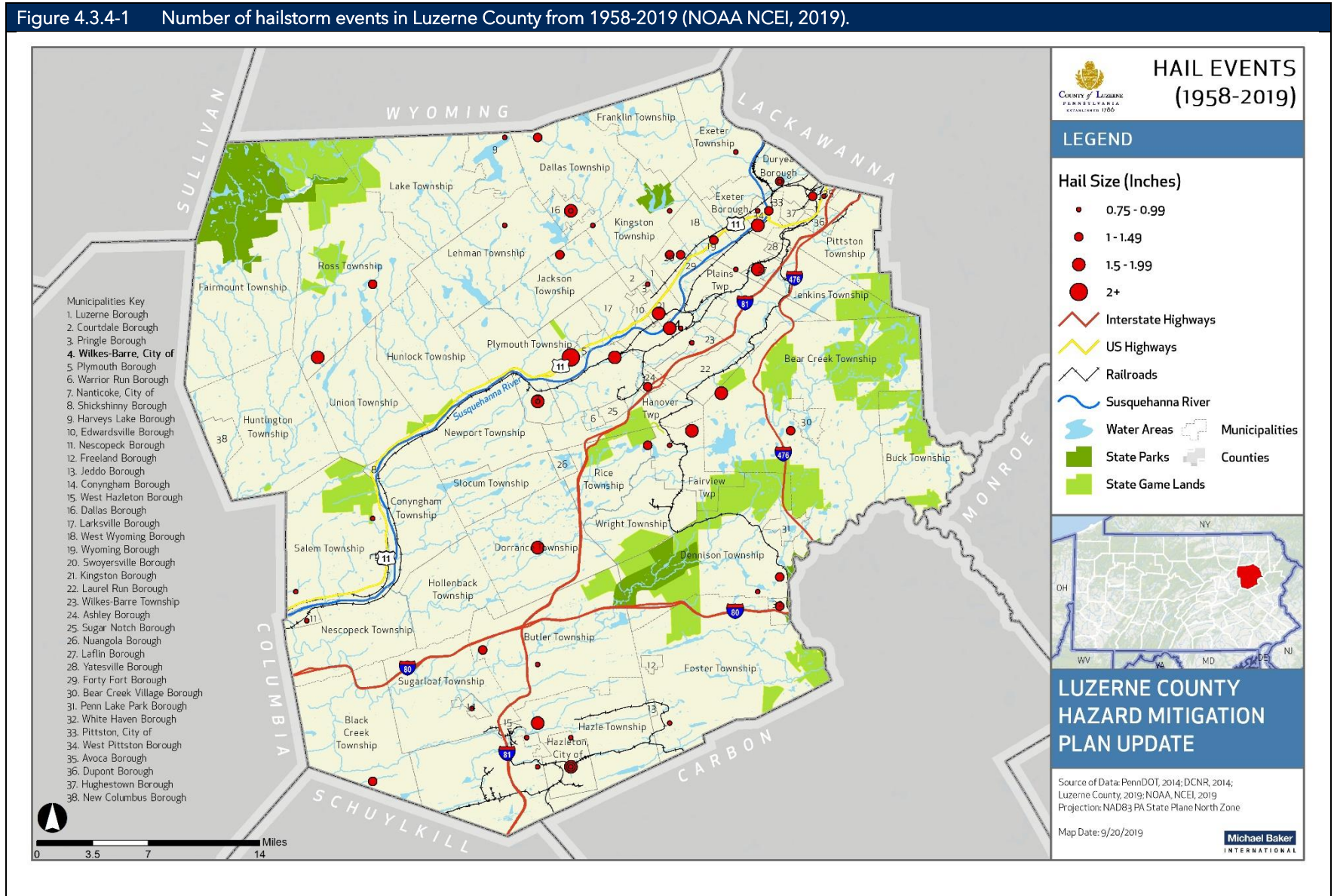
susceptible to damage. Also, people are at risk for serious injury if they don't seek immediate shelter. Since hail precipitation usually occurs during thunderstorm events, the impacts of other hazards associated with thunderstorms (i.e. strong winds, intense precipitation, etc.) often occur simultaneously (NOAA NSSL, 2020).

A potential worst-case scenario of a hailstorm would be if a storm carrying hail of over two inches were to occur over a prolonged period in a predominantly agricultural area. Because hail can cause significant crop damage, a storm of this magnitude would potentially destroy agricultural yields and result in significant lost revenue, as well as property damage and injuries.

#### **4.3.4.3. Past Occurrence**

Figure 4.3.4-1 shows a map of the number of recorded hailstorm events in Luzerne county between 1950 and 2019. A hailstorm event is defined as a storm with hail of  $\frac{3}{4}$  inches or greater in diameter. According to PEMA, approximately 96 percent of hailstorm events occurred during the months of April, May, June, July, August, and September. In addition, approximately 87% of historic events occurred during the afternoon or evening. Both results are consistent with the relationship between hail and thunderstorms, which most often occur during late spring, summer, and early fall months.

Figure 4.3.4-1 Number of hailstorm events in Luzerne County from 1958-2019 (NOAA NCEI, 2019).



## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

NOAA reports 87 hail events in Luzerne County from 1950-2019. This includes damage estimates for all hailstorms reported by local field offices. A list of all damages aggregated to the municipal scale is provided in the table below. PEMA determined that these events have caused a total of \$43,000 in property damage and \$1,000 in crop damage in Luzerne County.

**Table 4.3.4-2** Previous hail events in Luzerne County between 1950 and 2019 (NOAA NCEI, 2019). Note that countywide notes the event occurred in multiple locations.

LOCATION	DATE	ESTIMATED MAGNITUDE (inches)	ESTIMATED PROPERTY DAMAGE (\$)
Countywide	06/10/1958	1.00	<i>not provided</i>
Countywide	06/06/1971	1.38	<i>not provided</i>
Countywide	07/03/1975	1.25	<i>not provided</i>
Countywide	06/29/1976	1.75	<i>not provided</i>
Countywide	06/30/1976	1.75	<i>not provided</i>
Countywide	06/24/1985	2.08	<i>not provided</i>
Countywide	7/12/1985	1.00	<i>not provided</i>
Countywide	06/30/1990	1.75	<i>not provided</i>
Mountaintop	08/27/1994	1.00	<i>not provided</i>
Mountaintop	06/14/1995	1.00	\$3,000
Countywide	07/06/1995	0.75	\$1,000
Countywide	07/15/1995	1.00	<i>not provided</i>
Dorran	05/24/2000	1.75	<i>not provided</i>
Huntsville	07/10/2001	1.00	<i>not provided</i>
Nanticoke	07/11/2001	1.75	<i>not provided</i>
White Haven	05/11/2003	0.75	<i>not provided</i>
Wilkes-Barre	08/16/2003	0.75	<i>not provided</i>
Dallas	05/24/2004	1.00	<i>not provided</i>
Nescopeck	06/06/2005	0.75	<i>not provided</i>
Nanticoke	04/24/2006	0.88	<i>not provided</i>
White Haven	05/30/2006	0.75	<i>not provided</i>
Countywide	06/09/2006	0.84	<i>not provided</i>
Countywide	07/09/2006	0.82	<i>not provided</i>
West Hazleton	07/11/2006	0.75	<i>not provided</i>
Harveys Lake	05/31/2007	0.75	<i>not provided</i>
Wilkes-Barre	07/06/2007	0.75	<i>not provided</i>
Countywide	08/17/2007	1.08	\$25,000
Countywide	06/20/2008	0.94	<i>not provided</i>
Countywide	08/10/2008	0.75	<i>not provided</i>
Countywide	06/15/2009	0.88	<i>not provided</i>
Hazleton	07/19/2010	0.88	<i>not provided</i>
Ashley	09/13/2010	1.00	<i>not provided</i>

**Table 4.3.4-2** Previous hail events in Luzerne County between 1950 and 2019 (NOAA NCEI, 2019). Note that countywide notes the event occurred in multiple locations.

LOCATION	DATE	ESTIMATED MAGNITUDE (inches)	ESTIMATED PROPERTY DAMAGE (\$)
Countywide	09/22/2010	0.88	not provided
Forty Fort	04/26/2011	1.00	\$10,000
Countywide	05/26/2011	1.17	not provided
Countywide	06/09/2011	0.75	not provided
Conyngham	08/13/2011	1.00	not provided
White Haven	08/19/2011	1.00	not provided
Pond Hill	09/04/2011	0.88	not provided
Pittston	06/22/2012	1.00	not provided
Necopeck	07/26/2012	0.75	not provided
Countywide	09/06/2012	0.83	not provided
Duryea	04/10/2013	1.00	not provided
Dallas	06/24/2013	1.75	\$2,000
Countywide	05/22/2014	0.88	not provided
Countywide	03/16/2016	0.88	not provided
Countywide	02/25/2017	1.38	not provided
Countywide	07/17/2017	1.25	\$3,000
Duryea	05/10/2018	0.75	not provided
Countywide	05/15/5018	0.75	not provided
Countywide	04/15/2019	1.13	not provided
Dallas	05/19/2019	0.75	not provided

**4.3.4.4. Future Occurrence**

It is not possible to predict the formation of a hailstorm with more than a few days’ lead time. The past occurrences in the County described above, however, indicate that this event is one that can happen several times in any given year, most likely during the late spring and summer months. Based on prior occurrences, the County can expect a 1-49.9% probability of hailstorms occurring annually. Therefore, the future occurrence of hailstorms in Luzerne County can be considered *possible* as defined by the Risk Factor methodology probability criteria (See Table 4.4.1-1).

**4.3.4.5. Vulnerability Assessment**

All of Luzerne County, including all critical infrastructure, is vulnerable to the effects of hail, as the storm cells that produce this hazard are spread over a large (multi-county) area. The area of damage due to these storms is relatively small, in that a single storm does not cause widespread devastation but may cause damage in a focused area of the storm.

As a hazard, damage to crops and vehicles are typically the most significant impacts of hailstorms. Damage to trees, shrubbery, and other vegetation may occur during hailstorm events through defoliation. Unless there are compounding stresses, natural vegetation can

typically recover over time following the event. However, crops such as corn and soybeans can be damaged to the point of total loss, particularly if an event occurs later in the growing season.

Potential losses from a hailstorm event can be derived from agricultural sales information as reported in the Drought hazard profile, Section 4.3.1. There are 451 farms located in Luzerne County. These businesses sold approximately \$17,793,000 in agricultural products in 2017, the majority of which came from crop sales, totaling \$13,287,000 (75%).

### 4.3.5. Hurricane, Tropical Storm, Nor'easter



#### 4.3.5.1. Location and Extent

Hurricanes, tropical storms, and nor'easters are classified as cyclones and are any closed circulation developing around a low-pressure center in which the winds rotate counterclockwise. Tropical storms impacting Luzerne County develop in tropical or sub-tropical waters found in the Atlantic Ocean, Gulf of Mexico, or Caribbean Sea. Cyclones with maximum sustained winds of less than 39 miles per hour are called tropical

depressions. A tropical storm is a cyclone with maximum sustained winds between 39-74 mph. These storms sometimes develop into hurricanes with wind speeds in excess of 74 mph. Although Luzerne County is located over 100 miles inland from the Atlantic Coast, tropical storms and hurricanes can track inland causing heavy rainfall and strong winds.

Nor'easters are extra-tropical storms which typically develop from low-pressure centers off the Atlantic Coast during the winter months. Extra-tropical is a term used to describe a hurricane or tropical storm with a cyclone that has lost its 'tropical' characteristics. While an extra-tropical storm denotes a change in weather pattern and how the storm is gathering energy, it may still have northeast winds that are tropical storm or hurricane force. Nor'easters can also produce heavy precipitation in the form of rain, snow, or ice.

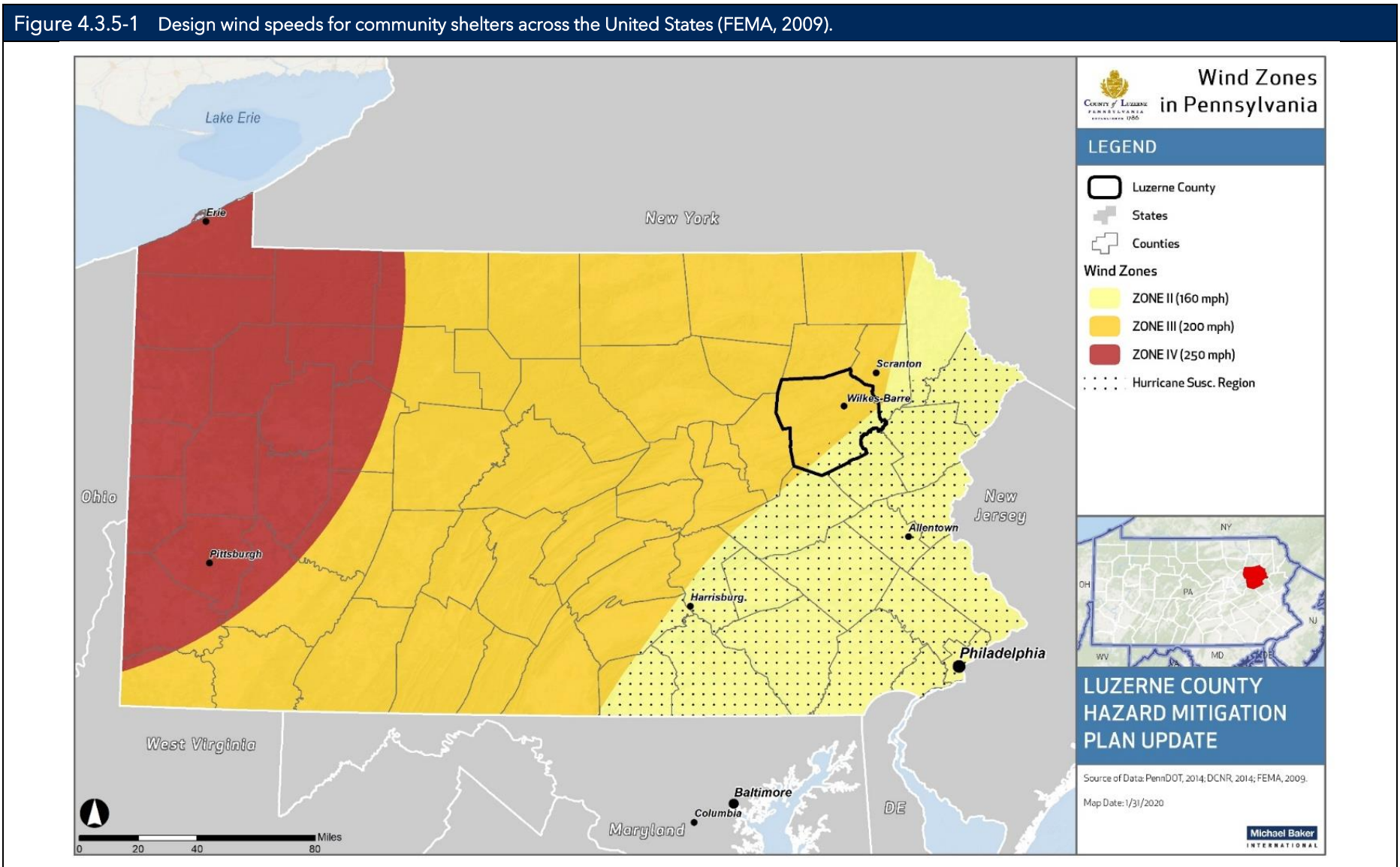
Hurricanes, tropical storms, and nor'easters are regional events that can impact areas as large as hundreds or thousands of miles across through the life the storm. Therefore, all communities within Luzerne County are equally subject to the impacts of hurricanes, tropical storms, and nor'easters that track through or near the region. Areas in Luzerne County which are subject to flooding, wind, and winter storm damage are particularly vulnerable in these situations.

The map below shows wind speed zones developed by the American Society of Civil Engineers. This information is based on 40 years of tornado history and over 100 years of hurricane history. It identifies wind speeds that could occur across the United States to be used as the basis for design and evaluation of the structural integrity of shelters and critical facilities.

Luzerne County falls in Zone II and Zone III, which are classified as 160 mph and 200 mph wind zones, respectively. This means design wind speeds for shelters and critical facilities should be able to withstand a three second gust of up to 160 mph and 200 mph, regardless of whether the gust is the result of a tornado, hurricane, tropical storm, or windstorm event. In Luzerne, County, all new residential and commercial structures are required to be constructed per the International Building Code, which requires structures to be designed to a 90-mph wind speed. Therefore, the impact to future development due to high wind events is expected to be minimal

# LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

Figure 4.3.5-1 Design wind speeds for community shelters across the United States (FEMA, 2009).



**4.3.5.2. Range of Magnitude**

The impacts associated with hurricanes and tropical storms are primarily wind damage and flooding. It is not uncommon for tornadoes to develop during these events. Historical tropical storm and hurricane events have brought intense rainfall that can lead to damaging floods, and northeast winds, which, when combined with waterlogged soils can cause trees and utility poles to fall. Nor'easters can also bring damaging rain and wind but because they often occur during the winter months, they bring the additional threat of snow and ice associated with winter storms. Heavy snow can cause roof collapse in older homes, and ice presents a threat of slipping and tree branch collapse. More information on the range of magnitude of winter storms can be found in Section 4.3.12

The impact tropical storm or hurricane events have on an area is typically measured in terms of wind speed. Expected damage from hurricane force winds is measured using the Saffir-Simpson Scale. The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds, barometric pressure, and storm surge potential (characteristic of tropical storms and hurricanes), which are combined to estimate potential damage. Table 4.3.5-1 lists Saffir-Simpson Scale categories with associated wind speeds and expected damages. Categories 3, 4, and 5 are classified as "major" hurricanes. While major hurricanes comprise only 20 of all tropical cyclones making landfall, they account for over 70 percent of the damage in the United States. The intensity of a storm is also impacted by its orientation, location of landfall, and speed. The likelihood of these damages occurring in Luzerne County is assessed in Section 4.3.5.4, Future Occurrence.

<b>STORM CATEGORY</b>	<b>WIND SPEED (mph)</b>	<b>DESCRIPTION OF DAMAGES</b>
1	74-95	<b>Very dangerous winds will produce some damage:</b> Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap, and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110	<b>Extremely dangerous winds will cause extensive damage:</b> Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3	111-129	<b>Devastating damage will occur:</b> Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.



**Table 4.3.5-1 Saffir-Simpson Scale categories with associated wind speeds and damages (NHC, 2019).**

STORM CATEGORY	WIND SPEED (mph)	DESCRIPTION OF DAMAGES
4	130-156	<b>Catastrophic damage will occur:</b> Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted, and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5	>157	<b>Catastrophic damage will occur:</b> A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

It is important to recognize the potential for flooding events during hurricanes, tropical storms, and nor’easters; the risk assessment and associated impact for these events is included in Section 4.3.3. Wind impacts in Luzerne County generally include downed trees and utility poles, which can spark widespread utility interruptions. Wind impacts are particularly an issue for mobile homes and other manufactured housing; these structures are often not well-anchored and are highly susceptible to wind damage in a hurricane, tropical storm, or nor’easter.

The worst-case scenario for a hurricane, tropical storm, or nor’easter event in Luzerne County was Hurricane Agnes, which struck the Wyoming Valley in June 1972 and caused over 16 inches in rain. The Susquehanna River reached a depth of 34.23 feet. The City of Wilkes-Barre was particularly impacted by the hurricane. Water inundated the entire Southern portion of the City.

**4.3.5.3. Past Occurrence**

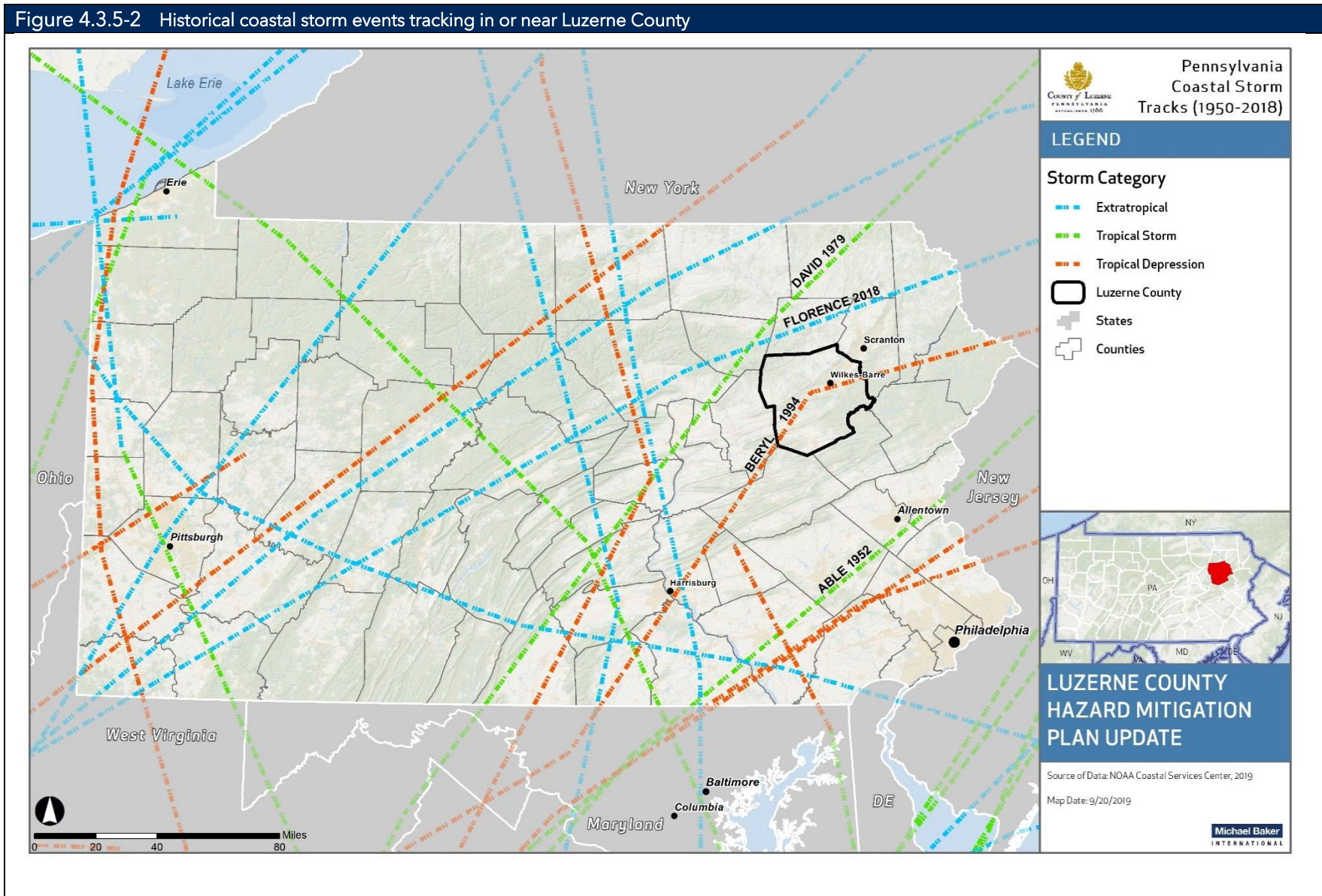
NOAA’s Coastal Services Center maintains records of all coastal storms occurring in the United States since the 1850s. The following table lists all coastal storms having centers of circulation to pass through or within 30 nautical miles of Luzerne County. Typically, when these storms reach Luzerne County, they have lost their hurricane speed winds, so structural damage is usually not as bad as coastal communities may experience.

**Table 4.3.5-2 Previous tropical storm events with centers of circulation within 30 nautical miles of Luzerne County.**

YEAR	EVENT	STRENGTH IN/NEAR LUZERNE COUNTY
2018	Florence	Hurricane
1994	Beryl	Tropical Depression
1979	David	Tropical Storm
1952	Able	Tropical Storm

Figure 4.3.5-2 shows the tracking of some of these storm events in or near Luzerne County. It is important to note that a number of hurricane and tropical storm events have impacted the County without tracking through or near it; these storm events include Hurricane Sandy (2012), Tropical Storm Lee (2011), Hurricane Irene (2011), Hurricane Katrina (2005), and Tropical Depression Ivan (2004). Each of these storm events resulted in a Presidential Disaster Declaration. Most recently, Tropical Storm Lee and Hurricane Irene caused significant damage throughout the county. The storms occurred just two weeks apart, which added to post disaster complications. Tropical Storm Lee had an average rainfall of ten inches of rain over three days, and the Susquehanna River crested at a record level of 42.66 feet. In addition, Hurricane Agnes (1972) did not track in or near Luzerne County but resulted in significant flooding in the City of Wilkes-Barre as described in Section 4.3.3 above. These examples indicate that Luzerne County is vulnerable to damage from flooding and heavy winds when hurricanes and tropical storms come near the region. The following map highlights storms that have tracked through Luzerne County while also showing the storms that have tracked through the remaining parts of Pennsylvania. The NOAA NCEI database does not track nor'easters as a separate weather event; they are tracked as high wind, heavy snow, and/or coastal flooding events, so a complete listing is not available. However, other sources provide record that some of the winter storms listed in Section 4.3.11.3 were nor'easters. For instance, a nor'easter affected much of Pennsylvania and several other states between Washington, D.C. and Boston, Massachusetts from January 6-8, 1996, resulting in Presidential Disaster Declaration 1085. Blizzard conditions included heavy snow, strong winds, and very cold temperatures (NWS, 1996). About a week later, unseasonably high temperatures and rainfall melted the thick snowpack left by the Nor'easter and resulted in Presidential Disaster Declaration 1093 for flooding (NCEI, 2014). More recently, there was a nor'easter that took place on October 29, 2011 and brought 1-3" of snow accumulation with 9-16" of accumulation in higher elevations. The heavy, wet snow brought tree and utility damage, causing half a million power outages state-wide (NCEI, 2014).

Figure 4.3.5-2 Historical coastal storm events tracking in or near Luzerne County



#### 4.3.5.4. *Future Occurrence*

Although hurricanes, tropical storms, and nor'easters can cause flood events consistent with 1 percent- and 0.2 percent- level frequency, their probability of occurrence is measured relative to wind speed. The future occurrence of hurricanes, tropical storms, and nor'easters can be considered *likely*, as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1). It is difficult to assign a probability to the future occurrence of nor'easters in Luzerne County; however, the storms are possible in the county.

Climate change can worsen the severity of hurricanes through increased rainfall totals and durations. There has been an increase in North Atlantic hurricane activity over the last several decades due to natural variability and climate change which in turn magnifies the intensity of tropical cyclones.

Although Luzerne County is not likely to experience the severe high winds faced in more coastal communities during a nor'easter, the county is subject to heavy snow, ice, and blizzard conditions.

#### 4.3.5.5. *Vulnerability Assessment*

A vulnerability assessment for hurricanes, tropical storms, and nor'easters focuses on the impacts of flooding and severe wind. Therefore, the assessment for flood-related vulnerability is addressed in Section 4.3.3. In addition, mobile/manufactured homes are vulnerable to hurricanes, tropical storms, and nor'easters. Section 4.3.9 discusses vulnerability to wind damage and includes Figure 4.3.9-6 which shows the number of mobile homes per community. The County is also vulnerable to severe winter weather impacts caused by nor'easters which are evaluated in Section 4.3.12. PEMA has estimated that the *average* annualized losses in Luzerne County due to hurricane wind hazards using Hazus software. Average annual direct building losses are estimated at more than \$142,000 while total business interruption losses have the potential to reach \$3,695,000,000.

### 4.3.6. **Landslide**

#### 4.3.6.1. *Location and Extent*



A landslide is the downward and outward movement of slope-forming soil, rock, and vegetation reacting to the force of gravity. Landslides may be triggered by both natural and human-caused changes in the environment, including heavy rain, rapid snow melt, steepening of slopes due to construction, erosion, earthquakes, and changes in groundwater levels. Mudflows, mudslides, rockfalls, rockslides, and rock topples are all forms of a landslide. Landslides usually occur in areas of Luzerne County with

moderate to steep slopes and during high precipitation. Many slope failures are associated with precipitation events – periods of sustained above-average precipitation, specific rainstorms, or snowmelt events. Areas experiencing erosion, decline in vegetation cover, and earthquakes are also susceptible to landslides. Human activities that contribute to slope failure

include altering the natural slope gradient, increasing soil water content, and removing vegetation cover. The geologic instabilities that cause landslides to occur are often exacerbated by highway projects in which the earth is cut, and soil is loosened.

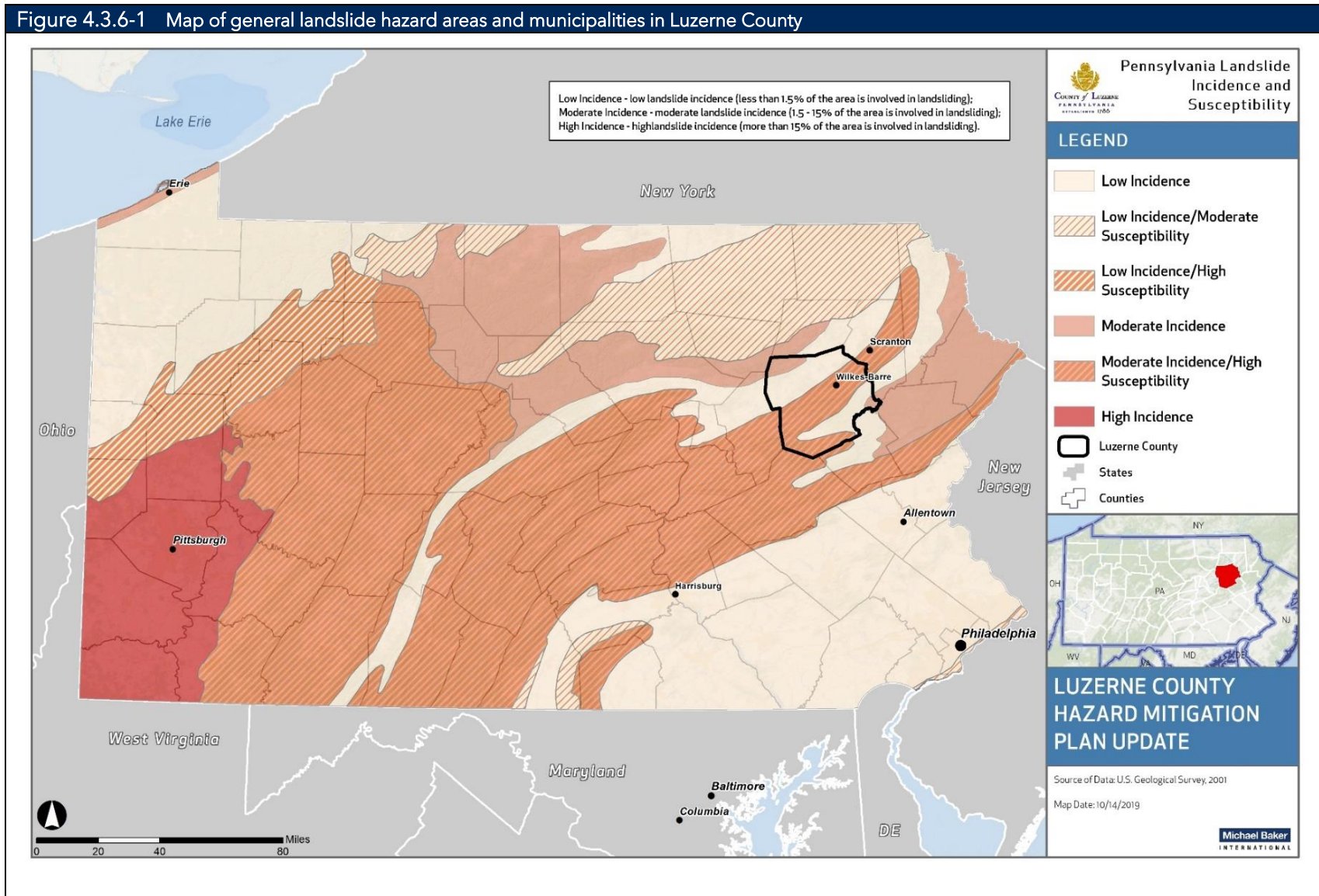
The USGS identifies Luzerne County as falling into several zones of landslide susceptibility and incidence (Figure 4.3.6-1). A Northern and Southeastern portion of the County fall into the *Low Incidence* zone, meaning that these areas have low susceptibility to landslides with a low incidence of occurrence. The Northwest corner of the County falls into the *Moderate Incidence* zone, meaning that this area has moderate susceptibility to landslides with a moderate incidence of occurrence. The remaining areas in the Central, Northern, and Southern parts of the County fall into the *Moderate Incidence/High Susceptibility* zone, meaning these areas have high susceptibility to landslides with a moderate incidence of occurrence.

A slope greater than 7% (approximately around 15 degrees) needs special considerations for building roads according to common engineering practice, and a slope of 15% (approximately around 25 degrees) is generally unstable and highly sensitive to surface changes. Slopes greater than 25% are very unstable.

Given the right conditions, landslides can occur anywhere in the County. The Susquehanna River and Lackawanna River valleys are prone to larger landslides triggered by the rivers' undercutting of the slope material consisting of stratified sedimentary rock. A 1989 report by the Geological Society of America (GSA) identified thirteen potential "rock block" slides on Shickshinny Mountain. At the time when the report was written, one rock block slide had occurred when slopes were undercut by the construction of a roadway.

# LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

Figure 4.3.6-1 Map of general landslide hazard areas and municipalities in Luzerne County



**4.3.6.2. Range of Magnitude**

Landslide velocity can vary from rapid to slow, and the amount of material moving in a landslide can range from a relatively small amount to a large amount. Landslides can include falling, sliding, or flowing of rocks and soil or a combination of these different types of motion.

The impact of landslides on the environment depends on the size and specific location of the event. In general, impacts include:

- Changes to topography
- Damage or destruction of vegetation
- Potential diversion or blockage of water in the vicinity of streams, rivers, etc.
- Increased sediment runoff both during and after event

Landslides in Luzerne County have reportedly involved a small amount of rocks tumbling down a hillside; here, a small amount means an amount sufficient to fill the shoulder of a road for a linear distance of about 10 feet with rock, but not enough to block the entire roadway. A more damaging scenario could occur in Luzerne County if a landslide occurred along one of the major interstates. The landslide could cause damage to vehicles and the roadway and injuries to people. In addition, the landslide would have secondary effects caused by shutting down the roadway.

A possible worst-case scenario for landslides in Luzerne County could occur on Shickshinny Mountain. Although the probability of a Shickshinny Mountain rock block slide is low, the impacts would be substantial. The deposition of landslide material in the Susquehanna River would fill the river channel and act as a dam, backing up river water upstream of the slide. It is difficult to estimate the volume of material that would be deposited, but the upstream inundation area could potentially include communities upstream of the slide to the northern limits of Luzerne County, like the City of Wilkes-Barre. Eventually, the material acting as a dam would breach, and a flood wave would travel downstream along the river. It is possible that the resulting upstream inundation area and downstream flood wave would rival the limits of the SFHA.

**4.3.6.3. Past Occurrence**

A comprehensive inventory of landslides events in Pennsylvania does not exist. The NCDC database captures landslides as they occur in conjunction with severe storms; the NCDC database does not report any landslides in Luzerne County. However, representatives from the County and municipal officials identified several incidents of falling rock that have occurred. Historically, there have been several reports of small landslides within the County. All the reports have been isolated to roadway rock falls, two of which and have resulted in minor road closures along secondary routes. In 1986, a slide developed approximately two miles southeast of the City of Nanticoke where the slopes had been undercut during the construction of I-81.

#### 4.3.6.4. *Future Occurrence*

Given that no damage due to landslide has been recorded in Luzerne County, the future occurrence of landslides can be considered *unlikely* as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1). However, there is the possibility of some rock falling from a steep slope, given that this occurred several times in the past. These events are expected to be small, and cause little to no damage. The probability of large-scale future landslide events in Luzerne County is considered low due to the County's position over the glaciated low plateau physiographic province. This is a geological formation with low landslide potential. Mismanaged intense development in steeply sloped areas could increase the frequency of occurrence.

#### 4.3.6.5. *Vulnerability Assessment*

A landslide might cause a structure to collapse or might cause minor damages such as broken windows. A landslide might cause a roadway to be temporarily blocked. Transportation routes throughout the County located at the base or crest of cliffs should be considered vulnerable to this hazard. Roadways around Shickshinny Mountain are most vulnerable to landslide events, based on understandings of past events. A comprehensive inventory of these areas is not available.

Table 4.3.6-1 details the number of structures and critical facilities in each municipality that are in areas with steep slopes and may, therefore, experience damages should a landslide occur. According to PEMA, Luzerne County is among the top three most vulnerable Pennsylvania Counties to landslide by numbers of vulnerable people and buildings with more than 243,000 people in the vulnerable population. Additionally, there are over 105,000 vulnerable buildings, which add up to over \$27,000,000,000 in exposed building value. This is 78% of the total building value in Luzerne County. While the occurrence of a massive, devastating landslide is unlikely, the impacts can greatly impact a community.

Butler Township has the largest number of structures in steep slope areas over 15% (418), while Shickshinny Borough has the greatest percentage of structures in these areas (27.83%). This vulnerability assessment also measures the number and percentage of critical facilities in steep slope areas across Luzerne County. Hanover Township and the City of Wilkes-Barre have the largest number of critical facilities in steep slope areas over 15% with 12 each. These municipalities are all more vulnerable to landslide events based on their existing topography and the location of their structures and critical facilities. It is much more likely that a landslide event will occur in a steep slope area over 15%. While all municipalities have some steep slope areas, those with the most structures and critical facilities on this geography are more likely to incur damages from a landslide event.



## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

MUNICIPALITY	TOTAL STRUCTURES IN MUNICIPALITY	STRUCTURES IN STEEP SLOPE AREAS OVER 15%	PERCENT OF STRUCTURES IN STEEP SLOPE AREAS OVER 15%	TOTAL CRITICAL FACILITIES IN MUNICIPALITY	TOTAL CRITICAL FACILITIES IN STEEP SLOPE AREAS OVER 15%	PERCENT CRITICAL FACILITIES IN STEEP SLOPE AREAS OVER 15%
Ashley Borough	1,287	40	3.13%	17	2	11.76%
Avoca Borough	1,185	56	4.73%	18	3	16.67%
Bear Creek Village Borough	165	17	10.30%	46	2	4.35%
Bear Creek Township	1,467	33	2.25%	5	0	0.00%
Black Creek Township	1,217	67	5.51%	22	4	18.18%
Buck Township	270	7	2.59%	6	0	0.00%
Butler Township	4,332	418	9.65%	62	3	4.84%
Conyngam Borough	816	6	0.74%	6	0	0.00%
Conyngam Township	736	60	8.15%	22	1	4.55%
Courtdale Borough	336	10	2.98%	5	2	40.00%
Dallas Borough	1,306	68	5.21%	14	1	7.14%
Dallas Township	3,584	102	2.85%	52	2	3.85%
Dennison Township	583	29	4.97%	18	1	5.56%
Dorrance Township	1,004	65	6.47%	40	2	5.00%
Dupont Borough	1,370	67	4.89%	18	1	5.56%
Duryea Borough	2,228	30	1.35%	20	5	25.00%
Edwardsville Borough	1,911	102	5.34%	12	2	16.67%
Exeter Borough	2,584	34	1.32%	15		0.00%
Exeter Township	1,034	106	10.25%	23	4	17.39%
Fairmount Township	755	49	6.49%	30	3	10.00%
Fairview Township	1,864	16	0.86%	17	2	11.76%
Forty Fort Borough	1,965	108	5.50%	12	0	0.00%

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

Table 4.3.6-1 Landslide Vulnerability for Luzerne County						
MUNICIPALITY	TOTAL STRUCTURES IN MUNICIPALITY	STRUCTURES IN STEEP SLOPE AREAS OVER 15%	PERCENT OF STRUCTURES IN STEEP SLOPE AREAS OVER 15%	TOTAL CRITICAL FACILITIES IN MUNICIPALITY	TOTAL CRITICAL FACILITIES IN STEEP SLOPE AREAS OVER 15%	PERCENT CRITICAL FACILITIES IN STEEP SLOPE AREAS OVER 15%
Foster Township	1,986	20	1.01%	37	3	8.11%
Franklin Township	793	18	2.27%	18	1	5.56%
Freeland Borough	1,660	0	0.00%	4	0	0.00%
Hanover Township	5,306	283	5.33%	90	12	13.33%
Harveys Lake Borough	2,083	277	13.30%	15	1	6.67%
Hazle Township	5,226	158	3.02%	72	2	2.78%
City of Hazleton	10,316	67	0.65%	57	0	0.00%
Hollenback Township	683	58	8.49%	11	0	0.00%
Hughestown Borough	665	25	3.76%	5	0	0.00%
Hunlock Township	1,072	88	8.21%	29	4	13.79%
Huntington Township	994	92	9.26%	45	2	4.44%
Jackson Township	1,082	67	6.19%	19	2	10.53%
Jeddo Borough	54	0	0.00%	1	0	0.00%
Jenkins Township	2,107	45	2.14%	27	7	25.93%
Kingston Borough	5,502	18	0.33%	44	0	0.00%
Kingston Township	3,141	191	6.08%	35	5	14.29%
Lafin Borough	664	24	3.61%	13	3	23.08%
Lake Township	919	31	3.37%	24	0	0.00%
Larksville Borough	1,972	91	4.61%	14	2	14.29%
Laurel Run Borough	267	27	10.11%	3	0	0.00%
Lehman Township	1,669	50	3.00%	33	1	3.03%
Luzerne Borough	1,331	52	3.91%	10	2	20.00%
City of Nanticoke	4,745	235	4.95%	26	0	0.00%

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

Table 4.3.6-1 Landslide Vulnerability for Luzerne County						
MUNICIPALITY	TOTAL STRUCTURES IN MUNICIPALITY	STRUCTURES IN STEEP SLOPE AREAS OVER 15%	PERCENT OF STRUCTURES IN STEEP SLOPE AREAS OVER 15%	TOTAL CRITICAL FACILITIES IN MUNICIPALITY	TOTAL CRITICAL FACILITIES IN STEEP SLOPE AREAS OVER 15%	PERCENT CRITICAL FACILITIES IN STEEP SLOPE AREAS OVER 15%
Nescopeck Borough	704	2	0.28%	5	0	0.00%
Nescopeck Township	511	50	9.78%	25	4	16.00%
New Columbus Borough	105	0	0.00%	4	0	0.00%
Newport Township	2,051	255	12.43%	19	4	21.05%
Nuangola Borough	408	29	7.11%	2	0	0.00%
Penn Lake Park Borough	249	17	6.83%	4	1	25.00%
City of Pittston	3,514	197	5.61%	41	8	19.51%
Pittston Township	1,637	48	2.93%	14	2	14.29%
Plains Township	4,696	92	1.96%	58	5	8.62%
Plymouth Borough	2,903	298	10.27%	18	3	16.67%
Plymouth Township	890	223	25.06%	20	4	20.00%
Pringle Borough	459	39	8.50%	7	2	28.57%
Rice Township	1,427	22	1.54%	33	0	0.00%
Ross Township	1,413	83	5.87%	36	0	0.00%
Salem Township	1,909	107	5.61%	39	1	2.56%
Shickshinny Borough	345	96	27.83%	8	1	12.50%
Slocum Township	534	27	5.06%	9	0	0.00%
Sugarloaf Township	1,747	173	9.90%	4	0	0.00%
Sugar Notch Borough	468	56	11.97%	39	2	5.13%
Swoyersville Borough	2,438	29	1.19%	12	0	0.00%
Union Township	959	78	8.13%	24	2	8.33%
Warrior Run Borough	281	13	4.63%	3	0	0.00%
West Hazelton Borough	1,936	1	0.05%	21	2	9.52%

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

MUNICIPALITY	TOTAL STRUCTURES IN MUNICIPALITY	STRUCTURES IN STEEP SLOPE AREAS OVER 15%	PERCENT OF STRUCTURES IN STEEP SLOPE AREAS OVER 15%	TOTAL CRITICAL FACILITIES IN MUNICIPALITY	TOTAL CRITICAL FACILITIES IN STEEP SLOPE AREAS OVER 15%	PERCENT CRITICAL FACILITIES IN STEEP SLOPE AREAS OVER 15%
West Pittston Borough	2,177	0	0.00%	6	1	16.67%
West Wyoming Borough	1,299	25	1.92%	8	0	0.00%
White Haven Borough	561	34	6.06%	8	1	12.50%
City of Wilkes-Barre	16,308	399	2.45%	35	3	8.57%
Wilkes-Barre Township	1,895	54	2.85%	109	12	11.01%
Wright Township	2,376	53	2.23%	36	0	0.00%
Wyoming Borough	1,504	1	0.07%	13	0	0.00%
Yatesville Borough	288	27	9.38%	2	0	0.00%
<b>TOTAL</b>	<b>144,219</b>	<b>5,935</b>	<b>4.12%</b>	<b>1,774</b>	<b>145</b>	<b>8.17%</b>

*\*Calculated by selecting the 2010 census block centroids that intersect the SFHAs. Provides an approximation of populations living near the SFHA.*

### 4.3.7. Pandemic and Infectious Disease



#### 4.3.7.1. Location and Extent

Pandemic is defined as a disease affecting or attacking the population of an extensive region, including several countries, and/or continent(s). It is further described as extensively epidemic. Generally, pandemic diseases cause sudden, pervasive illness in all age groups on a global scale. Infectious diseases are also highly virulent but are not spread person-to-person.

Pandemic and infectious disease events cover a wide geographical area and can affect large populations, potentially including the entire population of the County. The exact size and extent of an infected population is dependent upon how easily the illness is spread, the mode of transmission and the amount of contact between infected and uninfected individuals. The transmission rates of pandemic illnesses are often higher in denser areas where there are large concentrations of people. The transmission rate of infectious disease will depend on the mode of transmission of a given illness. Pandemic events can also occur after other natural disasters, particularly floods, when there is the potential for bacteria to grow and contaminate water.

Luzerne County is primarily concerned with the possibility of a pandemic flu outbreak. Influenza, also known as “the flu”, is a contagious disease that is caused by the influenza virus and most commonly attacks the respiratory tract in humans. Influenza is considered to have pandemic potential if it is novel, meaning that people have no immunity to it, virulent, meaning that it causes deaths in normally healthy individuals, and easily transmittable from person-to-person. Different strands of influenza mutate over time and replace older stands of the virus and thus have drastically different effects. The H1N1 virus, colloquially known as swine flu, is of particular concern. This virus was first detected in people in the United States in April 2009. On June 11, 2009, the world health organization signaled that a pandemic of 2009 H1N1 flu was underway (CDC, 2009). Avian influenza, also known as bird flu, infects birds. A recent strain, H5N1, has caused concern due to its ability to pass from wild birds to poultry then on to people. This virus has killed more than half of the people infected with it, although the avian flu is less like to infect humans.

During the Hazard Mitigation Plan Update process, a novel coronavirus spread into a worldwide pandemic. Named COVID-19, this type of coronavirus is a new virus that causes respiratory illness and is extremely contagious. Flu like in nature, symptoms of the virus include fever, cough, shortness of breath, and diarrhea. This virus became a great concern due to its high rates of transmission, in addition to so little being known about it. People were advised to practice social distancing; only leaving the house for essentials like grocery shopping, and no gathering even in small groups. Even when going on walks, people should remain six feet apart to slow the spread of transmission.

#### **4.3.7.2. Range of Magnitude**

The magnitude of a pandemic or infectious disease threat in Luzerne County will range significantly depending on the aggressiveness of the virus in question and the ease of transmission. Pandemic influenza is easily transmitted from person-to-person, but advances in medical technologies have greatly reduced the number of deaths caused by influenza over time. The magnitude of a pandemic may be exacerbated by the fact that an influenza pandemic will cause outbreaks across the United States, limiting the ability to transfer assistance from one jurisdiction to another. Additionally, effective preventative and therapeutic measures, including vaccines and other medications, will likely be in short supply or will not be available.

In terms of lives lost, the impact various pandemic influenza outbreaks have had globally over the last century has declined (see Table 4.3.7-1). The severity of illness from the 2009 H1N1 influenza flu virus varied, with the gravest cases occurring mainly among those considered at high risk. High risk populations considered more vulnerable include children, the elderly, pregnant women, and chronic disease patients with reduce immune system capacity. These populations are described in more detail in Section 4.3.7.5. Most people infected with swine flu in 2009 recovered without needing medical treatment. Unlike a regular flu season, according to the Centers for Disease Control (CDC) the majority of the people who died, as many as 77%, were 18 to 64 years old with up to 11% of the deaths estimated in those 17 years old and younger.

The 1918 Spanish flu pandemic was the worst-case pandemic event in the 20<sup>th</sup> century for both Pennsylvania and worldwide. County data is unavailable, and mortality figures were probably under-reported, it is recorded that 8,000 Pennsylvanians died from the flu or its complications in the first month alone (US DHHS, 2010). Infection rates were much worse in denser cities, which should be a high priority for response actions in future flu events.

It is believed that the virus originated in an open-air market in the Wuhan province of China in November 2019. Shortly afterwards, the virus began to spread to nearby countries like Japan and South Korea. By March 2020, the virus had reached almost every country worldwide, with the most cases in the US. At first, people were mostly concerned with people who might be infected due to recent travel. However, community infections soon began to crop up in many cities and towns. This led to a statewide shutdown of schools and businesses and the cancellation of large events for Spring and Summer 2020. Only life sustaining services were permitted to remain open, including medical facilities, pharmacies, and grocery stores. People were advised to remain home as much as possible in attempt to slow the transmission of COVID-19. State health officials note that the virus has infected all age ranges at about the same rate, and that no age group can be considered more or less vulnerable to infection.

**4.3.7.3. Past Occurrence**

The United States Department of Health and Human Services estimates that influenza pandemics have occurred for at least 300 years at unpredictable intervals. There have been several pandemic influenza outbreaks over the past 100 years. A list of events and worldwide deaths are shown in Table 4.3.7-1. D

**Table 4.3.7-1** List of previous significant outbreaks of influenza over the past century (Global Security, 2009; WHO, 2009).

DATE	PANDEMIC	WORLDWIDE DEATHS (APPROXIMATE)
1918-1920	Spanish Flu / H1N1	50 million
1957-1958	Asian Flu / H2N2	1.5-2 million
1968-1969	Hong Kong Flu / H3N2	1 million
2009 - 2010	Swine Flu / A/H1N1	12,000

Confirmed flu cases have been on the rise in Luzerne County over the past few years. Figure 4.3.7-2 lists the number of confirmed flu cases in Luzerne County by flu season. According to the Pennsylvania Department of Health (DOH), there were 3,721 confirmed cases in the most recent influenza season from September 2019 to March 2020 (PA DOH, 2020).

The CDC marked the 2014-2015 flu season as severe, with approximately 710,000 hospitalizations. The CDC does not track national deaths in adults, but the organization reported 148 pediatric deaths from influenza. The 2017-2018 flu season was another severe season. The CDC reported that the H3N2 flu, along with other strains including H1N1, led to more cases, doctors' visits, hospital visits, and deaths than previous flu seasons. The CDC also noted that the flu became widespread in all states and jurisdictions at the same time. In January 2018, approximately halfway through the flu season, 37 pediatric deaths were reported. The CDC estimated that 34 million Americans were affected by the flu (CDC, 2018).

**Table 4.3.7-2** Confirmed Flu Cases in Luzerne County by Flu Season (PA DOH, 2020)

FLU SEASON	NUMBER OF CONFIRMED CASES
2014/15	1,898
2015/16	1,037
2016/17	1,315
2017/18	4,615
2018/19	3,096
2019/20	3,721

An avian flu outbreak in Pennsylvania occurred in 1983-1984, in which 17 million birds were lost. There has not been an outbreak since, although there have recently been outbreaks in

the Midwest. In 1996-1997, a number of table-egg farms in Lancaster and Lebanon Counties tested positive for H7N2 avian influenza. As a result, nine flocks were lost, and PADA imposed a quarantine on a 75-square-mile area restricting movement of poultry or poultry products into or out of the area (Jacob et al., 1998).

The COVID-19 outbreak began in China in November 2019. The virus reached the US in late February 2020, and most counties in Pennsylvania were affected by March 2020. As of April 29, 2020, there were more than 43,000 confirmed cases in Pennsylvania, with just over 2,000 cases and 82 deaths reported in Luzerne County. These numbers are expected to continue to increase with a peak in May 2020. While those who tested positive are isolating in their homes, county officials urge the entire population to isolate and act as if the virus is everywhere.

#### **4.3.7.4. Future Occurrence**

Future occurrences of pandemics and infectious diseases are unclear. 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. This emergence of a novel virus is the first step toward a pandemic. Future pandemics may also emerge from other diseases, especially invasive pathogens that Pennsylvanians do not have natural immunity to. While it is unlikely that pandemics and infectious diseases will affect the county, this hazard occurred recently in Spring 2020. It is impossible to predict this type of hazard. The best form of county response is to expect that these events can occur at any time and to constantly evaluate resources and update emergency response plans.

Looking at the number of historical incidences of pandemic-potential diseases, the probability of future pandemic events can be considered *unlikely* according to the Risk Factor Methodology (see Table 4.4-1).

#### **4.3.7.5. Vulnerability Assessment**

Certain population groups are at higher risk of pandemic flu infection. This population group includes people 65 years and older, children younger than 5 years old, pregnant women, and people of any age with certain chronic medical conditions. Such conditions include but are not limited to diabetes, heart disease, asthma and kidney disease (CDC, 2015). Schools, colleges, convalescent centers, and other institutions serving those younger than 5 years old and older than 65 years old, are locations conducive to faster transmission of pandemic influenza since populations identified as being at high risk are concentrated at these facilities or because of a large number of people living in close quarters. In general, jurisdictions that are more densely populated are more vulnerable to disease threats when the disease is directly spread from human to human, but every jurisdiction in the Commonwealth has some vulnerability to pandemic and infectious disease threats.



There are some occupation-specific risks that may make some employees more vulnerable. For example, those working in direct patient care situations are more likely to be exposed to a pandemic disease.

There are no true environmental impacts of pandemics and infectious disease threats, but there will be significant economic and social costs beyond the possibility of disease-related deaths. Widespread illness may increase the likelihood of shortages of personnel to perform essential community services. In addition, high rates of illness and worker absenteeism occur within the business community, and these contribute to social and economic disruption. Social and economic disruptions could be temporary but may be amplified in today's closely interrelated and interdependent systems of trade and commerce. Social disruption may be greatest when rates of absenteeism impair essential services, such as power, transportation, and communications.

Jurisdictional losses in a pandemic or infectious disease outbreak stem from lost wages and productivity, not losses to buildings or land. Losses are difficult to estimate because the exact rates of absenteeism and cost of treating a widespread disease will depend on the virus or bacterium in question, the availability of vaccination or treatment, and the severity of symptoms. For historical context, though, the Asian and Hong Kong Flu pandemics killed over 1.5 million people worldwide and caused an estimated \$32 billion loss due to lost productivity and medical expenses (Smith, 2004). With Pennsylvania's economy so integral to the national economy, economic losses from a pandemic or infectious disease threat could be significant.

An avian flu outbreak could cause some economic loss for poultry farmers in Luzerne County. According to the 2017 Agricultural census, livestock sales make up about 25% of Luzerne County's agricultural sales. Poultry and egg sales totaled around \$36,000 in 2017.

It is expected that there will be immense losses due to the COVID-19 pandemic. Thousands of individuals were laid off across the commonwealth as non-essential businesses were forced to close. In just one week, over three million Americans filed for unemployment; the greatest amount ever. There is specific concern for those who worked in service and hospitality industries. Construction projects and other businesses are in limbo, while many others decide to permanently close. However, the commonwealth and the federal government are releasing relief packages for individuals and businesses. The Luzerne County Chamber of Commerce compiled a growing list with links to medical information, relief packages, and other resources. It is currently unknown how COVID-19 will change the county.

### 4.3.8. Radon Exposure



#### 4.3.8.1. Location and Extent

Radioactivity caused by airborne radon has been recognized for many years as an important component in the natural background radioactivity exposure of humans, but it was not until the 1980s that the wide geographic distribution of elevated values in houses and the possibility of extremely high radon values in houses were recognized. In 1984, routine monitoring of employees leaving the Limerick nuclear power plant near Reading, PA, showed that the readings on Mr. Stanley Watras frequently exceeded expected radiation levels, yet only natural, non-fission-product radioactivity was detected on him. Radon levels in his home were detected around 2,500 pCi/L (pico Curies per Liter), much higher than the 4 pCi/L guideline of the Environmental Protection Agency or even the 67 pCi/L limit for uranium miners. As a result of this event, the Reading Prong section of Pennsylvania where Watras lived became the focus of the first large-scale radon scare in the world.

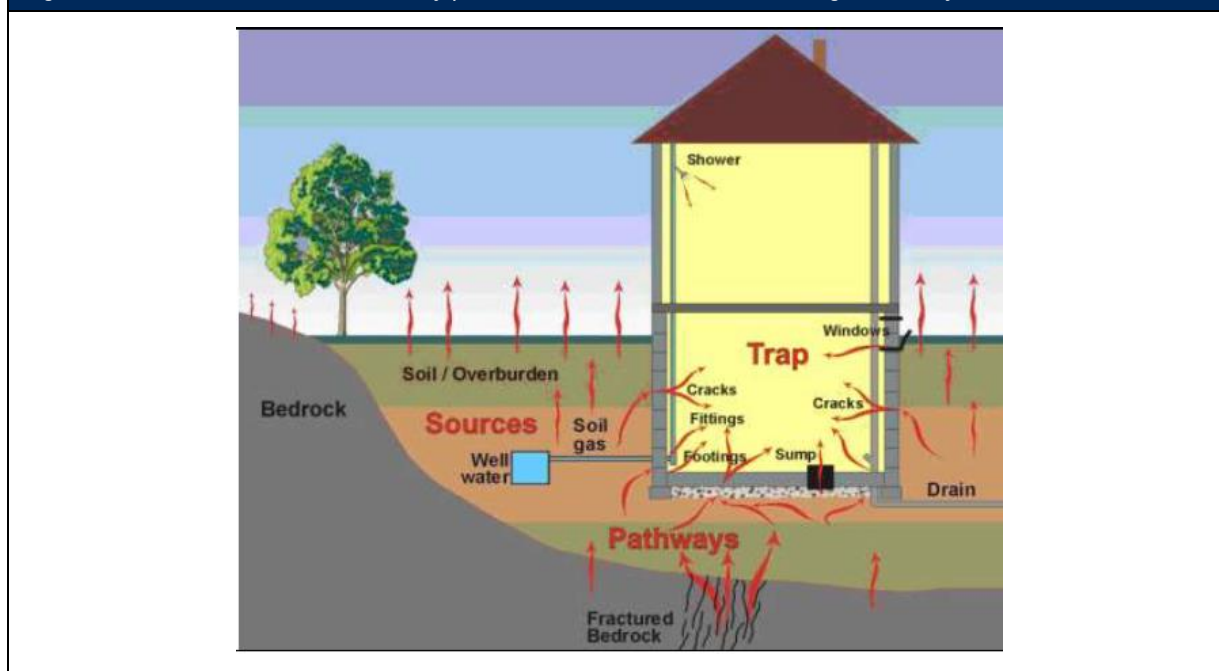
Radon is a gas that cannot be seen or smelled. It is a noble gas that originates by the natural radioactive decay of uranium and thorium. Like other noble gases (e.g., helium, neon, and argon), radon forms essentially no chemical compounds and tends to exist as a gas or as a dissolved atomic constituent in groundwater. Two isotopes of radon are significant in nature,  $^{222}\text{Rn}$  and  $^{220}\text{Rn}$ , formed in the radioactive decay series of  $^{238}\text{U}$  and  $^{232}\text{Th}$ , respectively. The isotope thoron (i.e.  $^{220}\text{Rn}$ ) has a half-life (time for decay of half of a given group of atoms) of 55 seconds, barely long enough for it to migrate from its source to the air inside a house and pose a health risk. However, radon (i.e.  $^{222}\text{Rn}$ ), which has a half-life of 3.8 days, is a widespread hazard.

The distribution of radon is correlated with the distribution of radium (i.e.  $^{226}\text{Ra}$ ), its immediate radioactive parent, and with uranium, its original ancestor. Due to the short half-life of radon, the distance that radon atoms can travel from their parent before decay is generally limited to distances of feet or tens of feet.

Three sources of radon are now recognized in houses (shown in Figure 4.3.8-1):

- Radon in soil air that flows into the house;
- Radon dissolved in water from private wells and exsolved during water usage; this is rarely a problem in Pennsylvania; and
- Radon emanating from uranium-rich building materials (e.g. concrete blocks or gypsum wallboard); this is not known to be a problem in Pennsylvania.

Figure 4.3.8-1 Sketch of radon entry points into a house (Arizona Geological Survey, 2006).



High radon levels were initially thought to be exacerbated in houses that are tightly sealed, but it is now recognized that rates of air flow into and out of houses, plus the location of air inflow and the radon content of air in the surrounding soil, are key factors in radon concentrations. Outflows of air from a house, caused by a furnace, fan, thermal “chimney” effect, or win effects, require that air be drawn into the house to compensate. If the upper part of the house is tight enough to impede influx of outdoor air (radon concentration generally  $<0.1$  pCi/L), then an appreciable fraction of the air may be drawn in from the soil or fractures bedrock through the foundation and slab beneath the house, or through cracks in openings for pipes, sumps, and similar features (see figure 4.3.7-1). Soil gas typically contains from a few hundred to a few thousand pCi/L of radon; therefore, even a small rate of soil gas inflow can lead to elevated radon concentrations in a house.

The radon concentration of soil gas depends on a number of soil properties, the importance of which is still being evaluated. In general, ten to fifty percent of newly formed radon atoms escape the host mineral of their parent radium and gain access to the air-filled pore space. The radon content of soil gas clearly tends to be higher in soils containing higher levels of radium and uranium, especially if the radium occupies a site on or near the surface of a grain from which the radon can easily escape. The amount of pore space in the soil and its permeability for air flow, including cracks and channels, are important factors determining radon concentration in soil gas and its rate of flow into a house. Soil depth and moisture content, mineral host and form for radium, and other soil properties may also be important. For houses built on bedrock, fractured zones may supply air having radon concentrations similar to those in deep soil.

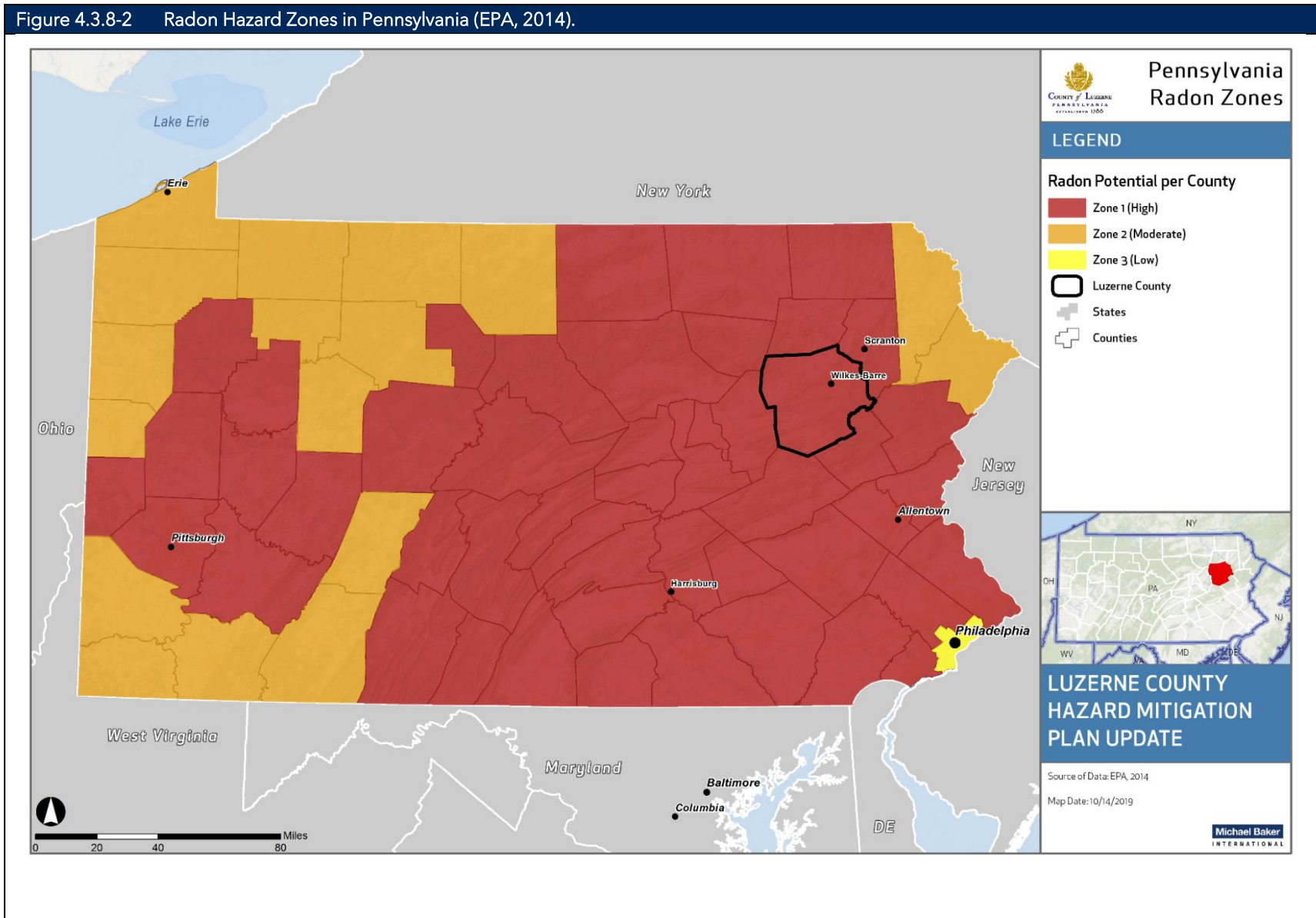
Each county in Pennsylvania is classified as having a *low*, *moderate*, or *high* radon hazard potential. Luzerne County is classified as having a high hazard, meaning that the predicted indoor radon level is greater than 4 pCi/L (see Figure 4.3.8-2).

Areas where houses have high levels of radon can be divided into three groups in terms of uranium content in rock and soil:

- Areas of very elevated uranium content (>50 parts per million (ppm)) around uranium deposits and prospects. Although very high levels of radon can occur in such areas, the hazard normally is restricted to within a few hundred feet of the deposit. In Pennsylvania, such localities occupy an insignificant area.
- Areas of common rocks having higher than average uranium content (5 to 50 ppm). In Pennsylvania, such rock types include granitic and felsic alkali igneous rocks and black shales. In the Reading Prong, high uranium values in rock or soil and high radon levels in houses are associated with Precambrian granitic gneisses commonly containing 10 to 20 ppm uranium, but locally containing more than 500 ppm uranium. In Pennsylvania, elevated uranium occurs in black shales of the Devonian Marcellus Formation and possibly the Ordovician Martinsburg Formation. High radon values are locally present in areas underlain by these formations.
- Areas of soil or bedrock that have normal uranium content but properties that promote high radon levels in houses. This group is incompletely understood at present. Relatively high soil permeability can lead to high radon, the clearest example being houses built on glacial eskers. Limestone-dolomite soils also appear to be predisposed for high radon levels in houses, perhaps because of the deep clay-rich residuum in which radium is concentrated by weathering on iron oxide or clay surfaces, coupled with moderate porosity and permeability.

# LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

Figure 4.3.8-2 Radon Hazard Zones in Pennsylvania (EPA, 2014).



**4.3.8.2. Range of Magnitude**

Exposure to radon is the second leading cause of lung cancer after smoking. It is the number one cause of lung cancer among non-smokers. Radon is responsible for about 21,000 lung cancer deaths every year; approximately 2,900 of which occur among people who have never smoked. Lung cancer is the only known effect on human health from exposure to radon in air and thus far, there is no evidence that children are at greater risk of lung cancer than are adults (EPA, March 2010). The main hazard is from the radon daughter products (218Po, 214Pb, 214Bi), which may become attached to lung tissue and induce lung cancer by their radioactive decay.

According to the EPA, the average radon concentration in the indoor air of homes nationwide is about 1.3 pCi/L. The EPA recommends homes be fixed if the radon level is 4 pCi/L or more. However, because there is no known safe level of exposure to radon, the EPA also recommends that Americans consider fixing their home for radon levels between 2 pCi/L and 4 pCi/L. Table 4.3.8-1 shows the relationship between various radon levels, probability of lung cancer, comparable risks from other hazards, and action thresholds. As is shown in the table, a smoker exposed to radon has a much higher risk of lung cancer.

<b>Table 4.3.8-1 Radon risk for smokers and non-smokers (EPA, March 2010).</b>			
<b>RADON LEVEL (pCi/L)</b>	<b>IF 1,000 PEOPLE WERE EXPOSED TO THIS LEVEL OVER A LIFETIME*</b>	<b>RISK OF CANCER FROM RADON EXPOSURE COMPARES TO**</b>	<b>ACTION THRESHOLD</b>
<b>SMOKERS</b>			
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 of the risk of dying from food poison	Consider fixing structure between 2 and 4 pCi/L
1.3	About 20 people could get lung cancer	(Average indoor radon level)	Reducing radon levels below 2pCi/L is difficult
0.4	About 3 people could get lung cancer	(Average outdoor radon level)	
<b>NON-SMOKERS</b>			
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	

**Table 4.3.8-1 Radon risk for smokers and non-smokers (EPA, March 2010).**

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
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.*

The worst-case scenario for radon exposure would be that a large area of tightly sealed homes provided residents high levels of exposure over a prolonged period without the resident being aware. This worst-case scenario exposure then could lead to large numbers of people with cancer attributed to the radon exposure.

**4.3.8.3. Past Occurrence**

Current data on abundance and distribution of radon as it affects individual houses in the state of Pennsylvania in general is considered incomplete and potentially biased. Luzerne County is not an exception. The EPA has estimated that the national average indoor radon concentration is 1.3 pCi/L and the level for action is 4.0 pCi/L; however they have estimated that the average indoor concentration in Pennsylvania basements is about 7.1 pCi/L and 3.6 pCi/L on the first floor (PADEP, 2014).

The Pennsylvania Department of Environmental Protection Bureau of Radiation Protection provides information for homeowners on how to test for radon in their houses. If a test results in radon concentrations over 4 pCi/L, then the Bureau works to help the homeowners make repairs to their houses to mitigate against high radon levels. The total number tests reported to the Bureau since 1990 and their results are provided by zip code on the Bureau's website. However, this information is only provided if over 30 tests total were reported in order to best approximate the average for the area.

In Luzerne County, 36 ZIP codes have sufficient tests reported to the Bureau to list their findings, which are shown in Table 4.3.8-2. This table does not include the ZIP codes for which insufficient data was collected in both basements and first floors.

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

**Table 4.3.8-2 Radon level tests and results in Luzerne County zip codes (PADEP, 2015).**

ZIP CODE	BASEMENT			FIRST FLOOR		
	NUMBER OF TESTS	MAXIMUM RESULT (PCI/L)	AVERAGE RESULT (PCI/L)	NUMBER OF TESTS	MAXIMUM RESULT (PCI/L)	AVERAGE RESULT (PCI/L)
17814	252	370.0	17.3	66	55.5	5.7
17878	89	130.0	12.9	<i>Insufficient Data</i>	<i>Insufficient Data</i>	<i>Insufficient Data</i>
18201	1403	63.5	3.6	269	10.2	1.2
18202	595	87.4	8.7	60	23.0	3.9
18219	372	84.7	8.4	52	59.9	5.2
18222	1649	827.6	7.6	204	46.9	4.0
18224	303	103.0	6.2	74	20.8	2.3
18234	33	19.1	5.0	<i>Insufficient Data</i>	<i>Insufficient Data</i>	<i>Insufficient Data</i>
18249	617	294.0	11.4	96	56.2	6.2
18602	152	36.7	5.2	<i>Insufficient Data</i>	<i>Insufficient Data</i>	<i>Insufficient Data</i>
18603	1249	433.7	10.8	270	74.7	4.6
18612	2896	173.0	4.7	303	49.0	2.4
18617	68	9.0	2.40	<i>Insufficient Data</i>	<i>Insufficient Data</i>	<i>Insufficient Data</i>
18618	313	118.3	4.4	59	49.9	2.2
18621	278	52.8	7.4	33	22.7	2.8
18634	901	302.0	3.8	142	14.8	1.3
18635	258	276.9	23.9	<i>Insufficient Data</i>	<i>Insufficient Data</i>	<i>Insufficient Data</i>
18640	1249	75.0	3.8	164	13.8	1.8
18641	564	605.0	5.7	63	11.1	2.3
18642	457	108.2	4.5	70	9.8	2.0
18643	1307	46.8	3.6	118	36.2	2.3
18644	1129	56.8	4.9	177	25.9	1.9
18651	400	98.6	3.7	87	14.6	1.5
18655	437	218.6	7.1	70	20.1	2.5
18656	187	90.8	6.3	34	12.7	3.9
18660	236	93.6	9.2	38	32.2	5.3
18661	528	94.2	5.6	139	48.7	2.8
18701	111	20.6	2.6	<i>Insufficient Data</i>	<i>Insufficient Data</i>	<i>Insufficient Data</i>
18702	2807	62.7	2.8	485	12.5	1.3
18703	52	22.7	2.6	<i>Insufficient Data</i>	<i>Insufficient Data</i>	<i>Insufficient Data</i>
18704	3453	309.7	3.3	419	18.0	1.4



**Table 4.3.8-2 Radon level tests and results in Luzerne County zip codes (PADEP, 2015).**

ZIP CODE	BASEMENT			FIRST FLOOR		
	NUMBER OF TESTS	MAXIMUM RESULT (PCI/L)	AVERAGE RESULT (PCI/L)	NUMBER OF TESTS	MAXIMUM RESULT (PCI/L)	AVERAGE RESULT (PCI/L)
18705	1183	56.7	3.0	134	8.8	1.3
18706	292	31.4	2.7	61	9.8	1.5
18707	3522	302.0	4.7	332	123.4	2.3
18708	2034	104.0	4.8	184	55.1	3.1
18709	208	53.3	4.9	45	16.2	2.8

**4.3.8.4. Future Occurrence**

Radon exposure retains a significant probability given present soil, geologic, and geomorphic factors in Luzerne County. Future occurrence of high radon level hazards can be considered *possible* by the Risk Factor Methodology probability criteria (See Table 4.4.1-1). Development in areas where previous radon levels have been significantly high will continue to be more susceptible to exposure. However, new incidents of concentrated exposure may occur with future development or deterioration of older structures. Exposure can be limited with proper testing for both past and future development and appropriate mitigation measures.

**4.3.8.5. Vulnerability Assessment**

Houses in Luzerne County, particularly in high vulnerability areas, could be susceptible to moderate levels of radon. Smokers can be up to ten times more vulnerable to lung cancer from high levels of radon depending on the level of radon they are exposed to (see Figure 4.3.7-4). Older houses that have crawl spaces or unfinished basements are more vulnerable as well because of the increased exposure to soils which could be releasing higher levels of radon gas. Additionally, houses that rely on wells for their water may face additional risk, although this type of exposure is low and rare in Pennsylvania. Proper testing for radon levels should be completed across Luzerne County, especially in areas of higher incidence levels and for vulnerable populations that face the contributing risks described above. This testing will determine the level of vulnerability that residents face in their homes, as well as in their businesses and schools.

The EPA determines that an average radon mitigation system costs \$1,200. The EPA also states that current state surveys show that 1 home in 5 has elevated radon levels. Using this methodology, radon loss estimation is factored by assuming that 20% of the buildings within the ZIP codes with elevated test results have elevated radon values and each would require a radon mitigation system installed at the EPA estimated average of \$1,200. According to the Pennsylvania State Hazard Mitigation Plan, Luzerne County has 133,021 buildings in areas with high radon test results, while approximately 20%, or 26,604, of these buildings will be impacted. The estimated costs for radon mitigation total \$31,925,000.

Radon exposure has minimal environmental impacts. Due to the relatively short half-life of radon, it tends to only affect living and breathing organisms such as humans or pets which are routinely in contained areas (i.e. basement or house) where the gas is released.

#### 4.3.9. Subsidence, Sinkhole



##### 4.3.9.1. Location and Extent

There are two common causes of subsidence in Pennsylvania. Dissolution of carbonate rock such as limestone or dolomite, and mining activity. In the first case, water passing through naturally occurring fractures and bedding planes dissolves bedrock leaving voids below the surface. Eventually, overburden on top of the voids collapses, leaving surface depressions resulting in karst topography. Characteristic structures associated with karst topography include sinkholes, linear depressions, and caves. Collapse sometimes occurs only after a large amount of activity, or when a heavy burden is placed on the overlying material. This type of subsidence is fairly localized in extent.

In Pennsylvania, research has shown that subsidence may occur, but will not necessarily occur, in areas underlain by carbonate bedrock. Figure 4.3.9-1 shows that a small portion of the Southwestern part of Luzerne County is underlain by carbonate bedrock (i.e., limestone). This area lies over parts of Conyngham Township, Nescopeck Township, and Salem Township. Sinkholes in Pennsylvania are also often due to subsurface mining. There is a strip of underground mines stretching across the central part of the County, along the Susquehanna River. There are also mines in the southern portion of the County, near the City of Hazleton.

Human activity can accelerate the creation of subsidence or sinkhole events. Leaking water pipes or structures that convey storm-water runoff may also result in areas of subsidence as the water dissolves substantial amounts of rock over time. Poorly managed stormwater may be an exacerbating factor in subsidence events. In some cases, construction, land grading, or earthmoving activities that cause changes in stormwater flow can trigger sinkhole events.

##### 4.3.9.2. Range of Magnitude

No two subsidence areas or sinkholes are exactly alike. Variations in size and shape, time period under which they occur (i.e. gradually or abruptly), and their proximity to development ultimately determines the magnitude of damage incurred. Based on the geologic formations underlying parts of Luzerne County, subsidence and sinkhole events may occur gradually or abruptly. Events could result in minor elevation changes or deep, gaping holes in the ground surface. Subsidence and sinkhole events can cause severe damage in urban environments, although gradual events can be addressed before significant damage occurs. Primarily, problems related to subsidence include the disruption of utility services and damages to private and public property including buildings, roads, and underground infrastructure. If long-term subsidence or sinkhole formation is not recognized and mitigation measures are not implemented, fractures or complete collapse of building foundations and roadways may

result. If mitigation measures are not taken, the cost to fill in and stabilize sinkholes can be significant although sinkholes are limited in extent.

General recommendations have been published for site investigations prior to construction of buildings due to the potential for karst subsidence. These recommendations include thorough geotechnical investigations to identify un-collapsed karst features and potential excavation to solid rock prior to construction.

Groundwater in limestone and other similar carbonate rock formations can be easily polluted, because water moves readily from the Earth's surface down through solution cavities and fractures, thus undergoing very little filtration. Contaminants such as sewage, fertilizers, herbicides, pesticides, or industrial products are of concern.

Luzerne County is located in four physiographic regions: the Glaciated Low Plateau Section, the Susquehanna Lowland Section, the Anthracite Upland Section, and the Anthracite Valley Section. The Glaciated Low Plateau Section is characterized by red-green-gray sedimentary rocks of the Catskill Formation. The Susquehanna Lowland Section is characterized by ridges which are parallel to the streams that drain the area. The Anthracite Upland section is characterized by mountains and steep-sided valleys. Coal, shale, sandstone, and conglomerate make up this region, which can all contribute to karst topography. The Anthracite Valley Section is a valley with sharp mountain ridges on either side of the valley. Approximately half of the valley (the southwestern end) is noted for its deposits of anthracite. It is important to note that there are many underground mines in the Anthracite Upland and the Anthracite Valley sections of the County.

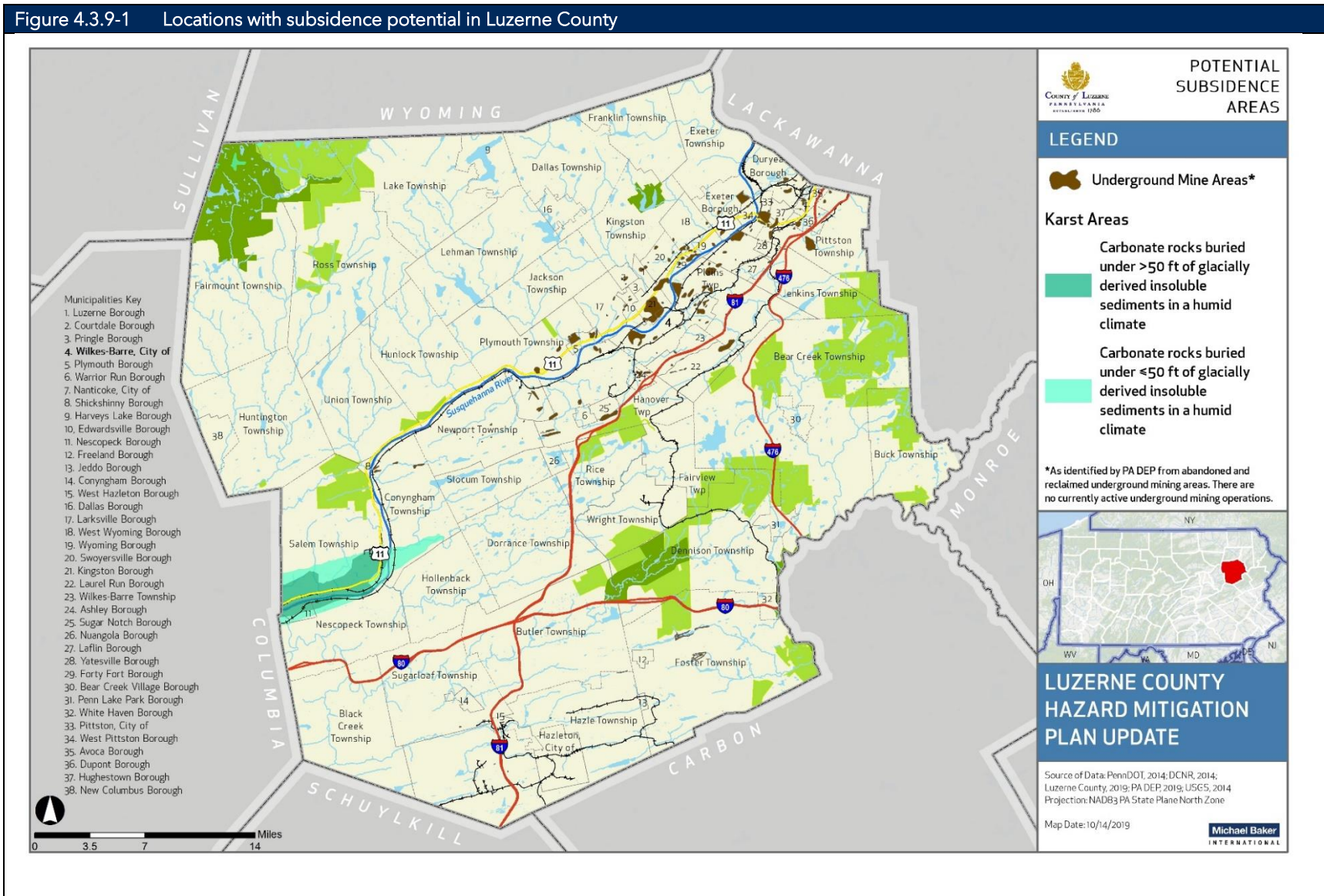
The magnitude of land subsidence and sinkholes in Luzerne County can be moderate as there have been past occurrences of land subsidence. Experience in Pennsylvania shows that subsidence may cause from a fraction of an inch to several feet of sagging of the surface of the earth and may occur within minutes or over several years.

According to the PADEP, structural damages due to subsidence range from slight damage requiring cosmetic repairs to severe damage requiring foundation replacement or other high cost repairs.

A worst-case scenario for subsidence and sinkholes would be if a sinkhole occurred under a critical facility such as a hospital. Not only could structural damage occur to the building, but there could also be injuries to people as well. In addition, part of the facility would have to be closed in order to repair the structural damage, and this would reduce the hospital's capacity and ability to treat people with other illnesses and injuries.

# LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

Figure 4.3.9-1 Locations with subsidence potential in Luzerne County



#### **4.3.9.3. Past Occurrence**

The Pennsylvania Department of Conservation and Natural Resources (PADCNR) maintains an online *Sinkhole Inventory Database* of sinkholes throughout the Commonwealth. No occurrence of subsidence or sinkholes has been reported for Luzerne County.

However, Luzerne County has a long history of sinkholes and subsidence. At least 26 municipalities in the county have experienced underground mine subsidence incidents in the past. Northeastern Pennsylvania was a prominent coal mining region, and many homes were built on top of active mines. The most intense historic mining operations were generally conducted along the Susquehanna River Corridor. As mines were sold to new companies, safe practices were not always taken, leaving properties overtop of mining areas vulnerable to issues with mine subsidence. In 1909, a sinkhole caused by mine subsidence opened near Pittston Township. A Train drove into the hole, killing two workers. In 1959, mining operations dug within six feet of the Susquehanna River in Jenkins Township near the City of Pittston. Underground mines were flooded and have resulted in a mine pool which extends across the width of the Susquehanna River Valley from the Northern limits of the county, South to the City of Nanticoke. This is known as the Knox Mine Disaster. In February 2008, a collapsed sewer line caused a subsidence in Hanover Township. Later that year in April, a case of mine subsidence damaged two houses in Hazle Township. In April 2019, a road in Wilkes-Barre Township was closed due to a sinkhole. Mine experts investigated the incident as they believed it may have been due to mine subsidence.

#### **4.3.9.4. Future Occurrence**

Based on geological conditions, subsidence events may possibly occur in the future for the areas in Luzerne County underlain by carbonate rock, or by mines. Sinkholes and surface depressions are dependent on several variables, including land use and water management. Changes in these variables can affect the likelihood and frequency of future subsidence events. Overall, though, the probability of future subsidence and sinkhole events can be considered *unlikely* according to the Risk Factor Methodology (see Table 4.4.1-1).

#### **4.3.9.5. Vulnerability Assessment**

The secondary effects of sinkhole formation have the potential to cause significant impacts in communities underlain by surface-level limestone and historical mines, including structural damage, damage to transportation systems, and damage to subsurface utility systems. Structures and critical facilities located over limestone and dolomite bedrock are considered vulnerable to sinkholes and are inventories in Table 4.3.9-1. Salem Township has the greatest number of structures on karst topography (1,393), and the second greatest percentage (72.97%). 100% of the structures in Nescopeck Borough are located on karst topography (704 structures). Salem Township also has the greatest number of critical facilities on karst topography (24), and the second greatest percentage (60%). 100% of the critical facilities in Nescopeck borough are located on karst topography (5 structures). Nescopeck Borough and Salem Township can be considered the most vulnerable municipalities for subsidence hazards based on location of structures in relation to karst topography.

Subsidence hazards can also be due to underground mine collapse. Kingston Borough and the City of Wilkes-Barre have the greatest number of structures on underground mine areas with 1,893 and 1,788 respectively. Kingston Borough also has the greatest percentage of structures on underground mine areas (34.41%). Kingston Borough has the greatest number (14) and percentage (31.82%) of critical facilities on underground mine areas. Kingston Borough, Plymouth Borough, the City of Pittston, and the City of Wilkes-Barre can all be considered the most vulnerable municipalities for subsidence hazards based on location of structures in relation to underground mine areas.

**LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE**

**Table 4.3.9-1 Subsidence Vulnerability for Luzerne County**

MUNICIPALITY	TOTAL STRUCTURES IN MUNICIPALITY	TOTAL STRUCTURES ON KARST TOPOGRAPHY	PERCENT OF STRUCTURES ON KARST TOPOGRAPHY	TOTAL STRUCTURES ON UNDERGROUND MINE AREAS	PERCENT STRUCTURES ON UNDERGROUND MINE AREAS	TOTAL CRITICAL FACILITIES IN MUNICIPALITY	TOTAL CRITICAL FACILITIES ON STRUCTURES ON KARST TOPOGRAPHY	PERCENT CRITICAL FACILITIES ON KARST TOPOGRAPHY	TOTAL CRITICAL FACILITIES ON UNDERGROUND MINE AREAS	PERCENT CRITICAL FACILITIES ON UNDERGROUND MINE AREAS
Ashley Borough	1,278	0	0.00%	217	16.98%	17	0	0.00%	0	0.00%
Avoca Borough	1,185	0	0.00%	102	8.61%	19	0	0.00%	0	0.00%
Bear Creek Village Borough	165	0	0.00%	0	0.00%	5	0	0.00%	0	0.00%
Bear Creek Township	1,467	0	0.00%	0	0.00%	48	0	0.00%	0	0.00%
Black Creek Township	1,217	0	0.00%	0	0.00%	22	0	0.00%	0	0.00%
Buck Township	270	0	0.00%	0	0.00%	8	0	0.00%	0	0.00%
Butler Township	4,332	0	0.00%	0	0.00%	63	0	0.00%	0	0.00%
Conyngam Borough	816	0	0.00%	0	0.00%	6	0	0.00%	0	0.00%
Conyngam Township	736	39	5.30%	0	0.00%	24	5	20.83%	0	0.00%
Courtdale Borough	336	0	0.00%	10	2.98%	5	0	0.00%	0	0.00%
Dallas Borough	1,306	0	0.00%	0	0.00%	15	0	0.00%	0	0.00%
Dallas Township	3,548	0	0.00%	0	0.00%	53	0	0.00%	0	0.00%
Dennison Township	583	0	0.00%	0	0.00%	19	0	0.00%	0	0.00%
Dorrance Township	1,004	0	0.00%	0	0.00%	41	0	0.00%	0	0.00%
Dupont Borough	1,370	0	0.00%	170	12.41%	19	0	0.00%	0	0.00%
Duryea Borough	2,228	0	0.00%	299	13.42%	21	0	0.00%	2	9.52%
Edwardsville Borough	1,911	0	0.00%	93	4.87%	13	0	0.00%	0	0.00%

**LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE**

**Table 4.3.9-1 Subsidence Vulnerability for Luzerne County**

MUNICIPALITY	TOTAL STRUCTURES IN MUNICIPALITY	TOTAL STRUCTURES ON KARST TOPOGRAPHY	PERCENT OF STRUCTURES ON KARST TOPOGRAPHY	TOTAL STRUCTURES ON UNDERGROUND MINE AREAS	PERCENT STRUCTURES ON UNDERGROUND MINE AREAS	TOTAL CRITICAL FACILITIES IN MUNICIPALITY	TOTAL CRITICAL FACILITIES ON STRUCTURES ON KARST TOPOGRAPHY	PERCENT CRITICAL FACILITIES ON KARST TOPOGRAPHY	TOTAL CRITICAL FACILITIES ON UNDERGROUND MINE AREAS	PERCENT CRITICAL FACILITIES ON UNDERGROUND MINE AREAS
Exeter Borough	2,584	0	0.00%	261	10.10%	15	0	0.00%	1	6.67%
Exeter Township	1,034	0	0.00%	0	0.00%	23	0	0.00%	0	0.00%
Fairmount Township	755	0	0.00%	0	0.00%	31	0	0.00%	0	0.00%
Fairview Township	1,864	0	0.00%	0	0.00%	18	0	0.00%	0	0.00%
Forty Fort Borough	1,965	0	0.00%	355	18.07%	13	0	0.00%	3	23.08%
Foster Township	1,986	0	0.00%	1	0.05%	37	0	0.00%	0	0.00%
Franklin Township	793	0	0.00%	0	0.00%	18	0	0.00%	0	0.00%
Freeland Borough	1,660	0	0.00%	0	0.00%	4	0	0.00%	0	0.00%
Hanover Township	5,306	0	0.00%	263	4.96%	90	0	0.00%	1	1.11%
Harveys Lake Borough	2,083	0	0.00%	0	0.00%	15	0	0.00%	0	0.00%
Hazle Township	5,226	0	0.00%	4	0.08%	73	0	0.00%	0	0.00%
City of Hazleton	10,316	0	0.00%	25	0.24%	57	0	0.00%	0	0.00%
Hollenback Township	683	0	0.00%	0	0.00%	12	0	0.00%	0	0.00%
Hughestown Borough	665	0	0.00%	45	6.77%	5	0	0.00%	0	0.00%
Hunlock Township	1,072	0	0.00%	0	0.00%	30	0	0.00%	0	0.00%
Huntington Township	994	0	0.00%	0	0.00%	46	0	0.00%	0	0.00%



**LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE**

**Table 4.3.9-1 Subsidence Vulnerability for Luzerne County**

MUNICIPALITY	TOTAL STRUCTURES IN MUNICIPALITY	TOTAL STRUCTURES ON KARST TOPOGRAPHY	PERCENT OF STRUCTURES ON KARST TOPOGRAPHY	TOTAL STRUCTURES ON UNDERGROUND MINE AREAS	PERCENT STRUCTURES ON UNDERGROUND MINE AREAS	TOTAL CRITICAL FACILITIES IN MUNICIPALITY	TOTAL CRITICAL FACILITIES ON STRUCTURES ON KARST TOPOGRAPHY	PERCENT CRITICAL FACILITIES ON KARST TOPOGRAPHY	TOTAL CRITICAL FACILITIES ON UNDERGROUND MINE AREAS	PERCENT CRITICAL FACILITIES ON UNDERGROUND MINE AREAS
Jackson Township	1,082	0	0.00%	0	0.00%	20	0	0.00%	0	0.00%
Jeddo Borough	54	0	0.00%	0	0.00%	1	0	0.00%	0	0.00%
Jenkins Township	2,107	0	0.00%	368	17.47%	27	0	0.00%	0	0.00%
Kingston Borough	5,502	0	0.00%	1,893	34.41%	44	0	0.00%	14	31.82%
Kingston Township	3,141	0	0.00%	0	0.00%	36	0	0.00%	0	0.00%
Lafin Borough	664	0	0.00%	1	0.15%	14	0	0.00%	1	7.14%
Lake Township	919	0	0.00%	0	0.00%	25	0	0.00%	0	0.00%
Larksville Borough	1,972	0	0.00%	66	3.35%	15	0	0.00%	0	0.00%
Laurel Run Borough	267	0	0.00%	0	0.00%	3	0	0.00%	0	0.00%
Lehman Township	1,669	0	0.00%	0	0.00%	34	0	0.00%	0	0.00%
Luzerne Borough	1,331	0	0.00%	118	8.87%	10	0	0.00%	0	0.00%
City of Nanticoke	4,745	0	0.00%	320	6.74%	27	0	0.00%	0	0.00%
Nescopeck Borough	704	704	100.00%	0	0.00%	5	5	100.00%	0	0.00%
Nescopeck Township	511	29	5.68%	0	0.00%	25	3	12.00%	0	0.00%
New Columbus Borough	105	0	0.00%	0	0.00%	5	0	0.00%	0	0.00%
Newport Township	2,051	0	0.00%	39	1.90%	20	0	0.00%	0	0.00%

**LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE**

**Table 4.3.9-1 Subsidence Vulnerability for Luzerne County**

MUNICIPALITY	TOTAL STRUCTURES IN MUNICIPALITY	TOTAL STRUCTURES ON KARST TOPOGRAPHY	PERCENT OF STRUCTURES ON KARST TOPOGRAPHY	TOTAL STRUCTURES ON UNDERGROUND MINE AREAS	PERCENT STRUCTURES ON UNDERGROUND MINE AREAS	TOTAL CRITICAL FACILITIES IN MUNICIPALITY	TOTAL CRITICAL FACILITIES ON STRUCTURES ON KARST TOPOGRAPHY	PERCENT CRITICAL FACILITIES ON KARST TOPOGRAPHY	TOTAL CRITICAL FACILITIES ON UNDERGROUND MINE AREAS	PERCENT CRITICAL FACILITIES ON UNDERGROUND MINE AREAS
Nuangola Borough	408	0	0.00%	0	0.00%	2	0	0.00%	0	0.00%
Penn Lake Park Borough	249	0	0.00%	0	0.00%	4	0	0.00%	0	0.00%
City of Pittston	3,514	0	0.00%	982	27.95%	14	0	0.00%	4	28.57%
Pittston Township	1,637	0	0.00%	159	9.71%	42	0	0.00%	2	4.76%
Plains Township	4,696	0	0.00%	834	17.76%	59	0	0.00%	2	3.39%
Plymouth Borough	2,903	0	0.00%	971	33.45%	18	0	0.00%	4	22.22%
Plymouth Township	890	0	0.00%	13	1.46%	21	0	0.00%	0	0.00%
Pringle Borough	459	0	0.00%	0	0.00%	7	0	0.00%	0	0.00%
Rice Township	1,427	0	0.00%	0	0.00%	34	0	0.00%	0	0.00%
Ross Township	1,413	0	0.00%	0	0.00%	37	0	0.00%	0	0.00%
Salem Township	1,909	1,393	72.97%	0	0.00%	40	24	60.00%	0	0.00%
Shickshinny Borough	345	0	0.00%	0	0.00%	9	0	0.00%	0	0.00%
Slocum Township	534	0	0.00%	0	0.00%	10	0	0.00%	0	0.00%
Sugarloaf Township	1,747	0	0.00%	0	0.00%	40	0	0.00%	0	0.00%
Sugar Notch Borough	468	0	0.00%	3	0.64%	4	0	0.00%	0	0.00%
Swoyersville Borough	2,438	0	0.00%	110	4.51%	13	0	0.00%	0	0.00%
Union Township	959	0	0.00%	0	0.00%	25	0	0.00%	0	0.00%

**LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE**

**Table 4.3.9-1 Subsidence Vulnerability for Luzerne County**

MUNICIPALITY	TOTAL STRUCTURES IN MUNICIPALITY	TOTAL STRUCTURES ON KARST TOPOGRAPHY	PERCENT OF STRUCTURES ON KARST TOPOGRAPHY	TOTAL STRUCTURES ON UNDERGROUND MINE AREAS	PERCENT STRUCTURES ON UNDERGROUND MINE AREAS	TOTAL CRITICAL FACILITIES IN MUNICIPALITY	TOTAL CRITICAL FACILITIES ON STRUCTURES ON KARST TOPOGRAPHY	PERCENT CRITICAL FACILITIES ON KARST TOPOGRAPHY	TOTAL CRITICAL FACILITIES ON UNDERGROUND MINE AREAS	PERCENT CRITICAL FACILITIES ON UNDERGROUND MINE AREAS
Warrior Run Borough	281	0	0.00%	0	0.00%	3	0	0.00%	0	0.00%
West Hazleton Borough	1,936	0	0.00%	0	0.00%	22	0	0.00%	0	0.00%
West Pittston Borough	2,177	0	0.00%	215	9.88%	6	0	0.00%	1	16.67%
West Wyoming Borough	1,299	0	0.00%	35	2.69%	9	0	0.00%	1	11.11%
White Haven Borough	561	0	0.00%	0	0.00%	8	0	0.00%	0	0.00%
City of Wilkes-Barre	16,308	0	0.00%	1,788	10.96%	109	0	0.00%	2	1.83%
Wilkes-Barre Township	1,895	0	0.00%	55	2.90%	35	0	0.00%	0	0.00%
Wright Township	2,376	0	0.00%	0	0.00%	37	0	0.00%	0	0.00%
Wyoming Borough	1,504	0	0.00%	20	1.33%	14	0	0.00%	2	14.29%
Yatesville Borough	288	0	0.00%	15	5.21%	2	0	0.00%	0	0.00%
<b>TOTAL</b>	<b>144,219</b>	<b>2,165</b>	<b>1.50%</b>	<b>9,850</b>	<b>6.83%</b>	<b>1,820</b>	<b>37</b>	<b>2.03%</b>	<b>40</b>	<b>2.20%</b>

There are a few measures that can reduce the overall vulnerability to subsidence and sinkholes. Municipal governments may determine guidelines for construction in high-subsidence areas. A community can reduce its vulnerability to subsidence or sinkholes by implementing solutions such as land use controls, insurance programs, subsidence-resistant designs, or in the case of mine-related subsidence, conduct selective support or mine filling. If a sinkhole occurs on private property, it is normally the responsibility of the property owner to initiate repairs. Homeowners' insurance often does not cover damages attributed to subsidence. Since 1987, sinkhole insurance has been available within Pennsylvania and may serve to eliminate the financial burdens placed on the homeowner.

Careful planning is the least-costly and most effective method for reducing vulnerability to subsidence hazards. Municipalities can minimize the potential for sinkhole development through proper maintenance and updating of water utility lines. Zoning laws can also be enacted to regulate development within highly karst areas.

**4.3.10. Tornado, Windstorm**



**4.3.10.1. Location and Extent**

Tornadoes and potentially damaging high winds occur throughout Pennsylvania. Tornadoes and high winds may be experienced at any location in Luzerne County.

A tornado, a violently rotating funnel-like vortex, is an extraordinary feature of severe thunderstorms. A condensation funnel does not need to reach to the ground for a tornado to be present; a debris cloud beneath a thunderstorm is all that is needed to confirm the presence of a tornado, even in the total absence of a funnel. While the extent of tornado damage is usually localized, the extreme winds of this vortex can be among the most destructive on earth when they move through populated, developed areas.

Tornadoes can occur at any time during the day or night but are most frequent during late afternoon into early evening, the warmest hours of the day. May to August is the most likely time for tornadoes to occur in Pennsylvania. Tornado movement is characterized in two ways: direction and speed of the spinning winds and forward movement of the tornado/storm track. Rotational wind speeds of the vortex can range from 100 mph to more than 250 mph. In addition, the speed of forward motion can be zero to 45 or 50 mph. Therefore, some estimates place the maximum velocity (combination of ground speed, wind speed, and upper winds) of tornadoes at about 300 mph.

The forward motion of the tornado path can be a few hundred yards or several hundred miles in length. The width of tornadoes can vary greatly, but generally range in size from less than 100 feet to over a mile in width. Some tornadoes never touch the ground and are short-lived, while others may touch the ground several times.

Straight-line winds often accompany tornadoes and are caused by the movement of air from areas of higher pressure to areas of lower pressure - the greater the difference in pressure, the

stronger the winds. Windstorms are generally defined as sustained wind speeds of 40 mph or greater lasting for one hour or longer, or winds of 58 mph or greater for any duration.

The destruction caused by tornadoes ranges from light to inconceivable depending on the intensity, size, and duration of the storm. Typically, tornadoes cause the greatest damages to structures of light construction such as mobile homes. The impact of tornado hazards is ultimately dependent on the population or amount of property present in the area in which the tornado occurs. Tornado events are often so severe that property loss or human fatality is typically inevitable if evacuation or proper construction standards are not implemented. The enhanced Fujita Tornado Scale (or the -EF-Scale) classifies U.S. tornadoes into six intensity categories, named EF0 to EF5, based upon the estimated maximum winds occurring within the funnel. The EF-Scale has subsequently become the definitive metric for estimating wind speeds within tornadoes based upon the damage done to buildings and structures.

**4.3.10.2. Range of Magnitude**

Since 2007 the EF Scale has been used in the United States to describe the magnitude of tornadoes. Prior to 2007, the Fujita Scale (F-Scale) was commonly used to describe magnitude. This scale is based on new information about the relationship between wind speed given in miles per hour (mph) and corresponding damages. The EF Scale categorized tornadoes from EF0 to EF5 with EF0 being the most commonly occurring type of tornado. The strongest tornado recorded in Luzerne County has been a category 2 or EF2 tornado. The following table shows the relationship between the EF- and F- Scales.

**Table 4.3.10-1** Enhanced Fujita Scale (EF-Scale) categories with associated wind speeds

FUJITA SCALE		ENHANCED FUJITA SCALE	
F NUMBER	3-SECOND GUST (MPH)	EF NUMBER	3-SECOND GUST (MPH)
0	45-78	0	65-85
1	79-117	1	86-110
2	118-161	2	111-135
3	162-209	3	136-165
4	210-261	4	166-200
5	262-317	5	OVER 200

The types of damages that can be expected with each category of tornado are described in Table 4.3.10-2.

**Table 4.3.10-2** Expected Tornado Damages.

F OR EF SCALE	EXAMPLES OF POSSIBLE DAMAGE
0	Light damage. Some damage to chimneys; broken tree branches; shallow-rooted trees pushed over; damage to sign boards.
1	Moderate damage. Surface peeled off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off roads.
2	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.
3	Severe damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; cars lifted off ground and thrown.
4	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown, and large missiles generated.
5	Catastrophic damage. Well-built houses swept completely away, leaving only the slab foundations.

Figure 4.3.5-1 in the Hurricane, Tropical Storm, and Nor'easter hazard profile shows wind speed zones developed by the American Society of Civil Engineers based on information including 40 years of tornado history and over 100 years of hurricane history. It identifies wind speeds that could occur across the United States to be used as the basis for design and evaluation of the structural integrity of shelters and critical facilities. Luzerne County falls in Zone II and Zone III, which are classified as 160 mph and 200 mph wind zones, respectively. This meaning design wind speeds for shelters and critical facilities should be able to withstand a three second gust of up to 160 mph and 200 mph, regardless of whether the gust is the result of a tornado, hurricane, tropical storm, or windstorm event. In Luzerne, County, all new residential and commercial structures are required to be constructed per the International Building Code (IBC), which requires structures to be designed to a 90-mph wind speed.

**4.3.10.3. Past Occurrence**

The most impactful tornado recorded in Luzerne County was an F2 in July 1984 when 12 people were injured, and livestock were killed. Most injuries were a result of flying debris; however, three people were injured due to their automobile being picked up and thrown into a pond. Several houses and farm buildings were demolished. Four vehicles were totaled, with 40 more withstanding varying degrees of damage. Tornado magnitudes in Luzerne County have never exceeded F2/EF2. F2/EF2 tornados have touched down in 1960, 1968, 1984, 2006, 2017, and 2018. The most recent tornado destroyed several homes and damaged 24 businesses. Roofs, windows, and signs were all damaged at a shopping center, with one sign

found 7 miles from the mall area. Table 4.3.10-3 below summarizes previous tornado events in Luzerne County.

**Table 4.3.10-3** Previous tornado events between 1950 and 2019 in Luzerne County (NCEI, 2019).

LOCATION	DATE	ESTIMATED LENGTH	ESTIMATED WIDTH	MAGNITUDE	ESTIMATED PROPERTY DAMAGE (\$)
Countywide	07/04/1960	0 miles	33 yards	F2	\$25,000
Countywide	01/27/1962	0 miles	200 yards	F1	\$250,000
Countywide	09/10/1968	0 miles	33 yards	F2	\$25,000
Countywide	06/19/1975	0 miles	33 yards	F1	\$25,000
Countywide	05/06/1980	0.3 miles	13 yards	F0	\$2,500
Countywide	06/21/1981	3.3 miles	17 yards	F1	\$25,000
Countywide	07/06/1984	0.3 miles	300 yards	F2	\$250,000
Countywide	05/31/1985	11 miles	530 yards	F1	\$250,000
Countywide	08/10/1986	0.1 miles	100 yards	F0	\$2,500
Countywide	09/20/1988	0.5 miles	50 yards	F1	\$25,000
Bear Creek	04/16/1993	2.1 miles	400 yards	F1	\$500,000
Duryea	06/22/1996	1.5 miles	100 yards	F0	\$200,000
Pittston	05/31/1998	0.2 miles	40 yards	F0	\$50,000
Dallas	07/22/2006	1.5 miles	75 yards	F0	\$100,000
Hobbie	12/01/2006	20 miles	150 yards	F2	\$1,000,000
Highland	07/26/2012	0.52 miles	75 yards	EF1	\$30,000
Harveyville	07/08/2014	0.9 miles	50 yards	EF0	\$5,000
Westminister	02/25/2017	7.12 miles	500 yards	EF2	\$250,000
Boulevard Manor	06/13/2018	2.9 miles	150 yards	EF2	\$5,000,000

High winds moving in a straight line are the movement of air from areas of higher pressure to areas of lower pressure. As the difference in pressure increases, the strength and speed of the winds increase. As previously mentioned, windstorms are generally defined as having sustained straight-line wind speeds of 40 mph or greater that last for one hour or longer, or winds of 58 mph (i.e. 50 knots) or greater for any duration. In 2019 alone, windstorm events caused \$247,000 in damage. Previous high wind events in the County are summarized in Table 4.3.10-4.

**Table 4.3.10-4** Previous windstorm events greater than 50 knots in Luzerne County between 1950 and 2019 (NCEI, 2019).

LOCATION*	DATE	ESTIMATED WIND SPEED (knots)	ESTIMATED PROPERTY DAMAGE (\$)
Countywide	06/06/1971	76	<i>not provided</i>
Countywide	04/03/1982	60	<i>not provided</i>

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

**Table 4.3.10-4** Previous windstorm events greater than 50 knots in Luzerne County between 1950 and 2019 (NCEI, 2019).

LOCATION*	DATE	ESTIMATED WIND SPEED (knots)	ESTIMATED PROPERTY DAMAGE (\$)
Countywide	07/16/1988	50	<i>not provided</i>
Countywide	01/14/1992	64	<i>not provided</i>
Dorrance	09/03/1993	52	<i>not provided</i>
Wilkes-Barre/Scranton	05/24/1995	56	<i>not provided</i>
East Berwick	07/18/1997	55	\$125,000
Countywide	02/17/1998	55	<i>not provided</i>
Hunlock Creek	09/07/1998	65	\$200,000
Harveys Lake	07/09/1999	50	<i>not provided</i>
Wilkes-Barre	05/18/2000	65	<i>not provided</i>
Countywide	06/02/2000	55	<i>not provided</i>
Countywide	12/12/2000	52	\$100,000
East Berwick	04/09/2001	52	<i>not provided</i>
Hazleton	04/09/2001	52	<i>not provided</i>
Pittston	05/27/2001	80	\$50,000
Harveys Lake	07/01/2001	55	<i>not provided</i>
Lehman	07/01/2001	50	<i>not provided</i>
Countywide	03/09/2002	60	\$10,000
Dallas	07/21/2003	55	\$50,000
Sybertsville	07/21/2003	55	\$5,000
Countywide	09/19/2003	50	\$50,000
Countywide	10/15/2003	60	\$100,000
Countywide	11/13/2003	58	\$30,000
Harveys Lake	8/20/2004	60	\$10,000
Harveys Lake	11/25/2004	60	\$50,000
Huntington Mills	06/06/2005	50	\$5,000
West Pittston	06/09/2005	75	\$100,000
Huntington Mills	07/13/2005	50	\$2,000
Red Rock	08/12/2005	50	\$5,000
Warrior Run	08/14/2005	50	\$5,000
Harveys Lake	11/06/2005	50	\$2,000
Ashley	11/06/2005	57	<i>not provided</i>
Kingston	11/06/2005	50	\$20,000
Conyngham	11/09/2005	50	\$2,000
Countywide	11/29/2005	50	\$5,000
Hazleton	02/17/2006	57	\$10,000
Nanticoke	07/02/2006	50	\$1,000
New Columbus	08/03/2006	50	\$1,000
Countywide	12/01/2006	55	\$5,000



**Table 4.3.10-4** Previous windstorm events greater than 50 knots in Luzerne County between 1950 and 2019 (NCEI, 2019).

LOCATION*	DATE	ESTIMATED WIND SPEED (knots)	ESTIMATED PROPERTY DAMAGE (\$)
Nescopeck	12/01/2006	55	\$10,000
Nuangola	12/01/2006	66	not provided
Avoca	12/01/2006	57	not provided
Wilkes-Barre	06/08/2007	50	not provided
Kingston	06/08/2007	50	not provided
Huntington Mills	06/19/2007	50	not provided
Sweet Valley	06/19/2007	50	not provided
Shickshinny	06/19/2007	52	not provided
Shavertown	06/19/2007	52	not provided
Kingston	06/27/2007	50	not provided
Wilkes-Barre	07/27/2007	50	\$5,000
Forty Fort	08/07/2007	50	\$25,000
Pringle	08/07/2007	50	\$10,000
Conyngham	08/25/2007	50	not provided
Chase	06/10/2008	50	not provided
Sweet Valley	06/10/2008	50	\$10,000
Wilkes-Barre	06/10/2008	50	not provided
Hazleton	06/16/2008	55	not provided
Huntington Mills	07/17/2008	50	not provided
Nesopeck	07/17/2008	50	\$2,000
Conyngham	07/17/2008	50	not provided
Dallas	06/26/2009	50	\$10,000
Chauncey	04/08/2010	50	\$1,000
Kyttle	04/08/2010	50	\$2,000
Nesopeck	09/22/2010	50	not provided
Rock Glen	09/22/2010	50	not provided
West Pittston	10/11/2010	50	\$2,000
Harding	10/11/2010	50	\$2,000
Harding	10/11/2010	50	\$2,000
Countywide	04/16/2011	52	\$50,000
Countywide	04/16/2011	54	\$10,000
Idetown	04/26/2011	61	\$75,000
Lehman	04/28/2011	60	\$50,000
Lehman	04/28/2011	83	\$50,000
Swoyersville	05/30/2011	50	\$3,000
Forty Fort	06/09/2011	52	not provided
Glen Summit Springs	07/18/2011	50	\$2,000
Wordan Place	07/18/2011	50	\$1,000

**Table 4.3.10-4** Previous windstorm events greater than 50 knots in Luzerne County between 1950 and 2019 (NCEI, 2019).

LOCATION*	DATE	ESTIMATED WIND SPEED (knots)	ESTIMATED PROPERTY DAMAGE (\$)
Edwardsville	07/25/2011	50	\$10,000
Kingston	07/25/2011	50	\$5,000
Kis Lyn	08/13/2011	50	\$5,000
Conyngham	08/13/2011	50	\$3,000
Pardeesville	08/13/2011	50	\$4,000
Countywide	08/28/2011	50	\$100,000
Sweet Valley	05/29/2012	50	\$1,000
Plains	06/22/2012	61	\$10,000
Drums	07/07/2012	50	\$2,000
Nesopeck	07/07/2012	50	\$2,000
Hazleton	07/07/212	50	\$3,000
Hazleton	07/26/2012	50	\$10,000
Drums	07/26/2012	50	\$2,000
Countywide	10/29/2012	58	\$400,000
Fairview Heights	04/10/2013	50	\$10,000
Pringle	06/24/2013	50	\$2,000
Dallas	07/08/2014	50	\$30,000
Harding	07/08/2014	61	\$30,000
Glen Lyon	07/13/2014	50	\$5,000
Bear Creek	07/13/2014	50	\$5,000
Hazleton Municipal Airport	09/06/2014	50	\$5,000
Glen Lyon	06/28/2016	55	\$4,000
Pittston	07/25/2016	50	\$5,000
Shickshinny	07/25/2016	55	\$5,000
Westminister	02/25/2017	60	<i>not provided</i>
Wilkes-Barre	05/01/2017	52	\$3,000
Penobscot	07/17/2017	50	\$3,000
Ashley	07/20/2017	50	\$3,000
Newtown	08/22/2017	50	\$1,000
Harding	05/10/2018	50	\$5,000
Sweet Valley	05/15/5018	50	\$15,000
Nanticoke	05/15/5018	50	\$10,000
Wilkes-Barre	05/15/2018	50	\$15,000
Duryea	05/15/2018	50	\$1,000
Nanticoke	05/15/2018	50	\$2,000
Hollenback	06/13/2018	65	\$30,000
Huntsville	06/24/2018	50	\$20,000

**Table 4.3.10-4** Previous windstorm events greater than 50 knots in Luzerne County between 1950 and 2019 (NCEI, 2019).

LOCATION*	DATE	ESTIMATED WIND SPEED (knots)	ESTIMATED PROPERTY DAMAGE (\$)
Boulevard Manor	07/17/2018	50	\$5,000
Shickshinny	10/02/2018	50	\$10,000
Slocum	10/02/2018	50	\$15,000
Broadway	04/15/2019	70	\$10,000
Maplewood Heights	04/15/2019	70	\$10,000
Plains	04/15/2019	50	\$15,000
Pittston	04/15/2019	50	\$10,000
Edwardsville	04/15/2019	50	\$2,000
Kingston	04/15/2019	50	\$5,000
Kingston	04/15/2019	50	\$5,000
Nesopeck	05/19/2019	50	\$5,000
Shickshinny	05/19/2019	50	\$5,000
Conyngham	05/19/2019	50	\$5,000
Hobbie	05/19/2019	50	\$5,000
Forty Fort	05/19/2019	50	\$5,000
Edwardsville	05/19/2019	50	\$5,000
Wilkes-Barre	05/19/2019	50	\$10,000
Shickshinny	05/19/2019	50	\$10,000
Lehman	05/19/2019	50	\$10,000
Larksville	05/19/2019	50	\$5,000
Larksville	05/19/2019	50	\$10,000
Wanamie	05/29/2019	50	\$5,000
Blytheburn	05/29/2019	50	\$5,000
Nescopeck Pass	05/29/2019	50	\$5,000
Silkworth	07/02/2019	50	\$10,000
Pittston	07/21/2019	50	\$10,000
Fairmount Springs	07/21/2019	50	\$5,000
Muangola Station	07/21/2019	50	\$5,000
Pittston	07/30/2019	50	\$10,000
Duryea	07/30/2019	50	\$5,000
Dallas	08/02/2019	50	\$5,000
Wordan Place	08/02/2019	50	\$5,000
Duryea	08/08/2019	50	\$5,000
Red Rock	08/15/2019	50	\$5,000
Bloomington	08/15/2019	50	\$5,000
Beach Haven	08/17/2019	50	\$10,000
Beach Haven	08/17/2019	50	\$5,000
Shickshinny	08/18/2019	50	\$5,000

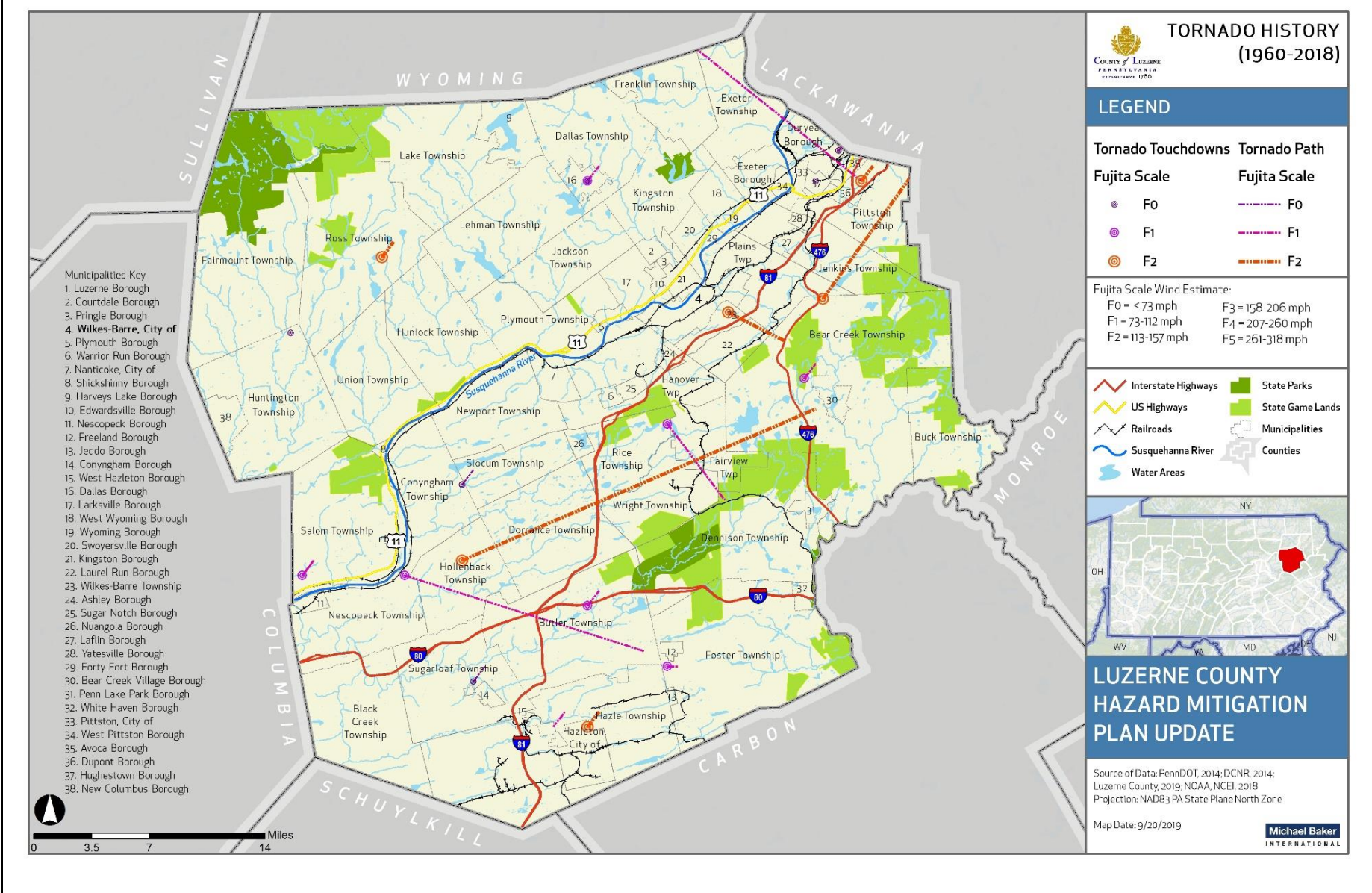
**Table 4.3.10-4** Previous windstorm events greater than 50 knots in Luzerne County between 1950 and 2019 (NCEI, 2019).

LOCATION*	DATE	ESTIMATED WIND SPEED (knots)	ESTIMATED PROPERTY DAMAGE (\$)
Kingston	08/18/2019	50	\$10,000

\*Location as stated on the NOAA Storm Events Database

Figure 4.3.10-1 below shows that tornado activity has occurred throughout the entire County.

Figure 4.3.10-1 Tornadoes that have touched down in Luzerne County



**4.3.10.4. Future Occurrence**

Nineteen tornadoes were reported for Luzerne County for the entire 1950-2020 period in NCEI. Therefore, the annual probability of being in the path of a tornado in Luzerne County is relatively minor. While the chance of being hit by a tornado is small, the damage that results when the tornado arrives can be potentially devastating. According to NCDC, there have been over 150 wind events in Luzerne County between 1950 and 2019. The probability of tornadoes and windstorms in Luzerne County can be considered *possible* as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

In recent years, there have been increasing numbers of tornadoes and windstorms around Luzerne County in Pennsylvania. An event in August 2019 brought down trees and utility lines across the county. These damaged vehicles and blocked roadways. While most of the recent windstorms and tornadoes have occurred outside of the county, their proximity contributes to future risk. Because more windstorms have been seen in the central Pennsylvania region, it is possible that an increasing number of tornadoes will be seen in Luzerne County.

**4.3.10.5. Vulnerability Assessment**

For tornadoes or high winds, aged and dilapidated structures or structures not built to applicable building codes are more susceptible to damage. Mobile homes and campgrounds are especially susceptible to damage due to tornado or high wind. Strong winds can rip roofs off of any dilapidated structures and overturn mobile homes. Past experience with tornadoes in Luzerne County shows that death and injury are indeed possibilities.

Vulnerability to the effects of a tornado or high wind is somewhat dependent upon the age of a structure because as building codes become more stringent, buildings are capable of enduring greater wind forces.

In Luzerne County, high winds occur annually. The most common detrimental effects are interruptions in power supply and communications services due to downed wires and blocked roadways due to downed trees. Most severe power failures or outages are regional events. With the loss of power, electrical-powered equipment and systems will not be operational. Examples include lighting, HVAC and ancillary support equipment, communication systems, ventilation system, refrigerators, sterilizers, and medical equipment. This can cause food spoilage, loss of heat or air conditions, basement flooding (sump pump failure), lack of light, loss of water (well pump failure), lack of phone service, or lack of internet. While it is most often a short-term nuisance rather than a catastrophic hazard, utility interruptions can cause challenges for communications and response, particularly in more rural areas of the county. A worst-case scenario for utility interruption in Luzerne County would involve a power outage during winter snow or ice storms, which have the potential to cause power outages for prolonged periods of time.

High winds often occur during hurricanes, tropical storms, and nor'easters. Information about potential annualized losses due to hurricane winds can be found in Section 4.3.5.

All structures and infrastructure might be exposed to the effects of a tornado or other high winds. Depending upon the severity of a tornado or high wind, any existing structures might be damaged to some extent. Any future structures might be exposed to tornados or high winds as this hazard does not occur in specific locations. However, future buildings will be somewhat protected from the effects of tornado or high wind as they will meet the most current State building code requirements for bracing and roof design.

Manufactured housing (i.e. mobiles homes or trailers) is particularly vulnerable to high winds and tornadoes. The U.S. Census Bureau defines manufactured homes as “movable dwellings, eight feet or wider and 40 feet or longer, design to be towed on its own chassis, with transportation gear integral to the unit when it leaves the factory, and without need of a permanent foundation (U.S. Census, 2010).” They can include multi-wide and expandable manufactured homes but exclude travel trailers, motor homes, and modular housing. Due to their lightweight and often unanchored design, manufactured housing is extremely vulnerable to high winds and will generally sustain the most damage.

Table 4.3.5.10-5 below displays the number of manufactured housing units per municipality in Luzerne County. Exeter Borough and Jenkins Township are the most vulnerable, each municipality having over 200 mobile homes. Additionally, Ashley Borough, Dallas Township, Foster Township, Franklin Township, Hazle Township, the City of Hazleton, Kingston Township, Lake Township. Laurel Run Borough, Lehman Township, Plains Township, Rice Township, Ross Township, and Salem township have over 100 mobile homes each. Laurel Run Borough has the greatest proportion of mobile homes, with over 46% of residential structures being mobile homes.

**Table 4.3.10-5 Mobile Homes in Luzerne County**

MUNICIPALITY	TOTAL RESIDENTIAL STRUCTURES	TOTAL MOBILE HOMES	PERCENT MOBILE HOMES	MUNICIPALITY	TOTAL RESIDENTIAL STRUCTURES	TOTAL MOBILE HOMES	PERCENT MOBILE HOMES
Ashley Borough	1,221	174	14.25%	Lafin Borough	631	1	0.16%
Avoca Borough	1,096	32	2.92%	Lake Township	829	114	13.75%
Bear Creek Village Borough	143	0	0.00%	Larksville Borough	1,861	84	4.51%
Bear Creek Township	1,313	12	0.91%	Laurel Run Borough	254	117	46.06%
Black Creek Township	843	37	4.39%	Lehman Township	1,505	116	7.71%

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

Table 4.3.10-5 Mobile Homes in Luzerne County							
MUNICIPALITY	TOTAL RESIDENTIAL STRUCTURES	TOTAL MOBILE HOMES	PERCENT MOBILE HOMES	MUNICIPALITY	TOTAL RESIDENTIAL STRUCTURES	TOTAL MOBILE HOMES	PERCENT MOBILE HOMES
Buck Township	235	14	5.96%	Luzerne Borough	1,187	16	1.35%
Butler Township	3,784	70	1.85%	City of Nanticoke	4,412	3	0.07%
Conyngham Borough	758	0	0.00%	Nescopec k Borough	638	21	3.29%
Conyngham Township	691	49	7.09%	Nescopec k Township	465	38	8.17%
Courtdale Borough	319	7	2.19%	New Columbus Borough	100	18	18.00%
Dallas Borough	1,099	2	0.18%	Newport Township	1,917	10	0.52%
Dallas Township	3,063	195	6.37%	Nuangola Borough	392	6	1.53%
Dennison Township	531	50	9.42%	Penn Lake Park Borough	242	0	0.00%
Dorrance Township	898	65	7.24%	City of Pittston	3,204	19	0.59%
Dupont Borough	1,260	39	3.10%	Pittston Township	1,392	84	6.32%
Duryea Borough	2,051	28	1.37%	Plains Township	4,173	162	3.88%
Edwardsville Borough	1,694	9	0.53%	Plymouth Borough	2,714	8	0.29%
Exeter Borough	2,399	248	10.34%	Plymouth Township	804	24	2.99%
Exeter Township	970	21	2.16%	Pringle Borough	430	8	1.86%
Fairmount Township	668	57	8.53%	Rice Township	1,297	117	9.02%
Fairview Township	1,098	1	0.09%	Ross Township	1,292	105	8.13%
Forty Fort Borough	1,784	1	0.06%	Salem Township	1,771	129	7.28%
Foster Township	1,754	128	7.30%	Shickshiny Borough	291	3	1.03%
Franklin Township	740	111	15.00%	Slocum Township	489	20	4.09%



## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

**Table 4.3.10-5 Mobile Homes in Luzerne County**

MUNICIPALITY	TOTAL RESIDENTIAL STRUCTURES	TOTAL MOBILE HOMES	PERCENT MOBILE HOMES	MUNICIPALITY	TOTAL RESIDENTIAL STRUCTURES	TOTAL MOBILE HOMES	PERCENT MOBILE HOMES
Freeland Borough	1,539	27	1.75%	Sugarloaf Township	1,518	38	2.50%
Hanover Township	4,816	85	1.76%	Sugar Notch Borough	436	1	0.23%
Harveys Lake Borough	1,675	57	3.40%	Swoyersville Borough	2,338	15	0.64%
Hazle Township	4,471	140	3.13%	Union Township	879	45	5.12%
City of Hazleton	9,382	132	1.41%	Warrior Run Borough	269	4	1.49%
Hollenback Township	479	45	9.39%	West Hazleton Borough	1,741	2	0.11%
Hughestown Borough	634	7	1.10%	West Pittston Borough	2,026	0	0.00%
Hunlock Township	1,007	83	8.24%	West Wyoming Borough	1,217	13	1.07%
Huntington Township	925	98	10.59%	White Haven Borough	480	46	9.58%
Jackson Township	1,002	9	0.88%	City of Wilkes-Barre	14,791	10	0.07%
Jeddo Borough	53	0	0.00%	Wilkes-Barre Township	1,449	15	1.04%
Jenkins Township	1,786	299	16.74%	Wright Township	2,230	15	0.67%
Kingston Borough	4,959	2	0.04%	Wyoming Borough	1,302	3	0.23%
Kingston Township	2,926	138	4.72%	Yatesville Borough	259	2	0.77%
				<b>Total</b>	<b>129,249</b>	<b>3,904</b>	<b>3.02%</b>

Environmental impacts from tornadoes can include debris in streams, wetlands, and other sensitive environmental features. Tree damage is commonly seen after high wind events.

Hazardous material facilities should meet design requirements for the wind zones identified in Figure 4.3.5-1 in order to prevent release of hazardous materials into the environment.

### 4.3.11. Wildfire



#### 4.3.11.1. Location and Extent

A wildfire is an uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures. A wildland fire is a wildfire in an area in which development is essentially nonexistent, except for roads, railroads, power lines, and similar facilities. An urban-wildland interface fire is a wildfire in a geographical area where structures and other human development meet or intermingle with wildland or vegetative fuels.

Wildfires can occur at any time of the year but are most likely to occur in the County during a drought. Wildland fires in Pennsylvania can occur in fields, grass, and brush as well as in the forest itself. Under dry conditions or drought, wildfires have the potential to burn forests as well as croplands. Any small fire in a wooded area, if not quickly detected and suppressed, can get out of control. Most wildland fires are caused by human carelessness, negligence, and ignorance. In 2017, debris burning accounted for the largest number of wildfires, while incendiary causes accounted for the largest number of acres burned in Pennsylvania (DCNR, 2017). However, some are precipitated by lightning strikes and in rare instances, spontaneous combustion.

Luzerne County is generally rural in nature, consisting of large tracts of undeveloped and forested lands. Therefore, a wildfire could develop in any portion of the County. The most high-risk areas of the County are at the forest-urban interface, where the potential for wildfire to spread to structures is greatest.

#### 4.3.11.2. Range of Magnitude

Wildfire events can range from small fires that can be managed by local firefighters to large fires impacting many acres of land. Large events may require evacuation from one or more communities and necessitate regional or national firefighting support. The impact of a severe wildfire can be devastating. A wildfire has the potential to kill people, livestock, fish, and wildlife. They often destroy property, valuable timber, and forage, recreational, and scenic values.

Vegetation loss is often an environmental concern with wildfires, but it typically is not a serious impact in that they burn dead trees, leaves, and grasses to allow more open space for new and different types of vegetation to grow and receive sunlight. Another positive effect of a wildfire is that it stimulates the growth of new shoots on trees and shrubs and its heat can open pinecones and other seed pods. The most significant negative impact the potential for severe erosion, silting of stream beds and reservoirs, and flooding due to ground-cover loss following a fire event.

In addition to the risk wildfires pose to the general public and property owners, the safety of firefighters is also a concern. Although loss of life among firefighters does not occur often in Pennsylvania, it is always a risk. More common firefighting injuries include falls, sprains, abrasions, or heat-related injuries such as dehydration. Response to wildfires also exposes emergency responders to the risk of motor vehicle accidents and can place them in remote acres away from the communities that they are chartered to protect.

**4.3.11.3. Past Occurrence**

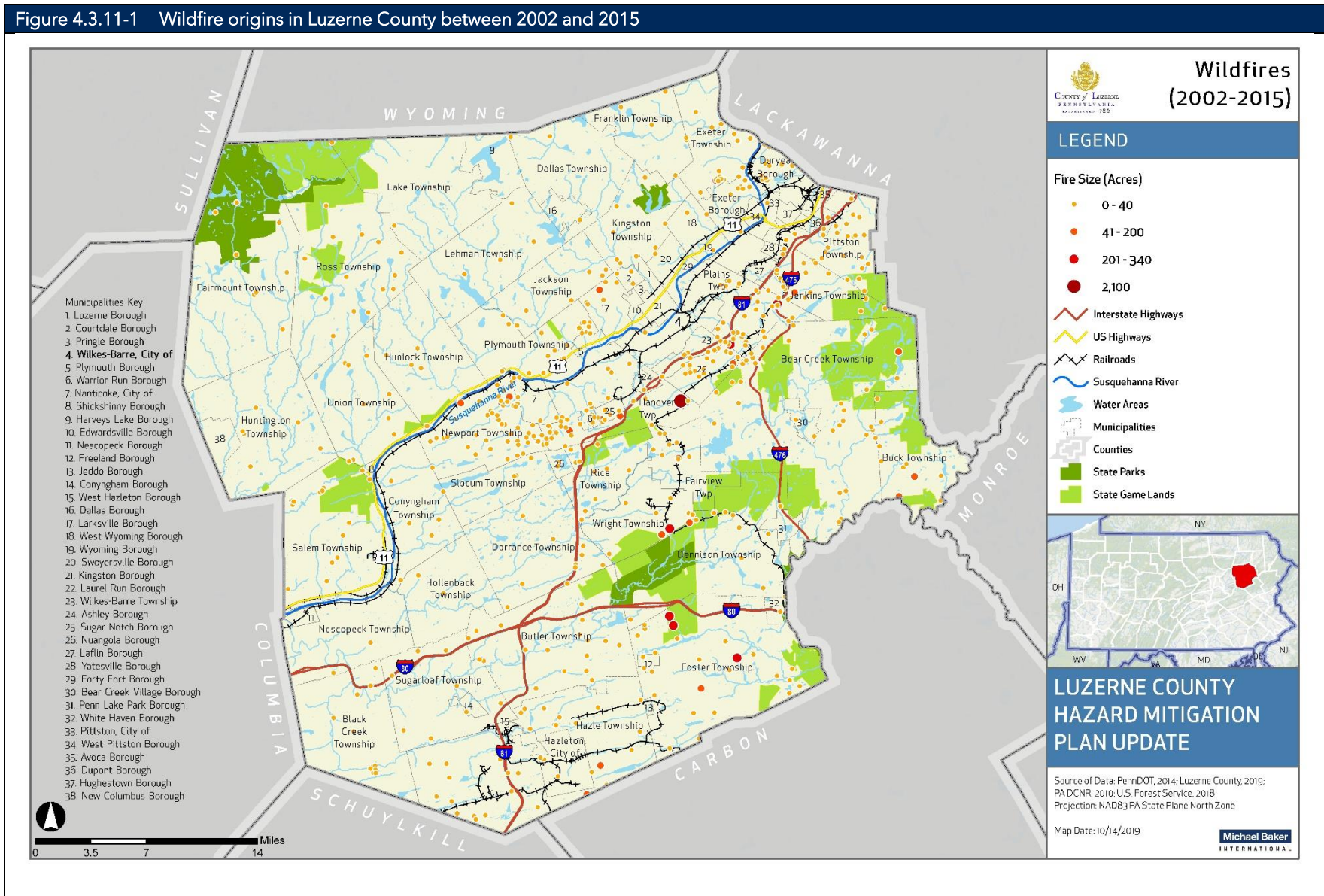
From 2014-2019, there were 511 wildfire events in Pennsylvania State Forest District 11 reported to the PADCNr Bureau of Forestry (BOF). District 11 consists of Luzerne County in addition to Lackawanna, Susquehanna, Wayne, and Wyoming Counties. This number does not include wildfires that were not reported to PADCNr or that were controlled solely by the volunteer fire departments in the County, but it is the most current and comprehensive list of wildfire occurrences available for the region surrounding Luzerne County. Table 4.3.11-1 shows the list of wildfire events reported to the PADCNr.

<b>Table 4.3.11-1 List of wildfire events reported in PA State Forest District 11 from 2014-2019 (DCNR, 2019).</b>				
<b>YEAR</b>	<b>TOTAL # OF FIRES</b>	<b>TOTAL AREA (ACRES)</b>	<b>% TOTAL FIRES</b>	<b>%TOTAL AREA (ACRES)</b>
2014	103	1842.7	11.8%	18.7%
2015	140	518.0	17.1%	12.4%
2016	102	411.8	12.0%	3.4%
2017	48	307.4	9.0%	18.6%
2018	76	126.4	11.0%	6.9%
2019	42	85.5	7.8%	12.3%
Notes: % Total Fires and % Total area represent percentages of the entire state of Pennsylvania.				

Figure 4.3.11-1 maps the origins of the wildfire events which were reported to the PADCNr listed in the table above. It is important to note that this is not an inclusive map of all wildfires, just those with known locations. The map shows that previous occurrences of wildfires have occurred throughout the entire County between 2002 and 2015.

# LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

Figure 4.3.11-1 Wildfire origins in Luzerne County between 2002 and 2015



#### **4.3.11.4. Future Occurrence**

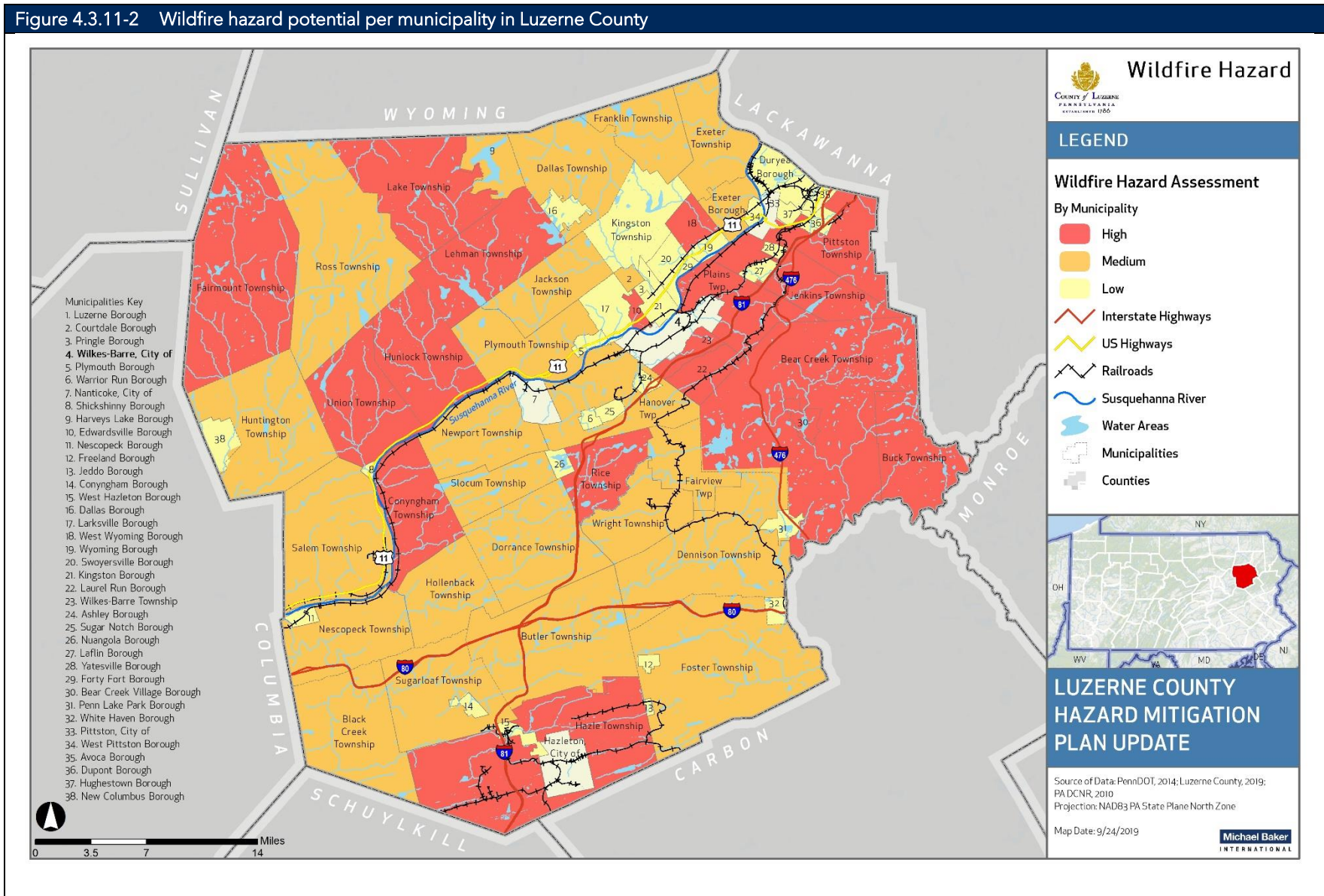
There have been over 500 wildfire events reported to the PADCNR over the past six years. Previous events indicate that wildfires will continue to occur yearly in Luzerne County. Therefore, the probability of a wildfire is estimated to be more than ninety percent in any given year and can be considered *highly likely* as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1). The likelihood of a fire attaining significant size and intensity is unpredictable and highly dependent on environmental conditions and firefighting response.

#### **4.3.11.5. Vulnerability Assessment**

The PADCNR-BOF has conducted an independent wildfire hazard risk assessment for the various municipalities across Luzerne County. Results of that assessment are shown in Figure 4.3.11-2. *Wildfire hazard* is defined based on conditions that affect wildfire ignition and/or behavior such as fuel, topography and local weather. Based on this assessment, eighteen jurisdictions have a *high* wildfire rating. Twenty-five municipalities within Luzerne County have a *medium* wildfire hazard potential. Twenty-nine jurisdictions, generally spatially concentrated around the Susquehanna River, are considered to have *low* wildfire hazard potential. All four cities in Luzerne County are listed as having no wildfire hazard potential.

# LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

Figure 4.3.11-2 Wildfire hazard potential per municipality in Luzerne County



Wildfires have the potential to destroy huge areas of vegetation with no regard to the man-made structures within those areas. The rural areas in which these fires occur generally have little firefighting infrastructure such as hydrants, and the fire departments servicing those areas may take extended times to reach and ultimately extinguish the fire.

Using this PADCNR assessment, the parcels and critical facilities most vulnerable to wildfire hazards are those located within the eighteen high-rated jurisdictions. Table 4.3.11-2 lists the total structures and critical facilities in the county. Please note that the individual vulnerability of communities will differ based on the design of the urban/wildland interface, the number of ingress and egress points into a community, and the availability of water to fight fires. All structures in Bear Creek Village Borough, Bear Creek Township, Buck Township, Conyngham Township, Fairmount Township, Laurel Run Borough, Rice Township, and West Wyoming Borough are located within high wildfire hazard areas. Hazle Township and Plains Township have the largest number of structures within high wildfire hazard areas (5,146 and 4,690 structures). One hundred percent of critical facilities are located in high wildfire hazard areas in 3 municipalities. Hazle, Pittston and Plains Townships also have the highest number of critical facilities in high wildfire hazard areas (72, 41 and 58 critical facilities). These municipalities have the highest vulnerability to damages in a wildfire event.

**Table 4.3.11-2 Structures and Critical Facilities Vulnerable to Wildfires in Luzerne County (High Hazard Areas and Forested Areas)**

MUNICIPALITY	TOTAL STRUCTURES IN MUNICIPALITY	STRUCTURES IN HIGH WILDFIRE HAZARD AREAS	PERCENT OF STRUCTURES	TOTAL CRITICAL FACILITIES IN MUNICIPALITY	TOTAL CRITICAL FACILITIES IN HIGH WILDFIRE HAZARD AREAS	PERCENT CRITICAL FACILITIES
Ashley Borough	1,287	0	0.00%	17	0	0.00%
Avoca Borough	1,185	2	0.17%	18	0	0.00%
Bear Creek Village Borough	165	165	100.00%	46	31	67.39%
Bear Creek Township	1,467	1,467	100.00%	5	4	80.00%
Black Creek Township	1,217	13	1.07%	22	0	0.00%
Buck Township	270	270	100.00%	6	5	83.33%
Butler Township	4,332	2	0.05%	62	1	1.61%
Conyngham Borough	816	0	0.00%	6	0	0.00%
Conyngham Township	736	736	100.00%	22	16	72.73%

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

<b>Table 4.3.11-2 Structures and Critical Facilities Vulnerable to Wildfires in Luzerne County (High Hazard Areas and Forested Areas)</b>						
<b>MUNICIPALITY</b>	<b>TOTAL STRUCTURES IN MUNICIPALITY</b>	<b>STRUCTURES IN HIGH WILDFIRE HAZARD AREAS</b>	<b>PERCENT OF STRUCTURES</b>	<b>TOTAL CRITICAL FACILITIES IN MUNICIPALITY</b>	<b>TOTAL CRITICAL FACILITIES IN HIGH WILDFIRE HAZARD AREAS</b>	<b>PERCENT CRITICAL FACILITIES</b>
Courtdale Borough	336	0	0.00%	5	0	0.00%
Dallas Borough	1,306	0	0.00%	14	0	0.00%
Dallas Township	3,584	1	0.03%	52	0	0.00%
Dennison Township	583	0	0.00%	18	0	0.00%
Dorrance Township	1,004	6	0.60%	40	0	0.00%
Dupont Borough	1,370	3	0.22%	18	0	0.00%
Duryea Borough	2,228	1	0.04%	20	0	0.00%
Edwardsville Borough	1,911	1,902	99.53%	12	12	100.00%
Exeter Borough	2,584	0	0.00%	15	0	0.00%
Exeter Township	1,034	0	0.00%	23	0	0.00%
Fairmount Township	755	755	100.00%	30	23	76.67%
Fairview Township	1,864	0	0.00%	17	0	0.00%
Forty Fort Borough	1,965	0	0.00%	12	0	0.00%
Foster Township	1,986	1	0.05%	37	0	0.00%
Franklin Township	793	0	0.00%	18	0	0.00%
Freeland Borough	1,660	0	0.00%	4	0	0.00%
Hanover Township	5,306	0	0.00%	90	0	0.00%
Harveys Lake Borough	2,083	30	1.44%	15	0	0.00%
Hazle Township	5,226	5,146	98.47%	72	64	88.89%
City of Hazleton	10,316	0	0.00%	57	0	0.00%
Hollenback Township	683	0	0.00%	11	0	0.00%



## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

<b>Table 4.3.11-2 Structures and Critical Facilities Vulnerable to Wildfires in Luzerne County (High Hazard Areas and Forested Areas)</b>						
<b>MUNICIPALITY</b>	<b>TOTAL STRUCTURES IN MUNICIPALITY</b>	<b>STRUCTURES IN HIGH WILDFIRE HAZARD AREAS</b>	<b>PERCENT OF STRUCTURES</b>	<b>TOTAL CRITICAL FACILITIES IN MUNICIPALITY</b>	<b>TOTAL CRITICAL FACILITIES IN HIGH WILDFIRE HAZARD AREAS</b>	<b>PERCENT CRITICAL FACILITIES</b>
Hughestown Borough	665	0	0.00%	5	0	0.00%
Hunlock Township	1,072	1,065	99.35%	29	22	75.86%
Huntington Township	994	2	0.20%	45	0	0.00%
Jackson Township	1,082	0	0.00%	19	0	0.00%
Jeddo Borough	54	0	0.00%	1	0	0.00%
Jenkins Township	2,107	2,105	99.91%	27	25	92.59%
Kingston Borough	5,502	5	0.09%	44	0	0.00%
Kingston Township	3,141	1	0.03%	35	1	2.86%
Laflin Borough	664	11	1.66%	13	1	7.69%
Lake Township	919	916	99.67%	24	18	75.00%
Larksville Borough	1,972	0	0.00%	14	0	0.00%
Laurel Run Borough	267	267	100.00%	3	3	100.00%
Lehman Township	1,669	1,665	99.76%	33	25	75.76%
Luzerne Borough	1,331	0	0.00%	10	0	0.00%
City of Nanticoke	4,745	0	0.00%	26	0	0.00%
Nescopeck Borough	704	0	0.00%	5	0	0.00%
Nescopeck Township	511	0	0.00%	25	0	0.00%
New Columbus Borough	105	0	0.00%	4	0	0.00%
Newport Township	2,051	0	0.00%	19	0	0.00%
Nuangola Borough	408	2	0.49%	2	0	0.00%
Penn Lake Park Borough	249	0	0.00%	4	0	0.00%

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

<b>Table 4.3.11-2 Structures and Critical Facilities Vulnerable to Wildfires in Luzerne County (High Hazard Areas and Forested Areas)</b>						
<b>MUNICIPALITY</b>	<b>TOTAL STRUCTURES IN MUNICIPALITY</b>	<b>STRUCTURES IN HIGH WILDFIRE HAZARD AREAS</b>	<b>PERCENT OF STRUCTURES</b>	<b>TOTAL CRITICAL FACILITIES IN MUNICIPALITY</b>	<b>TOTAL CRITICAL FACILITIES IN HIGH WILDFIRE HAZARD AREAS</b>	<b>PERCENT CRITICAL FACILITIES</b>
City of Pittston	3,514	10	0.28%	41	38	92.68%
Pittston Township	1,637	1,611	98.41%	14	0	0.00%
Plains Township	4,696	4,690	99.87%	58	52	89.66%
Plymouth Borough	2,903	0	0.00%	18	0	0.00%
Plymouth Township	890	0	0.00%	20	0	0.00%
Pringle Borough	459	0	0.00%	7	0	0.00%
Rice Township	1,427	1,427	100.00%	33	19	57.58%
Ross Township	1,413	9	0.64%	36	0	0.00%
Salem Township	1,909	0	0.00%	39	0	0.00%
Shickshinny Borough	345	5	1.45%	8	0	0.00%
Slocum Township	534	4	0.75%	9	0	0.00%
Sugarloaf Township	1,747	1	0.06%	4	0	0.00%
Sugar Notch Borough	468	0	0.00%	39	0	0.00%
Swoyersville Borough	2,438	0	0.00%	12	0	0.00%
Union Township	959	957	99.79%	24	14	58.33%
Warrior Run Borough	281	0	0.00%	3	0	0.00%
West Hazelton Borough	1,936	5	0.26%	21	0	0.00%
West Pittston Borough	2,177	0	0.00%	6	0	0.00%
West Wyoming Borough	1,299	1,299	100.00%	8	8	100.00%
White Haven Borough	561	0	0.00%	8	0	0.00%
City of Wilkes-Barre	16,308	0	0.00%	35	19	54.29%

**Table 4.3.11-2 Structures and Critical Facilities Vulnerable to Wildfires in Luzerne County (High Hazard Areas and Forested Areas)**

MUNICIPALITY	TOTAL STRUCTURES IN MUNICIPALITY	STRUCTURES IN HIGH WILDFIRE HAZARD AREAS	PERCENT OF STRUCTURES	TOTAL CRITICAL FACILITIES IN MUNICIPALITY	TOTAL CRITICAL FACILITIES IN HIGH WILDFIRE HAZARD AREAS	PERCENT CRITICAL FACILITIES
Wilkes-Barre Township	1,895	1,854	97.84%	109	0	0.00%
Wright Township	2,376	0	0.00%	36	0	0.00%
Wyoming Borough	1,504	0	0.00%	13	0	0.00%
Yatesville Borough	288	29	10.07%	2	0	0.00%
<b>TOTAL</b>	<b>144,219</b>	<b>28,440</b>	<b>19.72%</b>	<b>1,774</b>	<b>401</b>	<b>22.60%</b>

**4.3.12. Winter Storm**

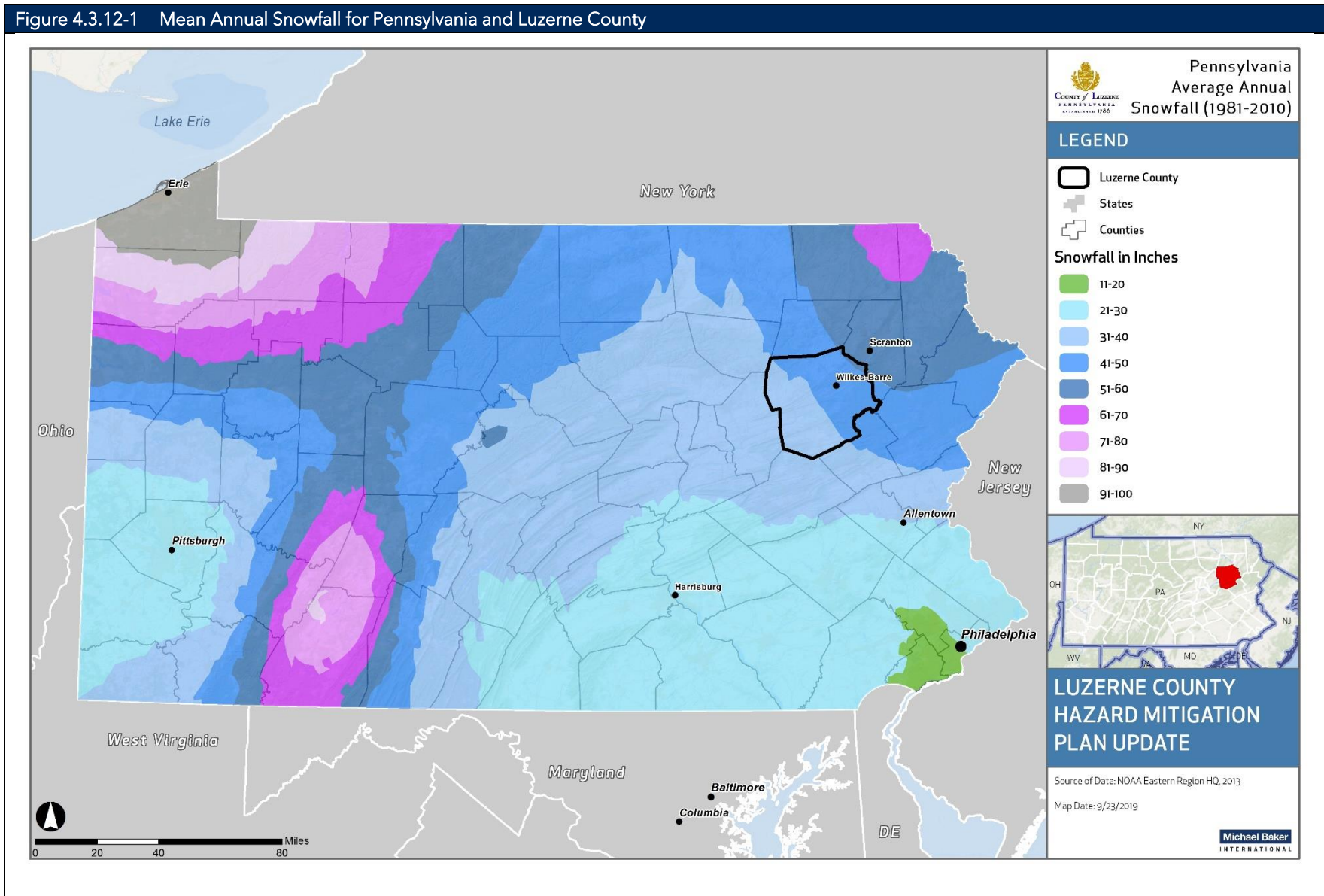


**4.3.12.1. Location and Extent**

Heavy snow or ice occurs throughout the Commonwealth of Pennsylvania. Every municipality in Luzerne County is affected by these storms. Luzerne County experiences all levels of winter storms from ice storms and freezing rain to heavy snow and blizzards. Generally, the average annual snowfall is consistent throughout the County, with the area receiving between 31 and 50 inches of snow annually (see the map below). This was the most current data available at the time of this HMP Update.

# LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

Figure 4.3.12-1 Mean Annual Snowfall for Pennsylvania and Luzerne County



#### 4.3.12.2. *Range of Magnitude*

Winter storms consist of cold temperatures, heavy snow or ice and sometimes strong winds. Because winter storms are a regular occurrence in Luzerne County, they are considered hazards only when they result in damage to specific structures and/or overwhelm local capabilities to handle disruptions to traffic, communications, and electric power. The cost of removing snow, repairing damages, especially from ice storms, and the loss to businesses can have a negative economic impact for communities. Winter storms can generate other hazards such as infrastructure disruption (blocked roads and power outages), human-caused hazards (traffic accidents and trapped vehicles), and technological problems (communication system outages and overload). Winter storms can adversely affect roadways, utilities, business activities, and can cause loss of life, frostbite, or freezing.

Winter storms may include one or more of the following weather events:

- **Heavy Snowstorm:** Accumulations of four inches or more in a six-hour period, or six inches or more in a 12-hour period.
- **Sleet Storm:** Sleet is formed when snow falling to the earth partially melts as it passes through a layer of warm air. The precipitation then passes through a cold layer of air and refreezes into solid pellets. Sleet causes surfaces to become slippery, posing hazards to pedestrians and motorists.
- **Ice Storm:** An ice storm occurs when rain freezes upon impact with the ground or other objects such as trees and power lines. Heavy accumulations of ice can bring down trees and topple utility poles, disrupting power and communication for days while crews make the necessary repairs. The icy conditions are also dangerous for pedestrians and vehicular traffic.
- **Blizzard:** According to the National Weather Service, a blizzard is a severe snowstorm that occurs when winds reach 35mph or more. The blowing snow reduces visibility to less than one-quarter of a mile for at least three hours. Storms that meet these criteria are not frequent in Luzerne County; however, storms that produce blizzard-like conditions are a common occurrence.
- **Severe Blizzard:** Wind velocity of 45 mph, 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.

One of the worst examples of a winter storm event in Luzerne County occurred in 2017 when a snowstorm deposited over 30 inches in Northeastern Pennsylvania. The Wilkes-Barre/Scranton airport set an all-time daily snowfall record of 22.1 inches. In January 2003, a slow-moving nor'easter dropped 4-9 inches in Luzerne County. The weight of the snow combined with the weight of ice from a previous storm caused additional power outages. All major roads in the region had motor vehicle accidents.

**4.3.12.3. Past Occurrence**

The Commonwealth of Pennsylvania has a long history of winter storms. Winter storms generally occur more than once each year in the County. The NCEI data on past occurrences for winter storm lists events since 1995, causing over \$767,000 in damages. These winter storm events are listed in Table 4.3.12-1 below.

<b>Table 4.3.12-1 Previous winter storm events impacting Luzerne County since 1995 (NCEI, 2020).</b>			
<b>LOCATION</b>	<b>DATE</b>	<b>TYPE</b>	<b>ESTIMATED PROPERTY DAMAGE (\$)</b>
Countywide	01/02/1996	Heavy Snow	\$3,000
Countywide	01/07/1996	Heavy Snow	\$20,000
Countywide	01/12/1996	Heavy Snow	\$4,000
Countywide	03/06/1996	Heavy Snow	<i>not provided</i>
Countywide	05/31/1996	Heavy Snow	<i>not provided</i>
Countywide	03/31/1997	Heavy Snow	<i>not provided</i>
Countywide	04/01/1997	Heavy Snow	<i>not provided</i>
Countywide	12/29/1997	Heavy Snow	<i>not provided</i>
Countywide	02/23/1998	Heavy Snow	<i>not provided</i>
Countywide	1/02/1999	Ice Storm	<i>not provided</i>
Countywide	01/13/1999	Winter Storm	<i>not provided</i>
Countywide	03/14/1999	Heavy Snow	<i>not provided</i>
Countywide	03/21/1999	Heavy Snow	<i>not provided</i>
Countywide	01/20/2000	Heavy Snow	<i>not provided</i>
Countywide	01/25/2000	Heavy Snow	<i>not provided</i>
Countywide	01/30/2000	Heavy Snow	<i>not provided</i>
Countywide	02/13/2000	Ice Storm	<i>not provided</i>
Countywide	02/18/2000	Heavy Snow	<i>not provided</i>
Countywide	04/08/2000	Heavy Snow	<i>not provided</i>
Countywide	12/13/2000	Winter Storm	<i>not provided</i>
Countywide	12/19/2000	Heavy Snow	<i>not provided</i>
Countywide	01/20/2001	Heavy Snow	<i>not provided</i>
Countywide	02/05/2001	Heavy Snow	<i>not provided</i>
Countywide	02/24/2001	Ice Storm	<i>not provided</i>
Countywide	03/04/2001	Heavy Snow	<i>not provided</i>
Countywide	01/06/2002	Heavy Snow	<i>not provided</i>
Countywide	01/31/2002	Winter Storm	<i>not provided</i>
Countywide	02/01/2002	Winter Storm	<i>not provided</i>
Countywide	12/05/2002	Heavy Snow	<i>not provided</i>
Countywide	12/11/2002	Winter Weather	<i>not provided</i>
Countywide	12/24/2002	Heavy Snow	<i>not provided</i>
Countywide	01/03/2003	Heavy Snow	\$300,000
Countywide	02/17/2003	Heavy Snow	\$50,000
Countywide	12/06/2003	Heavy Snow	\$20,000

**Table 4.3.12-1 Previous winter storm events impacting Luzerne County since 1995 (NCEI, 2020).**

LOCATION	DATE	TYPE	ESTIMATED PROPERTY DAMAGE (\$)
Countywide	03/16/2004	Heavy Snow	\$20,000
Countywide	01/06/2005	Winter Weather	\$100,000
Countywide	01/23/2005	Heavy Snow	\$20,000
Countywide	03/01/2005	Heavy Snow	\$20,000
Countywide	03/24/2005	Heavy Snow	\$10,000
Countywide	10/25/2005	Winter Weather	not provided
Countywide	12/09/2005	Heavy Snow	\$10,000
Countywide	12/16/2005	Winter Storm	\$10,000
Countywide	02/13/2007	Winter Storm	\$75,000
Countywide	03/16/2007	Heavy Snow	not provided
Countywide	04/15/2007	Winter Storm	not provided
Countywide	11/17/2007	Winter Weather	\$5,000
Countywide	02/10/2008	Winter Weather	\$100,000
Countywide	10/28/2008	Winter Storm	not provided
Countywide	12/19/2008	Heavy Snow	not provided
Countywide	10/15/2009	Winter Weather	not provided
Countywide	02/10/2010	Winter Storm	not provided
Countywide	02/25/2010	Winter Storm	not provided
Countywide	02/20/2011	Winter Storm	not provided
Countywide	03/23/2011	Winter Storm	not provided
Countywide	10/29/2011	Winter Storm	not provided
Countywide	01/02/2014	Winter Storm	not provided
Countywide	02/05/2014	Winter Storm	not provided
Countywide	02/13/2014	Winter Storm	not provided
Countywide	11/26/2014	Winter Storm	not provided
Countywide	02/01/2015	Heavy Snow	not provided
Countywide	01/23/2016	Heavy Snow	not provided
Countywide	02/09/2017	Heavy Snow	not provided
Countywide	03/09/2017	Heavy Snow	not provided
Countywide	03/14/2017	Blizzard	not provided
Countywide	03/02/2018	Heavy Snow	not provided
Countywide	11/15/2018	Heavy Snow	not provided

**4.3.12.4. Future Occurrence**

Data from NCDC shows that winter storms are a regular occurrence in Luzerne County. So, the probability of the occurrence of a damaging heavy snow or ice storm in Luzerne County in any given year is 100 percent. The future occurrence of winter storms hazard can be considered *highly likely* as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

**4.3.12.5. Vulnerability Assessment**

Vulnerability to the effects of winter storms on buildings is somewhat dependent on the age of a building because as building codes become more stringent, buildings can support heavier loads and as buildings age, various factors may deteriorate their structural integrity.

Vulnerability also depends upon the type of construction and the degree to which a structure has been maintained.

The most vulnerable structures are those that were poorly built or are dilapidated. The weight of heavy snow or ice may lead to structural collapse or to minor damage. Some shed roofs that protect township and borough road maintenance or firefighting equipment have large span roofs that may collapse under the weight of especially heavy snow or ice although none have collapsed due to recent heavy snow or ice storms.

In Luzerne County, accumulations of snow and/or ice during winter months are expected and normal. The most common detrimental effects of snow and/or ice are not collapsed structures but traffic accidents and interruptions in power supply and communications services.

All structures and infrastructure in Luzerne County are exposed to heavy snow and ice. For this analysis, structures built prior to 1940 are identified as being potentially at risk of being somewhat weakened and more susceptible to damage due to heavy snow or ice. The following table shows the number of housing units in Luzerne County built prior to 1940 according to the US Census Bureau’s estimates. The City of Wilkes-Barre has the most structures of any municipality in the county built prior to 1940 (over 9,000). However, Jeddo Borough has the largest proportion of housing units built prior to 1940 (88.4%). While the U.S. Census provides estimates for residential structures, the age of non-residential structures is not available.

MUNICIPALITY	NUMBER OF HOUSING UNITS BUILT PRIOR TO 1940	PERCENT OF TOTAL HOUSING UNITS
Ashley Borough	815	59.1%
Avoca Borough	641	52.0%
Bear Creek Township	138	9.5%
Bear Creek Village Township	55	35.5%
Black Creek Township	404	35.0%
Buck Township	46	17.5%
Butler Township	471	11.2%
Conyngam Borough	130	15.0%
Conyngam Township	357	45.1%
Courtdale Borough	121	41.2%
Dallas Borough	271	22.7%
Dallas Township	433	11.6%
Dennison Township	77	13.4%



**Table 4.3.12-2 Age of housing units in Luzerne County (U.S. Census, 2017)**

MUNICIPALITY	NUMBER OF HOUSING UNITS BUILT PRIOR TO 1940	PERCENT OF TOTAL HOUSING UNITS
Dorrance Township	182	20.0%
Dupont Borough	512	41.4%
Duryea Borough	845	36.0%
Edwardsville Borough	737	30.5%
Exeter Borough	841	32.8%
Exeter Township	192	18.9%
Fairmount Township	136	20.1%
Fairview Township	252	15.5%
Forty Fort Borough	1,056	53.5%
Foster Township	458	22.9%
Franklin Township	127	16.5%
Freeland Borough	891	55.2%
Hanover Township	1,927	35.5%
Harveys Lake Borough	452	23.8%
Hazle Township	1,063	23.1%
City of Hazleton	4,544	42.0%
Hollenback Township	103	20.3%
Hughestown Borough	294	43.6%
Hunlock Township	198	18.8%
Huntington Township	208	23.6%
Jackson Township	150	15.4%
Jeddo Borough	107	88.4%
Jenkins Township	463	21.3%
Kingston Borough	2,481	36.8%
Kingston Township	686	24.1%
Laflin Borough	23	3.4%
Lake Township	167	18.3%
Larksville Borough	695	33.9%
Laurel Run Borough	39	15.2%
Lehman Township	300	18.1%
Luzerne Borough	601	36.0%
City of Nanticoke	2,497	46.3%
Nescopeck Borough	330	43.9%
Nescopeck Township	117	23.3%
New Columbus Borough	28	24.6%
Newport Township	1,084	50.3%
Nuangola Borough	146	34.0%
Penn Lake Park Borough	13	6.0%
City of Pittston	2,380	56.4%

**Table 4.3.12-2 Age of housing units in Luzerne County (U.S. Census, 2017)**

MUNICIPALITY	NUMBER OF HOUSING UNITS BUILT PRIOR TO 1940	PERCENT OF TOTAL HOUSING UNITS
Pittston Township	501	33.5%
Plains Township	1,741	37.3%
Plymouth Borough	1,812	55.5%
Plymouth Township	387	46.3%
Pringle Borough	198	38.3%
Rice Township	126	9.1%
Ross Township	369	24.4%
Salem Township	441	22.4%
Shickshinny Borough	228	57.9%
Slocum Township	176	35.6%
Sugarloaf Township	210	13.3%
Sugar Notch Borough	276	61.5%
Swoyersville Borough	1,101	44.7%
Union Township	216	23.1%
Warrior Run Borough	158	54.7%
West Hazleton Borough	900	45.5%
West Pittston Borough	1,510	62.6%
West Wyoming Borough	311	25.2%
White Haven Borough	264	47.2%
City of Wilkes-Barre	9,720	49.8%
Wilkes-Barre Township	697	47.7%
Wright Township	258	11.2%
Wyoming Borough	698	45.2%
Yatesville Borough	70	25.3%
<b>Total</b>	<b>53,652</b>	<b>35.8%</b>

All structures and infrastructure in Luzerne County will be exposed to heavy snow and ice. Because all of Luzerne County has adopted the 2009 IBC and IRC, building, new construction will be able to withstand the weight of heavy snow or ice.

HUMAN-MADE HAZARDS

4.3.13. Cyber-Terrorism



4.3.13.1. Location and Extent

Cyberterrorism is a broad term that refers to acts associated with the convergence of terrorism and cyberspace. Generally, cyberterrorism involves unlawful attacks or threats against computers, networks, and the information stored therein to intimidate or coerce a government or its people to achieve political or social objectives (Denning, 2000). These acts can range from taking control of a host website, to using networked resources to directly cause destruction and harm. The Pennsylvania Department of Homeland Security defines the following types and methods of cyberattacks:

THREAT	DESCRIPTION
Botnet (also zombies)	A collection of computers subject to control by an outside party, usually without the knowledge of the owners, using secretly installed software robots. The robots are spread by trojan horses and viruses. The botnets can be used to launch denial-of-service attacks and transmit spam.
Card Skimming	The act of using a skimmer to illegally collect data from the magnetic stripe of a credit, debit or ATM card. This information, copied onto another blank card's magnetic stripe, is then used by an identity thief to make purchases or withdraw cash in the name of the actual account holder. Skimming can take place at an ATM and can occur at restaurants, taxis, or other places where a user surrenders his or her card to an employee.
Denial-of-service attack	Flooding the networks or servers of individuals or organizations with false data requests so they are unable to respond to requests from legitimate users.
Malicious code (also malware)	Any code that can be used to attack a computer by spreading viruses, crashing networks, gathering intelligence, corrupting data, distributing misinformation and interfering with normal operations.
Pharming	The act of sending an e-mail to a user falsely claiming to be an established legitimate enterprise to scam the user into surrendering private information that will be used for identity theft. The e-mail directs the user to visit a website where they are asked to update personal information, such as passwords and credit card, social security, and bank account numbers that the legitimate organization already has. The website, however, is bogus and set up only to steal the user's information.
Phishing	Using fake e-mail to trick individuals into revealing personal information, such as Social Security numbers, debit and credit card account numbers and passwords, for nefarious uses.

Table 4.3.13-1 Methods of Cyberattacks (PA Department of Homeland Security, 2017)	
THREAT	DESCRIPTION
Spam	Unsolicited bulk e-mail that may contain malicious software. Spam is now said to account for around 81 percent of all e-mail traffic.
Spear Phishing	A type of phishing attack that focuses on a single user or department within an organization, addressed from someone within the company in a position of trust and requesting information such as login IDs and passwords. Spear phishing scams will often appear to be from a company's own human resources or technical support divisions and may ask employees to update their username and passwords. Once hackers get this data, they can gain entry into secured networks. Another type of spear phishing attack will ask users to click on a link, which deploys spyware that can thief data.
Spoofing	Making a message or transaction appear to come from a source other than the originator.
Spyware	Software that collects information without a user's knowledge and transfers it to a third party.
Trojan horse	A destructive program that masquerades as a benign application. Unlike viruses, Trojan horses do not replicate themselves, but they can be just as destructive. One of the most insidious types of Trojan horse is a program that claims to rid your computer of viruses but instead introduces viruses onto your computer.
Virus	A program designed to degrade service, cause inexplicable symptoms or damage networks.
Worm	Program or algorithm that replicates itself over a computer network and usually performs malicious actions, such as using up the computer's resources and possibly shutting the system down. A worm, unlike a virus, has the capability to travel without human action and does not need to be attached to another file or program.

Cyberattacks may not always constitute acts of cyberterrorism because some acts may have relatively small impacts and only produce annoyances. A cyberattack is generally considered an act of cyberterrorism when the following motivations are present:

- **Effects-based:** What computer attacks result in effects that are disruptive enough to generate fear comparable to a traditional act of terrorism.
- **Intent-based:** When unlawful or politically motivated computer attacks are done to intimidate or coerce a government or people to further a political objective, or to cause grave harm or severe economic damage (Rollins and Clay, 2007).

Cyberattacks can be further divided into the following categories based on the complexity of the attack:

- **Simple-Unstructured:** Simple-unstructured attacks are the most common. These are amateurish attacks with relatively minimal consequences.

- **Advanced-Structured:** Advanced-structured attacks are more sophisticated and consequential and have a greater emphasis on targeting victims prior to an attack, resulting in a more debilitating effect.
- **Complex-Coordinated:** Complex-coordinated attacks are the most advanced and most troublesome type of attack where success could mean a network shutdown (Denning, 2000).

Cyberterrorism can cause severe disruptions to transportation, public safety, and utility services, all of which are critical infrastructure that are highly dependent on information technology. Cyberterrorism can take many forms, including attacks through physical means, electronic means, and use of malicious code. Cyberterrorists can also have a wide range of personal, political, or cultural agendas. All state agencies, as well as individuals, businesses, and other institutions in Luzerne County, are potential targets for cyberterrorism. Potential threats include identity theft, loss of sensitive information, disruption of services, and other malicious activity.

Cyber terrorists can be difficult to identify because the internet provides a meeting place for individuals from various parts of the world. Individuals or groups planning a cyber-attack are not organized in a traditional manner, as they are able to effectively communicate over long distances without delay. Cyber-attacks are also unpredictable and typically occur without warning.

#### **4.3.13.2. Range of Magnitude**

In recent years, cyberterrorism has become a significant threat and can impact people, businesses, institutions, local governments, and state agencies to varying degrees. Impacts from a large-scale cyberterrorism event could disrupt the state’s economy and potentially threaten its economic stability. The magnitude of a cyberterrorism attack will vary greatly based on the extent of systems affected and duration of the impact. Additionally, the magnitude will vary based upon which specific system is affected by an attack, the ability to preempt an attack, and an attack’s effect on continuity of operations. The largest threat to institutions from cyberterrorism comes from any processes that are networked and controlled via computer. The county and individual municipalities should address and take measures to reduce any vulnerabilities that could allow access to sensitive data or processes.

#### **4.3.13.3. Past Occurrence**

In June 2019, there was a cyberattack on the Luzerne County courthouse network. The attack targeted computers with information including property assessment records, budgetary and financial information, and employee time clock reports. Luzerne County government is protected through a cyber risk policy under its general liability insurance. Following the attack, the County selected an outside vendor to assist with remediation. Remediation refers to post cyberattack assessments made to determine what parts of the network are infected and need

fixing. The County was forced to shut down its entire network following the attack to stop the virus from spreading (Learn-Andes, 2019).

Since 2012, there have been two statewide cyberterrorism related incidents reported to PEMA-KC. In 2017 there was an international cyber-attack, and in 2018 there was a statewide cyber incident. There were also cyber threats and attacks in other Pennsylvania Counties, including York in 2016, and Northampton and Bethlehem City in 2017.

Another large-scale attack was the Equifax data breach in 2017, which was estimated to potentially impact over 5.5 million residents of Pennsylvania and over 145.5 million nationally. The information accessed included names, Social Security numbers, birthdates, addresses, and driver's license numbers (PA Office of the Attorney General, 2017). Additionally, in 2014 the largest data breach in history impacted over 3 billion Yahoo user accounts, including the names, email address, date of birth, and telephone numbers of over 500 million users (CSO, 2018). In terms of a data breach cyber-attack, this could be considered a worst-case scenario event. Other large-scale data breach events have also occurred in recent years and are becoming more common.

In addition to large-scale acts of cyberterrorism, smaller cyberattacks occur daily. Billions of emails are sent each day, and spam and phishing emails account for a significant share of all email traffic. Additionally, brute force attacks, which are trial and error attempts to obtain user passwords and pins, are frequently used by criminals attempting to crack encrypted data or gain access to private accounts. Firewalls can be effective at keeping security threats such as these out, but once a cybercriminal gains access to a system, they can attack from within. For example, gaining access to a state employees email account would allow a hacker to send additional phishing emails from within a network, which may not be as monitored as closely as attacks from outside the system. This is known as spear phishing.

#### **4.3.13.4. Future Occurrence**

Cyberterrorism is an emerging hazard that has the potential to impact the County's computer infrastructure and the systems and services that are provided to the public. Concerns about cyberterrorism throughout the United States is growing as its impacts could have potentially crippling effects. Security experts describe the threat of cyberterrorism as imminent. The future occurrence of cyberterrorism can be considered *possible* as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

Following its recent cyber-attack, Luzerne County has put several measures in place to reduce the risk of future attacks. County departments were tasked with creating contingency plans for operation during emergencies, so there is less disruption if future incidents occur. Additionally, all county employees have received mandatory training in cybersecurity measures. The county has also posted a new position in the Information Technology department.

**4.3.13.5. Vulnerability Assessment**

Generally, cyberterrorism has no direct effect on the environment; however, the environment may be affected if a hazardous materials release occurred because of critical infrastructure failure as a result of cyberterrorism. Similarly, an act of cyberterrorism on a nuclear power plant could have devastating environmental consequences if the plant suffered an intentional catastrophic failure. Please see Section 4.3.15 for more information on Hazardous Materials Release.

All county and municipal facilities are vulnerable to cyberterrorism. While the physical structures of these buildings are generally not at risk, information systems and data stored within them are vulnerable. Government computer networks contain sensitive information that is integral to the security of the Commonwealth and could be the target of a cyber-attack. County and municipal governments may also possess and maintain forms of personal and financial information, including tax filings, birth and death records, Social Security numbers, medical information, and more. Additionally, many critical facilities that are essential to Luzerne County operations are reliant upon computer networks to monitor and control critical functions. For example, an attack on a nuclear power plant or the power grid could have detrimental impacts on County services and functions. Additionally, a large-scale computer breach could lead to economic costs in lost productivity to the impacted agency/organization and potentially related businesses and industries. However, lost revenues and productivity would depend on the type of magnitude of the cyberterrorism event.

All communities in Luzerne County are vulnerable on some level, directly or indirectly, to a cyberterrorism attack. However, in general, areas with higher concentrations of government or industry facilities may have higher risk. Additionally, areas with higher concentrations of people, businesses, and critical infrastructure might be at higher risk.

**4.3.14. Dam Failure**



Due to data sensitivity, the Dam Failure profile can be found in Appendix H.

### 4.3.15. Hazardous Materials Release



#### 4.3.15.1. Location and Extent

Hazardous material releases pose threats to the natural environment, the built environment, and public safety through the diffusion of harmful substances, materials, or products. Hazardous materials can include toxic chemicals, infectious substances, biohazardous waste, and any materials that are explosive, corrosive, flammable, or radioactive. Hazardous material releases can occur wherever hazardous materials are manufactured, used, stored, or transported. Such releases can occur along transportation routes or at fixed-site facilities. Hazardous material releases can result in human and wildlife injury, property damage, and contamination of air, water, and soils.

The environmental impacts of hazardous material release include:

- Hydrologic effects - surface and groundwater contamination
- Other effects on water quality such as changes in water temperature
- Damages to streams, lakes, ponds, estuaries, and wetland ecosystems
- Air quality effects - pollutants, smoke, and dust
- Loss of quality in landscape
- Reduced soil quality
- Damage to plant communities - loss of biodiversity; damage to vegetation
- Damage to animal species - animal fatalities; degradation of wildlife and aquatic habitat; pollution of drinking water for wildlife; loss of biodiversity; disease

Transportation of hazardous materials on highways via tankers or trailers accounts for the greatest number of hazardous materials release incidents in Pennsylvania. According to the U.S. DOT's Office of Operations and the U.S. Census Bureau, it is estimated that 11 percent of all freight transported by trucks is hazardous material. A number of major highways may be used in Luzerne County for the transport of hazardous materials including I-80, I-81, PA-29, PA-93, PA-115, PA-309, PA-315, and PA-940. Luzerne County has over 2,600 linear miles of roadway according to PennDOT's 2018 Pennsylvania Highway Statistics Report (PennDOT, 2018). Many of these roads are used to transport hazardous materials. Additionally, many cross rivers and streams and travel through downtown and residential areas, increasing the potential to pollute surface water and groundwater and cause harm to life and property. Data indicates that highway freight travel accounts for more than 80% of all freight transported within Pennsylvania, and more than 50% of all freight shipped to or from the Commonwealth. The majority of freight travel in Luzerne County occurs on the interstate system roadways, with Interstates 80, 81, and 84 carrying the highest volumes of freight bearing trucks. Interstates 476 and 380 and U.S. 11 and 6 also carry significant truck volumes. Luzerne County is most vulnerable to accidents at fixed-site facilities along or nearby these routes.



Potential also exists for hazardous material release incidents to occur along rail lines and pipelines. Large spills can result from collisions or derailments of train cars. Several railroad accidents have occurred in Pennsylvania involving hazardous materials (NTSB, 2018), though none in Luzerne County. Luzerne County has many miles of railroad throughout the County, mainly used for moving freight. The exact mileage of railroads is not listed, except for the Luzerne County Rail Corporation, which operates 56 miles of freight-only track in the County. The North Shore Railroad Company runs branch line service along the west shore of the Susquehanna River, stopping at the Susquehanna Steam Electric Station. A HAZMAT rail accident in this location would be a worst-case scenario for Luzerne County. See Section 4.3.17 for more information about risk related to Nuclear Power Plants. Active rails are concentrated along the Susquehanna River near the cities of Pittston and Wilkes-Barre. Rail lines extend along US-11 and US-437 (Comp plan, 2011). Additionally, there are lines near the City of Hazleton. There are inactive rail lines located near all areas of active rail lines, with an additional line along PA-309 in the Northern part of Luzerne County (Comp plan, 2011).

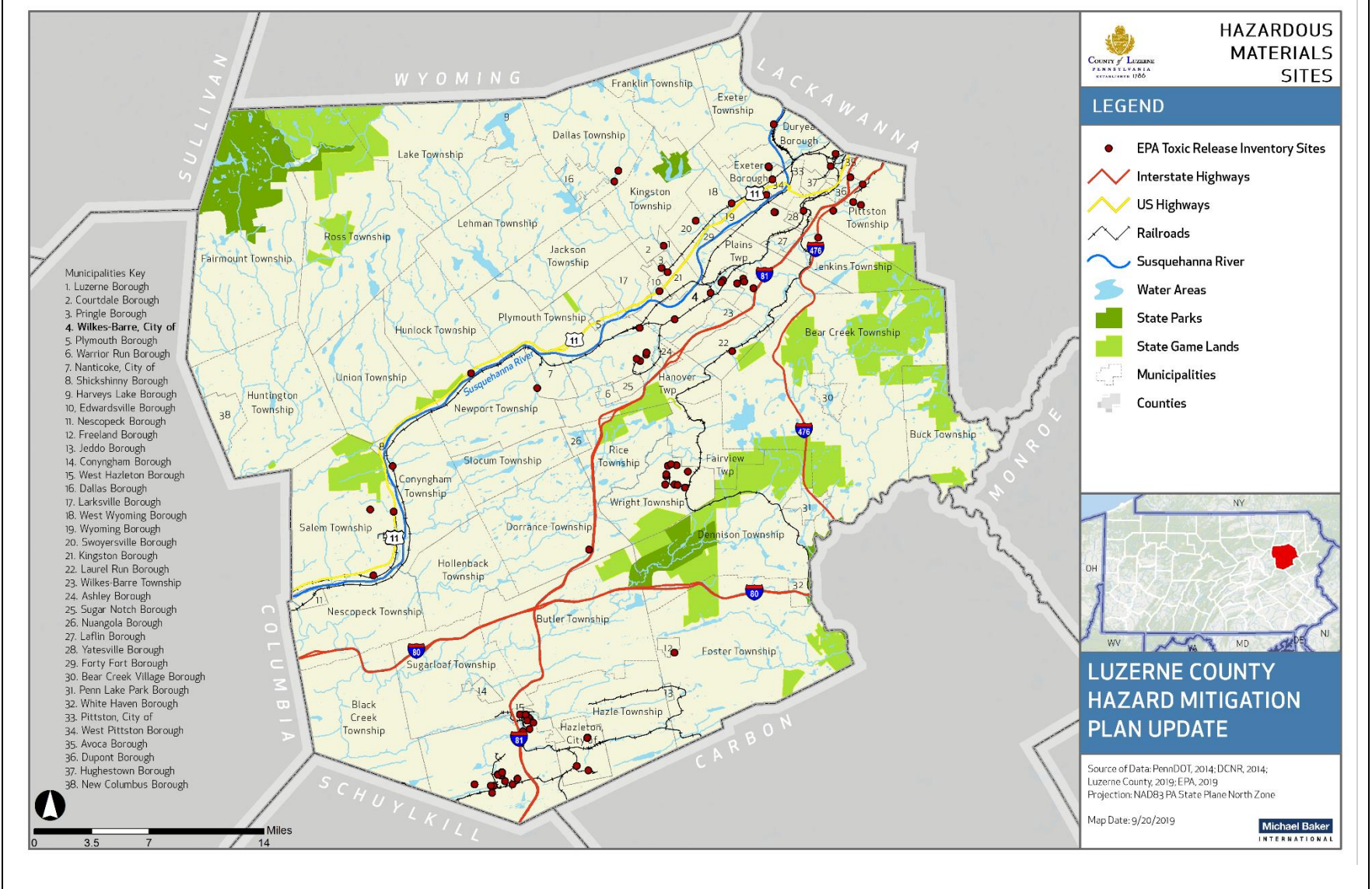
Fixed-site facilities that use, manufacture, or store hazardous materials in Pennsylvania pose significant risk to public health and the environment and must comply with both Title III of the federal Superfund Amendments and Reauthorization Act (SARA), also known as the Emergency Planning and Community Right-to-Know Act (EPCRA), and the Commonwealth's reporting requirements under the Hazardous Materials Emergency Planning and Response Act (1990-165), as amended. These statutes require that all owners or operators of facilities that manufacture, produce, use, import, export, store, supply, or distribute any extremely hazardous substance, as defined by the EPA, at or above the threshold planning quantity, report to the county where the facility is located and the Commonwealth. These facilities are subject to the requirement of assisting the Local Emergency Planning Committee (LEPC) in developing an Off-site Emergency Response Plan. The community right-to-know reporting requirements keep communities abreast of the presence and release of chemicals at individual facilities.

The list of SARA Title III facilities is not an exhaustive, fully comprehensive inventory of all hazardous material locations within Luzerne County. The EPA also tracks key information about chemicals handled by industrial facilities through its Toxics Release Inventory (TRI) database. Facilities which employ ten or more full-time employees, and which manufacture or process 25,000 pounds or more, or otherwise use 10,000 pounds or more, 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. In 2018, Luzerne County had 32 facilities on the EPA's TRI list. See the map below of TRI facility locations. According to the 2018 TRI Factsheet, these facilities managed 2.9 million pounds of production-related waste that year. The TRI Factsheet also lists the top five chemicals released into air and water in Luzerne County in 2018. The biggest releases into the air include glycol ethers, ammonia, styrene, propylene, and xylene. Ammonia accounts for 99% of releases into the water, the other 1% being made up of nickel and other metals.

Nuclear facilities are another type of fixed facility that poses risk of hazard material release. For more information about nuclear incidents, reference Section 4.3.17.

Figure 4.3.15-1 shows the locations of hazardous materials sites in Luzerne County.

Figure 4.3.15-1 Hazardous Materials Sites in Luzerne County



#### 4.3.15.2. *Range of Magnitude*

Hazardous material releases can contaminate air, water, and soils possibly resulting in death and/or injuries. Dispersion can take place rapidly when transported by water and wind. While often accidental, releases can occur as a result of human carelessness, intentional acts, or natural hazards. When caused by natural hazards, these incidents are known as secondary events. As previously mentioned, materials can include toxic chemicals, radioactive materials, infectious substances and hazardous wastes. Such releases can affect nearby populations and contaminate critical or sensitive environmental areas.

With a hazardous material release, whether accidental or intentional, there are several potentially mitigating or exacerbating circumstances that will affect its severity or impact. Mitigating conditions are precautionary measures taken in advance to reduce the impact of a release on the surrounding environment. Primary and secondary containment or shielding by sheltering-in-place protects people and property from the harmful effects of a hazardous material release. Exacerbating conditions, characteristics that can enhance or magnify the effects of a hazardous material release include:

- **Weather conditions:** affects how the hazard occurs and develops
- **Micro-meteorological effects of buildings and terrain** alters dispersion of hazardous materials
- **Non-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 severity of the incident is dependent not only on the circumstances described above, but also on the type of material released and the distance and related response time for emergency response teams. The areas within closest proximity to the releases are generally at greatest risk, yet depending on the agent, a release can travel great distances or remain present in the environment for a long period of time (e.g. centuries to millennia for radioactive materials), resulting in extensive impacts on people and the environment.

One of the worst recorded hazardous materials incidents known in Pennsylvania occurred in March 2009 when a tractor trailer overturned spilling 33,000 pounds of toxic hydrofluoric acid near Wind Gap, Pennsylvania resulting in the evacuation of 5,000 people (USA Today, 2009). Residents were evacuated because contact with concentrated solutions of the acid can cause severe burns and inhaling the gas can cause respiratory irritation, severe eye damage, and pulmonary edema. More recently in Pennsylvania, a train derailment incident required the evacuation of an entire town of approximately 1,000 residents roughly 100 miles southeast of Pittsburgh. In August 2017, at least 32 cars on a CSX freight train derailed causing some cars to catch fire. CSX reported that one car containing liquid petroleum gas and another containing molten sulfur leaked and caught fire. Additionally, one of the cars collided with a home and set fire to the garage (CBS News, 2017).

Luzerne County could experience many issues if a hazardous material release occurred in the most populous jurisdictions. These include the City of Hazleton, Kingston Borough, the City of Nanticoke, the City of Pittston, and the City of Wilkes-Barre. A hazardous material release would likely cause the evacuation of city residents, visitors, and employees.

#### **4.3.15.3. Past Occurrence**

According to the Pipeline and Hazardous Materials Safety Administration, 165,053 hazardous material release incidents have been reported during transportation (including in-transit, loading, and unloading) in the United States since 2010. Pennsylvania alone can account for 8,092 of those incidents, with damages exceeding \$31 Million, 68 hospitalizations, and one fatality (PHMSA, 2019). Specific information regarding incident reports by year can be found on the U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration website.

Since the passage of SARA, Title III facilities that produce, use, or store hazardous chemicals must notify the public through the county emergency dispatch center and PEMA if an accidental release of a hazardous substance meets or exceeds a designated reportable quantity and affects or has the potential to affect persons and/or the environment outside the plant. SARA Title III and Pennsylvania Act 165 also require a written follow-up report to PEMA and the County. These written follow-up reports include any known or anticipated health risks associated with the release and actions to be taken to mitigate potential future incidents. In addition, Section 204(a) (10) of Act 165 requires PEMA to staff and operate a 24-hour State Emergency Operations Center (SEOC) to provide effective emergency response coordination. PEMA-KC reports that Luzerne County experienced 157 hazardous materials incidents between 2013 and 2018.

#### **4.3.15.4. Future Occurrence**

While many hazardous material release incidents have occurred in Pennsylvania in the past, not many have specifically happened in Luzerne County. Hazardous material release incidents are generally considered difficult to predict. An occurrence is largely dependent upon the accidental or intentional actions of a person or group. Risk associated with hazardous materials release is expected to remain moderate. The future occurrence of hazardous materials release incidents in Luzerne County can be characterized as *possible* as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

Shifting traffic patterns and the presence of a multitude of hazardous materials in transit through the County warrants the need for development of increased response capability. It is difficult to predict when and where environmental hazards will arise as they are often related to equipment failure and human error. Adequate monitoring through the PADEP will reduce the likelihood of potential impacts to the community and to the environment.

#### **4.3.15.5. Vulnerability Assessment**

The vulnerability of a community and the environment to a spill or release of an extremely hazardous substance at a facility or from a transportation accident depends on many variables.

These include: the specific chemical, the extent of the spill or release, the proximity of waterways, and the number of people residing in a radius from the facility or accident location that can reasonably be expected to be adversely affected.

Furthermore, the vulnerability of a community and the environment to a hazardous material release from a transportation incident is directly related to several specific variables; namely the mode and class of transportation. Each mode is further subject to several categories of hazard. Each mode of transportation (truck/highway, aircraft, rail, watercraft, or pipeline) has separate and distinct factors affecting the vulnerability. Transportation carriers must have response plans in place to address accidents, otherwise the local emergency response team will step-in to secure and restore the area. Quick response minimizes the volume and concentration of hazardous materials that disperse through air, water, and soil. All types of population are evaluated in determining the population at risk within the radius of vulnerability including hospitals, schools, homes for the elderly, and critical facilities. There are more than 30 facilities in Luzerne County included on the EPA's TRI and that store extremely hazardous substances. Populations in communities that contain these facilities are more vulnerable to facility releases, particularly those within 1.5 miles of a given facility. Jurisdictions within one-quarter mile of major highways and railways are considered more vulnerable in the event of a transportation incident involving hazardous materials. Note that there is some overlap among these vulnerable jurisdictions. For example, an individual that lives within 1.5 miles of a hazardous materials site may also live within one-quarter mile of a major road.

To determine jurisdictional vulnerability to hazardous materials release, GIS analysis was conducted to identify all census blocks with centers located in areas characterized by high risk of hazardous material release. As previously defined, high-risk areas are those within one-quarter mile of major Interstates, U.S. highways, state highway, and rail lines, and areas within 1.5 miles of hazardous materials sites identified. The total populations and buildings within these census blocks were summed by county to determine the total vulnerable population and the total number and value of vulnerable buildings. The 2018 Pennsylvania State Hazard Mitigation Plan reports that Luzerne County has a vulnerable population of over 236,000 and over 101,000 vulnerable structures. These buildings make up over 77% of the county building value, valued at over \$27 million.

Luzerne County has a low chemical facility rating but has a high transportation threat rating according to PEMA. The County contracts with Datom Products, an environmental protection and remediation organization, for support with hazard materials incidents including spill response.

Table 4.3.15-2 shows the estimated number and percentage of population in each municipality living in hazardous material hazard areas. These numbers are based off 2010 Census population estimates. The City of Wilkes-Barre and the City of Hazleton have the highest populations living in hazard areas (41,489 and 25,340 people respectively). One hundred per cent of the population is located within hazard areas in 32 municipalities.

Municipalities with high numbers and proportions of population located in hazard areas are much more vulnerable in the event of hazardous material release.

**Table 4.3.15-1 Population Vulnerable to Hazardous Material Sites in Luzerne County**

MUNICIPALITY	TOTAL ESTIMATED 2010 POPULATION	TOTAL POPULATION IN HAZMAT HAZARD AREA	PERCENT POPULATION IN HAZMAT HAZARD AREA	MUNICIPALITY	TOTAL ESTIMATED 2010 POPULATION	TOTAL POPULATION IN HAZMAT HAZARD AREA	PERCENT POPULATION IN HAZMAT HAZARD AREA
Ashley Borough	2,790	2,790	100.00%	Laflin Borough	1,487	1,487	100.00%
Avoca Borough	2,661	2,661	100.00%	Lake Township	2,049	561	27.38%
Bear Creek Village Borough	257	4	1.56%	Larksville Borough	4,480	4,313	96.27%
Bear Creek Township	2,774	1,202	43.33%	Laurel Run Borough	500	265	53.00%
Black Creek Township	2,016	742	36.81%	Lehman Township	3,508	2,176	62.03%
Buck Township	435	18	4.14%	Luzerne Borough	2,845	2,845	100.00%
Butler Township	9,221	5,262	57.07%	City of Nanticoke	10,465	10,465	100.00%
Conyngham Borough	1,914	1,914	100.00%	Nescopeck Borough	1,583	1,583	100.00%
Conyngham Township	1,453	225	15.49%	Nescopeck Township	1,155	284	24.59%
Courtdale Borough	732	732	100.00%	New Columbus Borough	227	0	0.00%
Dallas Borough	2,804	2,804	100.00%	Newport Township	5,374	4,361	81.15%
Dallas Township	8,994	7,943	88.31%	Nuangola Borough	679	679	100.00%
Dennison Township	1,125	368	32.71%	Penn Lake Park Borough	308	0	0.00%
Dorrance Township	2,188	1,175	53.70%	City of Pittston	7,739	7,739	100.00%
Dupont Borough	2,711	2,711	100.00%	Pittston Township	3,368	3,345	99.32%
Duryea Borough	4,917	4,917	100.00%	Plains Township	9,961	9,957	99.96%
Edwardsville Borough	4,816	4,816	100.00%	Plymouth Borough	5,951	5,951	100.00%
Exeter Borough	5,652	5,652	100.00%	Plymouth Township	1,812	1,821	83.94%
Exeter Township	2,378	264	11.10%	Pringle Borough	979	979	100.00%
Fairmount Township	1,276	0	0.00%	Rice Township	3,335	1,594	47.80%

**Table 4.3.15-1 Population Vulnerable to Hazardous Material Sites in Luzerne County**

MUNICIPALITY	TOTAL ESTIMATED 2010 POPULATION	TOTAL POPULATION IN HAZMAT HAZARD AREA	PERCENT POPULATION IN HAZMAT HAZARD AREA	MUNICIPALITY	TOTAL ESTIMATED 2010 POPULATION	TOTAL POPULATION IN HAZMAT HAZARD AREA	PERCENT POPULATION IN HAZMAT HAZARD AREA
Fairview Township	4,520	4,520	100.00%	Ross Township	2,937	291	9.91%
Forty Fort Borough	4,212	4,212	100.00%	Salem Township	4,254	3,469	81.55%
Foster Township	3,467	2,007	57.89%	Shickshinny Borough	838	0	0.00%
Franklin Township	1,757	0	0.00%	Slocum Township	1,115	656	58.83%
Freeland Borough	3,531	3,531	100.00%	Sugarloaf Township	4,211	2,524	59.94%
Hanover Township	11,076	11,022	99.51%	Sugar Notch Borough	989	989	100.00%
Harveys Lake Borough	2,791	1,089	39.02%	Swoyersville Borough	5,062	3,833	75.72%
Hazle Township	9,549	9,249	96.86%	Union Township	2,042	0	0.00%
City of Hazleton	25,340	25,340	100.00%	Warrior Run Borough	584	584	100.00%
Hollenback Township	1,196	210	17.56%	West Hazleton Borough	4,594	4,561	99.28%
Hughestown Borough	1,392	1,392	100.00%	West Pittston Borough	4,868	4,868	100.00%
Hunlock Township	2,443	300	12.28%	West Wyoming Borough	2,725	2,338	85.80%
Huntington Township	2,244	0	0.00%	White Haven Borough	1,097	1,097	100.00%
Jackson Township	4,646	834	17.95%	City of Wilkes-Barre	41,498	41,498	100.00%
Jeddo Borough	98	98	100.00%	Wilkes-Barre Township	2,967	2,967	100.00%
Jenkins Township	4,442	4,442	100.00%	Wright Township	5,651	3,183	56.33%
Kingston Borough	13,182	13,182	100.00%	Wyoming Borough	3,073	3,073	100.00%
Kingston Township	6,999	5,495	78.51%	Yatesville Borough	607	607	100.00%
				<b>Total</b>	<b>320,918</b>	<b>269,782</b>	<b>84.07%</b>



**4.3.16. Levee Failure**



**4.3.16.1. Location and Extent**

A levee is a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water to reduce the risk from temporary flooding (FEMA, 2016). Breaches of these structures occur when they are overtopped or physically incapable of containing the pressure exerted by the floodwaters. If a levee breaks, many properties may be quickly

submerged in floodwaters and residents may become trapped by this rapidly rising water. The failure of levees has the potential to result in loss of life, property damage, and substantial economic impacts (for example from damage to infrastructure or agriculture).

According to the USACE National Levee Database (NLD), there are six major levee systems in Luzerne County, excluding the four debris dams and earthen embankments less than 0.1 miles in length (Table 4.3.16-1) (NLD, 2019). They are all located in the northeastern part of the County where the Susquehanna River flows through historically urbanized areas. Levee systems can be Federal or Non-Federal projects. Federal projects are congressionally authorized projects that are generally planned, designed and constructed by USACE and a cost-sharing levee sponsor. Levees require maintenance to continue to provide the level of protection for which they were designed and built. Maintenance and operational responsibilities, referred to as sponsorship, belong to a variety of entities including levee districts, water management districts, local governments, state governments, and tribal governments. Table 4.3.17-1 shows the entity responsible for constructing, operating, and maintaining the major levee systems in Luzerne County. This information was obtained from the NLD. The County has a total of about 18 miles of levee systems, with 16 miles operated and maintained by the Luzerne County Flood Protection Authority (LCFPA) and two miles operated and maintained by local governments. Figure 4.3.16-1 shows the location of the levees and levee-impacted areas.

LEVEE SYSTEM NAME	SPONSOR	LENGTH (MI)	USACE REHABILITATION STATUS*	AUTHORIZATION CATEGORY
Kingston to Exeter**	Luzerne County Flood Protection Authority	8.62	Active	USACE Federally constructed, turned over to public sponsor operations and maintenance.
Wilkes-Barre-Hanover Township**	Luzerne County Flood Protection Authority	5.57	Active	USACE Federally constructed, turned over to public sponsor

Table 4.3.16-1 Levee and Floodwall Information for Luzerne County (USACE, 2020)				
LEVEE SYSTEM NAME	SPONSOR	LENGTH (MI)	USACE REHABILITATION STATUS*	AUTHORIZATION CATEGORY
				operations and maintenance
Plymouth**	Luzerne County Flood Protection Authority	1.83	Active	USACE Federally constructed, turned over to public sponsor operations and maintenance.
Duryea Flood Protection Project	Borough of Duryea	0.96	Inactive	Non-Federal Levee, Locally Operated and Maintained
Brookside Levee	City of Wilkes-Barre	0.51	Inactive	Non-Federal Levee, Locally Operated and Maintained
Wilkes-Barre Left Bank	City of Wilkes-Barre	0.28	Active	Non-Federal Levee, Locally Operated and Maintained
<p><i>*The USACE Rehabilitation Program (authorized under Public Law 84-99) is a voluntary program that provides for the repair of eligible levees damaged by floods and coastal storms. Only locally operated and maintained levees are eligible. To be active in the program, a levee must remain properly maintained by the local project sponsor.</i></p> <p><i>**Part of the Wyoming Valley Flood Risk Management Project</i></p>				

FEMA plays an important role in helping local officials and community members understand the risk of flooding in levee-impacted areas. While levees can reduce the risk of flooding, they do not eliminate it. Levees do not “protect” lives or property from flooding. Rather, they reduce risk. The primary way that FEMA communicates flood risk in levee-impacted areas is through its Flood Insurance Rate Maps (FIRMs). These maps show the areas with low, moderate, and high risk of flooding during a 1-percent-annual-chance flood, or a flood that has a one-percent chance of happening in any given year. The FEMA flood maps for Luzerne County became effective in November 2012 and show flood hazards in levee-impacted areas based on the best available data at that time.

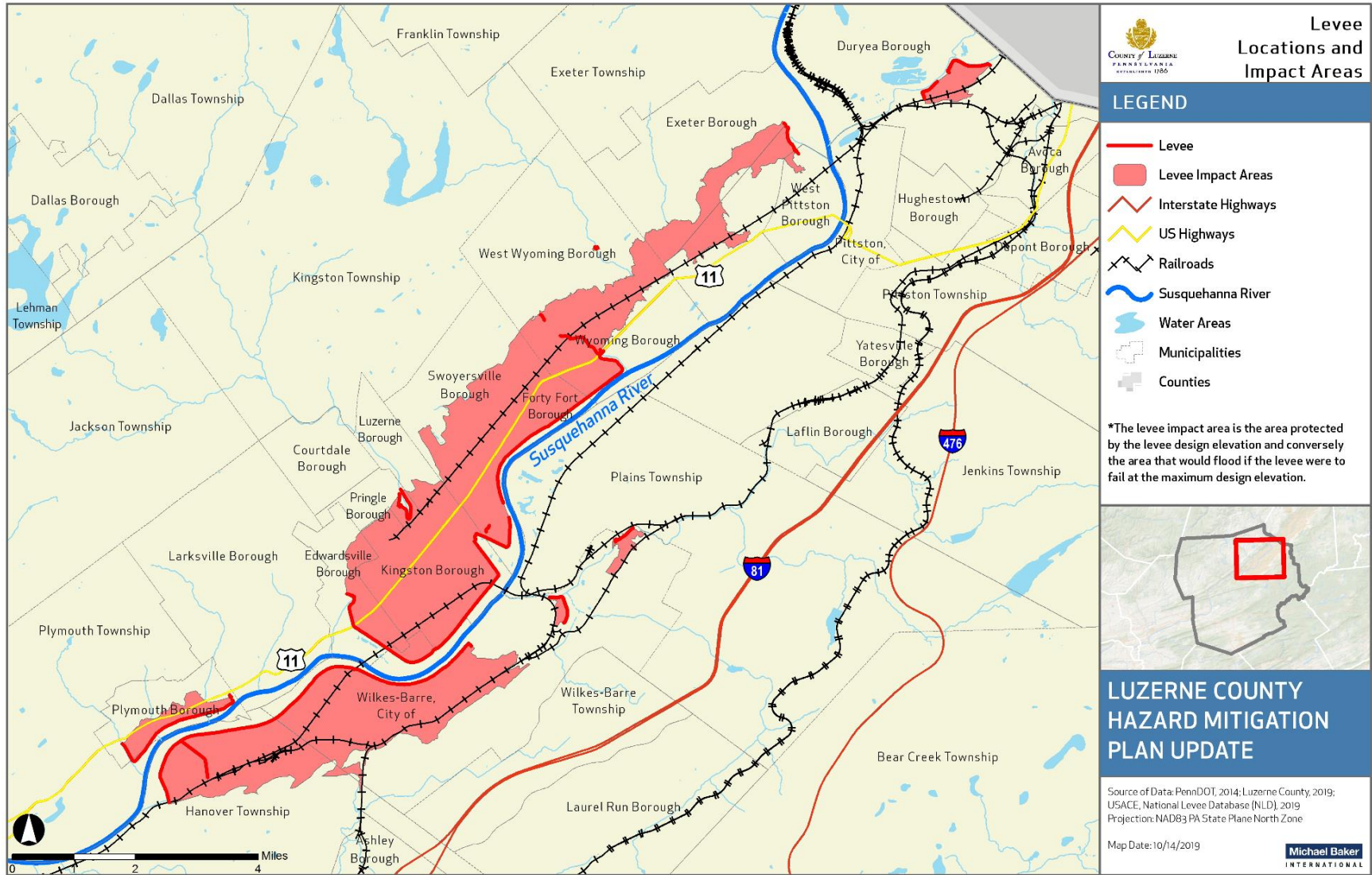
Because conditions change over time, FEMA is currently engaged in a long-term process of updating the flood maps for levee-impacted areas in Luzerne County. One of the main drivers of this effort is a recent hydrologic study completed by USACE in 2013. After Tropical Storm Lee, the USACE used the latest available data to analyze flood flows along the Susquehanna River and estimate flood elevations for the 1-percent-annual-chance flood. The study found that the flood elevations calculated using the latest available data are much higher than those shown on the effective FIRM. Updated flood depths are anywhere from 0.7 to four feet higher

than the effective flood depths. Such significant increases in flood risk need to be communicated to residents, especially in levee-impacted areas.

FEMA is working with affected communities and stakeholders to update the flood maps for areas impacted by the six major levee systems in Luzerne County. This process involves re-evaluating the extent of the area that could be flooded, as well as re-evaluating the level of risk reduction provided by each levee system. If a levee system meets certain Federal requirements to show that it is tall enough, strong enough, and properly operated and maintained (those in Code of Federal Regulations, Title 44, Chapter 1, Section 65.10), FEMA will recognize, or "accredit," the levee as reducing the hazard from the 1-percent-annual-chance flood. Although there is still a risk of flooding in the levee-impacted area, FEMA will show the area as moderate risk instead of high risk.

The flood map update process also involves significant community engagement. FEMA has started working with Local Levee Partnership Teams for four of the six levee systems in Table 4.3.16-1 - The Wilkes-Barre-Hanover Township Levee System, the Plymouth Levee System, the Brookside Levee System, and the Wilkes-Barre Left Bank Levee System. As the flood map update process moves forward, it is important that residents, businesses, local officials, and other stakeholders recognize that the flood hazards shown in levee-impacted areas on the effective FIRM have not been updated to reflect the latest available data. It is critical that property owners understand their risk and take the appropriate steps to mitigate it.

Figure 4.3.16-1 Levee Locations and Impact Areas in Luzerne County



#### **4.3.16.2. Range of Magnitude**

Flood-related hazards due to levee failures range in magnitude including: overtopping, when the water-level rises over the top of the levee; back-ending, when water flows around the back of the levee, outside of the edge of the levee system; and total failure as seen during Hurricane Katrina. Levees are typically designed with three feet of freeboard to prevent overtopping, but older levees were not built to that standard (FEMA, 2016).

A levee failure or breach causes flooding in landward areas adjacent to the structure. The failure of a levee or other flood protection structure could be devastating depending on the level of flooding for which the structure is designed and the amount of landward development present. In some instances, the magnitude of flooding could be more severe under a levee failure event compared to a normal flooding event. If an abrupt failure occurs, the rushing waters of a flood wave could result in catastrophic losses.

Properties located in the area of reduced risk landward of a levee system are not subject to the mandatory flood insurance purchase requirement of the National Flood Insurance Program. Thus, regardless of whether a levee is accredited, there is concern that properties in these areas lack flood insurance. In the event of a failure, it is like that inundated properties will not be insured.

The environmental impacts of a levee failure result in significant water quality and debris disposal issues. Flood waters will back up sanitary sewer systems and inundate wastewater treatment plants, causing raw sewage to contaminate residential and commercial buildings and the flooding waterway. The contents of unsecured containers of oil, fertilizers, pesticides, and other chemicals get added to flood waters. Water supplies and water treatment could be off-line for weeks. After the flood waters subside, contaminated and flood damaged building materials and contents must be properly disposed. Contaminated sediment must be removed from buildings, yards, and properties.

The worst-case levee failure is one which occurs abruptly with little warning and results in deep, fast-moving flood waters through a developed or populated area. The potential for significant impact from a levee failure to occur in Luzerne County is possible because all levees in Luzerne County are located within densely populated areas.

#### **4.3.16.3. Past Occurrence**

The levee systems along the Susquehanna River in Luzerne County were built following several flood events in the late 19<sup>th</sup> and early 20<sup>th</sup> century. Severe flood damage led to the 1936 National Flood Control Act, which appropriated \$27 million for flood-control projects in Pennsylvania and New York. This funded the \$9.1 million levee system in Wilkes-Barre and Kingston, known as the Wyoming Valley Flood Risk Management Project. This was extended to include systems stretching Northwards to West Wyoming – the levee systems in place today.

The levee systems in Luzerne County were first overtopped and breached in 1972 during the Hurricane Agnes flood events. This caused \$1 billion in damage (in 1972 dollars). Afterwards, a \$147 million project was proposed to increase the levee's height from three to five feet along the 15-mile stretch of levee systems. After two more damaging flood events in 1975 and 1976, it was decided that the project could not be delayed any longer. The levee raising project was finished in 2003 at the cost of over \$250 million. The levees are now designed to protect against an Agnes-level flood, when the Susquehanna River crested at 41 feet.

In 1996, the Luzerne County Flood Protection Authority (LCFPA) was organized to maintain the 16-mile Wyoming Valley Flood Risk Management Project (LCFPA, 2019). The LCFPA has carefully monitored these levee systems since the project was completed. During Tropical Storm Lee, the Susquehanna River flooded but did not overtop the levee systems. The LCFPA cautions that the systems protect against most flood events that are seen on the river, but that a flood higher than 41 feet will overtop the levee.

Levees were erected along the Lackawanna River near the Borough of Duryea by the old Pennsylvania Department of Forests and Waters. A part of this levee was overtopped during the 1972 flood, allowing water to enter a large section of Duryea and causing \$2.8 billion in damages. PADEP completed plans to raise the height of the levee by three feet and borough officials are hoping this will eliminate some of the danger of backwater flooding from the Susquehanna River.

#### **4.3.16.4. Future Occurrence**

Given certain circumstances, a levee failure can occur at any time. However, the probability of future occurrence can be reduced through proper design, construction, and maintenance measures. The age of the levee can increase the potential for failures if not maintained. In Pennsylvania, the average age of the federally authorized levee systems is nearing 50 years, the typical lifespan of a levee. The average age of the non-federally authorized systems is 48 years (ASCE, 2014)

Most levees are designed to operate safely at specified levels of flooding. While FEMA focuses on mapping levees that will reduce the risk of a 1% annual chance flood, other levees may be designed to protect against smaller or larger floods. Design specifications provide information on the percent-annual-chance flood a structure is expected to withstand, given that it has been adequately constructed and maintained. Levee failure is also influenced by the frequency and severity of flood events. Therefore, potential future changes in climate and weather conditions, such as predicted increases in heavy precipitation events, may impact the future occurrences of levee failure. For more information on the future occurrence of flood events, please see Section 4.3.3 Overall, the probability of future levee failures can be considered *unlikely* according to the Risk Factor Methodology (See Table 4.4.1-1).

#### **4.3.16.5. Vulnerability Assessment**

One of six levee systems in Luzerne County has been accredited as providing protection for the 1%-annual-chance event on effective FIRMs. However, non-accredited levees provide some measure of protection during more frequent, lesser flood events. To account for this fact, the HMP identifies the structures and critical facilities that are either within the Zone X Shaded levee protection area or within 2,000 feet of the identified levee and floodwall systems in Table 4.3.16-2. This should be considered a broad estimate of structures potentially vulnerable to levee failures.

The City of Wilkes-Barre and Kingston Borough have the largest number of structures vulnerable to levee failure (5,551 and 5,478 structures). Forty Fort Borough and Kingston Borough have the greatest percentage of structures vulnerable to levee failure (100% and 99.56% of structures). The City of Wilkes-Barre and Kingston Borough also have the greatest number of critical facilities vulnerable to levee failure (42 and 43 facilities respectively). Forty Fort Borough and Kingston Borough also have the greatest percentage of critical facilities vulnerable to levee failure (92% and 98% of facilities). The City of Wilkes-Barre and Kingston Borough have the largest population vulnerable to levee failure (15,403 and 13,182 people). Forty Fort Borough and Kingston Borough also have the greatest percentage of people vulnerable to levee failure (99.05% and 100% of people). The City of Wilkes-Barre, Kingston Borough, and Forty Fort Borough have the highest vulnerability to damages from levee failure. Structures, critical facilities, and populations are all susceptible to damages in this type of event.

According to PEMA, Luzerne County has a vulnerable population of over 53,500 in Levee Impact Areas. There are over 22,000 vulnerable buildings in Levee Impact Areas, which represent 18.9% of the County's building value. These buildings have a value of over \$6.5 billion. Luzerne County has been identified as one of the top three counties with the greatest risk of levee failure in Pennsylvania. This is due to the extensive levee systems built in Luzerne County, in addition to highest risk in terms of number and total value of vulnerable buildings.

In 2003, the Wyoming Valley Flood Risk Management Project was modified to provide Hurricane Agnes level flood risk management and in 2011 when Tropical Storm Lee caused rivers to crest above Hurricane Agnes levels, the system was not overtopped potentially preventing more than \$2.5 billion in damages.

Some insight into the vulnerability of affected communities to levee failure can also be gathered from the LCFPA Flood Operations Plan for the Wyoming Valley Flood Risk Management System. In addition to documenting the measures that LCFPA will take as the river level (or stage) rises from Action Stage to Major Flood Stage, the Flood Operations Plan documents areas that are likely to flood as the river stage rises. This shows the extent of vulnerability even when the Wyoming Valley Flood Risk Management System performs as designed and high-water maintenance and operation is flawless. The gradient of impacts as

the flood level rises emphasizes that levees do not “protect” lives or property from flooding. Rather they reduce risk.



**LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE**

**Table 4.3.16-2 Structures and Critical Facilities Vulnerable to Levee Failure in Luzerne County**

MUNICIPALITY	TOTAL STRUCTURES IN MUNICIPALITY	TOTAL STRUCTURES VULNERABLE TO LEVEE FAILURE	PERCENT STRUCTURES VULNERABLE TO LEVEE FAILURE	TOTAL CRITICAL FACILITIES IN MUNICIPALITY	TOTAL CRITICAL FACILITIES VULNERABLE TO LEVEE FAILURE	PERCENT CRITICAL FACILITIES VULNERABLE TO LEVEE FAILURE	TOTAL ESTIMATED 2010 POPULATION	ESTIMATED POPULATION VULNERABLE TO LEVEE FAILURE	PERCENT POPULATION VULNERABLE TO LEVEE FAILURE
Ashley Borough	1,278	0	0.00%	17	0	0.00%	2,790	0	0.00%
Avoca Borough	1,185	0	0.00%	18	0	0.00%	2,661	0	0.00%
Bear Creek Village Borough	165	0	0.00%	46	0	0.00%	257	0	0.00%
Bear Creek Township	1,467	0	0.00%	5	0	0.00%	2,777	0	0.00%
Black Creek Township	1,217	0	0.00%	22	0	0.00%	2,016	0	0.00%
Buck Township	270	0	0.00%	6	0	0.00%	391	0	0.00%
Butler Township	4,332	0	0.00%	62	0	0.00%	9,275	0	0.00%
Conyngham Borough	816	0	0.00%	6	0	0.00%	1,914	0	0.00%
Conyngham Township	736	0	0.00%	22	0	0.00%	1,453	0	0.00%
Courtdale Borough	336	0	0.00%	5	0	0.00%	732	0	0.00%
Dallas Borough	1,306	0	0.00%	14	0	0.00%	2,807	0	0.00%
Dallas Township	3,548	0	0.00%	52	0	0.00%	8,991	0	0.00%
Dennison Township	583	0	0.00%	18	0	0.00%	1,128	0	0.00%
Dorrance Township	1,004	0	0.00%	40	0	0.00%	2,188	0	0.00%
Dupont Borough	1,370	0	0.00%	18	0	0.00%	2,715	0	0.00%
Duryea Borough	2,228	583	26.17%	20	2	10.00%	4,917	1,110	22.57%
Edwardsville Borough	1,911	616	32.23%	12	8	66.67%	4,816	1,705	35.40%

**LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE**

**Table 4.3.16-2 Structures and Critical Facilities Vulnerable to Levee Failure in Luzerne County**

MUNICIPALITY	TOTAL STRUCTURES IN MUNICIPALITY	TOTAL STRUCTURES VULNERABLE TO LEVEE FAILURE	PERCENT STRUCTURES VULNERABLE TO LEVEE FAILURE	TOTAL CRITICAL FACILITIES IN MUNICIPALITY	TOTAL CRITICAL FACILITIES VULNERABLE TO LEVEE FAILURE	PERCENT CRITICAL FACILITIES VULNERABLE TO LEVEE FAILURE	TOTAL ESTIMATED 2010 POPULATION	ESTIMATED POPULATION VULNERABLE TO LEVEE FAILURE	PERCENT POPULATION VULNERABLE TO LEVEE FAILURE
Exeter Borough	2,584	1,027	39.74%	15	3	20.00%	5,652	2,533	44.82%
Exeter Township	1,034	0	0.00%	23	0	0.00%	2,378	0	0.00%
Fairmount Township	755	0	0.00%	30	0	0.00%	1,276	0	0.00%
Fairview Township	1,864	0	0.00%	17	0	0.00%	4,174	0	0.00%
Forty Fort Borough	1,965	1,965	100.00%	12	11	91.67%	4,214	4,174	99.05%
Foster Township	1,986	0	0.00%	37	0	0.00%	3,467	0	0.00%
Franklin Township	793	0	0.00%	18	0	0.00%	1,757	0	0.00%
Freeland Borough	1,660	0	0.00%	4	0	0.00%	3,531	0	0.00%
Hanover Township	5,306	1,288	24.27%	90	13	14.44%	11,069	2,507	22.65%
Harveys Lake Borough	2,083	0	0.00%	15	0	0.00%	2,796	0	0.00%
Hazle Township	5,226	0	0.00%	72	0	0.00%	9,534	0	0.00%
City of Hazleton	10,316	0	0.00%	57	0	0.00%	25,340	0	0.00%
Hollenback Township	683	0	0.00%	11	0	0.00%	1,196	0	0.00%
Hughestown Borough	665	0	0.00%	5	0	0.00%	1,392	0	0.00%
Hunlock Township	1,072	0	0.00%	29	0	0.00%	2,443	0	0.00%
Huntington Township	994	0	0.00%	45	0	0.00%	2,248	0	0.00%

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

**Table 4.3.16-2 Structures and Critical Facilities Vulnerable to Levee Failure in Luzerne County**

MUNICIPALITY	TOTAL STRUCTURES IN MUNICIPALITY	TOTAL STRUCTURES VULNERABLE TO LEVEE FAILURE	PERCENT STRUCTURES VULNERABLE TO LEVEE FAILURE	TOTAL CRITICAL FACILITIES IN MUNICIPALITY	TOTAL CRITICAL FACILITIES VULNERABLE TO LEVEE FAILURE	PERCENT CRITICAL FACILITIES VULNERABLE TO LEVEE FAILURE	TOTAL ESTIMATED 2010 POPULATION	ESTIMATED POPULATION VULNERABLE TO LEVEE FAILURE	PERCENT POPULATION VULNERABLE TO LEVEE FAILURE
Jackson Township	1,082	0	0.00%	19	0	0.00%	4,646	0	0.00%
Jeddo Borough	54	0	0.00%	1	0	0.00%	98	0	0.00%
Jenkins Township	2,107	0	0.00%	27	0	0.00%	4,442	0	0.00%
Kingston Borough	5,502	5,478	99.56%	44	43	97.73%	13,182	13,182	100.00%
Kingston Township	3,141	0	0.00%	35	0	0.00%	6,999	0	0.00%
Lafin Borough	664	0	0.00%	13	0	0.00%	1,487	0	0.00%
Lake Township	919	0	0.00%	24	0	0.00%	2,049	0	0.00%
Larksville Borough	1,972	0	0.00%	14	0	0.00%	4,480	0	0.00%
Laurel Run Borough	267	0	0.00%	3	0	0.00%	500	0	0.00%
Lehman Township	1,669	0	0.00%	33	0	0.00%	3,503	0	0.00%
Luzerne Borough	1,331	234	17.58%	10	2	20.00%	2,845	616	21.65%
City of Nanticoke	4,745	0	0.00%	26	0	0.00%	10,465	0	0.00%
Nescopeck Borough	704	0	0.00%	5	0	0.00%	1,583	0	0.00%
Nescopeck Township	511	0	0.00%	25	0	0.00%	1,138	0	0.00%
New Columbus Borough	105	0	0.00%	4	0	0.00%	225	0	0.00%
Newport Township	2,051	0	0.00%	19	0	0.00%	5,374	0	0.00%

**LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE**

**Table 4.3.16-2 Structures and Critical Facilities Vulnerable to Levee Failure in Luzerne County**

MUNICIPALITY	TOTAL STRUCTURES IN MUNICIPALITY	TOTAL STRUCTURES VULNERABLE TO LEVEE FAILURE	PERCENT STRUCTURES VULNERABLE TO LEVEE FAILURE	TOTAL CRITICAL FACILITIES IN MUNICIPALITY	TOTAL CRITICAL FACILITIES VULNERABLE TO LEVEE FAILURE	PERCENT CRITICAL FACILITIES VULNERABLE TO LEVEE FAILURE	TOTAL ESTIMATED 2010 POPULATION	ESTIMATED POPULATION VULNERABLE TO LEVEE FAILURE	PERCENT POPULATION VULNERABLE TO LEVEE FAILURE
Nuangola Borough	408	0	0.00%	2	0	0.00%	679	0	0.00%
Penn Lake Park Borough	249	0	0.00%	4	0	0.00%	308	0	0.00%
City of Pittston	3,514	0	0.00%	41	0	0.00%	7,739	0	0.00%
Pittston Township	1,637	0	0.00%	14	0	0.00%	3,364	0	0.00%
Plains Township	4,696	0	0.00%	58	0	0.00%	9,961	0	0.00%
Plymouth Borough	2,903	668	23.01%	18	6	33.33%	5,951	1,285	21.59%
Plymouth Township	890	0	0.00%	20	0	0.00%	1,812	0	0.00%
Pringle Borough	459	56	12.20%	7	1	14.29%	979	55	5.62%
Rice Township	1,427	0	0.00%	33	0	0.00%	3,335	0	0.00%
Ross Township	1,413	0	0.00%	36	0	0.00%	2,937	0	0.00%
Salem Township	1,909	0	0.00%	39	0	0.00%	4,269	0	0.00%
Shickshinny Borough	345	0	0.00%	8	0	0.00%	838	0	0.00%
Slocum Township	534	0	0.00%	9	0	0.00%	1,115	0	0.00%
Sugarloaf Township	1,747	0	0.00%	4	0	0.00%	4,205	0	0.00%
Sugar Notch Borough	468	0	0.00%	39	0	0.00%	989	0	0.00%
Swoyersville Borough	2,438	1,778	72.93%	12	8	66.67%	5,062	3,945	77.93%
Union Township	959	0	0.00%	24	0	0.00%	2,042	0	0.00%

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

**Table 4.3.16-2 Structures and Critical Facilities Vulnerable to Levee Failure in Luzerne County**

MUNICIPALITY	TOTAL STRUCTURES IN MUNICIPALITY	TOTAL STRUCTURES VULNERABLE TO LEVEE FAILURE	PERCENT STRUCTURES VULNERABLE TO LEVEE FAILURE	TOTAL CRITICAL FACILITIES IN MUNICIPALITY	TOTAL CRITICAL FACILITIES VULNERABLE TO LEVEE FAILURE	PERCENT CRITICAL FACILITIES VULNERABLE TO LEVEE FAILURE	TOTAL ESTIMATED 2010 POPULATION	ESTIMATED POPULATION VULNERABLE TO LEVEE FAILURE	PERCENT POPULATION VULNERABLE TO LEVEE FAILURE
Warrior Run Borough	281	0	0.00%	3	0	0.00%	584	0	0.00%
West Hazelton Borough	1,936	0	0.00%	21	0	0.00%	4,561	0	0.00%
West Pittston Borough	2,177	40	1.84%	6	1	16.67%	4,868	95	1.95%
West Wyoming Borough	1,299	492	37.88%	8	2	25.00%	2,725	1,192	43.74%
White Haven Borough	561	0	0.00%	8	0	0.00%	1,097	0	0.00%
City of Wilkes-Barre	16,308	5,551	34.04%	35	0	0.00%	41,489	15,403	37.13%
Wilkes-Barre Township	1,895	0	0.00%	109	42	38.53%	2,983	0	0.00%
Wright Township	2,376	0	0.00%	36	0	0.00%	5,648	0	0.00%
Wyoming Borough	1,504	151	10.04%	13	4	30.77%	3,073	157	5.11%
Yatesville Borough	288	0	0.00%	2	0	0.00%	607	0	0.00%
<b>TOTAL</b>	<b>144,219</b>	<b>19,927</b>	<b>13.82%</b>	<b>1,774</b>	<b>146</b>	<b>8.23%</b>	<b>320,877</b>	<b>47,959</b>	<b>14.95%</b>

*Note: Calculated by selecting the 2010 census block centroids that intersect the levee impact areas. Approximates populations living near the levee impact areas.*

### 4.3.17. Nuclear Incident



#### 4.3.17.1. Location and Extent

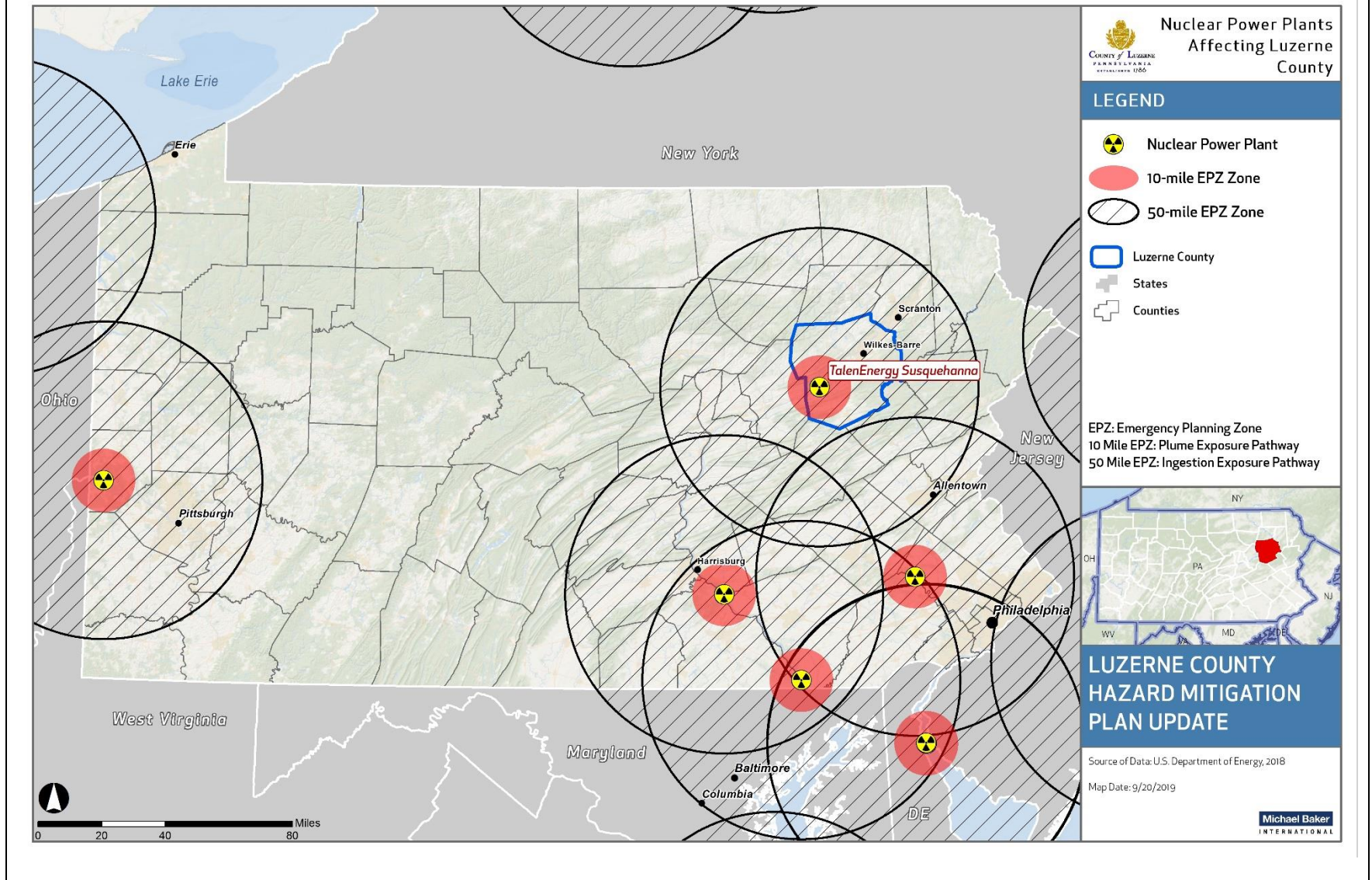
Nuclear incidents generally refer to events involving the release of significant levels of radioactivity or exposure of workers or the general public to radiation. The primary concern following such an incident or accident is the extent of radiation, inhalation, and ingestion of radioactivity isotopes which can cause acute health effects (e.g. death, burns, severe impairment), chronic health effects (e.g. cancer), and psychological effects (US EPA, 2020).

The Nuclear Regulatory Commission (NRC) encourages the use of Probabilistic Risk Assessments to quantitatively estimate the potential risk to public health and safety considering the design, operations, and maintenance practices at nuclear power plants. Probabilistic Risk Assessments typically focus on accidents that can severely damage the core and that may challenge containment. FEMA, PEMA, and county governments have formulated Radiological Emergency Response Plans to prepare for radiological emergencies at the five nuclear power generating facilities in the Commonwealth of Pennsylvania. These plans include a *Plume Exposure Pathway Emergency Planning Zone (EPZ)* with a radius of ten miles from each nuclear power facility and an *Ingestion Exposure Pathway EPZ* with a radius of fifty miles from each facility. The exact size and configuration of the EPZ may vary in relation to local emergency response capabilities, topography, road networks, and political boundaries.

Luzerne County hosts one nuclear power generating facility in Salem Township called the Susquehanna Steam Electric Station. As seen in Figure 4.3.17-1, the County is located within the ten-mile plume Exposure Pathway EPZ and the fifty-mile Ingestion Exposure Pathway EPZ for this plant. The remaining four nuclear plants in Pennsylvania are more than fifty miles away from Luzerne County. The County is just beyond the fifty-mile Ingestion Exposure Pathway EPZ for the Limerick Generating Station and Three Mile Island nuclear power generating facilities, located in Montgomery County, PA and Dauphin County, PA respectively. This distance exceeds the Plume Exposure and Ingestion Exposure Pathway EPZs for nuclear emergencies; therefore, these facilities are considered a minimal threat to the County. However, in the event of an emergency, evacuees from distant EPZs may seek shelter in Luzerne County.

According to PEMA there are approximately 60,000 people at risk in the Plume Exposure EPZ of the Susquehanna Steam Electric Station. Additionally, there are over 1.1 million people at risk in the Ingestion Exposure EPZ.

Figure 4.3.17-1 Nuclear Power Plans Affecting Luzerne County



#### 4.3.17.2. *Range of Magnitude*

Nuclear accidents/incidents can be placed into three categories:

- **Criticality accidents:** Involves loss of control of nuclear assemblies or power reactors.
- **Loss-of-coolant accidents:** Occurs whenever a reactor coolant system experiences a break or opening large enough so that the coolant inventory in the system cannot be maintained by the normally operating make-up system.
- **Loss-of-containment accidents:** Involves the release of radioactivity from materials such as tritium, fission products, plutonium, and natural, depleted, or enriched uranium. Points of release have been containment vessels at fixed facilities or damages packages during transportation accidents.

The magnitude of a nuclear incident differs for those within the Plume Exposure Pathway EPZ and those within the Ingestion Exposure Pathway EPZ. The Plume Exposure Pathway EPZ refers to whole-body external exposure to gamma radiation from a radioactive plume and from deposited materials and inhalation exposure from the passing radioactive plume. The duration of primary exposures could range in length from hours to months depending on the proximity to the point of radioactive release. Luzerne County is at risk to the Plume Exposure Pathway EPZ, as the southwest portion of the county is located within 10 miles of the Susquehanna Steam Electric System.

Luzerne County is also at risk of impact of the Ingestion Exposure Pathway EPZ. This EPZ refers to exposure primarily from ingestion of water or foods such as milk and fresh vegetables that have been contaminated with radiation. This kind of exposure can stem from any of the three categories of nuclear accident. Potential environmental impacts specific to the 50-mile Ingestion Exposure Pathway EPZ include the long-term effects of radioactive contamination in the environment and in agricultural products (US EPA, 2020). Luzerne County can expect some radioactive contamination in very small amounts in the case of a nuclear incident. This is not a significant concern in terms of external exposure and immediate health risks, but even a small amount of radiation will require the protection of the food chain, particularly milk supplies. Small amounts of radiation ingested over time could lead to future health issues in humans. There is an increased cancer risk over decades for people who have ingested radiation. The damage to cells and internal organs may be mild to severe, depending on the amount of radiation ingested and the number of years over which the ingestion occurred. As a result, in the case of a nuclear incident, foodstuffs, crops, milk, livestock feed and forage, and farm water supplies will need to be protected from and tested for contamination. Additionally, spills and releases of radiologically active materials from accidents can result in the contamination of soil and public water supplies. Areas underlain by limestone and some types of glacial sediments are particularly susceptible to contamination.



Nuclear facilities must notify the appropriate authorities in the event of an accident. NRC uses four classification levels for nuclear incidents (US NRC, 2018a):

- **Unusual Event:** Under this category, events are in process or have occurred which indicate *potential degradation in the level of safety of the plant*. No release of radioactive material requiring offsite response or monitoring is expected unless further degradation occurs.
- **Alert:** If an alert is declared, events are in process or have occurred which involve an actual or potential substantial degradation in the level of safety of the plant. Any releases of radioactive material from the plant are expected to be limited to a small fraction of the EPA Protective Action Guides.
- **Site Area Emergency:** A site area emergency involves events in process, or which have occurred that result in actual or likely major failures of plant functions needed for protection of the public. Any releases of radioactive material are not expected to exceed the EPA Protective Action Guides, except near the site boundary.
- **General Emergency:** A general emergency involves actual or imminent substantial core damage or melting of reactor fuel with the potential for loss of containment integrity. Radioactive releases during a general emergency can reasonably be expected to exceed the EPA Protective Action Guides for more than the immediate site area.

A worst-case scenario for Luzerne County would be if a General Emergency occurred at the Susquehanna Steam Electric Station that leaked enough radiation to create longer-term damage in the form of contaminated water, soil, and food supplies in the County.

The North Shore Railroad Company runs branch line service along the West shore of the Susquehanna River. This service stops at the Susquehanna Steam Electric Station and other industries along the line. A rail accident or train derailment at this facility could be disastrous for Luzerne County and surround areas.

The accident at the Three Mile Island Generating Station in March 1979 remains the nation's only nuclear incident at the *General Emergency level* and remains the worst nuclear incident on record in Pennsylvania, and in the nation. During this incident, equipment malfunctions, design-related problems, and worker errors led to a partial meltdown of the TMI Unit 2 reactor core at TMI (US NRC, 2018b).

The nuclear industry has adopted pre-determined, site-specific Emergency Action Levels (EALs). The EALs provide the framework and guidance to observe, address, and classify the severity of site-specific events and conditions that are communicated to off-site emergency response organizations (US NRC, 2018c). There are additional EALs that specifically deal with issues of security, such as threats of airborne attack, hostile action within the facility, or facility attack. These EALs ensure that appropriate notifications for the security threat are made in a timely manner. Each facility is also equipped with a public alerting system, which includes several sirens to alert the public located in the Plume Ingestion Pathway EPZ. This alerting

system is activated by the counties of each specific EPZ. Emergency notifications and instructions are communicated to the public via the Emergency Alert System as activated by the Commonwealth of Pennsylvania Emergency Operations Center. State officials also have the capability to send emergency messages as text messages to mobile devices.

#### **4.3.17.3. Past Occurrence**

There have been no failures at the Susquehanna Steam Electric Station that have resulted in damages, injuries, or fatalities. The 2014 Luzerne County Hazard Mitigation Plan states that the nuclear power generating plant had one 'Alert' declared on March 2, 2006. Alerts are the second lowest of four emergency classifications for nuclear power plants. Alerts are declared when an event has occurred that could reduce the plant's level of safety, but backup plant systems still work.

Nuclear incidents rarely occur, but the incident at Three Mile Island is the worst fixed-nuclear facility accident in US history. The resulting contamination and state of the reactor core led to the development of a fourteen-year cleanup and scientific effort. Additionally, the *Presidents' Commission on the Accident at Three Mile Island* examined the costs of the accident, concluding, "The accident at Three Mile Island on March 28, 1979, generated considerable economic disturbance. Some of the impacts were short term, occurring during the first days of the accident. Many of the impacts were experienced by the local community; others will be felt at the regional and national levels." The report concluded: "It appears clear that the major costs of the TMI Unit 2 accident are associated with the emergency management replacement power and the plant refurbishment or replacement. The minimum cost estimate of nearly \$1 billion supports the argument that considerable additional resources can be cost effective if spent to guard against future accidents" (US DHS, 1979).

Despite the severity of the damage, no injuries due to radiation exposure occurred. However, numerous studies were conducted to determine the measurable health effects related to radiation and/or stress. More than a dozen epidemiological and stress related studies conducted to date have found no discernible direct health effects to the population in the vicinity of the plant. However, one study conducted by the DOH's Three Mile Island Health Research Program did find evidence of psychological stress, "lasting in some cases for five to six years." According to the program chief, "the people suffering from stress perceived their health as being poorer than it actually was when the Health Department checked the medical records."

The accident at Three Mile Island had a profound effect on the residents, emergency management community, government officials, and nuclear industry, not only in Pennsylvania, but nationwide. There were minimal requirements for off-site emergency planning for nuclear power stations prior to this accident. Afterwards, comprehensive, coordinated, and exercised plans were developed for the state, counties, school districts, special facilities (hospitals, nursing homes, and detention facilities) and municipalities to assure the safety of the population. Costs associated with an event at a nuclear facility, be it real or perceived, are

significant. The mitigation efforts put in place immediately following the 1979 continue until today. The Commonwealth Nuclear/Radiological plan which is a successor of the original "Annex E" is a result of the Commonwealth's efforts to address the many components of mitigation planning. The comprehensive planning involved with the five nuclear facilities is an ongoing effort. Plans are reviewed and amended on an annual basis. Recent amendments to various planning documents and station procedures include the efforts to enhance station security measures and the means to bolster communications and response in the event of terrorist activities.

The most recent nuclear incident to occur worldwide was that which involved the Fukushima Daiichi nuclear reactor in Okuma, Fukushima, Japan. This incident occurred on March 11, 2011. An earthquake in the area resulted in a series of equipment failures, nuclear meltdowns, and releases of radioactive materials. These failures and releases were largely attributed to the water that penetrated the structures following the tsunami that was generated by the earthquake. The flooding caused the failure of multiple generators meant to keep the systems operating safely after the automatic shutdown. No deaths have been directly attributed to the incidents at the reactor at this time. The World Health Organization completed a report that indicated there were only small proportional increases in the occurrence of certain cancers following the radiation exposure from the plant (WNA, 2020).

Following this incident, the United States Nuclear Regulatory Commission developed a set of recommendations based on the lessons learned from the Fukushima incident. These recommendations are meant to enhance reactor safety for US-based nuclear reactors against a variety of factors. Recommendations included the categories of regulatory framework, ensuring protection (of the facilities and equipment), enhancing mitigation, strengthening emergency preparedness and improving the efficiency of NRC programs. One of the specific recommendations involved the re-evaluation and upgrade of seismic and flooding protection of structures, systems and components for each reactor. As more information comes out, and more lessons learned are developed, it should only serve to reinforce the protections in place against any type of incident involving nuclear power stations.

#### **4.3.17.4. Future Occurrence**

Pennsylvania is home to the only nuclear power plant *General Emergency* in the nation. Since the Three Mile Island incident, nuclear power has become significantly safer and is one of the most heavily regulated industries in the nation. Despite the knowledge gained since then, there is still the potential for a similar accident to occur again at one of the five nuclear generating facilities in the Commonwealth. The Nuclear Energy Agency of the Organization for Economic Co-Operation and Development notes that studies estimate the chance of protective barriers in a modern nuclear facility at less than one in 100,000 per year (NEA, 2005).

Across the United States, several *Unusual Event* and *Alert* classification level events occur each year at the 100+ nuclear facilities that warrant notification of local emergency managers. Of

these, *Alert* emergency occur less frequently. For example, in 1997, there were forty notifications of *Unusual Events* and three *Alert* events nationwide. Based on historical events, *Site Area Emergency* and *General Emergency* incidents are very rare. Therefore, the future occurrence of nuclear incidents that affect Luzerne County can be considered *unlikely* as defined by the Risk Factor methodology probability criteria (see Table 4.4.1-1).

**4.3.17.5. Vulnerability Assessment**

Nineteen municipalities in Luzerne County are located within the 10-mile Plume Exposure Pathway EPZ of the Susquehanna Steam Electric Station. These are shown in Figure 4.3.16-2. Luzerne County is located entirely within the Ingestion Pathway EPZ of the Susquehanna Steam Electric Station. As a result, the entire County is vulnerable to the contamination effects possible in a nuclear incident.

Table 4.3.17-1 Municipalities located within the 10-mile Plume Exposure Pathway EPZ of the Susquehanna Steam Electric station		
Black Creek Township	Huntington Township	Salem Township
Butler Township	City of Nanticoke	Shickshinny Borough
Conyngam Borough	Nescopeck Borough	Slocum Township
Conyngam Township	Nescopeck Township	Sugarloaf Township
Dorrance Township	New Columbus Borough	Union Township
Hollenback Township	Newport Township	
Hunlock Township	Nuangola Borough	

As stated above, the County’s primary vulnerability to nuclear incidents comes in the form of food, soil, and water contamination. In terms of vulnerable land, 49,000 acres of farmland held in the County’s 451 farms are vulnerable to radiological contamination in a nuclear incident. In 2017, the market value of all agricultural products of these farms exceeded \$17 million.

Water contamination is also a concern in nuclear incidents. There are several public water suppliers that operate in Luzerne County or provide water to municipalities. Suppliers include Pennsylvania American Water, Aqua America, Hazleton City Water Department, and Suez Dallas. These water supplies, coupled with the County’s 8,800 domestic drinking water wells, are all vulnerable to the effects of a nuclear incident.

The loss experienced by each jurisdiction in the case of a nuclear incident will depend on the magnitude of the event. The example of the Three Mile Island incident gives an indication of local and regional economic loss, though. The President’s Commission on the Three Mile Island Incident calculated the economic impact of the accident, looking at direct and indirect losses and other potential growth impacts. Direct impacts to the manufacturing sector were estimated at \$6.3 million. These losses occurred within a few days after the accident and quickly subsided thereafter with no evidence of permanent layoffs resulting. Food processors also incurred expenses with some farms purchasing equipment to detect radiation levels and converting dairy production to powered milk.

The utility itself incurred significant costs in the areas of emergency management and plant refurbishment and replacement power. Emergency management costs ran in the hundreds of millions of dollars and replacement power for both units at a cost of \$24 million a month. The unaffected unit TMI Unit 1 was shut down for 6.5 years. During this time, more than \$100 million in plant upgrades and refurbishment took place. Replacement power costs today are estimated at nearly twice the 1979 dollars. Cost of the accident cleanup and placing the facility in monitored storage cost approximately \$1 billion.

The impact to tourism was estimated at approximately \$6.5 million with lost wages in this sector estimated from \$2.8 million to \$3.8 million. Losses to the agricultural sector appeared to be minimal due to off-growing season. The Pennsylvania Department of Agriculture indicated that losses were significantly less than \$1 million.

Vulnerability was calculated by identifying all census tracts with centers located within 10 miles of a nuclear power station, as defined in the 10-mile Plume Exposure EPZ. Population, buildings counts, and exposed building value were then aggregated to the county scale. Luzerne County has a vulnerable population of approximately 41,800 people in the 10-mile Plume Exposure EPZ. There are approximately 17,800 buildings in these census tracts.

Potential jurisdictional losses in the 50-mile EPZ will originate from losses in farm products and contamination of farmland. PEMA estimates that 60,930 acres of farmland would be affected in the 50-mile EPZ in the event of a nuclear incident at the Susquehanna Steam Electric station. These farmlands would lose almost \$22,000,000 in agricultural products sold.

### 4.3.18. Opioid Addiction



#### 4.3.18.1. Location and Extent

Opioid addiction occurs when an individual becomes physically dependent on opioid, a class of drugs that reduces pain. Opioid is used as a broad term and includes opiates, which are drugs naturally extracted from certain types of poppy plants and narcotics. Opioids can also be synthetically made to emulate opium.

According to the Drug Enforcement Administration (DEA) opioids come in various forms: tablets, capsules, skin patches, powder, chunks in various colors from white to shades of brown and black, liquid form for oral use and injection, syrups, suppositories, and lollipops (US DEA, 2020). The Centers for Disease Control and Prevention (CDC) defines the following as the three most common types of opioids (CDC, 2020):

- **Prescription Opioids:** Opioid medication prescribed by doctors for pain treatment. Prescription opioids can be synthetic-oxycodone (OxyContin) or hydrocodone (Vicodin), or natural, like morphine.
- **Fentanyl:** A powerful synthetic opioid that is 50 to 100 times more powerful than morphine and is used for treating severe pain. Illegally made and distributed fentanyl is becoming more prevalent.

- **Heroin:** An illegal natural opioid processed from morphine and is also becoming more commonly used in the United States.

Opioids are highly addictive. They block the body's ability to feel pain and can create a sense of euphoria. Additionally, individuals often build a tolerance to opioids, which can lead to misuse and overdose. Fentanyl and fentanyl-related substances are hazardous materials and should be treated as such. Contact with fentanyl can impact first responders and family and friends of opioid users. Depending on the potency of the drug, it can take as little as the equivalent of a few grams of table salt to cause health complications (DEA, 2016).

Opioid addiction impacts the entire Commonwealth. Nationally, Pennsylvania is among four of the hardest hit states from opioid-related deaths, along with West Virginia, Ohio, and New Hampshire. The CDC estimates that nearly 38 out of every 100,000 Pennsylvania residents died from opioid-related overdoses in 2016, higher than the national rate of opioid-related deaths of approximately 20 out of 100,000 people. In Pennsylvania, overdoses caused by opioids have become the leading cause of accidental death, surpassing automobile accidents (CDC, 2017).

People under the age of 35 have been particularly vulnerable to the opioid virus. According to a joint intelligence report prepared by the DEA Philadelphia Division and the University of Pittsburgh, between 2015 and 2016 in Pennsylvania, fentanyl use increased 380 percent among 15- to 24-year-olds while heroin use increased 970 percent in the 25- to 34-year age range. The report also documented a higher percentage of drug-related deaths attributed to opioid use in Pennsylvania's rural communities at 42 percent, compared to 34 percent in urban communities (DEA Philadelphia Division, 2017).

According to a recent study, environmental scientists at the Cary Institute of New York found traces of opioid and other drugs in streams, rivers, and lakes. These traces came from human urine and feces, and medications that have been flushed down the toilet. However, the ecological and environmental impacts are unknown. The United States Environmental Protection Agency (EPA) suggests that while the risks of pharmaceuticals found in wastewater, ambient water, and drinking water is low, further research is needed (EPA, 2014).

#### **4.3.18.2. Range of Magnitude**

Opioid addiction can lead to overdose, which can be fatal. The most dangerous side effect of an opioid overdose is depressed breathing. The lack of oxygen to the brain causes permanent brain damage, leading to organ failure, and eventually, death. Signs and symptoms include respiratory depression, drowsiness, disorientation, pinpoint pupils, and clammy skin.

Opioid addiction can also be passed from mother to child in the womb. This condition, known as neonatal abstinence syndrome, has increased five-fold from 2000 to 2012, according to the National Institute of Drug Abuse (NIDA), resulting in an estimated 22,000 babies in the United States born with this condition (NIDA, 2017).

First responders – paramedics, police officers, and fire fighters, are also affected by Pennsylvania’s opioid addiction crisis. In addition to the crisis consuming time and resources, first responders also face exposure risk, particularly to synthetic fentanyl. According to the DEA, it takes two to three milligrams of fentanyl to induce respiratory depression, arrest, and possibly death. Since fentanyl is indistinguishable from several other narcotics and powdered substances, first responders must take extra precaution when dealing with calls related to drug abuse (DEA, 2017).

The City of Hazleton experienced five opioid overdoses in 12 hours with two resulting in death on May 4, 2018. The Hazleton police chief warned citizens about a potentially deadly batch of heroin, possibly laced with fentanyl (WNEP, 2018).

**4.3.18.3. Past Occurrence**

The CDC found that opioids are the main cause of drug-related overdoses and deaths, being responsible for nearly seventy-five percent of drug-related deaths nationally in 2017. Of the more than 4,600 drug-related deaths in Pennsylvania in 2016, nearly 84 percent were attributed to two or more drugs. Therefore, drug-related overdose and death statistics account for all drug types, however, as noted above, the majority of drug-related deaths involve opioids. Luzerne County had 95 and 140 opioid related deaths in 2015 and 2016 respectively (DEA Philadelphia Division, 2017). County sources document that Luzerne County had 155 and 156 opioid-related deaths in 2017 and 2018 respectively.

Though an opioid addiction crisis is complex and unprecedented, it is widely acknowledged that the opioid crisis began in the late 1990s when pharmaceutical companies introduced opioid-based pain medication, such as OxyContin, Percocet, and Vicodin. As these drugs become more frequently prescribed, misuse and overdose increased and it became clear that prescription opioids were highly addictive (NIDA, 2020).

**4.3.18.4. Future Occurrence**

Pennsylvania has seen a steady rise in opioid related deaths over the last several years, with drug-related death rates increasing 102 percent between 2014 and 2017. If opioid related deaths continue to increase at this pace, then the Commonwealth could experience an estimated 10,000 drug-related deaths in the year 2020.

However, future occurrences of opioid addiction and misuse, overdose, and fatalities are unclear as the state moves forward with overdose prevention initiatives. In January 2018, Governor Tom Wolf declared Pennsylvania’s opioid addictions epidemic a disaster emergency. This declaration should enhance coordination and data collection between state and local responders, improve tools for families and first responders, and expand treatment access. The declaration also improves access to naloxone, a lifesaving drug that reverses the effects of a drug-overdose. In addition, a new Opioid Coordination Group is housed within the Pennsylvania Emergency Management Agency (PA DOH, 2018).

There are several local efforts in Luzerne County to stop the use of opioids. The County’s Coalition to STOP Overdoses has helped to increase prescription drug monitoring, and increased access to naloxone. The county has also implemented drug awareness programs in schools and expanded treatment initiatives with the help of federal funds. There is also a

resident led group called the Luzerne County Citizens Opioid Committee. This group has been meeting with local government officials and law enforcement to press for additional federal funding for the county Drug Task Force. It is possible that risk will reduce in the future depending on the outcome of these initiatives.

Overall, the probability of future opioid overdose and death is *likely* as defined by the Risk Factor Methodology (see Section 4.4.1).

#### **4.3.18.5. Vulnerability Assessment**

County facilities are not at risk to the opioid crisis, but there are some occupation-specific risks that may make some employees more vulnerable. Employees working in direct patient care are vulnerable to fentanyl exposure. Since fentanyl can be ingested orally, inhaled through the nose or mouth, or absorbed through the skin or eyes, any substance suspected to contain fentanyl should be handled with extreme caution. Exposure to a small amount of fentanyl can lead to respiratory depression or death. Fentanyl-related substances have been found in powders, pills, capsules, liquids, and on blotter paper. The DEA recommends that all first responders carry a Personal Protective Equipment (PPE) kit that includes: nitrile gloves, N-95 dust masks, sturdy eye protection, paper coveralls and shoe protection, and naloxone injectors. The DEA also suggests using extreme caution when using police dogs, as they are at serious risks to health complications from inhaling fentanyl and fentanyl-related substances (DEA, 2017).

Additionally, absenteeism from jobs associated with an opioid addiction in high-risk areas could lead to economic loss through lost productivity and increased medical costs.

In general, jurisdictions that are more densely populated are more vulnerable to opioid addiction threats as access to the drugs increases. However, as stated above, rural communities have experienced larger per-capita opioid-related deaths.

Jurisdictional losses in the opioid addiction crisis stem from lost wages, productivity, and resources rather than losses to buildings or land. Locally, many Pennsylvania counties have seen an increase of time and resources devoted to the opioid epidemic as overdose and response increases, however there is no comprehensive tracking mechanism to record total local losses associated with the opioid crisis.

Impacts including total costs to jurisdictions are only beginning to be understood, researched, and tracked. There is no comprehensive database currently tracking monetary losses at the local level. However, the American Enterprise Institute (AEI), using national data from the CDC and White House Council of Economic Advisors, calculated a total cost per capita (\$1,799), of the opioid epidemic for Pennsylvania. Using this per capita estimate in combination with county population estimates, losses can be estimated for Luzerne. It is important to note that this methodology assumes equal per capita opioid misuse and fatalities across all counties, however, based on reported drug overdoses and drug related deaths, it is known that some counties, including those in the southwestern region, are more vulnerable and more likely to



experience higher per capita costs while counties in central and north central Pennsylvania tent to be less vulnerable and likely have lesser costs per capita. Another important caveat regarding this methodology is that a portion of the costs will have been state losses rather than County or jurisdictional, but the ratio of state to local cost burden is unknown at this time. It is estimated that Luzerne County has had a total per capita cost of \$570,900,057.

#### 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 planning area. The RF can also be used to assist local community officials in ranking and prioritizing those hazards that pose the most significant threat to their 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, and 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 18 hazards profiled in the 2020 HMP Update. Those categories include *probability*, *impact*, *spatial extent*, *warning time*, and *duration*. Each degree of risk was assigned a value ranging from 1 to 4. The weighting factor is shown in Table 4.4.1-1. 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 example equation:

$$\text{Risk Factor Value} = [(Probability \times .30) + (Impact \times .30) + (Spatial \text{ Extent} \times .20) + (Warning \text{ Time} \times .10) + (Duration \times .10)]$$

Table 4.4.1-1 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 4.4.1-1 Summary of Risk Factor approach used to rank hazard risk				
Risk Assessment Category	Degree of Risk			Weight Value
	Level	Criteria	Index	
<b>PROBABILITY</b> <i>What is the likelihood of a hazard event occurring in a given year?</i>	UNLIKELY	LESS THAN 1% ANNUAL PROBABILITY	1	30%
	POSSIBLE	BETWEEN 1% & 49.9% ANNUAL PROBABILITY	2	
	LIKELY	BETWEEN 50% & 90% ANNUAL PROBABILITY	3	
	HIGHLY LIKELY	GREATER THAN 90% ANNUAL PROBABILITY	4	
<b>IMPACT</b> <i>In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?</i>	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	
<b>SPATIAL EXTENT</b> <i>How large of an area could be impacted by a hazard event? Are impacts localized or regional?</i>	NEGLIGIBLE	LESS THAN 1% OF AREA AFFECTED	1	20%
	SMALL	BETWEEN 1 & 10.9% OF AREA AFFECTED	2	
	MODERATE	BETWEEN 11 & 25% OF AREA AFFECTED	3	
	LARGE	GREATER THAN 25% OF AREA AFFECTED	4	
<b>WARNING TIME</b> <i>Is there usually some lead time associated with the hazard event? Have warning measures been implemented?</i>	MORE THAN 24 HRS	SELF-DEFINED	1	10%
	12 TO 24 HRS	SELF-DEFINED	2	
	6 TO 12 HRS	SELF-DEFINED	3	
	LESS THAN 6 HRS	SELF-DEFINED	4	
<b>DURATION</b> <i>How long does the hazard event usually last?</i>	LESS THAN 6 HRS	SELF-DEFINED	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 4.4.2-1 lists the Risk Factor calculated for each of the 18 hazards identified in the 2020 HMP Update. Hazards identified as *high* risk have risk factors of 2.5 or greater. 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.

RISK	NATURAL HAZARD	RISK ASSESSMENT CATEGORY					RISK FACTOR
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	
HIGH	Flooding	3	4	3	3	3	3.3
	Winter Storm	4	2	4	1	2	2.9
	Drought	2	2	4	1	4	2.5
MODERATE	Hurricane, Tropical Storm	2	2	3	2	2	2.2
	Opioid Addiction	4	2	1	1	1	2.2
	Levee Failure	1	3	2	3	2	2.1
	Nuclear Release	1	2	3	3	2	2.0
	Earthquake	1	2	3	4	1	2.0
	Wildfire	3	1	2	3	1	2.0
	Pandemic	1	2	4	1	2	2.0
LOW	Landslide	1	2	2	4	2	1.9
	Dam Failure	1	3	1	3	1	1.8
	Subsidence, Sinkhole	1	3	1	3	1	1.8
	Tornado	2	2	1	3	1	1.8
	Hailstorm	2	1	2	4	1	1.8
	Cyber-Terrorism	2	1	1	4	2	1.7
	Hazardous Materials Release	2	1	1	4	2	1.7
	Radon	2	1	1	2	4	1.7

Based on these results, there are three *high* risk hazards, eight *moderate* risk hazards and five *low* risk hazards in Luzerne County. Mitigation actions were developed for all high, moderate, and low risk hazards (see Section 6.4).

A risk assessment result for the entire county does not mean that each municipality the same risk to each hazard. Municipalities completed a *Hazard Risk Assessment Survey* to during the planning process evaluate their jurisdictional risk to each hazard. Results from these surveys were reassessed by the HMPT, and the update risk assessment was used to complete Table 4.4.2-2 which shows the different municipalities in Luzerne County and whether their risk is greater than (>), less than (<), or equal to (=) the risk factor assigned to the County as a whole.

LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

Table 4.4.2-2 Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk																		
JURISDICTION	IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR																	
	Flooding	Winter Storm	Drought	Hurricane, Tropical Storm	Opioid Addiction	Levee Failure	Nuclear Release	Earthquake	Wildfire	Pandemic	Landslide	Dam Failure	Subsidence, Sinkhole	Tornado	Hailstorm	Cyber-Terrorism	Hazardous Materials Release	Radon
	3.3	2.9	2.5	2.2	2.2	2.1	2	2	2	2	1.9	1.8	1.8	1.8	1.8	1.7	1.7	1.7
Ashley Borough	=	>	<	=	=	<	=	=	<	=	<	<	>	>	=	<	>	=
Avoca Borough	=	>	<	=	=	<	=	=	<	=	>	<	=	<	<	<	>	=
Bear Creek Village Borough	>	>	<	>	>	<	=	=	>	=	<	<	<	<	=	<	<	=
Bear Creek Township	>	>	>	>	>	<	=	=	>	=	<	>	<	<	=	>	=	=
Black Creek Township	>	=	<	>	>	<	>	>	=	=	>	<	<	=	>	<	=	=
Buck Township	=	>	<	=	>	<	=	=	>	=	<	>	<	=	=	<	<	=
Butler Township	>	=	>	>	>	<	>	=	=	=	>	>	<	<	>	>	>	=
Conyngam Borough	<	=	<	<	=	<	>	=	<	>	>	<	<	<	=	<	>	=
Conyngam Township	>	=	<	>	>	<	>	<	>	=	<	=	>	=	>	<	=	=
Courtdale Borough	<	>	<	<	=	<	=	<	=	=	<	<	<	<	>	<	>	=
Dallas Borough	=	>	>	=	>	<	=	<	=	>	<	=	<	<	>	<	>	=
Dallas Township	=	>	=	=	=	<	=	<	<	=	>	=	<	=	>	>	>	=
Dennison Township	=	>	>	=	>	<	=	=	=	=	<	=	<	>	>	<	=	=
Dorrance Township	>	=	>	>	>	<	>	=	=	=	<	=	<	=	>	>	=	=
Dupont Borough	>	>	<	>	=	<	=	=	<	=	<	<	=	=	=	<	>	=
Duryea Borough	=	>	<	=	=	>	=	<	<	=	>	=	>	<	=	<	>	=
Edwardsville Borough	=	>	<	=	=	>	=	<	>	=	>	<	=	<	<	<	>	=
Exeter Borough	=	>	=	=	=	>	=	<	=	=	<	<	>	>	=	<	>	=

**LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE**

Table 4.4.2-2 Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk																		
JURISDICTION	IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR																	
	Flooding	Winter Storm	Drought	Hurricane, Tropical Storm	Opioid Addiction	Levee Failure	Nuclear Release	Earthquake	Wildfire	Pandemic	Landslide	Dam Failure	Subsidence, Sinkhole	Tornado	Hailstorm	Cyber-Terrorism	Hazardous Materials Release	Radon
	3.3	2.9	2.5	2.2	2.2	2.1	2	2	2	2	1.9	1.8	1.8	1.8	1.8	1.7	1.7	1.7
Exeter Township	=	>	<	=	=	<	=	<	=	=	>	<	<	<	>	<	<	=
Fairmount Township	>	>	<	>	>	<	=	<	>	=	=	>	<	=	>	<	<	=
Fairview Township	=	>	<	=	>	<	=	=	=	=	<	=	<	<	=	<	>	=
Forty Fort Borough	>	>	<	>	>	>	=	=	<	=	>	<	>	<	<	<	>	=
Foster Township	=	=	>	=	>	<	=	>	=	=	<	=	<	=	>	<	=	=
Franklin Township	<	>	=	<	>	<	=	<	=	=	<	>	<	>	>	<	<	=
Freeland Borough	<	=	<	<	=	<	=	=	<	=	<	<	<	<	<	<	>	=
Hanover Township	>	>	=	>	=	>	=	=	=	=	>	>	>	<	=	>	>	=
Harveys Lake Borough	>	>	<	>	>	<	=	<	=	=	>	<	<	=	>	<	=	=
Hazle Township	=	=	>	=	=	<	=	>	>	=	>	>	<	=	=	>	>	=
City of Hazleton	<	=	>	<	=	<	=	>	<	=	<	<	<	<	<	>	>	=
Hollenback Township	>	=	=	>	>	<	>	=	=	=	<	<	<	>	>	<	<	=
Hughestown Borough	<	>	<	<	=	<	=	=	<	=	<	<	=	<	=	<	>	=
Hunlock Township	>	>	=	>	>	<	>	<	>	=	=	=	<	=	>	<	=	=
Huntington Township	>	=	=	>	>	<	>	<	<	=	<	>	<	>	>	>	<	=
Jackson Township	=	>	>	=	=	<	=	<	=	=	<	>	<	<	>	<	=	=
Jeddo Borough	<	=	<	<	>	<	=	=	<	=	<	<	<	<	=	<	>	=
Jenkins Township	=	>	<	=	=	<	=	=	>	=	>	>	>	>	=	<	>	=
Kingston Borough	<	>	>	<	=	>	=	=	<	=	<	<	>	<	<	>	>	=
Kingston Township	>	>	<	>	=	<	=	<	<	=	>	>	<	=	>	<	=	=

**LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE**

Table 4.4.2-2 Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk																		
JURISDICTION	IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR																	
	Flooding	Winter Storm	Drought	Hurricane, Tropical Storm	Opioid Addiction	Levee Failure	Nuclear Release	Earthquake	Wildfire	Pandemic	Landslide	Dam Failure	Subsidence, Sinkhole	Tornado	Hailstorm	Cyber-Terrorism	Hazardous Materials Release	Radon
	3.3	2.9	2.5	2.2	2.2	2.1	2	2	2	2	1.9	1.8	1.8	1.8	1.8	1.7	1.7	1.7
Laflin Borough	>	>	<	>	=	<	=	=	<	=	>	<	<	<	=	<	>	=
Lake Township	=	>	=	=	>	<	=	<	>	=	<	=	<	>	>	<	=	=
Larksville Borough	<	>	<	<	=	<	=	<	<	=	<	<	=	=	>	<	>	=
Laurel Run Borough	<	>	<	<	>	<	=	=	>	=	<	<	<	>	=	<	<	=
Lehman Township	=	>	>	=	>	<	=	<	>	=	<	>	<	=	>	<	=	=
Luzerne Borough	>	>	<	>	=	=	=	<	<	=	<	<	=	<	<	<	>	=
City of Nanticoke	=	>	<	=	=	<	>	=	<	=	>	<	>	<	<	<	>	=
Nescopeck Borough	=	=	<	=	=	<	>	=	<	=	<	<	>	=	>	<	>	=
Nescopeck Township	>	=	=	>	>	<	>	=	=	=	=	<	>	=	>	<	=	=
New Columbus Borough	>	=	<	>	>	<	>	<	<	=	<	<	<	>	>	<	<	=
Newport Township	=	>	<	=	=	<	>	<	=	=	>	=	=	<	>	<	>	=
Nuangola Borough	>	>	<	>	>	<	>	=	<	=	<	<	<	<	=	<	>	=
Penn Lake Park Borough	>	>	<	>	>	<	=	=	<	=	<	>	<	<	=	<	<	=
City of Pittston	<	>	=	<	=	<	=	=	<	=	>	<	>	<	<	<	>	=
Pittston Township	<	>	<	<	=	<	=	=	>	=	>	<	=	=	<	>	>	=
Plains Township	>	>	<	>	=	=	=	=	>	=	<	>	>	=	<	>	>	=
Plymouth Borough	<	>	<	<	=	>	=	<	<	=	>	>	>	<	<	<	>	=
Plymouth Township	>	>	<	>	>	<	=	<	=	=	>	<	<	<	=	<	>	=

LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

Table 4.4.2-2 Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk																		
JURISDICTION	IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR																	
	Flooding	Winter Storm	Drought	Hurricane, Tropical Storm	Opioid Addiction	Levee Failure	Nuclear Release	Earthquake	Wildfire	Pandemic	Landslide	Dam Failure	Subsidence, Sinkhole	Tornado	Hailstorm	Cyber-Terrorism	Hazardous Materials Release	Radon
	3.3	2.9	2.5	2.2	2.2	2.1	2	2	2	2	1.9	1.8	1.8	1.8	1.8	1.7	1.7	1.7
Pringle Borough	<	=	<	<	=	>	=	<	<	=	>	>	<	<	<	<	>	=
Rice Township	>	>	>	>	=	<	=	=	>	=	<	>	<	>	>	<	=	=
Ross Township	>	>	=	>	>	<	=	<	=	=	<	>	<	=	>	<	<	=
Salem Township	>	=	>	>	>	<	>	<	=	=	>	=	>	=	>	>	>	=
Shickshinny Borough	>	=	<	>	>	<	>	=	=	=	>	<	<	<	<	<	<	=
Slocum Township	<	>	>	=	>	<	>	=	=	=	<	=	<	=	>	<	=	=
Sugarloaf Township	>	=	>	>	>	<	>	>	=	=	>	<	<	<	>	>	=	=
Sugar Notch Borough	<	>	<	<	=	<	=	=	<	=	<	<	<	<	=	<	>	=
Swoyersville Borough	=	>	<	=	=	>	=	<	<	=	<	<	=	<	<	<	=	=
Union Township	>	=	=	>	>	<	>	<	>	=	=	>	<	=	>	<	<	=
Warrior Run Borough	<	>	<	<	=	<	=	=	<	=	<	<	<	<	=	<	>	=
West Hazelton Borough	<	=	<	<	=	<	=	=	<	=	<	<	<	<	=	<	>	=
West Pittston Borough	>	>	<	>	=	>	=	=	<	=	<	<	>	<	<	<	>	=
West Wyoming Borough	>	>	<	>	=	>	=	<	>	=	<	<	=	<	<	<	>	=
White Haven Borough	<	=	<	<	>	<	=	=	<	=	<	<	<	>	<	<	>	=
City of Wilkes-Barre	>	>	=	>	=	>	=	=	<	=	>	=	>	<	<	>	>	=
Wilkes-Barre Township	<	>	<	<	=	<	=	=	>	=	<	=	=	<	<	<	>	=
Wright Township	=	>	=	=	=	<	=	=	=	=	<	=	<	<	<	<	>	=



## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

Table 4.4.2-2 Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk																		
JURISDICTION	IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR																	
	Flooding	Winter Storm	Drought	Hurricane, Tropical Storm	Opioid Addiction	Levee Failure	Nuclear Release	Earthquake	Wildfire	Pandemic	Landslide	Dam Failure	Subsidence, Sinkhole	Tornado	Hailstorm	Cyber-Terrorism	Hazardous Materials Release	Radon
	3.3	2.9	2.5	2.2	2.2	2.1	2	2	2	2	1.9	1.8	1.8	1.8	1.8	1.7	1.7	1.7
Wyoming Borough	=	>	<	=	=	=	=	=	<	=	<	<	<	<	<	<	>	=
Yatesville Borough	<	>	<	<	=	<	=	=	<	=	<	<	<	<	<	<	>	=

#### 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. Estimates provided in this section are based on Hazus version 4.0, 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.

This plan employed an enhanced Hazus analysis for floods. As opposed to basic analysis using only default data, enhanced analysis incorporates more recent, up-to-date, or specific data for inclusion in the hazard models. The enhanced data incorporated into this plan update include:

- Updated demographic data from the 2010 Census;
- Updated essential facilities data from the County and other sources

Using these datasets in Hazus, total building-related losses from a 1%-annual-chance flood in Luzerne County are estimated to equal \$35 million. Residential occupancies make up 72% of the total estimated building-related losses. Damages would be most significant along the Susquehanna River floodway, where most of the vulnerable buildings are located. Total economic loss, including replacement value, content loss, functional loss and displacement cost, from a countywide 1%-annual-chance flood are estimated to equal \$573 million. In this scenario, an expected 1,205 buildings would be moderately damaged. In addition, an estimated 3,019 households would be displaced, and 4,915 people would require shelter. Essential facilities would largely remain undamaged in this scenario, but five fire stations, three hospitals, one police station, and four schools are estimated to have at least moderate damage. Of these facilities, five fire stations, one police station, and five schools would experience some loss of use. For more details on the Hazus methodology used and additional results reports, see **Appendix F**.

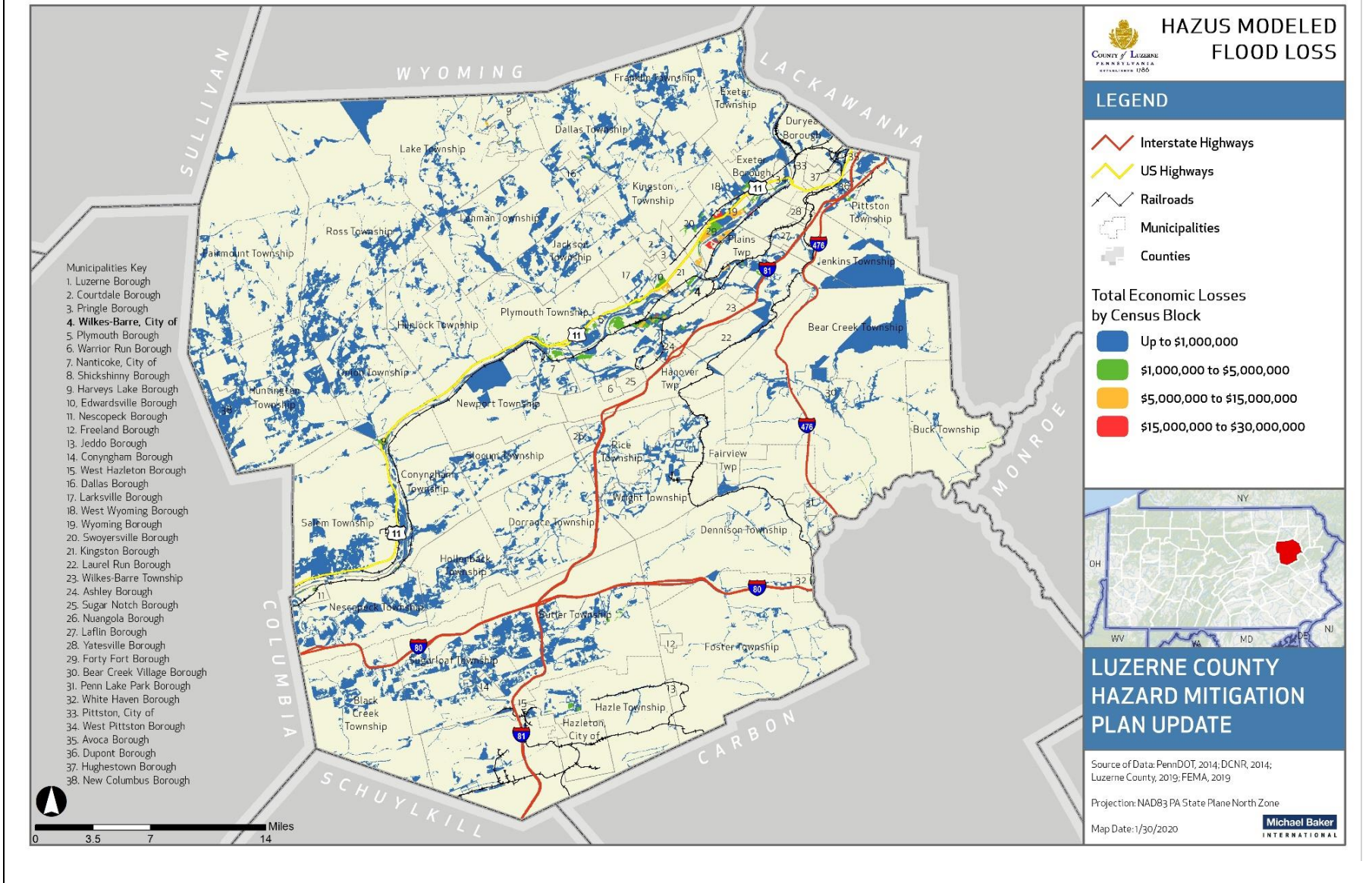
Losses associated with natural hazard events are sometimes reported to the NCEI with the event. The reporting time frame is 1950-2019. While these historic losses give a glimpse of potential losses in hazard events, they are not reported for all events and should be considered a broad estimate. Several deaths and millions of dollars' worth of property

damage have been caused by floods, flash floods, or ice jams in Luzerne County. Previous flood events listed in Figure 4.3.3-3 have caused an estimated \$293 million worth of property damage throughout the County from 1996-2019. It is important to note that loss estimates are not available for many of the previous flood events which have occurred in the County. Historical loss estimates are available for only 65 of the 94 events listed in Figure 4.3.3-3.

Additionally, as discussed in Section 4.3.3.5 there are 6,147 structures in Luzerne County insured under the NFIP. A total of 3,993 NFIP claims for flood damages have been made since 1978 for these structures. Cumulative NFIP payments for flood damages have exceeded \$90 million.

Below, Figure 4.4.3-1 shows Hazus modeled potential flood losses in Luzerne County. This model is consistent with other data found for flood risk in the county. The greatest losses are expected to be found in areas along the Susquehanna River, for example Forty Fort Borough, the City of Wilkes-Barre, and Wyoming Borough. However, due to the topography of Luzerne County, flood losses can be expected in every municipality.

Figure 4.4.3-1 Hazus Modeled Flood Loss in Luzerne County



The NCEI database listed losses for hailstorms, tornados and windstorms, and winter weather events in Luzerne County. Hailstorms building and agricultural losses estimated \$44,000. Tornados and windstorms accounted for over \$8.2 million in losses. For winter storm events, there were three events with reported losses ranging from \$100,000 to \$300,000 per event. Together, the events totaled \$767,000 in losses. A high percentage of losses from winter storms are usually in the form of repairs to damaged utility poles, wires, and other infrastructure.

#### **4.4.4. Future Development and Vulnerability**

Risk and vulnerability to natural 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. Luzerne 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.

Population change and the age of the housing stock are main indicators of vulnerability change in Luzerne County. As discussed in Section 2.3, the total population of Luzerne County is estimated to have decreased by 0.3 percent from 2010-2017, indicating the overall population of the County has generally stayed the same. Thirty-six municipalities increased in population while forty-one decreased in population during this time period. Areas of higher density, in the larger municipalities and growing municipalities, face increased vulnerability and increased exposed structures with most hazard events. Increases in population results in increased vulnerability to hazards such as wildfires, floods, and winter storms as more people will be impacted.

Section 1.4 discusses the projected population change in Luzerne County by 2040. Figure 2.3-2 shows the percent population change from 2010-2040 for each municipality. The largest population increases are expected to occur in the Northern and Southern portions of the county. This includes Butler, Dennison, Fairview, and Rice Townships, and Penn Lake Park Borough. The smallest population increases are expected to be seen in more densely populated areas along the Susquehanna River, like the City of Wilke-Barre.

The Luzerne County Zoning Officer reports through the Luzerne County Department of Planning and Zoning. The Zoning Officer oversees the administration of zoning matters, including floodplain management duties, for 22 of the County's municipalities and subdivision regulations for 28 of the County's municipalities under the Luzerne County Zoning Ordinance. Table 5.2.1-1 in the Capability Assessment lists these municipalities. Under the Luzerne County Zoning Ordinance developers must first get a permit from the Luzerne County Zoning Office. They are then directed to the local municipality's Flood Plain Administrator for additional flood plain management and building code requirements. Under Section 13 of the Luzerne County Zoning Ordinance, no development is permitted in the Special Flood Hazard Area. This includes encroachments, fill, construction, use, substantial improvements, substantial excavation or grading modification, or any other development. While there are

some exceptions, no new construction or development can be located within the area measured fifty feet landward from the top-of-bank of any watercourse within any SFHA.

Current zoning and development regulations dictate how future development should safely occur within the SFHA. However, there are structures within the SFHA that were constructed prior to the first Flood Insurance Rate Maps were available and floodplain management regulations were in effect. This suggests that there is potential for additional loss due to flooding in the future. SFHA development regulations relate to the base flood elevation, which is the estimated level of flooding that has a 1-percent chance of being equaled or exceeded in any given year. Because the SFHA or floodplain development regulations specify that residential structures must be elevated to or above the base flood elevation and commercial structures must either be elevated or flood-proofed to or above this level, the degree to which future structures are exposed to flood damages should be minimal. However, calculations of base flood elevations are based on models that rely upon data about previous flood events; should future floods be greater than those experienced in the past, the base flood elevation may not provide enough protection.

In addition, remote and sparsely populated municipalities also face higher vulnerability to certain hazards because they may not have as easy access to care facilities or response personnel. For instance, the less populated municipalities such as Bear Creek Village Borough, New Columbus Borough, and Penn Lake Park Borough face increased vulnerability to winter storms due to isolation, access issues, and longer emergency response times.

Roughly five percent of Luzerne County's population is over the age of 65. Older residents pose unique challenges when it comes to evacuation and/or mobility during the rescue and recovery processes that typically occur in the case of a hazard event. Officials may consider partnering with human services organizations to specifically plan for this vulnerable population.

The aging housing stock in Luzerne County is another source of current and future vulnerability in many hazard events. As discussed in Section 4.3.11.5, many homes in the County were built before 1940. Luzerne County can experience gusts of wind up to 200 miles per hour during windstorms, tornadoes, hurricane, tropical storms, or nor'easters. The structure of these older houses may be more at risk of destruction under these strong wind conditions. These structures may also be at risk during flooding and winter storm events if the materials are either not strong enough to withstand the pressure or weight of the precipitation or are liable to leak, causing further risk of destruction to the house. Eighty-eight percent of the housing units in Jeddo Borough were built before 1940, making it potentially more vulnerable to the risks from these hazards. West Pittston and Sugar Notch Boroughs also have large percentages of housing units built before 1940 (63% and 62% respectively). Twenty-six municipalities in the county have over 40% of housing units built before 1940.

In 2011, Luzerne County adopted a bi-county Regional Plan as the Comprehensive Plan and Long-Range Transportation Plan for the MPO titled *Lackawanna-Luzerne: Come, Shape the*

*Future.* The Long-Range Transportation Plan was updated and adopted in 2016. The 2011 Regional Plan is the current Comprehensive Plan for Luzerne County, and is the policy basis for zoning decisions and other land development policies in the County. This plan is described as “a guide for integrating land use, transportation, economic development, and sustainability in the region.” In particular, “the Land Use Plan proposes that development and redevelopment be largely directed to specific locations in the form of relatively-concentrated mixed-use settings, providing opportunities for people to live, work, and play in close proximity.” The Land Use Plan is intended to “provide a density of population sufficient to support new retail uses and community facilities and attract employment.” Concentrating growth may help to reduce isolation-based vulnerability of communities with few access routes, no municipal water supply, and low cell phone reception. On the other hand, higher densities mean that more people are likely to be impacted in a hazard event should it strike those more populated areas.

In 2010, Luzerne County adopted a Stormwater Management Plan and Ordinance, titled the *Luzerne County Stormwater Management Ordinance*. This ordinance states that no regulated activities can begin until a Storm Water Management Plan is written for and approved by the municipality. This ordinance regulates all activities that may affect stormwater runoff, including land development and earth disturbance activity. The purpose of this ordinance is to promote health, safety, and welfare within the municipality and its watershed. Provisions of this ordinance include meeting legal water quality requirements, preserving natural drainage systems, managing stormwater runoff close to the source, maintaining groundwater recharge, and preventing scour and erosion of stream banks and streambeds.

## 5. Capability Assessment

### 5.1. Update Process Summary

The purpose of the Capability Assessment is to identify strengths and weaknesses that will affect the ability of the County and participating jurisdictions to implement mitigation actions. It is important to perform a mitigation capability assessment in order to develop a comprehensive and implementable mitigation strategy. Capabilities include a variety of regulations, existing planning mechanisms, and administrative capabilities provided through established agencies or authorities.

The Capability Assessment comprises a number of main components:

1. Document Review - an inventory of the County's existing planning and regulatory tools and a review and incorporation of existing plans and other technical information as appropriate;
2. Participation in the National Flood Insurance Program; and
3. Municipal Capability Assessment - an analysis of municipal capacity from a planning, policy, staffing, training, outreach, and political standpoint.

Based on these components as well as the vulnerability analysis identified earlier in the plan, Luzerne County can assess its current resources and begin to address the legal, regulatory, administrative, financial, and other capabilities which it currently has at its disposal to address the potential hazards which make the County and its local municipalities vulnerable.

Luzerne County has several resources it can access to implement hazard mitigation initiatives including emergency response measures, local planning and regulatory tools, administrative assistance and technical expertise, financial 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 hazard event. The most important resources which provide the basis for addressing hazard potential and mitigation are the emergency services manpower, equipment, and fiscal resources available within Luzerne County communities.

In 2014, the County, municipalities, and stakeholders, identified the suite of resources available in the County to support hazard mitigation, including regulatory, planning, and administrative resources. It also indicated the presence of local plans, ordinances, and codes in applicable municipalities. Finally, the 2014 Capability Assessment specified the County's staffing and training capabilities. For the 2020 plan, the HMPT updated the 2014 Capability Assessment by distributing a *Capability Assessment Survey* to all 76 municipalities and summarizing responses. In addition, the HMPT provided additional input into the 2020 Capability Assessment through feedback at meetings. An analysis of how municipalities have implemented the NFIP in their communities is also provided.



The 2020 Capability Assessment provides an updated inventory of the most critical local planning and regulatory tools available within each municipality, a summary of the fiscal and technical capabilities available through programs and organizations outside of the County and provides an opportunity to discuss any plan integration opportunities with the hazard mitigation plan. It also identifies emergency management capabilities and the processes used for implementation of the National Flood Insurance Program.

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.

Additionally, a number of documents have been reviewed as part of this Plan Update. While some reviews have been derived from the 2009 and 2014 Plans and updated where applicable, additional documents have been identified and reviewed for purposes of integration into other local planning mechanisms. Several plans and ordinances at the county and municipal level have been reviewed and a summary with options to integrate the data, information, and hazard mitigation goals and actions into other planning mechanisms are included.

The Mitigation Strategy, including the goals and actions, is incorporated into relevant planning mechanisms based on their pertinence and relevance to specific plans and ordinances. For example, all structural projects should be included in the Capital Improvements Program. Land use and zoning related projects should be incorporated into the next update of the Community’s Comprehensive Plan and Zoning Ordinance though collaboration with the Planning and Zoning departments. Likewise, information from relevant planning documents was used to inform and update the Hazard Mitigation Plan. A general list of relevant plans and documents and corresponding areas for incorporation are listed below:

<b>RELEVANT DOCUMENTS</b>	<b>HAZARD MITIGATION PLANNING ELEMENTS</b>
Comprehensive Plan/Land Use Plan, Zoning/Subdivision Regulations, Floodplain Ordinance	Demographic data, land use, development trends, and floodplain management information
Stormwater Management (SWM) Plan, Sediment and Erosion Control Plan, Culvert and Bridge Maintenance Plans, Long Range Transportation Plan.	Stormwater management and infrastructure data and projects
Evacuation Plan, Emergency Operations/Response Plan, Wyoming Valley Flood Risk Management Project Response Plan	All-hazards information for evacuation, response and recover
Climate Change Plan, Dam Safety Regulations, Wetland Regulations	Risk and vulnerability data, and storm/floodwater management
Open Space Plan	Mitigation progress and solutions

RELEVANT DOCUMENTS	HAZARD MITIGATION PLANNING ELEMENTS
Wyoming Valley Flood Risk Management O&M Manuals	Flood control infrastructure maintenance

## 5.2. Capability Assessment Findings

Luzerne County and participating jurisdictions have several plans, tools, and resources in place to support the goals of hazard mitigation planning.

### 5.2.1. Planning and Regulatory Capability

The purpose of a plan/ordinance review as part of this planning process is trifold:

- To identify existing Commonwealth, Regional/County, and Municipal initiatives;
- To provide an inventory and review of sample plans and ordinances and identify sections in these documents that address hazard mitigation-related issues; and
- To provide a platform to integrate plans and other documents so recommendations and strategies are not in contradiction with one another (e.g., between the hazard mitigation plan and comprehensive plan).

A review of updated and existing zoning and subdivision ordinances, comprehensive plans, open space and recreation plans, stormwater management plans, sediment and erosion control plans, and emergency operations plans, among others, are summarized below by level of administration (Commonwealth, Regional/County, and Municipal).

#### Commonwealth of Pennsylvania Document Review

- The 2018 Update of the **Pennsylvania State All-Hazard Mitigation Plan** goals and objectives that are applicable to this Luzerne County Plan Update including:
  - Protect lives, property, environmental quality, and resources of the Commonwealth;
  - Enhance consistent coordination, collaboration, and communications among stakeholders;
  - Provide a framework for active hazard mitigation planning and implementation; and
  - Increase awareness, understanding, and preparedness across all sectors.

Hazard identification and risk assessment data for Luzerne County has been incorporated into the appropriate sections of this Plan update from the 2018 PA All-Hazard Mitigation Plan.

- The **Uniform Construction Code (UCC)** is the statewide building code (Act 45 of 1999) that took effect in Pennsylvania in April of 2004. The UCC is mandated by the State for all municipalities in Pennsylvania and establishes minimum regulations for most new

construction, including additions and renovations to existing structures. All new construction is required to meet the UCC requirements statewide.

- The **Commonwealth of Pennsylvania Governor's Executive Order 1999-1 (Land Use Planning)** provides the basis for the requirement to integrate hazard mitigation into comprehensive land use planning. As part of this executive order, the Interagency Land Use Team was established, comprising the following state agencies: Department of Agriculture; Department of Community and Economic Development; Department of Conservation and Natural Resources; Department of Environmental Protection; Governor's Green Government Council; Fish and Boat Commission; Game Commission; Department of Transportation; and the Pennsylvania Emergency Management Agency. One of the most significant outcomes of PEMA's participation on the team is the integration of hazard mitigation goals and objectives into the comprehensive land use planning process.
- The **Pennsylvania Erosion and Sediment Control Code** requires all earthmoving projects in the Commonwealth to develop an erosion and sediment pollution control plan to ensure that proper site development practices are employed for land development and implement best management practices for the control of sediment pollution during construction. Pennsylvania DEP requires a National Pollution Discharge Elimination System (NPDES) permit for earthmoving activities exceeding one acre. As well as erosion and sediment pollution control during construction, the permit also addresses post-construction stormwater management.

### Regional/County Document Review

- The **Lackawanna-Luzerne Regional Comprehensive Plan and Long-Range Transportation Plan** was completed and adopted in May 2011. A comprehensive plan is a policy document identifying community goals and objectives for future growth and development. In Luzerne County, this is the policy basis for zoning decisions and other land development policies countywide. Long-Range Transportation Plans are used to guide a region's planning for a 20-year horizon. Lackawanna and Luzerne Counties decided to work on joint planning efforts as they exist in a highly integrated region. The 2011 Regional Plan is the current Comprehensive Plan for Luzerne County. The [Long-Range Transportation Plan](#) was updated and adopted in 2016. Both plans are currently being updated, with expected completion dates in 2021.
- The **Open Space, Greenways, and Outdoor Recreation Master Plan for Lackawanna and Luzerne Counties**, 2004, provides recommendations for achieving a balance between natural resources and the built environment in the bi-county region. This plan looks at land resources and identifies areas offering opportunities for preserving and protecting natural resources. This plan is currently being updated with the bi-county Comprehensive and Long-Range Transportation Plans, with an expected completion date of 2021.

- After FEMA provides a municipality with regulatory flood hazard information, they are required to adopt a **floodplain ordinance** that meets or exceeds the minimum NFIP requirements in order to participate in the NFIP. The purpose of these overriding regulations is to ensure that participating communities take flood hazard data into account when acting on land management and use. Floodplain ordinances in Luzerne County are included in individual municipalities’ zoning ordinances. The required free board is 1.5 feet above base flood elevation and no building permits are issued for structures in the floodway. Elevation certificates are required by all municipalities for structures in the floodplain. More on floodplain ordinances administration can be found below in *Section 5.2.1.3*.
- **Zoning and Subdivision regulations** are administered similarly through the **Zoning Ordinance** and the **Subdivision and Land Development Ordinance (SALDO) of Luzerne County**. Communities can elect to opt-in and have the County administer their zoning and subdivision regulations or opt out and develop their own zoning and subdivision ordinance. While the County has no control over the municipalities that have their own zoning ordinances, these municipalities still must meet the Act 247 guidelines – State Municipal Planning Code. The Luzerne County Office of Planning and Zoning oversees the administration of zoning matters for 22 of the County’s municipalities and subdivision regulations for 28 of the County’s municipalities under the Luzerne County Zoning Ordinance. There is some overlap between these two designations. Table 5.2.1-1 lists these municipalities.
- **The Luzerne County Act 167 General Stormwater Management Ordinance** is included as an appendix to the County SALDO. The County Stormwater Management Ordinance applies to those municipalities within the County in which subdivision and land development and zoning reviews are administered by the County. All regulated activities must adhere to requirements in the stormwater management ordinance. Watersheds in the county with detailed analyses conducted under past Act 167 Plans have specific regulations for stormwater management. All municipalities are required to adopt the model ordinance or amend existing ordinances to be consistent with the standards and criteria set forth in the Plan. If municipalities do not have the capabilities to review plans for consistency with the standards and criteria set forth in the Plan, they will be responsible to designate a representative organization that can complete the review on the municipalities’ behalf.

<b>ZONING JURISDICTION</b>	<b>SUBDIVISION JURISDICTION</b>
Avoca Borough	Avoca Borough
Conyngham Township	Conyngham Township
Courtdale Borough	Courtdale Borough
Dupont Borough	Dallas Borough
Duryea Borough	Dupont Borough
Fairmount Township	Duryea Borough

**Table 5.2.1-1 Municipalities under Luzerne County Zoning and Subdivision/Land Use Jurisdiction**

ZONING JURISDICTION	SUBDIVISION JURISDICTION
Hughestown Borough	Exeter Township
Hunlock Township	Fairmount Township
Huntington Township	Hughestown Borough
Jeddo Borough	Hunlock Township
Laflin Borough	Huntington Township
Lake Township	Jeddo Borough
Luzerne Borough	Laflin Borough
New Columbus Borough	Lake Township
Newport Township	Luzerne Borough
Pringle Borough	New Columbus Borough
Ross Township	Newport Township
Union Township	Plymouth Borough
Warrior Run Borough	Plymouth Township
West Wyoming Borough	Pringle Borough
Wyoming Borough	Ross Township
Yatesville Borough	Shickshinny Borough
	Union Township
	Warrior Run Borough
	West Pittston Borough
	West Wyoming Borough
	Wyoming Borough
	Yatesville Borough

- Fifty-three of the 76 municipalities issue permits and have a **building code** that is based on the **UCC** (see Commonwealth of Pennsylvania Document Review, Bullet "A"). Six municipalities do not issue permits or perform UCC functions. They include: Jeddo, New Columbus, and Warrior Run Boroughs and Ross, Union, and Conyngham Townships. The following list is a breakdown of the municipal functions regarding building code:
  - Municipality issues permits; separate entity performs UCC function - 3 municipalities
  - Municipality issues permits; does not perform UCC function - 4 municipalities
  - Municipality issues permits; building codes based on UCC codes - 53 municipalities
  - Municipality does not issue permits but performs UCC functions - 3 municipalities
  - Municipality issues permits but does not perform UCC functions - 3 municipalities
  - Does not issue permits or perform UCC functions - 6 municipalities
  - Did not report - 4 municipalities

- **Sediment and Erosion Control Regulations** is administered by the Luzerne County Conservation District. For those municipalities that have their own subdivision ordinance regulations, the stormwater regulations are included in the subdivision ordinance. The level of enforcement of these regulations varies by municipality and is based on staff availability and technical capability. If a project requires a sediment and erosion control permit, a plan is required to be submitted.
- The **Luzerne County Emergency Operations Plan** was completed and approved in May 2018. The Luzerne County Emergency Management Agency encourages EOPs be created for daycares, hospitals, municipalities, schools, and senior care facilities. Resources are available to guide individuals in plan writing. Luzerne County operates a separate 911 Center and an Emergency Operations Center (EOC). The 911 Center and the EOC have listings of resources available from County assets as well as resources available from the municipalities via mutual aid agreements for reciprocal emergency assistance as needed. The Emergency Operations Plan (EOP) mentions the most likely and damaging hazards for the County to be flooding, winter storms, and drought. **Emergency Action Plans** have been prepared for high hazard dams located in Luzerne County as well as those for which the inundation area includes part of Luzerne County. Each Emergency Action Plan addresses ways to safeguard lives and reduce property damage within the inundation area; procedures for effective dam surveillance; procedures for prompt notification of emergency management officials; warning and evacuation procedures; and emergency response actions that will be taken in the event of potential or imminent failure of the dam. Plans are typically prepared by dam owners and are reviewed by Luzerne County officials. Plans are not available to the public due to sensitive information.
- The **Luzerne County EMS System Response Plan** was approved by the Pennsylvania Department of Health in cooperation with Emergency Medical Services of Northeastern Pennsylvania in August of 2016. The goal of the countywide response plan is to expedite responses by eliminating the delay of any agency that has low staffing and who will not be able to crew when being requested by the center for response to a 9-1-1 initiated call received through the Luzerne County Communications Center.
- **Act 165: Hazardous Materials Emergency Planning and Response Act**, amended in 2001, established a Statewide hazardous materials safety program. This created the Hazardous Materials Response Fund, county Hazardous Material Emergency Response Accounts, and further provided duties to PEMA and the Pennsylvania Emergency Management Council. This Act requires facilities with extremely hazardous chemicals on hand to create Off-site Emergency Response Plans, which are then presented to Local Emergency Planning Committees.
- **The Susquehanna Steam Electric Station: Emergency Plan**, approved 2016, is the current emergency action plan for the Susquehanna Steam Electric Station. This EAP includes definitions of possible emergencies, existing organizational control, and scope of the facility. The plan also includes measures and actions for potential

emergencies. There is a section dedicated to emergency preparedness at and around the nuclear facility.

- **The County of Luzerne: EMS System Response Plan**, approved 2016, details county response actions and plans to be used in the event of an emergency. The goals of the plan are to expedite responses by eliminating the delay of any agency that has low staffing and who will not be able to “crew” when being requested by the center for response to a 9-1-1 initiated call.
- A total of 44 **shelters** exist in the county that are designated and maintained by the Red Cross. The shelters are widely dispersed throughout the county. All shelters follow the Red Cross guidelines for shelters and shelter management.
- Following Tropical Storm Lee in September 2011, the Boroughs of Duryea and West Pittston and the Townships of Conyngham, Jenkins, and Plains agreed that cooperation was needed to address repetitive flooding. FEMA provided the Wyoming Valley Steering Committee with Long-Term Community Recovery (LTCR) and targeted technical assistance including training, information, and advice regarding recovery planning, facilitation support, and partnership development. The steering committee identified regional recovery projects including cross-municipality cooperation, flood mitigation education, options for acquired property, and business continuity planning which would raise awareness such as employee preparedness and flood insurance. These projects are outlined in the **Wyoming Valley Report**, produced in April 2012.

### Local/Municipal Document Review

- A total of 21 projects were identified as part of the **West Pittston – Long Term Community Recovery Plan June 2012** with the vision of a clean, safe, and progressive community rooted in family values and historic tradition. Each project identified a champion to iron out the project’s details, find the funds or necessary resources, attract volunteers and help bring the project to fruition. Some projects needed a great deal of volunteer time while others required millions of dollars in funding and partnerships of Federal, State, County, and local authorities. A wide variety of post-flood solutions for the Borough were discussed and each project included a detailed write-up.
- The **Shickshinny Long Term Community Recovery Plan April 2012** identified a number of recovery projects categorized as: Five Mountain (those that would influence other projects), three Mountain (critical projects that rely on information from Five Mountain projects), and One Mountain (projects that would take longer to implement). Each recovery project includes a cost estimate, project development guide (scope of work, timeline and budget) and a project champion to help implement the project.
- The **Wyoming Valley Report April 2012** summarizes technical assistance provided as part of the Wyoming Valley Long-Term Community Recovery initiative that resulted in the formation of Valley United, a recovery organization represented by Conyngham Township, Duryea Borough, Jenkins, Township, Plains Township, and West Pittston Borough. These areas have had targeted for recover and mitigation efforts since.

### **5.2.1.2. Community Political Capability**

Luzerne County's system of government was comprised of three county commissioners and eleven elected row officers and was established by state law in the County Code, implemented in 1955. Many provisions of the County Code were identical to, or derived from, laws, rules, and procedures which were first adopted by the Pennsylvania Legislature in the 1800s. The provisions of this County Code applied to all similar-sized counties without regard to a county's unique history, geography, demography, political climate, or economic makeup. Over time, as the roles and responsibilities of county government have expanded in scope, expense, and complexity, the County Code has remained largely unchanged. It was thus concluded that Luzerne County's antiquated governmental system was a substantial cause of the problems faced by the county and its residents and that the reforms contained in the Recommended Home Rule Charter would significantly strengthen and improve the professionalism, accountability, efficiency, and integrity of Luzerne County government.

While the original government system involved the unification of county political authority and day-to-day operational control in the county commissioners, it was believed that it was imperative, to the degree possible, to separate politics from the day-to-day decision making of Luzerne County government. The Recommended Home Rule Charter vests the executive power and day-to-day decision-making authority for Luzerne County in an appointed professional county manager. Political authority is vested in an eleven member, part-time, county council, which is the county's legislative and policymaking body. Council members are prohibited by the charter from interfering in the day-to-day decision making of the professional manager and staff. This structure is designed to insulate county operations from corrosive political concerns.

The first elections called for under the charter occurred in 2011, and the strengthened government system took effect in Luzerne County on January 2, 2012. After the 2016 election year, the Home Rule Charter was amended to lift a ban requiring county board/authority/commission members to wait one year after leaving their seats to run for county offices, require a majority of council votes to amend the county budget in the years following council elections, and allow employees of companies with county contracts to serve on authorities at the council's discretion.

### **5.2.1.3. Participation in the National Flood Insurance Program**

The Pennsylvania Floodplain Management Act (Act 166 of 1978) requires every municipality with flood hazard areas identified by the Federal Emergency Management Agency (FEMA) to participate in the 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.



## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

Of the municipalities in Luzerne County, 75 of 76 participate in the NFIP. Table 5.2.1-3 shows whether the municipality is participating in NFIP, the number of policies they have, whether the municipality is in good standing, and when they entered the NFIP. Slocum Township has never participated in the NFIP and flood studies have never identified a flood hazard area in Slocum Township.

MUNICIPALITY	DATE ENTERED THE NFIP	# POLICIES	IS THE COMMUNITY IN GOOD STANDING?
Ashley Borough	09/30/80	21	Yes
Avoca Borough	07/16/81	18	Yes
Bear Creek Township	07/26/02	3	Yes
Bear Creek Village Borough	09/29/78	4	Yes
Black Creek Township	09/03/80	8	Yes
Buck Township	04/15/81	1	Yes
Butler Township	12/16/80	46	Yes
Conyngham Borough	07/16/80	2	Yes
Conyngham Township	02/16/77	18	Yes
Courtdale Borough	06/01/79	2	Yes
Dallas Borough	01/02/81	11	Yes
Dallas Township	04/01/88	8	Yes
Dennison Township	04/15/81	10	Yes
Dorrance Township	08/15/80	4	Yes
Dupont Borough	06/15/81	20	Yes
Duryea Borough	06/18/80	75	Yes
Edwardsville Borough	04/15/77	231	Yes
Exeter Borough	05/16/77	63	Yes
Exeter Township	09/15/83	21	Yes
Fairmount Township	04/01/81	7	Yes
Fairview Township	06/01/79	8	Yes
Forty Fort Borough	04/01/77	654	Yes
Foster Township	04/01/81	9	Yes
Franklin Township	05/19/81	0	Yes
Freeland Borough	05/26/78	0	Yes
Hanover Township	05/16/77	425	Yes
Harveys Lake Borough	12/02/80	22	Yes
Hazle Township	04/01/81	18	Yes
City of Hazleton	07/31/78	4	Yes
Hollenback Township	09/17/80	1	Yes
Hughestown Borough	07/31/78	0	Yes
Hunlock Township	04/01/80	31	Yes
Huntington Township	04/15/81	8	Yes

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

**Table 5.2.1-2 NFIP Participation in Luzerne County (FEMA CIS 2020).**

MUNICIPALITY	DATE ENTERED THE NFIP	# POLICIES	IS THE COMMUNITY IN GOOD STANDING?
Jackson Township	09/17/80	6	Yes
Jeddo Borough	07/31/78	0	Yes
Jenkins Township	05/16/77	30	Yes
Kingston Borough	06/01/77	1,815	Yes
Kingston Township	01/02/81	28	Yes
Laflin Borough	12/02/80	5	Yes
Lake Township	09/03/80	3	Yes
Larksville Borough	04/01/77	8	Yes
Laurel Run Borough	09/01/87	0	Yes
Lehman Township	12/02/80	1	Yes
Luzerne Borough	04/15/77	32	Yes
City of Nanticoke	04/15/77	7	Yes
Nescopeck Borough	02/01/80	7	Yes
Nescopeck Township	08/01/80	8	Yes
New Columbus Borough	03/16/81	1	Yes
Newport Township	12/02/80	1	Yes
Nuangola Borough	09/28/79	2	Yes
Penn Lake Park Borough	12/05/80	7	Yes
City of Pittston	05/02/77	6	Yes
Pittston Township	06/15/81	8	Yes
Plains Township	05/16/77	55	Yes
Plymouth Borough	04/01/77	148	Yes
Plymouth Township	04/15/77	25	Yes
Pringle Borough	05/02/77	11	Yes
Rice Township	01/02/81	5	Yes
Ross Township	04/15/81	4	Yes
Salem Township	03/18/80	25	Yes
Shickshinny Borough	12/31/76	39	Yes
Slocum Township	Not Participating		
Sugarloaf Township	07/02/80	6	Yes
Sugar Notch Borough	06/30/76	0	Yes
Swoyersville Borough	06/15/77	457	Yes
Union Township	09/30/80	6	Yes
Warrior Run Borough	06/25/76	0	Yes
West Hazleton Borough	07/31/78	1	Yes
West Pittston Borough	04/15/77	310	Yes
West Wyoming Borough	04/15/77	42	Yes
White Haven Borough	08/01/77	1	Yes
City of Wilkes-Barre	09/30/77	1,212	Yes
Wilkes-Barre Township	12/02/80	11	Yes

**Table 5.2.1-2 NFIP Participation in Luzerne County (FEMA CIS 2020).**

MUNICIPALITY	DATE ENTERED THE NFIP	# POLICIES	IS THE COMMUNITY IN GOOD STANDING?
Wright Township	01/16/81	22	Yes
Wyoming Borough	11/16/77	37	Yes
Yatesville Borough	07/31/78	2	Yes
<b>TOTAL</b>		<b>6,147</b>	

For a community to participate in the NFIP, it must adopt and enforce floodplain management regulations that meet or exceed the minimum NFIP standards and requirements. These standards are intended to prevent loss of life and property, as well as economic and social hardships that result from flooding. Once FEMA provides communities with flood hazard information upon which floodplain management regulations are based, the community is required to adopt a floodplain ordinance that meets or exceeds the minimum NFIP requirements. All NFIP participating communities in Luzerne County have either adopted a stand-alone ordinance or have arranged for County administration of floodplain regulations in 2012 after an updated FIRM went effective for the County.

The overriding purpose of the minimum floodplain management regulations as outlined by the Code of Federal Regulations (44 CFR) is to ensure that participating communities consider flood hazards, to the extent that they are known, in all official actions relating to land management and use. Municipalities range from "A" to "E" levels of regulation based on their identified flood zones. In Luzerne County, seven municipalities are Level "A" indicating they have no FEMA identified flood hazard areas, five are Level "B", and 63 are Level "D" indicating that a floodway has been designated for certain flooding sources. Regulations become more comprehensive as you move from A to E and are dependent on whether a municipality has identified flood hazard areas, flood elevations, floodways, or coastal high-hazard areas.

The following information is summarized to document how the County currently assists municipalities in addressing NFIP compliance and requirements:

- The County makes FIRMs and FIS Reports available to the public for review at the offices of the Luzerne County Flood Protection Authority. The Authority also serves as the depository for most flood-related information.
- FIRMs will be available in the form of printed copies and with links to the FEMA web site. The FIRMS are available to the public for review at the offices of the Luzerne County Flood Protection Authority.
- Out of 76 total municipalities in the County, there are 22 municipalities that are under the jurisdiction of the Luzerne County Zoning Ordinance and there are 28 municipalities that are under the jurisdiction of the Luzerne County SALDO (See Section 5.2.1.1). Local municipalities, not under the jurisdiction of the County, are responsible for all third party LOMR requests to either be: 1) submitted to FEMA

through the local municipality, or 2) provided with evidence that the local municipality has been notified of the LOMR request to FEMA.

- The Luzerne County Flood Protection Authority provides advice and guidance to the public regarding elevation certificates and LOMAs. However, the NFIP is a program administered through FEMA. Through its Flood Hazard Mapping Program, FEMA maintains and updates data through FIRMs. Copies of documents that pertain to changing or correcting FIRMs are available through FEMA and may also be available in the offices of the local municipalities.
- The Luzerne County Flood Protection Authority provides advice and guidance to the public in interpreting the DFIRM and flood studies. However, the decision regarding a specific properties status in the floodplain must be made by the local municipalities where the land improvements are located.
- The Luzerne County Flood Protection Authority conducts monthly public meetings where the business activities of the Authority are discussed. The topics of flood insurance and floodplain management are frequently discussed.
- The Authority collects revenue for its operating expenses for maintenance of its flood protection system through an annual levee fee imposed on residents. In the annual fee statement mailings, a letter is included that describes the fee and the importance of obtaining flood insurance for properties located in the floodplain(s).

The Luzerne County Flood Protection Authority provides advice regarding elevation certificates and LOMAs and assists residents in interpreting the FIRM and flood studies.

A summary of Luzerne County floodplain ordinances can be found below and Table 5.2.1-3 provides additional details about NFIP levels of regulation and higher standards.

- 7 communities have incorporated their floodplain regulations into their existing zoning ordinance
- 22 communities are under County jurisdiction for both zoning and subdivision and land use (highlighted blue in Table 5.2.1-3). Six additional communities are under County jurisdiction for subdivision and land use only (highlighted yellow in Table 5.2.1-3). Luzerne County Zoning Ordinance contains floodplain language, restrictions, definitions, and prohibitions however the majority of the 22 municipalities under County Zoning jurisdiction still have a stand-alone floodplain management ordinance based on the state model ordinance. Under the Luzerne County Zoning Ordinance developers must first get a permit from Zoning Officer housed in the Department of Planning and Zoning. The Zoning Officer also acts as the Floodplain Administrator for these 22 municipalities. See section 5.2.1.1 for more information on the Zoning Ordinance and SALDO of Luzerne County.
- Of the 54 municipalities that have adopted floodplain ordinances, some have adopted higher standards making development in the floodplain more restrictive. 50 have

incorporated more restrictive freeboard requirements, 38 have incorporated repetitive loss, and 5 have incorporated substantial damage/substantial improvement.

In addition, some stand-alone ordinances included measures that go above and beyond the minimum standards and requirements for floodplain management. All 75 municipalities participating in the NFIP in Luzerne County have a freeboard requirement in their floodplain management ordinance and fifty-six municipalities included other more restrictive requirements such as limiting construction within the area 50 feet landward of a levee, restricting manufactured homes within the floodway, prohibiting of recreation vehicles, barring substances considered dangerous to human life, eliminating any uses that require special permits, and prohibiting fill.

LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

Table 5.2.1-3 Floodplain Management Ordinance Review in Luzerne County (FEMA CIS 2020).

MUNICIPALITY	LEVEL OF REGS	Freeboard	Repetitive Loss	Cumulative Substantial Damage/Improvement	Conservation District Review	Restrictions on Construction/Development/permits	Restrictions on Manufactured Homes	Fill Prohibited	Community Identified SFHA	Hazardous Materials Restriction	Recreational Vehicle Restriction
Ashley Borough	D	X	X		X	X					
Avoca Borough	D	X	X		X					X	
Bear Creek Township	D	X	X			X			X		
Bear Creek Village Borough	D	X	X		X	X					
Black Creek Township	D	X	X		X	X	X			X	
Buck Township	D	X				X	X	X		X	X
Butler Township	D	X	X	X	X		X			X	
Conyngam Borough	D	X	X								
Conyngam Township	D	X	X							X	
Courtdale Borough	D	X	X	X	X	X	X			X	
Dallas Borough	D	X				X	X		X		
Dallas Township	D	X	X								
Dennison Township	D	X									
Dorrance Township	D	X									

LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

Table 5.2.1-3 Floodplain Management Ordinance Review in Luzerne County (FEMA CIS 2020).

MUNICIPALITY	LEVEL OF REGS	Freeboard	Repetitive Loss	Cumulative Substantial Damage/Improvement	Conservation District Review	Restrictions on Construction/Development/permits	Restrictions on Manufactured Homes	Fill Prohibited	Community Identified SFHA	Hazardous Materials Restriction	Recreational Vehicle Restriction
Dupont Borough	D	X	X	X	X	X	X	X	X	X	X
Duryea Borough	D	X		X	X	X	X			X	
Edwardsville Borough	D	X		X	X	X				X	
Exeter Borough	D	X	X		X	X	X	X	X	X	X
Exeter Township	D	X	X		X	X	X			X	
Fairmount Township	D	X				X		X		X	
Fairview Township	D	X									
Forty Fort Borough	D	X		X	X	X	X		X	X	
Foster Township	D	X	X								
Franklin Township	D	X	X								
Freeland Borough	A	X									
Hanover Township	D	X	X	X							
Harveys Lake Borough	B	X	X	X							

## LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

**Table 5.2.1-3 Floodplain Management Ordinance Review in Luzerne County (FEMA CIS 2020).**

MUNICIPALITY	LEVEL OF REGS	Freeboard	Repetitive Loss	Cumulative Substantial Damage/Improvement	Conservation District Review	Restrictions on Construction/Development/permits	Restrictions on Manufactured Homes	Fill Prohibited	Community Identified SFHA	Hazardous Materials Restriction	Recreational Vehicle Restriction
Hazle Township	D	X	X								
City of Hazelton	A	X									
Hollenback Township	D	X									
Hughestown Borough	A	X								X	
Hunlock Township	D	X	X		X		X			X	
Huntington Township	D	X	X	X						X	
Jackson Township	D	X	X		X	X					
Jeddo Borough	A	X								X	
Jenkins Township	D	X									
Kingston Borough	D	X	X		X	X	X			X	
Kingston Township	D	X	X		X	X	X			X	
Laflin Borough	B	X	X	X	X	X	X			X	
Lake Township	D	X	X	X	X	X	X	X	X	X	X
Larksville Borough	D	X				X	X			X	



**LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE**

**Table 5.2.1-3 Floodplain Management Ordinance Review in Luzerne County (FEMA CIS 2020).**

MUNICIPALITY	LEVEL OF REGS	Freeboard	Repetitive Loss	Cumulative Substantial Damage/Improvement	Conservation District Review	Restrictions on Construction/Development/permits	Restrictions on Manufactured Homes	Fill Prohibited	Community Identified SFHA	Hazardous Materials Restriction	Recreational Vehicle Restriction
Laurel Run Borough	B	X									
Lehman Township	D	X	X		X	X	X			X	
Luzerne Borough	D	X	X							X	
City of Nanticoke	D	X									
Nescopeck Borough	D	X									
Nescopeck Township*	D	X	X	X	X	X	X			X	
New Columbus Borough	D	X	X	X	X	X	X		X	X	
Newport Township	D	X	X	X	X	X	X	X	X	X	X
Nuangola Borough	B	X	X	X	X	X	X		X	X	
Penn Lake Park Borough	D	X	X		X	X	X			X	
City of Pittston	D	X	X			X					
Pittston Township	D	X	X	X		X	X		X	X	
Plains Township*	D	X	X								

LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

Table 5.2.1-3 Floodplain Management Ordinance Review in Luzerne County (FEMA CIS 2020).

MUNICIPALITY	LEVEL OF REGS	Freeboard	Repetitive Loss	Cumulative Substantial Damage/Improvement	Conservation District Review	Restrictions on Construction/Development/permits	Restrictions on Manufactured Homes	Fill Prohibited	Community Identified SFHA	Hazardous Materials Restriction	Recreational Vehicle Restriction
Plymouth Borough	D	X		X							
Plymouth Township	D	X				X					
Pringle Borough	D	X	X	X	X	X	X		X	X	
Rice Township	D	X									
Ross Township	D	X				X				X	
Salem Township	D	X	X	X		X					
Shickshinny Borough	D	X	X	X							
Slocum Township	NP										
Sugarloaf Township	A	X									
Sugar Notch Borough	D	X									
Swoyersville Borough	D	X	X								
Union Township	D	X								X	
Warrior Run Borough	A	X								X	
West Hazleton Borough	D	X			X	X	X				

LUZERNE COUNTY 2020 HAZARD MITIGATION PLAN UPDATE

Table 5.2.1-3 Floodplain Management Ordinance Review in Luzerne County (FEMA CIS 2020).

MUNICIPALITY	LEVEL OF REGS	Freeboard	Repetitive Loss	Cumulative Substantial Damage/Improvement	Conservation District Review	Restrictions on Construction/Development/permits	Restrictions on Manufactured Homes	Fill Prohibited	Community Identified SFHA	Hazardous Materials Restriction	Recreational Vehicle Restriction
West Pittston Borough	D	X									
West Wyoming Borough	D	X	X							X	
White Haven Borough	D	X									
City of Wilkes-Barre	B	X									
Wilkes-Barre Township	D	X									
Wright Township	D	X		X	X	X	X				
Wyoming Borough	D	X								X	
Yatesville Borough	A	X								X	

Many of the above stated higher standards adopted by municipalities such as freeboard requirements and addressing repetitive loss properties could be eligible for credit under the Community Rating System (CRS). The NFIP's 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 damage 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 CRS in the NFIP and 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 CRS, 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:

- Reduce flood losses
- Reduce damage to property
- Protect public health and safety
- Prevent increases in flood damage from new construction
- Reduce the risk of erosion damage
- Protect natural and beneficial floodplain functions
- Facilitate accurate insurance rating
- Promote the awareness of flood insurance

There are 10 CRS classes that provide varied reduction in insurance premiums. Class 1 requires the most credit points and gives the largest premium reduction; Class 10 receives no premium reduction. CRS premium discounts on flood insurance range from 5 percent for Class 9 communities up to 45 percent for Class 1 communities. The CRS recognizes 18 creditable activities that are organized under four

### **CRS Communities**

These communities have exceeded minimum floodplain management standards and in turn receive discounts on flood insurance premiums for residents!

**City of Wilkes-Barre**  
**Class 6**  
**20% Discount**

**Borough of Kingston**  
**Class 8**  
**10% Discount**

**Township of Hanover**  
**Class 9**  
**5% Discount**

categories: Public Information, Mapping and Regulations, Flood Damage Reduction, and Flood Preparedness.

The Township of Hanover (CRS Class 9), Borough of Kingston (CRS Class 8), and City of Wilkes-Barre (CRS Class 6) are the municipalities in Luzerne County participating in this program. Class 9 results in 5% discount on flood insurance while Class 6 results in 20% discount on flood insurance. These municipalities have received CRS points for the following: elevation certificates, higher regulatory floodplain management standards, stormwater management, flood map information, outreach projects, and open space preservation. West Pittston Borough applied to the CRS program in 2019, documenting enough credit points to achieve a Class 7 rating. Local officials anticipate receiving acceptance into the program in Spring 2020.

For communities that participate in the NFIP, substantial damage determinations are required by local floodplain management ordinances. These rules must be in place for residents of a community to purchase flood insurance through the NFIP. The decision about a structure being “substantially damaged” is made at the local government level, generally by a building official or floodplain manager. Substantial damage applies to a structure in the SFHA for which the total cost of repairs is 50 percent or more of the structure’s market value before the disaster occurred, regardless of the cause of damage. This percentage could vary among jurisdictions but must not be below NFIP standards. Preliminary damage assessments conducted by Luzerne County after a disaster (as discussed in Section 5.2.1.1) can be used when making substantial damage determinations. If a building within the floodplain is determined to be substantially damaged after a disaster, it will need to be brought into compliance through methods such as elevating the structure and floodproofing utilities. This should be monitored by the local community in order to stay in compliance with the NFIP.

### **5.2.2. Administrative and Technical Capability**

A variety of administrative capabilities are established in Luzerne County and its jurisdictions. These capabilities can support the implementation of mitigation actions that are proposed in this plan. These capabilities are:

- **The Luzerne County Engineers Office** is responsible for the technical review and the administrative aspect of county projects, design and construction of road and bridge projects, and contract administration for county projects. The Department of Planning and Zoning acts as intake for all subdivision and land development plans and dictates the review. Minor subdivision plans and those that do not require a stormwater management review are typically routed to the County Engineer. Land development and major subdivision plans are forwarded to one of three third-party engineering companies with which the County has an MOUs. Those municipalities that are administered by the County are required to incorporate comments received. Other

municipalities that are not administered by the County can use the County comments at their discretion.

- **The Luzerne County Department of Planning and Zoning** makes recommendations to the governing body on a number of issues, including zoning, subdivision/land development and comprehensive planning. The Department administers a zoning ordinance for 22 municipalities within the county and administers the subdivision/land development ordinance for 28 municipalities and also reviews subdivision/land development plans for all municipalities within the County, including those over which the County does not have control.
- The Planning Commission administers the stormwater management ordinance for land development and is the funding mechanism for the **Luzerne County Agricultural Preservation Program (LCAPP)**, and through the Department of Planning and Zoning, provides funding for the purchase of easements and associated incidental costs (State Farmland Preservation Board funding). The Luzerne County Conservation District administers LCAPP.
- The Planning Commission is involved in transportation planning via the **Metropolitan Planning Organization (MPO)**. The MPO decides how Federal and State transportation funds will be allocated in the two-county MPO region. Two Department of Planning and Zoning staff are also full time MPO staff.
- **The Luzerne County Emergency Management Agency** is responsible for protection of the County's public health, safety and environment, and management through and recovery from natural disasters, emergencies or threats to security. The EMA also contains a **Local Emergency Planning Committee (LEPC)** which is responsible for overseeing the Hazardous Materials Response Account and approving Off-site Emergency Response Plans. The LEPC is comprised of the County emergency management coordinator, a county council member, local government representative, law enforcement official, firefighter, and emergency management personnel, among others.
- **The Luzerne County Office of Community Development** is entrusted with the provision of decent housing, a suitable living environment, and expanded economic opportunities that will improve the quality of life of County residents. The Office of Community Development administers three Federally funded Housing and Urban Development (HUD) programs:
  - **Community Development Block Grant Program (CDBG)** - community development activities directed toward revitalizing neighborhoods, economic development, and providing improved community facilities and services. CDBG funds may be used for activities such as acquisition of real property; relocation and demolition; rehabilitation of residential and non-residential structures; and construction of public facilities and improvements to facilities such as water, sewer, and streets.
- **The Luzerne County Redevelopment Authority's** mission is to work with Luzerne County and its municipalities to assist in improving the quality of life and property for

residents through eminent domain, the administration of grant programs, tax abatement programs, delinquent tax buyback programs, and the acquisition of the short line railroad that serves Luzerne County, and a portion of Lackawanna County. Redevelopment Authority staff are experienced in grant writing and administration and have assisted communities in the County who have received grants from various government and not-for-profit agencies. Staff can meet with communities and organizations about project needs and will then explore the potential for various grants.

- **The Luzerne Conservation District** strives to conserve natural resources in Luzerne County through public awareness, technical assistance, and encouraging regulatory compliance. It works closely with property owners, public and private organizations and citizens to increase their responsibility to the natural environment.
- The **Luzerne County Department of Roads and Bridges** maintains county roads and bridges. State highways are maintained by PennDOT and local roads are maintained by individual municipalities (roads bridges, culverts, pipes, inlets, etc.).
- Flood control facility maintenance falls under the auspices of the **Luzerne County Flood Protection Authority (LCFPA)** by contractual agreement with the Army Corps of Engineers. The LCFPA oversees the **Wyoming Valley Flood Risk Management Project (WVFRMP)**. The 16-mile long project helps protect the communities of Edwardsville Borough, Exeter Borough, Forty Fort Borough, Hanover Township, Municipality of Kingston, Luzerne Borough, Plymouth Borough, Pringle Borough, Swoyersville Borough, West Wyoming Borough, Wyoming Borough and the City of Wilkes-Barre. The Susquehanna River is one of the most flood prone waterways in the United States. Locally, since 1865 the river has exceeded the natural flood stage of 22 feet, seventy-seven (77) times or about once every 2 years. Consequently, the existing flood protection system is one of the largest systems in the nation. For river flooding and major events (above 30 feet) the Luzerne County Flood Protection Authority (LCFPA) serves as the technical arm for the EMA and prepares maps and detailed information on limits of flooding based on a projected crest, list of impacted communities, name/address and also impacted infrastructure (which roads need to be closed, etc.). This information is used by the EMA to issue notifications. LCFPA developed and maintains the [Wyoming Valley Flood Operations Plan](#) which depicts flood stages and corresponding impacts as well as necessary response activities.
- The **Susquehanna River Basin Commission** works to enhance public welfare through comprehensive planning, water supply allocation, and management of the water resources of the Susquehanna River Basin. To accomplish this mission, the Commission works to reduce damages caused by floods; provide for the reasonable and sustained development and use of surface and ground water for municipal, agricultural, recreational, commercial and industrial purposes; protect and restore fisheries, wetlands and aquatic habitat; protect water quality and instream uses; and ensure future availability of flows to the Chesapeake Bay.

- The **Northeastern Pennsylvania Alliance (NEPA)**, a regional community and economic development agency, serves the seven counties of Northeastern Pennsylvania including Carbon, Lackawanna, Luzerne, Monroe, Pike, Schuylkill and Wayne. NEPA Alliance services include business financing, government contracting assistance, international trade assistance, non-profit assistance, transportation planning, research and information, and local government services.
- **Mountain Council of Governments (MCOG)** consists of over 20 municipalities, school districts, authorities, the Greater Hazleton Civic Partnership, and the Chamber of Commerce in the Greater Hazleton area. MCOG works to build on the collective strengths and resources between communities such as shared road services and equipment, beautification projects, assistance in developing Rails to Trails, and provides information on grant writing.
- **North Branch Land Trust:** North Branch Land Trust conserves the natural, working, and scenic landscapes in Northeastern Pennsylvania. As an accredited not for profit land conservation organization, NBLT strives to conserve important natural assets by fostering sustainable communities that can maintain a healthy environment and a vibrant economy. Some core values include creating a sustainable balance between the economic growth and the healthy natural surroundings and preserving the beauty and environmental health of Pennsylvania.
- **Northeast PA Regional Counter-Terrorism Task Force:** One of nine Regional Homeland Security Task Forces in PA, the Northeast PA Regional Task Force has three Hazmat Teams, three Bomb Disposal Teams, two Urban Search and Rescue teams, and eight SWAT teams. Luzerne County joined the Northeast PA Regional Task Force on January 1, 2020. The Task Force provides “All Hazards” planning, mitigation response and recovery services to citizens in the following Pennsylvania counties: Carbon, Lackawanna, Lehigh, Luzerne, Monroe, Northampton, Pike, Susquehanna and Wayne Counties.
- In June 2007, Luzerne County was certified as a **StormReady Community** by the National Weather Service and the Pennsylvania Eastern Region Storm Ready Advisory Board. The County was recertified in 2019. The Storm Ready program was established to help local governments improve the timeliness and effectiveness of hazardous weather-related warnings for the public. By participating in this program, local agencies can earn recognition for their jurisdiction by meeting the guidelines established by the National Weather Service in partnership with Federal, State, and local emergency management professionals. The certification also makes Luzerne County and its municipalities eligible for 25 points in the Community Rating System, awarded to local governments that meet the flood threat recognition system.
- The **Pennsylvania State Association of Township Supervisors (PSATS)** strives to preserve and strengthen township government and to improve involvement for townships in the state. PSATS sponsors training opportunities to provide township officials with the information and skills they need to meet the challenges of township office.



### 5.2.3. Financial Capability

A critical key to the implementation of any plan is the financial resources to accomplish the priority projects identified. The implementation of mitigation actions requires time and fiscal resources. While some mitigation actions are less costly than others, it is important that money is available locally to implement policies and projects. Financial resources are particularly important if communities are trying to take advantage of state or federal mitigation grant funding opportunities that require local-match contributions. Based on the *Capability Assessment Survey* results received, most municipalities within the County perceive fiscal capability to be limited; however, four communities listed their capability to be moderate to high.

Support for mitigation planning actions is provided by the Commonwealth of Pennsylvania and the Federal Government. Programs that complement Luzerne County mitigation planning initiatives are:

- Pennsylvania administered programs including:
  - **Shared Municipal Services**, which provides grant funds to promote cooperation among municipalities.
  - **Land Use Planning and Technical Assistance Program**, which provides grant funds for the preparation of community comprehensive plans and ordinances to implement them.
  - **Floodplain Land Use Assistance Program**, which provides grants and technical assistance to improve management of floodplain lands.
  - **Community Revitalization Program**, which provides grant funds to support local initiatives that promote social and economic diversity to ensure a productive tax base and good quality of life.
  - **Pennsylvania Gaming Local Share Account Program** has recognized the Redevelopment Authority of Luzerne County as an eligible applicant for grant funding for projects such as improving the physical condition of public buildings and infrastructure or capital improvements projects that better community safety.
  - **Growing Greener** is a State program that addresses critical environmental concerns. Projects include farmland preservation projects; protection of open space; restoration of watersheds; funding for recreational trails and local parks; land use; and provision of new and upgraded water and sewer systems. Projects of special interest include those that implement stormwater management. Recognizing that there was great similarity between the goals of the Hazard Mitigation Grant Program and Growing Greener, PEMA and the Department of Environmental Protection entered into a cooperative agreement in which Growing Greener funding would be used to pay the non-federal share for HMGP projects that resulted in creating open space. This infusion of funds

provides financial leverage for the Commonwealth's property acquisition program, the goal of which is to return the floodplain to its natural function.

- Federal Government programs including the:
  - **Hazard Mitigation Assistance Programs**, which provide grants for cost-effective mitigation projects either in the absence of a disaster or after a disaster declaration has occurred:
    - Pre-Disaster Mitigation Assistance Program (PDM)
    - Flood Mitigation Assistance Program (FMA)
    - Hazard Mitigation Grant Program (HMGP)

The following is a sampling of projects for which FEMA has awarded Hazard Mitigation Assistance grants in Luzerne County:

- Plymouth Township - Poplar & Canal Street Acquisitions
- West Pittston Substantial Damage Acquisition
- Harvey's Creek and Canal Street Wastewater Pumping Stations
- Flood Protection Project on Mill Creek - Avoca
- Wyoming Valley Sanitary Pump Station
- Woodcrest Development Property Acquisition and Clearance Project
- Shickshinny Borough Substantially Damaged Acquisition Project
- Plainsville Acquisition and Clearance Project
- Hunlock Gardens Property Acquisition
- Pine Creek Wastewater Pumping Stations
  
- **Community Development Block Grants**, which provides funds to address a wide range of community development needs.
- **Small Communities Program Fund**, which supports water quality infrastructure projects.
- **Weatherization Assistance Program**, which enables low-income households to make their homes more energy efficient.
- **Firewise Communities** Program, which involves homeowners and community leaders in protecting structures from fire damage.

### 5.2.4. Education and Outreach

Education and outreach programs and methods are used to implement mitigation activities and communicate hazard-related information. Examples include fire safety programs that fire departments deliver to students at local schools; participation in community programs, such as Firewise Communities Certification or StormReady Certification; and activities conducted as part of hazard awareness campaigns, such as Hurricane Preparedness Week. Some

communities have their own public information or communications office to handle outreach initiatives.

Reported education and outreach activities in Luzerne County are summarized as follows:

- Luzerne County disseminates critical information via the Swift911™ Mass Notification and Incident Management System. This system is designed to contact specific people or areas in the event of an emergency or for sharing important information. The Luzerne County Emergency Management Agency will use this system to alert citizens of information regarding their safety, or the safety of their property. The system can make thousands of calls, send thousands of text messages and emails per minute to convey vital information. These messages may include information on floods, fires, water emergencies, evacuation orders, and weather emergencies. Residents can download an app or register a cellular phone number online.
- Luzerne County hosted a **Hazard Mitigation Planning Workshop** facilitated by PEMA's State Hazard Mitigation Planner in April 2019.
- The **Lackawanna-Luzerne Transportation Study** included a **Public Participation Plan**, which was updated in 2015. The plan includes a description of public participation to date and a large section describing participation tools and techniques that can help with transportation planning. This Public Participation Plan demonstrates the Lackawanna-Luzerne Transportation Study Metropolitan Planning Organization's ongoing efforts to provide timely and meaningful opportunities for public involvement in the transportation planning and decision-making process. These strategies and techniques can be implemented throughout the hazard mitigation planning process as well.
- [Susquehanna Nuclear Power Plant Emergency Information](#) - Columbia and Luzerne Counties provide an emergency guide with information and instructions about what may be asked of residents in case a serious emergency occurs at the Susquehanna Nuclear Power Plant in Salem Township in Luzerne County. The protective actions described in this document follow protocol set out by state, county, and municipal emergency plans to provide a coordinated public response in case of emergency. Additionally, the community has access to [Talen Energy: 2019 Emergency Preparedness Guide](#). This is an emergency preparedness guide written by Talen Energy, the owner of the Susquehanna Nuclear Power Station. This guide includes information for the public about how to recognize an emergency and what steps to follow. Emergency information includes school pickup locations, evacuation routes and reception centers, pre-emergency and emergency checklists, and evacuation maps. This is an important document for spreading information about nuclear hazard response to the public

### 5.2.5. Plan Integration

Plan integration ensures that hazard mitigation planning is woven into each municipality's planning and regulatory documents. These include the plans, policies, codes, and programs that guide land use and development. Effective integration of hazard mitigation occurs when the planning framework fosters development that does not increase risks from known hazards or leads to redevelopment that reduces risk from known hazards (FEMA, 2013).

While not all regulatory tools are relevant to every municipality in Luzerne County, each municipality should evaluate what tools are available to them related to their vulnerability identified in this HMP. Communities should continue to review and revise building codes, zoning ordinances, floodplain ordinances, and subdivision and land development ordinances with respect to the findings in the 2020 HMP risk assessment. For example, a municipality could revise its zoning ordinance to restrict the density of new development in hazard-prone areas or guide development away from these areas. Some tools may also be useful for addressing multiple hazards in these municipalities; for example, the presence of a stormwater management plan would greatly enhance mitigation capabilities needed to address both flood and transportation hazards.

As mentioned above, Luzerne County adopted its Comprehensive Plan in May 2011. An update to this 2009 plan will be finalized in 2021. The introduction section discusses the Hazard Mitigation Plan for Lackawanna and Luzerne Counties that was developed in conjunction with this Regional Plan and states that "as a result of this collaborative effort, future development is being directed to avoid known or possible hazard areas. In addition, identifying possible mitigation areas for future purchase and developing transportation planning to incorporate improving evacuation routes into and out of the area was part of the overall strategy in these planning efforts." This is the first time that all three planning emphasis areas - the Comprehensive Plan, Long-Range Transportation Plan, and Hazard Mitigation Plan - have been addressed concurrently for two counties in Pennsylvania. While this plan is being updated, the Counties should consider including hazard mitigation as an element.

Hazard mitigation planning can be integrated into Luzerne County's Stormwater Management Regulations. The municipalities that are regulated by the County's stormwater management requirements in its SALDO could also opt to develop their own, more stringent stormwater management ordinances. Municipalities can provide recommendations for proper long-term operation and maintenance of stormwater management facilities within the land development subdivision ordinances, work closely with the County to assure that stormwater facilities are maintained over the long-term, and can ensure any new hydrology studies are adopted upon completion.

Specific language in the Luzerne County Zoning Ordinance that relates directly to hazard mitigation is documented below. Whether the County is administering the zoning ordinance for municipalities or the municipality maintains administration, the following guidelines from

Luzerne County's Zoning Ordinance can be enforced through the lens of mitigating each municipality's hazards:

- The 100-year floodplain districts can be treated as an overlay zone; however, if there is a conflict between the provisions of the 100-year overlay or the underlying district, the more restrictive provisions and those pertaining to the 100-year floodplain district apply. All development within the 100-year floodplain is required to be in strict compliance with this ordinance and with the building code and subdivision and land development ordinance.
- No development is permitted in the floodway except where the development on flood heights is fully offset by accompanying stream improvements, which have been approved by all appropriate local and/or State authorities.
- In the 100-year flood fringe and general flood conservation districts, development must be in strict compliance with the flood-proofing and related provisions contained in all other applicable codes and ordinances. In the 100-year special flood conservation district, the same provisions apply; however, specific uses are required to be flood-proofed or elevated above the crown of the nearest street as set forth in all applicable building codes and/or building permit ordinances and the subdivision and land development ordinances.

Luzerne County's Open Space, Greenways and Outdoor Recreation Master Plans' goals are to preserve high-quality open space, establish and expand greenway and multi-modal trail systems, increase riparian buffers, improve access and connection to the Susquehanna River, conserve the county's natural resources, and facilitate healthy lifestyles. The purpose of the plan is to establish specific priorities for conserving open spaces such as farms, forests, community parks and waterbodies and for creating future greenway corridors. The Plan recommends several different approaches that should be pursued by county and local governments, landowners, conservation groups, not-for-profit organizations and other interested parties, to protect, conserve or acquire the recommended conservation lands.

The Luzerne County Emergency Operations Plan embraces an "all-hazards" principle. Most emergency response functions are similar, regardless of the hazard, and the EMC is required to mobilize functions and personnel as required by the emergency. This plan mentions that mitigation opportunities will be considered throughout disaster operations. Implementation includes a combination of conservation tools including land management plans and easements; regulatory methods like density transfers, zoning overlays, buffer zones, and subdivision exactions, and land acquisition made possible through donation and purchase, and purchase of development rights. These principles must be encouraged.

Based on the capability assessment results and information from the Luzerne County Department of Planning and Zoning, all of Luzerne County's jurisdictions have some form of local land use controls. As is discussed in Section 6.1, upon review of the 2014 mitigation actions, it was determined that several municipalities completed mitigation actions that

achieve plan integration by furthering hazard mitigation goals through various land development regulations.

Some other land use tools in municipalities have not been updated recently. As municipalities work to update comprehensive plans and land use ordinances, local governments can go further to use land use regulations to direct development away from hazard-prone areas.

A barrier to plan integration is often the lack of resources to accomplish activities that plan integration requires. Several municipalities noted on the *Capability Assessment Surveys* that lack of financial resources precludes development of some planning tools. The Self-Assessment portion of the survey provided each municipality an opportunity 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 "limited," "moderate," or "high." Table 5.2.2-1 summarizes the results of the self-assessment survey as a percentage of responses received. With available resources being limited and stretched into the foreseeable future, plan integration is extremely relevant and will help leverage existing resources to the maximum extent possible.

**Table 5.2.5-1** Summary of self-assessment capability responses expressed as a percentage of responses received.

CAPABILITY CATEGORY	LIMITED	MODERATE	HIGH
Planning & Regulatory	29%	43%	29%
Administrative & Technical	21%	43%	36%
Financial	64%	18%	14%
Community Political	29%	50%	21%

## 6. Mitigation Strategy

### 6.1. Update Process Summary

The mitigation strategy serves as the long-term road map to reduce the potential losses, vulnerabilities, and shortcomings identified in the Hazard Identification and Risk Assessment section. A typical mitigation strategy includes a list of goals and objectives, with mitigation actions to address the goals and objectives, that are then prioritized, based on the community’s need.

**Goals** are long-term aspirations about the resiliency of the community given the potential effects of hazards. **Objectives** are measurable strategies that the Luzerne County community has determined will be necessary to move closer to attaining each goal. **Actions** are the tasks that are proposed for realizing each objective.

There were 7 goals and 15 objectives identified in the 2014 Luzerne County Hazard Mitigation Plan Update. The Steering Committee reviewed goals and objectives during a Steering Committee Review Meeting on August 7, 2019. The review of the goals and objectives is summarized below in Table 6.1-1.

Table 6.1-1 List and review summary of 2014 mitigation strategy goals and objectives.	
<b>Goal A: Ensure hazard mitigation goals and objectives are consistent with goals of other plans and ordinances in the counties and municipalities.</b>	
<b>Objective A.1:</b> Promote responsible growth and development via proper enforcement and through the incorporation of hazard mitigation principals in municipal plans, and zoning, subdivision and land development, stormwater ordinances, and floodplain ordinances, as appropriate.	<b>Review:</b> The HMPT agreed that this goal should be continued into the 2020 plan. Objectives A.1, A.2, A.3, A.4, and A.5 have been continued into the 2020 plan but will swap positions with Goal D2.
<b>Objective A.2:</b> Incorporate hazard mitigation planning projects into capital improvement plans.	
<b>Objective A.3:</b> Continue to regulate development in conservation areas and within floodplains to prevent flood damage.	
<b>Objective A.4:</b> Work with municipalities to continue to be compliant with the National Flood Insurance Program (NFIP) through periodic training of municipal officials.	
<b>Objective A.5:</b> Better integrate plans and ordinances to ensure concurrency and harmony between them.	
<b>Goal B: Promote sustainable development to improve the quality of life in Luzerne County.</b>	
<b>Objective B.1:</b> Ensure that existing drainage systems (pipes, culverts, and channels) are adequate and functioning properly through regular maintenance or upgrades.	<b>Review:</b> The HMPT agreed that this goal should be continued into the 2020 plan.

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.1-1 List and review summary of 2014 mitigation strategy goals and objectives.	
<u>Objective B.2:</u> Protect natural resources and open space including parks and wetlands within the floodplain and watersheds.	Objectives B.1 and B.2 have been continued into the 2020 plan.
<b>Goal C: Promote public understanding, support and involvement in mitigation related activities.</b>	
<u>Objective C.1:</u> Work with television, radio and newspaper partners to promote public awareness on the potential impacts of natural hazards and actions to reduce those impacts.	<b>Review:</b> The HMPT agreed that this goal should be continued.  Objective C.1 and C.2 have been continued into the 2020 plan.
<u>Objective C.2:</u> Consider education campaigns and workshops to promote 'safe' development and other hazard mitigation principles.	
<b>Goal D1: Encourage high construction standards on structural projects.</b>	
<u>Objective D.1-1:</u> Minimize damage to critical facilities in high hazard areas, (i.e. 100-year floodplain, heavily forested areas, areas of geologic subsidence) and develop measures to prevent future damages.	<b>Review:</b> This Goal will be continued as an Objective Goal D2.
<b>Goal D2: Minimize structural damage caused by flooding, wind events, winter storms, transportation incidents, and wildfires.</b>	
<u>Objective D2-1:</u> Remove or retrofit repeatedly flooded structures to reduce the flood risk.	<b>Review:</b> The HMPT agreed this goal should continue into the 2020 plan but will be expanded to include the protection of lives, property, and resources from the impacts of natural and human-made disasters. This Goal will move to the Goal A position.
<b>Goal D3: Ensure continuity of emergency management services during hazard events.</b>	
<u>Objective D3-1:</u> Ensure that hazards do not interrupt emergency response services and critical functions.	<b>Review:</b> Goal D3 will be combined with Goal D4 into a single emergency response goal.
<u>Objective D3-2:</u> Continue to provide residents with adequate warning of potential hazards.	
<u>Objective D3-3:</u> Provide for adequate shelters during hazard events.	
<b>Goal D4: Ensure adequacy of shelters and efficiency of evacuation routes within the County.</b>	
<u>Objective D4-1:</u> Identify safe and efficient evacuation routes during hazard events to ensure continued service.	<b>Review:</b> Goal D4 will be combined with Goal D3 into a single emergency response goal.



Mitigation actions have been carried over and developed for the County as well as for each participating jurisdiction. While some actions may be more general in nature and could apply to more than one jurisdiction, most actions are specific to individual jurisdictions. The mitigation actions that were developed were based on the following: issues identified in the Hazard Identification and Risk Assessment, gaps identified in the mitigation capability analysis, input from the HMPT, and feedback from the Risk Assessment and Mitigation Solutions Workshop held October 21, 2019. These mitigation actions may be implemented through a variety of local tools such as: changes in ordinances and policies, inclusion into capital improvements budgets, and grant funding.

County and Municipal actions in the 2014 Plan were distributed at the October 2019 Mitigation Solutions workshop for review and update. Each action has been assigned one of the following categories:

- "Completed" - Actions that were completed since the adoption of the 2009 Plan
- "Cancelled" - Actions that were terminated.
- "Deferred" - Actions that had not been initiated since the adoption of the 2014 Plan
- "On-Going" - Actions that are performed on a regular and continuous basis by the department

The majority of existing mitigation actions have been carried over into the 2020 Hazard Mitigation Plan as they are continuous actions or actions that were not completed. A list of these actions as well as their status is included in Table 6.1-2. Actions were evaluated by the HMPT and municipal officials with the intent of producing a usable mitigation action plan in 2020 with actions and projects that could be completed over the next five years. **Appendix C** contains a summary of responses provided by municipalities to the *Mitigation Action Progress Report Form*.

Table 6.1-2 List and status of 2014 Mitigation Action Plan							
Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Complete	Canceled	Deferred	Ongoing
Luzerne County	1	All hazards	Develop an evacuation plan for the County and municipalities in conjunction with the Long-Range Transportation Plan. The Plan should include issues such as staging areas, feeding plan for displaced persons, signs, temporary housing, decontamination, and destination points such as shelters. Involve experts in emergency planning, transportation planning, and traffic engineering in developing the plan.		X		

## Luzerne County 2020 Hazard Mitigation Plan

Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Complete	Canceled	Deferred	Ongoing
Luzerne County	2	All hazards	Continue to work with the Red Cross to conduct an annual assessment of existing shelters in the county to determine their condition and adequacy with respect to beds, etc. and determine which ones would need to be retrofitted. Identify additional locations that could be equipped and identified as shelters based on the needs and the population centers in the county.				X
Luzerne County	3	Flood	Make the Luzerne County Flood Protection Authority a one-stop shop for property owners and municipalities who have flooding problems and expand the Authority's mission to provide advice to municipalities on flood hazards, availability of flood insurance, and flood protection methods.		X		
Luzerne County	4	Flood	Include the following language in the new county zoning ordinance to: 1) concur with the Model Floodplain Ordinance and/or regulations and the Subdivision/Land development Ordinance (SALDO) with respect to what is allowed in the floodplain; and 2) for all development to construct first floors above the base flood elevation for areas that are protected by the levee systems.				X
Luzerne County	5	All hazards	Encourage the municipalities to come under the control of the County Zoning & Subdivision/Land Development ordinances.			X	
Luzerne County	6	Flood	Conduct an annual workshop for floodplain officials in the county and those who administer the floodplain ordinance in the municipalities to educate them on sound flood management principles.				X
Luzerne County	7	All hazards	Work with the following four municipalities to encourage them to issue building permits and perform UCC functions including inspections: Jeddo, New Columbus, and Warrior Run Boroughs and Ross Township.				X
Luzerne County	8	All hazards	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).				X
Luzerne County	9	Flood, Drought	Work with municipalities, particularly those along the Susquehanna River and large streams, to join the CRS by educating them on the benefits of CRS and providing them with technical assistance; work with municipalities to adopt and enforce the requirements of the Countywide ACT 167 plan.				X

## Luzerne County 2020 Hazard Mitigation Plan

Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Complete	Canceled	Deferred	Ongoing
Luzerne County	10	Drought	Develop a Source Water Protection Plan to properly utilize and protect ground water resources in the two counties.				X
Luzerne County	11	Wildfire, Drought	Encourage the county to include in their zoning ordinance, measures to enhance the concept of defensible space practice; and discourage development on permeable soils to reduce the impacts of drought.				X
Luzerne County	12	Flood	Currently, all municipalities are in the NFIP Program. Encourage the individual municipalities to be firmly committed to continued compliance with the NFIP by regulating development and redevelopment through the adoptions of provisions that exceed the minimum NFIP requirements. Work with communities to ensure that there are no deficiencies when the Community Assistance Visits are conducted to ensure continued compliance.				X
Luzerne County	13	All hazards	Work with each municipality to identify a point of contact to perform an annual review of the mitigation actions for their municipality from this Hazard Mitigation Plan.				X
Luzerne County	14	Earthquake, Subsidence	Initiate a research and education program with local universities to map the extents of the mine pools in the Lackawanna and Susquehanna River valleys. Because earthquakes will have the greatest effect in areas of abandoned mine lands, this program will seek to quantify the effects of earthquakes on destabilized earth, such as that over flooded mine pools.				X
Luzerne County	15	Drought	Coordinate efforts between the Joint-County Comprehensive Plan and the countywide Act 167 Stormwater Management Plan to identify groundwater recharge areas and sensitive groundwater areas such as mine lands. Work closely with the municipalities to enforce infiltration and groundwater recharge requirements in these areas to reduce the impacts of drought.				X
Luzerne County	16	Flood	For those parties not interested in acquisition or where acquisition is not feasible, continue to work with municipalities to advise homeowners with a preferred mitigation alternative such as elevation or flood proofing.				X
Luzerne County	17	Flood	Continue to stay involved with the Mitigation Board of the Wyoming Valley Flood Authority to implement hazard mitigation plan recommendations.		X		

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.1-2 List and status of 2014 Mitigation Action Plan							
Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Complete	Canceled	Deferred	Ongoing
Luzerne County	18	Land subsidence , Flood	Work with Duryea Borough and DEP to conduct annual inspections of the structures that discharge stormwater and groundwater from the flooded mine pool and identify any structural repairs needed.				X
Luzerne County	19	Wildfire	Encourage municipalities to reduce the vulnerability of critical facilities to wildfires by: increasing buffers and introducing defensible spaces; identifying farm roads, service roads, and other private access corridors in high hazard areas that could be used as fire breaks; and providing assistance to the County Emergency Management to identify vulnerable structures (firewise communities).				X
Luzerne County	20	Flood	Work with FEMA to conduct detailed studies for Abrahams Creek of Forty Fort, Big Wapwallopen Creek, Lackawanna River, Nescopeck Creek, Solomon Creek, and Toby Creek as identified in the FEMA Region III Post-Flood Community Flood Risk Evaluation for Luzerne County.				X
Luzerne County	21	All hazards	Designate specific locations throughout the County such as the County Emergency Management Agency, County Planning Department, municipal libraries, and events such as fairs to provide information to the public on flooding and other hazards. Encourage these locations to stock a variety of FEMA publications on various natural and human caused hazards and the most recent FIRMs; also include information on the County's website.				X
Luzerne County	22	Drought, Flood, Mine	Conduct an educational campaign and develop brochures on topics such as: the impacts of drought, proper sediment and erosion control, and dangers of developing on old mines and dumps.				X
Luzerne County	23	Flood	Stay closely involved with the activities of the Delaware Regional Basin Commission, Susquehanna River Basin Commission, Water Board, and other water planning organizations by encouraging a staff member from the County Planning Commission to be present at their meetings depending on their availability.				X

## Luzerne County 2020 Hazard Mitigation Plan

Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Complete	Canceled	Deferred	Ongoing
Luzerne County	24	All hazards	Work with State agencies, professional organizations, and non-government organizations to conduct an annual workshop at a key location in each county for private developers to involve them in hazard mitigation activities and educate them on 'safe' development principles that can be incorporated into their development proposals.				X
Luzerne County	25	Flood	Continue to provide inquirers with technical advice and information from the community's FIRM and FEMA's website on a property's location in a Special Flood Hazard Area, zone, and its base flood elevation if data is available.				X
Luzerne County	26	Flood, Mine Related Hazards	Work with real estate agents throughout the county and encourage them to advise prospective property purchasers in flood prone and mine subsidence areas to obtain flood or mine subsidence insurance in municipalities over which the County has jurisdiction.				X
Luzerne County	27	Flood	Continue to conduct an annual inspection of all county-owned flood control structures.				X
Luzerne County	28	All hazards	Monitor and evaluate mitigation actions annually and update the hazard mitigation plan every five years to reflect changes in development after a major hazard event and provide technical assistance to municipalities in implementing individual hazard mitigation actions.				X
Ashley Borough	1	All hazards	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).				X
Avoca Borough	1	Flood	Identify mitigation options to address the flooding of Mill Creek on the 700 block of Grove Street. Use FEMA publication 551, Selecting Appropriate Mitigation Measures for Floodprone Structures, which provides guidance on determining appropriate mitigation measures.				X
Avoca Borough	2	Flood	Identify measures to prevent/remove ice build-up in the Mill Creek channel during winter months.				X
Avoca Borough	3	Flood	Continue to work with the DEP to determine solutions to the Grove Street flooding issue.				X
Avoca Borough	4	Flood	Improve drainage structures and storm sewers throughout the Borough, which are undersized and cause roadway flooding.				X
Avoca Borough	5	Flood	Separate combined sanitary and storm sewers in the 3rd Ward.				X

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.1-2 List and status of 2014 Mitigation Action Plan							
Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Complete	Canceled	Deferred	Ongoing
Bear Creek Township	1	Flood	Replace the undersized culvert on S.R. 115 near Bear Creek Lake to reduce upstream flooding and prevent overtopping of the road.				X
Bear Creek Village Borough	1	Flood	Replace the undersized culvert below Bear Creek to reduce flooding in parts of the Village.	X			
Black Creek Township	1	Landslide	Consider adding walls to Falls Creek.				X
Black Creek Township	2	Flood	Consider replacing the Tower Road Bridge.	X			
Buck Township	1	Flood	Identify specific mitigation actions for the structures on Wilkes-Barre and Easton Roads that are vulnerable to flooding.				X
Butler Township	1	Flood	Identify mitigation options to address the flooding action on Nescopeck Creek and St. Johns Road and State Route 222. Use FEMA publication 551, Selecting Appropriate Mitigation Measures for Floodprone Structures, which provides guidance on determining appropriate mitigation measures.				X
Conyngham Borough	1	Flood	The urbanization of the Borough without stormwater management controls has led to flooding issues from stormwater run-off upstream of the Borough. Develop a plan to implement stormwater management features in the Borough. Pursue recommendations identified in the Act 167 Plan and consider sewer pump retrofit.				X
Conyngham Township	1	Flood	Acquire and demolish/elevate residential structures located in Kadtke Court, Pulaski Court, Italy Street, Park Street, Pulaski Circle, Lincoln Street, and Nicely Street that lie within the Susquehanna River's flood hazard area.				X
Conyngham Township	2	All hazards	Work with the County to develop a procedure to issue building permits and perform UCC functions including inspections.				X
Courtdale Borough	1	All hazards	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).				X
Dallas Borough	1	Flood	Conduct an engineering study to identify the most appropriate mitigation measure for the Borough's Government Building and the Police Department on Main Street.				X

## Luzerne County 2020 Hazard Mitigation Plan

Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Complete	Canceled	Deferred	Ongoing
Dallas Borough	2	Flood	Conduct an engineering study to identify the most appropriate mitigation measure for heavy rain - flooding in the area of Columbia Avenue, American Legion Post and Leggio's Restaurant.	X			
Dallas Borough	3	Flood	Conduct an inspection and provide engineering recommendation for the Toby Creek culvert which runs underneath Fino's Pharmacy, Citizens Bank and their respective parking lots.				X
Dallas Township	1	Flood	Conduct a study to identify ways (e.g., property acquisitions and stream widening) to mitigate the continual flooding of properties at the confluence of Toby's Creek and Trout Run (Fernbrook Corners).				X
Dallas Township	2	Flood	Flooding along Leonard's Creek has caused severe damage to two bridges and channel improvements. FEMA funding has been secured to rebuild one bridge and wall improvements. Identify additional actions that should be taken at the Kunkle/Leonard's and Shady Side Creek area.				X
Dallas Township	3	Flood	Conduct a study to identify stream bed improvements along public roads which continue to be heavy flooded.	X			
Dallas Township	4	Flood	Conduct a study to identify the need for retaining structures with creek bed improvements at Toby Creek from Offset Paperback and Route 309 to the Dallas Township - Kingston Township municipal boundary.				X
Dennison Township	1	All hazards	Conduct an engineering study to identify the most appropriate mitigation measure for the multiple structures in the 100-year floodplains throughout the Township.				X
Dorrance Township	1	Flood	Conduct a study to identify solutions to mitigating regular flooding at the intersection of Stairville Road and St. Mary's Road.				X
Dupont Borough	1	Flood	Conduct a study to identify problems on Dupont Creek (Lidy, Collins, Mill) and Mill Creek.				X
Duryea Borough	1	Flood	Lower Lackawanna Sewer Authority placed a valve in their Diversion Chamber to help alleviate the sewage from backing up into the homes on Chittenden Street. LLVSA inspects and maintains the valve but does not determine when the valve should be opened or closed. Duryea Borough Sewer Authority is interested in the placement of check valves for sanitary laterals on individual homes located on Chittenden Street.				X

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.1-2 List and status of 2014 Mitigation Action Plan							
Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Complete	Canceled	Deferred	Ongoing
Duryea Borough	2	Flood	The engineering study has been completed on the dike project and hopefully construction will begin this year on the section determined by dep. The levee certification has not been completed yet. Replace culverts under the levee, flap gates and landside structures for the 18 outfalls.	X			
Duryea Borough	3	Flood	Purchase portable pumps along with discharge hoses for pumping of landside water in the event the flap gates are closed, and interior flooding of streets occurs on the landside of the levee.				X
Edwardsville Borough	1	Mine Subsidence	Identify specific mitigation for the structures on Hillside Avenue, Elm, Green, and Cherry Streets that are vulnerable to mine subsidence.				X
Exeter Borough	1	Flood	Acquire residential structures located along Susquehanna Avenue and Schooley Avenue within the Susquehanna River's flood hazard area.				X
Exeter Borough	2	Flood	Conduct a feasibility study for floodwall protection improvements required for the problem areas of Susquehanna Avenue and Grant Street.				X
Exeter Borough	3	Flood	Continue to perform creek and riverbank maintenance and stabilization activities along strategic areas of the Susquehanna River and Hicks Creek.				X
Exeter Borough	4	Flood	Post a digital version of the DFIRM and the availability of flood protection guidance documents on the Borough website.				X
Exeter Borough	5	All hazards	Use the Exeter Borough website to update residents on hazard mitigation related activities.				X
Exeter Borough	6	Flood	Adopt a resolution to ensure Real Estate Disclosure of properties in the floodplain to potential residents interested in these properties.				X
Exeter Borough	7	Flood	Pursue the recommendations for culvert removal/replacement along the Hicks Creek, and pump station upgrades made in the 2006-2007 Hicks Creek and Abrahams Creek Flood Study. Continue to work with the Luzerne County Flood Protection Authority during the Detailed Feasibility Assessment of Hicks Creek concerning the construction of a pressure conduit, pump station, levee culvert modifications, or combination of these solutions.				X
Exeter Township	1	Flood	Acquire and demolish/elevate residential structures located in Riverview Village and within the Susquehanna River's flood hazard area.				X



## Luzerne County 2020 Hazard Mitigation Plan

Table 6.1-2 List and status of 2014 Mitigation Action Plan							
Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Complete	Canceled	Deferred	Ongoing
Exeter Township	2	Flood	Conduct a feasibility study to determine improvements for the problem areas along Route 92, Dymund Creek, Sutton Creek and Appletree Road.				X
Exeter Township	3	Flood	Identify creek and riverbank maintenance and stabilization activities along strategic areas of the Susquehanna River and the Township's tributary creeks.				X
Exeter Township	4	Flood	Develop a website for the Township and post a digital version of the FIRM and availability of flood protection guidance documents.				X
Exeter Township	5	All hazards	Include hazard mitigation updates in the Township Newsletter.	X			
Exeter Township	6	Flood	Install a local flood warning gauge to improve river threat monitoring.				X
Exeter Township	7	Flood	Acquire and demolish the Gentile property and preserve it as open space in perpetuity.				X
Exeter Township	8	Flood	Adopt a resolution to ensure Real Estate Disclosure of properties in the floodplain to potential residents interested in these properties.	X			
Fairmount Township	1	Dam Failure	An Emergency Action Plan for Lake Jean was adopted in 2006. Continue annual inspection of the dam and perform updates of the EAP as necessary.				X
Fairview Township	1	All hazards	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).				X
Forty Fort Borough	1	Flood	Conduct a study to correct combined stormwater and sewer overflows.				X
Foster Township	1	Flood	Foster Township - Identify specific mitigation actions for the structures on Shadetree Drive, Brookside Drive, and Tannery Road that are vulnerable to flooding.				X
Franklin Township	1	Flooding	Identify mitigation options to reduce flooding on Municipal Road and Valley View Road.				X
Franklin Township	2	Dam Failure	Make repairs to the dam on Flat Rock Road.				X
Franklin Township	3	Dam Failure	Make repairs to the existing high hazard dam on Lake Louise.				X
Freeland Borough	1	Mine	Conduct a survey of structures in the Central Business District to address areas structural remediation is necessary.				X
Hanover Township	1	Flood	Adopt a resolution to ensure Real Estate Disclosure of properties in the floodplain to potential residents interested in these properties.				X

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.1-2 List and status of 2014 Mitigation Action Plan							
Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Complete	Canceled	Deferred	Ongoing
Hanover Township	2	All hazards	Conduct public outreach to better educating residents to become better prepared to face hazards.				X
Harveys Lake Borough	1	All hazards	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).				X
Hazle Township	1	All hazards	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).				X
City of Hazleton	1	All hazards	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).				X
City of Hazleton	2	All hazards	Conduct public outreach to better educating residents to become better prepared to face hazards.				X
City of Hazleton	3	Flood	Develop a sewer maintenance program.				X
Hollenback Township	1	All hazards	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).				X
Hughestown Borough	1	All hazards	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).				X
Hunlock Township	1	Flood	Acquire and demolish/elevate residential structures located on Garden Drive and within the Susquehanna River's flood hazard area.				X
Hunlock Township	2	Hazardous materials	The UGI propane tank storage facility lies along State Route 11. Construct guardrails alongside the road to protect the roadway for motorists.				X
Huntington Township	1	Flood	Florkowski, Daro, Hubbard Flaps Roads and State Route 239 close during storm events as the Huntingdon Creek overtops roadway. Replace culverts at these locations.				X
Jackson Township	1	All hazards	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).				X
Jeddo Borough	1	All hazards	Work with the County to develop a procedure to issue building permits and perform UCC functions including inspections.				X

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.1-2 List and status of 2014 Mitigation Action Plan							
Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Complete	Canceled	Deferred	Ongoing
Jenkins Township	1	Flood	Acquire and demolish/elevate residential structures located along River Road, Tennant Street, Miller Road, lots on Paradise TP and within the Susquehanna River's flood hazard area.				X
Jenkins Township	2	Flood	Remove trailers from upper islands in the Susquehanna River.				X
Jenkins Township	3	Flood	Remove sediment from islands in the Susquehanna River.				X
Kingston Borough	1	Mine	Conduct an engineering study to identify the most appropriate mine subsidence mitigation measure for the Government Building and Police Department on Wyoming Avenue.				X
Kingston Borough	2	Mine	Conduct an engineering study to identify the most appropriate mine subsidence mitigation measure for the Chester Street Elementary School and Wyoming Valley West Middle School on Chester Street.				X
Kingston Township	1	All hazards	Identify the most appropriate mitigation measures for the Dallas Area Municipal Authority and the PA Water Treatment plant. Use FEMA publication 551, Selecting Appropriate Mitigation Measures for Floodprone Structures, which provides guidance on determining appropriate mitigation measures.				X
Kingston Township	2	Flood	Conduct a study to identify the most appropriate mitigation measure for the 2 small dams located in the southwestern portion of the Township that are located near historic farming operations. Since Hillside Farms is public property, owners should be contacted.				X
Lafin Borough	1	Flood	Investigate solutions to the flooding issues along Gardner Creek.				X
Lafin Borough	2	Winter Weather	Improve roadway de-icing and snow removal to address icing issues on the steeply sloped streets in the Borough.				X
Lafin Borough	3	All hazards	Identify measures to address power outages due to a single source of electric power to the Borough, and which impact communication services in hazard events.				X
Lafin Borough	4	All hazards	Identify measures to prevent/respond to train derailments in the Borough, which could impact evacuation procedures during hazard events.				X
Lake Township	1	All hazards	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).				X

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.1-2 List and status of 2014 Mitigation Action Plan							
Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Complete	Canceled	Deferred	Ongoing
Larksville Borough	1	Flood	Provide watertight seals for manholes impacted by the Susquehanna River's 500-year flood.	X			
Larksville Borough	2	Flood	Identify clearing and dredging activities for Boston Creek upstream of US 11 in order to maintain its flood carrying and storage and capacity.		X		
Larksville Borough	3	Flood	Provide dry floodproofing measures for metal doors/windows for structures within the Susquehanna River's flood hazard area.				X
Laurel Run Borough	1	Flood	Conduct an engineering study to identify the most appropriate mitigation measure for the Government Building on Dupont Drive.				X
Lehman Township	1	Flood	The dam on Harvey's Creek has recently been classified as a high-risk dam. Develop a program to conduct regular maintenance of this dam.				X
Luzerne Borough	1	Flood	Conduct an engineering study to identify the most appropriate mitigation measure for the Luzerne Borough Volunteer Fire Department on Academy Street.				X
City of Nanticoke	1	Flood	Conduct an engineering study to identify the most appropriate mitigation measure to address land subsidence for the Luzerne County Community College on South Prospect Street.				X
City of Nanticoke	2	Flood	Pursue property acquisition for properties along the Newport Creek which are flooded by Susquehanna River backwater.				X
Nescopeck Borough	1	Flood	Continue to acquire and demolish structures within the Susquehanna River's flood hazard area on West Third Street.				X
Nescopeck Borough	2	All hazards	Identify emergency management duties to protect residents north and south of the railroad tracks (which divide the borough) in the event of a train derailment.				X
Nescopeck Borough	3	Flood	Continue to pursue measures to protect the wastewater treatment plant's essential facilities which cannot be elevated above, or relocated out of, the floodplain.				X
Nescopeck Township	1	Flood	Continue to acquire and demolish/elevate residential structures located along River Road and within the Susquehanna River's flood hazard area.				X
Nescopeck Township	2	Flood	Continue to pursue measures to protect the wastewater treatment plant's essential facilities which cannot be elevated above, or relocated out of, the floodplain.				X
New Columbus Borough	1	All hazards	Work with the County to develop a procedure to issue building permits and perform UCC functions including inspections.				X

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.1-2 List and status of 2014 Mitigation Action Plan							
Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Complete	Canceled	Deferred	Ongoing
Newport Township	1	All hazards	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).				X
Nuangola Borough	1	All hazards	Purchase a generator to assist the Borough during power outages.				X
Nuangola Borough	2	Flood	Conduct a study to identify flooding problems at North End Road.				X
Nuangola Borough	3	All hazards	Recommend revising the 1965 Comprehensive plan and incorporate hazard mitigation principles in various plan elements.	X			
Nuangola Borough	4	Flood	Examine development in sensitive areas such as Lake Nuangola, wetlands, flood prone areas to ensure it complies with the local code/ordinance.				X
Penn Lake Park Borough	1	Dam Failure	An Emergency Action Plan for Penn Lake was adopted in 2008. Continue annual inspection of the dam and perform updates of the EAP as necessary.				X
City of Pittston	1	Flood	Elevate/floodproof structures on Benedict Street and Towpath Court.				X
City of Pittston	2	Flood	Evaluate storm drainage needs and sewer system improvements required for problem areas of Benedict Street, Towpath Court, KOZ area and New Street.				X
City of Pittston	3	All hazards	Establish a Pittston City Newsletter for hazard mitigation information updates.				X
Pittston Township	1	Mine	Conduct an engineering study to identify the most appropriate mitigation measure to address mine subsidence for the Intake Dam, Mill Creek, on Armstrong Road.				X
Pittston Township	2	Mine	Conduct an engineering study to identify the most appropriate mitigation measure to address mine subsidence for the Pittston Township Police Department on Broad Street.				X
Plains Township	1	Flood	Continue to identify and restore channels that are damaged/clogged causing flooding in the Township's residential areas. Most of the problematic channels have been addressed; the Township is pursuing some additional actions to restore the remainder of the channels in the Township.				X

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.1-2 List and status of 2014 Mitigation Action Plan							
Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Complete	Canceled	Deferred	Ongoing
Plains Township	2	Flood	Continue to acquire and demolish/elevate residential structures located along Gallagher Drive, McCullough Street, North River Road, North River Street, South River Street, Mitchell Street, Courtright Street, Reese Street, and Roberts Street that lie within the Susquehanna River's flood hazard area.		X		
Plains Township	3	Flood/Hazardous Materials	Pursue measures to minimize the potential for a train derailment caused by flooding where the Mill Creek meets the Gardners Creek at Union Street.				X
Plymouth Borough	1	Mine	Conduct an engineering study to identify the most appropriate mitigation measure to address mine subsidence for the following three dams: 1) Brown Creek Dam on Cherry Street, Wadham Creek Dam on Shawnee Street, and Duffy's Run Dam on 1st Street.				X
Plymouth Township	1	Flood	Acquire and demolish/elevate residential structures located along West Poplar Street, East Poplar Street, Mill Street, Allen Street, Elkton Street, Houseman Street, Canal Street, East Canal Street, Flats Road, West Main Street, East Main Street, Garden Drive, and Ferry Street that lie within the Susquehanna River's flood hazard area.				X
Plymouth Township	2	All hazards	Develop mitigation measures including an implementation strategy for the fire station and water treatment plant that are in the floodplain. Use FEMA publication 551, <i>Selecting Appropriate Mitigation Measures for Floodprone Structures</i> , which provides guidance on determining appropriate mitigation measures.				X
Pringle Borough	1	All hazards	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).				X
Rice Township	1	All hazards	Purchase a generator for the fire company to serve as back-up during power outages.				X
Ross Township	1	All hazards	Purchase a generator for the Ross Township Building to serve as a back-up power source during power outages. Delete existing action.				X
Salem Township	1	Hazardous materials	Since the nuclear material transported to and from the Susquehanna Steam Electric Nuclear Facility could pose a threat to the Township, make residents aware of the procedures to follow a hazardous materials incident. Develop a brochure on what to do when an incident occurs.				X

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.1-2 List and status of 2014 Mitigation Action Plan							
Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Complete	Canceled	Deferred	Ongoing
Salem Township	2	Flood	Identify options to address the flooding of Mud Swamp Creek unto Sonny Drive.	X			
Shickshinny Borough	1	Flood	Acquire and demolish/elevate residential structures located along South Canal Street, North Canal Street, Susquehanna Avenue, East Union Street, Oak Street, McClintock Street, and South Main Street that lie within the Susquehanna River's flood hazard area.				X
Slocum Township	1	Winter storms	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).				X
Sugar Notch Borough	1	All hazards	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).				X
Sugar Notch Borough	2	Flood	Identify measures to prevent sanitary sewer backups during rainfall and flooding events.				X
Sugar Notch Borough	3	Flood	Improve drainage structures and storm sewers throughout the Borough, which are undersized and cause roadway flooding.				X
Sugarloaf Township	1	All hazards	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).				X
Swoyersville Borough	1	Flood	Work with a consultant to determine the causes of, and investigate solutions to, the three flooding issues along Main Street.	X			
Swoyersville Borough	2	All hazards	Conduct public outreach to better educating residents to become better prepared to face hazards.				X
Swoyersville Borough	3	Flood, Mine	Wade Run project was completed in early 2011; the mine reclamation				X
Union Township	1	All hazards	Work with the County to develop a procedure to issue building permits and perform UCC functions including inspections.				X
Warrior Run Borough	1	All hazards	Work with the County to develop a procedure to issue building permits and perform UCC functions including inspections.				X
Warrior Run Borough	2	Flood	Improve drainage structures and storm sewers throughout the Borough, which are inadequate and cause flooding.				X

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.1-2 List and status of 2014 Mitigation Action Plan							
Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Complete	Canceled	Deferred	Ongoing
West Hazleton Borough	1	All hazards	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).				X
West Hazleton Borough	2	Hazardous materials	Since the hazardous materials from the Humboldt and Valmont industrial parks could pose a threat to the Borough, make residents aware of the procedures to follow a hazardous materials incident. Develop a brochure on what to do when an incident occurs.				X
West Pittston Borough	1	Flood, Mine	Identify structural solutions to stormwater ponding and sewer back-ups area in the Borough that had been subject to mine subsidence.	X			
West Pittston Borough	2	Flood	Offer a cost-sharing program for residents affected by sewage back-up damage and publicize use of backflow valves within the community to residents subject to sewer backups and associated damages.	X			
West Pittston Borough	3	Flood, Mine	Include information in the Borough newsletter on the availability of flood insurance, basement back-up insurance, and mine subsidence insurance.				X
West Pittston Borough	4	All hazards	Purchase a portable generator to power heating systems at shelter locations.				X
West Pittston Borough	5	Flood	Develop and implement a procedure for regular drainage maintenance.				X
West Pittston Borough	6	Flood	Advertise the availability of FIRMS at the Borough Building and Borough Public Works Garage.				X
West Pittston Borough	7	All hazards	Display mitigation publications and resources in the City library.				X
West Pittston Borough	8	Flood	Develop annual mailers for public information about flood mitigation and flood warning and response activities.				X
West Wyoming Borough	1	Flood	Pursue the recommendations for culvert removal/replacement along the Abrahams Creek made in the 2006-2007 Hicks Creek and Abrahams Creek Flood Study. The undersized structures are the Upper 8th Street bridge and the Erie-Lackawanna Railroad bridge.				X



## Luzerne County 2020 Hazard Mitigation Plan

Table 6.1-2 List and status of 2014 Mitigation Action Plan							
Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Complete	Canceled	Deferred	Ongoing
White Haven Borough	1	All hazards	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).				X
City of Wilkes-Barre	1	All hazards	Conduct a study to identify the most appropriate mitigation measure for the Geisinger South hospital, which is located near historic mining operations and floodplains.	X			
City of Wilkes-Barre	2	Flood	Flood proof the electrical substation located near Mill Creek.	X			
City of Wilkes-Barre	3	Flood	Consider the stabilization of Laurel Run Creek and Mill Creeks.	X			
City of Wilkes-Barre	4	Flood	Restore the wall along Solomon Creek.	X			
City of Wilkes-Barre	5	Flood	Continue to work with the Luzerne County Flood Protection Authority and Wilkes-Barre Township to finalize a solution to the flooding issues along Coal Brook.				X
City of Wilkes-Barre	6	Winter Weather	Improve snow removal activities throughout the City during winter weather events.				X
Wilkes-Barre Township	1	Flood	Continue to work with the Luzerne County Flood Protection Authority and the City of Wilkes-Barre to finalize a solution to the flooding issues along Coal Brook.				X
Wright Township	1	All hazards	Purchase a generator for the Wright Township Fire Department to ensure uninterrupted power supply when the facility is used as a communications and evacuation center during emergencies.	X			
Wright Township	2	Flood	Improve drainage at the creek at Glendale Drive, Laurel Drive, and Terrace Drive to prevent them from flooding.				X
Wright Township	3	Flood	Conduct a study to determine the feasibility of replacing stormwater catch basins so they can handle additional runoff.	X			
Wright Township	4	Winter storms	Work with the utility and cable companies to develop a plan for the preventive right-of-way maintenance of trees near powerlines particularly during the winter.	X			
Wright Township	5	Wildfire	Develop informational materials to educate and assist homeowners near wildfire prone areas of Firewise concepts including safe zones and defensible spaces.				X

Table 6.1-2 List and status of 2014 Mitigation Action Plan							
Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Complete	Canceled	Deferred	Ongoing
Wright Township	6	All hazards	Purchase a generator for the Wright Township Municipal Building.	X			
Wright Township	7	Flood	Identify measures to mitigate flooding and roadway washouts at the intersection of S. Church Road.	X			
Wright Township	8	All hazards	Coordinate with local officials to address inconsistencies in street naming, to minimize confusion with first responders in a hazard event.	X			
Wyoming Borough	1	Flood	Pursue the recommendations along the Abrahams Creek made in the Hicks Creek and Abrahams Creek Detailed Feasibility Study, to address flooding issues on Eight Street, Sweetland Lane.				X
Wyoming Borough	2	Flood	Identify flood protection measures, or pursue property acquisition, for properties along Susquehanna Avenue between 4th and 8th Streets which are affected by flooding from the Susquehanna River.				X
Yatesville Borough	1	All hazards	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).				X

**Mitigation Success**

A great deal of mitigation progress has been made on hazard mitigation projects and actions in the last five years. Details on numerous actions marked as “Completed” and “Ongoing” are summarized below:

- Conyngham Borough is currently working with Conyngham/Sugarloaf Joint Municipal Authority to develop a new sewer plan in order to approve the construction of a new sewage treatment plant. As part of specific MS4 requirements, smoke testing was completed, and waterways were tested.
- Approximately 85% of homes within the Susquehanna River’s flood hazard area in Conyngham Township have been acquired and demolished.
- Repairs to gates along the Lake Jean Dam in Fairmount Township were repaired.
- Union Township worked with the County to develop a procedure to issue building permits and to perform UCC functions including inspections.
- The City of Wilkes-Barre has begun construction on a stormwater pumping station at the Vulcan/Brook Street Intersection to help alleviate localized flooding in the areas of

Brook Street, Vulcan Street, Waller Street, and Barney Street, including the Geisinger South Wilkes-Barre Hospital. Completion and full operation are expected by Summer 2020.

- The City of Wilkes-Barre completed floodproofing the electric substation located near Mill Creek.
- The City of Wilkes-Barre has applied for the H2O PA Flood Control Program to fund an engineering analysis of the structural integrity of specific sections of the Laurel Run and Mill Creeks. Future construction phases of this project to improve the structural integrity involve reconstruction of the retaining creek walls.
- Floodgate retrofits were completed on the Franklin Street Bridge to restore the wall along Solomon Creek in the City of Wilkes-Barre. Bids are being solicited to complete retrofits to Waller Street, Barney Street, and Regent Street.
- In 2019, the Coal Brook Creek in City of Wilkes-Barre was cleaned using 5 employees, an excavator, loader and dump trucks to remove sediment from the creek channel starting at Laurel Run Creek to the intersection of Conyngham Avenue with Wilkes-Barre Boulevard.
- Between 2019 and 2020, the City of Wilkes-Barre has obtained two additional 2-ton dump trucks fully equipped with plows and spreaders to improve snow removal activities through the City during winter weather events. Additionally, they will be using City budget to hire additional independent snow removal contractors during severe snowstorm events.
- The LCFPA is currently working on a closure structures modifications project on the WVLRP. There are 20 openings in the line of protection that the LCFPA must close during high water events. The LCFPA has identified 4 closures that can be converted from sandbag to a prefabricated sliding gate, 2 openings at the former railroad right-of-way locations that can be eliminated, and the levee re-established, and one sandbag closure that can be eliminated by raising the road profile. The LCFPA is awaiting announcement of a 2018 FEMA HMA grant award to help fund our closure structures modifications project.

Additionally, 166 acquisitions have been funded through HMGP. The following is a list of projects for Luzerne County for which FEMA HMGP grants have been approved since the last plan update in 2014. The Borough of Shickshinny has the largest number of acquisition projects at 37, followed by Townships of Jenkins and Mocanaqua at 24 each. The federally obligated funding for these projects adds up to more than \$600 million.

## Luzerne County 2020 Hazard Mitigation Plan

**Table 6.1-3** Hazard Mitigation Grant Program Funded Acquisitions Since 2014 (FEMA 2020)

Municipality	Structure Type	Federally Obligated	Year Approved	Project Type
City of Wilkes-Barre	Single Family	\$94,321.00	2017	Substantially Damaged
City of Wilkes-Barre	Single Family	\$55,000.00	2017	Substantially Damaged
City of Wilkes-Barre	Single Family	\$11,343.00	2017	Substantially Damaged
City of Wilkes-Barre	Single Family	\$6,445.00	2017	Substantially Damaged
City of Wilkes-Barre	Single Family	\$48,000.00	2017	Substantially Damaged
City of Wilkes-Barre	Single Family	\$81,688.00	2017	Substantially Damaged
City of Wilkes-Barre	Single Family	\$110,954.00	2017	Substantially Damaged
City of Wilkes-Barre	Single Family	\$56,589.00	2017	Substantially Damaged
City of Wilkes-Barre	Single Family	\$72,300.00	2017	Substantially Damaged
Conyngham Township	Vacant Land	\$8,000.00	2017	Substantially Damaged
Conyngham Township	Single Family	\$35,100.00	2017	Substantially Damaged
Conyngham Township	Single Family	\$20,401.00	2017	Substantially Damaged
Conyngham Township	Single Family	\$50,862.00	2017	Substantially Damaged
Conyngham Township	Single Family	\$53,602.00	2017	Substantially Damaged
Conyngham Township	Single Family	\$16,600.00	2017	Substantially Damaged
Conyngham Township	Single Family	\$52,234.00	2017	Substantially Damaged
Conyngham Township	Single Family	\$60,383.00	2017	Substantially Damaged
Conyngham Township	2-4 Family	\$58,313.00	2017	Substantially Damaged
Conyngham Township	Single Family	\$58,500.00	2017	Substantially Damaged
Conyngham Township	Vacant Land	\$8,000.00	2017	Substantially Damaged
Conyngham Township	Single Family	\$65,000.00	2017	Substantially Damaged
Conyngham Township	Vacant Land	\$8,000.00	2017	Substantially Damaged
Conyngham Township	Vacant Land	\$8,500.00	2017	Substantially Damaged
Conyngham Township	Single Family	\$55,051.00	2017	Substantially Damaged
Conyngham Township	Vacant Land	\$8,500.00	2017	Substantially Damaged
Conyngham Township	Vacant Land	\$9,500.00	2017	Substantially Damaged
Conyngham Township	Vacant Land	\$8,500.00	2017	Substantially Damaged
Conyngham Township	Single Family	\$55,000.00	2017	Substantially Damaged
Conyngham Township	Single Family	\$55,700.00	2017	Substantially Damaged
Conyngham Township	Single Family	\$37,932.00	2017	Substantially Damaged
Conyngham Township	Single Family	\$52,078.00	2017	Substantially Damaged
Jenkins Township	Single Family	\$15,300.00	2017	Substantially Damaged
Jenkins Township	Single Family	\$13,000.00	2017	Substantially Damaged
Jenkins Township	Vacant Land	\$7,500.00	2017	Substantially Damaged
Jenkins Township	2-4 Family	\$76,900.00	2017	Substantially Damaged
Jenkins Township	Vacant Land	\$7,500.00	2017	Substantially Damaged
Jenkins Township	Single Family	\$71,461.00	2017	Substantially Damaged
Jenkins Township	Single Family	\$52,932.00	2017	Substantially Damaged
Jenkins Township	Vacant Land	\$13,000.00	2017	Substantially Damaged
Jenkins Township	Single Family	\$13,200.00	2017	Substantially Damaged
Jenkins Township	Single Family	\$44,501.00	2017	Substantially Damaged
Jenkins Township	Single Family	\$18,000.00	2017	Substantially Damaged
Jenkins Township	Single Family	\$15,000.00	2017	Substantially Damaged
Jenkins Township	Single Family	\$12,600.00	2017	Substantially Damaged
Jenkins Township	Single Family	\$115,720.00	2017	Substantially Damaged
Jenkins Township	Single Family	\$58,470.00	2017	Substantially Damaged
Jenkins Township	Vacant Land	\$5,000.00	2017	Substantially Damaged
Jenkins Township	Single Family	\$110,526.00	2017	Substantially Damaged
Jenkins Township	2-4 Family	\$114,782.00	2017	Substantially Damaged
Jenkins Township	Single Family	\$35,600.00	2017	Substantially Damaged
Jenkins Township	Single Family	\$134,700.00	2017	Substantially Damaged
Jenkins Township	2-4 Family	\$36,000.00	2017	Substantially Damaged
Jenkins Township	Single Family	\$129,600.00	2017	Substantially Damaged
Jenkins Township	Single Family	\$127,800.00	2017	Substantially Damaged

## Luzerne County 2020 Hazard Mitigation Plan

**Table 6.1-3** Hazard Mitigation Grant Program Funded Acquisitions Since 2014 (FEMA 2020)

Municipality	Structure Type	Federally Obligated	Year Approved	Project Type
Jenkins Township (Port	Single Family	\$43,700.00	2017	Substantially Damaged
Jenkins Township (Port	2-4 Family	\$52,414.00	2017	Substantially Damaged
Jenkins Township (Port	2-4 Family	\$13,600.00	2017	Substantially Damaged
Jenkins Township (Port	Single Family	\$40,700.00	2017	Substantially Damaged
Jenkins Township (Port	Single Family	\$12,200.00	2017	Substantially Damaged
Jenkins Township (Port	Single Family	\$116,200.00	2017	Substantially Damaged
Jenkins Township (Port	Single Family	\$12,500.00	2017	Substantially Damaged
Jenkins Township (Port	Single Family	\$120,700.00	2017	Substantially Damaged
Pittston Township	Single Family	\$19,000.00	2017	Substantially Damaged
Pittston Township	Single Family	\$83,700.00	2017	Substantially Damaged
Pittston Township	Single Family	\$12,900.00	2017	Substantially Damaged
Pittston Township	Manufactured	\$40,320.00	2017	Substantially Damaged
Pittston Township	Manufactured	\$34,000.00	2017	Substantially Damaged
Pittston Township	Single Family	\$48,900.00	2017	Substantially Damaged
Pittston Township	Single Family	\$12,500.00	2017	Substantially Damaged
Pittston Township	Single Family	\$54,250.00	2017	Substantially Damaged
Pittston Township	Single Family	\$22,045.00	2017	Substantially Damaged
Pittston Township	Single Family	\$1,008.00	2017	Substantially Damaged
Pittston Township	Single Family	\$147,200.00	2017	Substantially Damaged
Pittston Township	Single Family	\$141,503.00	2017	Substantially Damaged
Pittston Township	Single Family	\$84,000.00	2017	Substantially Damaged
Plains Township	Single Family	\$102,273.00	2017	Substantially Damaged
Plains Township	Single Family	\$23,898.00	2017	Substantially Damaged
Plains Township	Single Family	\$69,000.00	2017	Substantially Damaged
Plains Township	Vacant Land	\$20,000.00	2017	Substantially Damaged
Plains Township	Single Family	\$69,557.00	2017	Substantially Damaged
Plains Township	Single Family	\$89,000.00	2017	Substantially Damaged
Plains Township	Vacant Land	\$13,000.00	2017	Substantially Damaged
Plains Township (Plainsville)	Single Family	\$62,000.00	2017	Substantially Damaged
Plymouth Township	Single Family	\$17,190.00	2017	Substantially Damaged
Plymouth Township	Single Family	\$54,521.00	2017	Substantially Damaged
Plymouth Township (W.	Single Family	\$27,692.00	2017	Substantially Damaged
Plymouth Township (W.	Single Family	\$34,567.00	2017	Acquisition
Plymouth Township (W.	2-4 Family	\$64,848.00	2017	Acquisition
Plymouth Township (W.	Single Family	\$6,000.00	2017	Acquisition
Plymouth Township (W.	Single Family	\$68,751.00	2017	Substantially Damaged
Plymouth Township (W.	Single Family	\$25,520.00	2017	Substantially Damaged
Shickshinny Borough	Single Family	\$13,200.00	2017	Substantially Damaged
Shickshinny Borough	Single Family	\$13,000.00	2017	Substantially Damaged
Shickshinny Borough	Single Family	\$51,500.00	2017	Substantially Damaged
Shickshinny Borough	Single Family	\$57,241.00	2017	Substantially Damaged
Shickshinny Borough	Vacant Land	\$5,000.00	2017	Substantially Damaged
Shickshinny Borough	Vacant Land	\$28,000.00	2017	Substantially Damaged
Shickshinny Borough	Single Family	\$39,516.00	2017	Substantially Damaged
Shickshinny Borough	Vacant Land	\$5,000.00	2017	Substantially Damaged
Shickshinny Borough	Single Family	\$12,300.00	2017	Substantially Damaged
Shickshinny Borough	Single Family	\$55,000.00	2017	Substantially Damaged
Shickshinny Borough	2-4 Family	\$15,600.00	2017	Substantially Damaged
Shickshinny Borough	Vacant Land	\$12,000.00	2017	Substantially Damaged
Shickshinny Borough	Single Family	\$31,249.00	2017	Substantially Damaged
Shickshinny Borough	Single Family	\$43,500.00	2017	Acquisition
Shickshinny Borough	Single Family	\$33,349.00	2017	Acquisition
Shickshinny Borough	Vacant Land	\$7,500.00	2017	Acquisition
Shickshinny Borough	Single Family	\$106,522.00	2017	Substantially Damaged

## Luzerne County 2020 Hazard Mitigation Plan

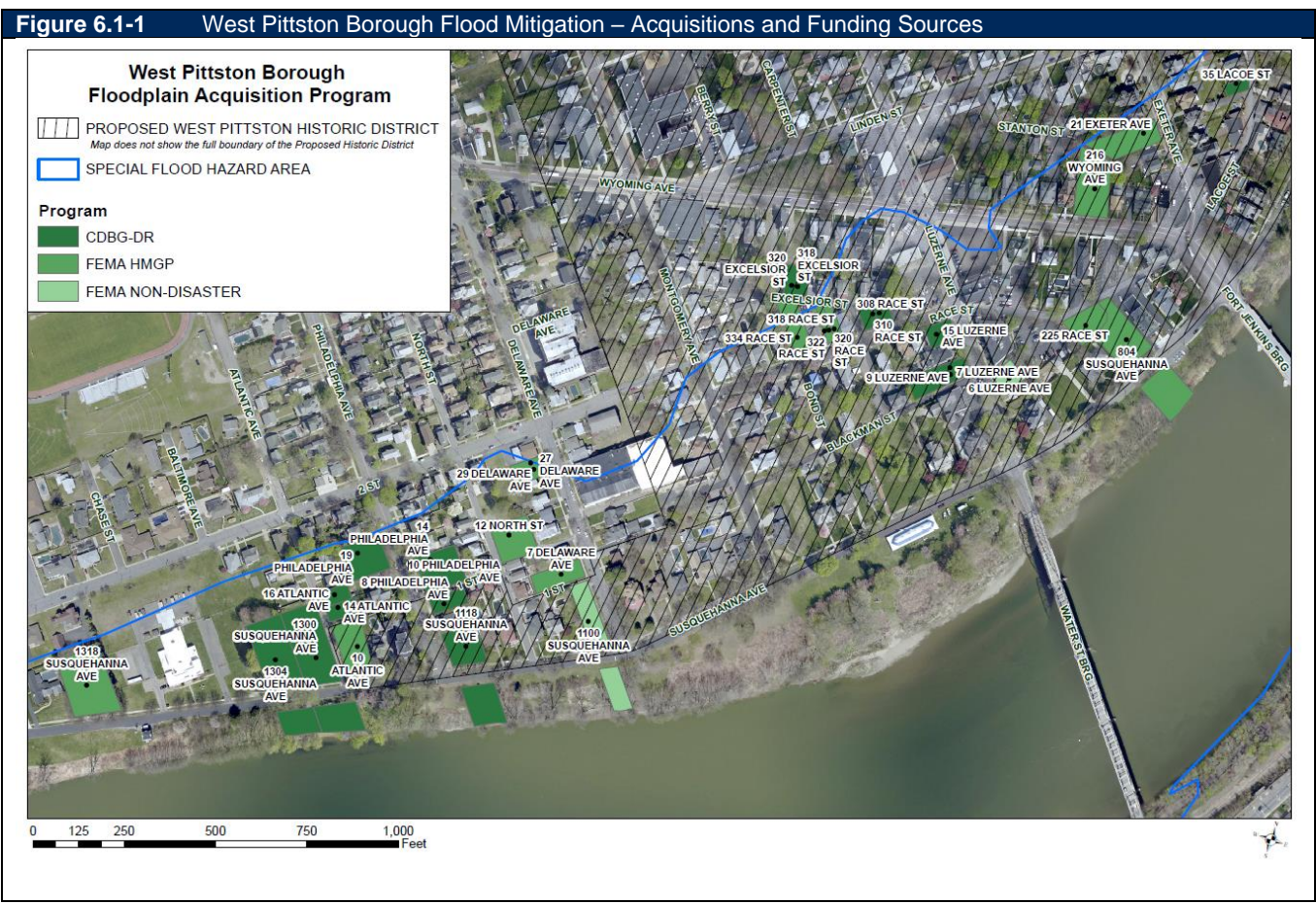
**Table 6.1-3** Hazard Mitigation Grant Program Funded Acquisitions Since 2014 (FEMA 2020)

Municipality	Structure Type	Federally Obligated	Year Approved	Project Type
West Pittston Borough	Single Family	\$237,691.00	2017	Substantially Damaged
West Pittston Borough	Single Family	\$68,258.00	2017	Substantially Damaged
West Pittston Borough	Single Family	\$203,128.00	2017	Substantially Damaged
City of Nanticoke	Other	\$14,900.00	2016	Substantially Damaged
City of Nanticoke	Single Family	\$15,781.00	2016	Substantially Damaged
City of Nanticoke	Single Family	\$37,196.00	2016	Substantially Damaged
Conyngham Township	Single Family	\$46,264.00	2016	Substantially Damaged
Conyngham Township	Single Family	\$73,200.00	2016	Substantially Damaged
Conyngham Township	Single Family	\$24,679.00	2016	
Exeter Township (Harding)	Single Family	\$73,500.00	2016	Substantially Damaged
Exeter Township (Harding)	Single Family	\$54,000.00	2016	Substantially Damaged
Exeter Township (Harding)	Vacant Land	\$12,000.00	2016	Substantially Damaged
Hunlock Township (Hunlock	Single Family	\$101,700.00	2016	Substantially Damaged
Jenkins Township	Single Family	\$59,455.00	2016	Substantially Damaged
Nescopeck Borough	2-4 Family	\$62,344.00	2016	Substantially Damaged
Nescopeck Borough	2-4 Family	\$185,500.00	2016	Substantially Damaged
Pittston Township	Manufactured	\$25,700.00	2016	Substantially Damaged
Pittston Township	Single Family	\$46,300.00	2016	Substantially Damaged
Pittston Township	Single Family	\$68,900.00	2016	Substantially Damaged
Pittston Township	Single Family	\$26,088.00	2016	Substantially Damaged
Pittston Township	Single Family	\$14,200.00	2016	Substantially Damaged
Shickshinny Borough	Single Family	\$46,000.00	2016	Substantially Damaged
Shickshinny Borough	Single Family	\$55,500.00	2016	Substantially Damaged
Shickshinny Borough	Vacant Land	\$9,500.00	2016	Substantially Damaged
Shickshinny Borough	Single Family	\$50,000.00	2016	Substantially Damaged
Shickshinny Borough	Single Family	\$20,000.00	2016	Substantially Damaged
West Pittston Borough	2-4 Family	\$12,000.00	2016	Substantially Damaged
West Pittston Borough	Single Family	\$129,000.00	2016	Substantially Damaged
West Pittston Borough	2-4 Family	\$67,100.00	2016	Substantially Damaged
West Pittston Borough	2-4 Family	\$105,640.00	2016	Substantially Damaged
West Pittston Borough	2-4 Family	\$55,383.00	2016	Substantially Damaged
West Pittston Borough	Single Family	\$55,372.00	2016	Substantially Damaged
West Pittston Borough	Single Family	\$22,000.00	2016	Substantially Damaged
West Pittston Borough	Single Family	\$41,950.00	2016	Substantially Damaged
West Pittston Borough	Single Family	\$22,000.00	2016	Substantially Damaged
City of Nanticoke	Single Family	\$82,812.00	2015	Acquisition
City of Nanticoke	Single Family	\$47,304.00	2015	Acquisition
City of Nanticoke	Single Family	\$44,163.00	2015	Acquisition
City of Nanticoke	2-4 Family	\$125,700.00	2015	Acquisition
Conyngham Township	Vacant Land	\$27,000.00	2015	Substantially Damaged
Conyngham Township	Single Family	\$75,000.00	2015	Substantially Damaged
Plymouth Township	Single Family	\$51,000.00	2015	Acquisition
Plymouth Township	Single Family	\$47,100.00	2015	Acquisition
Shickshinny Borough	Single Family	\$64,400.00	2014	Acquisition
Shickshinny Borough	2-4 Family	\$75,900.00	2014	Acquisition
Shickshinny Borough	Single Family	\$28,900.00	2014	Acquisition
Shickshinny Borough	Single Family	\$57,400.00	2014	Acquisition
Shickshinny Borough	Single Family	\$109,000.00	2014	Acquisition
Shickshinny Borough	Single Family	\$134,300.00	2014	Acquisition
Shickshinny Borough	Single Family	\$64,700.00	2014	Acquisition
Shickshinny Borough	Single Family	\$56,800.00	2014	Acquisition
Shickshinny Borough	Single Family	\$41,900.00	2014	Acquisition
Shickshinny Borough	Single Family	\$69,500.00	2014	Acquisition
Shickshinny Borough	Single Family	\$66,600.00	2014	Acquisition

**Table 6.1-3** Hazard Mitigation Grant Program Funded Acquisitions Since 2014 (FEMA 2020)

Municipality	Structure Type	Federally Obligated	Year Approved	Project Type
Shickshinny Borough	Vacant Land	\$75,900.00	2014	Acquisition
Shickshinny Borough	Single Family	\$96,500.00	2014	Acquisition
Shickshinny Borough	Single Family	\$58,900.00	2014	Acquisition
Shickshinny Borough	Single Family	\$1.00	2014	Acquisition

In addition to the HMGP funded mitigation projects above, West Pittston Borough acquired and demolished an additional 14 properties through Community Development Block Grant funding. This was part of the larger program in which 150 additional acquisition projects costing approximately \$15 million occurred in the county’s high risk river communities. The Figure below specifically shows the impact of West Pittston Borough’s Floodplain Acquisition Program. As seen on this map, many acquired properties are within the “Proposed West Pittston Historic District”; all within the West Pittston Borough Special Flood Hazard Area. The different shades of green represent project funding type.



## 6.2. Mitigation Goals and Objectives

Based on results of the review of the 2014 HMP mitigation goals and objectives established, a new set of goals and objectives were developed in 2020. Tables 6.1-1 explains how goals and objectives were updated and revised. Table 6.2-1 lists the mitigation goals and objectives established for the 2020 plan. There are 5 goals and 21 objectives identified.

<b>Table 6.2-1 List of 2020 mitigation strategy goals and objectives.</b>	
<b>GOAL 1</b>	<b>Protect lives, property, and resources in Luzerne County.</b>
Objective 1.1	Protect existing structures in the Special Flood Hazard Area.
Objective 1.2	Encourage high construction standards on all structural projects to reduce risk from all natural and man-made hazards.
Objective 1.3	Develop a comprehensive approach for reducing the possibility of damage to and loss of function at critical facilities located in High-Hazard Area.
Objective 1.4	Continue to monitor low risk hazards based on Risk Factor (RF) Methodology and modify the plan if risk should change before the plan needs to be updated.
Objective 1.5	Develop and distribute public awareness materials about natural hazard risks, preparedness, and mitigation.
Objective 1.6	Target owners of properties within identified hazard areas for additional outreach regarding mitigation and disaster preparedness.
Objective 1.7	Promote hazard mitigation as a public value in recognition of its importance to the health, safety, and welfare of the population.
Objective 1.8	Coordinate with High Hazard Potential Dam owners and affected officials on dam rehabilitation and funding.
<b>GOAL 2</b>	<b>Promote sustainable development to improve the quality of life in Luzerne County.</b>
Objective 2.1	Ensure that existing drainage systems (pipes, culverts and channels) are adequate and functioning properly through regular maintenance or upgrades.
Objective 2.2	Protect natural resources and open space including parks and wetlands within the floodplain and watersheds.
<b>GOAL 3</b>	<b>Promote public understanding, support, and implementation in mitigation-related activities.</b>
Objective 3.1	Work with television, radio and newspaper partners to promote public awareness on the potential impacts of natural hazards and actions to reduce those impacts.
Objective 3.2	Consider education campaigns and workshops to promote 'safe' development and other hazard mitigation principles.
<b>GOAL 4</b>	<b>Ensure adequacy and continuity of emergency management services during hazard events.</b>
Objective 4.1	Ensure that hazards do not interrupt emergency response services and critical functions.
Objective 4.2	Continue to provide residents with adequate warning of potential hazards.
Objective 4.3	Identify safe and efficient evacuation routes during hazard events to ensure continued service.
Objective 4.4	Provide for adequate shelters during hazard events.



Table 6.2-1 List of 2020 mitigation strategy goals and objectives.	
<b>GOAL 5</b>	<b>Ensure hazard mitigation goals and objectives are consistent with goals of other plans and ordinances in the counties and municipalities.</b>
<b>Objective 5.1</b>	Promote responsible growth and development via proper enforcement and through the incorporation of hazard mitigation principals in municipal plans, and zoning, subdivision and land development, stormwater ordinances, and floodplain ordinances, as appropriate.
<b>Objective 5.2</b>	Incorporate hazard mitigation planning projects into capital improvement plans.
<b>Objective 5.3</b>	Continue to regulate development in conservation areas and within floodplains to prevent flood damage.
<b>Objective 5.4</b>	Work with municipalities to continue to be compliant with the National Flood Insurance Program (NFIP) through periodic training of municipal officials. Encourage further participation by educating municipal officials on the benefits of the Community Rating System.
<b>Objective 5.5</b>	Better integrate plans and ordinances to ensure concurrency and harmony between them.

### 6.3. Identification and Analysis of Mitigation Techniques

The mitigation strategy in the updated Hazard Vulnerability Assessment and Mitigation Plan Update should include analysis of a comprehensive range of specific techniques or actions. FEMA, through the March 2013 Local Mitigation Handbook, and PEMA, through the October 2013 Standard Operating Guide (SOG), identify four categories of hazard mitigation techniques.

- **Local plans and regulations:** Government authorities, policies, or codes that influence the way land and buildings are developed and built. Examples include, but are not limited to, comprehensive plans, subdivision regulations, building codes and enforcement, and NFIP and CRS.
- **Structure and infrastructure:** Modifying existing structures and infrastructure or constructing new structures to reduce hazard vulnerability. Examples include, but are not limited to, acquisition and elevation of structures in flood prone areas, utility undergrounding, structural retrofits, floodwalls and retaining walls, detention and retention structures, and culverts.
- **Natural systems protection:** Actions that minimize damage and losses and preserve or restore the functions of natural systems. Examples include, but are not limited to, sediment and erosion control, stream corridor restoration, forest management, conservation easements, and wetland restoration and preservation.
- **Education and awareness:** Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate the hazards and may also include participation in national programs. Examples include, but are not limited to, radio or television spots, websites with maps and information, provide information and training, NFIP outreach, StormReady, and Firewise Communities.

The HMPT reviewed the four types of mitigation techniques and examples of actions at the Risk Assessment and Mitigation Solutions Workshop and ensured that all mitigation technique types were applied across hazards. The specific actions associated with these techniques are included in Table 6.4-1.

### 6.4. Mitigation Action Plan

A kick-off meeting for the 2020 Luzerne County Hazard Mitigation Plan Update was held on June 6, 2019 to develop a framework for the plan. The goals and objectives were presented during this meeting. During the Risk Assessment and Mitigation Solutions Workshop on October 21, 2019, Mitigation Techniques were discussed using FEMA's *Mitigation Ideas* document. During the workshop, municipalities were provided their *Mitigation Action Progress Report Form* which listed their actions and projects from the 2014 HMP for review and update as described in Section 6.1. Actions that have been deferred or ongoing have been carried over to the 2020 Action Plan and are again proposed for implementation.

In addition, participants were given *Mitigation Action Forms* to provide any new actions or projects to be included in the plan update. Mitigation Action forms were also posted to the project website and sent out via email (or post if requested). Meeting participants who were not affiliated with a municipality were provided with *New Mitigation Action Forms* to include new mitigation actions in the 2020 plan if they so wished.

The final list of 191 mitigation actions is contained in Table 6.4-1. This table provides an overview of the strategy that will be utilized in order to implement each of the proposed mitigation actions. For each action listed in Table 6.4-1, the associated strategy identifies the agency or job title that will be responsible for initiating the work and potential sources of funding for the work. Each strategy also indicates a timeframe for when the action will happen.

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
ACTION NO: 1	Continue to work with the Red Cross to conduct an annual assessment of existing shelters in the county to determine their condition and adequacy with respect to beds, etc. and determine which ones would need to be retrofitted. Identify additional locations that could be equipped and identified as shelters based on the needs and the population centers in the county.
COMMUNITY: Luzerne County	
Category:	Plans and Regulations, Structural and Infrastructure
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	County Office of Emergency Management
Implementation Schedule:	Ongoing
Funding Source:	HMGP

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
ACTION NO: 2	Include the following language in the new county zoning ordinance to: 1) concur with the Model Floodplain Ordinance and/or regulations and the Subdivision/Land development Ordinance (SALDO) with respect to what is allowed in the floodplain; and 2) for all development to construct first floors above the base flood elevation for areas that are protected by the levee systems.
COMMUNITY: Luzerne County	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	County Planning & Zoning, County Engineers Office, LCFPA
Implementation Schedule:	1-2 Years
Funding Source:	LC/PZST
ACTION NO: 3	Evaluate the Preliminary Flood Insurance Rate Map, scheduled to be released in Fall 2020, to determine where and how changes to the flood hazard area and base flood elevation are expected. Apply this new data to floodplain management and development across the County and incorporate it into the next annual HMP review.
COMMUNITY: Luzerne County	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	County Planning & Zoning
Implementation Schedule:	1 Yr.
Funding Source:	LC/PZST
ACTION NO: 4	Promote and share information about available trainings and webinars (provided by ASFPM, PAFPM, FEMA, DEP, etc.) with local floodplain management officials.
COMMUNITY: Luzerne County	
Category:	Education and Awareness
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Luzerne County Flood Protection Authority, County Office of Emergency Management
Implementation Schedule:	Ongoing
Funding Source:	County staff time, Web Administration
ACTION NO: 5	Work with the following four municipalities to encourage them to issue building permits and perform UCC functions including inspections: Jeddo, New Columbus, and Warrior Run Boroughs and Ross Township.
COMMUNITY: Luzerne County	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	County Planning & Zoning

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
Implementation Schedule:	1-2 Years
Funding Source:	LC/PZST
ACTION NO: 6	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).
COMMUNITY: Luzerne County	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	County Planning & Zoning
Implementation Schedule:	1-2 Years
Funding Source:	LC/PZST
ACTION NO: 7	Work with municipalities, particularly those along the Susquehanna River and large streams, to join the CRS by educating them on the benefits of CRS and also providing them with technical assistance; work with municipalities to adopt and enforce the requirements of the Countywide ACT 167 plan.
COMMUNITY: Luzerne County	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam, Drought
Lead Agency/Department:	LCFPA, County Engineers Office
Implementation Schedule:	6-10 Years
Funding Source:	DEP , PDM, FMA, HMGP
ACTION NO: 8	Develop a Source Water Protection Plan to properly utilize and protect ground water resources in the two counties.
COMMUNITY: Luzerne County	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Drought
Lead Agency/Department:	DEP
Implementation Schedule:	3-5 Years
Funding Source:	DEP
ACTION NO: 9	Encourage the county to include in their zoning ordinance, measures to: enhance the concept of defensible space practice; and discourage development on permeable soils to reduce the impacts of drought.
COMMUNITY: Luzerne County	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Wildfire, Drought
Lead Agency/Department:	County Planning & Zoning
Implementation Schedule:	1-2 Years
Funding Source:	LC/PZST

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
ACTION NO: 10	Encourage the individual municipalities to be firmly committed to continued compliance with the NFIP by regulating development and redevelopment through the adoptions of provisions that exceed the minimum NFIP requirements. Work with communities to ensure that there are no deficiencies when the Community Assistance Visits are conducted to ensure continued compliance.
COMMUNITY: Luzerne County	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	LCFPA
Implementation Schedule:	1-2 Years
Funding Source:	PDM, FMA, HMGP, FLUAP
ACTION NO: 11	Work with each municipality to identify a point of contact to perform an annual review of the mitigation actions for their municipality from this Hazard Mitigation Plan.
COMMUNITY: Luzerne County	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	County Planning & Zoning
Implementation Schedule:	1-2 Years
Funding Source:	PDM
ACTION NO: 12	Initiate a research and education program with local universities to map the extents of the mine pools in the Lackawanna and Susquehanna River valleys. Because earthquakes will have the greatest effect in areas of abandoned mine lands, this program will seek to quantify the effects of earthquakes on destabilized earth, such as that over flooded mine pools.
COMMUNITY: Luzerne County	
Category:	Education and Awareness
Hazard(s) Addressed:	Earthquake, Land Subsidence
Lead Agency/Department:	PA DEP
Implementation Schedule:	6-10 Years
Funding Source:	DEP
ACTION NO: 13	Coordinate efforts between the Joint-County Comprehensive Plan and the countywide Act 167 Stormwater Management Plan to identify groundwater recharge areas and sensitive groundwater areas such as mine lands. Work closely with the municipalities to enforce infiltration and groundwater recharge requirements in these areas to reduce the impacts of drought.
COMMUNITY: Luzerne County	
Category:	Natural Systems Protection

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<b>Hazard(s) Addressed:</b>	Drought
<b>Lead Agency/Department:</b>	LCFPA, County Engineers Office
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	DEP
<b>ACTION NO: 14</b>	For those parties not interested in acquisition or where acquisition is not feasible, continue to work with municipalities to advise homeowners with a preferred mitigation alternative including demolition, reconstruction and elevation or flood proofing.
<b>COMMUNITY: Luzerne County</b>	
<b>Category:</b>	Education and Awareness
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	LCFPA, County Engineers Office
<b>Implementation Schedule:</b>	3-5 Years
<b>Funding Source:</b>	FMA, PDM, HMGP, RFC, Wyoming Valley Levee-Raising Project Mitigation Funds
<b>ACTION NO: 15</b>	Work with Duryea Borough and DEP to conduct annual inspections of the structures that discharge stormwater and groundwater from the flooded mine pool and identify any structural repairs needed.
<b>COMMUNITY: Luzerne County</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Subsidence & Sinkholes, Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	PA DEP
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Growing Greener (DEP), CDBG
<b>ACTION NO: 16</b>	Encourage municipalities to reduce the vulnerability of critical facilities to wildfires by: increasing buffers and introducing defensible spaces; identifying farm roads, service roads, and other private access corridors in high hazard areas that could be used as fire breaks; and providing assistance to the County Emergency Management to identify vulnerable structures (firewise communities).
<b>COMMUNITY: Luzerne County</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Wildfire
<b>Lead Agency/Department:</b>	PA DEP - Bureau of Forestry
<b>Implementation Schedule:</b>	3-5 Years
<b>Funding Source:</b>	PDM, HMGP
<b>ACTION NO: 17</b>	Work with FEMA to conduct detailed studies for Abrahams Creek of Forty Fort, Big Wapwallopen Creek, Lackawanna River, Nescopeck Creek, Solomon Creek, and Toby Creek as identified in the FEMA Region III Post-Flood Community Flood Risk Evaluation for Luzerne County.

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<b>COMMUNITY: Luzerne County</b>	
<b>Category:</b>	Plans and Regulations, Natural Resources Protection
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	FEMA, County Engineers Office, LCFPA
<b>Implementation Schedule:</b>	6-10 Years
<b>Funding Source:</b>	PDM, HMGP
<b>ACTION NO: 18</b>	Designate specific locations throughout the County such as the Emergency Management Agency, Planning & Zoning Department, municipal libraries, and events such as fairs to provide information to the public on flooding and other hazards. Encourage these locations to stock a variety of FEMA publications on various natural and human caused hazards and also the most recent FIRMs; also include information on the County's website.
<b>COMMUNITY: Luzerne County</b>	
<b>Category:</b>	Education and Awareness
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Lead Agency/Department:</b>	County Planning & Zoning, Public Information Office
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	PDM
<b>ACTION NO: 19</b>	Conduct an educational campaign and develop brochures on topics such as: the impacts of drought, proper sediment and erosion control, and dangers of developing on old mines and dumps.
<b>COMMUNITY: Luzerne County</b>	
<b>Category:</b>	Education and Awareness
<b>Hazard(s) Addressed:</b>	Drought, Flood, Flash Flood, & Ice Jam, Land Subsidence
<b>Lead Agency/Department:</b>	Public Information Office, PA DEP
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	PDM
<b>ACTION NO: 20</b>	Stay closely involved with the activities of the Delaware Regional Basin Commission, Susquehanna River Basin Commission, Water Board, and other water planning organizations by encouraging a staff member from Luzerne County Department of Planning & Zoning to be present at their meetings depending on their availability.
<b>COMMUNITY: Luzerne County</b>	
<b>Category:</b>	Plans and Regulations
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	County Planning & Zoning
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	LC/PZST

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
ACTION NO: 21	Work with State agencies, professional organizations, and non-government organizations to conduct an annual workshop at a key location in each county for private developers to involve them in hazard mitigation activities and educate them on 'safe' development principles that can be incorporated into their development proposals.
COMMUNITY: Luzerne County	
Category:	Education and Awareness
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	PA DCED, PATS
Implementation Schedule:	1-2 Years
Funding Source:	FMA, PDM
ACTION NO: 22	Continue to provide inquirers with technical advice and information from the community's FIRM and FEMA's website on a property's location in a Special Flood Hazard Area, zone, and its base flood elevation if data is available.
COMMUNITY: Luzerne County	
Category:	Education and Awareness
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	County Planning & Zoning
Implementation Schedule:	Ongoing
Funding Source:	PDM
ACTION NO: 23	Work with real estate agents throughout the county and encourage them to advise prospective property purchasers in flood prone and Land Subsidence areas to obtain flood or Land Subsidence insurance in municipalities over which the County has jurisdiction.
COMMUNITY: Luzerne County	
Category:	Education and Awareness
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam, Land Subsidence
Lead Agency/Department:	LCFPA, County Planning & Zoning, PA DEP, PA DCED
Implementation Schedule:	1-2 Years
Funding Source:	PDM
ACTION NO: 24	Continue to perform regular inspections of the Wyoming Valley Flood Risk Management Project as outlined in the Project Cooperation Agreement between the federal government and LCFPA.
COMMUNITY: Luzerne County	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	LCFPA
Implementation Schedule:	Ongoing
Funding Source:	Levee Fee



## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
ACTION NO: 25	Monitor and evaluate mitigation actions annually and update the hazard mitigation plan every five years to reflect changes in development after a major hazard event and provide technical assistance to municipalities in implementing individual hazard mitigation actions.
COMMUNITY: Luzerne County	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	Luzerne EMA, LCFPA, County Planning & Zoning
Implementation Schedule:	Ongoing
Funding Source:	PDM, HMGP
ACTION NO: 26	Continue to maintain and update threat protection program software
COMMUNITY: Luzerne County	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Cyber-Terrorism
Lead Agency/Department:	Department of Information Technology
Implementation Schedule:	Ongoing
Funding Source:	Annual County Budget
ACTION NO: 27	Provide annual cyber-security and awareness training to all County staff to reduce risk and occurrence of phishing and malware attacks
COMMUNITY: Luzerne County	
Category:	Education and Awareness
Hazard(s) Addressed:	Cyber-Terrorism
Lead Agency/Department:	Department of Information Technology
Implementation Schedule:	Ongoing
Funding Source:	Annual County Budget
ACTION NO: 28	Provide notice of funding opportunity and supporting documentation from the county HMP to EMCs of municipalities with High Hazard Potential Dams to promote rehabilitation and safety in Luzerne County.
COMMUNITY: Luzerne County	
Category:	Education and Awareness
Hazard(s) Addressed:	Dam Failure, HHPD
Lead Agency/Department:	Luzerne EMA, LCFPA
Implementation Schedule:	Annually by December (grant applications due June each year)
Funding Source:	Staff time
ACTION NO: 29	Each spring, post a link on the County website banner with hailstorm safety information.
COMMUNITY: Luzerne County	

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<b>Category:</b>	Education and Awareness
<b>Hazard(s) Addressed:</b>	Hailstorm
<b>Lead Agency/Department:</b>	Luzerne EMA
<b>Implementation Schedule:</b>	Ongoing
<b>Funding Source:</b>	Staff Time
<b>ACTION NO: 30</b>	<b>Identify hazardous materials sites, including TRI facilities and oil and gas wells, that are in or near flood zones and develop strategies to reduce potential damage.</b>
<b>COMMUNITY: Luzerne County</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Hazardous Materials Release; Flood, Flash Flood, and Ice Jam
<b>Lead Agency/Department:</b>	Luzerne EMA in cooperation with Zoning and Building Officials of each Municipality
<b>Implementation Schedule:</b>	2-3 years
<b>Funding Source:</b>	County, Municipal Annual Budgets
<b>ACTION NO: 31</b>	<b>Identify opportunities to upgrade or bury power lines during new development or redevelopment.</b>
<b>COMMUNITY: Luzerne County</b>	
<b>Category:</b>	Structure and Infrastructure
<b>Hazard(s) Addressed:</b>	Hurricane, Tropical Storm, Nor'easter; Tornado & Windstorm, Winter Storm
<b>Lead Agency/Department:</b>	Luzerne County Planning & Zoning in cooperation with Zoning and Building Officials of each Municipality
<b>Implementation Schedule:</b>	1-3 years
<b>Funding Source:</b>	County, Municipal Annual Budgets; HMGP
<b>ACTION NO: 32</b>	<b>Maintain regular contact with Pennsylvania Department of Conservation and Natural Resources to ensure that County information about the potential for landslides is current.</b>
<b>COMMUNITY: Luzerne County</b>	
<b>Category:</b>	Local Plans and Regulations
<b>Hazard(s) Addressed:</b>	Landslide
<b>Lead Agency/Department:</b>	Luzerne County EMA
<b>Implementation Schedule:</b>	Ongoing; Annually
<b>Funding Source:</b>	County Annual Budget
<b>ACTION NO: 33</b>	<b>Continue to work with the USACE to implement the National Levee Safety Program and refine an inventory of all levees in the County.</b>
<b>COMMUNITY: Luzerne County</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Levee Failure; Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	LCFPA

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
Implementation Schedule:	Ongoing
Funding Source:	LCFPA Annual Budget, PADEP
<b>ACTION NO: 34</b>	<b>Develop nuclear mitigation actions work group.</b>
<b>COMMUNITY: Luzerne County</b>	
Category:	Education and Awareness; Plans and Regulations
Hazard(s) Addressed:	Nuclear Incident
Lead Agency/Department:	Luzerne County EMA
Implementation Schedule:	Ongoing
Funding Source:	County Annual Budget
<b>ACTION NO: 35</b>	<b>Work with the Wilkes-Barre City Health Department and the PA Health Department to make the public aware of the availability of a Covid-19 vaccine, once a vaccine has been developed.</b>
<b>COMMUNITY: Luzerne County</b>	
Category:	Education and Awareness
Hazard(s) Addressed:	Pandemic
Lead Agency/Department:	Luzerne EMA, Luzerne Human Services
Implementation Schedule:	18 months
Funding Source:	Staff time, Act 315
<b>ACTION NO: 36</b>	<b>Work with other County Departments to incorporate hazard mitigation actions and planning into other plan updates, including Emergency Operations Plan updates.</b>
<b>COMMUNITY: Luzerne County</b>	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	Luzerne EMA, Luzerne County Planning & Zoning, LCFPA in coordination with local emergency and planning departments
Implementation Schedule:	Ongoing
Funding Source:	County and Municipal Annual Budgets
<b>ACTION NO: 37</b>	<b>Work with Pennsylvania Department of Health to increase awareness about treating and preventing opioid addiction.</b>
<b>COMMUNITY: Luzerne County</b>	
Category:	Education and Awareness
Hazard(s) Addressed:	Opioid Addiction
Lead Agency/Department:	Luzerne County Drug and Alcohol in coordination with PADOH
Implementation Schedule:	Ongoing
Funding Source:	County Annual Budget; DOH
<b>ACTION NO: 38</b>	<b>Encourage homeowners to install appropriate devices to monitor and reduce radon exposure in homes.</b>

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<b>COMMUNITY: Luzerne County</b>	
<b>Category:</b>	Education and Awareness
<b>Hazard(s) Addressed:</b>	Radon Exposure
<b>Lead Agency/Department:</b>	Luzerne County Planning & Zoning, Luzerne County Office of Community Development
<b>Implementation Schedule:</b>	Ongoing
<b>Funding Source:</b>	HMGP, County Annual Budget
<b>ACTION NO: 39</b>	<b>After an event, provide information on alternatives to reconstruction of structures that sustain damages more than or equal to 50% of value to property owners.</b>
<b>COMMUNITY: Luzerne County</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam; Tornado & Windstorm, Winter Storm; Hurricane, Tropical Storm, and Nor'easter; Wildfire
<b>Lead Agency/Department:</b>	Luzerne County Planning & Zoning, LCFPA
<b>Implementation Schedule:</b>	5 years
<b>Funding Source:</b>	HMGP, County Annual Budget
<b>ACTION NO: 40</b>	<b>Work with PEMA to transition evacuation planning for the Susquehanna Steam Electric Station to the new "keyhole" approach</b>
<b>COMMUNITY: Luzerne County</b>	
<b>Category:</b>	Local Plans and Regulations
<b>Hazard(s) Addressed:</b>	Nuclear Incident
<b>Lead Agency/Department:</b>	PEMA, Talen Energy
<b>Implementation Schedule:</b>	3-5 Years
<b>Funding Source:</b>	County Annual Budget, Staff Time
<b>ACTION NO: 41</b>	<b>Coordinate with PEMA and Talen Energy on updated public information materials and a public information campaign to inform people in the 10-mile EPZ about the new evacuation plan.</b>
<b>COMMUNITY: Luzerne County</b>	
<b>Category:</b>	Education and Awareness
<b>Hazard(s) Addressed:</b>	Nuclear Incident
<b>Lead Agency/Department:</b>	PEMA, Talen Energy
<b>Implementation Schedule:</b>	1 year
<b>Funding Source:</b>	County Annual Budget
<b>ACTION NO: 42</b>	<b>Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).</b>
<b>COMMUNITY: Ashley Borough</b>	
<b>Category:</b>	Local Plans and Regulations

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	Local Planning & Zoning Department
Implementation Schedule:	1-2 Years
Funding Source:	Borough Staff Time
ACTION NO: 43	Identify mitigation options to address the flooding of Mill Creek on the 700 block of Grove Street. Use FEMA publication 551, <i>Selecting Appropriate Mitigation Measures for Flood prone Structures</i> , which provides guidance on determining appropriate mitigation measures.
COMMUNITY: Avoca Borough	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Local EMA in coordination with LCFPA
Implementation Schedule:	1-2 Years
Funding Source:	Borough Annual Budget
ACTION NO: 44	Identify measures to prevent/remove ice build up in the Mill Creek channel during winter months.
COMMUNITY: Avoca Borough	
Category:	Local Plans and Regulations, Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Local EMA
Implementation Schedule:	1-2 Years
Funding Source:	Borough Annual Budget
ACTION NO: 45	Improve drainage structures and storm sewers throughout the Borough, which are undersized and cause roadway flooding.
COMMUNITY: Avoca Borough	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Local Engineering Department
Implementation Schedule:	3-5 Years
Funding Source:	Borough Annual Budget
ACTION NO: 46	Separate combined sanitary and storm sewers in the 3rd Ward.
COMMUNITY: Avoca Borough	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Local Engineering Department, Local Public Works Department
Implementation Schedule:	3-5 Years
Funding Source:	Borough Annual Budget

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
ACTION NO: 47	Make municipal building accessible to residents to do business without having to come in direct contact with township employees. Outfit front door with an intercom that would allow visitors be buzzed into the building and place hand sanitizing stations throughout.
<b>COMMUNITY: Bear Creek Township</b>	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Pandemic
Lead Agency/Department:	Local Public Works Department
Implementation Schedule:	1 year
Funding Source:	Township Annual Budget
ACTION NO: 48	Consider adding walls to Falls Creek.
<b>COMMUNITY: Black Creek Township</b>	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Landslide
Lead Agency/Department:	Local Engineering Department
Implementation Schedule:	3-5 Years
Funding Source:	Township Annual Budget
ACTION NO: 49	Improve access for snow removal on certain roads with snow plow truck operation.
<b>COMMUNITY: Bear Creek Village Borough</b>	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Winter Storm
Lead Agency/Department:	Council Road Master
Implementation Schedule:	Ongoing
Funding Source:	Borough Annual Budget
ACTION NO: 50	Engineering study to assess feasibility and cost, and title search cost estimate, of project to channelize/dredge the Bear Creek South of SR 115 in the Borough.
<b>COMMUNITY: Bear Creek Village Borough</b>	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Local EMA, Local Engineering Department, Public Works
Implementation Schedule:	1-2 Years
Funding Source:	HMGP
ACTION NO: 51	Identify specific mitigation actions for the structures on Wilkes Barre and Easton Roads that are vulnerable to flooding.
<b>COMMUNITY: Buck Township</b>	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<b>Lead Agency/Department:</b>	Local EMA, Local Engineering Department, Public Works
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 52</b>	Identify mitigation options to address the flooding action on Nescopeck Creek and St. Johns Road and State Route 222. Use FEMA publication 551, <i>Selecting Appropriate Mitigation Measures for Flood prone Structures</i> , which provides guidance on determining appropriate mitigation measures.
<b>COMMUNITY: Butler Township</b>	
<b>Category:</b>	Local Plans and Regulations, Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local EMA, Local Engineering Department, Public Works
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 53</b>	The urbanization of the Borough without stormwater management controls has led to flooding issues from stormwater run-off upstream of the Borough. Develop a plan to implement stormwater management features in the Borough. Pursue recommendations identified in the Act 167 Plan and consider sewer pump retrofit.
<b>COMMUNITY: Conyngham Borough</b>	
<b>Category:</b>	Local Plans and Regulations
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local Engineering Department, Public Works
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Borough Annual Budget
<b>ACTION NO: 54</b>	Ensure integration of vulnerabilities into local, regional, and countywide comprehensive planning processes.
<b>COMMUNITY: Conyngham Borough</b>	
<b>Category:</b>	Local Plans and Regulations
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Lead Agency/Department:</b>	Local Emergency Manager
<b>Implementation Schedule:</b>	Ongoing
<b>Funding Source:</b>	Borough Annual Budget
<b>ACTION NO: 55</b>	Work with the County to develop a procedure to issue building permits and perform UCC functions including inspections.
<b>COMMUNITY: Conyngham Township</b>	
<b>Category:</b>	Local Plans and Regulations
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Lead Agency/Department:</b>	Local Planning & Zoning Department
<b>Implementation Schedule:</b>	1-2 Years

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
Funding Source:	Township Annual Budget
ACTION NO: 56	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).
COMMUNITY: Courtdale Borough	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	Local Planning & Zoning Department
Implementation Schedule:	1-2 Years
Funding Source:	Borough Staff Time
ACTION NO: 57	Conduct an engineering study to identify the most appropriate mitigation measure for the Borough's Government Building and the Police Department on Main Street.
COMMUNITY: Dallas Borough	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Local Engineering Department, Local EMA
Implementation Schedule:	3-5 Years
Funding Source:	Borough Annual Budget
ACTION NO: 58	Conduct an engineering study to identify the most appropriate mitigation measure for heavy rain - flooding in the area of Columbia Avenue, American Legion Post and Leggio's Restaurant.
COMMUNITY: Dallas Borough	
Category:	Local Plans and Regulations, Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Local Engineering Department, Local EMA
Implementation Schedule:	3-5 Years
Funding Source:	Borough Annual Budget
ACTION NO: 59	Conduct an inspection and provide engineering recommendation for the Toby Creek culvert which runs underneath Fino's Pharmacy, Citizens Bank and their respective parking lots.
COMMUNITY: Dallas Borough	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Dallas Borough (culvert owner) and private property owners
Implementation Schedule:	1-2 Years
Funding Source:	Borough Annual Budget
ACTION NO: 60	Creek bank restoration and sedimentation clean out around culvert area in tributary to Toby creek. This will mitigate storm water flooding in area near Forest St/Wood Lawn Ave.



## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<b>COMMUNITY: Dallas Borough</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local Engineering Department, Public Works
<b>Implementation Schedule:</b>	2-4 Years
<b>Funding Source:</b>	Borough Annual Budget
<b>ACTION NO: 61</b>	Conduct a study to identify ways (e.g., property acquisitions and stream widening) to mitigate the continual flooding of properties at the confluence of Toby's Creek and Trout Run (Fernbrook Corners).
<b>COMMUNITY: Dallas Township</b>	
<b>Category:</b>	Local Plans and Regulations, Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local Engineering Department
<b>Implementation Schedule:</b>	2-3 Years
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 62</b>	Flooding along Leonard's Creek has caused severe damage to two bridges and channel improvements. FEMA funding has been secured to rebuild one bridge and wall improvements. Identify additional actions that should be taken at the Kunkle/Leonard's and Shady Side Creek area.
<b>COMMUNITY: Dallas Township</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local Engineering Department, Local EMA
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 63</b>	Conduct a study to identify stream bed improvements along public roads which continue to be heavy flooded.
<b>COMMUNITY: Dallas Township</b>	
<b>Category:</b>	Natural Systems Protection
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local Engineering Department in coordination with LCFPA, Local Streets Department
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 64</b>	Conduct a study to identify the need for retaining structures with creek bed improvements at Toby Creek from Offset Paperback and Route 309 to the Dallas Township - Kingston Township municipal boundary.
<b>COMMUNITY: Dallas Township</b>	
<b>Category:</b>	Structural and Infrastructure

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local Engineering Department, Local Streets Department
<b>Implementation Schedule:</b>	2-3 Years
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 65</b>	Conduct an engineering study to identify the most appropriate mitigation measure for the multiple structures in the Special Flood Hazard Area throughout the Township.
<b>COMMUNITY: Dennison Township</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Lead Agency/Department:</b>	Local Engineering Department in coordination with LCFPA
<b>Implementation Schedule:</b>	2-3 Years
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 66</b>	Conduct a study to identify solutions to mitigating regular flooding at the intersection of Stairville Road and St. Mary's Road.
<b>COMMUNITY: Dorrance Township</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local Engineering Department, Local Streets Department
<b>Implementation Schedule:</b>	2-3 Years
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 67</b>	Conduct a study to identify problems on Dupont Creek (Lidy, Collins, Mill) and Mill Creek.
<b>COMMUNITY: Dupont Borough</b>	
<b>Category:</b>	Natural Systems Protection
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local Engineering Department in coordination with LCFPA
<b>Implementation Schedule:</b>	2-3 Years
<b>Funding Source:</b>	Borough Annual Budget
<b>ACTION NO: 68</b>	Lower Lackawanna Sewer Authority placed a valve in their Diversion Chamber to help alleviate the sewage from backing up into the homes on Chittenden Street. LLVSA inspects and maintains the valve but does not determine when the valve should be opened or closed. Duryea Borough Sewer Authority is interested in the placement of check valves for sanitary laterals on individual homes located on Chittenden Street.
<b>COMMUNITY: Duryea Borough</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Lower Lackawanna Sewer Authority

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
Implementation Schedule:	3-5 Years
Funding Source:	Borough Annual Budget
ACTION NO: 69	Purchase portable pumps along with discharge hoses for pumping of landside water in the event the flap gates are closed and interior flooding of streets occurs on the landside of the levee.
COMMUNITY: Duryea Borough	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam; Levee Failure
Lead Agency/Department:	Local Public Works, Local Streets Department
Implementation Schedule:	1-2 Years
Funding Source:	Borough Annual Budget
ACTION NO: 70	Raise Levee/Dike System in Duryea Borough.
COMMUNITY: Duryea Borough	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam; Levee Failure
Lead Agency/Department:	DEP; USACE
Implementation Schedule:	3-5 years
Funding Source:	Municipal Annual Budget, HMGP
ACTION NO: 71	Identify specific mitigation for the structures on Hillside Avenue, Elm, Green, and Cherry Streets that are vulnerable to Land Subsidence.
COMMUNITY: Edwardsville Borough	
Category:	Structural and Infrastructure, Nature Systems Protection
Hazard(s) Addressed:	Land Subsidence
Lead Agency/Department:	Local Engineering Department
Implementation Schedule:	2-3 Years
Funding Source:	Borough Annual Budget
ACTION NO: 72	Move the EOC out of flood waters. Maintenance of underground Floodway interceptor.
COMMUNITY: Edwardsville Borough	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	EMA Director
Implementation Schedule:	5 Years
Funding Source:	Borough Annual Budget
ACTION NO: 73	Conduct a feasibility study for floodwall protection improvements required for the problem areas of Susquehanna Avenue and Grant Street.
COMMUNITY: Exeter Borough	
Category:	Structural and Infrastructure

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local Engineering Department, Local Public Works, Floodwall Owner
<b>Implementation Schedule:</b>	2-3 Years
<b>Funding Source:</b>	Borough Annual Budget
<b>ACTION NO: 74</b>	<b>Continue to perform creek and river bank maintenance and stabilization activities along strategic areas of the Susquehanna River and Hicks Creek.</b>
<b>COMMUNITY: Exeter Borough</b>	
<b>Category:</b>	Natural Systems Protection
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local Public Works Department
<b>Implementation Schedule:</b>	3-5 Years
<b>Funding Source:</b>	Borough Annual Budget
<b>ACTION NO: 75</b>	<b>Post a digital version of the DFIRM and the availability of flood protection guidance documents on the Borough website.</b>
<b>COMMUNITY: Exeter Borough</b>	
<b>Category:</b>	Education and Awareness
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local EMA, Local Planning and Zoning Department
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Borough Annual Budget
<b>ACTION NO: 76</b>	<b>Use the Exeter Borough website to update residents on hazard mitigation related activities.</b>
<b>COMMUNITY: Exeter Borough</b>	
<b>Category:</b>	Education and Awareness
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Lead Agency/Department:</b>	Local EMA
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Borough Annual Budget
<b>ACTION NO: 77</b>	<b>Adopt a resolution to ensure Real Estate Disclosure of properties in the floodplain to potential residents interested in these properties.</b>
<b>COMMUNITY: Exeter Borough</b>	
<b>Category:</b>	Local Plans and Regulations
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Council, Local EMA, Local Department of Planning and Zoning
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Borough Annual Budget

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
ACTION NO: 78	Pursue the recommendations for culvert removal/replacement along the Hicks Creek, and pump station upgrades made in the 2006-2007 Hicks Creek and Abrahams Creek Flood Study. Continue to work with the Luzerne County Flood Protection Authority during the Detailed Feasibility Assessment of Hicks Creek concerning the construction of a pressure conduit, pump station, levee culvert modifications, or combination of these solutions.
COMMUNITY: Exeter Borough	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam; Levee Failure
Lead Agency/Department:	Local Engineering Department, Local Public Works Department in coordination with LCFPA
Implementation Schedule:	2-4 Years
Funding Source:	Borough Annual Budget
ACTION NO: 79	Consider elevation of houses and/or utilities along Susquehanna Avenue.
COMMUNITY: Exeter Borough	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Local Planning and Zoning Department
Implementation Schedule:	3-5 Years
Funding Source:	Borough Annual Budget
ACTION NO: 80	Conduct a feasibility study to determine improvements for the problem areas along Route 92, Dymund Creek, Sutton Creek and Appletree Road.
COMMUNITY: Exeter Township	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Local Engineering Department
Implementation Schedule:	2-3 Years
Funding Source:	Township Annual Budget
ACTION NO: 81	Identify creek and riverbank maintenance and stabilization activities along strategic areas of the Susquehanna River and the Township's tributary creeks.
COMMUNITY: Exeter Township	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Local Engineering Department, Local Public Works Department in coordination with LCFPA
Implementation Schedule:	2-3 Years

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
Funding Source:	Township Annual Budget
ACTION NO: 82	Develop a website for the Township and post a digital version of the FIRM and availability of flood protection guidance documents.
COMMUNITY: Exeter Township	
Category:	Education and Awareness
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Local EMA, Local Community Development Department
Implementation Schedule:	1-2 Years
Funding Source:	Township Annual Budget
ACTION NO: 83	Adopt a resolution to ensure Real Estate Disclosure of properties in the floodplain to potential residents interested in these properties.
COMMUNITY: Exeter Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Council, Local Department of Planning and Zoning
Implementation Schedule:	1-2 Years
Funding Source:	Township Annual Budget
ACTION NO: 84	An Emergency Action Plan for Lake Jean was adopted in 2006. Continue annual inspection of the dam and perform updates of the EAP as necessary.
COMMUNITY: Fairmount Township	
Category:	Local Plans and Regulations; Structural and Infrastructure
Hazard(s) Addressed:	Dam Failure; HHPD
Lead Agency/Department:	Local EMA, Local Engineering Department, Dam Owner
Implementation Schedule:	Ongoing
Funding Source:	Township Annual Budget
ACTION NO: 85	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).
COMMUNITY: Fairview Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	Local Planning and Zoning Department
Implementation Schedule:	1-2 Years
Funding Source:	Township Staff Time
ACTION NO: 86	Conduct a study to correct combined stormwater and sewer overflows.
COMMUNITY: Forty Fort Borough	
Category:	Structural and Infrastructure

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local Department of Public Works
<b>Implementation Schedule:</b>	2-3 Years
<b>Funding Source:</b>	Borough Annual Budget
<b>ACTION NO: 87</b>	<b>Identify specific mitigation actions for the structures on Shadetree Drive, Brookside Drive, and Tannery Road that are vulnerable to flooding.</b>
<b>COMMUNITY: Foster Township</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local EMA, Local Engineering Department
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 88</b>	<b>Identify mitigation options to reduce flooding on Municipal Road and Valley View Road.</b>
<b>COMMUNITY: Franklin Township</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local EMA, Local Engineering Department
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 89</b>	<b>Make repairs to the dam on Flat Rock Road.</b>
<b>COMMUNITY: Franklin Township</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Dam Failure
<b>Lead Agency/Department:</b>	Dam Owner
<b>Implementation Schedule:</b>	3-5 Years
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 90</b>	<b>Make repairs to the existing high hazard dam on Lake Louise.</b>
<b>COMMUNITY: Franklin Township</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Dam Failure; HHPD
<b>Lead Agency/Department:</b>	Dam Owner
<b>Implementation Schedule:</b>	3-5 Years
<b>Funding Source:</b>	Township Annual Budget; HHPD Grant Program
<b>ACTION NO: 91</b>	<b>Conduct a survey of structures in the Central Business District to address areas structural remediation is necessary.</b>
<b>COMMUNITY: Freeland Borough</b>	
<b>Category:</b>	Structural and Infrastructure

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<b>Hazard(s) Addressed:</b>	Land Subsidence
<b>Lead Agency/Department:</b>	Local Community Development Department
<b>Implementation Schedule:</b>	2-3 Years
<b>Funding Source:</b>	Borough Annual Budget
<b>ACTION NO: 92</b>	<b>Adopt a resolution to ensure Real Estate Disclosure of properties in the floodplain to potential residents interested in these properties.</b>
<b>COMMUNITY: Hanover Township</b>	
<b>Category:</b>	Local Plans and Regulations
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Council, Local Department of Planning and Zoning
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 93</b>	<b>Conduct public outreach to better educate residents to become better prepared to face hazards.</b>
<b>COMMUNITY: Hanover Township</b>	
<b>Category:</b>	Education and Awareness
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Lead Agency/Department:</b>	Local Department of Community Development
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 94</b>	<b>Repair storm water joins on Kniffer Street and Lyndwood Avenue. The joints are loose, causing sink holes</b>
<b>COMMUNITY: Hanover Township</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam; Sinkhole and Subsidence
<b>Lead Agency/Department:</b>	Local Stormwater Management Department/Public Works
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 95</b>	<b>Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).</b>
<b>COMMUNITY: Harveys Lake Borough</b>	
<b>Category:</b>	Local Plans and Regulations
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Lead Agency/Department:</b>	Local Planning and Zoning Department
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Borough Staff Time



## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
ACTION NO: 96	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).
COMMUNITY: Hazle Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	Local Planning and Zoning Department
Implementation Schedule:	1-2 Years
Funding Source:	Township Staff Time
ACTION NO: 97	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).
COMMUNITY: City of Hazleton	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	Local Planning and Zoning Department
Implementation Schedule:	1-2 Years
Funding Source:	City Staff Time
ACTION NO: 98	Conduct public outreach to better educate residents to become better prepared to face hazards.
COMMUNITY: City of Hazleton	
Category:	Education and Awareness
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	Local Community Development Department
Implementation Schedule:	1-2 Years
Funding Source:	City Annual Budget
ACTION NO: 99	Develop a sewer maintenance program.
COMMUNITY: City of Hazleton	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Department of Public Works
Implementation Schedule:	1-2 Years
Funding Source:	City Annual Budget
ACTION NO: 100	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).
COMMUNITY: Hollenback Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	All Hazards

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<b>Lead Agency/Department:</b>	Local Planning and Zoning Department
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Township Staff Time
<b>ACTION NO: 101</b>	<b>Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).</b>
<b>COMMUNITY: Hughestown Borough</b>	
<b>Category:</b>	Local Plans and Regulations
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Lead Agency/Department:</b>	Local Planning and Zoning Department
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Borough Staff Time
<b>ACTION NO: 102</b>	<b>Acquire and demolish/elevate residential structures located on Garden Drive and within the Susquehanna River's flood hazard area.</b>
<b>COMMUNITY: Hunlock Township</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local Planning and Zoning Department
<b>Implementation Schedule:</b>	Ongoing
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 103</b>	<b>The UGI propane tank storage facility lies along State Route 11. Construct guardrails alongside the road to protect the roadway for motorists.</b>
<b>COMMUNITY: Hunlock Township</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Hazardous Materials Release
<b>Lead Agency/Department:</b>	Local Streets Department
<b>Implementation Schedule:</b>	2-4 Years
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 104</b>	<b>Ground stabilization planting and building a barrier along routes to prevent roadway blockage caused by erosion and landslides.</b>
<b>COMMUNITY: Hunlock Township</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Landslides
<b>Lead Agency/Department:</b>	PennDOT
<b>Implementation Schedule:</b>	5-7 Years
<b>Funding Source:</b>	Township Annual Budget

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
ACTION NO: 105	Add piping and drains in Main Road 4016. The existing two drains are not capable of handling stormwater during heavy rainfall, causing ponding and flooding of homes.
COMMUNITY: Hunlock Township	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Commonwealth of PA, PennDOT
Implementation Schedule:	2-3 Years
Funding Source:	Township Annual Budget
ACTION NO: 106	Florkowski, Daro, Hubbard Flaps Roads and State Route 239 close during storm events as the Huntingdon Creek overtops roadway. Replace culverts at these locations.
COMMUNITY: Huntington Township	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Local Streets Department in coordination with PennDOT
Implementation Schedule:	3-5 Years
Funding Source:	Township Annual Budget
ACTION NO: 107	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).
COMMUNITY: Jackson Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	Local Planning & Zoning Department
Implementation Schedule:	1-2 Years
Funding Source:	Township Staff Time
ACTION NO: 108	Work with the County to develop a procedure to issue building permits and perform UCC functions including inspections.
COMMUNITY: Jeddo Borough	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	Local Planning & Zoning Department
Implementation Schedule:	1-2 Years
Funding Source:	Borough Annual Budget
ACTION NO: 109	Acquire and demolish/elevate residential structures located along River Road, Tennant Street, Miller Road, lots on Paradise TP and within the Susquehanna River's Special Flood Hazard Area.
COMMUNITY: Jenkins Township	

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local Planning & Zoning Department, Local Community Development Department
<b>Implementation Schedule:</b>	Ongoing
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 110</b>	Conduct an engineering study to identify the most appropriate Land Subsidence mitigation measure for the Government Building and Police Department on Wyoming Avenue.
<b>COMMUNITY: Kingston Borough</b>	
<b>Category:</b>	Local Plans and Regulations, Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Land Subsidence
<b>Lead Agency/Department:</b>	Local Engineering Department, Local EMA
<b>Implementation Schedule:</b>	2-3 Years
<b>Funding Source:</b>	Borough Annual Budget
<b>ACTION NO: 111</b>	Conduct an engineering study to identify the most appropriate Land Subsidence mitigation measure for the Chester Street Elementary School and Wyoming Valley West Middle School on Chester Street.
<b>COMMUNITY: Kingston Borough</b>	
<b>Category:</b>	Local Plans and Regulations, Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Land Subsidence
<b>Lead Agency/Department:</b>	Local Engineering Department
<b>Implementation Schedule:</b>	2-3 Years
<b>Funding Source:</b>	Borough Annual Budget
<b>ACTION NO: 112</b>	Identify the most appropriate mitigation measures for the Dallas Area Municipal Authority and the PA Water Treatment plant. Use FEMA publication 551, Selecting Appropriate Mitigation Measures for Floodprone Structures, which provides guidance on determining appropriate mitigation measures.
<b>COMMUNITY: Kingston Township</b>	
<b>Category:</b>	Local Plans and Regulations, Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Lead Agency/Department:</b>	Local EMA, Dallas Area Municipal Authority, PA Water Treatment Plant
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 113</b>	Conduct a study to identify the most appropriate mitigation measure for the 2 small dams located in the southwestern portion of the Township that are located near historic farming operations. Since Hillside Farms is public property, owners should be contacted.
<b>COMMUNITY: Kingston Township</b>	

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam; Dam Failure
<b>Lead Agency/Department:</b>	Local EMA, Local Planning & Zoning Department in coordination with LCFPA
<b>Implementation Schedule:</b>	2-3 Years
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 114</b>	<b>Investigate solutions to the flooding issues along Gardner Creek.</b>
<b>COMMUNITY: Laflin Borough</b>	
<b>Category:</b>	Local Plans and Regulations, Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local EMA, Local Planning & Zoning Department in coordination with LCFPA
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Borough Annual Budget
<b>ACTION NO: 115</b>	<b>Identify measures to address power outages due to a single source of electric power to the Borough, and which impact communication services in hazard events.</b>
<b>COMMUNITY: Laflin Borough</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Lead Agency/Department:</b>	Local EMA, Local Utilities Department
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Borough Annual Budget
<b>ACTION NO: 116</b>	<b>Identify measures to prevent/respond to train derailments in the Borough, which could impact evacuation procedures during hazard events.</b>
<b>COMMUNITY: Laflin Borough</b>	
<b>Category:</b>	Local Plans and Regulations, Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Lead Agency/Department:</b>	Local EMA, Railroad Owner
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Borough Annual Budget
<b>ACTION NO: 117</b>	<b>Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).</b>
<b>COMMUNITY: Lake Township</b>	
<b>Category:</b>	Local Plans and Regulations
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Lead Agency/Department:</b>	Local Planning and Zoning Department
<b>Implementation Schedule:</b>	1-2 Years

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
Funding Source:	Township Staff Time
ACTION NO: 118	Provide watertight seals for manholes impacted by flooding on the Susquehanna River.
COMMUNITY: Larksville Borough	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Department of Public Works
Implementation Schedule:	2-4 Years
Funding Source:	Borough Annual Budget
ACTION NO: 119	Identify clearing and dredging activities for Boston Creek upstream of US 11 in order to maintain its flood carrying and storage and capacity.
COMMUNITY: Larksville Borough	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Department of Public Works
Implementation Schedule:	1-2 Years
Funding Source:	Borough Annual Budget
ACTION NO: 120	Provide dry floodproofing measures for metal doors/windows for structures within the Susquehanna River's Special Flood Hazard Area.
COMMUNITY: Larksville Borough	
Category:	Education and Awareness
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Department of Public Works
Implementation Schedule:	2-4 Years
Funding Source:	Borough Annual Budget
ACTION NO: 121	Conduct an engineering study to identify the most appropriate mitigation measure for the Government Building on Dupont Drive.
COMMUNITY: Laurel Run Borough	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Local EMA, Local Engineering Department
Implementation Schedule:	2-3 Years
Funding Source:	Borough Annual Budget
ACTION NO: 122	The dam on Harvey's Creek has recently been classified as a high-risk dam. Develop a program to conduct regular maintenance of this dam.
COMMUNITY: Lehman Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam; Dam Failure, HHPD

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<b>Lead Agency/Department:</b>	Dam Owner
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 123</b>	Conduct an engineering study to identify the most appropriate mitigation measure for the Luzerne Borough Volunteer Fire Department on Academy Street.
<b>COMMUNITY: Luzerne Borough</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local EMA, Local Engineering Department
<b>Implementation Schedule:</b>	2-3 Years
<b>Funding Source:</b>	Borough Annual Budget
<b>ACTION NO: 124</b>	Conduct an engineering study to identify the most appropriate mitigation measure to address land subsidence for the Luzerne County Community College on South Prospect Street.
<b>COMMUNITY: City of Nanticoke</b>	
<b>Category:</b>	Local Plans and Regulations, Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam, Subsidence & Sinkholes
<b>Lead Agency/Department:</b>	Local Engineering Department
<b>Implementation Schedule:</b>	2-3 Years
<b>Funding Source:</b>	City Annual Budget
<b>ACTION NO: 125</b>	Pursue property acquisition for properties along the Newport Creek which are flooded by Susquehanna River backwater.
<b>COMMUNITY: City of Nanticoke</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local Planning and Zoning Department, Local Community Development Department
<b>Implementation Schedule:</b>	Ongoing
<b>Funding Source:</b>	City Annual Budget
<b>ACTION NO: 126</b>	Identify emergency management duties to protect residents north and south of the railroad tracks (which divide the borough) in the event of a train derailment.
<b>COMMUNITY: Nescopeck Borough</b>	
<b>Category:</b>	Local Plans and Regulations, Education and Awareness
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Lead Agency/Department:</b>	Local EMA
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Borough Annual Budget

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
ACTION NO: 127	Continue to pursue measures to protect the wastewater treatment plant's essential facilities which cannot be elevated above, or relocated out of, the floodplain.
COMMUNITY: Nescopeck Borough	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Local Public Works
Implementation Schedule:	3-5 Years
Funding Source:	Borough Annual Budget
ACTION NO: 128	Continue to acquire and demolish/elevate residential structures located along River Road and within the Susquehanna River's Special Flood Hazard Area.
COMMUNITY: Nescopeck Township	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Local Planning and Zoning Department
Implementation Schedule:	Ongoing
Funding Source:	Township Annual Budget
ACTION NO: 129	Continue to pursue measures to protect the wastewater treatment plant's essential facilities which cannot be elevated above, or relocated out of, the floodplain.
COMMUNITY: Nescopeck Township	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Local Public Works
Implementation Schedule:	3-5 Years
Funding Source:	Township Annual Budget
ACTION NO: 130	Work with the County to develop a procedure to issue building permits and perform UCC functions including inspections.
COMMUNITY: New Columbus Borough	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	Local Planning and Zoning Department
Implementation Schedule:	1-2 Years
Funding Source:	Borough Annual Budget
ACTION NO: 131	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).
COMMUNITY: Newport Township	



## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<b>Category:</b>	Local Plans and Regulations
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Lead Agency/Department:</b>	Local Planning and Zoning Department
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Township Staff Time
<b>ACTION NO: 132</b>	<b>Purchase a generator to assist the Borough during power outages.</b>
<b>COMMUNITY: Nuangola Borough</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Lead Agency/Department:</b>	Local EMA
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Borough Annual Budget
<b>ACTION NO: 133</b>	<b>Conduct a study to identify flooding problems at North End Road.</b>
<b>COMMUNITY: Nuangola Borough</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local Engineering Department
<b>Implementation Schedule:</b>	2-3 Years
<b>Funding Source:</b>	Borough Annual Budget
<b>ACTION NO: 134</b>	<b>Examine development in sensitive areas such as Lake Nuangola, wetlands, flood prone areas to ensure it complies with the local code/ordinance.</b>
<b>COMMUNITY: Nuangola Borough</b>	
<b>Category:</b>	Local Plans and Regulations
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local Planning and Zoning Department
<b>Implementation Schedule:</b>	3-5 Years
<b>Funding Source:</b>	Borough Annual Budget
<b>ACTION NO: 135</b>	<b>An Emergency Action Plan for Penn Lake was adopted in 2008. Continue annual inspection of the dam and perform updates of the EAP as necessary.</b>
<b>COMMUNITY: Penn Lake Park Borough</b>	
<b>Category:</b>	Local Plans and Regulations
<b>Hazard(s) Addressed:</b>	Dam Failure
<b>Lead Agency/Department:</b>	Local EMA, Dam Owner
<b>Implementation Schedule:</b>	Ongoing
<b>Funding Source:</b>	Borough Annual Budget

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
ACTION NO: 136	Conduct an engineering study to identify the most appropriate mitigation measure to address Land Subsidence for the Intake Dam, Mill Creek, on Armstrong Road.
COMMUNITY: Pittston Township	
Category:	Local Plans and Regulations, Structural and Infrastructure
Hazard(s) Addressed:	Land Subsidence
Lead Agency/Department:	Local Engineering Department
Implementation Schedule:	2-3 Years
Funding Source:	Township Annual Budget
ACTION NO: 137	Conduct an engineering study to identify the most appropriate mitigation measure to address Land Subsidence for the Pittston Township Police Department on Broad Street.
COMMUNITY: Pittston Township	
Category:	Local Plans and Regulations, Structural and Infrastructure
Hazard(s) Addressed:	Land Subsidence
Lead Agency/Department:	Local Engineering Department
Implementation Schedule:	2-3 Years
Funding Source:	Township Annual Budget
ACTION NO: 138	Evaluate storm drainage needs and sewer system improvements required for problem areas of Benedict Street, Towpath Court, KOZ area and New Street.
COMMUNITY: City of Pittston	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Local Public Works
Implementation Schedule:	1-2 Years
Funding Source:	City Annual Budget
ACTION NO: 139	Establish a Pittston City Newsletter for hazard mitigation information updates.
COMMUNITY: City of Pittston	
Category:	Education and Awareness
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	Local EMA, Local Community Development Department
Implementation Schedule:	1-2 Years
Funding Source:	City Annual Budget
ACTION NO: 140	Continue to identify and restore channels that are damaged/clogged causing flooding in the Township's residential areas .Most of the problematic channels have been addressed; the Township is pursuing some additional actions to restore the remainder of the channels in the Township.

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<b>COMMUNITY: Plains Township</b>	
<b>Category:</b>	Natural Systems Protection
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local Engineering Department in coordination with LCFPA
<b>Implementation Schedule:</b>	Ongoing
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 141</b>	Continue to acquire and demolish/elevate residential structures located along Gallagher Drive, McCullough Street, North River Road, North River Street, South River Street, Mitchell Street, Courtright Street, Reese Street, and Roberts Street that lie within the Susquehanna River's Special Flood Hazard Area.
<b>COMMUNITY: Plains Township</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local Planning & Zoning Department in coordination with LCFPA
<b>Implementation Schedule:</b>	Ongoing
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 142</b>	Pursue measures to minimize the potential for a train derailment caused by flooding where the Mill Creek meets the Gardners Creek at Union Street.
<b>COMMUNITY: Plains Township</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam, Hazardous Materials Release
<b>Lead Agency/Department:</b>	Local Engineering Department, Local Public Works/Streets Department
<b>Implementation Schedule:</b>	Ongoing
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 143</b>	Conduct an engineering study to identify the most appropriate mitigation measure to address Land Subsidence for the following three dams: 1)Brown Creek Dam on Cherry Street, Wadham Creek Dam on Shawnee Street, and Duffy's Run Dam on 1st Street.
<b>COMMUNITY: Plymouth Borough</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Land Subsidence; Dam Failure
<b>Lead Agency/Department:</b>	Local Engineering Department
<b>Implementation Schedule:</b>	2-3 Years
<b>Funding Source:</b>	Borough Annual Budget

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
ACTION NO: 144	Develop mitigation measures including an implementation strategy for the fire station and water treatment plant that are located in the floodplain. Use FEMA publication 551, <i>Selecting Appropriate Mitigation Measures for Floodprone Structures</i> , which provides guidance on determining appropriate mitigation measures.
<b>COMMUNITY: Plymouth Township</b>	
<b>Category:</b>	Local Plans and Regulations, Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Lead Agency/Department:</b>	Local EMA
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Township Annual Budget
ACTION NO: 145	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).
<b>COMMUNITY: Pringle Borough</b>	
<b>Category:</b>	Local Plans and Regulations
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Lead Agency/Department:</b>	Local Planning & Zoning Department
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	LUPTAP
ACTION NO: 146	Purchase a generator for the fire company to serve as back-up during power outages.
<b>COMMUNITY: Rice Township</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Lead Agency/Department:</b>	Local EMA
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Township Annual Budget
ACTION NO: 147	Purchase a generator for the Ross Township Building to serve as a back-up power source during power outages.
<b>COMMUNITY: Ross Township</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Lead Agency/Department:</b>	Local EMA
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Township Annual Budget
ACTION NO: 148	Since the nuclear material transported to and from the Susquehanna Steam Electric Nuclear Facility could pose a threat to the Township, make residents aware of the procedures to follow after a hazardous

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
	materials incident. Develop a brochure on what to do when an incident occurs.
<b>COMMUNITY: Salem Township</b>	
<b>Category:</b>	Education and Awareness
<b>Hazard(s) Addressed:</b>	Hazardous Materials Release; Nuclear Incident
<b>Lead Agency/Department:</b>	Local EMA, Local Community Development Department
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 149</b>	Identify options to address the flooding of Mud Swamp Creek unto Sonny Drive.
<b>COMMUNITY: Salem Township</b>	
<b>Category:</b>	Local Plans and Regulations, Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local Engineering Department, Local Public Works Department, in coordination with LCFPA
<b>Implementation Schedule:</b>	2-3 Years
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 150</b>	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).
<b>COMMUNITY: Slocum Township</b>	
<b>Category:</b>	Local Plans and Regulations
<b>Hazard(s) Addressed:</b>	Winter Weather
<b>Lead Agency/Department:</b>	Local Planning & Zoning Department
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	LUPTAP
<b>ACTION NO: 151</b>	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).
<b>COMMUNITY: Sugar Notch Borough</b>	
<b>Category:</b>	Local Plans and Regulations
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Lead Agency/Department:</b>	Local Planning & Zoning Department
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	LUPTAP
<b>ACTION NO: 152</b>	Identify measures to prevent sanitary sewer backups during rainfall and flooding events.
<b>COMMUNITY: Sugar Notch Borough</b>	

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local Public Works
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Borough Annual Budget
<b>ACTION NO: 153</b>	<b>Improve drainage structures and storm sewers throughout the Borough, which are undersized and cause roadway flooding.</b>
<b>COMMUNITY: Sugar Notch Borough</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local Public Works
<b>Implementation Schedule:</b>	2-3 Years
<b>Funding Source:</b>	Borough Annual Budget
<b>ACTION NO: 154</b>	<b>Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).</b>
<b>COMMUNITY: Sugarloaf Township</b>	
<b>Category:</b>	Local Plans and Regulations
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Lead Agency/Department:</b>	Local Planning & Zoning Department
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	LUPTAP
<b>ACTION NO: 155</b>	<b>Work with a consultant to determine the causes of, and investigate solutions to, the three flooding issues along Main Street.</b>
<b>COMMUNITY: Swoyersville Borough</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local EMA
<b>Implementation Schedule:</b>	2-3 Years
<b>Funding Source:</b>	Borough Annual Budget
<b>ACTION NO: 156</b>	<b>Conduct public outreach to better educate residents to become better prepared to face hazards.</b>
<b>COMMUNITY: Swoyersville Borough</b>	
<b>Category:</b>	Education and Awareness
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Lead Agency/Department:</b>	Local EMA, Local Community Development Department
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Borough Annual Budget

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
ACTION NO: 157	Clean culverts in township to prevent streams from flooding or damming up.
COMMUNITY: Union Township	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Local Emergency Manager
Implementation Schedule:	Ongoing
Funding Source:	Township Annual Budget
ACTION NO: 158	Work with the County to develop a procedure to issue building permits and perform UCC functions including inspections.
COMMUNITY: Warrior Run Borough	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	Local Planning & Zoning Department
Implementation Schedule:	1-2 Years
Funding Source:	Borough Annual Budget
ACTION NO: 159	Improve drainage structures and storm sewers throughout the Borough, which are inadequate and cause flooding.
COMMUNITY: Warrior Run Borough	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Local Public Works
Implementation Schedule:	2-3 Years
Funding Source:	Borough Annual Budget
ACTION NO: 160	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).
COMMUNITY: West Hazleton Borough	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	Local Planning & Zoning Department
Implementation Schedule:	1-2 Years
Funding Source:	LUPTAP
ACTION NO: 161	Since the hazardous materials from the Humboldt and Valmont industrial parks could pose a threat to the Borough, make residents aware of the procedures to follow after a hazardous materials incident. Develop a brochure on what to do when an incident occurs.
COMMUNITY: West Hazleton Borough	
Category:	Education and Awareness

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<b>Hazard(s) Addressed:</b>	Hazardous Materials Release
<b>Lead Agency/Department:</b>	Local EMA, Local Community Development Department
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Borough Annual Budget
<b>ACTION NO: 162</b>	<b>Identify structural solutions to stormwater ponding and sewer back-ups area in the Borough that had been subject to Land Subsidence.</b>
<b>COMMUNITY: West Pittston Borough</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam, Land Subsidence
<b>Lead Agency/Department:</b>	Local Engineering Department
<b>Implementation Schedule:</b>	2-3 Years
<b>Funding Source:</b>	Borough Annual Budget
<b>ACTION NO: 163</b>	<b>Offer a cost-sharing program for residents affected by sewage back-up damage and publicize use of backflow valves within the community to residents subject to sewer backups and associated damages.</b>
<b>COMMUNITY: West Pittston Borough</b>	
<b>Category:</b>	Education and Awareness
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Local Public Works
<b>Implementation Schedule:</b>	2-3 Years
<b>Funding Source:</b>	Borough Annual Budget
<b>ACTION NO: 164</b>	<b>Include information in the Borough newsletter on the availability of flood insurance, basement back-up insurance, and Land Subsidence insurance.</b>
<b>COMMUNITY: West Pittston Borough</b>	
<b>Category:</b>	Education and Awareness
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam, Land Subsidence
<b>Lead Agency/Department:</b>	Local Community Development Department
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Borough Annual Budget
<b>ACTION NO: 165</b>	<b>Purchase a portable generator to power heating systems at shelter locations.</b>
<b>COMMUNITY: West Pittston Borough</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Lead Agency/Department:</b>	Local EMA
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Borough Annual Budget



## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
ACTION NO: 166	Pursue the recommendations for culvert removal/replacement along the Abrahams Creek made in the 2006-2007 Hicks Creek and Abrahams Creek Flood Study. The undersized structures are the Upper 8th Street bridge and the Erie-Lackawanna Railroad bridge.
<b>COMMUNITY: West Wyoming Borough</b>	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Local Engineering Department
Implementation Schedule:	3-5 Years
Funding Source:	Borough Annual Budget
ACTION NO: 167	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).
<b>COMMUNITY: White Haven Borough</b>	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	Local Planning & Zoning Department
Implementation Schedule:	1-2 Years
Funding Source:	LUPTAP
ACTION NO: 168	Continue to work with the Luzerne County Flood Protection Authority and the City of Wilkes-Barre to finalize a solution to the flooding issues along Coal Brook.
<b>COMMUNITY: Wilkes-Barre Township</b>	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Local Engineering Department in coordination with LCFPA
Implementation Schedule:	2-3 Years
Funding Source:	Township Annual Budget
ACTION NO: 169	Conduct a study to identify the most appropriate mitigation measure for the Geisinger South hospital, which is located near historic mining operations and floodplains.
<b>COMMUNITY: City of Wilkes-Barre</b>	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	City Engineering Department
Implementation Schedule:	1-2 Years
Funding Source:	City Annual Budget
ACTION NO: 170	Consider the stabilization of Laurel Run Creek and Mill Creeks.
<b>COMMUNITY: City of Wilkes-Barre</b>	

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<b>Category:</b>	Natural Systems Protection
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	City Engineering Department in coordination with LCFPA
<b>Implementation Schedule:</b>	2-3 Years
<b>Funding Source:</b>	City Annual Budget
<b>ACTION NO: 171</b>	<b>Restore the wall along Solomon Creek.</b>
<b>COMMUNITY: City of Wilkes-Barre</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	City Engineering Department in coordination with LCFPA
<b>Implementation Schedule:</b>	2-4 Years
<b>Funding Source:</b>	City Annual Budget
<b>ACTION NO: 172</b>	<b>Continue to work with the Luzerne County Flood Protection Authority and Wilkes-Barre Township to finalize a solution to the flooding issues along Coal Brook.</b>
<b>COMMUNITY: City of Wilkes-Barre</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	City Engineering Department in coordination with LCFPA
<b>Implementation Schedule:</b>	Ongoing
<b>Funding Source:</b>	City Annual Budget
<b>ACTION NO: 173</b>	<b>Improve snow removal activities throughout the City during winter weather events.</b>
<b>COMMUNITY: City of Wilkes-Barre</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Winter Weather
<b>Lead Agency/Department:</b>	City Public Works/Streets Department
<b>Implementation Schedule:</b>	2-3 Years
<b>Funding Source:</b>	City Annual Budget
<b>ACTION NO: 174</b>	<b>Establish programs and facilities to prevent, reduce, and/or eliminate the impact of opioid addiction affecting vulnerable residents of the City of Wilkes-Barre.</b>
<b>COMMUNITY: City of Wilkes-Barre</b>	
<b>Category:</b>	Structural and Infrastructure, Education and Awareness
<b>Hazard(s) Addressed:</b>	Opioid Addiction
<b>Lead Agency/Department:</b>	City of Wilkes-Barre Department of Health, City of Wilkes-Barre EMA Coordinator
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	City Annual Budget

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
ACTION NO: 175	Obtain FEMA accreditation for the Wilkes-Barre City-Hanover Township Levee System.
COMMUNITY: City of Wilkes-Barre	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Levee Failure, Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	City of Wilkes-Barre Operations Department
Implementation Schedule:	5 Years
Funding Source:	City Annual Budget
ACTION NO: 176	Obtain FEMA accreditation for the Brookside Levee System.
COMMUNITY: City of Wilkes-Barre	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Levee Failure, Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	City of Wilkes-Barre Operations Department
Implementation Schedule:	5 Years
Funding Source:	City Annual Budget
ACTION NO: 177	Obtain FEMA accreditation for the Mill Creek Left Bank Upstream Levee System.
COMMUNITY: City of Wilkes-Barre	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Levee Failure, Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	City of Wilkes-Barre Operations Department
Implementation Schedule:	5 Years
Funding Source:	City Annual Budget
ACTION NO: 178	Obtain FEMA accreditation for the Laurel Run Levee System.
COMMUNITY: City of Wilkes-Barre	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Levee Failure, Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	City of Wilkes-Barre Operations Department
Implementation Schedule:	5 Years
Funding Source:	City Annual Budget
ACTION NO: 179	Rehabilitate/modify vulnerable bridges over streams including Strass Lane Bridge over Solomon Creek.
COMMUNITY: City of Wilkes-Barre	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<b>Lead Agency/Department:</b>	City of Wilkes-Barre Operations Department
<b>Implementation Schedule:</b>	2-3 Years
<b>Funding Source:</b>	City Annual Budget
<b>ACTION NO: 180</b>	Rehabilitate/modify bridges over streams vulnerable to flooding including Blackman Street Bridge over Bowman Spring Creek.
<b>COMMUNITY: City of Wilkes-Barre</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	City of Wilkes-Barre Operations Department
<b>Implementation Schedule:</b>	2-3 Years
<b>Funding Source:</b>	City Annual Budget
<b>ACTION NO: 181</b>	Relocate the Emergency Response Center outside of the flood hazard area. Convert 4,249 square feet of existing storage space on the second floor of the city-owned Department of Public Works building into an Emergency Response Center.
<b>COMMUNITY: City of Wilkes-Barre</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	All-Hazards, Flood, Flash Flood & Ice Jam
<b>Lead Agency/Department:</b>	City of Wilkes-Barre Department of Health, City of Wilkes-Barre EMA Coordinator
<b>Implementation Schedule:</b>	2-3 Years
<b>Funding Source:</b>	Luzerne County Local Share Account Program
<b>ACTION NO: 182</b>	Construct a storage/maintenance facility for LCFPA's Market Street Bridge Flood Closure Structures.
<b>COMMUNITY: City of Wilkes-Barre</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Levee Failure, Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Wilkes-Barre City Operations Department; the Wilkes-Barre City Emergency Management Coordinator and the Luzerne County Flood Protection Authority.
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Luzerne County Local Share Account Program
<b>ACTION NO: 183</b>	Improve drainage at the creek at Glendale Drive, Laurel Drive, and Terrace Drive to prevent them from flooding.
<b>COMMUNITY: Wright Township</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<b>Lead Agency/Department:</b>	Local Engineering Department
<b>Implementation Schedule:</b>	2-3 Years
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 184</b>	<b>Develop informational materials to educate and assist homeowners near wildfire prone areas of firewise concepts including safe zones and defensible spaces.</b>
<b>COMMUNITY: Wright Township</b>	
<b>Category:</b>	Education and Awareness
<b>Hazard(s) Addressed:</b>	Wildfire
<b>Lead Agency/Department:</b>	Local EMA, Local Community Development Department
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 185</b>	<b>Educate the public on potential hazards and provide emergency contact information for the public via the web. Focus on high pressure gas line and Crystal Lake dam warnings, and other common hazards like wildfires and downed phone lines.</b>
<b>COMMUNITY: Wright Township</b>	
<b>Category:</b>	Education and Awareness
<b>Hazard(s) Addressed:</b>	All Hazards
<b>Lead Agency/Department:</b>	Township Secretary, Township Fire Department
<b>Implementation Schedule:</b>	Ongoing
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 186</b>	<b>Hire third party code enforcement to enforce local safety and nuisance ordinances.</b>
<b>COMMUNITY: Wright Township</b>	
<b>Category:</b>	Local Plans and Regulations
<b>Hazard(s) Addressed:</b>	Wildfire
<b>Lead Agency/Department:</b>	Code Official
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Township Annual Budget
<b>ACTION NO: 187</b>	<b>Purchase new leaf machine to remove leaves from swales to mitigate flood issues throughout the Township.</b>
<b>COMMUNITY: Wright Township</b>	
<b>Category:</b>	Structural and Infrastructure
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Department of Public Works
<b>Implementation Schedule:</b>	1-2 Years
<b>Funding Source:</b>	Township Annual Budget

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-1 List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
ACTION NO: 188	Remove dead and downed trees/lumber throughout the Township to mitigate wildfire hazard.
COMMUNITY: Wright Township	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Wildfire
Lead Agency/Department:	Fire Department, Department of Public Works, Township Administration
Implementation Schedule:	Ongoing
Funding Source:	Township Annual Budget
ACTION NO: 189	Pursue the recommendations along the Abrahams Creek made in the Hicks Creek and Abrahams Creek Detailed Feasibility Study, to address flooding issues on Eight Street, Swetland Lane.
COMMUNITY: Wyoming Borough	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Local Engineering Department, Local Planning and Zoning Department
Implementation Schedule:	2-3 Years
Funding Source:	Borough Annual Budget
ACTION NO: 190	Identify flood protection measures, or pursue property acquisition, for properties along Susquehanna Avenue between 4th and 8th Streets which are affected by flooding from the Susquehanna River.
COMMUNITY: Wyoming Borough	
Category:	Structural and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Local Planning & Zoning Department
Implementation Schedule:	Ongoing
Funding Source:	Borough Annual Budget
ACTION NO: 191	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).
COMMUNITY: Yatesville Borough	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	Local Planning & Zoning Department
Implementation Schedule:	1-2 Years
Funding Source:	Borough Staff Time

At least one mitigation action was established for each hazard in Luzerne County. More than one action is identified for several hazards. Every participating jurisdiction has at least one mitigation action.

Many of these mitigation actions will require substantial time commitments from staff at the County and local municipalities. While all these activities will be pursued over the next five years, the reality of limited time and resources requires the identification of the feasibility and priority level of mitigation actions. Prioritization allows the individuals and organizations involved to focus their energies and ensure progress on mitigation activities.

Evaluating mitigation actions involves judging each action against certain criteria to determine its feasibility and potential impact. Actions evaluated and prioritized by applying the Multi-Objective Mitigation Action Prioritization criteria. For each action, scores were assigned to each criterion using the following weighted, multi-objective mitigation action prioritization criteria.

- **Effectiveness** (weight: 20% of score): The extent to which an action reduces the vulnerability of people and property.
- **Efficiency** (weight: 30% of score): The extent to which time, effort, and cost is well used as a means of reducing vulnerability.
- **Multi-Hazard Mitigation** (weight: 20% of score): The action reduces vulnerability for more than one hazard.
- **Addresses High Risk Hazard** (weight: 15% of score): The action reduces vulnerability for people and property from a hazard(s) identified as high risk.
- **Addresses Critical Communications/Critical Infrastructure** (weight: 15% of score): The action pertains to the maintenance of critical functions and structures such as transportation, supply chain management, data circuits, etc.

Scores of 1, 2, or 3 were assigned for each multi-objective mitigation action prioritization criterion where 1 is a low score and 3 is a high score. The Efficiency criterion, which considers the cost and effort of each action versus its overall vulnerability reduction benefit, is the most highly weighted criterion as part of the total prioritization score. Actions were prioritized using the cumulative score assigned to each. Each mitigation action was then given a priority ranking (Low, Medium, and High) based on the following:

- Low Priority: 1.0 – 1.8
- Medium Priority: 1.9 – 2.4
- High Priority: 2.5 – 3.0

Table 6.4-2 presents the cumulative results of the prioritization of mitigation actions. 30 actions were ranked High Priority, 47 are ranked Medium Priority, with the remaining 114 ranked as Low Priority.

Table 6.4-2 Mitigation Action Prioritization.							
MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					
		Low = 0.0-1.8		Medium = 1.9-2.4		High = 2.5-3.0	
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/Critical Infrastructure	Total Score
1	Continue to work with the Red Cross to conduct an annual assessment of existing shelters in the county to determine their condition and adequacy with respect to beds, etc. and determine which ones would need to be retrofitted. Identify additional locations that could be equipped and identified as shelters based on the needs and the population centers in the county.	1.5	1	2.5	2.5	2	1.8
2	Include the following language in the new county zoning ordinance to: 1) concur with the Model Floodplain Ordinance and/or regulations and the Subdivision/Land development Ordinance (SALDO) with respect to what is allowed in the floodplain; and 2) for all development to construct first floors above the base flood elevation for areas that are protected by the levee systems.	2	3	1.5	3	2	2.4
3	Evaluate the Preliminary Flood Insurance Rate Map, scheduled to be released in Fall 2020, to determine where and how changes to the flood hazard area and base flood elevation are expected. Apply this new data to floodplain management and development across the County and incorporate it into the next annual HMP review.	3	3	2	3	2	2.7
4	Promote and share information about available trainings and webinars (provided by ASFPM, PAFPM, FEMA, DEP, etc.) with local floodplain management officials.	1.5	1	2.5	2.5	2	1.8
5	Work with the following four municipalities to encourage them to issue building permits and perform UCC functions including inspections: Jeddo, New Columbus, and Warrior Run Boroughs and Ross Township.	2	3	1.5	3	2	2.4
6	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).	1.5	1.5	2	2	1.5	1.7



## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-2 Mitigation Action Prioritization.							
MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					
		Low = 0.0-1.8		Medium = 1.9-2.4		High = 2.5-3.0	
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	Total Score
7	Work with municipalities, particularly those along the Susquehanna River and large streams, to join the CRS by educating them on the benefits of CRS and also providing them with technical assistance; work with municipalities to adopt and enforce the requirements of the Countywide ACT 167 plan.	2	3	1.5	3	2	2.4
8	Develop a Source Water Protection Plan to properly utilize and protect ground water resources in the two counties.	1.5	1.5	2	3	2	1.9
9	Encourage the county to include in their zoning ordinance, measures to: enhance the concept of defensible space practice; and discourage development on permeable soils to reduce the impacts of drought.	2	2	1.5	3	2	2.1
10	Encourage the individual municipalities to be firmly committed to continued compliance with the NFIP by regulating development and redevelopment through the adoptions of provisions that exceed the minimum NFIP requirements. Work with communities to ensure that there are no deficiencies when the Community Assistance Visits are conducted to ensure continued compliance.	2	3	2	3	2	2.5
11	Work with each municipality to identify a point of contact to perform an annual review of the mitigation actions for their municipality from this Hazard Mitigation Plan.	2.5	2.5	3	3	2.5	2.7
12	Initiate a research and education program with local universities to map the extents of the mine pools in the Lackawanna and Susquehanna River valleys. Because earthquakes will have the greatest effect in areas of abandoned mine lands, this program will seek to quantify the effects of earthquakes on destabilized earth, such as that over flooded mine pools.	2	2	1.5	2	2	1.9

Table 6.4-2 Mitigation Action Prioritization.							
MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					
		Low = 0.0-1.8		Medium = 1.9-2.4		High = 2.5-3.0	
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	Total Score
13	Coordinate efforts between the Joint-County Comprehensive Plan and the countywide Act 167 Stormwater Management Plan to identify groundwater recharge areas and sensitive groundwater areas such as mine lands. Work closely with the municipalities to enforce infiltration and groundwater recharge requirements in these areas to reduce the impacts of drought.	2	2	2	3	2	2.2
14	For those parties not interested in acquisition or where acquisition is not feasible, continue to work with municipalities to advise homeowners with a preferred mitigation alternative including demolition, reconstruction and elevation or flood proofing.	1.5	2	1.5	3	2	2.0
15	Work with Duryea Borough and DEP to conduct annual inspections of the structures that discharge stormwater and groundwater from the flooded mine pool and identify any structural repairs needed.	2	1.5	1.5	3	2	1.9
16	Encourage municipalities to reduce the vulnerability of critical facilities to wildfires by: increasing buffers and introducing defensible spaces; identifying farm roads, service roads, and other private access corridors in high hazard areas that could be used as fire breaks; and providing assistance to the County Emergency Management to identify vulnerable structures (firewise communities).	1.5	1.5	1.5	2	2	1.7
17	Work with FEMA to conduct detailed studies for Abrahams Creek of Forty Fort, Big Wapwallopen Creek, Lackawanna River, Nescopeck Creek, Solomon Creek, and Toby Creek as identified in the FEMA Region III Post-Flood Community Flood Risk Evaluation for Luzerne County.	2	3	1.5	3	2	2.4

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-2 Mitigation Action Prioritization.							
MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					
		Low = 0.0-1.8		Medium = 1.9-2.4		High = 2.5-3.0	
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	Total Score
18	Designate specific locations throughout the County such as the Emergency Management Agency, Planning & Zoning Department, municipal libraries, and events such as fairs to provide information to the public on flooding and other hazards. Encourage these locations to stock a variety of FEMA publications on various natural and human caused hazards and also the most recent FIRMs; also include information on the County's website.	2	2	1.5	3	2	2.1
19	Conduct an educational campaign and develop brochures on topics such as: the impacts of drought, proper sediment and erosion control, and dangers of developing on old mines and dumps.	2	2	2.5	2	2	2.1
20	Stay closely involved with the activities of the Delaware Regional Basin Commission, Susquehanna River Basin Commission, Water Board, and other water planning organizations by encouraging a staff member from the County Planning & Zoning to be present at their meetings depending on their availability.	2	3	1.5	3	2	2.4
21	Work with State agencies, professional organizations, and non-government organizations to conduct an annual workshop at a key location in each county for private developers to involve them in hazard mitigation activities and educate them on 'safe' development principles that can be incorporated into their development proposals.	1.5	1.5	2	2	2	1.8
22	Continue to provide inquirers with technical advice and information from the community's FIRM and FEMA's website on a property's location in a Special Flood Hazard Area, zone, and its base flood elevation if data is available.	2	2	1.5	3	2	2.1

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-2 Mitigation Action Prioritization.							
MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					
		Low = 0.0-1.8		Medium = 1.9-2.4		High = 2.5-3.0	
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	Total Score
23	Work with real estate agents throughout the county and encourage them to advise prospective property purchasers in flood prone and land subsidence areas to obtain flood or land subsidence insurance in municipalities over which the County has jurisdiction.	1.5	1.5	1.5	1.5	2	1.6
24	Continue to perform regular inspections of the Wyoming Valley Flood Risk Management Project as outlined in the Project Cooperation Agreement between the federal government and LCFPA.	3	2	2	3	3	2.5
25	Monitor and evaluate mitigation actions annually and update the hazard mitigation plan every five years to reflect changes in development after a major hazard event and provide technical assistance to municipalities in implementing individual hazard mitigation actions.	3	3	3	3	3	3.0
26	Continue to maintain and update threat protection program software	3	3	3	3	3	3.0
27	Provide annual cyber-security and awareness training to all County staff to reduce risk and occurrence of phishing and malware attacks	3	3	1	2	3	2.5
28	Provide notice of funding opportunity and supporting documentation from the county HMP to EMCs of municipalities with High Hazard Potential Dams to promote rehabilitation and safety in Luzerne County.	1.5	1.5	1.5	1	2	1.5
29	Each spring, post a link on the County website banner with hailstorm safety information.	1.5	1.5	1.5	1	2	1.5
30	Identify hazardous materials sites, including TRI facilities and oil and gas wells, that are in or near flood zones and develop strategies to reduce potential damage.	1	1	1.5	2	2	1.4
31	Identify opportunities to upgrade or bury power lines during new development or redevelopment.	2	3	1.5	3	2	2.4
32	Maintain regular contact with Pennsylvania Department of Conservation and Natural Resources to ensure that County information about the potential for landslides is current.	2	3	1.5	3	2	2.4

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-2 Mitigation Action Prioritization.							
MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					
		Low = 0.0-1.8		Medium = 1.9-2.4		High = 2.5-3.0	
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/Critical Infrastructure	Total Score
33	Continue to work with the USACE to implement the National Levee Safety Program and refine an inventory of all levees in the County.	1.5	1.5	1.5	3	3	2.0
34	Develop nuclear mitigation actions work group.	2	2	1.5	2	2	1.9
35	Work with the Wilkes-Barre City Health Department and the PA Health Department to make the public aware of the availability of a Covid-19 vaccine, once a vaccine has been developed.	3	2	1.5	2	1	2.0
36	Work with other County Departments to incorporate hazard mitigation actions and planning into other plan updates, including Emergency Operations Plan updates.	2	3	1.5	3	2	2.4
37	Work with Pennsylvania Department of Health to increase awareness about treating and preventing opioid addiction.	2	3	1.5	2	2	2.2
38	Encourage homeowners to install appropriate devices to monitor and reduce radon exposure in homes.	2	2	1.5	1	2	1.8
39	After an event, provide information on alternatives to reconstruction of structures that sustain damages more than or equal to 50% of value to property owners.	2	1.5	3	3	3	2.4
40	Work with PEMA to transition evacuation planning for the Susquehanna Steam Electric Station to the new "keyhole" approach	2	2	1	2	3	2.0
41	Coordinate with PEMA and Talen Energy on updated public information materials and a public information campaign to inform people in the 10-mile EPZ about the new evacuation plan.	2	2	1	2	3	2.0
42	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).	1.5	1.5	2	2	1.5	1.7

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-2 Mitigation Action Prioritization.							
MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					
		Low = 0.0-1.8		Medium = 1.9-2.4		High = 2.5-3.0	
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/Critical Infrastructure	Total Score
43	Identify mitigation options to address the flooding of Mill Creek on the 700 block of Grove Street. Use FEMA publication 551, Selecting Appropriate Mitigation Measures for Floodprone Structures, which provides guidance on determining appropriate mitigation measures.	3	2.5	2.5	3	2.5	2.7
44	Identify measures to prevent/remove ice build up in the Mill Creek channel during winter months.	2	2	2	2	3	2.2
45	Improve drainage structures and storm sewers throughout the Borough, which are undersized and cause roadway flooding.	2	2	1.75	2.5	2.25	2.1
46	Separate combined sanitary and storm sewers in the 3rd Ward.	2.5	2.5	2	2.5	3	2.5
47	Make municipal building accessible to residents to do business without having to come in direct contact with township employees. Outfit front door with an intercom that would allow visitors be buzzed into the building and place hand sanitizing stations throughout.	1.5	1.5	2	2	1.5	1.7
48	Consider adding walls to Falls Creek.	1.2	1.2	1.5	2	2	1.5
49	Improve access for snow removal on certain roads with snow plow truck operation.	1	1.5	1	2	2	1.5
50	Engineering study to assess feasibility and cost, and title search cost estimate, of project to channelize/dredge the Bear Creek South of SR 115 in the Borough.	1	1.5	1	1	1	1.2
51	Identify specific mitigation actions for the structures on Wilkes Barre and Easton Roads that are vulnerable to flooding.	1.5	2	1.5	2	2	1.8
52	Identify mitigation options to address the flooding action on Nescopeck Creek and St. Johns Road and State Route 222. Use FEMA publication 551, Selecting Appropriate Mitigation Measures for Floodprone Structures, which provides guidance on determining appropriate mitigation measures.	2	2	2	2	2.25	2.0

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-2 Mitigation Action Prioritization.							
MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					
		Low = 0.0-1.8		Medium = 1.9-2.4		High = 2.5-3.0	
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/Critical Infrastructure	Total Score
53	The urbanization of the Borough without stormwater management controls has led to flooding issues from stormwater run-off upstream of the Borough. Develop a plan to implement stormwater management features in the Borough. Pursue recommendations identified in the Act 167 Plan and consider sewer pump retrofit.	2	1	1.5	2	2	1.6
54	Ensure integration of vulnerabilities into local, regional, and countywide comprehensive planning processes.	2	2	3	3	3	2.5
55	Work with the County to develop a procedure to issue building permits and perform UCC functions including inspections.	1.5	1	2.5	2.5	2	1.8
56	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).	1.5	1.5	2	2	1.5	1.7
57	Conduct an engineering study to identify the most appropriate mitigation measure for the Borough's Government Building and the Police Department on Main Street.	1.5	1.5	1	2	1.5	1.5
58	Conduct an engineering study to identify the most appropriate mitigation measure for heavy rain - flooding in the area of Columbia Avenue, American Legion Post and Leggio's Restaurant.	1.5	1.5	1	2	1.5	1.5
59	Conduct an inspection and provide engineering recommendation for the Toby Creek culvert which runs underneath Fino's Pharmacy, Citizens Bank and their respective parking lots.	1.5	1.5	1	2	1.5	1.5
60	Creek bank restoration and sedimentation clean out around culvert area in tributary to Toby creek. This will mitigate storm water flooding in area near Forest St/Wood Lawn Ave.	2	2	1.5	2	2	1.9

Table 6.4-2 Mitigation Action Prioritization.							
MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					
		Low = 0.0-1.8		Medium = 1.9-2.4		High = 2.5-3.0	
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	Total Score
61	Conduct a study to identify ways (e.g., property acquisitions and stream widening) to mitigate the continual flooding of properties at the confluence of Toby's Creek and Trout Run (Fernbrook Corners).	2	2	1.5	2.5	2.5	2.1
62	Flooding along Leonard's Creek has caused severe damage to two bridges and channel improvements. FEMA funding has been secured to rebuild one bridge and wall improvements. Identify additional actions that should be taken at the Kunkle/Leonard's and Shady Side Creek area.	2.5	2.5	2	3	3	2.6
63	Conduct a study to identify stream bed improvements along public roads which continue to be heavy flooded.	1.5	1	2.5	2.5	2	1.8
64	Conduct a study to identify the need for retaining structures with creek bed improvements at Toby Creek from Offset Paperback and Route 309 to the Dallas Township - Kingston Township municipal boundary.	2.5	2.5	2	3	3	2.6
65	Conduct an engineering study to identify the most appropriate mitigation measure for the multiple structures in the Special Flood Hazard Area throughout the Township.	1	1	2	2	2	1.5
66	Conduct a study to identify solutions to mitigating regular flooding at the intersection of Stairville Road and St. Mary's Road.	1	1	2	2	2	1.5
67	Conduct a study to identify problems on Dupont Creek (Lidy, Collins, Mill) and Mill Creek.	2.5	2.5	2.5	3	3	2.7
68	Lower Lackawanna Sewer Authority placed a valve in their Diversion Chamber to help alleviate the sewage from backing up into the homes on Chittenden Street. LLVSA inspects and maintains the valve but does not determine when the valve should be opened or closed. Duryea Borough Sewer Authority is interested in the placement of check valves for sanitary laterals on individual homes located on Chittenden Street.	3	3	2.5	3	3	2.9



Table 6.4-2 Mitigation Action Prioritization.							
MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					
		Low = 0.0-1.8		Medium = 1.9-2.4		High = 2.5-3.0	
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	Total Score
69	Purchase portable pumps along with discharge hoses for pumping of landside water in the event the flap gates are closed and interior flooding of streets occurs on the landside of the levee.	1.5	1	1.5	2	2	1.5
70	Raise Levee/Dike System in Duryea Borough.	1	1	1.5	2	2	1.4
71	Identify specific mitigation for the structures on Hillside Avenue, Elm, Green, and Cherry Streets that are vulnerable to mine subsidence.	1	1	1.5	2	2	1.4
72	Move the EOC out of flood waters. Maintenance of underground Floodway interceptor.	3	3	2.5	2.75	2.75	2.8
73	Conduct a feasibility study for floodwall protection improvements required for the problem areas of Susquehanna Avenue and Grant Street.	1.5	1	1.5	2	2	1.5
74	Continue to perform creek and river bank maintenance and stabilization activities along strategic areas of the Susquehanna River and Hicks Creek.	1.5	1	1.5	2	2	1.5
75	Post access to the FIRM and the availability of flood protection guidance documents on the Borough website.	2	2	1	1.5	1.5	1.7
76	Use the Exeter Borough website to update residents on hazard mitigation related activities.	2	2	1	1.5	1.5	1.7
77	Adopt a resolution to ensure Real Estate Disclosure of properties in the floodplain to potential residents interested in these properties.	1.5	1	1	2	2	1.4
78	Pursue the recommendations for culvert removal/replacement along the Hicks Creek, and pump station upgrades made in the 2006-2007 Hicks Creek and Abrahams Creek Flood Study. Continue to work with the Luzerne County Flood Protection Authority during the Detailed Feasibility Assessment of Hicks Creek concerning the construction of a pressure conduit, pump station, levee culvert modifications, or combination of these solutions.	2.5	2.5	2.5	3	3	2.7

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-2 Mitigation Action Prioritization.							
MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					
		Low = 0.0-1.8		Medium = 1.9-2.4		High = 2.5-3.0	
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	Total Score
79	Consider elevation of houses and/or utilities along Susquehanna Avenue	2.5	2.5	3	3	3	2.8
80	Conduct a feasibility study to determine improvements for the problem areas along Route 92, Dymund Creek, Sutton Creek and Appletree Road.	1.5	1.5	1.5	2	2	1.7
81	Identify creek and river bank maintenance and stabilization activities along strategic areas of the Susquehanna River and the Township's tributary creeks.	2	2	1.5	2	2	1.9
82	Develop a website for the Township and post access to the FIRM and availability of flood protection guidance documents.	2	2	1	1.5	1.5	1.7
83	Adopt a resolution to ensure Real Estate Disclosure of properties in the floodplain to potential residents interested in these properties.	1.5	1.5	1.5	1.5	1.5	1.5
84	An Emergency Action Plan for Lake Jean was adopted in 2006. Continue annual inspection of the dam and perform updates of the EAP as necessary.	1.5	1.5	1.5	2	2	1.7
85	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).	1.5	1.5	2	2	1.5	1.7
86	Conduct a study to correct combined stormwater and sewer overflows.	2	2	1.5	2	2	1.9
87	Identify specific mitigation actions for the structures on Shadetree Drive, Brookside Drive, and Tannery Road that are vulnerable to flooding.	1.5	1	1.5	2	2	1.5
88	Identify mitigation options to reduce flooding on Municipal Road and Valley View Road.	1.5	1	1.5	2	2	1.5
89	Make repairs to the dam on Flat Rock Road.	1.5	1	1.5	2	2	1.5
90	Make repairs to the existing high hazard dam on Lake Louise.	1.5	1	1.5	2	2	1.5
91	Conduct a survey of structures in the Central Business District to address areas structural remediation is necessary.	1.5	1	1.5	2	2	1.5

Table 6.4-2 Mitigation Action Prioritization.							
MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					
		Low = 0.0-1.8		Medium = 1.9-2.4		High = 2.5-3.0	
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/Critical Infrastructure	Total Score
92	Adopt a resolution to ensure Real Estate Disclosure of properties in the floodplain to potential residents interested in these properties.	1.5	1	1.5	2	2	1.5
93	Conduct public outreach to better educate residents to become better prepared to face hazards.	1.5	1	1.5	2	2	1.5
94	Repair storm water joins on Kniffer Street and Lyndwood Avenue. The joints are loose, causing sink holes	1.5	1.5	1.5	2	2.5	1.7
95	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).	1.5	1.5	2	2	1.5	1.7
96	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).	1.5	1.5	2	2	1.5	1.7
97	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).	1.5	1.5	2	2	1.5	1.7
98	Conduct public outreach to better educate residents to become better prepared to face hazards.	1.5	1.5	3	1.5	1.5	1.8
99	Develop a sewer maintenance program.	1.75	1.5	1.5	2	2	1.7
100	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).	1.5	1.5	2	2	1.5	1.7
101	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).	1.5	1.5	2	2	1.5	1.7

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-2 Mitigation Action Prioritization.							
MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					
		Low = 0.0-1.8		Medium = 1.9-2.4		High = 2.5-3.0	
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/Critical Infrastructure	Total Score
102	Acquire and demolish/elevate residential structures located on Garden Drive and within the Susquehanna River's flood hazard area.	2.5	2.5	3	3	3	2.8
103	The UGI propane tank storage facility lies along State Route 11. Construct guardrails alongside the road to protect the roadway for motorists.	1.5	1.5	1	1	2	1.4
104	Ground stabilization planting and building a barrier along routes to prevent roadway blockage caused by erosion and landslides.	1.5	1.5	2	1	2	1.6
105	Add piping and drains in Main Road 4016. The existing two drains are not capable of handling stormwater during heavy rainfall, causing ponding and flooding of homes.	1.5	1.5	1	1	2	1.4
106	Florkowski, Daro, Hubbard Flaps Roads and State Route 239 close during storm events as the Huntingdon Creek overtops roadway. Replace culverts at these locations.	1.5	2	2	2	2	1.9
107	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).	1.5	1.5	2	2	1.5	1.7
108	Work with the County to develop a procedure to issue building permits and perform UCC functions including inspections.	1.5	1.5	2	1	2	1.6
109	Acquire and demolish/elevate residential structures located along River Road, Tennant Street, Miller Road, lots on Paradise TP and within the Susquehanna River's Special Flood Hazard Area.	2.5	2.5	3	3	3	2.8
110	Conduct an engineering study to identify the most appropriate land subsidence mitigation measure for the Government Building and Police Department on Wyoming Avenue.	1.5	1.5	2	1	2	1.6
111	Conduct an engineering study to identify the most appropriate land subsidence mitigation measure for the Chester Street Elementary School and Wyoming Valley West Middle School on Chester Street.	1.5	1.5	2	1	2	1.6

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-2 Mitigation Action Prioritization.							
MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					
		Low = 0.0-1.8		Medium = 1.9-2.4		High = 2.5-3.0	
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	Total Score
112	Identify the most appropriate mitigation measures for the Dallas Area Municipal Authority and the PA Water Treatment plant. Use FEMA publication 551, Selecting Appropriate Mitigation Measures for Floodprone Structures, which provides guidance on determining appropriate mitigation measures.	2	2.5	3	3	3	2.7
113	Conduct a study to identify the most appropriate mitigation measure for the 2 small dams located in the southwestern portion of the Township that are located near historic farming operations. Since Hillside Farms is public property, owners should be contacted.	1.5	1.5	2	1	2	1.6
114	Investigate solutions to the flooding issues along Gardner Creek.	1.5	1.5	2	1	2	1.6
115	Identify measures to address power outages due to a single source of electric power to the Borough, and which impact communication services in hazard events.	1.75	1.75	2	2	2.5	2.0
116	Identify measures to prevent/respond to train derailments in the Borough, which could impact evacuation procedures during hazard events.	1.75	1.75	2	2	2.5	2.0
117	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).	1.5	1.5	2	2	1.5	1.7
118	Provide watertight seals for manholes impacted by flooding on the Susquehanna River.	1.5	1.5	2	2	2	1.8
119	Identify clearing and dredging activities for Boston Creek upstream of US 11 in order to maintain its flood carrying and storage and capacity.	1.5	1.5	2	2	2	1.8
120	Provide dry floodproofing measures for metal doors/windows for structures within the Susquehanna River's Special Flood Hazard Area.	1.5	1.5	2	2	2	1.8

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-2 Mitigation Action Prioritization.							
MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					
		Low = 0.0-1.8		Medium = 1.9-2.4		High = 2.5-3.0	
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	Total Score
121	Conduct an engineering study to identify the most appropriate mitigation measure for the Government Building on Dupont Drive.	1.5	1.5	2	2	2	1.8
122	The dam on Harvey's Creek has recently been classified as a high-risk dam. Develop a program to conduct regular maintenance of this dam.	1.5	1.5	2	2	2	1.8
123	Conduct an engineering study to identify the most appropriate mitigation measure for the Luzerne Borough Volunteer Fire Department on Academy Street.	1.5	1.5	2	2	2	1.8
124	Conduct an engineering study to identify the most appropriate mitigation measure to address land subsidence for the Luzerne County Community College on South Prospect Street.	1.5	1.5	2	2.25	2	1.8
125	Pursue property acquisition for properties along the Newport Creek which are flooded by Susquehanna River backwater.	1.5	1.5	2	2.5	2.5	1.9
126	Identify emergency management duties to protect residents north and south of the railroad tracks (which divide the borough) in the event of a train derailment.	1.5	1.5	2	2.5	2.5	1.9
127	Continue to pursue measures to protect the wastewater treatment plant's essential facilities which cannot be elevated above, or relocated out of, the floodplain.	2	2.5	3	3	3	2.7
128	Continue to acquire and demolish/elevate residential structures located along River Road and within the Susquehanna River's Special Flood Hazard Area.	2	2.5	3	3	3	2.7
129	Continue to pursue measures to protect the wastewater treatment plant's essential facilities which cannot be elevated above, or relocated out of, the floodplain.	2	2.5	3	3	3	2.7
130	Work with the County to develop a procedure to issue building permits and perform UCC functions including inspections.	1.5	1.5	1	2.25	2	1.6

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-2 Mitigation Action Prioritization.							
MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					
		Low = 0.0-1.8		Medium = 1.9-2.4		High = 2.5-3.0	
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	Total Score
131	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).	1.5	1.5	1	2.5	2	1.6
132	Purchase a generator to assist the Borough during power outages.	1.5	1.5	1	2	2	1.6
133	Conduct a study to identify flooding problems at North End Road.	1.5	1.5	1	2	2	1.6
134	Examine development in sensitive areas such as Lake Nuangola, wetlands, flood prone areas to ensure it complies with the local code/ordinance.	1.5	2	2	2.25	2	1.9
135	An Emergency Action Plan for Penn Lake was adopted in 2008. Continue annual inspection of the dam and perform updates of the EAP as necessary.	1.5	1.5	1	2	2	1.6
136	Conduct an engineering study to identify the most appropriate mitigation measure to address mine subsidence for the Intake Dam, Mill Creek, on Armstrong Road.	1.5	1.5	1	2	2	1.6
137	Conduct an engineering study to identify the most appropriate mitigation measure to address mine subsidence for the Pittston Township Police Department on Broad Street.	1.5	1.5	1	2	2	1.6
138	Evaluate storm drainage needs and sewer system improvements required for problem areas of Benedict Street, Towpath Court, KOZ area and New Street.	1.5	1.5	1	2	2	1.6
139	Establish a Pittston City Newsletter for hazard mitigation information updates.	1.5	1.5	2	2.5	2	1.8
140	Continue to identify and restore channels that are damaged/clogged causing flooding in the Township's residential areas .Most of the problematic channels have been addressed; the Township is pursuing some additional actions to restore the remainder of the channels in the Township.	1.5	1.5	1	2	2	1.6

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-2 Mitigation Action Prioritization.							
MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					
		Low = 0.0-1.8		Medium = 1.9-2.4		High = 2.5-3.0	
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	Total Score
141	Continue to acquire and demolish/elevate residential structures located along Gallagher Drive, McCullough Street, North River Road, North River Street, South River Street, Mitchell Street, Courtright Street, Reese Street, and Roberts Street that lie within the Susquehanna River's Special Flood Hazard Area.	2	2.5	3	3	3	2.7
142	Pursue measures to minimize the potential for a train derailment caused by flooding where the Mill Creek meets the Gardners Creek at Union Street.	2	2.5	2	2	3	2.3
143	Conduct an engineering study to identify the most appropriate mitigation measure to address mine subsidence for the following three dams: Brown Creek Dam on Cherry Street, Wadham Creek Dam on Shawnee Street, and Duffy's Run Dam on 1st Street.	1.5	1.5	1	2	2	1.6
144	Develop mitigation measures including an implementation strategy for the fire station and water treatment plant that are located in the floodplain. Use FEMA publication 551, Selecting Appropriate Mitigation Measures for Floodprone Structures, which provides guidance on determining appropriate mitigation measures.	2	3	3	3	3	2.8
145	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).	1.5	1.5	2	2	1.5	1.7
146	Purchase a generator for the fire company to serve as back-up during power outages.	1.5	1.5	1	2	2	1.6
147	Purchase a generator for the Ross Township Building to serve as a back-up power source during power outages.	1.5	1.5	1	2	2	1.6
148	Since the nuclear material transported to and from the Susquehanna Steam Electric Nuclear Facility could pose a threat to the Township, make residents aware of the procedures to follow after a hazardous materials incident. Develop a brochure on what to do when an incident occurs.	1.5	1.5	1	2	2	1.6



Table 6.4-2 Mitigation Action Prioritization.							
MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					
		Low = 0.0-1.8		Medium = 1.9-2.4		High = 2.5-3.0	
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/Critical Infrastructure	Total Score
149	Identify options to address the flooding of Mud Swamp Creek unto Sonny Drive.	1.5	1.5	1	2	2	1.6
150	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).	1.5	1.5	2	2	1.5	1.7
151	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).	1.5	1.5	2	2	1.5	1.7
152	Identify measures to prevent sanitary sewer backups during rainfall and flooding events.	2	2.5	3	3	3	2.7
153	Improve drainage structures and storm sewers throughout the Borough, which are undersized and cause roadway flooding.	2	2.5	2.5	2.5	2.5	2.4
154	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).	1.5	1.5	2	2	1.5	1.7
155	Work with a consultant to determine the causes of, and investigate solutions to, the three flooding issues along Main Street.	1	1	1.5	1.5	1.5	1.3
156	Conduct public outreach to better educate residents to become better prepared to face hazards.	2	2.5	2.5	2.5	2.5	2.4
157	Clean culverts in township to prevent streams from flooding or damming up.	2	2.5	2	2.5	2.5	2.3
158	Work with the County to develop a procedure to issue building permits and perform UCC functions including inspections.	1	1	1.5	1.5	1.5	1.3
159	Improve drainage structures and storm sewers throughout the Borough, which are inadequate and cause flooding.	2.5	2.5	2	2.5	2.5	2.4

Table 6.4-2 Mitigation Action Prioritization.							
MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					
		Low = 0.0-1.8		Medium = 1.9-2.4		High = 2.5-3.0	
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/Critical Infrastructure	Total Score
160	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).	1.5	1.5	2	2	1.5	1.7
161	Since the hazardous materials from the Humboldt and Valmont industrial parks could pose a threat to the Borough, make residents aware of the procedures to follow after a hazardous materials incident. Develop a brochure on what to do when an incident occurs.	1.5	2	2	2	1.5	1.8
162	Identify structural solutions to stormwater ponding and sewer back-ups area in the Borough that had been subject to mine subsidence.	1	1	1.5	1.5	1.5	1.3
163	Offer a cost-sharing program for residents affected by sewage back-up damage and publicize use of backflow valves within the community to residents subject to sewer backups and associated damages.	1	1	1.5	1.5	1.5	1.3
164	Include information in the Borough newsletter on the availability of flood insurance, basement back-up insurance, and mine subsidence insurance.	1	1	1.5	1.5	1.5	1.3
165	Purchase a portable generator to power heating systems at shelter locations.	1	1	1.5	1.5	1.5	1.3
166	Pursue the recommendations for culvert removal/replacement along the Abrahams Creek made in the 2006-2007 Hicks Creek and Abrahams Creek Flood Study. The undersized structures are the Upper 8th Street bridge and the Erie-Lackawanna Railroad bridge.	2	2.5	3	3	3	2.7
167	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).	1.5	1.5	2	2	1.5	1.7
168	Continue to work with the Luzerne County Flood Protection Authority and the City of Wilkes-Barre to finalize a solution to the flooding issues along Coal Brook.	2	2.5	3	3	3	2.7

## Luzerne County 2020 Hazard Mitigation Plan

Table 6.4-2 Mitigation Action Prioritization.							
MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					
		Low = 0.0-1.8		Medium = 1.9-2.4		High = 2.5-3.0	
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	Total Score
169	Conduct a study to identify the most appropriate mitigation measure for the Geisinger South hospital, which is located near historic mining operations and floodplains.	1	1	2	2	1.5	1.4
170	Consider the stabilization of Laurel Run Creek and Mill Creeks.	1	1	2	2	1.5	1.4
171	Restore the wall along Solomon Creek.	1	1	2	2	1.5	1.4
172	Continue to work with the Luzerne County Flood Protection Authority and Wilkes-Barre Township to finalize a solution to the flooding issues along Coal Brook.	2	2.5	3	3	3	2.7
173	Improve snow removal activities throughout the City during winter weather events.	1.5	1	2.5	2.5	2	1.8
174	Establish programs and facilities to prevent, reduce, and/or eliminate the impact of opioid addiction affecting vulnerable residents of the City of Wilkes-Barre.	1.5	1	2.5	2.5	2	1.8
175	Obtain FEMA accreditation for the Wilkes-Barre City-Hanover Township Levee System.	1.5	1.5	1.5	3	3	2.0
176	Obtain FEMA accreditation for the Brookside Levee System.	1.5	1.5	1.5	3	3	2.0
177	Obtain FEMA accreditation for the Mill Creek Left Bank Upstream Levee System.	1.5	1.5	1.5	3	3	2.0
178	Obtain FEMA accreditation for the Laurel Run Levee System.	1.5	1.5	1.5	3	3	2.0
179	Rehabilitate/modify bridges over streams vulnerable to flooding including Strass Lane Bridge over Solomon Creek.	1.5	1.5	3	1.5	1.5	1.8
180	Rehabilitate/modify bridges over streams vulnerable to flooding including Blackman Street Bridge over Bowman Spring Creek.	1.5	1.5	3	1.5	1.5	1.8
181	Relocate the Emergency Response Center outside of the flood hazard area. Convert 4,249 square feet of existing storage space on the second floor of the city-owned Department of Public Works building into an Emergency Response Center.	3	3	3	3	3	3.0
182	Construct a storage/maintenance facility for LCFPA's Market Street Bridge Flood Closure Structures.	3	3	3	3	3	3.0

Table 6.4-2 Mitigation Action Prioritization.							
MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					
		Low = 0.0-1.8		Medium = 1.9-2.4		High = 2.5-3.0	
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	Total Score
183	Improve drainage at the creek at Glendale Drive, Laurel Drive, and Terrace Drive to prevent them from flooding.	1.5	1	2.5	2.5	2	1.8
184	Develop informational materials to educate and assist homeowners near wildfire prone areas of firewise concepts including safe zones and defensible spaces.	1.5	1	2	1.5	2	1.5
185	Educate the public on potential hazards and provide emergency contact information for the public via the web. Focus on high pressure gas line and Crystal Lake dam warnings, and other common hazards like wildfires and downed phone lines.	1.5	1	2.5	2.5	2	1.8
186	Hire third party code enforcement to enforce local safety and nuisance ordinances.	1	1	2	2	2	1.5
187	Purchase new leaf machine to remove leaves from swales to mitigate flood issues throughout the Township.	1	1	1	1	1	1.0
188	Remove dead and downed trees/lumber throughout the Township to mitigate wildfire hazard.	1	1	1	1.5	1	1.1
189	Pursue the recommendations along the Abrahams Creek made in the Hicks Creek and Abrahams Creek Detailed Feasibility Study, to address flooding issues on Eight Street, Swetland Lane.	1.5	1	2.5	2	2	1.7
190	Identify flood protection measures, or pursue property acquisition, for properties along Susquehanna Avenue between 4th and 8th Streets which are affected by flooding from the Susquehanna River.	1.5	1	2	2.5	2	1.7
191	Promote denser development (small lot single family development) or cluster development to preserve environmentally sensitive areas (i.e., woodlands, wetlands, floodplains, or severely steep slopes).	1.5	1.5	2	2	1.5	1.7

## 7. Plan Maintenance

### 7.1. Update Process Summary

Once this Plan has received approval from PEMA and ultimately FEMA, the Plan will be adopted by the Luzerne County Council and all participating jurisdictions. This HMP Update is intended to be a 'living document'. Plan adoption is not considered the final step in the planning process but rather as a first step to 'realization'. The plan monitoring and maintenance schedule is a cycle of events that involve periodic review, adjustments, and improvement. Plan monitoring also provides an opportunity to recognize other planning initiatives within the county that may benefit from the incorporation of risk and/or mitigation objectives detailed in the HMP. This section establishes a method to monitor how the Plan will be evaluated and maintained in the future.

### 7.2. Monitoring, Evaluating, and Updating the Plan

In order to ensure that the Plan continues to provide a framework of reducing risk in Luzerne County, the Department of Planning & Zoning will take responsibility to convene an annual meeting of the HMPT with strong support from the Luzerne County Emergency Management Agency. The HMPT is comprised of County and municipal officials involved in the preparation of the Plan Update as well as other relevant stakeholder representatives that participated in the planning process.

An Annual Report Checklist has been developed for routine HMP maintenance and will be used as a guide for the annual plan maintenance and update. The Hazard Risk table will be reviewed and any changes to rankings based on frequency or severity to profiled hazards will be documented. Municipal officials will be asked to provide a mitigation action progress information each year and the Mitigation Action Plan will be updated accordingly. The HMPSC will prepare an annual update report of the mitigation actions based on the annual report forms from the municipalities as well as the County. The annual HMP review will be scheduled each year during the week of the HMP approval anniversary. The following questions will be considered as criteria for assessing the effectiveness of the HMP:

- Has the nature or magnitude of hazards affecting the county changed?
- Are there new hazards that have the potential to impact the county?
- Is there updated, or more quantitative, risk assessment data available related to the identified hazards in the plan? Can this data be integrated into the analysis to better assess the vulnerability, and depict the risk, of communities to the hazards?
- Do the identified goals and actions address current and expected conditions?
- Have mitigation actions been implemented or completed?
- Has the implementation of identified mitigation actions resulted in expected outcomes?
- Are current resources adequate to implement the plan?
- Should additional local resources be committed to address identified hazards?

- Are there current or upcoming planning mechanisms or initiatives in which the mitigation strategy should be considered for integration?

In addition to conducting an annual review of the Plan, the HMPSC will review the Plan within 30 days of a disaster. The Risk Assessment and Mitigation Strategy will be evaluated and any changes to community priorities or status will be documented. The HMP will receive a full, detailed update every five years, as required to reflect the current risk, vulnerabilities, development trends and as mitigation actions are implemented. While an annual report will be completed each year, any state and Federal mandates from PEMA and FEMA respectively, will be addressed in the five-year update. The municipalities will not be responsible for making any changes to the HMP document as part of annual reviews; their role will consist of information the review and report only. A copy of each Annual Plan Review will be provided to PEMA and FEMA and included as official documentation in the next 5-year HMP update.

### **7.3. Continued Public Involvement**

As was done during development of the 2020 HMP, the HMPT will involve the public during annual review periods by providing an opportunity to review and submit feedback. The public will have access to the current HMP through their local municipal office or on the Luzerne County government website. Responses from the community hazard mitigation survey revealed that the best way for the public to receive information about risk and preparedness would be through the municipal or county website, or via email/newsletter. Information on upcoming events related to the HMP or solicitation for comments will be announced via newsletters, social media, and the county website. The public is encouraged to submit comments on the HMP at any time. The HMSC will incorporate all relevant comments during the next update of the hazard mitigation plan.

The Comprehensive Plan; Capital Improvements Program; Building Code, Municipal Floodplain Management Regulations, Emergency Operations Plan, and Zoning Ordinance are identified for incorporation of hazard mitigation actions once the Plan is adopted. Each of these mechanisms will continue to be used to meet the intent of this Plan, as appropriate. Likewise, as these planning mechanisms are updated, they will be considered for incorporation into the HMP during the annual review process and/or the five-year cycle update.

The County and participating jurisdictions may propose additional mitigation actions for inclusion throughout the five-year cycle but must submit new mitigation actions through the Department of Planning & Zoning which will request an HMP amendment by contacting the PEMA State Hazard Mitigation Planner. FEMA must officially approve all additions and will amend the HMP by issuing an HMP Amendment Approval letter.

## 8. Plan Adoption

The Plan was submitted to the Pennsylvania State Hazard Mitigation Planner on August 19, 2020.

This section of the plan includes copies of the local adoption resolutions passed by Luzerne County and its municipal governments as well as a completed Local Mitigation Plan Review Crosswalk. Adoption resolution templates are provided to assist the County and municipal governments with recommended language for future adoption of the HMP.

Luzerne County 2020 Hazard Mitigation Plan  
County Adoption Resolution

Resolution No. \_\_\_\_\_  
Luzerne County, Pennsylvania

**WHEREAS**, the municipalities of Luzerne County, Pennsylvania are most vulnerable to natural and human-caused hazards which may result in loss of life and property, economic hardship, and threats to public health and safety, and

**WHEREAS**, Section 322 of the Disaster Mitigation Act of 2000 (DMA 2000) requires state and local governments to develop and submit for approval to the President a mitigation plan that outlines processes for identifying their respective natural hazards, risks, and vulnerabilities, and

**WHEREAS**, Luzerne County acknowledges the requirements of Section 322 of DMA 2000 to have an approved Hazard Mitigation Plan as a prerequisite to receiving post-disaster Hazard Mitigation Grant Program funds, and

**WHEREAS**, the Luzerne County 2020 Hazard Mitigation Plan has been developed by the Luzerne County Department of Planning & Zoning in cooperation with Luzerne County Emergency Management Agency, other county departments, local municipal officials, institutional stakeholders, and the citizens of Luzerne County, and

**WHEREAS**, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Luzerne County 2020 Hazard Mitigation Plan, and

**WHEREAS**, the Luzerne County 2020 Hazard Mitigation Plan recommends mitigation activities that will reduce losses to life and property affected by both natural and human-caused hazards that face the County and its municipal governments,

**NOW THEREFORE BE IT RESOLVED** by the governing body for the County of Luzerne that:

- The Luzerne County 2020 Hazard Mitigation Plan is hereby adopted as the official Hazard Mitigation Plan of the County, and
- The respective officials and agencies identified in the implementation strategy of the Luzerne County 2020 Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

**ADOPTED**, this \_\_\_\_\_ day of \_\_\_\_\_, 2020

**ATTEST:**

**LUZERNE COUNTY COUNCIL**

\_\_\_\_\_

By \_\_\_\_\_

By \_\_\_\_\_

By \_\_\_\_\_



Luzerne County 2020 Hazard Mitigation Plan  
Municipal Adoption Resolution

Resolution No. \_\_\_\_\_  
< Municipality Name>, Luzerne County, Pennsylvania

**WHEREAS**, the <Borough/Township of Municipality Name>, Luzerne County, Pennsylvania is most vulnerable to natural and human-caused hazards which may result in loss of life and property, economic hardship, and threats to public health and safety, and

**WHEREAS**, Section 322 of the Disaster Mitigation Act of 2000 (DMA 2000) requires state and local governments to develop and submit for approval to the President a mitigation plan that outlines processes for identifying their respective natural hazards, risks, and vulnerabilities, and

**WHEREAS**, the <Borough/Township of Municipality Name> acknowledges the requirements of Section 322 of DMA 2000 to have an approved Hazard Mitigation Plan as a prerequisite to receiving post-disaster Hazard Mitigation Grant Program funds, and

**WHEREAS**, the Luzerne County 2020 Hazard Mitigation Plan has been developed by the Luzerne County Department of Planning & Zoning in cooperation with Luzerne County Emergency Management Agency, other county departments, local municipal officials, institutional stakeholders, and the citizens of Luzerne County, and

**WHEREAS**, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Luzerne County 2020 Hazard Mitigation Plan, and

**WHEREAS**, the Luzerne County 2020 Hazard Mitigation Plan recommends mitigation activities that will reduce losses to life and property affected by both natural and human-caused hazards that face the County and its municipal governments,

**NOW THEREFORE BE IT RESOLVED** by the governing body for the < Municipality Name>:

- The Luzerne County 2020 Hazard Mitigation Plan is hereby adopted as the official Hazard Mitigation Plan of the <Borough/Township/City>, and
- The respective officials and agencies identified in the implementation strategy of the Luzerne County 2020 Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

**ADOPTED**, this \_\_\_\_\_ day of \_\_\_\_\_, 2020

**ATTEST:**

< MUNICIPALITY NAME>

\_\_\_\_\_

By \_\_\_\_\_

By \_\_\_\_\_

By \_\_\_\_\_