LYCOMING COUNTY 2020

HAZARD MITIGATION PLAN UPDATE

PREPARED FOR:

Lycoming County
Planning & Community Development
48 W. Third Street
Williamsport, PA 17701

PREPARED BY:

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Certification of Annual Review Meetings

The Lycoming County Hazard Mitigation Planning Team (HMPT) reviewed this Hazard Mitigation Plan. See Section XXX for further details regarding this form. The Director of the HMPT hereby certifies the review.

YEAR	DATE OF MEETING	AUDIENCE	SIGNATURE
2015		Multi- Municipality Comprehensive Plan Meeting	
2016		Multi- Municipality Comprehensive Plan Meeting	
2017		Multi- Municipality Comprehensive Plan Meeting	
2018		Flood Insurance Roundtable with FEMA and PEMA	
2018?		MS4 Stormwater Meeting	
2019		Muncy Resilience Meeting(s)	
2020		Transportation Improvement Program Meeting	
2021			
2022			
2023			

Record of Changes

DATE	DESCRIPTION OF CHANGE MADE, MITIGATION ACTION COMPLETED, OR PUBLIC OUTREACH PERFORMED	CHANGE MADE BY (PRINT NAME)	CHANGE MADE BY (SIGNATURE)
2015	FINAL PLAN ADOPTED		
2017	ENHANCED HAZUS RUN		

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

TABLE OF CONTENTS

Table of Acronyms			
ACRONYM	FULL NAME	ACRONYM	FULL NAME
BRIC	Building Resilient Infrastructure and Communities Program	NFIP	National Flood Insurance Program
CFR	Code of Federal Regulations	NFPA	National Fire Protection Association
CRS	Community Ratings System	NHC	National Hurricane Center
CZP	County Zoning Partnership	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	SFHA	Special Flood Hazard Area
HMPT	Hazard Mitigation Planning Team	SOG	Standard Operating Guide
HMPU	Hazard Mitigation Plan Update	UCC	Universal Construction Code

Table of Acronyms			
ACRONYM	FULL NAME	ACRONYM	FULL NAME
HVA	Hazards Vulnerability Analysis	US DOT	United States Department of Transportation
ICC	International Code Council	USACE	United States Army Corps of Engineers
IBC	International Building Code	USDA	United States Department of Agriculture
NCDC	National Climatic Data Center	USGS	United States Geological Survey
NDIS	National Drought Information System	WYO	Write Your Own
NDMC	National Drought Mitigation Center		

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.

2004 Hazard Mitigation Plan

The initial Hazard Mitigation Plan (HMP) for Lycoming County was adopted in 2004 as a comprehensive All-Hazard County wide plan for their 52 municipalities. This plan analyzed hazards and scoped projects by municipality, watershed and county-wide. The 2004 Plan identified acquisitions based on

Lycoming County Department of Planning & Community Development and Emergency Management Agency have taken an all-hazards approach to this Hazard Mitigation Plan Update.

floodway and repetitive loss, studies for flood damage reduction, and county wide stormwater management. Successes from this plan included acquisition of a 42-pad manufactured home park in the floodway in Lewis Township, adopting of a county-wide stormwater management plan and ordinances adopted by all 52 municipalities, and completion of studies for structural flood damage reduction in the Lycoming Creek watershed and Montoursville area.

2010 Plan Update

The 2010 Plan Update consisted of a review of the 2004 Plan, which was used as a base document. Flooding was still the top hazard but other changes, such as Marcellus Shale Natural Gas exploration and extraction prompted a review of natural gas drilling and the subsequent analysis of traffic accidents due to an increase of road traffic. Soon after the adoption of the 2010 plan, Tropical Storm Lee, August 2011, accelerated mitigation actions in the Loyalsock and Muncy Creek watersheds. In 2010, Lycoming County began a FEMA Risk MAP project, further focusing on areas of mitigation interest and developing data to enhance the public's understanding of risk.

2015 Plan Update

The 2015 plan was developed during the recovery phase of Tropical Storm Lee and the Lycoming County Risk MAP project. Flooding continued to be a top priority and communities were seeking guidance on risk, NFIP Flood insurance, and overall resilience opportunities. The plan continued to look to human-caused hazards, including the continued analysis of the natural gas impacts. In 2017, a project which developed data to run an enhanced HAZUS analysis was completed and used to update the 2015 plan. That data can be found in Appendix F. In addition, the data from the 2015 HMP was utilized in the 2015-2018 updates of the County Comprehensive Plan as well as 6 Multi Municipal Plans. As a result, Hazard Mitigation Projects rose to the # 1 or #2 priority in 4 of the six multi-municipal plans and in the County Plan.

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 Lycoming 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 2015 Plan and 2017 update. 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 2015 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 in the next 5-year cycle.

1.2. Project Scope

In July of 2020, Lycoming 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 Lycoming County and its 52 municipalities.

It should be noted that future funding for mitigation projects will be contingent upon having each jurisdiction in Lycoming 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.

1.3. Organization of the Plan

The 2020 Hazard Mitigation Plan Update consists of seven chapters, each focusing on a different aspect of the planning process. 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 Lycoming County and its municipalities will implement the Plan once it is adopted and ways to monitor progress and ensure continued public involvement.

1.4. 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 Lycoming 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 Lycoming 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.

1.5. Scope

The Lycoming 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.

1.6. 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.
- FEMA: *National Flood Insurance Program Fact Sheet*. May 2016.
- FEMA P-758: *Substantial Improvement / Substantial Damage Desk Reference*. May 2010.

The following Pennsylvania Emergency Management Agency (PEMA) guides and reference documents were used 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*. August 2020.
- PEMA: *Pennsylvania State Hazard Mitigation Plan, 2019 Update*.

The following additional guidance documents were used to update this plan:

- NFPA 1600: *Standard on Disaster/Emergency Management and Business Continuity Programs*. 2007.
- PA Dept. of Labor & Industry: *Lycoming County Profile*. October 2020.
- Lycoming County: *Lycoming 2030: Plan the Possible – County Comprehensive Plan Update*. July 2018.
- Lycoming County: *Williamsport Area Transportation Study (WATS) Metropolitan Planning Organization (MPO) Long Range Transportation Plan (LRTP).* December 2018.
- SEDA-COG and Williamsport Area Metropolitan Planning Organizations: *Coordinated Public Transit–Human Services Transportation Plan*. March 2014.
- Greater Williamsport Alliance Planning Area: *Multi-Municipal Plan*. December 2017.
- Montoursville-Muncy Planning Area: *Multi-Municipal Plan*. November 2017
- US-220/I-99 Planning Area: *Multi-Municipal Plan*. October 2017.
- US-15 South Planning Area: *Multi-Municipal Plan*. August 2017.
- Lower Lycoming Creek Planning Area: *Multi-Municipal Plan*. September 2017.
- Muncy Creek Planning Area: *Multi-Municipal Plan*. October 2017.

2. Community Profile

This section includes a profile of Lycoming 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 2015 Plan, other information such as the demographic and employment and industry information has been developed using the latest U.S. Census, the Comprehensive Plans, the Long-Range Transportation Plan, and other recent Economic Development Strategy and Planning documents.

In addition to the Lycoming County Comprehensive Plan, there are several multi-municipal planning areas that each have an individual comprehensive plan and planning process for the jurisdictions within each region. The multi-municipal planning areas include: Greater Williamsport Alliance Planning Area, Montoursville-Muncy Planning Area, US-220/I-99 Planning Area, US-15 South Planning Area, Lower Lycoming Creek Planning Area, and Muncy Creek Planning Area. Each multi-municipal comprehensive plan was reviewed in conjunction with the Lycoming County Comprehensive Plan to inform the Community Profile, as well as other sections of the 2020 Lycoming HMP.

2.1. Geography and Environment

Situated in North-central Pennsylvania at the convergence of two geomorphologic provinces - the Allegheny Plateau and the Valley and Ridge province - Lycoming County boasts a scenic landscape characterized by steep slopes, deep river valleys, and abundant forestland. At 1,244 square miles, Lycoming is the largest of Pennsylvania's 67 counties, equivalent in size to the state of Rhode Island. Figure 2.1-1 provides an outline of Lycoming County.

The County of Lycoming lies entirely within the Susquehanna River Basin, one of four major drainage basins in Pennsylvania. Over 2,200 miles of streams traverse the County, whose fertile valleys were settled long before land use controls and floodplain regulations were in place. The County's most populated watershed is the West Branch of the Susquehanna River, which flows for 38 miles through the County. Major tributaries of the West Branch include Pine Creek, Little Pine Creek, Larry's Creek, Lycoming Creek, Loyalsock Creek, Muncy Creek, Little Muncy Creek, White Deer Hole Creek, and Antes Creek. Several of these tributaries comprise watersheds that have been designated "exceptional and high quality" watersheds by the Pennsylvania Environmental Quality Board. Figure 2.1-2 shows the County's Watershed Outreach Groups (WOG) and Table 2.1-1 lists the WOGs and corresponding HUC 10 Watersheds. The County's six major watersheds are described as follows:

Pine Creek Watershed – Historically an area of low population density, Pine Creek Watershed, comprised mainly of recreation areas accounts for a low portion of Lycoming County's total population. A majority of the watershed's land acreage is designated state forest, game lands, and wild or natural areas. Furthermore, the close proximity of several major transportation corridors to meandering creek beds has created a localized flood hazard. Several times a year,

Pine Creek overtops its banks, forcing the closure of S.R. 414. Although private properties have rarely sustained water damage, flooding along S.R. 414 has impaired emergency service delivery on several occasions. The meandering nature of Little Pine Creek poses a threat to the village of English Center. A state-owned suspension bridge may be at risk if the creek continues to erode its banks during high-water events.

Larry's Creek Watershed – Larry's Creek Watershed drains an 89-square-mile area in western Lycoming County. The landscape is predominately forested and characterized by narrow valleys and steep wooded hillsides. Larry's Creek forms in Cogan House Township and flows southwesterly to its mouth on the West Branch Susquehanna River.

Lycoming Creek Watershed – Next to the West Branch Susquehanna, the Lycoming Creek Watershed is the most densely populated watershed in the County. While the City of Williamsport has lost population over the last 20 years, communities throughout the basin have witnessed some new development. Sanitary sewer lines were extended north along Lycoming Creek Road, and a new limited-access highway, both signs that the County is focusing growth in this area.

Loyalsock Creek Watershed – Five townships comprise the bulk of the population in this watershed: Upper Fairfield Township, Eldred Township, Gamble Township, Plunkett's Creek Township, and Cascade Township. Loyalsock Creek begins in the western edge of Wyoming County and flows for 60 miles until it reaches its mouth at the West Branch Susquehanna River in Montoursville Borough. It drains a region 494 square miles in area.

Muncy Creek Watershed – Muncy Creek is 33 miles long and drains a 216-square-mile area that encompasses parts of Sullivan, Columbia, Montour, and Lycoming Counties. The upper reaches of the drainage basin are relatively rough, forested areas, while the lower reaches consist of rolling topography and broad agricultural lands.

West Branch Susquehanna Watershed – The most heavily populated areas of the County can be found along its southern extent, trailing the West Branch of the Susquehanna River. The West Branch Susquehanna is one of six major sub-basins of the Susquehanna River, the largest tributary of the Chesapeake Bay. Although not the most developed, it is the largest sub-basin, draining an area some 6,992 square miles in extent. Agriculture and urban land uses predominate in the eastern and southern areas. The entire sub-basin supports a population of nearly 400,000, with major population centers in State College, Lock Haven, and Williamsport.

Figure 2.1-1 Base map of Lycoming County

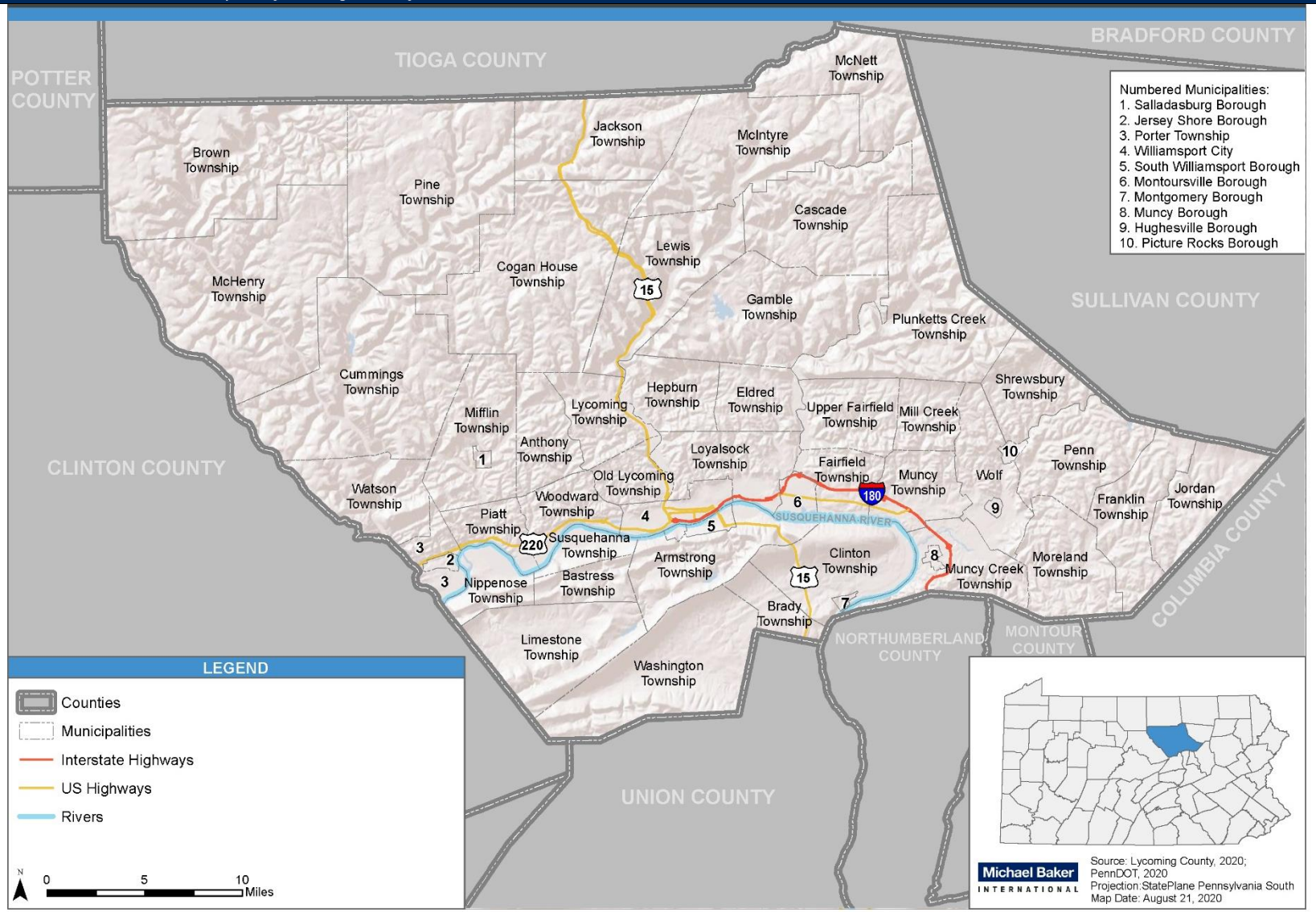


Figure 2.1-2 Lycoming County Watersheds by Watershed Outreach Group

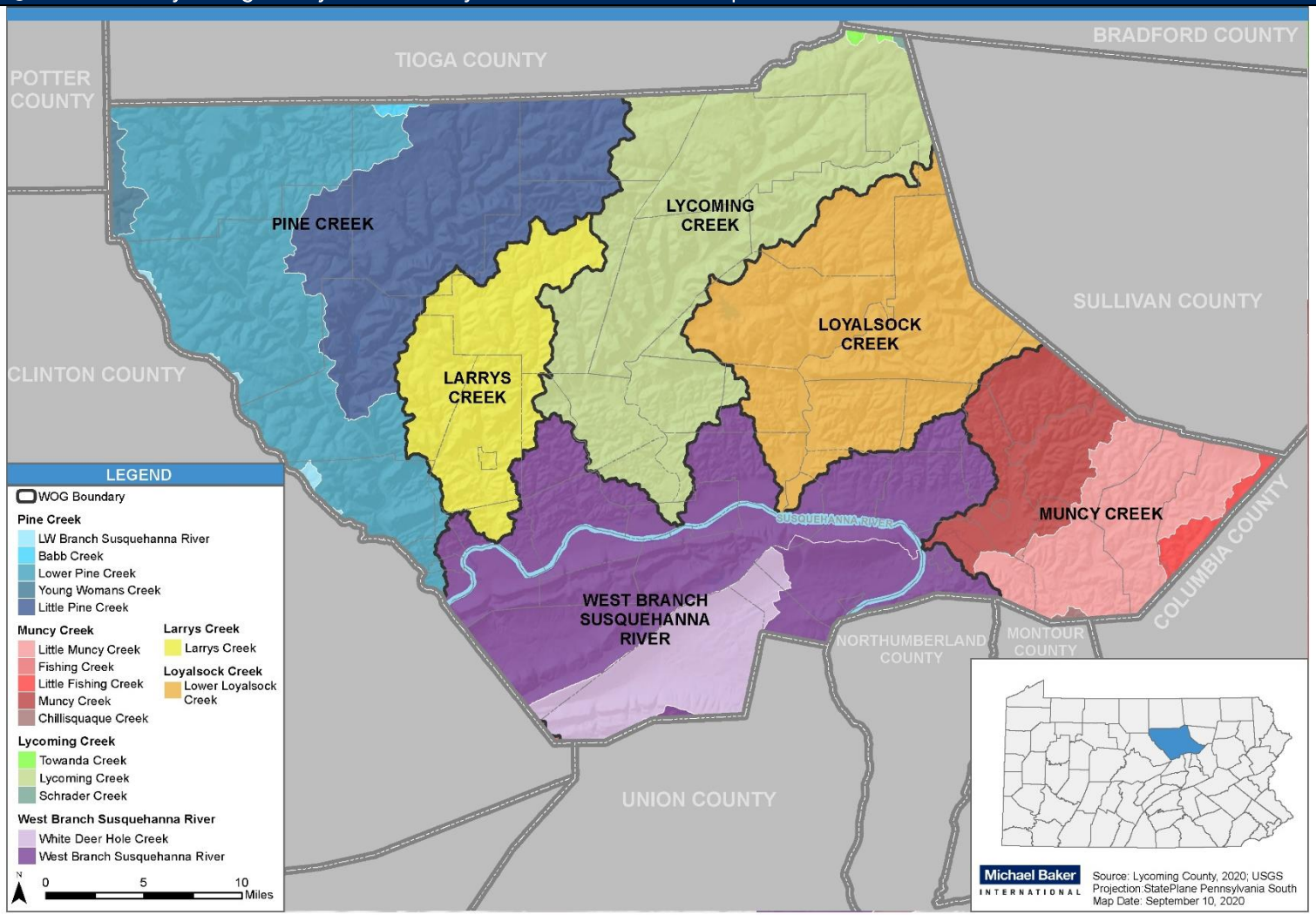


Table 2.1-1 Watershed Outreach Groups (WOG) and corresponding HUC 10 watersheds

WOG	HUC 10	HUC 10 NAME
Larrys Creek	205020601	Larrys Creek
Loyalsock Creek	205020605	Lower Loyalsock Creek
Lycoming Creek	205010602	Schrader Creek
	205010603	Towanda Creek
	205020602	Lycoming Creek
Muncy Creek	205010706	Little Fishing Creek
	205010707	Fishing Creek
	205020607	Little Muncy Creek
	205020608	Muncy Creek
	205020611	Chillisquaque Creek
Pine Creek	205020303	Young Womans Creek
	205020304	Lower West Branch Susquehanna River
	205020504	Babb Creek
	205020505	Little Pine Creek
	205020506	Lower Pine Creek
West Branch Susquehanna River	205020403	Fishing Creek
	205020609	White Deer Hole Creek
	0205020612; 0205020606	West Branch Susquehanna River

2.2. Community Facts

Despite its rural location, the County is quite accessible from urban areas throughout the Susquehanna River Valley. As Figure 2.1-1 illustrates, U.S. Route 15 provides access to points north and south while Interstate 180 and U.S. Route 220 link the County with Interstate 80, a major east-west trending highway that extends from New Jersey to the Ohio state line. The County is comprised of 52 municipalities, including 42 townships, 9 boroughs, and the City of Williamsport, the metropolitan center and County seat.

2.3. Population and Demographics

Population and demographic information provide baseline information about residents. Changes in demographics or populations may be used to identify higher-risk populations. Maintaining up-to-date data on demographics will allow the County to better assess magnitudes of hazards and develop more specific mitigation plans. Baseline demographic information for Lycoming County is provided in Table 2.3-1.

Table 2.3-1 Lycoming County Demographic Summary (U.S. Census)

DEMOGRAPHIC DATA POINT	2000	2010
Total Population	120,044	116,111
Female/Male	61,362/58,682	59,272/56,839
Median Age (years)	38.4	41.1
Under 5 years	6,601	6,449
5 – 19 years	25,294	21,884
20 – 64 years	68,898	68,666
65 years and older	19,251	19,112

Lycoming County has an estimated 2019 population of 113,299, making Lycoming the most populated county in the Pennsylvania Wilds region, which consists of Cameron, Clarion, Clearfield, Clinton, Elk, Forest, Jefferson, Lycoming, McKean, Potter, Tioga, and Warren Counties. Jefferson, with a population of approximately 80,216, has the next largest population estimate in the region.

Table 2.3-3 provides the total population for each jurisdiction in Lycoming County for years 2000 and 2010. As seen in the table, much of Lycoming County's population can be attributed to the City of Williamsport. The City of Williamsport had a total population of approximately 28,757 in 2018. The Williamsport Metropolitan Statistical Area (MSA) consists of all of Lycoming County and therefore, also has an estimated population of 113,299 in 2019. The two closest MSAs to the Williamsport MSA are the Scranton-Wilkes Barre-Hazelton MSA to the east and the State College MSA to the west of Lycoming County. Both MSAs are larger than the Williamsport MSA. In 2019, the Scranton-Wilkes Barre-Hazelton MSA, made up of Lackawanna; Luzerne; and Wyoming Counties; had a population of approximately 553,885. The State College MSA, comprised of just Centre County, had an approximate population of 162,385 in 2019.

In 2019, approximately 20 percent of Lycoming County's population was 65 or older. This is an increase from 2010 where approximately 16 percent of the County was 65 or older. These residents may have special needs. For example, many may be unable to drive; therefore, special evacuation plans may need to be created for them. They may also be hard of hearing or low vision which could make receiving emergency instructions difficult. Both older and younger populations have higher risks for contracting certain diseases. Lycoming County's combined under 5-years-of-age and over-65 populations represent approximately 25 percent of its population.

Population estimates, based on 2010 Census data, show that Lycoming County is projected to continue to decline in population. Census-based projections estimate that the County's

population will be 112,179 in 2040. However, those same estimates project a population of 115,311 in 2020. The 2019 population of 113,299 indicates that the population might be decreasing at a faster rate than estimated. A deeper discussion of this expected population loss, and its impacts on future development, risk, and vulnerability is discussed in Section 4.4.4.

Table 2.3-2 displays the housing characteristics for Lycoming County. In 2010, Lycoming County had 52,500 residential units. These properties may be vulnerable to various natural hazards, in particular flooding and windstorms. Damage to residential properties is not only expensive to repair or rebuild, but also devastating to the displaced family. Meanwhile, approximately 15 percent of the County's residential properties are vacant. Vacant buildings are particularly vulnerable to arson and criminal activity. Since many vacant properties may not have been maintained, they may be structurally deficient and at risk of collapsing during a hazard event.

Housing Characteristics (US Census 2000, 2010 SF1 datasets, ACS 2018 5-year Estimates Data Profiles- Selected Housing Characteristics)			
HOUSING CHARACTERISTIC	2000	2010	2018
Total Housing Units	52,464	52,500	53,340
Occupied Housing Units	47,003	46,700	45,897
Vacant Housing Units	5,461	5,800	7,443
Owner-Occupied Housing Units	32,636	31,821	31,852
Renter-Occupied Housing Units	14,357	14,879	13,270
Median Home Value [1]	$86,200	$127,000	$152,400
[1] Questions pertaining to home value were not included in SF1 Datasets; therefore, American Community Survey 2010 1-Year Estimates and Census 2000 SF 3 were used.			

Table 2.3-2 Municipal Population in Lycoming County (US Census).

MUNICIPALITY	US CENSUS POPULATION	
	2000	2010
BOROUGHS		
Duboistown	1,280	1,205
Hughesville	2,220	2,128
Jersey Shore	4,482	4,361
Montgomery	1,695	1,579
Montoursville	4,777	4,615
Muncy	2,663	2,477
Picture Rocks	693	678
Salladasburg	260	238
South Williamsport	6,412	6,379
Williamsport	30,706	29,381
TOTAL: Boroughs	*55,188*	*53,041*
TOWNSHIPS		
Anthony	904	865
Armstrong	717	681
Bastress	574	546
Brady	1,351	521
Brown	111	96
Cascade	419	413
Clinton	3,090	3,708
Cogan House	974	955
Cummings	355	273
Eldred	2,178	2,122
Fairfield	2,659	2,792
Franklin	915	933
Gamble	854	756
Hepburn	2,836	2,762
Jackson	414	396
Jordan	878	863
Lewis	1,139	987
Limestone	2,136	2,019
Loyalsock	10,876	11,026
Lycoming	1,606	1,478
McHenry	145	143
McIntyre	539	520
McNett	211	174
Mifflin	1,145	1,070
Mill Creek	572	604
Moreland	1,036	943

Table 2.3-2 Municipal Population in Lycoming County (US Census).

MUNICIPALITY	US CENSUS POPULATION	
	2000	2010
Muncy Creek	3,487	3,474
Muncy	1,059	1,089
Nippenose	729	709
Old Lycoming	5,508	4,938
Penn	900	960
Piatt	1,259	1,180
Pine	329	294
Plunketts Creek	771	684
Porter	1,633	1,601
Shrewsbury	433	409
Susquehanna	993	1,000
Upper Fairfield	1,854	1,823
Washington	1,613	1,619
Watson	550	537
Wolf	2,707	2,907
Woodward	2,397	2,200
TOTAL: Townships	*64,856*	*63,070*
Lycoming County	120,044	116,111

Approximately 30 percent of the County's population rent. Renters are often more transient than homeowners; therefore, communicating with renters may be more difficult than with homeowners. Similarly, tourists would be a harder population to communicate with during an emergency event. Communication strategies should be developed to ensure that these populations can be given proper notification, as outlined in several mitigation actions in Section 6.4-2. Additionally, approximately 3 percent of Lycoming County's population speaks a language other than English. Hazard mitigation strategies will need to address language barriers to ensure that all residents can receive emergency instructions.

As displayed in Table 2.3-4, the 2018 estimated median household income in the County is $52,407, which is lower than the Commonwealth of Pennsylvania's median household income of $59,445. The County's estimated per capita income of $26,867 is also lower than the Commonwealth's per capita income of $32,889.

Table 2.3-3 Income Levels & Wage Statistics (U.S. Census Bureau, ACS 2010 and 2018 Estimates; U.S. Bureau of Labor Statistics, County Employment and Wages in PA – First Quarter 2020).

INCOME	LYCOMING COUNTY		PENNSYLVANIA	
	2010	2018 ESTIMATES[1]	2010	2018 ESTIMATES[1]

Median Household Income	$41,037	$52,407	$49,288	$59,445
Median Family Income	$49,997	$68,870	$61,890	$75,477
Per Capita Income	$20,146	$26,867	$26,374	$32,889
WAGES (2ND QUARTER 2020)	LYCOMING COUNTY		PENNSYLVANIA	
Average Weekly Wage	$874		$1,177	
Average Annual Wage (2019)	$45,308		$57,497	

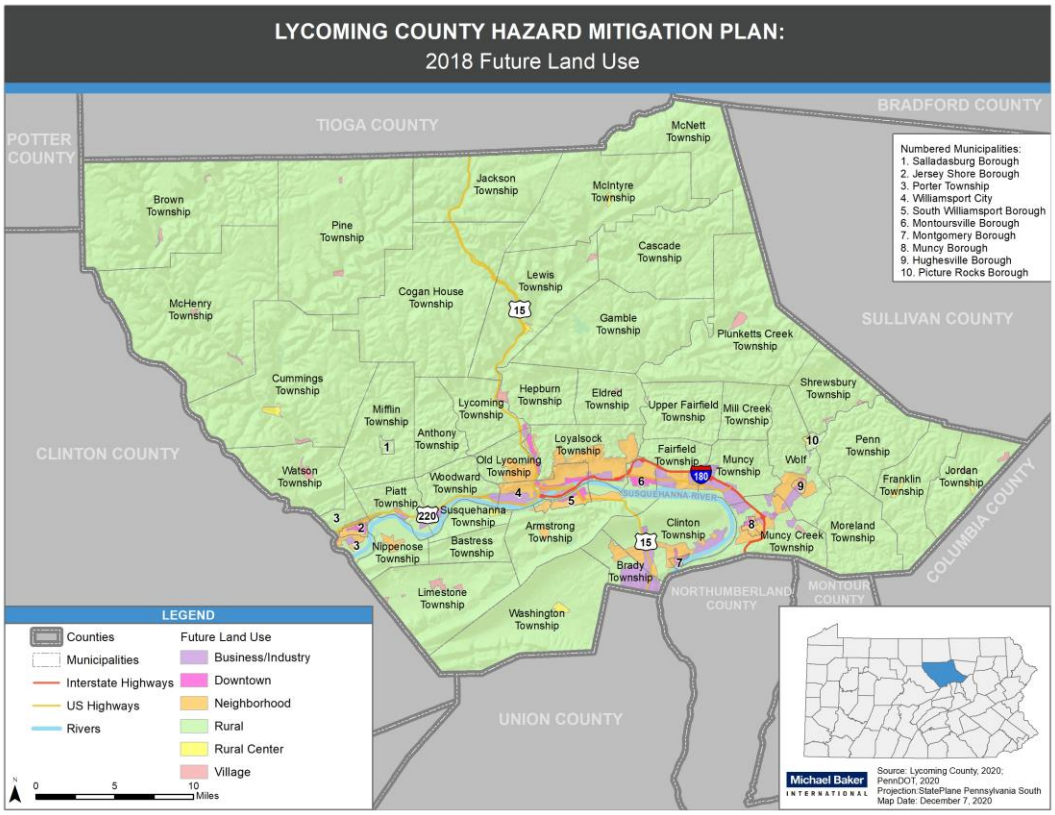
2.4. Land Use and Development

Lycoming County is mostly rural with the majority of its population located in the south-central area of the County, centered along the West Branch of the Susquehanna River and U.S. Route 15, Interstate 180, and U.S. Route 220. Figure 2.4-3 shows the current pattern of land use in the County by displaying the property type of the County's parcels as of 2014. The County's vision for future development, as documented in the 2018 Comprehensive Plan, is to keep growth centralized and protect its natural resource areas in the outer regions while steering development outside of flood prone areas. Figure 2.4-2 reflects this goal. To do so, the County has designated growth areas where the County will target economic development activity. These growth areas, which can be seen in Figure 2.4-2, are focused on development around Interstate 180, U.S. Route 15, U.S. Route 220, the future development of Interstate 99, and the Greater Williamsport, Montoursville, Muncy, and Lower Lycoming Creek communities. Six multi-jurisdictional planning regions, along with the desired development within each region, have been identified to help guide this development. The six planning regions are as follows: Greater Williamsport Alliance Planning, Lower Lycoming Creek Planning Area, Montoursville-Muncy Planning Area, Muncy Creek Planning Area, US 15 South Planning Area, and the US 220/Future I-99 Planning Area.

The County has many land development regulations in place to protect its natural, historic, and environmentally sensitive areas. These regulations for floodplain management exceed federal standards and are described in detail in Section 5.2.1. For more information on how future development patterns impact vulnerability to hazards, please see Section 4.4.4.

They Lycoming County Comprehensive Plan Update from 2018 lays out a Land Use Plan to guide development through 2030. The plan for future land use is shown in Figure 2.4-2 2018 Future Land Use. As this map shows, most development is planned for along the Susquehanna River. The rest of the county is mostly rural land and is planned to remain rural land. As the Comprehensive Plan details the conservation of forested and agricultural land is a priority of the county because it is critical to preserve the quality of habitats, ecosystems, recreational assets, and agricultural heritage (Lycoming County Comprehensive Plan, 2018).

Figure 2.4-2 Lycoming County Future Land Use Map (Lycoming County Comprehensive Plan, 2018)



2.5. Data Sources and Limitations

Lycoming County Department of Public Safety's Buildings (point data) and parcel (polygon layer) databases were used as an inventory of properties throughout the County. The buildings data did not include type or value. However, the Lycoming County GIS Department recommended using a spatial join between the buildings and the parcel database to associate a building use with each building using the property type codes assigned to each parcel. These property types were assigned a generalized land use code of agricultural, commercial, industrial, residential, transportation/utilities, and unknown (for parcels with no property type code). While this allows for generalized discussion of the type of buildings at risk in Lycoming County, the number of buildings by type used throughout this HMP should be considered estimates. The actual building and land use may differ than information contained in the database. The property type was also used to extract numbers of mobile homes. The buildings layer also did not have a value associated with each structure. As a result, loss estimates were derived from the parcel database.

Flood hazard data used in this plan is Lycoming County's FIRMS from FEMA's Mapping Services Center (MSC), which are effective June 2, 2016. This data is a digital representation of features of Flood Insurance Rate Maps (FIRMs).

Lycoming County also provided GIS datasets including community facilities, future land use, growth areas zoning, parcels, landslide hazard data, repetitive loss and severe repetitive loss hot spots, etc. Additional data for the base map was provided by the Pennsylvania Department of Transportation, Pennsylvania Game Commission, and the Pennsylvania Department of Conservation and Natural Resources.

Additional information used to complete the risk assessment for this plan was taken from various government agency and non-government agency sources. Those sources are cited where appropriate throughout the plan and on each map with full references listed in Appendix A – Bibliography. It should be noted that numerous GIS datasets were obtained from the Pennsylvania Spatial Data Access (PASDA) website (http://www.pasda.psu.edu/). PASDA is the official public access geospatial information

Lycoming County considers eleven types of facilities critical; or essential to the health and welfare of the community:

* Emergency Operation Center
* Fire Stations
* Hospitals
* Prisons
* Municipal Building
* Nursing Homes
* Police Stations
* Pre-schools
* SARA Title III
* Schools

clearinghouse for the Commonwealth of Pennsylvania. PASDA was developed by the Pennsylvania State University as a service to the citizens, governments, and businesses of the Commonwealth. PASDA is a cooperative project of the Governor's Office of Administration, Office for Information Technology, Geospatial Technologies Office and the Penn State Institutes of Energy and the Environment of the Pennsylvania State University.

In order to assess the vulnerability of different jurisdictions to the hazards, data on past occurrences of damaging hazard events was gathered. For a number of historic natural-hazard events, the National Climatic Data Center (NCDC) database was utilized. NCDC is a division of the US Department of Commerce's National Oceanic and Atmospheric Administration (NOAA). Information on hazard events is compiled by NCDC from data gathered by the National Weather Service (NWS), another division of NOAA. NCDC then presents it on their website in various formats. The data used for this plan came from the US 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, 2006). Due to changes in the data collection procedures over time, there may be more events available for certain kinds of natural hazards; incidences listed in this plan reflect data housed in the NCDC Storm Events Database as of November 2020.

HAZUS-MH is a powerful risk assessment methodology for analyzing potential losses from floods, hurricane winds and earthquakes. In HAZUS-MH, 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. HAZUS version 2.1 was used to estimate losses for floods in Lycoming County; this plan incorporates an enhanced analysis, meaning that county-specific data was incorporated into the model to make it more precise. In addition, Lycoming County's 1% annual-chance depth grid, a Risk MAP non-regulatory product, was used to incorporate the most recent hydraulic and hydrologic modeling in the county. For more information on the enhanced analysis methodology used for this plan's flood model, please see Appendix F.

This HMP evaluates the vulnerability of the County's critical facilities. The list of critical facilities provided in Appendix E was developed based on information provided by the Lycoming County GIS Department. For the purposes of this plan, critical facilities are those entities that are essential to the health and welfare of the community. This includes emergency operation centers, fire stations, hospitals, prisons, municipal building, nursing homes, police stations, pre-schools, SARA Title III facilities, and schools. Table 2.5-1 summarizes the critical facilities in Lycoming County by type and by municipality. For a complete listing of critical facilities and their vulnerability to individual hazards, please see Appendix E.

Table 2.5.1-1 Critical facilities by municipality and type

MUNICIPALITY	EOC	FIRE DEPARTMENT	HOSPITAL	PRISON	MUNICIPAL BUILDING	NURSING HOME	POLICE DEPARTMENT	PRE SCHOOL	SARA	SCHOOL	GRAND TOTAL
Anthony Township	2	0	0	0	1	0	0	0	1	0	4
Armstrong Township	0	0	0	0	1	0	0	0	5	0	6
Bastress Township	2	0	0	0	1	0	0	0	0	1	4
Brady Township	2	0	0	0	1	0	0	0	1	0	4
Brown Township	1	2	0	0	1	0	0	0	1	0	5
Cascade Township	1	0	0	0	1	0	0	0	0	0	2
Clinton Township	2	1	0	1	1	0	0	0	18	4	27
Cogan House Township	3	0	0	0	1	0	0	0	0	0	4
Cummings Township	2	1	0	0	1	0	0	0	0	0	4
Duboistown Borough	1	1	0	0	1	0	1	1	0	0	5
Eldred Township	1	1	0	0	1	0	0	1	0	0	4
Fairfield Township	1	0	0	0	1	0	0	1	7	1	11
Franklin Township	1	1	0	0	1	0	0	1	0	1	5
Gamble Township	2	0	0	0	1	0	0	0	0	0	3
Hepburn Township	1	1	0	0	1	0	0	1	1	1	6

Table 2.5.1-1 Critical facilities by municipality and type

MUNICIPALITY	EOC	FIRE DEPARTMENT	HOSPITAL	PRISON	MUNICIPAL BUILDING	NURSING HOME	POLICE DEPARTMENT	PRE SCHOOL	SARA	SCHOOL	GRAND TOTAL
Hughesville Borough	2	1	0	0	1	0	1	5	1	1	12
Jackson Township	2	0	0	0	1	0	0	0	3	0	6
Jersey Shore Borough	3	2	1	0	1	1	1	6	3	3	21
Jordan Township	2	1	0	0	1	0	0	0	0	0	4
Lewis Township	2	1	0	0	1	0	0	0	1	0	5
Limestone Township	2	1	0	0	1	0	0	2	0	3	9
Loyalsock Township	2	1	0	0	1	7	0	9	11	7	38
Lycoming Township	0	0	0	0	1	0	0	0	1	0	2
McHenry Township	2	1	0	0	1	0	0	0	1	0	5
McIntyre Township	2	1	0	0	1	0	0	0	0	0	4
McNett Township	1	0	0	0	1	0	0	0	0	0	2
Mifflin Township	1	0	0	0	1	0	0	1	2	1	6
Mill Creek Township	2	0	0	0	1	0	0	0	0	0	3
Montgomery Borough	2	1	0	0	1	0	1	0	1	0	6
Montoursville Borough	2	2	0	0	1	0	2	5	8	4	24

Table 2.5.1-1 Critical facilities by municipality and type

MUNICIPALITY	EOC	FIRE DEPARTMENT	HOSPITAL	PRISON	MUNICIPAL BUILDING	NURSING HOME	POLICE DEPARTMENT	PRE SCHOOL	SARA	SCHOOL	GRAND TOTAL
Moreland Township	2	0	0	0	1	0	0	0	0	0	3
Muncy Borough	2	1	0	0	1	0	1	2	2	2	11
Muncy Creek Township	2	1	1	0	1	1	0	0	11	0	17
Muncy Township	2	1	0	0	1	0	1	0	4	0	9
Nippenose Township	2	1	0	0	1	0	0	1	1	0	6
Old Lycoming Township	2	1	0	0	1	0	1	4	5	1	15
Penn Township	1	0	0	0	1	0	0	0	1	0	3
Piatt Township	0	0	0	0	1	0	0	0	0	0	1
Picture Rocks	1	1	0	0	1	0	0	0	0	1	4
Pine Township	1	0	0	0	1	0	0	0	0	0	2
Plunketts Creek Township	2	1	0	0	1	0	0	0	0	0	4
Porter Township	1	0	0	0	1	0	0	0	1	1	4
Salladasburg Borough	1	1	0	0	0	0	0	0	0	0	2
Shrewsbury Township	0	0	0	0	1	0	0	0	0	0	1
South Williamsport Borough	2	3	0	0	1	0	1	5	2	4	18

Table 2.5.1-1 Critical facilities by municipality and type

MUNICIPALITY	EOC	FIRE DEPARTMENT	HOSPITAL	PRISON	MUNICIPAL BUILDING	NURSING HOME	POLICE DEPARTMENT	PRE SCHOOL	SARA	SCHOOL	GRAND TOTAL
Susquehanna Township	1	1	0	0	1	0	0	0	1	1	5
Upper Fairfield Township	2	0	0	0	1	0	0	1	3	1	8
Washington Township	2	1	0	0	1	0	0	0	2	1	7
Watson Township	1	0	0	0	0	0	0	0	0	0	1
Williamsport City	2	2	2	1	1	1	2	32	42	15	100
Wolf Township	1	0	0	0	1	0	0	6	6	1	15
Woodward Township	2	1	0	0	1	0	0	1	2	1	8
Total	81	36	4	2	50	10	12	85	149	56	485

3. Planning Process

3.1. Introduction and Update Process Summary

A successful planning process builds partnerships and brings together members representing government agencies, the public, and other stakeholders to reach consensus on how the community will prepare for and respond to hazards that are most likely to occur. Applying a comprehensive and transparent process adds validity to the Plan. Those involved gain a better understanding of the problem or issue and how solutions and actions were devised. The result is an updated set of common community values and widespread support for directing financial, technical, and human resources to an agreed-upon action. The planning process has been an integral part of updating the Lycoming County Multi-Jurisdictional Hazard Mitigation Plan (HMP), which was originally adopted on September 24, 2004. This section describes Lycoming County's update process and how the HMP evolved since it was first approved by the Federal Emergency Management Agency (FEMA).

The 2020 HMP Update was again led by the Lycoming County Department of Planning and Community Development, contracting with Michael Baker International, to assist in updating the Lycoming County HMP. In accordance with the Disaster Mitigation Act of 2000 (DMA 2000) requirements, this plan documents the following topics:

1. Planning process
2. Hazard identification
3. Risk assessment
4. Mitigation strategy: goals, actions, and projects
5. Formal adoption by the participating jurisdictions
6. PEMA and FEMA approval

During the 2004 update process, planners began by identifying the hazards that could significantly impact the County and its municipalities, and they determined these hazards' economic, social, and environmental impacts. From this analysis, the County created an action strategy identifying technically feasible and cost-effective mitigation actions to reduce hazard impacts. In 2010, the HMP underwent a restructure so that it met the requirements set forth by PEMA using the Pennsylvania Hazard Mitigation Standard Operating Guidance. This same format was used during the 2015 HMP update and was carried

The 2020 Lycoming County Hazard Mitigation Planning Team included:

- Municipal Officials
- Five County Departments, Commissions, and Boards
- State and Federal Agencies
- Lycoming County Watershed Outreach Groups
- Lycoming County Conservation District
- Northcentral Pennsylvania Conservancy
- Penn College of Technology
- Pine Creek Preservation Association
- Susquehanna River Basin Commission
- West Branch Regional Authority

through to the 2020 HMP update as well. During the 2020 update, stakeholder feedback was solicited through meetings, workshops, a project website, and written and electronic communication. A total of eighteen hazards were carried over from the previous HMP update. Pandemic and Infectious Disease was added as a hazard to the HMP during the 2020 update, in order to address the current and future concerns related to pandemic health risks in the County. Stakeholders were asked to provide information on identified hazards and to assist with the Risk Factor ranking.

The mitigation strategy was reviewed by the Steering Committee and stakeholders provided information about what had been accomplished over the last five years along with actions and projects to be implemented moving forward.

The report format is structured in accordance with the most current planning guidance from FEMA, Local Mitigation Handbook (2013), and PEMA, Standard Operating Guide (SOG) (August 2020). The 2020 HMP follows the Pennsylvania Model Plan Outline developed by PEMA in 2020 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 Lycoming County Planning and Community Development to participate in the Plan Update process.

It is important to note that this plan update took place during the COVID-19 pandemic with varying stay-at-home orders in place at the local and state level throughout. In an effort to ensure participation and minimize any barrier to entry, the HMPSC took additional initiatives:

1. Identifying possible populations that would not be able to attend the virtual meetings and coordinating through trusted community members to ensure participation.
2. When possible offering in person and virtual meeting options. As internet connectivity is not a given in Lycoming, an in-person option was offered when possible with safety precautions in place.
3. Letter invitations were sent earlier than standard in case there were any delays in mail distribution.
4. Conducting additional outreach via individual phone calls to ensure municipalities were aware of upcoming meetings.
5. Reducing the technical requests to the HMPT to encourage a greater number and quality of responses.
6. Provided meetings at two different times of the day (standard) and recorded (new). The recordings, presentations, and applicable forms were all posted on the project website for later reference by the HMPSC, HMPT, and general public.

3.2. The Planning Team

Members of the HMPSC are listed below in Table 3.2-1. The HMPSC met July 28, 2020 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.

Table 3.2-1 Lycoming County Hazard Mitigation Plan Steering Committee

PARTICIPANT	TITLE
Alyssa Henry	Hazard Reduction Planner, Lycoming County Planning and Community Development
John Lavelle, AICP, CFM	Deputy Director, Lycoming County Planning and Community Development
Jenny Picciano, AICP	Community Development, Lycoming County Planning and Community Development
Sal Vitko, CFM	Transportation Planner, Lycoming County Planning and Community Development
Scott Williams	Transportation Supervisor, Lycoming County Planning and Community Development

The HMPT was organized by the County, with assistance from the Mitigation Planning consultant, to plan meetings, collect information, and conduct outreach. The HMPT included municipal officials, Lycoming County government representatives, non-profit organizations, state agencies, and other stakeholders such as regional watershed outreach groups and regional government and planning entities. All invited stakeholders and other participation documentation including meeting sign-in sheets are 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 paper and online surveys, questionnaires, or verbal comment. The HMSC communicated with the HMPT via letters, email, telephone, webinar, in person meeting, and the project website. 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.

The stakeholders listed in Table 3.2-2 served on the 2020 countywide HMPT and actively participated in the planning process.

Table 3.2-2 Stakeholders who participated in the planning process.

MUNICIPALITY/ORGANIZATION	PARTICIPANT(S)
Anthony Township	Dennis Buttorff
Armstrong Township	James Dunn
Bastress Township	John Deitrich
Brady Township	Linda Bower
Brown Township	Dennis Paucke
Cascade Township	Joe Colucci
City of Williamsport	Jon Sander, Mark Sechrist, Damon Hagan
Clinton Township	Mark Barbier, Matt Dodge, Pat Deitrick
Cogan House Township	Lori Douglass
Cummings Township	Mike Yohe, Rick Bierly
Duboistown Borough	Ann Baker
Eldred Township	Cody Hoover
Fairfield Township	Frank Welsh, Jody Johnston
Franklin Township	Raine Ohnmeiss
Gamble Township	Joe Reighard
Hepburn Township	Joe Hamm, Jeffrey Tempesco
Hughesville Borough	Richard Smith
Jackson Township	Stuart Hopkins
Jersey Shore Borough	Dennis Buttorff, Joe Hamm, Cody Hoover
Jordan Township	Raine Ohnmeiss
Lewis Township	Steve Sechrist
Limestone Township	Dale Winter
Loyalsock Township	Frank Pile, Bill Burdett
Lycoming Township	Jeffrey Tempesco
McHenry Township	Robert Groff, Donald Price, Tim Ward
McIntyre Township	Daniel Clark
McNett Township	Charlene Fitch
Mifflin Township	Renee Sheddy, Ty Sheddy, Doug Cohick
Mill Creek Township	Linda Hopkins
Montgomery Borough	Dennis Gruver
Montoursville Borough	David Hines, Dennis Holt
Moreland Township	Susan Luizza
Muncy Borough	Dennis Holt, Ed Feigles
Muncy Creek Township	Cari Buck
Muncy Township	Gwen Pidcoe
Nippenose Township	Robert Breon, Lori Barner
Old Lycoming Township	Matt Aikey, Justin Rosato
Penn Township	
Piatt Township	Dennis Buttorff
Picture Rocks Borough	William Dorman, Linda Sosniak
Pine Township	Iva Mae Guillaume
Plunketts Creek Township	John Blair
Porter Township	Dennis Buttorff
Salladasburgh Borough	
Shrewsbury Township	Dale Hessler
South Williamsport Borough	Steve Cappelli, Keith Anderson
Susquehanna Township	Mike Steinbacher, Lynn Hill
Upper Fairfield Township	Todd Weltmer

Table 3.2-2 Stakeholders who participated in the planning process.

MUNICIPALITY/ORGANIZATION	PARTICIPANT(S)
Washington Township	Susan Satteson
Watson Township	Gene Zinck
Wolf Township	Jennifer Mausteller
Woodward Township	Joe Bertin, Gary Knarr
Lycoming County Planning and Community Development	Alyssa Henry, John Lavelle, Jenny Picciano, Sal Vitko, Scott Williams
Lycoming County Department of Public Safety	Kelle Robinson, Jeff Hutchins
Lycoming County Board of Commissioners	Tony R. Mussare
Lycoming County Planning Commission	Linda Sosniak
Lycoming County Conservation District	Carey Entz-Rine
FEMA Region III	Mari Radford
Larry's Creek Watershed Association	Dennis Buttorff
Lycoming Creek Watershed Association	Mike Ditchfield
Williamsport Municipal Water Authority (WMWA) and Williamsport Sanitary Authority (WSA)	Wendy Walter
Northcentral Pennsylvania Conservancy	Renee Carey
PA Department of Community and Economic Development	Theo Ritsick
PA Department of Conservation and Natural Resources	Wes Fahringer
PA Department of Environmental Protection	Tom Mears
PEMA	Bill Bradfield
PA Historical and Museum Commission	Bryan Van Sweden
PennDOT Engineering District 3-0	Christopher King, Tracy Mausteller
Penn College of Technology	Jason Bogle
Pine Creek Preservation Association	Jason Bogle
SEDA-COG	Teri Provost
Susquehanna River Basin Commission	Ben Pratt
U.S. Department of Agriculture – Natural Resources Conservation Service	Ryan Koch
U.S. Environmental Protection Agency	Ann DiDonato
U.S. Geological Survey	Jeff Chaplin, John Clune
West Branch Regional Authority	Brittnee Vann, Lea Rehm

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.

July 28, 2020 – Steering Committee Kick-Off Meeting was held virtually and 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.

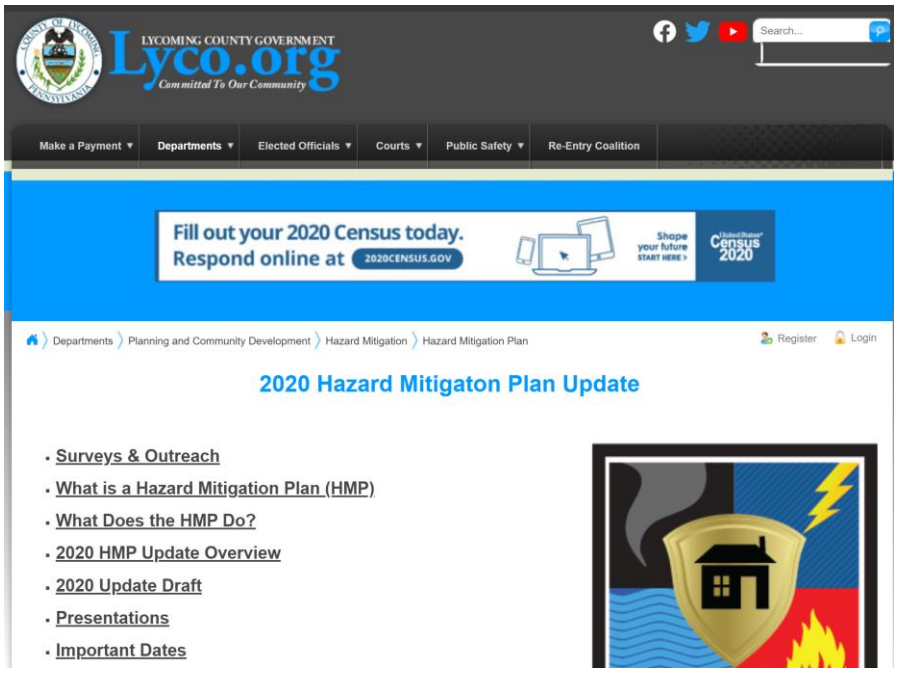
August 27, 2020 – Planning Team Kick-Off Meeting was held virtually and in person to discuss project scope, schedule, goals, the planning process, participation and engagement, and next steps. Hazards from the 2015 plan were reviewed with the HMPT at the kick-off. During this meeting, county staff, municipal 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 and NFIP Surveys were also completed by municipal attendees.

September 17, 2020 – Steering Committee Review Meeting was held virtually and 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 15, 2020 – Risk Assessment and Mitigation Solutions held virtually and in person to discuss Lycoming County's hazard vulnerability and new hazards to be profiled in the 2020 HMP. Participants discussed progress of mitigation actions from the 2015 Plan Update and identified additional mitigation actions that would help reduce or eliminate potential losses. This meeting included discussion between municipalities and State agencies about possible paths forward for delayed mitigation actions.

January 14, 2021 – 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 Lycoming County HMP. After noting comments received, the HMSC reminded participants about how to review and submit comments on the Draft HMP, as well as a final timeline for the review and submission of the HMP to PEMA and FEMA.

Figure 3.3-1 Project Website for the Lycoming County 2020 HMP Update



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 Lycoming County. Responses to these worksheets and surveys are included in Appendix C: Meeting and Other Participation Documentation.

- 2015 HMP Distribution and Comment Survey: At the beginning of the update process, the 2015 HMP was distributed to the Planning Team to review. In addition, members of the Planning Team were given a survey to collect comments on the 2015 Lycoming County HMP to help inform the 2020 HMP update. The 2015 HMP and survey form were also posted on the project website and publicly available.
- 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 2015 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.

- National Flood Insurance Policy (NFIP) Survey: Collects information on each municipality's floodplain management and ordinance enforcement related to NFIP standards and requirements.
- 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.

Community participation and comment was encouraged throughout the planning process, particularly through the County's project website, https://www.lyco.org/Hazard-Mitigation-Plan. This site acted as a repository for the entire planning process, including presentations (PPT and meeting recordings), agendas, minutes, and worksheets from each meeting as well as promulgating meeting dates, times, and important announcements. The site was made publicly available and linked to the County's website. Since the site was published in August 2020, it has received a total of XXX pageviews. Throughout the update process, the Hazard Mitigation Plan Steering Committee reviewed website activity to help inform outreach efforts.

Lycoming County posted the 2020 Draft Hazard Mitigation Plan Update on the plan update website (https://www.lyco.org/Hazard-Mitigation-Plan) for review and comment on December 29, 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 in via the online comment form or in writing to Alyssa Henry of the Lycoming County Planning and Community Development and/or to Rebecca Wetzler of Michael Baker International by mail or email.

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 Lycoming County are identified and defined in terms of location and geographic extent, magnitude of impact, previous events and likelihood of future occurrence. All information from the previous plan has been included or updated in the 2020 Lycoming County HMP Update, unless otherwise indicated. The Lycoming County HMPT reviewed the hazards profiled in the 2015 Lycoming County HMP Update during the August 27, 2020 Kick-Off Meeting. The HMPT determined that all the existing hazards should be carried over into the 2020 plan update and decided that Pandemic and Infectious Disease should be profiled as a hazard in the 2020 plan update. The hazards selected by the HMPT were then reviewed at the October 15, 2020 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. The Hazard Mitigation Plan Steering Committee reviewed comments and feedback to inform the Risk Assessment and Risk Assessment Prioritization Matrix.

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

- Drought
- Earthquake
- Flood, Flash Flood, Ice Jam
- Hailstorm
- Landslide
- Pandemic
- Radon Exposure
- Subsidence, Sinkhole
- Tornado and Windstorm
- Wildfire
- Winter Storm
- Terrorism
- Transportation Incident
- Dam Failure
- Environmental Hazard
- Levee Failure
- Nuclear Incident
- Utility Interruption
- Disorientation

Hazard profiles were then developed in order to define the characteristics of each hazard as it applies to Lycoming County. This process was completed using published information and web sites that address hazards globally, nationally, within Pennsylvania, or specifically within Lycoming 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 Lycoming 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 Lycoming County resulting in a Presidential Declaration or Emergency Declaration of Major Disaster. 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 2020 that have affected Lycoming County. There has not been a major disaster declaration in Lycoming County since the 2015 plan update. Additional declarations beyond 2020 can be found on the FEMA website at: https://www.fema.gov/disasters/disaster-declarations.

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

DECLARATION NUMBER	DATE	EVENT
4506	March 2020	Presidential Declaration – Pennsylvania Covid-19 Pandemic
3441	March 2020	Emergency Declaration – Pennsylvania Covid-19
4408	November 2018	Presidential Disaster – Severe Storms and Flooding
4292	December 2016	Presidential Disaster – Severe Storms and Flooding
3356	October 2012	Emergency Declaration – Hurricane Sandy
3340	September 2011	Emergency Declaration – Remnants of Tropical Storm Lee
4030	September 2011	Presidential Disaster Declaration - Remnants of Tropical Storm Lee
4003	July 2011	Presidential Disaster Declaration – Severe Storms and Flooding
3235	September 2005 (Emergency Declaration)	Emergency Declaration – Hurricane Katrina
1557	September 2004	Tropical Depression Ivan
3180	February 2003	Emergency Declaration – Severe Winter Storm
1497	September 2003	Presidential Disaster Declaration - Hurricane Isabel/Henri
1298	September 1999	Presidential Disaster Declaration – Tropical Depression Dennis and Flash Flooding
1294	September 1999	Presidential Disaster Declaration - Hurricane Floyd
1093	January 1996	Presidential Disaster Declaration - Flooding

Table 4.2.1-1 Presidential Disaster and Emergency Declarations affecting Lycoming County.		
DECLARATION NUMBER	DATE	EVENT
1085	January 1996	Presidential Disaster Declaration - Severe Winter Storms
1015	January and February 1994	Presidential Disaster Declaration - Severe Winter Storms
3105	March 1993	Emergency Declaration – Blizzard
737	June 1985	Presidential Disaster Declaration – Severe Storms, High Winds, and Tornadoes
485	September 1975	Presidential Disaster Declaration - Flood (Eloise)
340	June 1972	Presidential Disaster Declaration - Flood (Agnes)
206	August 1965	Presidential Disaster Declaration - Water Shortage
40	August 1955	Presidential Disaster Declaration – Floods, Rains

4.2.2. Summary of Hazards

Table 4.2.2-1 summarizes hazards identified in the 2015 Lycoming County HMP Update.

Table 4.2.2-1 Hazards identified in the Lycoming County 2015 Mitigation Plan Update.		
HAZARDS		
Flood, Flash Flood, Ice Jam	Winter Weather	Earthquake
Drought	Landslides	Wildfires
Subsidence and Sinkholes	Radon Exposure	Hailstorm
Environmental Hazards	Nuclear Incident	Dam Failure
Tornado, Windstorm	Levee Failure	Terrorism
Transportation Incidents	Utility Interruption	Disorientations

All hazards identified in 2015 plan were included in the 2020 HMP update. The hazards were reviewed by the HMPT at the August 27, 2020 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 Pandemic and Infectious Disease would be added as a new

hazard in the 2020 HMP Update. Table 4.2.2-2 contains a complete list of all potential hazards in Lycoming 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
NATURAL HAZARDS	
	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).
	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).
	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).
	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).
	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).

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
	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).
	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).
	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).
	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).
	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).
	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).
HUMAN MADE HAZARDS	

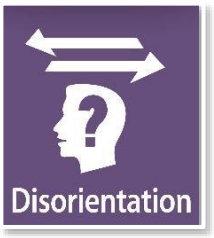
Table 4.2.2-2 List and description of natural and manmade hazards profiled in the 2020 Hazard Mitigation Plan Update. (PA 2018 Standard Operating Guide)	
HAZARD	HAZARD DESCRIPTION
	Dam failure is the uncontrolled release of water (and any associated wastes) from a dam. This hazard often results from 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).
	Large numbers of people are attracted to Pennsylvania's rural areas for recreational purposes such as hiking, camping, hunting, and fishing. As a result, people can become lost or trapped in remote and rugged wilderness areas. Search and rescue may be required for people who suffer from medical problems or injuries and those who become accidentally or intentionally disoriented. Search and rescue efforts are focused in and around state forest and state park lands.
	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.
	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).
	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).
	Terrorism is use of force or violence against persons or property with the intent to intimidate or coerce. Acts of terrorism include threats of terrorism; assassinations; kidnappings; hijackings; bomb scares and bombings; cyber-attacks (computer-based); and the use of chemical, biological, nuclear and radiological weapons (FEMA, 2009). Cyber-attacks have become an increasingly pressing concern.

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
	Transportation incidents are technological hazards involving the nation's system of land, sea, and air transportation infrastructure. A flaw or breakdown in any component of this system can and often does result in a major disaster involving loss of life, injuries, property and environmental damage, and economic consequences. (FEMA, 2018)
	Utility interruption hazards are hazards that impair the functioning of important utilities in the energy, telecommunications, public works, and information network sectors. Utility interruption hazards include the following: • Geomagnetic Storms • Fuel or Resource Shortage • Electromagnetic Pulse • Information Technology Failure • Ancillary Support Equipment • Public Works Failure • Telecommunications System Failure • Transmission Facility or Linear Utility Accident • Major Energy, Power, Utility Failure (Bonner, 2017)

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 Lycoming 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.

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.

Table 4.3.1-1 Palmer Drought Severity Index (NOAA, 2020)

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 Middle Susquehanna region of Pennsylvania have resulted in Palmer Drought Severity Index level as low as -6.10. This was during a drought that lasted for twenty-five months from 1930 - 1932. In the Lycoming County area, the average Palmer Drought Severity Index level for droughts is approximately -4.0 and the average duration of a drought is about 6 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, Lycoming 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 Lycoming County area between 1980 and 2017.

Table 4.3.1-2 Lycoming County Declared Drought Status from 1980 to 2019 (PADEP, 2020).

DATE	DROUGHT STATUS	DATE	DROUGHT STATUS
Nov 18, 1980 - Apr 20, 1982	Emergency	March 15, 1999 – June 10, 1999	Watch
Apr 26, 1985 - Jul 29, 1985	Watch	June 10, 1999 – June 18, 1999	Warning
Jul 29, 1985 - Oct 22, 1985	Watch	June 18, 1999 – July 20, 1999	Emergency
Oct 22, 1985 - Oct 29, 1985	Watch	July 20, 1999 – Sept 30, 1999	Watch

Table 4.3.1-2 Lycoming County Declared Drought Status from 1980 to 2019 (PADEP, 2020).			
DATE	DROUGHT STATUS	DATE	DROUGHT STATUS
Oct 29, 1985 - Dec 19, 1985	Watch	Sept 30, 1999 – Dec 16, 1999	Watch
Jul 7, 1988 - Aug 24, 1988	Watch	Dec 16, 1999 - Feb 25, 2000	Watch
Aug 24, 1988 - Dec 12, 1988	Warning	Feb 25, 2000 - May 5, 2000	Watch
March 3, 1989 – May 15, 1989	Watch	Aug 8, 2001 - Aug 24, 2001	Watch
Jun 28, 1991 - Jul 24, 1991	Warning	Aug 24, 2001 - Nov 6, 2001	Watch
Jul 24, 1991 – Aug 16, 1991	Emergency	Nov 6, 2001 - Dec 5, 2001	Watch
Aug 16, 1991 - Sep 13, 1991	Emergency	Dec 5, 2001 - Feb 12, 2002	Watch
Sep 13, 1991 - Oct 21, 1991	Emergency	Feb 12, 2002 - May 13, 2002	Watch
Oct 21, 1991 - Jan 16, 1992	Emergency	May 13, 2002 - June 14, 2002	Watch
Jan 17, 1992 - Apr 20, 1992	Emergency	Sept 5, 2002 - Nov 7, 2002	Watch
April 20, 1992 – June 23, 1992	Warning	April 11, 2006 - June 30, 2006	Watch
Sep 1, 1995 - Sep 20, 1995	Warning	Aug 6, 2007 – Sept 5, 2007	Watch
Sep 20, 1995 - Nov 8, 1995	Emergency	Sept 5, 2007 – Oct 5, 2007	Watch
Nov 8, 1995 - Dec 18, 1995	Warning	Oct 5, 2007 - Jan 11, 2008	Watch
Jul 17, 1997 - Oct 27, 1997	Watch	Jan 11, 2008 - Feb 15, 2008	Watch
Oct 27, 1997 - Nov 13, 1997	Watch	Sept 16, 2010 - Nov 10, 2010	Watch
Nov 13, 1997 – Jan 16, 1998	Watch	Aug 5, 2011 – Sept 2, 2011	Watch
Dec 3, 1998 - Dec 8, 1998	Warning	Mar 24, 2015 – June 17, 2015	Watch
Dec 8, 1998 - Dec 14, 1998	Warning	June 17, 2015 – July 10, 2015	Watch
Dec 14, 1998 - Dec 16, 1998	Warning	Aug 2, 2016 – Sept 6, 2016	Watch
Dec 16, 1998 – Jan 15, 1999	Emergency	Sept 6, 2016 – Nov 3, 2016	Watch
Jan 15, 1999 – March 15, 1999	Emergency		

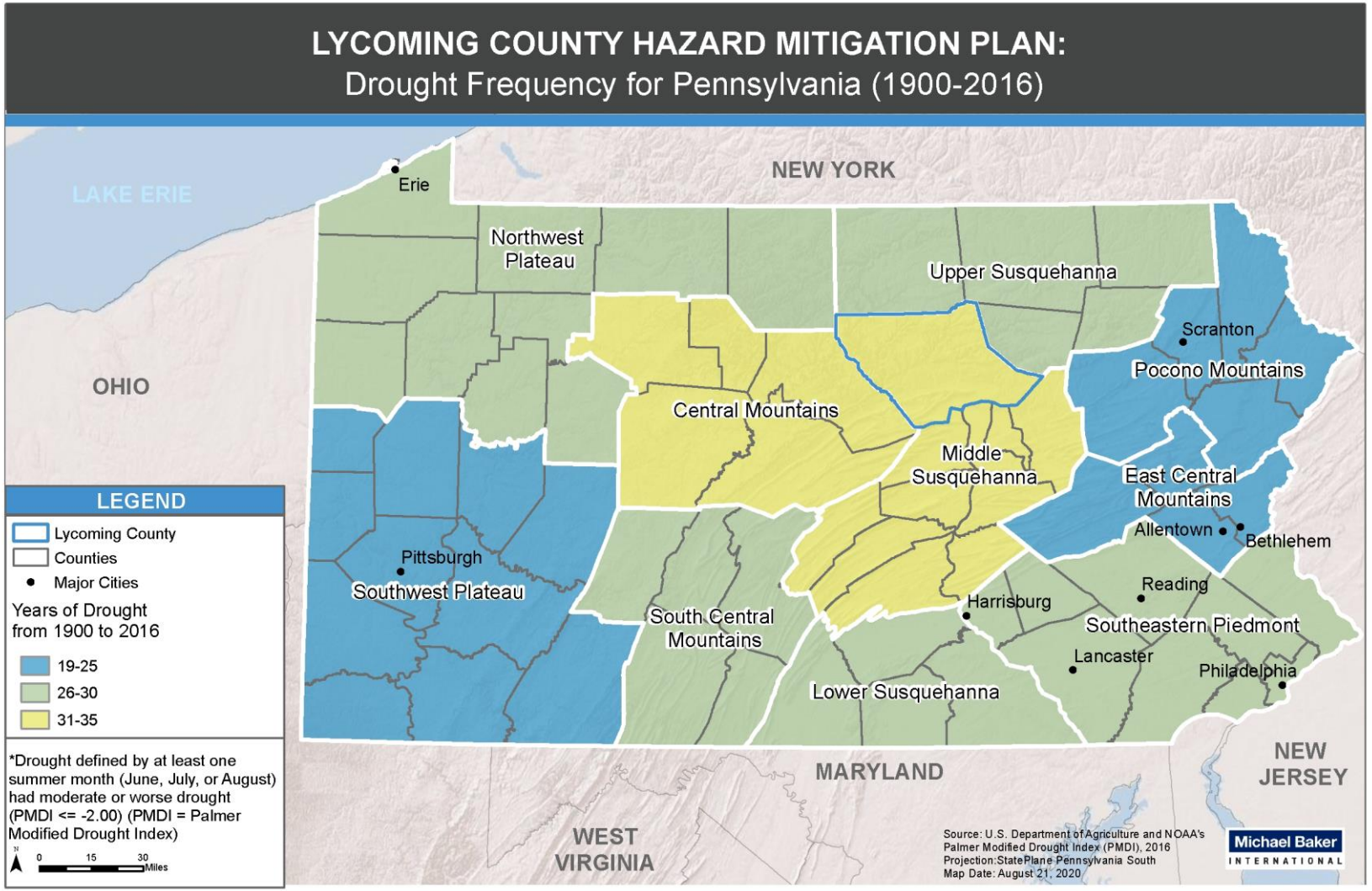
As can be seen in the table above, Lycoming County has not had a severe drought since 1999. According to DEP's Watershed Management Drought Information Center, the County has had twenty-two drought watches in the period since the last drought emergency in the summer of 1999. A burn ban was issued for Lycoming County on April 16, 2006 due to extremely dry weather conditions. The USDA Risk Management Agency operates and manages the Federal Crop Insurance Corporation program. Since Lycoming County farms are eligible for crop insurance, it is possible to determine agricultural losses due to drought in the county. Table 4.3.1-3 displays the crop loss insurance payments by year due to drought (including even mild drought occurrences) since 2017.

Table 4.3.1-3 Crop loss insurance compensation due to drought (USDA Risk Management Agency, 2020)	
CROP YEAR	INDEMNITY AMOUNT
2017	$ 60,302
2018	$ 597,098
2019	$ 125,115
2020 (Year-To-Date)	$ 89,115

One way to measure the magnitude of a drought is through the Palmer Drought Severity Index. This index is based on several meteorological and hydrological factors, including temperature and soil moisture levels, and is computed weekly by the National Weather Service's Climate Prediction Center. The index compares precipitation received against the average amount expected during that period. Droughts are expressed as negative numbers. Palmer values of -2.00 to -2.99 indicate a watch status; values of -3.00 to -3.99 indicate a warning; and values of -4.00 and less indicate an emergency.

According to the Palmer Drought Severity Index, Lycoming County spent 10% to 14.9% of the time between 1895 and 1995 in a severe and extreme drought (i.e., Palmer values less than or equal to -3). Figure 4.3.1-1 displays these findings and Lycoming County in relation to other areas in Pennsylvania.

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



4.3.1.4. Future Occurrence

The potential for a drought to occur in Lycoming County is high. Given the frequency of drought watches being issued for Lycoming County and its municipalities, the County can reasonably expect one to two drought watch periods each year. As stated above, Lycoming County spent 10% to 14.9% of the time between 1895 and 1995 in a severe and extreme drought; it can be assumed that the County will spend 10% to 14.9% of the future in these same drought conditions. While some form of drought condition frequently exists in Lycoming County, the impact depends on the duration of the event, severity of conditions, and area affected. On the whole, though, the probability of future drought events can be considered *possible* according to the Risk Factor Methodology (see Table 4.4.2-1).

4.3.1.5. Vulnerability Assessment

Drought vulnerability depends on the duration and area of impact. However, other factors contribute to the severity of a drought. Unseasonably high temperatures, prolonged winds, and low humidity can heighten the impact of a drought. Extended periods of drought can lead to lowered stream levels, altering the delicate balance of riverine ecosystems. Certain tree species are susceptible to fungal infections during prolonged periods of soil moisture deficit. Fall droughts pose a particular threat because groundwater levels are typically at their lowest following the height of the summer growing season.

Drought has serious implications for the agricultural sector of Lycoming County's economy. According to the 2017 USDA Census of Agriculture, Lycoming County has 186,130 acres in 1,043 farms. The market value of all agricultural products sold exceeded $63.7 million in 2017; some or this entire product is at risk during a drought event. Lycoming County ranks 33rd of the 67 counties in Pennsylvania in terms of the market value of agricultural products sold; in 2017, the market value of agricultural production topped $63 million. The county ranks ninth in tobacco; eighth in cut Christmas trees and short rotation woody crops; and fourteenth in nursery, greenhouse, floriculture, and sod in Pennsylvania by sales value (USDA, 2017). Other important crops include fruits, tree nuts, and berries; hogs and pigs; and other crops and hay. Table 4.3.1-5 lists the top livestock inventory items in Lycoming County. With these agricultural assets, drought events can severely impair the local economy with prolonged drought negatively impacting the livelihood of residents within agricultural communities particularly.

Table 4.3.1-3 Top Livestock Inventory Items in Lycoming County (USDA, 2017).

LIVESTOCK	COUNT
Broilers and Other Meat-Type Chickens	131,204
Hogs and Pigs	32,105
Cattle and Calves	13,790
Sheep and Lambs	1,131
Pullets	(D)
(D) Withheld to avoid disclosing data for individual operations.	

Wildfire is the most severe secondary effect associated with drought. Wildfires can devastate wooded and agricultural areas, threatening natural resources and farm production facilities. Prolonged drought conditions can cause major ecological changes, such as increases in scrub growth, flash flooding, and soil erosion.

Long-term water shortages can have a high impact on agribusinesses, hydropower-dependent utilities, and other industries reliant on water for production services; all critical infrastructure in Lycoming County is vulnerable to the effects of a drought. Drought can cause municipalities to enforce water rationing and distribution. This strains the availability of consumable water for the community and will significantly affect the operations of the five water authorities which include Jersey Shore Area Joint Water Authority, Lycoming County Water and Sewer Authority, and the Williamsport Municipal Water Authority – Williamsport Sanitary Authority. It also increases Lycoming County's vulnerability to other hazards such as severe weather, extreme heat, and public health emergencies. The special needs population of any county must also be considered during drought conditions.

Lycoming County residents that use private domestic wells are more vulnerable to droughts. Table 4.3.1-7 shows the number of domestic wells and the number of properties with public water access per municipality. It is important to note that the well data was obtained from the Pennsylvania Groundwater Information System (PaGWIS). PaGWIS relies on voluntary submissions of well record data by well drillers; as a result, it is not a complete database of all domestic wells in the County. This is the most complete dataset of domestic wells available. The municipalities with the highest number of domestic wells include Cummings Township, Hepburn Township, McHenry Township, and Upper Fairfield Township.

Table 4.3.1-4 Number of reported domestic wells in Lycoming County (PaGWIS, 2020).

MUNICIPALITY	NUMBER OF REPORTED DOMESTIC WELLS	MUNICIPALITY	NUMBER OF REPORTED DOMESTIC WELLS
Anthony Township	42	Mill Creek Township	50
Armstrong Township	34	Montgomery Borough	15
Bastress Township	44	Montoursville Borough	19
Brady Township	35	Moreland Township	45
Brown Township	60	Muncy Borough	1
Cascade Township	11	Muncy Creek Township	80
Clinton Township	85	Muncy Township	93
Cogan House Township	40	Nippenose Township	24
Cummings Township	105	Old Lycoming Township	73

Table 4.3.1-4 Number of reported domestic wells in Lycoming County (PaGWIS, 2020).

MUNICIPALITY	NUMBER OF REPORTED DOMESTIC WELLS	MUNICIPALITY	NUMBER OF REPORTED DOMESTIC WELLS
Duboistown Borough	14	Penn Township	38
Eldred Township	91	Piatt Township	47
Fairfield Township	98	Picture Rocks Borough	22
Franklin Township	31	Pine Township	42
Gamble Township	30	Plunketts Creek Township	23
Hepburn Township	125	Porter Township	38
Hughesville Borough	6	Salladasburg Borough	0
Jackson Township	21	Shrewsbury Township	21
Jersey Shore Borough	5	South Williamsport Borough	27
Jordan Township	25	Susquehanna Township	43
Lewis Township	37	Upper Fairfield Township	118
Limestone Township	91	Washington Township	73
Loyalsock Township	65	Watson Township	69
Lycoming Township	36	Williamsport City	52
McHenry Township	101	Wolf Township	55
McIntyre Township	15	Woodward Township	58
McNett Township	9	Unknown	407
Mifflin Township	41	Lycoming County Total	2,830

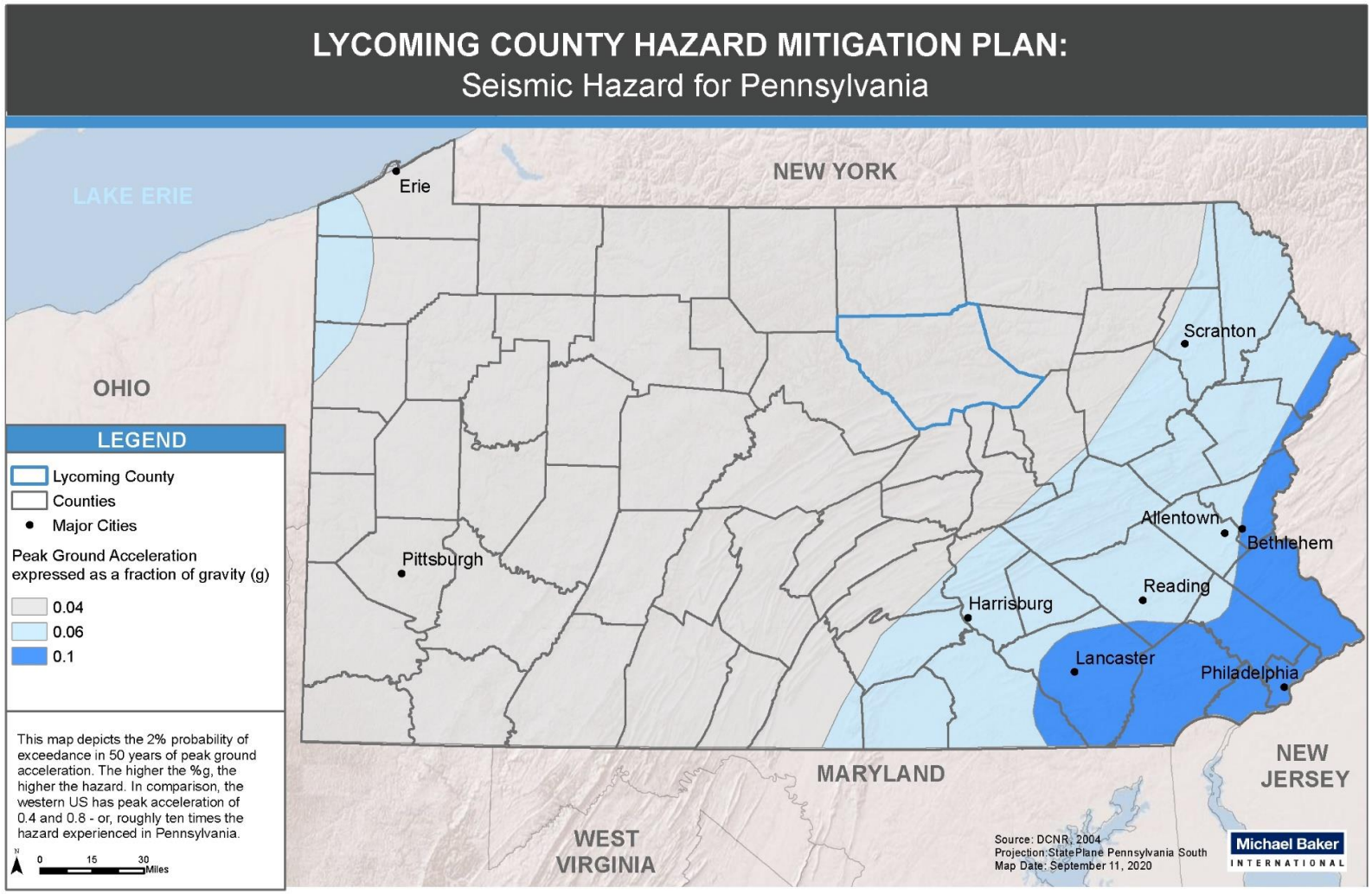
4.3.2. Earthquake

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 Lycoming 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 Lycoming County. Earthquakes can cause damage to buildings and other rigid superstructures, depending on factors like magnitude, distance of local areas to the 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 Lycoming 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 Lycoming County, expressed as the two-percent probability of exceedance in 50 years of peak ground acceleration (g). This map was digitized from the National Seismic Hazard report. Lycoming County lies in the 0.04 zone, indicating that the hazard is slight. Earthquakes originating from outside Pennsylvania, can also impact the Commonwealth, though they are not expected to cause significant damage. This was the most current data available when updating this plan.

Figure 4.3.2-1 Approximate USGS Seismic Hazard for Pennsylvania



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^2). 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^2 means that the shaking is equivalent to about one percent of the acceleration due to gravity. Generally, ground acceleration must exceed 15 cm/sec^2 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.

Table 4.3.2-1 Richter scale magnitudes and associated earthquake size effects.

RICHTER MAGNITUDES	EARTHQUAKE EFFECTS
Less than 3.5	Generally, not felt but recorded.
3.5-5.4	Often felt, but rarely causes damage.
Under 6.0	At most, slight damage to well-designed buildings; can cause major damage to poorly constructed buildings over small regions.
6.1-6.9	Can be destructive in areas where people live up to about 100 kilometers across.
7.0-7.9	Major earthquake; can cause serious damage over large areas.
8.0 or greater	Great earthquake; can cause serious damage in areas several hundred kilometers across.

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 Lycoming County near a populated area.

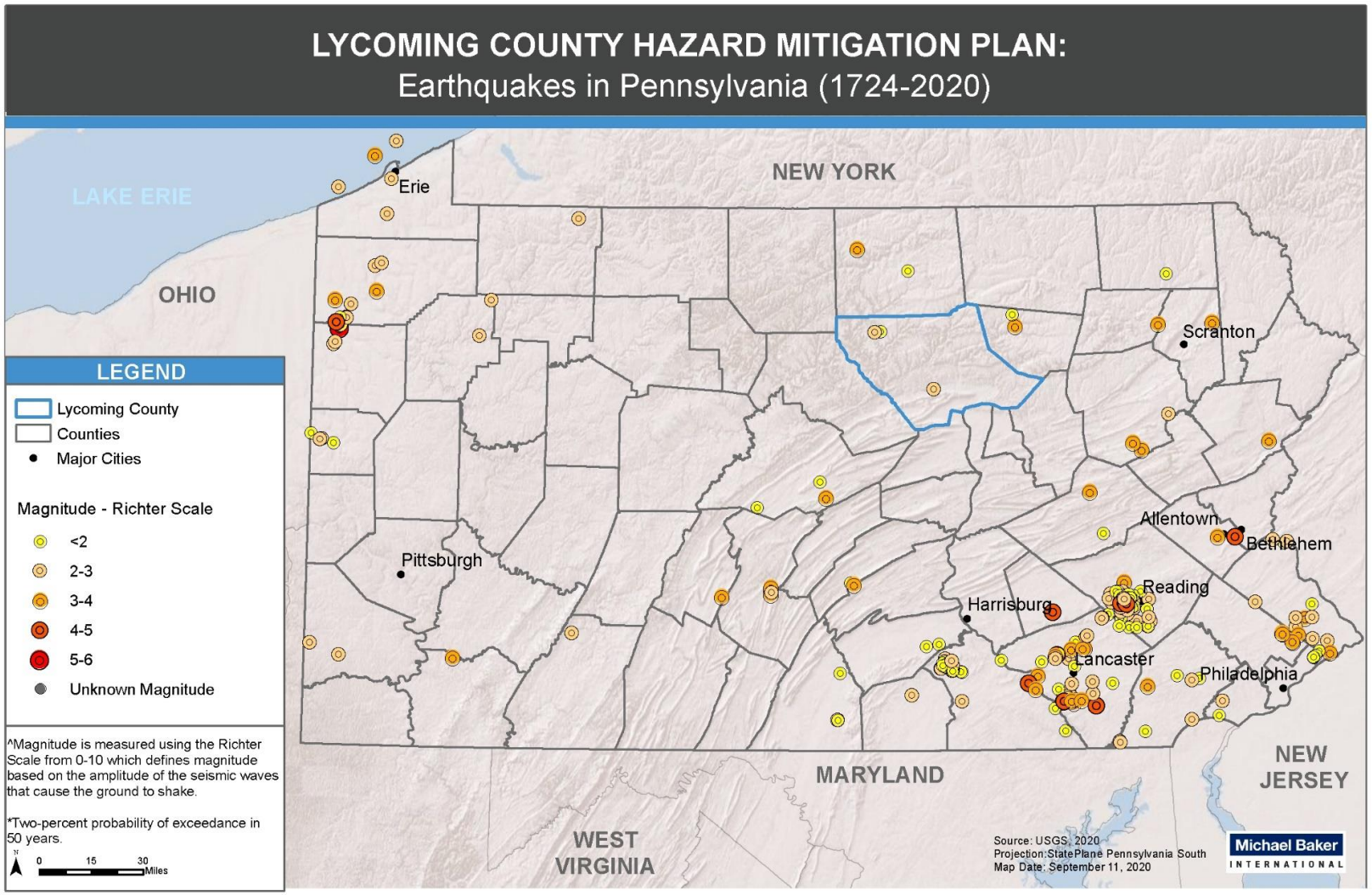
4.3.2.3. Past Occurrence

According to records maintained by the Pennsylvania Department of Conservation and Natural Resources (DCNR), there has been one earthquake recorded with its epicenter in Lycoming County. This event occurred in 1907, however its magnitude was not measured, and no epicenters have occurred within the county since. Parts of the county have likely experienced shock waves from some minor earthquakes that have occurred around the region show in Figure 4.3.2-2 below.

Earthquake events are shown in other areas of Pennsylvania, with a particular concentration of events occurring in the eastern part of the Commonwealth between Lancaster and Reading. In 2011, a magnitude 5.8 earthquake with an epicenter in rural Louisa County, VA was felt throughout Pennsylvania, triggering evacuations, emergency bridge and tunnel inspections, and minor damage to buildings. This shallow earthquake occurring along the Spotsylvania

Fault was felt as far north as Ontario, Canada and as far south as Alabama. DCNR's earthquake records end in 2003, but a number of minor earthquakes have occurred in Pennsylvania and have been documented by USGS's Seismic Hazard Program.

Figure 4.3.2-2 Map of earthquake epicenters in Pennsylvania



4.3.2.4. Future Occurrence

The probability of an earthquake event occurring in Lycoming County is very low. Lycoming 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 Lycoming 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, pipe failures, and utility interruptions. A very large earthquake affecting Lycoming 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 Lycoming 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 Lycoming County due to earthquakes, 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 Lycoming County is 31,843, or roughly 60% of buildings in the County (ACS, 2014-2018).

All future structures will also have the potential to experience an earthquake. However, given that new structures must also 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 the 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.

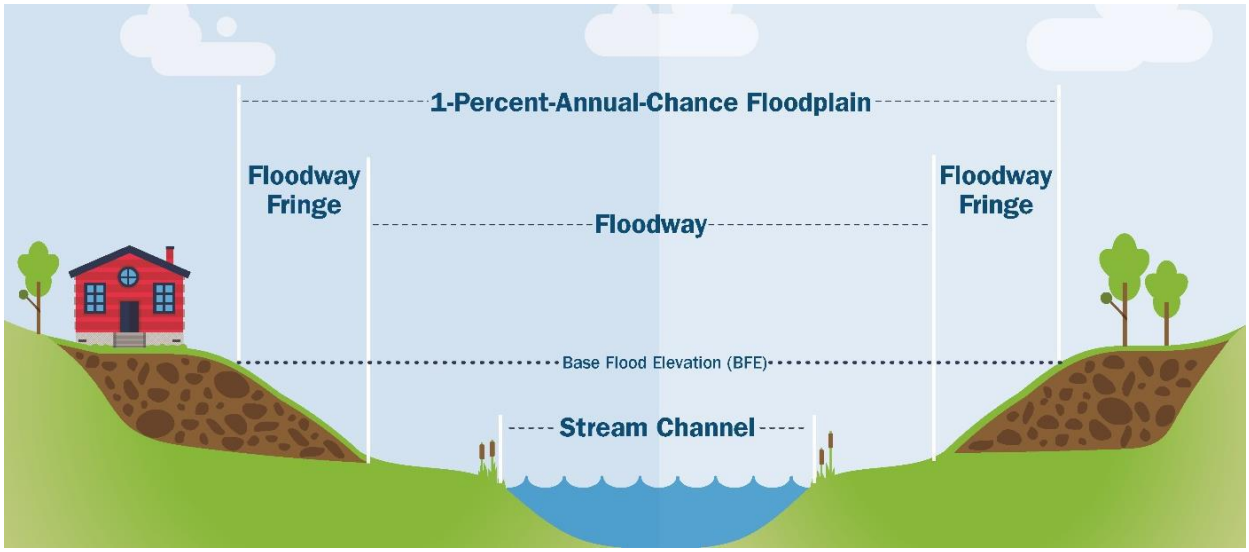
Lycoming County lies within the drainage basin of the Susquehanna River, which is the largest basin on the Atlantic Seaboard of the United States (PACD, 2019). The Susquehanna River drains directly into the Chesapeake Bay. Most of the County's population is in West Branch Susquehanna River Watershed, but the County is comprised of numerous other watersheds with dedicated outreach groups as illustrated in the Watersheds Map in Section 2, Figure 2.1-2. The County seat, the City of Williamsport, is located along the West Branch of the Susquehanna River in the south-central part of Lycoming 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 Lycoming County, towards the Susquehanna River. Large tributaries in the County include Loyalsock Creek, Lycoming Creek, Muncy Creek, and Pine Creek.

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 Lycoming 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.

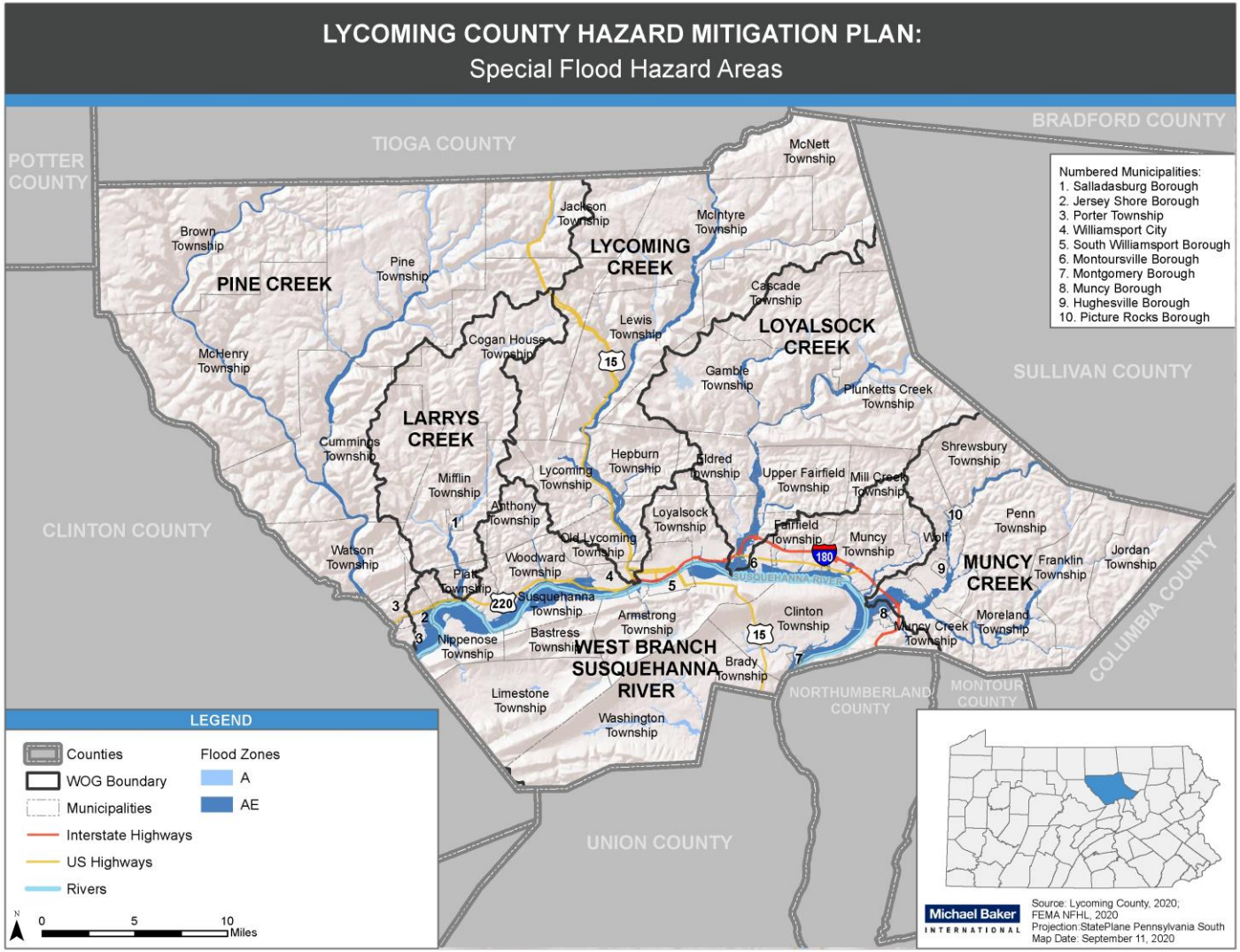


The current countywide FIRM and Flood Insurance Study (FIS) report were published for Lycoming County on June 2, 2016 (FEMA, 2016). This best available flood hazard data, which was used to update this flood hazard profile, included current effective FIRM data and incorporated Letters of Map Revision (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.

Pennsylvania has more stream miles than any other state, and many of its communities are located in floodplains. For waterfront communities, the level of risk constantly changes in response to unpredictable weather patterns and seasonal influences. Over 2,200 miles of stream traverse Lycoming County, more than any other county in Pennsylvania. Major flood-prone areas are communities located in low-lying valleys of major streams and tributaries. Unless protected by a dike or levee, most population concentrations along the Susquehanna River have a high possibility of flooding.

Figure 4.3.3-2 shows the location of watercourses and flood zones in Lycoming County. The location of approximate and detailed (which include BFEs) SFHAs (1-percent-annual chance zones) are shown.

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



4.3.3.2. Range of Magnitude

Floods are considered hazards when people and property are affected. Nationwide, hundreds of floods occur each year, making them one of the most common hazards in all 50 states and U.S. territories. In Pennsylvania, flooding occurs commonly and can happen during any season of the year from a variety of sources. Every two to three years, serious flooding occurs along one or more of Pennsylvania's major rivers or streams, and it is not unusual for this to occur several years in succession. Injuries and deaths can occur when people are swept away by flood currents or bacteria and disease are spread by moving or stagnant floodwaters. Most property damage results from inundation by sediment-filled water. A large amount of rainfall over a short time span can result in flash flood conditions. Small amounts of rain can 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 impermeable surfaces such as large parking lots, paved roadways, or other impervious developed areas.

Several factors determine the severity of floods, including rainfall intensity and duration, topography, ground cover and rate of snowmelt. Water runoff is greater in areas with steep slopes and little or no vegetative ground cover. Also, urbanization typically results in the replacement of vegetative ground cover with asphalt and concrete, increasing the volume of surface runoff and stormwater, particularly in areas with poorly planned stormwater drainage systems.

In Central Pennsylvania, including Lycoming County, there are seasonal differences in the causes for floods. In the winter and early spring (February to April), major flooding has occurred as a result of heavy rainfall on dense snowpack throughout contributing watersheds, although the snowpack is generally moderate during most winters. Winter floods also have resulted from runoff of intense rainfall on frozen ground, and local flooding has been exacerbated by ice jams in rivers, streams, and creeks. Ice jam floods occur on rivers that are totally or partially frozen. A rise in stream stage will break up a totally frozen river and create ice flows that can pile up on channel obstructions such as shallow riffles, log jams, or bridge piers. The jammed ice creates a dam across the channel over which the water and ice mixture continues to flow, allowing for more jamming to occur.

Summer floods have occurred from intense rainfall on previously saturated soils. Summer thunderstorms deposit large quantities of rainfall over a short period of time that can result in flash flood events.

Flood effects can be volume or force related. Major floods along larger streams having wide floodplains tend to result in large-scale inundations. This causes widespread damage through soaking and silt deposits in homes, businesses, and industrial plants. In hilly regions where runoff paths are steep, flash floods may be prevalent. Flash floods are short in duration and usually occur in a somewhat localized area. In these floods, the velocity rather than the volume of water causes flood damages. Torrents of water can rush down minor hillside gullies at 30-50

miles per hour, carrying trees, debris, and rocks. These floods are often unpredictable and, particularly if they occur at night, can cause major panic and loss of life. Frozen surfaces can more than double normal runoff velocities, particularly in small drainage areas. This causes flash floods which can be compounded by ice and debris jams in channels and culverts. Also, obstructions within the floodplain such as bridges and undersized culverts can also increase flooding.

Although floods can cause damage to property and loss of life, floods are naturally occurring events that benefit riparian systems which have not been disrupted by human actions. Such benefits include groundwater recharge and the introduction of nutrient rich sediment improving soil fertility. However, the destruction of riparian buffers, 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.

4.3.3.3. Past Occurrence

During the winter of 1996, unseasonably high temperatures began to melt an immense snowpack that had accumulated during the blizzard of 1996. Accompanying heavy rainfall and high winds carried large volumes of runoff, overwhelming small and large watersheds. Before the week was over, all 67 of Pennsylvania's counties had been declared federal disaster areas. The Susquehanna River Basin was hit particularly hard. Ice jams on the Susquehanna River contributed to rapid water rises, the highest recorded in Harrisburg since 1890. Flood levels in the Lycoming Creek Basin reached 22.6 feet, two feet higher than flood stages recorded during tropical storm Agnes in 1972. Throughout Lycoming County, damage sustained from storms and floods exceeded $100 million. Six lives were lost in the Lycoming Creek Valley.

Table 4.3.3-1 contains information on flooding-related events since 1996 that impacted Lycoming County. These are the oldest floods for which data is available from the NCDC. Reported property damages are estimates reported to the NCDC and displayed in the Storm Events database today. Please note a zero-dollar entry may indicate minimal property damage, or that damage costs were not reported.

Table 4.3.3-1 Flood and flash flood events impacting Lycoming County from 1950-2019 (NOAA, 2019). Note that property damage values are estimates based on best available information. "Countywide" indicates several locations in the County were affected.

DATE	LOCATION & DESCRIPTION	ESTIMATED TOTAL DAMAGE ($)
1/19/1996	Northern Lycoming County	0
1/19/1996	Countywide; Six fatalities along Lycoming Creek due to flooding.	0
1/19/1996	Southern Lycoming County	0

Table 4.3.3-1 Flood and flash flood events impacting Lycoming County from 1950-2019 (NOAA, 2019). Note that property damage values are estimates based on best available information. "Countywide" indicates several locations in the County were affected.

DATE	LOCATION & DESCRIPTION	ESTIMATED TOTAL DAMAGE ($)
11/8/1996	Western Lycoming County; Minor road flooding occurred due to heavy rainfall over western Lycoming County.	0
12/1/1996	Southeast Lycoming County	0
12/13/1996	Countywide	0
1/8/1998	Countywide	0
2/18/1998	Southern Lycoming County	0
6/16/1998	Muncy; Streets and small streams flooded.	0
9/7/1999	Southeast Lycoming County; The remnants of Hurricane Dennis produced 4 to 8 inches of rain across the southeast parts of Lycoming County. Thirty homes were damaged, and one bridge was out of service. Around 80 people were evacuated.	1,000,000
9/16/1999	Countywide	20,000
12/17/2000	Countywide	0
3/26/2002	Northern Lycoming County; Total rainfall amounts averaged slightly in excess of 2 inches from this system. Many roads were flooded as several small creeks exceeded their banks.	0
3/26/2002	Southern Lycoming County; Total rainfall amounts averaged slightly in excess of 2 inches from this system. Many roads were flooded as several small creeks exceeded their banks.	0
5/13/2002	Montgomery; Flash flooding along Black Hole Creek caused the closure of several roads in and around the Montgomery area. Flooded roadways were also reported in the Muncy area.	0
5/30/2002	Elimsport; Heavy rain caused extensive flooding along route 44, which eventually caused the closing of the roadway. There were also reports of trees down, resulting from saturated ground conditions.	0
3/20/2003	Southern Lycoming County; Rainfall of three quarters to 1 inch caused the West Branch Susquehanna River at Montgomery to exceed its flood stage of 17 feet.	0
11/20/2003	Southern Lycoming County; Heavy rain caused the West Branch Susquehanna River at Montgomery to exceed its flood stage of 17 feet.	0
3/7/2004	Southern Lycoming County; Rain and snow melt caused the West Branch Susquehanna River at Montgomery to exceed flood stage.	0
5/26/2004	Muncy; Heavy rain caused flash flooding in Lycoming county. Three mudslides were reported along Route 442 East of Clarkstown. In addition, Fegelman Road between Muncy and Clarkstown was under 3 feet of water and closed by the county.	0
7/31/2004	Hughesville; Heavy rain caused flash flooding in eastern Lycoming County from Hughsville to the Sullivan County line. Route 220 was closed due to flood waters, and several secondary roads were washed out.	0
9/8/2004	Northern Lycoming County	0
9/8/2004	Southern Lycoming County	0
9/10/2004	Southern Lycoming County; Heavy rain caused the West Branch of the Susquehanna River at Montgomery to exceed its flood stage of 17 feet.	0
9/17/2004	Southern Lycoming County	0

Table 4.3.3-1 Flood and flash flood events impacting Lycoming County from 1950-2019 (NOAA, 2019). Note that property damage values are estimates based on best available information. "Countywide" indicates several locations in the County were affected.

DATE	LOCATION & DESCRIPTION	ESTIMATED TOTAL DAMAGE ($)
9/17/2004	Northern Lycoming County	0
9/18/2004	Southern Lycoming County; Heavy rain caused the Loyalsock Creek at Loyalsockville to exceed its flood stage of 12 feet.	0
9/18/2004	Southern Lycoming County; Heavy rain caused the West Branch of the Susquehanna River at Montgomery to exceed its flood stage of 17 feet.	0
9/18/2004	Southern Lycoming County; Heavy rain caused the West Branch of the Susquehanna River at Williamsport to exceed its flood stage of 20 feet.	0
9/18/2004	Southern Lycoming County; Heavy rain caused the West Branch of the Susquehanna River at Jersey Shore to exceed its flood stage of 26 feet.	0
9/18/2004	Southern Lycoming County; Heavy rain caused the West Branch of the Susquehanna River at Muncy to exceed its flood stage of 20 feet.	0
1/15/2005	Southern Lycoming County; Heavy rain caused the West Branch of the Susquehanna River at Montgomery to exceed its flood stage of 17 feet.	0
3/29/2005	Southern Lycoming County	0
3/29/2005	Northern Lycoming County; Rainfall amounts from 1 to 3 inches, combined with rapid snowmelt to produce widespread flooding across the region. Numerous roadways were reported closed due to flooding, mainly from late Monday night into Tuesday morning. In addition, several streams overflowed their banks as a result of excessive runoff from the rain and melting snow. In Lycoming County, water covered routes 405 and 442 near Muncy.	0
3/29/2005	Southern Lycoming County; Heavy rain caused the West Branch of the Susquehanna River at Montgomery to exceed its flood stage of 17 feet.	0
4/2/2005	Southern Lycoming County	0
4/2/2005	Northern Lycoming County; Average rainfall amounts of 2 to 4 inches occurred during this time. This heavy rainfall led to numerous road closures as smaller streams and creeks overflowed their banks.	0
4/3/2005	Southern Lycoming County; Heavy rain caused the West Branch of the Susquehanna River at Montgomery to exceed its flood stage of 17 feet.	0
4/3/2005	Southern Lycoming County; Heavy rain caused the West Branch of the Susquehanna River at Muncy to exceed its flood stage of 20 feet.	0
11/30/2005	Southern Lycoming County; Heavy rain caused the West Branch of the Susquehanna River at Montgomery to exceed its flood stage of 17 feet.	0
12/1/2005	Southern Lycoming County; Heavy rain caused the West Branch of the Susquehanna River at Montgomery to exceed its flood stage of 17 feet.	0
11/16/2006	Muncy; Heavy rain caused flash flooding in Lycoming County. Small streams were out of their banks and flooding roads in Muncy. Route 220 was also closed due to flooding.	0
3/5/2008	Cedar Run; Heavy rain produced widespread urban, small stream and river flooding closing several roads including Route 220 north of Hughesville, John Brady Drive in Muncy, Chippewa Road in Muncy Creek Township, and Little Pine Creek Road in Pine Township.	0
7/23/2009	Jersey Shore; Heavy rain produced flash flooding across southwest Lycoming County. The flooding washed out a portion of Route 44 in Watson Township. A rock slide occurred on Route 973 in Watson and Mifflin Townships. Salladasburg Borough also reported flooding.	25,000

Table 4.3.3-1 Flood and flash flood events impacting Lycoming County from 1950-2019 (NOAA, 2019). Note that property damage values are estimates based on best available information. "Countywide" indicates several locations in the County were affected.

DATE	LOCATION & DESCRIPTION	ESTIMATED TOTAL DAMAGE ($)
7/23/2009	Jersey Shore; Heavy rain produced flash flooding across southwest Lycoming County. The flooding washed out a portion of Route 44 in Watson Township. A rock slide occurred on Route 973 in Watson and Mifflin Townships. Salladasburg Borough also reported flooding.	0
7/31/2009	Clarkstown; Heavy rainfall of 2-3 inches in a short duration produced flash flooding in the Muncy, Hughesville and Clarkstown areas. Several small streams and creeks exceeded bank edges including Muncy Creek along Routes 405 and 422 between Muncy and Hughesville. Nearly three feet of water closed roads in Muncy Creek Township near Clarkstown. Numerous low-lying and poor drainage flooding was also reported.	5,000
1/25/2010	Ellenton; Heavy rain along with snow melt caused flooding and closed a number of roads throughout the county. Route 220 near the Sullivan County line was closed, along with Route 14 near the Bradford County line. Several low-lying roads in the vicinity of Williamsport were washed out.	0
12/1/2010	Jersey Shore; Rainfall amounts between 2 and 4 inches produced significant flooding. The West Branch Susquehanna at Montgomery, Muncy and Williamsport crested over moderate flood stage. Little Pine Creek at Waterville came out of its banks and flooded nearby areas. Many roads were impassable in Muncy with water surrounding several homes. Other road closures included SR 2012 (Sylvan Dell Road) along the West Branch Susquehanna from Charles Street in South Williamsport to Sylvan Park Road in Armstrong Township, SR 4001 (Little Pine Creek Road) in Pine and Cummings Townships, and SR 44, 287 and 87 along Little Pine Creek and Mill Creek near Montoursville.	10,000
3/6/2011	Garden View; Several roads were closed due to high water, including SR4001 in Cummings and Pine Townships, Little Pine Creek Road near Williamsport and SR 4006 (Lick Run Road) in Pine Township between the intersections of Route 287 and Route 184 from a drainage pipe washout.	0
3/10/2011	Quiggleville; Many roads were closed around the region due to flooding. Included were SR 2012 (Sylvan Dell Road), Old Montgomery Pike Road in Armstrong Township, SR 3002 (Middle Road) in Limestone Township from Route 880 to Route 44, and SR 4001 (Little Pine Creek Road) from Route 287 at English Center in Pine Township to Little Pine Camp Area Road in Cummings Township.	0
3/11/2011	Muncy; On the West Branch of the Susquehanna River near Muncy the crest was estimated at 22.60 feet. This is categorized as a moderate flood. At 22.0 feet a number of homes are flooded. Route 405 is affected between Muncy and Montgomery.	0
4/28/2011	Muncy; The West Branch of the Susquehanna River near Muncy crested above moderate flood stage. A number of homes are flooded. Route 405 is affected between Muncy and Montgomery.	0

Table 4.3.3-1 Flood and flash flood events impacting Lycoming County from 1950-2019 (NOAA, 2019). Note that property damage values are estimates based on best available information. "Countywide" indicates several locations in the County were affected.

DATE	LOCATION & DESCRIPTION	ESTIMATED TOTAL DAMAGE ($)
9/7/2011	Picture Rocks; Loyalsock Creek at Loyalsockville crested at record/major flood level of 19.78 feet. The West Branch of the Susquehanna River at Muncy crested in moderate flood stage of 26.7 feet. This is the 9th highest crest all time. The West Branch of the Susquehanna River at Montgomery crested in moderate flood stage of 26.7 feet. Muncy Creek flooded extensive areas near Hughesville and Muncy. Residents reported the creek overflowing its banks and rushing down 5th Street flooding homes and yards. One home had its chimney and foundation washed away. Others reported extensive basement flooding. An off-ramp off the Route 405 Bridge was washed away. Glen Mar just north of Muncy was evacuated. The bridge on Route 220 near Hughesville was closed, though it did survive the floods. Picture Rocks suffered extensive damage. Route 87 on the Loyalsock Creek north of Montoursville was hard hit. Many homes outside of the 100-year flood plain reported significant flooding (and did not have flood insurance). Evacuations along the Loyalsock and Muncy Creeks.	11,000,000
9/28/2011	Montgomery; Slow moving heavy rain showers and thunderstorms produced flash flooding and flooding, closing several roadways.	0
7/28/2012	Garden View; Heavy thunderstorm rains (1-2 inches in less than one hour) caused urbanized flash flooding in downtown Williamsport. Numerous roads were flooded with approximately 15-20 occupied vehicles stranded in standing water. Local emergency officials and fire departments took part in several water rescues. Some roads were damaged due to washouts from the flash flooding. The Lycoming County Emergency Operations Center was activated for about two hours due to the flooding.	100,000
6/30/2015	Lairdsville; Heavy rainfall resulting in flooding in the Lairdsville area. Mill Lane was reported to be flooded.	0
10/21/2016	Bodines; Heavy rainfall brought flash flooding to parts of Lycoming County. The Loyalsock and Lycoming Creek watersheds were most heavily impacted. The flooding destroyed or seriously damaged multiple State and local roads and bridges. Over twenty primary residence homes were either destroyed or sustained major damage. Many camps and seasonal homes were also damaged or destroyed along Pleasant Stream, Wallis Run and Slacks Run. A liquid petroleum line was also damaged along the Loyalsock Creek and posed a significant environmental impact. Multiple state and municipal roads and bridges were impacted. For several days after the rain McIntyre, Gamble and Cascade Townships had locally isolated areas with long delays or limited access. Wallis Run Road, Field Station Road, Upper Bodines Roads are temporarily closed with detours. At least three state bridges were destroyed and a historic municipal stone arch bridge over Pleasant Stream in McIntyre and Lewis Townships was destroyed. This impacts accessibility into the community of Marsh Hill. There were 20 other municipality owned bridges damaged. A large earth slide near the junction of Wallis Run Road and Buttermut Grove Road caused a road closure. There were significant agricultural impacts and damages.	26,000,000
7/23/2018	Unityville; On Beauty Run, floodwaters were flowing through backyards.	0
7/24/2018	Picture Rocks; US-220 was closed north of Picture Rocks. Numerous additional roads were also closed in eastern Lycoming county, as a result of flooding occurring alongside Muncy Creek.	0

Table 4.3.3-1 Flood and flash flood events impacting Lycoming County from 1950-2019 (NOAA, 2019). Note that property damage values are estimates based on best available information. "Countywide" indicates several locations in the County were affected.

DATE	LOCATION & DESCRIPTION	ESTIMATED TOTAL DAMAGE ($)
8/3/2018	Barbours; Flash flooding closed Lower Barbours Road along Loyalsock Creek. Many roads were closed across the area.	0
7/6/2019	Linden; Stream out of banks and water running over Hulings road.	0
8/15/2019	Williamsport; Grafius Run and Loyalsock Run overflowed their banks.	0

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. A Repetitive Loss property is 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.

Using data provided by FEMA in November 2020, table 4.3.3-2 displays repetitive loss and severe repetitive loss properties by jurisdiction and type in Lycoming County. The County has 476 repetitive loss properties. Figure 4.3.3-3 shows the hot spots of repetitive loss and severe repetitive loss properties in Lycoming County. Old Lycoming Township has the most repetitive loss properties (85). Of these 476 repetitive loss structures properties in the County, the most are single family homes (403). There are 86 SRL properties in Lycoming County: Muncy Creek Township (15) and Old Lycoming Township (12) have the most SRL properties.

Table 4.3.3-2 Summary of the number and type of Repetitive Loss properties by municipality (FEMA, 2020). Please note that only communities with Repetitive Loss properties are shown.

MUNICIPALITY	TYPE					SUM OF REPETITIVE LOSS PROPERTIES
	2-4 FAMILY	ASSEMBLED CONDO	NON-RESIDENTIAL	OTHER RESIDENTIAL	SINGLE FAMILY	
Armstrong Township	0	0	0	0	4	4
Clinton Township	0	0	1	0	4	5
Cummings Township	0	0	0	0	5	5
Duboistown Borough	0	0	0	1	2	3
Fairfield Township	0	0	0	0	4	4
Hepburn Township	3	0	2	0	36	41
Hughesville Borough	0	0	0	0	1	1
Jersey Shore Borough	5	2	3	0	21	31
Lewis Township	2	0	0	0	21	23
Loyalsock Township	4	2	0	0	26	32
Lycoming Township	0	0	1	0	33	34
McHenry Township	0	0	0	0	5	5
McIntyre Township	0	0	2	0	9	11
Montgomery Borough	2	1	2	0	8	13
Montoursville Borough	4	2	3	1	14	24
Muncy Creek Township	1	2	5		14	22
Muncy Borough	6	0	1	1	45	53
Old Lycoming Township	4	1	0	0	80	85
Piatt Township	1	1	0	0	6	8
Pine Township	0	0	0	0	2	2
Plunketts Creek Township	0	0	2	0	16	18
Porter Township	0	1	0	0	0	1
South Williamsport Borough	1	0	0	0	5	6
Susquehanna Township	0	0	0	0	6	6
Upper Fairfield Township	0	0	0	0	15	15
Washington Township	0	0	0	0	1	1
Watson Township	0	1	0	0	2	3
Williamsport, City of	2	0	0	0	11	13
Woodward Township	0	0	0	0	7	7
Lycoming County Total	35	13	22	3	403	476

Table 4.3.3-3 Summary of the number and type of Severe Repetitive Loss properties by municipality (FEMA, 2020). Please note that only communities with Repetitive Loss properties are shown.

MUNICIPALITY	TYPE					SUM OF SEVERE REPETITIVE LOSS PROPERTIES
	2-4 FAMILY	ASSEMBLED CONDO	NON-RESIDENTIAL	OTHER RESIDENTIAL	SINGLE FAMILY	
Armstrong Township	0	0	0	0	1	1
Duboistown Borough	0	0	1	0	1	2
Eldred Township	0	0	0	0	1	1
Fairfield Township	0	1	0	0	3	4
Gamble Township	0	0	0	0	2	2
Hepburn Township	1	0	0	0	4	5
Lewis Township	0	0	1	0	5	6
Loyalsock Township	0	0	0	0	7	7
Lycoming Township	0	0	2	0	2	4
McIntyre Township	0	0	0	0	1	1
Mifflin Township	0	0	0	0	1	1
Montgomery Borough	0	0	0	0	2	2
Montoursville Borough	0	0	0	0	3	3
Muncy Borough	2	0	2	0	3	7
Muncy Creek Township	2	0	1	0	12	15
Muncy Township	0	0	1	0	0	1
Old Lycoming Township	0	0	2	0	10	12
Penn Township	0	0	1	0	1	2
Plunketts Creek	0	1	0	0	5	6
Porter Township	0	0	0	0	1	1
Upper Fairfield Township	0	0	0	0	2	2
Washington Township	0	0	0	0	1	1
Lycoming County Total	**5**	**2**	**11**	**0**	**68**	**86**

Figure 4.3.3-3 Repetitive Loss and Severe Repetitive Loss Hot Spots in Lycoming County

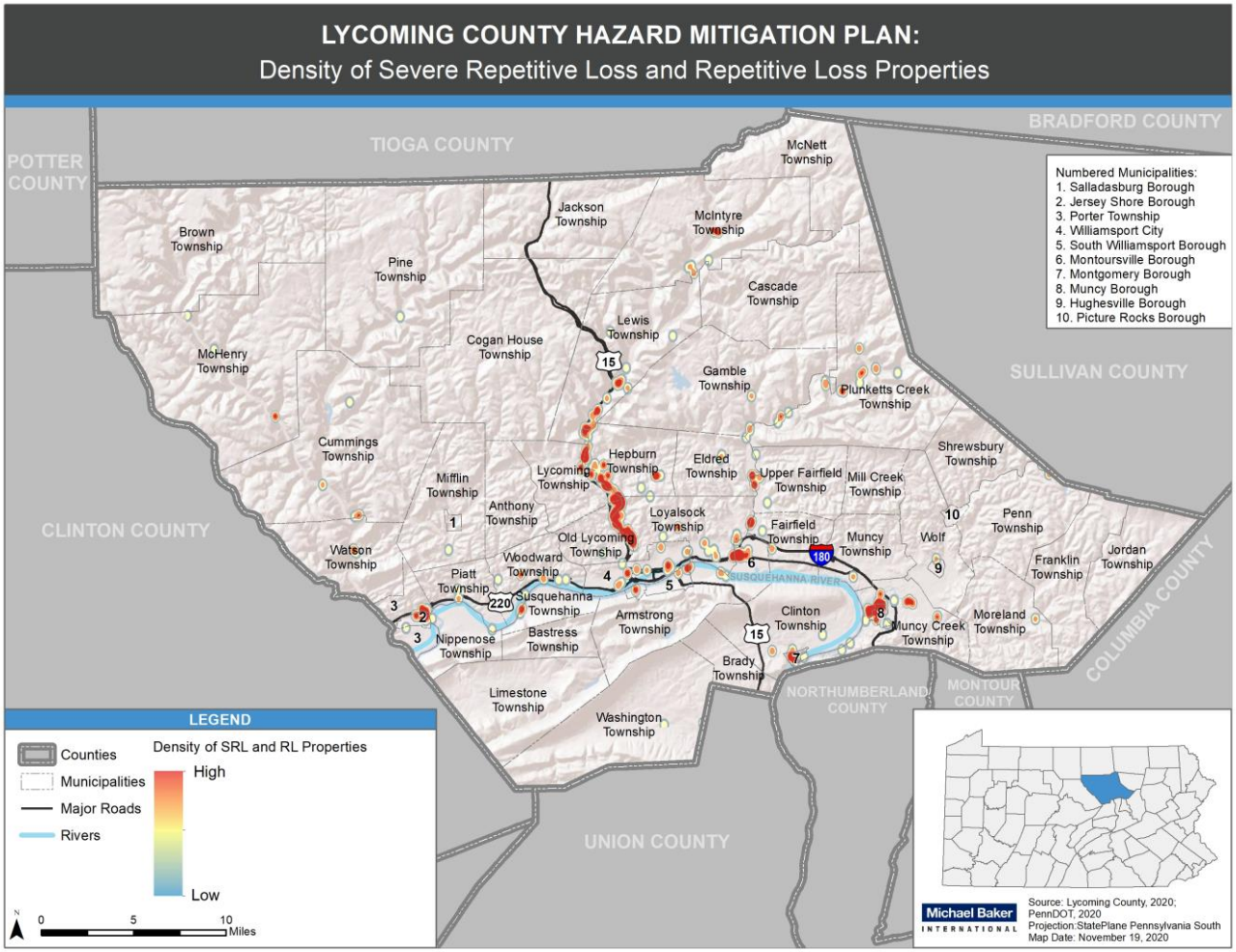


Table 4.3.3-4 and Table 4.3.3-5 show a summary of total Repetitive Loss (RL) and Severe Repetitive Loss (SRL) payments, respectively, received by Lycoming County. The tables show payments received by Lycoming County municipalities by property type. In total, Lycoming County communities have received approximately $26.1 Million in RL payments and $5.6 Million in SRL payments. Only communities that received RL or SRL payments are listed in the tables below. Figure 4.3.3-4 shows the hot spots of RL and SRL payments.

Table 4.3.3-4 Summary of total Repetitive Loss payments by municipality (FEMA, 2020). Please note that only communities with Repetitive Loss payments are shown.

MUNICIPALITY	TYPE					SUM OF REPETITIVE LOSS PAYMENTS
	2-4 FAMILY	ASSEMBLED CONDO	NON-RESIDENTIAL	OTHER RESIDENTIAL	SINGLE FAMILY	
Armstrong Township	$0	$0	$0	$0	$178,904.31	$178,904.31
Clinton Township	$0	$0	$35,272.97	$0	$77,167.28	$112,440.25
Cummings Township	$0	$0	$0	$0	$177,395.27	$177,395.27
Duboistown Borough	$0	$0	$0	$36,473.80	$33,046.09	$69,519.89
Fairfield Township	$0	$0	$0	$0	$392,022.77	$392,022.77
Hepburn Township	$118,046.32	$0	$151,414.53	$0	$1,907,858.57	$2,177,319.42
Hughesville Borough	$0	$0	$0	$0	$6,254.06	$6,254.06
Jersey Shore Borough	$57,196.10	$29,679.78	$52,546.71	$0	$445,465.74	$584,888.33
Lewis Township	$85,204.69	$0	$0	$0	$1,718,816.39	$1,804,021.08
Loyalsock Township	$499,217.61	$296,321.96	$0	$0	$1,445,158.43	$2,240,698.00
Lycoming Township	$0	$0	$12,049.72	$0	$1,819,467.12	$1,831,516.84
McHenry Township	$0	$0	$0	$0	$103,454.89	$103,454.89
McIntyre Township	$0	$0	$34,500.00	$0	$303,662.15	$338,162.15
Montgomery Borough	$96,153.73	$335,496.49	$70,508.28	$0	$171,383.26	$673,541.76
Montoursville Borough	$176,433.96	$471,752.39	$212,569.69	$240,373.37	$897,956.74	$1,999,086.15
Muncy Creek Township	$108,416.60	$163,564.80	$357,759.59	$0	$839,066.16	$1,468,807.15
Muncy Borough	$170,034.77	$0	$113,384.28	$163,541.25	$2,087,825.87	$2,534,786.17
Nippenose Township	$0	$0	$0	$0	$34,581.17	$34,581.17
Old Lycoming Township	$243,541.75	$118,164.19	$0	$0	$4,273,013.41	$4,634,719.35

Table 4.3.3-4 Summary of total Repetitive Loss payments by municipality (FEMA, 2020). Please note that only communities with Repetitive Loss payments are shown.

MUNICIPALITY	TYPE					SUM OF REPETITIVE LOSS PAYMENTS
	2-4 FAMILY	ASSEMBLED CONDO	NON-RESIDENTIAL	OTHER RESIDENTIAL	SINGLE FAMILY	
Piatt Township	$26,603.64	$54,186.60	$0	$0	$159,704.94	$240,495.18
Pine Township	$0	$0	$0	$0	$53,953.94	$53,953.94
Plunketts Creek Township	$0	$0	$130,982.96	$0	$1,406,005.83	$1,536,988.79
Porter Township	$0	$14,155.09	$0	$0	$0	$14,155.09
South Williamsport Borough	$25,185.71	$0	$0	$0	$149,216.65	$174,402.36
Susquehanna Township	$0	$0	$0	$0	$231,248.70	$231,248.70
Upper Fairfield Township	$0	$0	$0	$0	$1,440,556.15	$1,440,556.15
Washington Township	$0	$0	$0	$0	$19,185.35	$19,185.35
Watson Township	$0	$25,837.90	$0	$0	$64,957.53	$90,795.43
Williamsport, City of	$9,239.99	$0	$0	$0	$703,667.19	$712,907.18
Woodward Township	$0	$0	$0	$0	$199,584.03	$199,584.03
Lycoming County Total	$1,615,274.87	$1,509,159.20	$1,170,988.73	$440,388.42	$21,340,579.99	$26,076,391.21

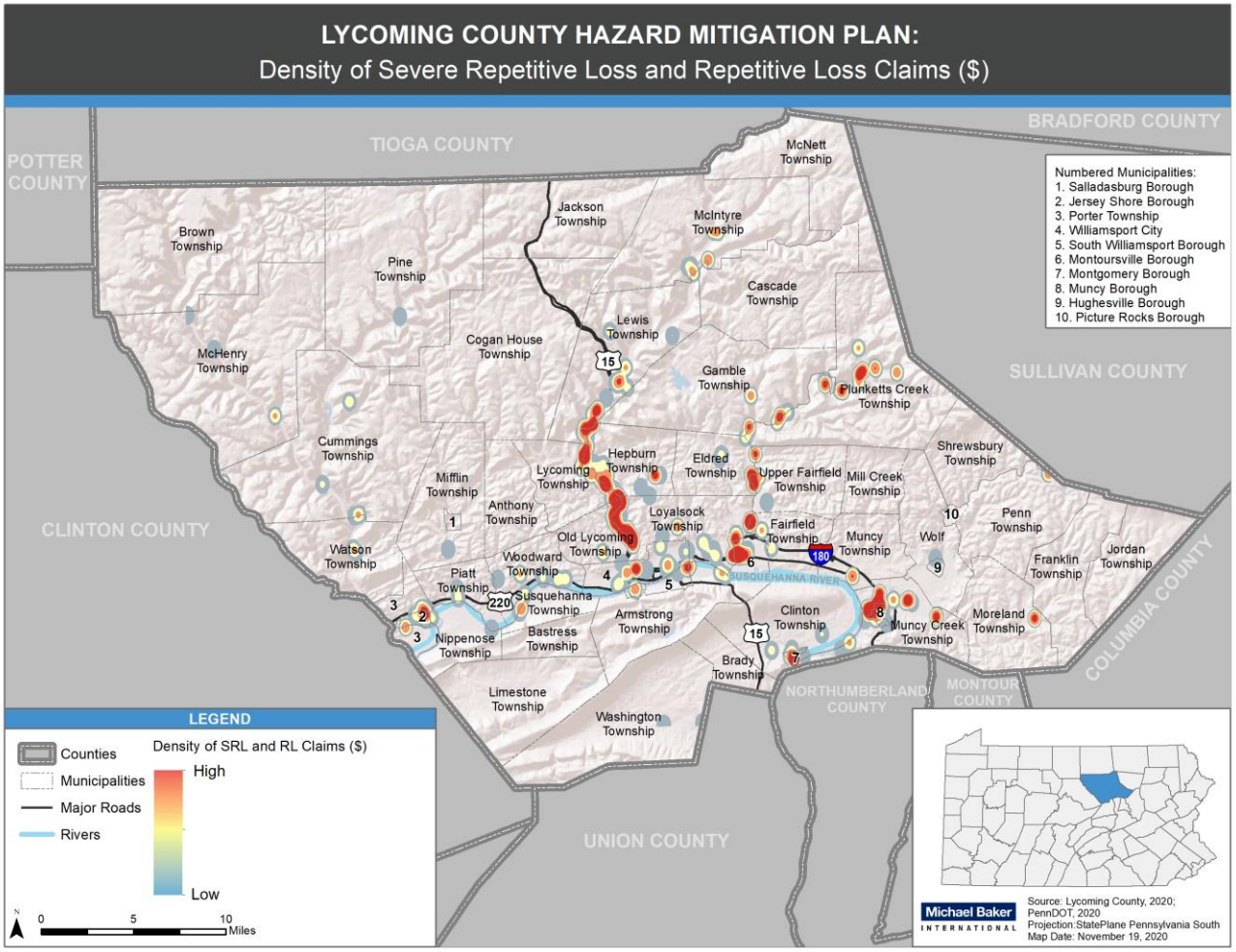
Table 4.3.3-5 Summary of total Severe Repetitive Loss payments by municipality (FEMA, 2020). Please note that only communities with Severe Repetitive Loss payments are shown.

MUNICIPALITY	TYPE					SUM OF SEVERE REPETITIVE LOSS PAYMENTS
	2-4 FAMILY	ASSEMBLED CONDO	NON-RESIDENTIAL	OTHER RESIDENTIAL	SINGLE FAMILY	
Armstrong Township	$0	$0	$0	$0	$38,445.45	$38,445.45
Duboistown Borough	$0	$0	$86,726.21	$0	$8,440.72	$95,166.93
Eldred Township	$0	$0	$0	$0	$31,743.94	$31,743.94
Fairfield Township	$0	$109,501.86	$0	$0	$360,893.28	$470,395.14

Table 4.3.3-5 Summary of total Severe Repetitive Loss payments by municipality (FEMA, 2020). Please note that only communities with Severe Repetitive Loss payments are shown.

MUNICIPALITY	TYPE					SUM OF SEVERE REPETITIVE LOSS PAYMENTS
	2-4 FAMILY	ASSEMBLED CONDO	NON-RESIDENTIAL	OTHER RESIDENTIAL	SINGLE FAMILY	
Gamble Township	$0	$0	$0	$0	$276,998.94	$276,998.94
Hepburn Township	$98,575.91	$0	$0	$0	$190,410.00	$288,985.91
Lewis Township	$0	$0	$36,082.03	$0	$223,163.05	$259,245.08
Loyalsock Township	$0	$0	$0	$0	$421,917.31	$421,917.31
Lycoming Township	$0	$0	$98,328.15	$0	$115,485.43	$213,813.58
McIntyre Township	$0	$0	$0	$0	$156,949.26	$156,949.26
Mifflin Township	$0	$0	$0	$0	$15,005.20	$15,005.20
Montgomery Borough	$0	$0	$0	$0	$63,029.99	$63,029.99
Montoursville Borough	$0	$0	$0	$0	$139,402.79	$139,402.79
Muncy Creek Township	$167,491.80	$0	$206,478.34	$0	$75,061.27	$449,031.41
Muncy Borough	$24,384.08	$0	$378,917.63	$0	$187,050.70	$590,352.41
Muncy Township	$0	$0	$176,255.83	$0	$0	$176,255.83
Old Lycoming Township	$0	$0	$418,509.53	$0	$529,747.87	$948,257.40
Penn Township	$0	$0	$117,139.66	$0	$29,394.26	$146,533.92
Plunketts Creek Township	$0	$236,037.91	$0	$0	$365,850.11	$601,888.02
Porter Township	$0	$0	$0	$0	$13,914.75	$13,914.75
Upper Fairfield Township	$0	$0	$0	$0	$233,894.78	$233,894.78
Watson Township	$0	$0	$0	$0	$15,084.43	$15,084.43
Lycoming County Total	$290,451.79	$345,539.77	$1,518,437.38	$0.00	$3,491,883.53	$5,646,312.47

Figure 4.3.3-4 Repetitive Loss and Severe Repetitive Loss Claim Hot Spots in Lycoming County

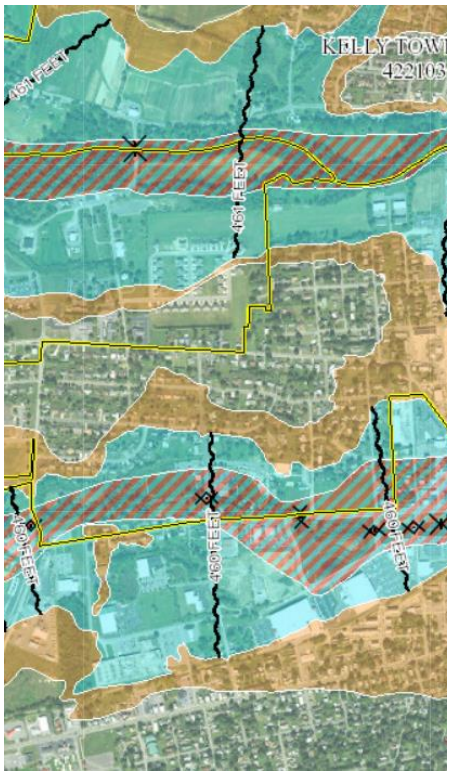


Floods are the most common and costly natural catastrophe in the United States. In terms of economic disruption, property damage, and loss of life, floods are "nature's number-one disaster" (FEMA, 2019). For that reason, flood insurance is a critical way for citizens to protect their property against 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, administrated 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 4.3.3-6 lists the Lycoming County municipalities participating in the NFIP.

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



Lycoming County's flood zones can be viewed on FEMA's National Flood Hazard Layer: https://www.fema.gov/flood-maps/products-tools/national-flood-hazard-layer

- 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.

Table 4.3.3-6 NFIP Policies and Claims in Lycoming County. FEMA CIS 2020.					
MUNICIPALITY	# OF STRUCTURES IN SFHA	# POLICIES IN FORCE	% POLICIES COMPARED TO # OF STRUCTURES IN SFHA*	# CLAIMS	# SUBSTANTIAL DAMAGE CLAIMS
Larry's Creek Watershed					
Anthony Township	5	2	40.00%	0	0
Cogan House Township	12	0	0.00%	1	0
Cummings Township	216	36	16.70%	70	9
Lycoming Township	319	48	15.00%	267	50
Mifflin Township	104	8	7.70%	3	0
Piatt Township	231	14	6.10%	72	25
Pine Township	149	6	4.00%	24	7
Porter Township	150	22	14.70%	20	0
Salladasburg Borough	37	4	10.80%	2	0
Watson Township	165	28	17.00%	59	2
Loyalsock Creek Watershed					
Cascade Township	3	1	33.30%	1	1
Eldred Township	30	15	50.00%	24	2
Fairfield Township	31	8	25.80%	49	14
Gamble Township	17	9	52.90%	15	4
Hepburn Township	159	22	13.80%	248	50
Lewis Township	279	32	11.50%	216	46
Loyalsock Township	193	64	33.20%	310	36
McNett Township	5	0	0.00%	3	0
Mill Creek Township	0	1*	0.00%	0	0
Montoursville Borough	107	15	14.00%	142	24
Plunketts Creek Township	146	50	34.20%	169	54

Table 4.3.3-6 NFIP Policies and Claims in Lycoming County. FEMA CIS 2020.					
MUNICIPALITY	# OF STRUCTURES IN SFHA	# POLICIES IN FORCE	% POLICIES COMPARED TO # OF STRUCTURES IN SFHA*	# CLAIMS	# SUBSTANTIAL DAMAGE CLAIMS
Shrewsbury Township	41	7	17.10%	12	3
Wolf Township	54	19	35.20%	18	1
Upper Fairfield Township	54	13	24.10%	97	28
Lycoming Creek Watershed					
Anthony Township	5	2	40.00%	0	0
Cascade Township	3	1	33.30%	1	1
Cogan House Township	12	0	0.00%	1	0
Eldred Township	30	15	50.00%	24	2
Gamble Township	17	9	52.90%	15	4
Hepburn Township	159	22	13.80%	248	50
Jackson Township	10	0	0.00%	0	0
Lewis Township	279	32	11.50%	216	46
Loyalsock Township	193	64	33.20%	310	36
Lycoming Township	319	48	15.00%	267	50
McIntyre Township	165	18	10.90%	68	9
McNett Township	5	0	0.00%	3	0
Old Lycoming Township	375	70	18.70%	592	105
Williamsport, City of	42	27	64.30%	129	21
Woodward Township	145	14	9.70%	51	7
Muncy Creek Watershed					
Franklin Township	62	2	3.20%	6	1
Hughesville Borough	0	6*	0.00%	9	0
Jordan Township	8	2	25.00%	1	0

Table 4.3.3-6 NFIP Policies and Claims in Lycoming County. FEMA CIS 2020.

MUNICIPALITY	# OF STRUCTURES IN SFHA	# POLICIES IN FORCE	% POLICIES COMPARED TO # OF STRUCTURES IN SFHA*	# CLAIMS	# SUBSTANTIAL DAMAGE CLAIMS
Limestone Township	48	2	4.20%	1	0
Mill Creek Township	0	1*	0.00%	0	0
Moreland Township	8	1	12.50%	12	2
Muncy Creek Township	340	58	17.10%	186	30
Muncy Township	9	4	44.40%	5	1
Penn Township	14	1	7.10%	11	1
Picture Rocks Borough	17	8	47.10%	7	0
Plunketts Creek Township	146	50	34.20%	169	54
Shrewsbury Township	41	7	17.10%	12	3
Washington Township	61	3	4.90%	0	0
Wolf Township	54	19	35.20%	18	1
Pine Creek Watershed					
Brown Township	34	5	14.70%	6	0
Cogan House Township	12	0	0.00%	1	0
Cummings Township	216	36	16.70%	70	9
Jackson Township	10	0	0.00%	0	0
Jersey Shore Borough	1,073	146	13.60%	256	4
McHenry Township	118	11	9.30%	35	0
Mifflin Township	104	8	7.70%	3	0
Nippenose Township	68	13	19.10%	6	1
Piatt Township	231	14	6.10%	72	25
Pine Township	149	6	4.00%	24	7
Porter Township	150	22	14.70%	20	0

Table 4.3.3-6 NFIP Policies and Claims in Lycoming County. FEMA CIS 2020.					
MUNICIPALITY	# OF STRUCTURES IN SFHA	# POLICIES IN FORCE	% POLICIES COMPARED TO # OF STRUCTURES IN SFHA*	# CLAIMS	# SUBSTANTIAL DAMAGE CLAIMS
Watson Township	165	28	17.00%	59	2
West Branch Susquehanna River Watershed					
Anthony Township	5	2	40.00%	0	0
Armstrong Township	68	11	16.20%	34	7
Bastress Township	0	0	0.00%	0	0
Brady Township	1	1	100.00%	4	0
Clinton Township	164	11	6.70%	29	2
Duboistown Borough	96	13	13.50%	36	2
Eldred Township	30	15	50.00%	24	2
Fairfield Township	31	8	25.80%	49	14
Hepburn Township	159	22	13.80%	248	50
Jersey Shore Borough	1,073	146	13.60%	256	4
Limestone Township	48	2	4.20%	1	0
Loyalsock Township	193	64	33.20%	310	36
Lycoming Township	319	48	15.00%	267	50
Mifflin Township	104	8	7.70%	3	0
Mill Creek Township	0	1*	0.00%	0	0
Montgomery Borough	273	38	13.90%	122	4
Montoursville Borough	107	15	14.00%	142	24
Muncy Borough	427	84	19.70%	481	18
Muncy Creek Township	340	58	17.10%	186	30
Muncy Township	9	4	44.40%	5	1
Nippenose Township	68	13	19.10%	6	1

Table 4.3.3-6 NFIP Policies and Claims in Lycoming County. FEMA CIS 2020.

MUNICIPALITY	# OF STRUCTURES IN SFHA	# POLICIES IN FORCE	% POLICIES COMPARED TO # OF STRUCTURES IN SFHA*	# CLAIMS	# SUBSTANTIAL DAMAGE CLAIMS
Old Lycoming Township	375	70	18.70%	592	105
Piatt Township	231	14	6.10%	72	25
Porter Township	150	22	14.70%	20	0
South Williamsport Borough	49	23	46.90%	44	3
Susquehanna Township	263	13	4.90%	50	9
Upper Fairfield Township	54	13	24.10%	97	28
Washington Township	61	3	4.90%	0	0
Williamsport, City of	42	27	64.30%	129	21
Wolf Township	54	19	35.20%	18	1
Woodward Township	145	14	9.70%	51	7
Lycoming County Total	**6,371**	**988**	**18.10%**	**3,965**	**576**

**NFIP policies may be associated with properties located outside the SFHA.*

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 Lycoming 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 (https://msc.fema.gov/portal/home).

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

Table 4.3.3-7 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 Lycoming 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. Within the flood-susceptible areas in Lycoming County, it is expected that the character of flooding will remain essentially unchanged from what has been experienced for many years. However, some increase in the severity and frequency of flooding may 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 Lycoming 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.

Despite the fact that all of Lycoming County's 52 municipalities participate in the National Flood Insurance Program (NFIP), communities need to strengthen floodplain management by reviewing current codes and ordinances and by strongly enforcing their floodplain codes on new development to avoid aggravating further flooding. Significant residential growth in the outlying rural townships can increase opportunities for flash flooding if floodplain development and stormwater management are not properly regulated. Numerous times since the January 1996 floods, localized rainstorms that went undetected by the National Weather Service created surface flooding, which forced evacuations in several floodplain communities.

The flood hazard vulnerability assessment for the County focused on the community assets that are located in the 1% chance floodplain. While greater and smaller floods are possible, information about the extent and depth for the 1% chance floodplain is available in a similar format for all 52 Lycoming County municipalities, providing a consistent basis for analysis. Table 4.3.3-8 shows the structures, critical facilities, and populations located in the SFHA; there are 6,445 structures in the SFHA county-wide (10% of all structures). Jersey Shore has the highest proportion of structures in the floodplain at over 45% of all structures vulnerable to flooding. Lewis Township, Lycoming Township, McIntyre Township, Muncy Borough, Montgomery Borough all have more than 30% structures in the SFHA. Over half of all municipalities do not have any critical facilities in the floodplain.

When looking at structures by property type, shown in Table 4.3.3-9, the majority of vulnerable structures are unsurprisingly residential in nature, followed by commercial and agricultural uses. A complete listing of critical facilities is in Appendix E.

Table 4.3.3-8 Community Flood Vulnerability for Lycoming County									
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
Larry's Creek Watershed									
Anthony Township	394	5	1%	4	1	25%	865	13	2%
Cogan House Township	1,054	12	1%	4	0	0%	955	11	1%
Cummings Township	850	216	25%	4	0	0%	273	122	45%
Lycoming Township	975	319	33%	2	0	0%	1,478	484	33%
Mifflin Township	588	104	18%	6	0	0%	1,070	212	20%
Piatt Township	867	231	27%	1	0	0%	1,184	257	22%
Pine Township	559	149	27%	2	0	0%	294	53	18%
Porter Township	894	147	16%	4	0	0%	1,601	262	16%
Shrewsbury Township	314	42	13%	1	0	0%	409	76	19%
Watson Township	516	165	32%	1	0	0%	537	149	28%
Loyalsock Creek Watershed									
Cascade Township	335	4	1%	2	0	0%	413	2	<1%

Table 4.3.3-8 Community Flood Vulnerability for Lycoming County									
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
Eldred Township	972	30	3%	4	0	0%	2,122	42	2%
Fairfield Township	1,494	31	2%	11	0	0%	2,791	33	1%
Gamble Township	608	17	3%	3	0	0%	756	20	3%
Hepburn Township	1,481	180	12%	6	0	0%	2,799	314	11%
Lewis Township	807	258	32%	5	4	80%	950	338	36%
Loyalsock Township	5,427	193	4%	38	4	11%	11,026	277	3%
McNett Township	260	4	2%	2	0	0%	174	2	1%
Mill Creek Township	317	0	0%	3	0	0%	604	0	0%
Montoursville Borough	2,260	107	5%	24	5	21%	4,616	194	4%
Plunketts Creek Township	700	146	21%	4	0	0%	684	143	21%
Shrewsbury Township	314	42	13%	1	0	0%	409	76	19%
Upper Fairfield Township	928	54	6%	8	0	0%	1,823	68	4%

Table 4.3.3-8 Community Flood Vulnerability for Lycoming County									
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
Wolf Township	1,609	53	3%	15	0	0%	2,907	85	3%
Lycoming Creek Watershed									
Anthony Township	394	5	1%	4	1	25%	865	13	2%
Cascade Township	335	4	1%	2	0	0%	413	2	<1%
Cogan House Township	1,054	12	1%	4	0	0%	955	11	1%
Eldred Township	972	30	3%	4	0	0%	2,122	42	2%
Gamble Township	608	17	3%	3	0	0%	756	20	3%
Hepburn Township	1,481	180	12%	6	0	0%	2,799	314	11%
Jackson Township	337	10	3%	4	0	0%	396	9	2%
Lewis Township	807	258	32%	5	4	80%	950	338	36%
Loyalsock Township	5,427	193	4%	38	4	11%	11,026	277	3%
Lycoming Township	975	319	33%	2	0	0%	1,478	484	33%

Table 4.3.3-8 Community Flood Vulnerability for Lycoming County									
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
McIntyre Township	434	165	38%	4	2	50%	520	193	37%
McNett Township	260	4	2%	2	0	0%	174	2	1%
Old Lycoming Township	3,107	375	12%	15	3	20%	4,935	591	12%
Williamsport, City of	12,243	42	0%	100	2	2%	29,381	5	0%
Woodward Township	1,647	145	9%	8	2	25%	2,199	101	5%
Muncy Creek Watershed									
Franklin Township	603	62	10%	5	0	0%	933	47	5%
Hughesville Borough	969	1	0%	12	0	0%	2,128	3	<1%
Jordan Township	576	8	1%	4	2	50%	863	12	1%
Limestone Township	1,407	48	3%	9	0	0%	2,019	59	3%
Mill Creek Township	317	0	0%	3	0	0%	604	0	0%
Moreland Township	591	8	1%	3	0	0%	943	15	2%
Muncy Creek Township	2,000	336	17%	17	2	12%	3,474	660	19%

Table 4.3.3-8 Community Flood Vulnerability for Lycoming County									
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
Muncy Township	667	9	1%	9	0	0%	1,089	9	1%
Penn Township	549	13	2%	3	0	0%	960	24	3%
Picture Rocks Borough	301	17	6%	4	0	0%	678	39	6%
Plunketts Creek Township	700	146	21%	4	0	0%	684	143	21%
Shrewsbury Township	314	42	13%	1	0	0%	409	76	19%
Washington Township	1,320	61	5%	7	0	0%	1,619	71	4%
Wolf Township	1,609	53	3%	15	0	0%	2,907	85	3%
Pine Creek Watershed									
Brown Township	430	34	8%	5	0	0%	96	2	2%
Cogan House Township	1,054	12	1%	4	0	0%	955	11	1%
Cummings Township	850	216	25%	4	0	0%	273	122	45%
Jackson Township	337	10	3%	4	0	0%	396	9	2%

Table 4.3.3-8 Community Flood Vulnerability for Lycoming County									
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
Jersey Shore Borough	2,345	1076	46%	21	3	14%	4,361	2,036	47%
McHenry Township	736	118	16%	5	0	0%	143	24	17%
Mifflin Township	588	104	18%	6	0	0%	1,070	212	20%
Nippenose Township	566	68	12%	6	2	33%	709	72	10%
Piatt Township	867	231	27%	1	0	0%	1,184	257	22%
Pine Township	559	149	27%	2	0	0%	294	53	18%
Porter Township	894	147	16%	4	0	0%	1,601	262	16%
Watson Township	516	165	32%	1	0	0%	537	149	28%
West Branch Susquehanna River Watershed									
Anthony Township	394	5	1%	4	1	25%	865	13	2%
Armstrong Township	539	67	12%	6	4	67%	681	57	8%
Bastress Township	263	0	0%	4	0	0%	546	0	0%
Brady Township	354	1	0%	4	0	0%	521	2	<1%

Table 4.3.3-8 Community Flood Vulnerability for Lycoming County									
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
Clinton Township	1,527	164	11%	27	2	7%	3,682	162	4%
Duboistown Borough	730	96	13%	5	0	0%	1,205	145	12%
Eldred Township	972	30	3%	4	0	0%	2,122	42	2%
Fairfield Township	1,494	31	2%	11	0	0%	2,791	33	1%
Hepburn Township	1,481	180	12%	6	0	0%	2,799	314	11%
Jersey Shore Borough	2,345	1076	46%	21	3	14%	4,361	2,036	47%
Limestone Township	1,407	48	3%	9	0	0%	2,019	59	3%
Loyalsock Township	5,427	193	4%	38	4	11%	11,026	277	3%
Lycoming Township	975	319	33%	2	0	0%	1,478	484	33%
Mifflin Township	588	104	18%	6	0	0%	1,070	212	20%
Mill Creek Township	317	0	0%	3	0	0%	604	0	0%
Montgomery Borough	825	273	33%	6	1	17%	1,605	476	30%
Montoursville Borough	2,260	107	5%	24	5	21%	4,616	194	4%

Table 4.3.3-8 Community Flood Vulnerability for Lycoming County									
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
Muncy Borough	1,122	431	38%	11	5	45%	2,477	978	39%
Muncy Creek Township	2,000	336	17%	17	2	12%	3,474	660	19%
Muncy Township	667	9	1%	9	0	0%	1,089	9	1%
Nippenose Township	566	68	12%	6	2	33%	709	72	10%
Old Lycoming Township	3,107	375	12%	15	3	20%	4,935	591	12%
Piatt Township	867	231	27%	1	0	0%	1,184	257	22%
Salladasburg Borough	145	37	26%	2	0	0%	238	61	26%
South Williamsport Borough	2,908	50	2%	18	0	0%	6,379	97	2%
Susquehanna Township	737	263	36%	5	2	40%	1,000	261	26%
Upper Fairfield Township	928	54	6%	8	0	0%	1,823	68	4%
Washington Township	1,320	61	5%	7	0	0%	1,619	71	4%
Williamsport, City of	12,243	42	0%	100	2	2%	29,381	5	0%

Table 4.3.3-8 Community Flood Vulnerability for Lycoming County

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
Wolf Township	1,609	53	3%	15	0	0%	2,907	85	3%
Woodward Township	1,647	145	9%	8	2	25%	2,199	101	5%
Lycoming County Total	64,197	**6,445**	**10%**	485	46	9%	**116,234**	**9,368**	**8%**

**Calculated by determining the percentage of buildings in SFHA for each census block, then multiplying that percentage to the population of the census block.*

Table 4.3.3-9 Flood Vulnerability by Land Use

MUNICIPALITY	TOTAL STRUCTURES	AGRICULTURE	COMMERCIAL	INDUSTRIAL	OTHER	RESIDENTIAL	UNKNOWN	TOTAL STRUCTURES
Larry's Creek Watershed								
Anthony Township	394	2	0	0	2	1	0	5
Cogan House Township	1,056	6	3	0	0	3	0	12
Cummings Township	850	4	19	0	9	183	1	216
Lycoming Township	975	14	102	1	14	188	0	319

Table 4.3.3-9 Flood Vulnerability by Land Use

MUNICIPALITY	TOTAL STRUCTURES	AGRICULTURE	COMMERCIAL	INDUSTRIAL	OTHER	RESIDENTIAL	UNKNOWN	TOTAL STRUCTURES
Mifflin Township	588	18	21	0	7	57	1	104
Piatt Township	867	22	65	6	8	128	2	231
Pine Township	559	49	3	0	3	93	1	149
Porter Township	892	5	8	1	0	136	0	150
Salladasburg Borough	145	4	17	1	0	15	0	37
Watson Township	516	6	16	0	9	133	1	165
Loyalsock Creek Watershed								
Cascade Township	332	1	0	0	1	1	0	3
Eldred Township	973	9	0	0	1	20	0	30
Fairfield Township	1,496	8	1	0	6	16	0	31
Gamble Township	609	9	0	0	0	8	0	17
Hepburn Township	1,459	6	64	0	4	84	1	159
Lewis Township	826	84	26	1	10	158	0	279
Loyalsock Township	5,426	9	78	2	6	97	1	193
McNett Township	262	0	0	0	3	0	2	5
Mill Creek Township	317	0	0	0	0	0	0	0

Table 4.3.3-9 Flood Vulnerability by Land Use

MUNICIPALITY	TOTAL STRUCTURES	AGRICULTURE	COMMERCIAL	INDUSTRIAL	OTHER	RESIDENTIAL	UNKNOWN	TOTAL STRUCTURES
Montoursville Borough	2,258	1	41	1	6	58	0	107
Plunketts Creek Township	701	26	3	0	24	91	2	146
Shrewsbury Township	312	3	4	0	4	30	0	41
Upper Fairfield Township	928	6	2	0	11	35	0	54
Wolf Township	1,616	4	10	0	6	34	0	54
Lycoming Creek Watershed								
Anthony Township	394	2	0	0	2	1	0	5
Cascade Township	332	1	0	0	1	1	0	3
Cogan House Township	1,056	6	3	0	0	3	0	12
Eldred Township	973	9	0	0	1	20	0	30
Gamble Township	609	9	0	0	0	8	0	17
Hepburn Township	1,459	6	64	0	4	84	1	159
Jackson Township	349	6	1	0	1	2	0	10
Lewis Township	826	84	26	1	10	158	0	279
Loyalsock Township	5,426	9	78	2	6	97	1	193

Table 4.3.3-9 Flood Vulnerability by Land Use

MUNICIPALITY	TOTAL STRUCTURES	AGRICULTURE	COMMERCIAL	INDUSTRIAL	OTHER	RESIDENTIAL	UNKNOWN	TOTAL STRUCTURES
Lycoming Township	975	14	102	1	14	188	0	319
McIntyre Township	434	13	24	3	16	108	1	165
McNett Township	262	0	0	0	3	0	2	5
Old Lycoming Township	3,106	2	59	16	14	284	0	375
Williamsport, City of	12,245	22	4	5	3	6	2	42
Woodward Township	1,647	38	10	13	17	67	0	145
Muncy Creek Watershed								
Franklin Township	603	6	32	1	0	23	0	62
Hughesville Borough	963	0	0	0	0	0	0	0
Jordan Township	576	2	1	0	0	5	0	8
Limestone Township	1,406	8	4	0	0	36	0	48
Mill Creek Township	317	0	0	0	0	0	0	0
Moreland Township	591	3	0	0	0	4	1	8
Muncy Creek Township	2,009	29	57	13	10	230	1	340

Table 4.3.3-9 Flood Vulnerability by Land Use

MUNICIPALITY	TOTAL STRUCTURES	AGRICULTURE	COMMERCIAL	INDUSTRIAL	OTHER	RESIDENTIAL	UNKNOWN	TOTAL STRUCTURES
Muncy Township	667	0	3	0	1	5	0	9
Penn Township	551	2	4	1	1	6	0	14
Picture Rocks Borough	299	0	3	3	1	10	0	17
Plunketts Creek Township	701	26	3	0	24	91	2	146
Shrewsbury Township	312	3	4	0	4	30	0	41
Washington Township	1,320	33	1	0	1	26	0	61
Wolf Township	1,616	4	10	0	6	34	0	54
Pine Creek Watershed								
Brown Township	430	1	0	0	1	32	0	34
Cogan House Township	1,056	6	3	0	0	3	0	12
Cummings Township	850	4	19	0	9	183	1	216
Jackson Township	349	6	1	0	1	2	0	10
Jersey Shore Borough	2,347	0	188	3	7	870	5	1073
McHenry Township	735	6	17	0	1	94	0	118
Mifflin Township	588	18	21	0	7	57	1	104
Nippenose Township	566	26	4	0	0	37	1	68

Table 4.3.3-9 Flood Vulnerability by Land Use

MUNICIPALITY	TOTAL STRUCTURES	AGRICULTURE	COMMERCIAL	INDUSTRIAL	OTHER	RESIDENTIAL	UNKNOWN	TOTAL STRUCTURES
Piatt Township	867	22	65	6	8	128	2	231
Pine Township	559	49	3	0	3	93	1	149
Porter Township	892	5	8	1	0	136	0	150
Watson Township	516	6	16	0	9	133	1	165
West Branch Susquehanna River Watershed								
Anthony Township	394	2	0	0	2	1	0	5
Armstrong Township	550	18	6	17	0	27	0	68
Bastress Township	264	0	0	0	0	0	0	0
Brady Township	353	0	0	0	1	0	0	1
Clinton Township	1,541	37	15	0	10	102	0	164
Duboistown Borough	730	0	15	0	1	78	2	96
Eldred Township	973	9	0	0	1	20	0	30
Fairfield Township	1,496	8	1	0	6	16	0	31
Hepburn Township	1,459	6	64	0	4	84	1	159
Jersey Shore Borough	2,347	0	188	3	7	870	5	1073
Limestone Township	1,406	8	4	0	0	36	0	48

Table 4.3.3-9 Flood Vulnerability by Land Use

MUNICIPALITY	TOTAL STRUCTURES	AGRICULTURE	COMMERCIAL	INDUSTRIAL	OTHER	RESIDENTIAL	UNKNOWN	TOTAL STRUCTURES
Loyalsock Township	5,426	9	78	2	6	97	1	193
Lycoming Township	975	14	102	1	14	188	0	319
Mifflin Township	588	18	21	0	7	57	1	104
Mill Creek Township	317	0	0	0	0	0	0	0
Montgomery Borough	811	5	88	18	1	161	0	273
Montoursville Borough	2,258	1	41	1	6	58	0	107
Muncy Borough	1,112	0	99	12	11	305	0	427
Muncy Creek Township	2,009	29	57	13	10	230	1	340
Muncy Township	667	0	3	0	1	5	0	9
Nippenose Township	566	26	4	0	0	37	1	68
Old Lycoming Township	3,106	2	59	16	14	284	0	375
Piatt Township	867	22	65	6	8	128	2	231
Porter Township	892	5	8	1	0	136	0	150
South Williamsport Borough	2,898	7	1	0	0	38	3	49
Susquehanna Township	737	84	29	0	6	144	0	263

Table 4.3.3-9 Flood Vulnerability by Land Use

MUNICIPALITY	TOTAL STRUCTURES	AGRICULTURE	COMMERCIAL	INDUSTRIAL	OTHER	RESIDENTIAL	UNKNOWN	TOTAL STRUCTURES
Upper Fairfield Township	928	6	2	0	11	35	0	54
Washington Township	1,320	33	1	0	1	26	0	61
Williamsport, City of	12,245	22	4	5	3	6	2	42
Wolf Township	1,616	4	10	0	6	34	0	54
Woodward Township	1,647	38	10	13	17	67	0	145
Lycoming County Total	**64,197**	**644**	**1,148**	**0**	**238**	**4,269**	**28**	**6,445**

Table 4.3.3-10 shows the number of structures in Lycoming County, by municipality, that are vulnerable to substantial damage from flooding. FEMA defines Substantial Damage as damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred. Work on structures that are determined to be substantially damaged is considered to be substantial improvement, regardless of the actual repair work performed (FEMA, 2010).

4.3.3-10 Substantial Damage vulnerability in Lycoming County.

MUNICIPALITY	STRUCTURES VULNERABLE TO SUBSTANTIAL DAMAGE
Larry's Creek Watershed	
Anthony Township	31
Cogan House Township	63
Cummings Township	0
Lycoming Township	2
Mifflin Township	3
Piatt Township	0
Pine Township	73
Porter Township	3
Salladasburg Borough	31
Watson Township	0
Loyalsock Creek Watershed	
Cascade Township	0
Eldred Township	121
Fairfield Township	14
Gamble Township	8
Hepburn Township	0
Lewis Township	1
Loyalsock Township	0
McNett Township	1
Mill Creek Township	32
Montoursville Borough	4
Plunketts Creek Township	1
Shrewsbury Township	4
Upper Fairfield Township	24
Wolf Township	0
Lycoming Creek Watershed	
Anthony Township	31
Cascade Township	0
Cogan House Township	63

4.3.3-10 Substantial Damage vulnerability in Lycoming County.	
MUNICIPALITY	STRUCTURES VULNERABLE TO SUBSTANTIAL DAMAGE
Eldred Township	121
Gamble Township	8
Hepburn Township	0
Jackson Township	0
Lewis Township	1
Loyalsock Township	0
Lycoming Township	2
McIntyre Township	0
McNett Township	1
Old Lycoming Township	0
Williamsport, City of	12
Woodward Township	0
Muncy Creek Watershed	
Franklin Township	1
Hughesville Borough	23
Jordan Township	21
Limestone Township	11
Mill Creek Township	32
Moreland Township	0
Muncy Creek Township	1
Muncy Township	23
Penn Township	39
Picture Rocks Borough	0
Plunketts Creek Township	1
Shrewsbury Township	4
Washington Township	23
Wolf Township	0
Pine Creek Watershed	
Brown Township	10
Cogan House Township	63
Cummings Township	0
Jackson Township	0
Jersey Shore Borough	10
McHenry Township	20
Mifflin Township	3
Nippenose Township	106
Piatt Township	0

4.3.3-10 Substantial Damage vulnerability in Lycoming County.	
MUNICIPALITY	STRUCTURES VULNERABLE TO SUBSTANTIAL DAMAGE
Pine Township	73
Porter Township	3
Watson Township	0
West Branch Susquehanna River Watershed	
Anthony Township	31
Armstrong Township	9
Bastress Township	51
Brady Township	0
Clinton Township	15
Duboistown Borough	0
Eldred Township	121
Fairfield Township	14
Hepburn Township	0
Jersey Shore Borough	10
Limestone Township	11
Loyalsock Township	0
Lycoming Township	2
Mifflin Township	3
Mill Creek Township	32
Montgomery Borough	0
Montoursville Borough	4
Muncy Borough	36
Muncy Creek Township	1
Muncy Township	23
Nippenose Township	106
Old Lycoming Township	0
Piatt Township	0
Porter Township	3
South Williamsport Borough	48
Susquehanna Township	65
Upper Fairfield Township	24
Washington Township	23
Williamsport, City of	12
Wolf Township	0
Woodward Township	0
Lycoming County Total	940

Table 4.3.3-11 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.

Table 4.3.3-11 Mobile Home Flood Vulnerability in Lycoming County

MUNICIPALITY	TOTAL MOBILE HOMES	TOTAL MOBILE HOMES IN SFHA	PERCENT MOBILE HOMES IN SFHA
Larry's Creek Watershed			
Anthony Township	18	1	6%
Cogan House Township	34	0	0%
Cummings Township	35	30	86%
Lycoming Township	134	94	70%
Mifflin Township	56	33	59%
Piatt Township	89	40	45%
Pine Township	42	12	29%
Porter Township	60	8	13%
Salladasburg Borough	21	17	81%
Watson Township	21	10	48%
Loyalsock Creek Watershed			
Cascade Township	21	0	0%
Eldred Township	105	0	0%
Fairfield Township	347	0	0%
Gamble Township	16	1	6%
Hepburn Township	201	35	17%
Lewis Township	42	12	29%
Loyalsock Township	44	24	55%
McNett Township	13	0	0%
Mill Creek Township	21	0	0%

Table 4.3.3-11 Mobile Home Flood Vulnerability in Lycoming County			
MUNICIPALITY	TOTAL MOBILE HOMES	TOTAL MOBILE HOMES IN SFHA	PERCENT MOBILE HOMES IN SFHA
Montoursville Borough	0	0	0%
Plunketts Creek Township	47	1	2%
Shrewsbury Township	17	2	12%
Upper Fairfield Township	102	0	0%
Wolf Township	310	9	3%
Lycoming Creek Watershed			
Anthony Township	18	1	6%
Cascade Township	21	0	0%
Cogan House Township	34	0	0%
Eldred Township	105	0	0%
Gamble Township	16	1	6%
Hepburn Township	201	35	17%
Jackson Township	34	0	0%
Lewis Township	42	12	29%
Loyalsock Township	44	24	55%
Lycoming Township	134	94	70%
McIntyre Township	43	19	44%
McNett Township	13	0	0%
Old Lycoming Township	148	31	21%
Williamsport, City of	3	0	0%
Woodward Township	285	4	1%
Muncy Creek Watershed			
Franklin Township	28	1	4%
Hughesville Borough	0	0	0%
Jordan Township	40	0	0%

Table 4.3.3-11 Mobile Home Flood Vulnerability in Lycoming County			
MUNICIPALITY	TOTAL MOBILE HOMES	TOTAL MOBILE HOMES IN SFHA	PERCENT MOBILE HOMES IN SFHA
Limestone Township	45	5	11%
Mill Creek Township	21	0	0%
Moreland Township	22	0	0%
Muncy Creek Township	439	18	4%
Muncy Township	18	0	0%
Penn Township	22	0	0%
Picture Rocks Borough	1	0	0%
Plunketts Creek Township	47	1	2%
Shrewsbury Township	17	2	12%
Washington Township	67	5	7%
Wolf Township	310	9	3%
Pine Creek Watershed			
Brown Township	10	1	10%
Cogan House Township	34	0	0%
Cummings Township	35	30	86%
Jackson Township	34	0	0%
Jersey Shore Borough	18	3	17%
McHenry Township	41	5	12%
Mifflin Township	56	33	59%
Nippenose Township	60	1	2%
Piatt Township	89	40	45%
Pine Township	42	12	29%
Porter Township	60	8	13%
Watson Township	21	10	48%
West Branch Susquehanna River Watershed			

Table 4.3.3-11 Mobile Home Flood Vulnerability in Lycoming County			
MUNICIPALITY	TOTAL MOBILE HOMES	TOTAL MOBILE HOMES IN SFHA	PERCENT MOBILE HOMES IN SFHA
Anthony Township	18	1	6%
Armstrong Township	54	0	0%
Bastress Township	6	0	0%
Brady Township	30	0	0%
Clinton Township	76	0	0%
Duboistown Borough	5	0	0%
Eldred Township	105	0	0%
Fairfield Township	347	0	0%
Hepburn Township	201	35	17%
Jersey Shore Borough	18	3	17%
Limestone Township	45	5	11%
Loyalsock Township	44	24	55%
Lycoming Township	134	94	70%
Mifflin Township	56	33	59%
Mill Creek Township	21	0	0%
Montgomery Borough	1	0	0%
Montoursville Borough	0	0	0%
Muncy Borough	1	1	100%
Muncy Creek Township	439	18	4%
Muncy Township	18	0	0%
Nippenose Township	60	1	2%
Old Lycoming Township	148	31	21%
Piatt Township	89	40	45%
Porter Township	60	8	13%
South Williamsport Borough	0	0	0%

Table 4.3.3-11 Mobile Home Flood Vulnerability in Lycoming County			
MUNICIPALITY	TOTAL MOBILE HOMES	TOTAL MOBILE HOMES IN SFHA	PERCENT MOBILE HOMES IN SFHA
Susquehanna Township	39	23	59%
Upper Fairfield Township	102	0	0%
Washington Township	67	5	7%
Williamsport, City of	3	0	0%
Wolf Township	310	9	3%
Woodward Township	285	4	1%
Lycoming County Total	3,332	446	13%

Additional information on flood vulnerability and losses in Lycoming 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.

4.3.4. Hailstorm

4.3.4.1. Location and Extent

Hailstorm events can occur in all areas of Lycoming 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 system 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 increases 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). Lycoming County has experienced hail ranging in size from 0.15 to 3.00 inches in diameter (NCDC, 2020).

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. Damage is dependent 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

The NCDC reports 109 hail events in Lycoming County from 1956-2019 causing $350,000 in property damage and $500,000 in crop damage, which can be seen in Table 4.3.4-2.

Table 4.3.4-2 Lycoming County Hail Events 1956-2019 (NCDC, 2020).

LOCATION	DATE	SIZE (IN)	PROPERTY AND CROP LOSSES
County-wide	6/23/1956	0.75 in.	0
County-wide	6/7/1964	1.00 in.	0
County-wide	6/17/1967	0.00 in.	0
County-wide	7/26/1969	1.75 in.	0
County-wide	6/18/1970	1.00 in.	0
County-wide	6/5/1973	0.88 in.	0
County-wide	7/28/1973	1.00 in.	0
County-wide	4/14/1974	3.00 in.	0
County-wide	4/14/1974	2.00 in.	0
County-wide	6/2/1978	1.00 in.	0
County-wide	7/11/1980	1.00 in.	0
County-wide	5/31/1985	1.75 in.	0
County-wide	5/31/1986	0.75 in.	0
County-wide	5/31/1986	1.00 in.	0
County-wide	5/31/1986	1.75 in.	0
County-wide	5/31/1986	1.75 in.	0
County-wide	4/25/1990	0.75 in.	0
County-wide	8/15/1991	0.75 in.	0
County-wide	8/15/1991	1.00 in.	0
County-wide	7/10/1992	1.00 in.	0
Danville	6/12/1994	0.75 in.	0
Williamsport	8/27/1994	1.00 in.	0
Warrensville	7/8/1996	0.85 in.	0
Williamsport	7/8/1996	0.15 in.	0
Picture Rocks	7/8/1996	0.75 in.	0

Table 4.3.4-2 Lycoming County Hail Events 1956-2019 (NCDC, 2020).

LOCATION	DATE	SIZE (IN)	PROPERTY AND CROP LOSSES
Hepburnville	7/7/1997	0.75 in.	0
Cedar Run	5/31/1998	1.00 in.	0
Buttonwood	5/31/1998	1.00 in.	0
Williamsport	9/7/1998	0.75 in.	0
Muncy	9/7/1998	2.25 in.	0
Montgomery	5/8/1999	0.75 in.	0
Montoursville	7/30/1999	0.75 in.	0
Williamsport	7/30/1999	1.00 in.	0
Montgomery	7/30/1999	1.00 in.	0
Warrensville	7/30/1999	1.75 in.	0
Williamsport	7/30/1999	1.75 in.	0
Montgomery	7/30/1999	1.75 in.	0
Jersey Shore	7/30/1999	1.00 in.	500,000
Oval	7/30/1999	1.00 in.	0
Montgomery	3/25/2000	0.75 in.	0
Warrensville	5/10/2000	1.00 in.	0
Cogan House	5/12/2000	1.00 in.	0
Williamsport	5/12/2000	1.25 in.	0
Williamsport	7/11/2001	1.00 in.	0
Barbours	9/13/2001	1.00 in.	0
Hughesville	9/13/2001	1.00 in.	0
Williamsport	9/13/2001	0.75 in.	0
Unityville	9/13/2001	1.75 in.	0
Williamsport	6/5/2002	1.00 in.	0
Muncy	8/20/2004	0.88 in.	0
Montoursville	6/6/2005	1.00 in.	0
Williamsport	6/6/2005	1.00 in.	0
Montoursville	6/6/2005	0.75 in.	0
Williamsport	5/30/2006	0.75 in.	0
Williamsport	5/30/2006	1.00 in.	0
Williamsport	6/9/2006	0.88 in.	0
Montoursville	6/9/2006	0.88 in.	0
Quiggleville	7/9/2006	0.75 in.	0
Williamsport	7/9/2006	0.75 in.	0
Williamsport	8/3/2006	0.75 in.	0
Balls Mills	5/10/2007	1.00 in.	0
Hughesville	6/12/2007	1.00 in.	0
Lairdsville	6/13/2007	0.88 in.	0
Pennsdale	6/13/2007	0.88 in.	0
Williamsport	6/19/2007	0.75 in.	0

Table 4.3.4-2 Lycoming County Hail Events 1956-2019 (NCDC, 2020).

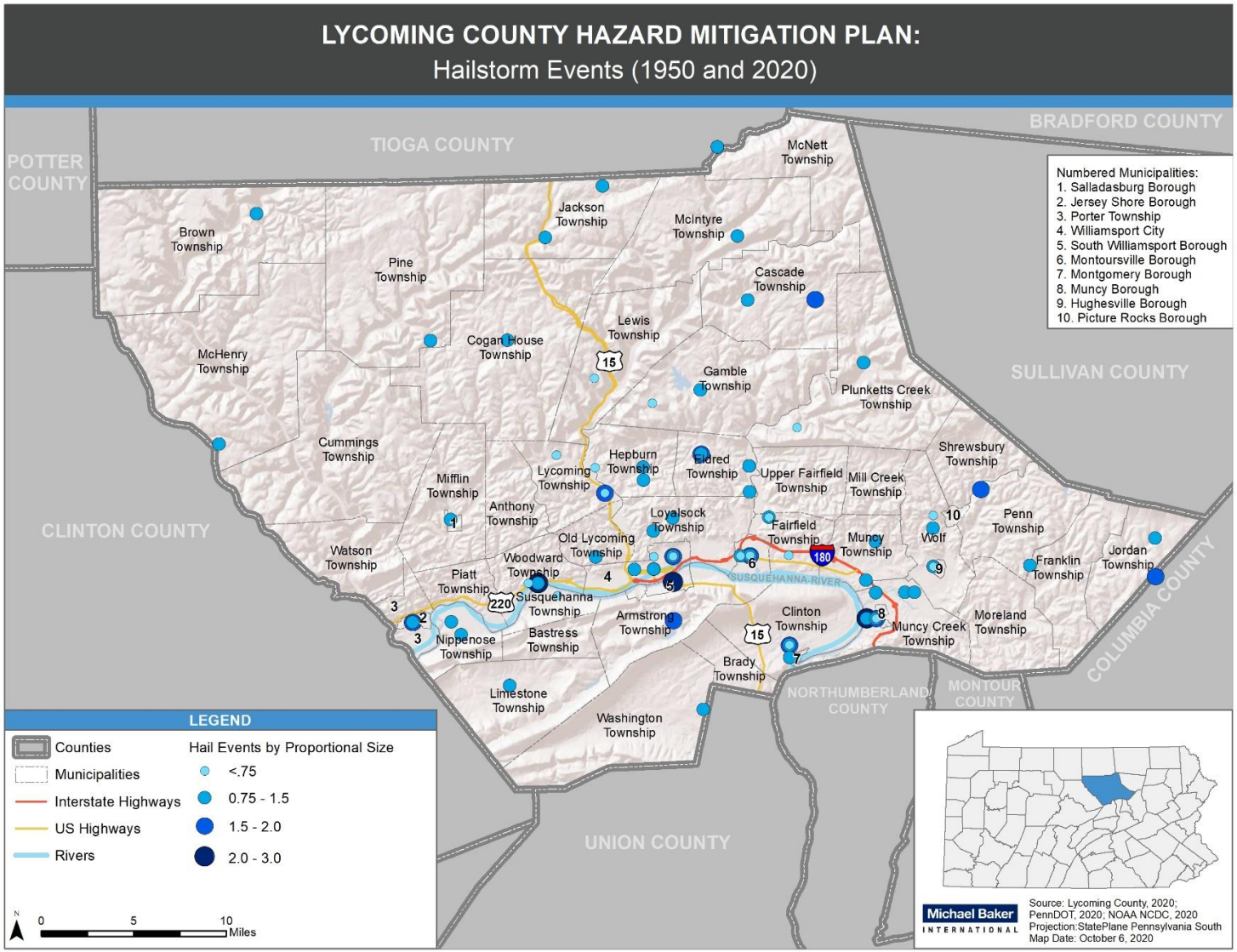
LOCATION	DATE	SIZE (IN)	PROPERTY AND CROP LOSSES
Muncy	6/19/2007	0.75 in.	0
Muncy	8/3/2007	0.88 in.	0
Garden View	8/17/2007	0.88 in.	0
Newberry	8/17/2007	1.00 in.	0
Loyalsockville	8/17/2007	0.88 in.	0
Montgomery	8/17/2007	1.50 in.	0
Muncy	8/17/2007	0.88 in.	0
Muncy	8/17/2007	1.75 in.	350,000
Trout Run	8/30/2007	0.75 in.	0
Balls Mills	9/27/2007	1.00 in.	0
Hughesville	2/6/2008	0.88 in.	0
Buttonwood	6/16/2008	0.88 in.	0
Salladasburg	6/16/2008	0.88 in.	0
Jersey Shore	6/16/2008	0.88 in.	0
Richards Grove	6/20/2008	0.88 in.	0
Pennsdale	7/26/2008	0.88 in.	0
(IPT) Williamsport Ar	7/11/2009	1.25 in.	0
Newberry	7/24/2009	0.88 in.	0
Muncy	7/24/2009	0.75 in.	0
Hepburnville	10/11/2010	0.75 in.	0
Williamsport	10/11/2010	1.00 in.	0
Leolyn	4/25/2011	0.88 in.	0
County-wide	6/9/2011	0.88 in.	0
County-wide	6/9/2011	0.88 in.	0
Tivoli	7/19/2011	1.75 in.	0
Jersey Shore	8/1/2011	1.00 in.	0
Linden	5/26/2012	0.88 in.	0
Hughesville	5/29/2012	0.88 in.	0
Newberry	7/7/2012	0.88 in.	0
Newberry	7/7/2012	1.00 in.	0
(IPT) Williamsport Ar	7/7/2012	0.75 in.	0
Hughesville	6/24/2013	0.75 in.	0
County-wide	9/11/2013	0.75 in.	0
County-wide	9/11/2013	1.00 in.	0
(IPT) Williamsport Ar	5/22/2014	0.88 in.	0
Muncy	5/22/2014	0.88 in.	0
Muncy	5/22/2014	1.00 in.	0
Jersey Shore	4/20/2015	1.25 in.	0
Jersey Shore	4/20/2015	1.00 in.	0
Montgomery	7/18/2016	0.88 in.	0

Table 4.3.4-2 Lycoming County Hail Events 1956-2019 (NCDC, 2020).

LOCATION	DATE	SIZE (IN)	PROPERTY AND CROP LOSSES
Jersey Mills	5/28/2019	1.50 in.	0
Jersey Shore	5/28/2019	1.75 in.	0
Antes Ft	5/28/2019	1.00 in.	0
Linden	5/28/2019	3.00 in.	0
		Total	$850,000

Figure 4.3.4-1 maps the recorded hailstorm events in Lycoming County between 1950 and 2020. A hailstorm even is defined as a storm with hail of ¾ inches or greater in diameter. According to PEMA, approximately 96% of hailstorm events occur between the months of April 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 Lycoming County between 1950 and 2020 (NCDC, 2020).



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 recordable hailstorms occurring annually. Overall, the probability of future hail events can be considered *possible* according to the Risk Factor Methodology (see Table 4.4.1-1).

4.3.4.5. Vulnerability Assessment

All of Lycoming 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.

The Pennsylvania Crop Insurance Education and Participation Program estimated that from 1981-2009, 6% of all crop losses in Pennsylvania were due to hail events (USDA RMA, 2010). Therefore, Lycoming County's $63.7 million in agricultural products are at risk in hail events. 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 1,043 farms located in Lycoming County. These businesses sold approximately $63,713,000 in agricultural products in 2017, about half of which came from crop sales, totaling $30,663,000 (48%). Corn and soybean crops are particularly vulnerable, and the USDA Census of Agriculture reports that in 2017, corn for grain, corn for silage, and soybeans were three of the top crop five crop items by acres (USDA, 2017).

4.3.5. Landslide

4.3.5.1. 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 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 occur primarily in colluvial (loose) soil and old landslide debris on steep slopes. Steep mountain slopes across the state have experienced debris avalanches associated with extreme rainfall or rain-on-snow events. Glacial and glacial-lake sediments underlie stream

bank and lake bluff slumps and other failure areas across much of the northern part of the state.

Landslides usually occur in areas of Lycoming 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 Lycoming County as falling into four zones of landslide susceptibility and incidence, each generally running east to west through the County (Figure 4.3.5-1). The southernmost part of the County falls into the *Moderate Incidence/High Susceptibility* zone, meaning this area has high susceptibility to landslides with a moderate incidence of occurrence. A thin strip above this falls in the *Low Incidence* zone*,* meaning the area has low susceptibility to landslides and a low incidence of occurrence. The northern half of the County lies mainly in the *Moderate Incidence* zone, meaning that this area has moderate susceptibility to landslides with a moderate incidence of occurrence. The northernmost strip of the County lies in the *Low Incidence/Moderate* Susceptibility zone, which has a moderate susceptibility to landslides but a low rate of occurrence.

Given the right conditions, landslides can occur anywhere in the County. For example, roadways near steep slopes may experience closures due to mudslides or rock falls. However, 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. Figure 4.3.5-2 identifies landslide hazard areas throughout Lycoming County.

Appendix XXXX includes landslide vulnerability maps for each municipality in Lycoming County. These show landslide hazard areas as compared to land uses in communities, including residential, commercial, agricultural, and open spaces. Communities with significant portions of residential and commercial areas or transportation routes in landslide hazard areas are the most vulnerable to these types of events.

Figure 4.3.5-1 Landslide Susceptibility and Incidence for Lycoming County

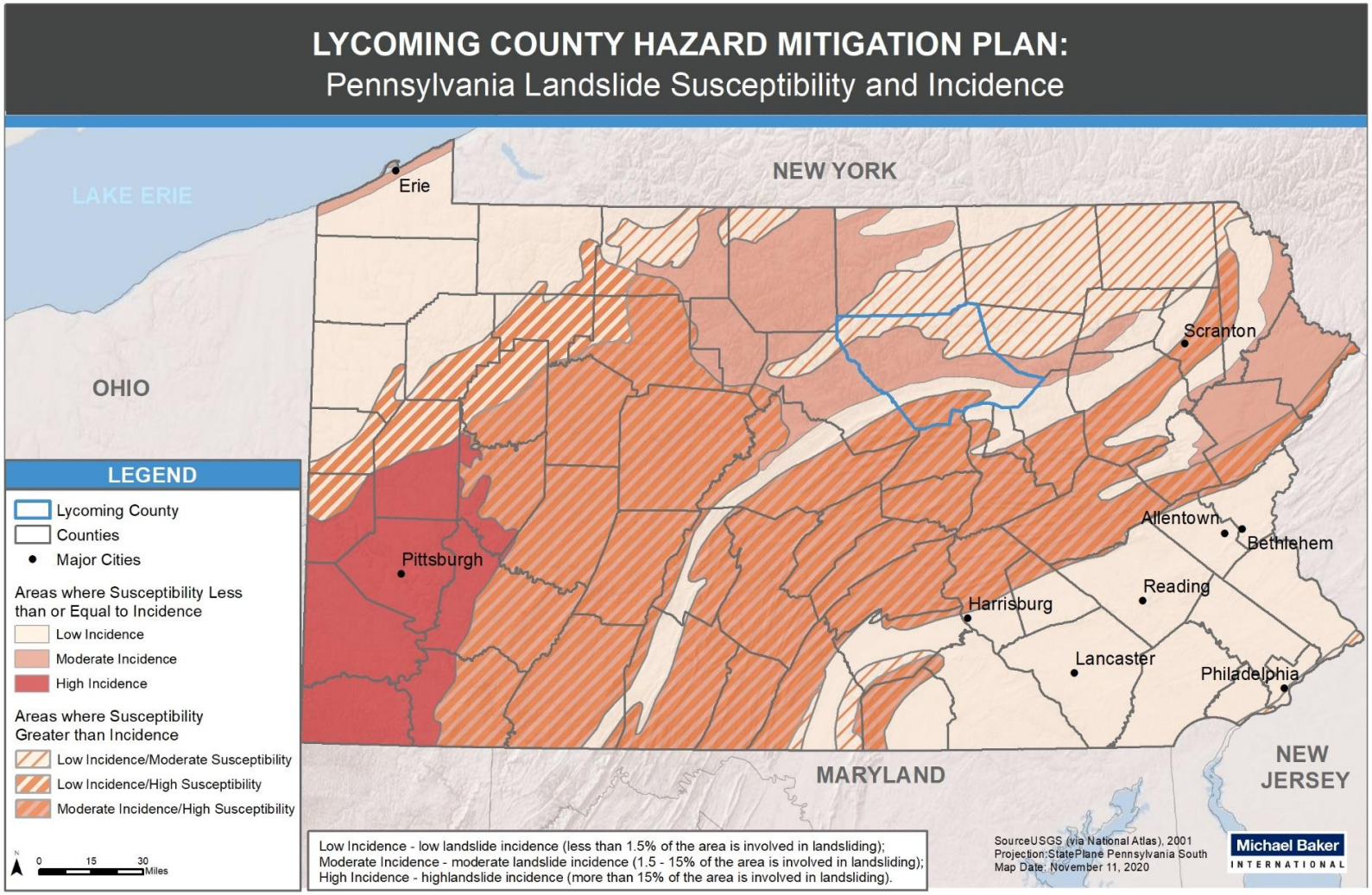
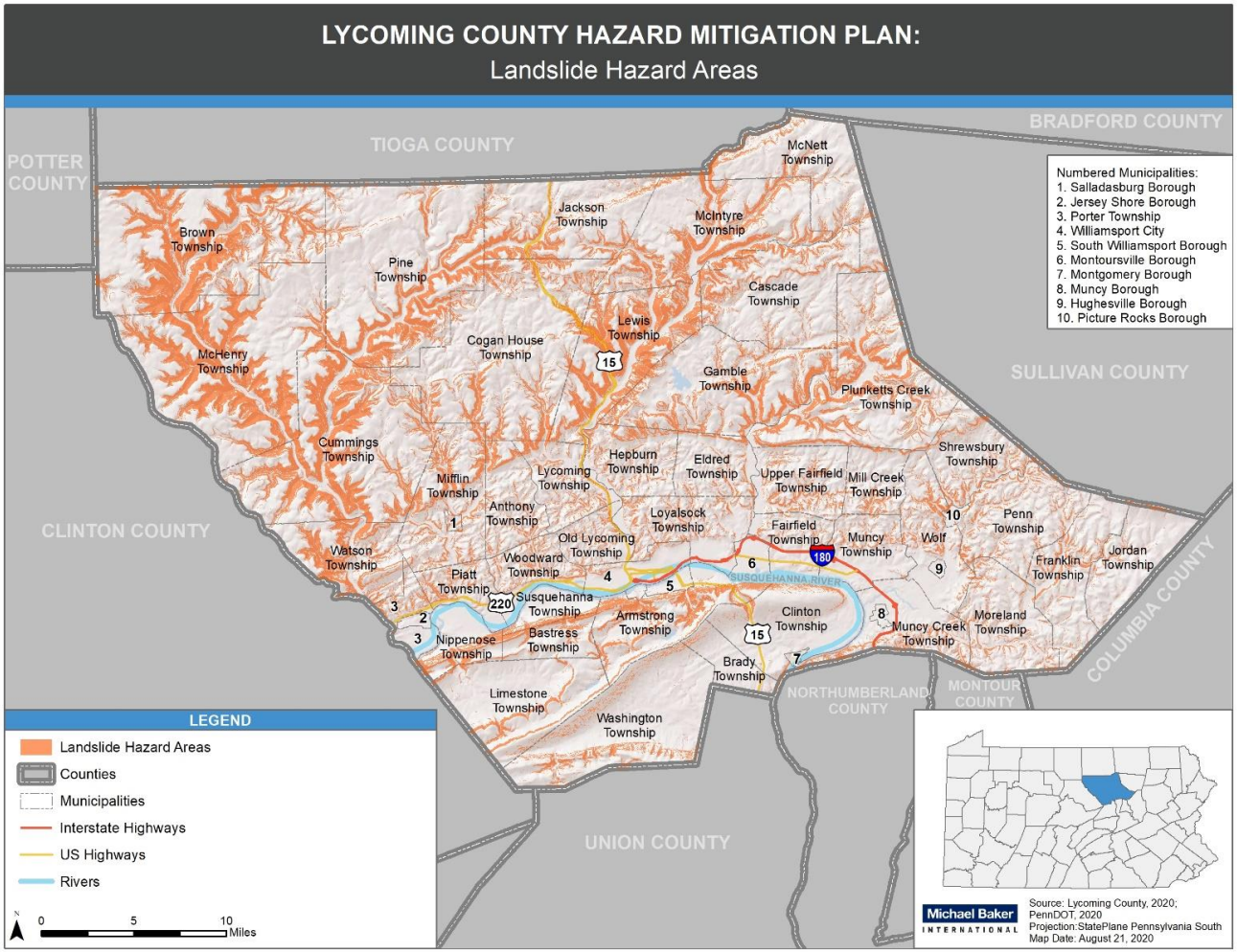


Figure 4.3.5-2 Lycoming County Landslide Hazard Areas



4.3.5.2. 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 can have potentially devastating consequences in localized areas. Landslides cause damage to transportation routes, utilities, and buildings and create travel delays and other side effects. Structures or infrastructure built on susceptible land will likely collapse as their footings slide downhill. Structures below the landslide can be crushed. Landslides next to roads and highways have the potential to fall on and damage vehicles or cause accidents.

Landslides in Lycoming County have reportedly involved mudslides and rockfalls resulting in road closures and traffic delays (Papa, 2018). A more damaging scenario could occur in Lycoming 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.

According to the DCNR, deaths and injuries due to landslides are rare in Pennsylvania. Most landslide events in the State are moderate to slow moving and damage property rather than people. Almost all of the known deaths due to landslides have occurred when rock falls or other slides along highways involved vehicles (DCNR, 2001). If residential and recreational development increases on and near steep mountain slopes, the hazard from these rapid events will also increase. Storm-induced debris flows are the only other type of landslide likely to cause death and injuries in Lycoming County.

Property losses due to landslides and associated effects are more common than injuries and deaths. An example of a worst-case scenario, as referenced in a 2001 PA DCNR landslide report, is a small landslide in 1990 that involved a broken petroleum pipeline. Spilled petroleum products entered a major river, causing city water systems to shut down. The identified costs of repair of this landslide damage, clean-up of the spill, technical investigations, legal and court costs, and environmental fines were approximately $12 million. The incalculable costs include lost productivity while people stayed at home because their businesses were closed or to care for children normally in schools that were closed due to lack of water supply, costs for the National Guard to deliver water to neighborhoods, and costs to

the pipeline company and its customers due to business loss for several months (DCNR, 2001). Although this example is extreme, associated damages such as this occur with many landslides.

Most damages are less expensive, but significant. "Backyard" landslides are usually repaired incompletely or not at all. Cost estimates of several hundred thousand dollars for stabilization and repair of a landslide affecting two or three properties are typical. With repair estimates exceeding the value of the properties, abandonment is a frequent "solution." Sometimes local governments assist with relocation costs or "buy out" homeowners. Insurance for landslide damage may be limited for homeowners and businesses (DCNR, 2001).

The Pennsylvania Department of Transportation and large municipalities incur substantial costs due to landslide damage and to extra construction costs for new roads in known landslide-prone areas. A 1991 estimate showed an average of $10 million per year is spent on landslide repair contracts across the State and a similar amount is spent on mitigation costs for grading projects (DCNR, 2001).

4.3.5.3. Past Occurrence

A comprehensive inventory of landslide events in Pennsylvania does not exist. DCNR does not record landslide events or related damages. Past studies have focused on the most vulnerable areas in Pennsylvania, so past occurrence data is not readily available for Lycoming County through these sources.

The NCDC database captures landslides as they occur in conjunction with severe storms. The only report of a landslide related event in Lycoming County is in the narrative of a flash flood event in May 2004, which resulted in three mudslides in the Muncy area (NCDC, 2020).

Representatives from the County and municipal officials noted that several landslide incidents that have occurred and some are under review for potential roadway changes.

4.3.5.4. Future Occurrence

Since the exact number of previous landslides over a definite time interval is not known, it is not possible to determine a quantitative probability of future occurrence for landslides in Lycoming County. With several landslide events in the past, the presence of areas susceptible to landslides, and increasing human development near hillsides, landslides causing varying levels of damage are likely to continue to occur in the absence of mitigation activities. Changing weather patterns have resulted in increased precipitation in the region. Climate specialists predict that precipitation intensity will doubly in the Lycoming County region by 2050 (Climate Central, 2019). More frequent and intense rainfall is leading to severe flooding and can trigger flash floods and river overflow. Saturated soils create prime conditions for landslides and mudflows. As intense rainfall continues to increase in Lycoming County, it can be expected that there will be an increase in landslide occurrence during and after rain events. Mismanaged intense development in steeply sloped areas could increase the frequency of

occurrence. Utilizing the Risk Factor Methodology, the probability for a landslide event to occur is *likely* (see Table 4.4-1)

4.3.5.5. Vulnerability Assessment

A landslide vulnerability assessment involved determining the location of susceptible lands and then determining what community assets are located on those susceptible lands. The following steps are typically followed the determine the spatial extent of landslide hazard:

- Identify existing or old landslides:
  - On or at the base of slopes;
  - In or at the base of minor drainage hollows;
  - At the base or top of an old fill slope;
  - At the base or top of a steep cut slope; or
  - Developed hillsides where leach field septic systems are used.
- Map the topography, since steeper slopes have greater probability of landslides.
- Map the geology, because in addition to the slope angle, the presence of rock or soil that weakens when saturated, as well as poorly drained rock or soil where indicators of slope instability as well.
- Contact local and state geological survey, other persons who might be knowledgeable about the local conditions in relation to landslides.

Conditions that may exacerbate or mitigate the severity and effects of landslides include erosion, unstable slopes, earthquakes, increase of weight of slopes, hydrologic factors and human activity. Human activities are responsible for initiating or intensifying certain conditions where otherwise there would have been little or no risk. Activities that increase vulnerability by triggering landslides include:

- Excavations and developments in unstable slope materials
- Haphazard construction or improper use of pipelines
- Disruption of surface or subsurface drainage (streams and springs) e.g. by filling
- Overuse of fill materials on slopes, particularly at the heads of existing slide masses
- Removal of materials at the bases of slopes
- Vibrations from heavy traffic, blasting, and driving piles near unstable slopes

Appendix XXXX includes maps showing landslide hazard areas by land use in each municipality. The most vulnerable communities are those that have significant portions of residential or commercial areas in landslide hazard areas. Cummings Township and Watson Township have large amounts of commercial land in landslide hazard areas. Picture Rocks Borough similarly has several landslide hazard areas throughout residential neighborhoods. Municipalities should use these maps to inform future land use controls, which can reduce development in hazardous areas.

Landslide vulnerability is highly site-specific, but this HMP provides an estimate of structures or critical facilities that may be vulnerable to landslides by being located on slopes of 15% or steeper, where it is much more likely that a landslide event will occur. Municipalities with the most structures and critical facilities along steep slopes are more likely to incur damages from a landslide event. Table 4.3.5-1 shows the number of structures vulnerable to landslides in each municipality. Less than 1% of structures in Lycoming County are located in landslide prone areas, and there are no critical facilities in these areas. 85 of 159 landslide prone structures are residential, and 47 are agricultural.

Table 4.3.5-1 Structures and critical facilities vulnerable to landslides.

MUNICIPALITY	TOTAL STRUCTURES	TOTAL STRUCTURES IN LANDSLIDE PRONE AREAS	PERCENT STRUCTURES IN LANDSLIDE PRONE AREAS
Anthony Township	394	2	0.51%
Armstrong Township	550	4	0.73%
Bastress Township	264	2	0.76%
Brady Township	353	0	0%
Brown Township	430	6	1.40%
Cascade Township	332	0	0%
Clinton Township	1,541	1	0.06%
Cogan House Township	1,056	4	0.38%
Cummings Township	850	7	0.82%
Duboistown Borough	730	3	0.41%
Eldred Township	973	1	0.10%
Fairfield Township	1,496	0	0%
Franklin Township	603	4	0.66%
Gamble Township	609	3	0.49%
Hepburn Township	1,459	8	0.55%
Hughesville Borough	963	0	0%
Jackson Township	349	0	0%
Jersey Shore Borough	2,347	0	0%
Jordan Township	576	0	0%
Lewis Township	826	5	0.61%
Limestone Township	1,406	1	0.07%
Loyalsock Township	5,426	18	0.33%
Lycoming Township	975	0	0%
McHenry Township	735	6	0.82%
McIntyre Township	434	2	0.46%
McNett Township	262	1	0.38%
Mifflin Township	588	2	0.34%
Mill Creek Township	317	3	0.95%

Table 4.3.5-1 Structures and critical facilities vulnerable to landslides.

MUNICIPALITY	TOTAL STRUCTURES	TOTAL STRUCTURES IN LANDSLIDE PRONE AREAS	PERCENT STRUCTURES IN LANDSLIDE PRONE AREAS
Montgomery Borough	811	1	0.12%
Montoursville Borough	2,258	0	0%
Moreland Township	591	2	0.34%
Muncy Borough	1,112	0	0%
Muncy Creek Township	2,009	2	0.10%
Muncy Township	667	1	0.15%
Nippenose Township	566	1	0.18%
Old Lycoming Township	3,106	10	0.32%
Penn Township	551	6	1.09%
Piatt Township	867	4	0.46%
Picture Rocks Borough	299	1	0.33%
Pine Township	559	1	0.18%
Plunketts Creek Township	701	2	0.29%
Porter Township	892	0	0%
Salladasburg Borough	145	0	0%
Shrewsbury Township	312	0	0%
South Williamsport Borough	2,898	6	0.21%
Susquehanna Township	737	3	0.41%
Upper Fairfield Township	928	5	0.54%
Washington Township	1,320	0	0%
Watson Township	516	8	1.55%
Williamsport, City of	12,245	12	0.10%
Wolf Township	1,616	3	0.19%
Woodward Township	1,647	8	0.49%
Lycoming County Total	**64,197**	**159**	**0.25%**

4.3.6. Pandemic and Infectious Disease

4.3.6.1. 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 and can be 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.

Lycoming 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 is causes deaths in normally healthy individuals, and easily transmittable from person-to-person. Different strands of influenza mutate over time and replace older strands 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 (CDCD, 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 likely 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 (CDC, 2020). 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, health care professionals recommended that individuals wear masks and remain six feet apart to slow the spread of transmission.

4.3.6.2. Range of Magnitude

The magnitude of a pandemic or infectious disease in Lycoming 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 than an influenza pandemic will cause outbreaks across the United States, limiting the ability to transfer assistance from one jurisdiction to another. Additionally, effective preventive 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 3.3.6-1). The severity of illness from the 2009 H1N1 influenza flu virus varied, with the gravest cases occurring mainly among those considered to be high risk. High risk populations are considered to be more vulnerable and include children, the elderly, pregnant women, and chronic disease patients with reduced immune system capacity. These populations are described in more detail in Section 4.3.6.5. 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 and Prevention (CDC) the majority of people who died, as many as 77%, were 18-64 years old with up to 11% of the deaths estimated in those 17 years old or younger (CDC, 2009).

The 1918 Spanish flu pandemic was the worst-case pandemic event in the 20th century for both Pennsylvania and worldwide. County data is unavailable, and mortality figures were probably under-reported. It is recorded that over 60,000 Pennsylvanians died from the flu or its complications in this pandemic (Shetty & Aher, 2018). Infection rates were much worse in denser cities, which should be a higher priority for response actions in future flu events.

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). A similar outbreak in Lycoming County could cause significant economic loss.

It is believed that the coronavirus 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 (CDC, 2020). At first, people were mostly concerned with those 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 remain home as much as possible in attempt to slow the transmission of COVID-19. Stay at home restrictions were lifted in June 2020. However, as the virus evolves the Pennsylvania Department of Health has changed restrictions as necessary to protect public health.

4.3.6.3. 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 4.3.6-1 below.

Table 4.3.6-1 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 flue cases have been on the rise in Lycoming County over the past few years. Figure 4.3.6-2 lists the number of confirmed flu cases in the County by flu season. According to the Pennsylvania Department of Health (DOH), there were 1,314 confirmed cases in the most recent influenza season from September 2019 to March 2020 (PA DOH, 2020a).

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 4.3.6-2 Confirmed Flu Cases in Lycoming County by Flu Season (PA DOH, 2020a)

FLU SEASON	NUMBER OF CONFIRMED CASES
2014/15	632
2015/16	147
2016/17	899
2017/18	900
2018/19	1194
2019/20	1314

COVID-19 was first confirmed in the US in late February 2020, and most counties in Pennsylvania were affected by March 2020 (CDC, 2020). As of December 7, 2020, there were more than 394,000 confirmed cases and more than 11,300 deaths in Pennsylvania, with 2,913 cases and 48 deaths reported in Lycoming County (PA DOH, 2020b). By late September, the US entered a third wave in case numbers. These numbers are expected to continue to increase as the 2020-2021 flu season approaches. Until a vaccine is readily available, it is expected that some shutdown measures will continue to stay in place. County officials encourage individuals who test positive to COVID and everyone else to shelter in place and self-quarantine as much as possible to decrease the spread.

4.3.6.4. 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 and is ongoing through the HMP update period. 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 4.4.1-1).

4.3.6.5. 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 population 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 population 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. The World Bank estimates that a severe flu pandemic could kill as many as 71 million people worldwide and cause a $3 trillion recession (CIDRAP, 2008). With Pennsylvania's economy is 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 Lycoming County. According to the 2017 Agricultural census, livestock sales make up about 52% of Lycoming County's agricultural sales. Poultry and egg sales totaled around $5,983,000 in 2017 (USDA, 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 (Rushe & Holpuch, 2020). There is specific concern for those who worked in service and hospitality industries. Construction projects and other businesses are forced to pause while many others decide to permanently close. However, the commonwealth and the federal government are releasing relief packages for individuals and businesses. Lycoming County has compiled a growing list with links on their website to medical information, relief packages, and other resources. The COVID-19 pandemic has also spurred conversations around creating safe public spaces and work environments in regard to pandemic and infectious disease. The International Code Council (ICC) published an overview of code compliance that helps facilitate response to pandemic instances. For example, properly designed, installed, and maintained ventilation systems can help in mitigating the spread of pathogens (ICC, 2020). Many buildings have chosen to inspect and upgrade these systems during shelter in place orders. This is essential towards stopping the spread of pathogens in high density residential buildings and ensures workers will return to a safe environment when it is safe to work in offices again.

4.3.7. Radon Exposure

4.3.7.1. 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 readings on a construction worker 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 the worker lived became the focus of the first large-scale radon scare in the world.

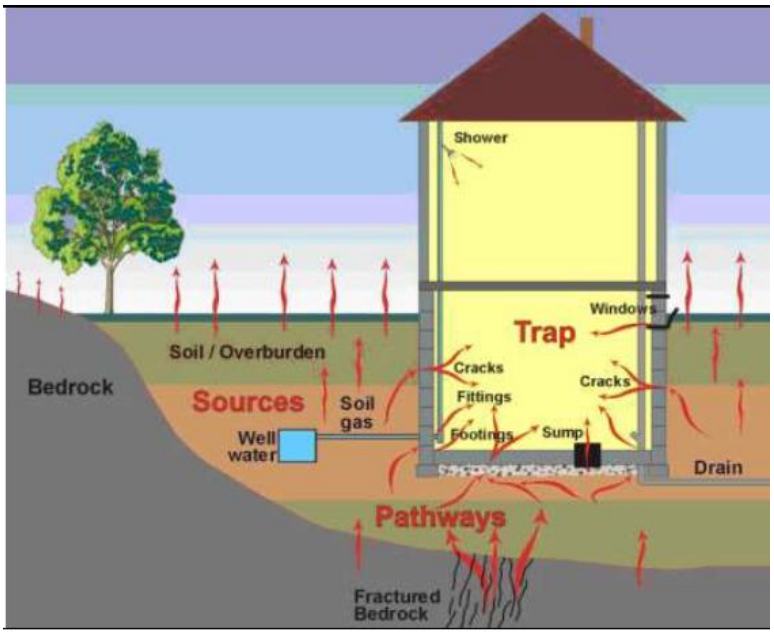
Radon is a gas that cannot be seen or smelled. It is a noble gas that originates by the natural radioactive decay of uranium and thorium. Like other noble gases (e.g., helium, neon, and argon), radon forms essentially no chemical compounds and tends to exist as a gas or as a dissolved atomic constituent in groundwater. Two isotopes of radon are significant in nature, 222Rn and 220Rn, formed in the radioactive decay series of 238U and 232Th, respectively. The isotope thoron (i.e. 220Rn) 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. 222Rn), 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. 226Ra), 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 in houses are now recognized (shown in Figure 4.3.5-1):

- 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 4.3.7-1 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 wind 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 fractured bedrock through the foundation and slab beneath the house, or through cracks and openings for pipes, sumps, and similar features (see Figure 4.3.4-2). 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 upon 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. Lycoming County is classified as having a high hazard, meaning there is a predicted indoor radon level greater than 4 pCi/L (see Figure 4.3.7-2).

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

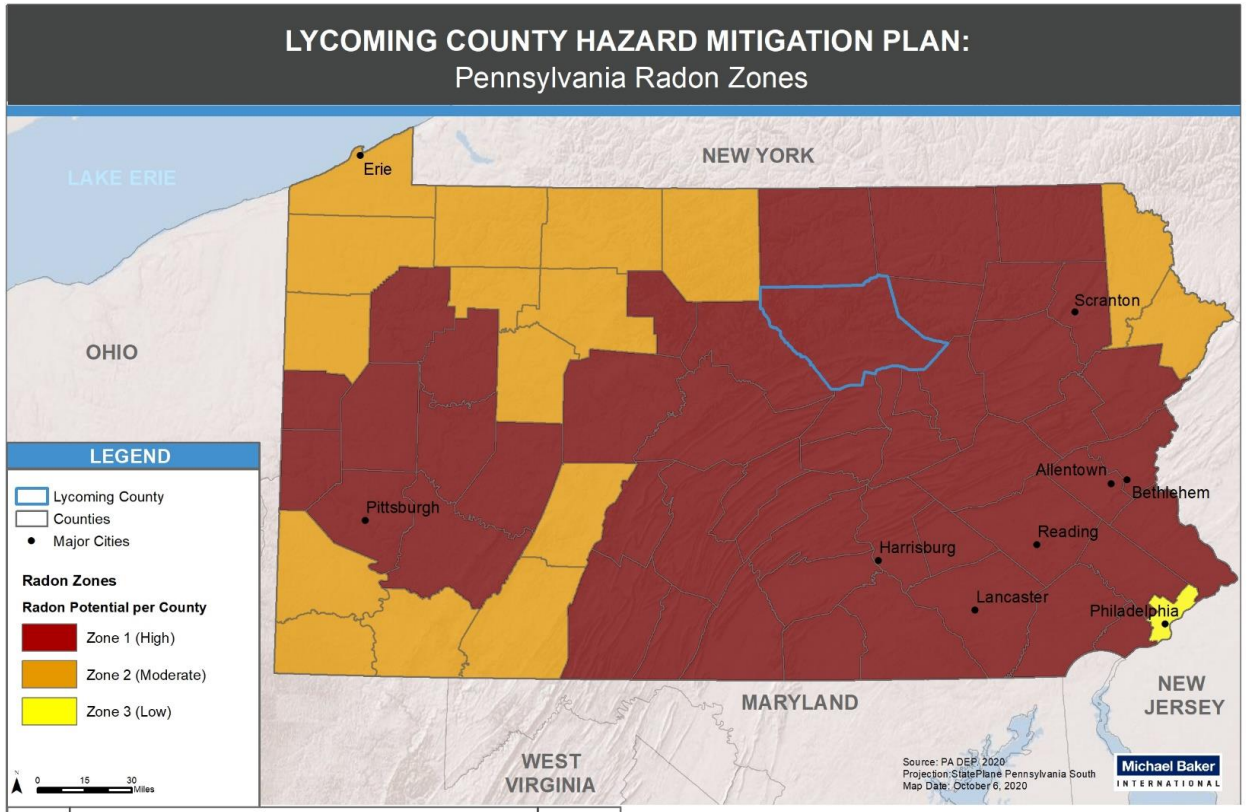
- Areas of very elevated uranium content (>50 parts per million (ppm) around uranium deposits and prospects. Although very high levels of radon can occur in such areas, the hazard normally is restricted to within a few hundred feet of the deposit. In Pennsylvania, such localities occupy an insignificant 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.

The second factor listed above is most likely the cause of high radon levels in Lycoming County. There are eight areas of Lycoming County which have had high radon level test results, mostly in the central area of the County. The areas and test results are shown in more detail in Table 4.3.5-2.

Figure 4.3.7-2 Radon Hazard Zones in Pennsylvania (USEPA, 1993)



	Zone 1 counties have a predicted average indoor radon screening level greater that 4 pCi/L (pico curies per liter) **(red zones)**	**High** Potential
	Zone 2 counties have a predicted average indoor radon screening level between 2 and 4 pCi/L **(orange zones)**	**Moderate** Potential
	Zone 3 counties have a predicted average indoor radon screening less than 2 pCi/L **(yellow zones)**	**Low** Potential

4.3.7.2. 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, 2020a). The main hazard is actually 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 4.3.4-1 shows the relationship between various radon levels, probability of lung cancer, comparable risks from other hazards, and action thresholds. As is shown in Table 4.3.4-1, a smoker exposed to radon has a much higher risk of lung cancer.

Table 4.3.7-1 Radon risk for smokers and non-smokers (EPA, 2016).

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

8	About 15 people could get lung cancer	4 times the risk of dying in a fall	
4	About 7 people could get lung cancer	The risk of dying in a car crash	
2	About 4 people could get lung cancer	The risk of dying from poison	Consider fixing structure between 2 and 4 pCi/L
1.3	About 2 people could get lung cancer	(Average indoor radon level)	Reducing radon levels below 2pCi/L is difficult
0.4	-	(Average outdoor radon level)	
NOTE: Risk may be lower for former smokers. ** Lifetime risk of lung cancer deaths from EPA Assessment of Risks from Radon in Homes (EPA 402-R-03-003).* *** Comparison data calculated using the Centers for Disease Control and Prevention's 1999-2001 National Center for Injury Prevention and Control Reports.*			

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 of time without the resident being aware. This worst-case scenario exposure then could lead to a large number of people with cancer attributed to the radon exposure.

4.3.7.3. Past Occurrence

Current data on abundance and distribution of radon as it affects individual houses in Pennsylvania in general and Lycoming County specifically is considered incomplete and potentially biased. 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 (EPA, 2016).

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 is reported to the Bureau 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 Lycoming County 25 zip codes had sufficient tests reported to the Bureau to report their findings, which are shown in Table 4.3.5-2. This table does not include the zip codes for which insufficient data was collected in both basements and first floors. The spatial distribution of this data is illustrated in Figures 4.3.5-3 and 4.3.5-4. Communities with high test levels in basements or first-floors include Anthony Township, Cascade Township, Cogan House Township, Eldred Township, Gamble Township, Hepburn Township, Jackson Township, Jordan Township, Lewis Township, Lycoming Township, and Woodward Township.

Table 4.3.7-2 Radon level tests and results in Lycoming County zip codes (PADEP, 2020).

ZIP CODE	AREA OF LYCOMING COUNTY	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)
16938	Blackwell	37	28.4	5.8	Insufficient Data	Insufficient Data	Insufficient Data
16930	Liberty	52	51	6.5	Insufficient Data	Insufficient Data	Insufficient Data
17701	Williamsport	3918	327.6	10.6	661	3013	8.8
17702	Williamsport	389	144.3	7.2	43	38.1	6.3
17724	Leroy	82	43.7	8.4	33	14.9	2.6
17728	Cogan Station	535	359.7	17.4	49	223	16.2
17737	Hughesville	409	322	13.2	68	52.3	4.6
17740	Salladasburgh	656	301	13	125	109.8	3.7
17744	Linden	130	150.8	18.9	Insufficient Data	Insufficient Data	Insufficient Data
17745	Lock Haven	1747	193.8	9.3	208	126.4	4.6
17747	Longanton	113	93.9	9	Insufficient Data	Insufficient Data	Insufficient Data
17752	Montgomery	250	100	7.4	36	6.6	1.6
17754	Montoursville	1841	448	11.2	160	91.7	7.2
17756	Muncy	784	321	13.1	187	188.3	3.6
17758	Sonestown	32	65.1	5.6	Insufficient Data	Insufficient Data	Insufficient Data
17771	Trout Run	158	402.2	21.3	32	13.4	3.1
17772	Turbotville	124	53.2	7.2	Insufficient Data	Insufficient Data	Insufficient Data
17774	Muncy	44	76.5	9.8	Insufficient Data	Insufficient Data	Insufficient Data
17777	Watsontown	529	219.3	8	76	37.5	3
17810	Montgomery	91	36.5	6.6	Insufficient Data	Insufficient Data	Insufficient Data
17814	Benton	252	370	17.3	66	55.5	5.7
17815	Bloomsburg	2973	627.5	13.1	480	501	6.6
17837	Lewisburg	3555	406	7.2	457	110.7	3.6
17844	Mifflinburg	825	218.4	11.3	227	42.8	2.6
17846	Millville	225	215	16.4	55	22.7	2.9

*Zip Codes with no data available or insufficient data are not included in this table. This includes the following zip codes: 16921, 17723, 17727, 17729, 17742, 17760, 17763, 17765, 17768, 17776, and 18619.

Figure 4.3.7-3 Pennsylvania Average Basement Radon Test Results from 1990-2020

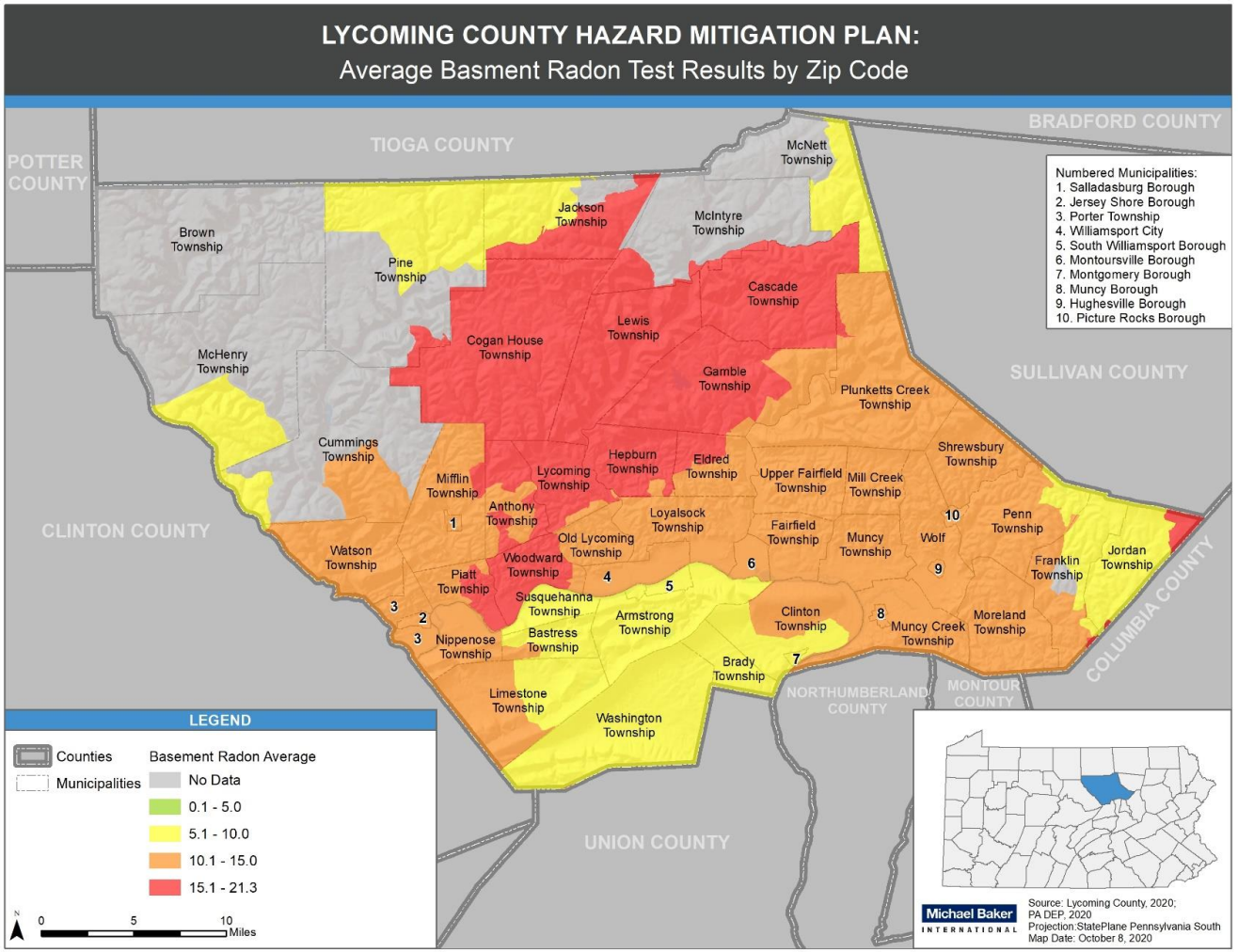
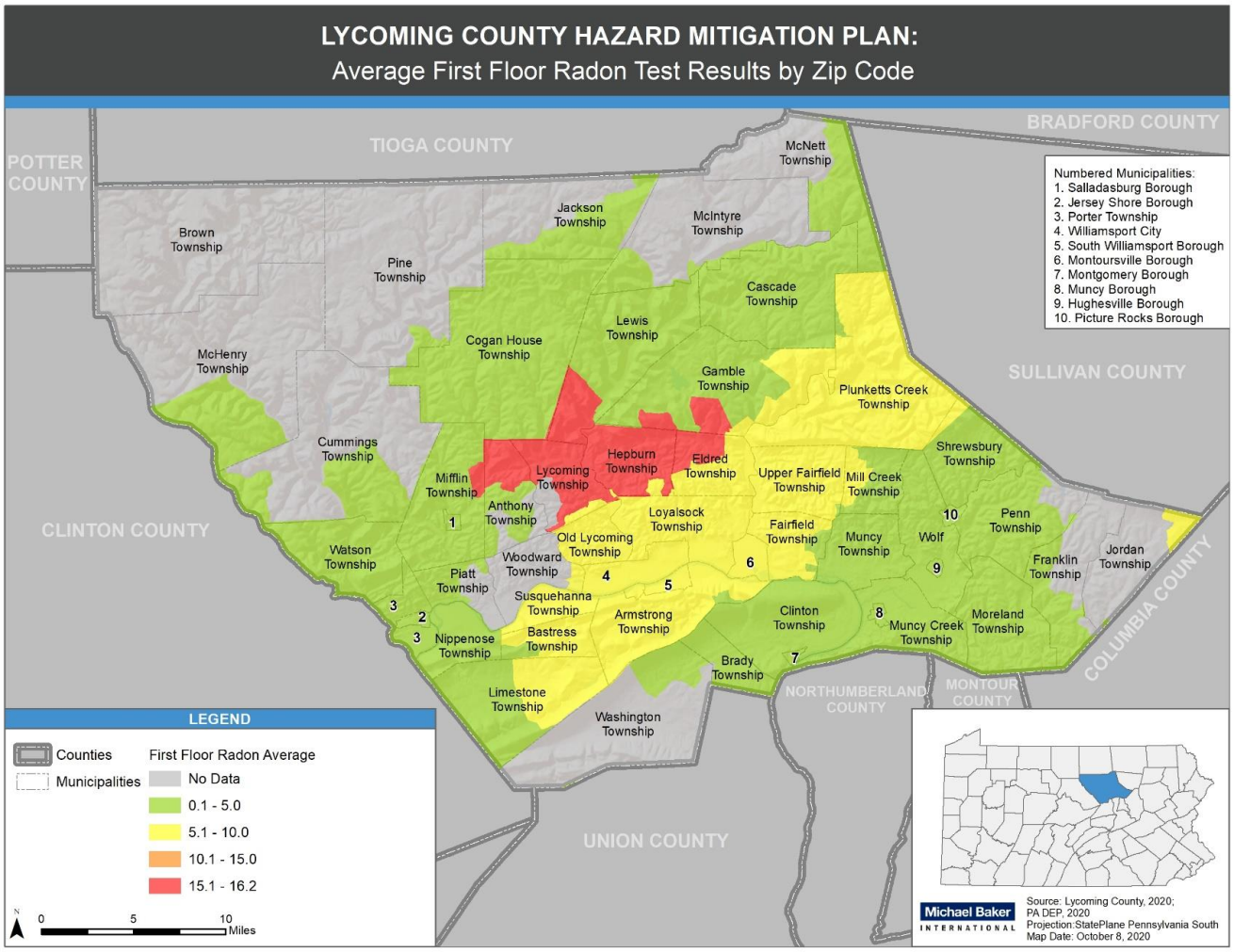


Figure 4.3.7-4 Pennsylvania Average First Floor Radon Test Results from 1990-2020



4.3.7.4. Future Occurrence

Radon exposure is inevitable given present soil, geologic, and geomorphic factors in Lycoming County. Future occurrence of high radon level hazards can be considered *possible* as defined by the Risk Factor Methodology probability criteria (see Table 4.4-1). 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.

4.3.7.5. Vulnerability Assessment

Houses in Lycoming County, especially in the central areas of the County, could be susceptible to high 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 Table 4.3.5-1). 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 an additional risk, although this type of exposure is low and rare in Pennsylvania. Proper testing for radon levels should be completed across Lycoming County, especially in areas of higher incidence levels and for those individuals and households 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 buildings within the zip codes with elevated rest 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, Lycoming County has 47,992 buildings in areas with high radon test results, while approximately 20%, or 9,598, of these buildings will be impacted. The estimated cost for radon mitigation total $11,518,080.

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

4.3.8. Subsidence, Sinkhole

4.3.8.1. 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 (DCNR, 2020a). Eventually, overburden on top of the void 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 materials. 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. Subsidence potential in Lycoming County is primarily associated with this type of subsidence event. Figure 4.3.6-1 shows that a small portion of Lycoming County lies in an area of Pennsylvania where limestone/dolomite bedrock is present near ground surface, thus making those areas more susceptible to natural sinkhole development. This area lies over parts of several communities in the South-West corner of Lycoming County. The map also illustrates DCNR's partial inventory of sinkholes and surface depressions.

The following municipalities have identified near-surface limestone and are therefore vulnerable to sinkholes:

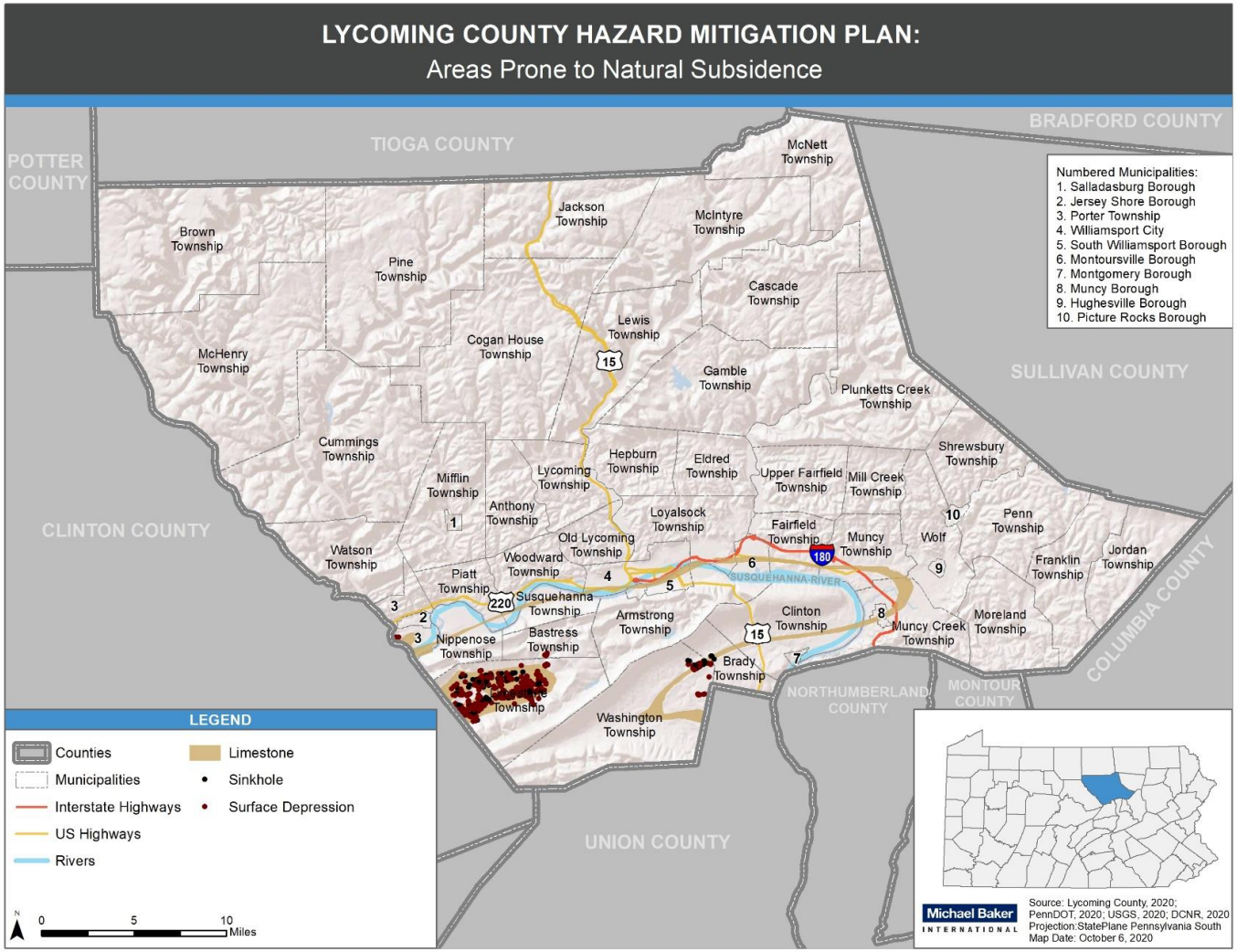
- Armstrong Township
- Brady Township
- Clinton Township
- Duboistown Borough
- Fairfield Township
- Limestone Township
- Montoursville Borough
- Muncy Borough
- Muncy Creek Township
- Muncy Township
- Nippenose Township
- Piatt Township
- Porter Township
- South Williamsport Borough
- Susquehanna Township
- Washington Township
- Williamsport, City of
- Wolf Township
- Woodward Township

Lycoming County is located within two distinctive physiographic provinces. Most of the county is within the Allegheny High Plateaus section of the Appalachian Plateaus Province. This section is characterized by rolling hills dissected by steep stream valleys. Rock layers here are still horizontal, not deformed into ridges. However, creeks have cut down through rock layers in this section to form steep valleys, such as the Pine Creek Gorge. The southern third is within the Appalachian Mountain section of the Valley and Ridge Province. This section is characterized by a series of sharp-crested ridges separated by long narrow valleys. Ridges are composed of hard resistant sandstones and quartzite, while the valleys are underlain by softer rocks such as limestone and shale (LCPC, 1993). Valley areas in the southern part of Lycoming County are the most susceptible to sinkholes and subsidence due to these geologic characteristics.

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.

Figure 4.3.8-1 Map showing areas of Lycoming County subject to natural subsidence due to the presence of limestone bedrock. Inventoried surface depression and sinkhole locations are also shown.



4.3.8.2. 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 Lycoming 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. They vary depending on the rock type immediately underlying soil cover. The recommendations include thorough geotechnical investigations to identify un-collapsed karst features and potential excavation to solid rock prior to construction.

In 2019, a break in the sewer line along Campbell Street in the City of Williamsport caused a large sinkhole. The City Municipal Water Authority estimated that it would need $550,000 in emergency repairs. Repairs on the original sewer before this incident were difficult due to its construction of brick and mortar, which has simply eroded away over time. Campbell Street was closed for several weeks after this incident (Danneker, June 14, 2019).

Figure 4.3.8-2 Large Sinkhole caused by sewer break in the City of Williamsport (Danneker, June 1, 2019).

Figure 4.3.8-3 Large Sinkhole caused by sewer break in the City of Williamsport (Danneker, June 14, 2019).

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.

The magnitude of land subsidence and sinkholes in Lycoming 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.

The worst-case scenario for sinkholes in Lycoming County would be a series of large sinkholes opening in Muncy Township. Though the geographic minority of the township is vulnerable to sinkholes, a series of sinkholes in this township could cut off access to I-180 and US-220, both

major roads in the County. In addition, Muncy Township has the highest value of property within the vulnerable area: over $264 million. Further, a series of sinkholes could close secondary roads, cause power outages, prevent the delivery of emergency services, and cause injuries or death to the township's residents. Other worst-case scenarios would involve a sinkhole under a critical facility such as a hospital. This could lead to structural damage and injuries to those in the building. During building repairs, part of the facility would need to be closed which would reduce capacity and ability to fill essential services.

4.3.8.3. Past Occurrence

The Pennsylvania Department of Conservation and Natural Resources (DCNR) maintains an online Sinkhole Inventory Database of sinkholes throughout the Commonwealth. According to the DCNR there have been a total of 70 sinkholes and 391 surface depressions in Lycoming County as of 2020. Table 4.3.6-1 shows the breakdown of sinkhole and surface depression by municipality.

Table 4.3.8-1 Sinkhole and surface depressions in Lycoming County by municipality

MUNICIPALITY	SINKHOLE	SURFACE DEPRESSION
Brady Township	3	0
Bastress Township	0	4
Limestone Township	56	360
Porter Township	0	3
Washington Township	11	24
Lycoming County Total	**70**	**391**

4.3.8.4. Future Occurrence

Based on geological conditions, subsidence events may possibly occur in the future for the areas of Lycoming County underlain by carbonate rock such as limestone. Sinkholes and surface depressions are dependent on a number of variables, including land use and water management. Changes in these variables can affect the likelihood and frequency of future subsidence events. Overall, the probability of future subsidence and sinkhole events can be considered *unlikely* according to the Risk Factor Methodology (see Table 4.4.2-1).

4.3.8.5. Vulnerability Assessment

The most vulnerable municipalities are those that have identified near-surface limestone or past sinkhole occurrence. See Section 4.3.8-1 for a listing of these communities.

The secondary effects of sinkhole formation have the potential to cause significant impacts in communities underlain by surface-level limestone, 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 inventoried in Table 4.3.8-2. Most vulnerable structures and critical facilities are located in Limestone Township, with 79% and 89% of each in subsidence prone areas. Table 4.3.8-3 provides the property type of the vulnerable structures within subsidence areas in Lycoming County. The majority of structures in subsidence prone areas are residential structures.

Table 4.3.8-2 Structures and critical facilities vulnerable to subsidence.

MUNICIPALITY	TOTAL STRUCTURES	TOTAL STRUCTURES IN SUBSIDENCE PRONE AREAS	PERCENT STRUCTURES IN SUBSIDENCE PRONE AREAS	TOTAL CRITICAL FACILITIES	CRITICAL FACILITIES IN SUBSIDENCE PRONE AREAS	PERCENT CRITICAL FACILITIES IN SUBSIDENCE PRONE AREAS
Anthony Township	394	0	0%	4	0	0%
Armstrong Township	550	8	1%	6	0	0%
Bastress Township	264	0	0%	4	0	0%
Brady Township	353	42	12%	4	0	0%
Brown Township	430	0	0%	5	0	0%
Cascade Township	332	0	0%	2	0	0%
Clinton Township	1,541	114	7%	27	1	4%
Cogan House Township	1,056	0	0%	4	0	0%
Cummings Township	850	0	0%	4	0	0%
Duboistown Borough	730	186	25%	5	0	0%
Eldred Township	973	0	0%	4	0	0%
Fairfield Township	1,496	263	18%	11	3	27%
Franklin Township	603	0	0%	5	0	0%
Gamble Township	609	0	0%	3	0	0%
Hepburn Township	1,459	0	0%	6	0	0%
Hughesville Borough	963	0	0%	12	0	0%
Jackson Township	349	0	0%	6	0	0%
Jersey Shore Borough	2,347	0	0%	21	0	0%
Jordan Township	576	0	0%	4	0	0%
Lewis Township	826	0	0%	5	0	0%
Limestone Township	1,406	1051	75%	9	8	89%
Loyalsock Township	5,426	59	1%	38	4	11%
Lycoming Township	975	0	0%	2	0	0%
McHenry Township	735	0	0%	5	0	0%

Table 4.3.8-2 Structures and critical facilities vulnerable to subsidence.

MUNICIPALITY	TOTAL STRUCTURES	TOTAL STRUCTURES IN SUBSIDENCE PRONE AREAS	PERCENT STRUCTURES IN SUBSIDENCE PRONE AREAS	TOTAL CRITICAL FACILITIES	CRITICAL FACILITIES IN SUBSIDENCE PRONE AREAS	PERCENT CRITICAL FACILITIES IN SUBSIDENCE PRONE AREAS
McIntyre Township	434	0	0%	4	0	0%
McNett Township	262	0	0%	2	0	0%
Mifflin Township	588	0	0%	6	0	0%
Mill Creek Township	317	0	0%	3	0	0%
Montgomery Borough	811	0	0%	6	0	0%
Montoursville Borough	2,258	460	20%	24	5	21%
Moreland Township	591	0	0%	3	0	0%
Muncy Borough	1,112	260	23%	11	2	18%
Muncy Creek Township	2,009	313	16%	17	1	6%
Muncy Township	667	75	11%	9	1	11%
Nippenose Township	566	107	19%	6	1	17%
Old Lycoming Township	3,106	0	0%	15	0	0%
Penn Township	551	0	0%	3	0	0%
Piatt Township	867	25	3%	1	0	0%
Picture Rocks Borough	299	0	0%	4	0	0%
Pine Township	559	0	0%	2	0	0%
Plunketts Creek Township	701	0	0%	4	0	0%
Porter Township	892	31	3%	4	0	0%
Salladasburg Borough	145	0	0%	2	0	0%
Shrewsbury Township	312	0	0%	1	0	0%
South Williamsport Borough	2,898	360	12%	18	1	6%
Susquehanna Township	737	154	21%	5	4	80%

Table 4.3.8-2 Structures and critical facilities vulnerable to subsidence.

MUNICIPALITY	TOTAL STRUCTURES	TOTAL STRUCTURES IN SUBSIDENCE PRONE AREAS	PERCENT STRUCTURES IN SUBSIDENCE PRONE AREAS	TOTAL CRITICAL FACILITIES	CRITICAL FACILITIES IN SUBSIDENCE PRONE AREAS	PERCENT CRITICAL FACILITIES IN SUBSIDENCE PRONE AREAS
Upper Fairfield Township	928	0	0%	8	0	0%
Washington Township	1,320	298	23%	7	5	71%
Watson Township	516	0	0%	1	0	0%
Williamsport, City of	12,245	75	1%	100	6	6%
Wolf Township	1,616	0	0%	15	0	0%
Woodward Township	1,647	8	0%	8	0	0%
Lycoming County Total	**64,197**	**3,889**	**6%**	**485**	**42**	**9%**

Table 4.3.8-3 Structures by land use subsidence vulnerability in Lycoming County.

MUNICIPALITY	TOTAL STRUCTURES	AGRICULTURE	COMMERCIAL	INDUSTRIAL	OTHER	RESIDENTIAL	UNKNOWN	TOTAL VULNERABLE STRUCTURES
Anthony Township	394	0	0	0	0	0	0	0
Armstrong Township	550	5	0	2	0	1	0	8
Bastress Township	264	0	0	0	0	0	0	0
Brady Township	353	6	1	0	1	34	0	42
Brown Township	430	0	0	0	0	0	0	0
Cascade Township	332	0	0	0	0	0	0	0
Clinton Township	1,541	24	4	0	1	85	0	114
Cogan House Township	1,056	0	0	0	0	0	0	0
Cummings Township	850	0	0	0	0	0	0	0
Duboistown Borough	730	0	10	0	0	173	3	186
Eldred Township	973	0	0	0	0	0	0	0
Fairfield Township	1,496	2	156	1	3	100	1	263

Table 4.3.8-3 Structures by land use subsidence vulnerability in Lycoming County.

MUNICIPALITY	TOTAL STRUCTURES	AGRICULTURE	COMMERCIAL	INDUSTRIAL	OTHER	RESIDENTIAL	UNKNOWN	TOTAL VULNERABLE STRUCTURES
Franklin Township	603	0	0	0	0	0	0	0
Gamble Township	609	0	0	0	0	0	0	0
Hepburn Township	1,459	0	0	0	0	0	0	0
Hughesville Borough	963	0	0	0	0	0	0	0
Jackson Township	349	0	0	0	0	0	0	0
Jersey Shore Borough	2,347	0	0	0	0	0	0	0
Jordan Township	576	0	0	0	0	0	0	0
Lewis Township	826	0	0	0	0	0	0	0
Limestone Township	1,406	352	19	12	30	630	8	1051
Loyalsock Township	5,426	0	41	3	2	13	0	59
Lycoming Township	975	0	0	0	0	0	0	0
McHenry Township	735	0	0	0	0	0	0	0
McIntyre Township	434	0	0	0	0	0	0	0
McNett Township	262	0	0	0	0	0	0	0
Mifflin Township	588	0	0	0	0	0	0	0
Mill Creek Township	317	0	0	0	0	0	0	0
Montgomery Borough	811	0	0	0	0	0	0	0
Montoursville Borough	2,258	0	112	17	2	329	0	460
Moreland Township	591	0	0	0	0	0	0	0
Muncy Borough	1,112	0	11	8	2	239	0	260
Muncy Creek Township	2,009	6	70	3	6	226	2	313
Muncy Township	667	16	19	2	1	37	0	75
Nippenose Township	566	10	41	0	0	55	1	107
Old Lycoming Township	3,106	0	0	0	0	0	0	0
Penn Township	551	0	0	0	0	0	0	0
Piatt Township	867	9	0	0	0	16	0	25
Picture Rocks Borough	299	0	0	0	0	0	0	0

Table 4.3.8-3 Structures by land use subsidence vulnerability in Lycoming County.

MUNICIPALITY	TOTAL STRUCTURES	AGRICULTURE	COMMERCIAL	INDUSTRIAL	OTHER	RESIDENTIAL	UNKNOWN	TOTAL VULNERABLE STRUCTURES
Pine Township	559	0	0	0	0	0	0	0
Plunketts Creek Township	701	0	0	0	0	0	0	0
Porter Township	892	4	0	0	0	27	0	31
Salladasburg Borough	145	0	0	0	0	0	0	0
Shrewsbury Township	312	0	0	0	0	0	0	0
South Williamsport Borough	2,898	0	96	15	8	234	7	360
Susquehanna Township	737	26	14	0	3	111	0	154
Upper Fairfield Township	928	0	0	0	0	0	0	0
Washington Township	1,320	121	12	0	2	163	0	298
Watson Township	516	0	0	0	0	0	0	0
Williamsport, City of	12,245	8	33	13	2	17	2	75
Wolf Township	1,616	0	0	0	0	0	0	0
Woodward Township	1,647	1	1	0	0	6	0	8
Lycoming County Total	64,197	590	640	76	63	2,496	24	3,889

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 sinkholes. 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 could 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.

4.3.9. Tornado, Windstorm

4.3.9.1. Location and Extent

Tornadoes and potentially damaging high winds occur throughout Pennsylvania. Tornadoes and windstorms can affect any area of Lycoming 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. However, these events can occur any time, and often accompany tropical storms and hurricanes as they move onto land.

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 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

4.3.9.2. Range of Magnitude

While the extent of tornado damage is usually localized, the vortex of extreme wind associated with a tornado can result in some of the most destructive forces on Earth. Rotational wind speeds can range from 100 mph to more than 250 mph. In addition, the speed of forward motion can range from 0 to 50 mph. Therefore, some estimates place the maximum velocity

(combination of ground speed, wind speed and upper winds) of tornadoes at about 300 mph. The damage caused by a tornado is a result of the high wind velocity and wind-blown debris, also accompanied by lightning or large hail. The most violent tornadoes have rotating winds of 250 miles per hour or more and are capable of causing extreme destruction and turning normally harmless objects into deadly missiles.

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 categorizes tornadoes from EF0 to EF5 with EF0 being the most commonly occurring type of tornado. The strongest tornado recorded in Lycoming County has been a category 2 or EF2 tornado. The following table shows the relationship between the EF- and F- Scales.

Table 4.3.9-1 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 4.3.9-2 Expected Tornado Damages.

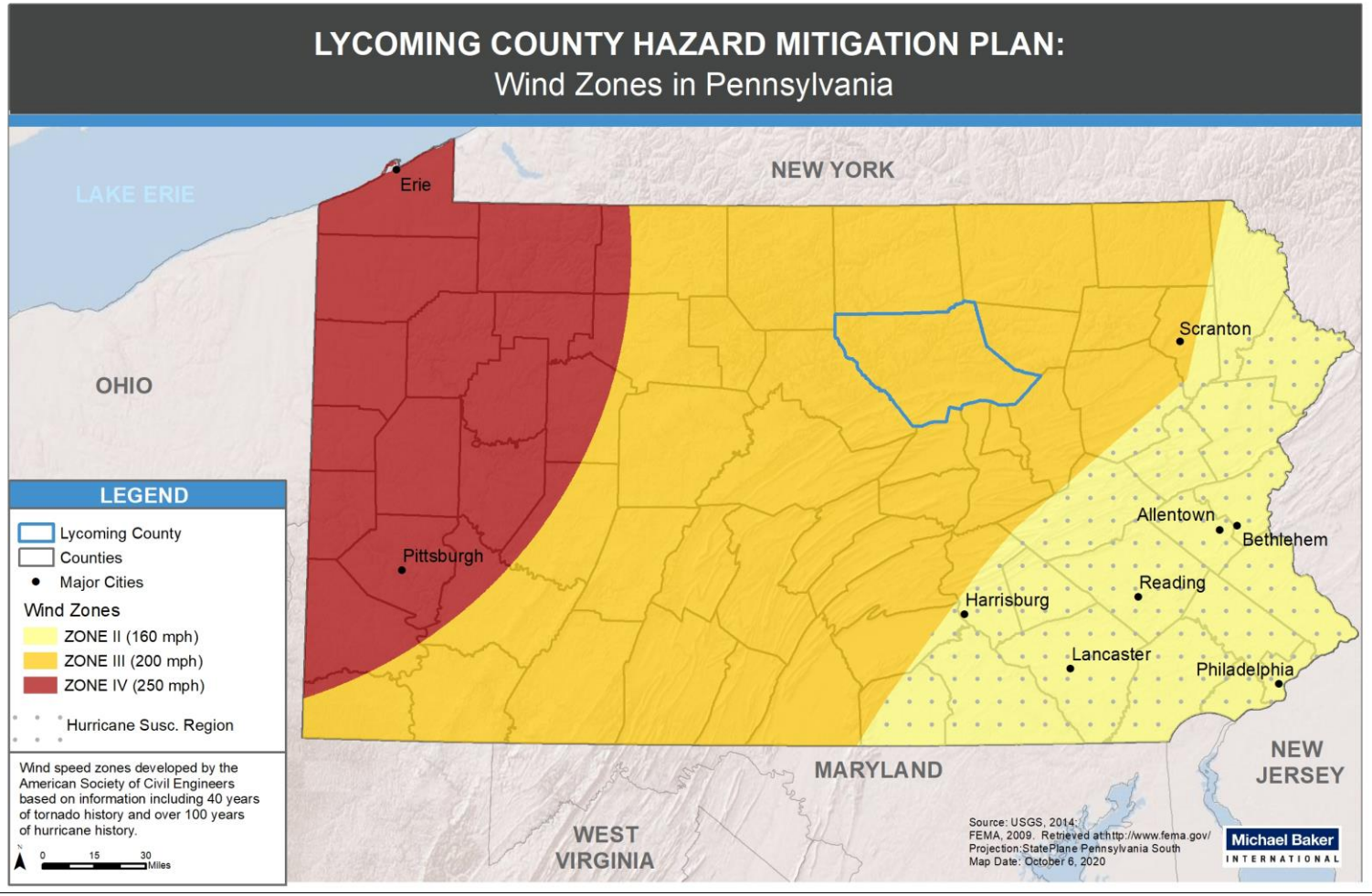
F OR EF SCALE	EXAMPLES OF POSSIBLE DAMAGE
0	Light damage. Some damage to chimneys; broken tree branches; shallow-rooted trees pushed over; damage to sign boards.
1	Moderate damage. Surface peeled off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off roads.
2	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.

Table 4.3.9-2 Expected Tornado Damages.	
F OR EF SCALE	EXAMPLES OF POSSIBLE DAMAGE
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.

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. In Lycoming County, the impacts from tornado and wind-storm events have included torn roofs, destroyed mobile homes, downed power lines, uprooted trees, damaged street signs and billboards, damaged vehicles and homes, debris-filled streets, and malfunctioning traffic signals. These impacts have the potential to lead to other hazards including transportation accidents and utility interruption.

Figure 4.3.7-1 shows wind speed zones developed for the design of tornado shelters. It identifies worst-case wind speeds that could occur across the United States to be used as the basis for design and evaluation of structural integrity of shelters and critical facilities. Lycoming County falls in Zone III, meaning design wind speeds for shelters and critical facilities should be able to withstand a 3-second gust of up to 200 mph. The wind zones identified in this map represent the strongest wind speeds anticipated throughout Pennsylvania, not the normal or routine wind speeds expected statewide. In Lycoming 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 withstand a 90-mph wind speed.

Figure 4.3.9-1 Map showing wind zones to guide design standards and shelter construction.



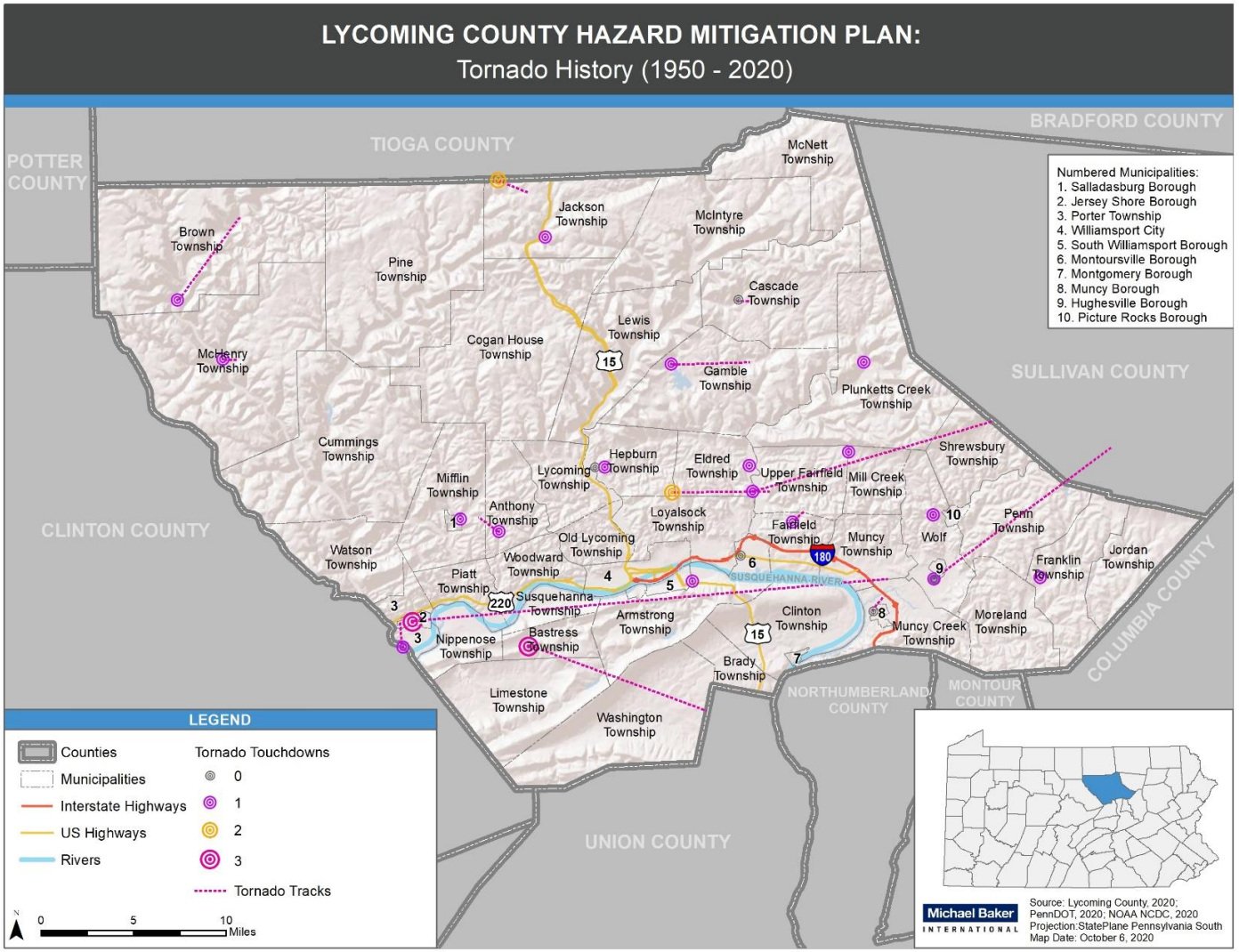
4.3.9.3. Past Occurence

Historically, between 1950 and 2018, there were 28 tornadoes in Lycoming County. According to the National Oceanic Atmospheric Administration (NOAA), there were two deaths and 20 injuries in Lycoming County resulting from a tornado on May 31, 1985, and no deaths or injuries since. Associated winds have damaged power lines, uprooting trees, structures, motor vehicles, and crops. Figure 4.3.7-2 shows tornadoes that have affected (touch-downed or passed through) the County. These have included Susquehanna Township (1976), Washington Township (1985), Shrewsbury Township (1985), Hughesville Borough (1994), and the Village of Loyalsockville (1996).

In May 1998, a tornado swept through Lycoming County, touching down in Mifflin Township, Wolf Township, the Williamsport Regional Airport, and Jackson Township, where it tore the roof off a lumberyard, downed power lines, and destroyed trees in the Village of Buttonwood. This event also caused over $1 million in damage at a nearby airport. The following June, there were two confirmed tornadoes in the forested area near the Borough of Picture Rocks. On July 1, 1999, a tornado touched down in Kellyburg, and on June 16, 2000, another tornado did some minor damage to homes and uprooted several trees in the Village of Farragut.

Recent tornado and windstorm events have mainly resulted in uprooting of trees and damage to some outbuildings and seasonal homes. Luckily, most of these recent events have occurred in rural areas and have not resulted in any injuries or fatalities.

Figure 4.3.9-2 Map showing tornado events and tracks in Lycoming County.



As can be seen from Table 4.3.7-3 below, the magnitude of reported and confirmed tornadoes in the County over the last five years is in the EF0 to EF2 range. While this is the lowest range to be classified as a tornado, such events can nevertheless be devastating to human life and property in the affected areas.

Table 4.3.9-3 Previous tornado events between 1950 and 2014 in Lycoming County (NCDC, 2020).

LOCATION	DATE	MAGNITUDE	DEATHS	INJURIES	ESTIMATED PROPERTY DAMAGE ($)
County-wide	8/16/1966	F2	0	1	25,000
County-wide	5/10/1973	F1	0	0	250,000
County-wide	7/29/1976	F3	0	0	2,500,000
County-wide	8/2/1979	F1	0	0	25,000
County-wide	5/31/1985	F3	2	20	25,000,000
County-wide	7/13/1986	F1	0	0	25,000
County-wide	8/13/1990	F1	0	0	2,500
Hughesville	6/12/1994	F0	0	0	50,000
Loyalsockville	7/8/1996	F1	0	0	0
Jersey Shore	11/8/1996	F1	0	0	100,000
Linden	11/8/1996	F1	0	0	100,000
Buttonwood	5/31/1998	F1	0	0	0
Salladasburg	5/31/1998	F1	0	0	0
Montoursville	5/31/1998	F0	0	0	0
Hughesville	5/31/1998	F0	0	0	0
Picture Rocks	6/16/1998	F1	0	0	0
Picture Rocks	6/16/1998	F1	0	0	0
Bodines	7/1/1999	F0	0	0	10,000
Farragut	6/16/2000	F1	0	0	0
Perryville	5/11/2003	F0	0	0	5,000
Lairdsville	7/21/2003	F1	0	0	10,000
Montoursville	6/6/2005	F1	0	0	0
Barbours	8/31/2005	F1	0	0	0
Muncy	6/19/2007	EF0	0	0	0
Slate Run	5/26/2011	EF1	0	0	8,000
Cammal	5/26/2011	EF1	0	0	6,000
Farragut	7/9/2015	EF1	0	0	100,000
Texas	10/2/2018	EF2	0	0	0
		Total	2	21	28,216,500

Windstorm events may be the result of thunderstorms, hurricanes, tropical storms, winter storms, or nor'easters. From 1950 to September 2014, there have been 179 events with wind speeds of greater than 50 knots, as shown in Table 4.3.7-4. These events most frequently

occurred in conjunction with thunderstorms. Windstorms events typically occur in areas including Farragut, Hughesville, Montgomery, Muncy, Newberry, and Williamsport.

Table 4.3.9-4 Previous wind events over 50 knots (NCDC, 2020).

LOCATION	DATE	TYPE	WIND SPEED	DEATHS/ INJURIES	PROPERTY DAMAGE ($)
County-wide	8/26/1976	Thunderstorm Wind	50 kts.	0	0
County-wide	6/21/1978	Thunderstorm Wind	68 kts.	0	0
County-wide	3/31/1982	Thunderstorm Wind	58 kts.	0	0
County-wide	7/16/1988	Thunderstorm Wind	52 kts.	0	0
Montoursville	11/11/1995	Thunderstorm Wind	51 kts.	0	0
Northern Lycoming (zone)	2/24/1996	High Wind	60 kts.	0	0
Loyalsockville	7/8/1996	Thunderstorm Wind	50 kts.	0	0
Northern Lycoming (zone)	2/13/1997	Winter Storm	NA	0	0
County-wide	2/22/1997	High Wind	60 kts.	0	0
Williamsport	5/3/1997	Thunderstorm Wind	51 kts.	0	0
Duboistown Borough, Hughesville	5/6/1997	Thunderstorm Wind	51 kts.	0	0
Williamsport	5/19/1997	Thunderstorm Wind	51 kts.	0	0
Williamsport	7/18/1997	Thunderstorm Wind	51 kts.	0	0
Cedar Run, Montoursville, Muncy	8/16/1997	Thunderstorm Wind	51 kts.	0	0
Muncy	8/28/1997	Thunderstorm Wind	51 kts.	0	0
Williamsport	5/29/1998	Thunderstorm Wind	51 kts.	0	0
Muncy	5/31/1998	Thunderstorm Wind	51 kts.	0	0
Glen Mawr	6/16/1998	Thunderstorm Wind	51 kts.	0	0
Jersey Shore, Montoursville	6/30/1998	Thunderstorm Wind	51 kts.	2	0
Jersey Shore	9/27/1998	Thunderstorm Wind	51 kts.	0	0
County-wide	1/2/1999	Winter Storm	NA	0	0
County-wide	1/8/1999	Winter Storm	NA	0	0
County-wide	1/14/1999	Winter Storm	NA	0	0
Montoursville	1/18/1999	Thunderstorm Wind	71 kts.	0	0
Northern Lycoming (zone)	9/16/1999	High Wind	60 kts.	0	0
County-wide	9/29/1999	High Wind	60 kts.	0	0
County-wide	2/18/2000	Winter Storm	NA	0	0
Montoursville	5/18/2000	Thunderstorm Wind	62 kts. M	0	0
Montoursville	6/2/2000	Thunderstorm Wind	51 kts. M	0	0
County-wide	12/13/2000	Winter Storm	NA	0	0
Calvert	4/9/2001	Thunderstorm Wind	50 kts. E	0	0
Moreland, Williamsport	6/20/2001	Thunderstorm Wind	50 kts. E	0	0

Table 4.3.9-4 Previous wind events over 50 knots (NCDC, 2020).

LOCATION	DATE	TYPE	WIND SPEED	DEATHS/ INJURIES	PROPERTY DAMAGE ($)
Glen Mawr, Wiliamsport	7/1/2001	Thunderstorm Wind	50 kts. E	0	0
Waterville	8/16/2001	Thunderstorm Wind	50 kts. E	0	0
Trout Run	8/19/2001	Thunderstorm Wind	50 kts. E	0	0
Montoursville, Wiliamsport	8/31/2001	Thunderstorm Wind	50 kts. E	0	0
Picture Rocks	9/13/2001	Thunderstorm Wind	50 kts. E	0	0
Jersey Shore	9/24/2001	Thunderstorm Wind	50 kts. E	0	0
Williamsport	10/16/2001	Thunderstorm Wind	50 kts. E	0	0
County-wide	12/14/2001	High Wind	60 kts. E	0	0
County-wide	2/1/2002	High Wind	63 kts. M	0	0
County-wide	3/9/2002	High Wind	50 kts. E	0	0
Hughesville	3/9/2002	Thunderstorm Wind	60 kts. M	0	0
Calvert, Williamsport	4/28/2002	Thunderstorm Wind	50 kts. E	0	0
Williamsport	5/31/2002	Thunderstorm Wind	50 kts. E	0	0
Tivoli, Williamsport	7/28/2002	Thunderstorm Wind	50 kts. E	0	0
Hughesville	5/11/2003	Thunderstorm Wind	50 kts. EG	0	$5,000
Jersey Shore	7/18/2003	Thunderstorm Wind	50 kts. EG	0	0
Hughesville, Muncy, Williamsport	7/21/2003	Thunderstorm Wind	50 kts. EG	0	0
Jersey Shore	7/27/2003	Thunderstorm Wind	50 kts. EG	0	0
Trout Run	8/16/2003	Thunderstorm Wind	50 kts. EG	0	0
Picture Rocks	8/29/2003	Thunderstorm Wind	50 kts. EG	0	0
Southern Lycoming (zone)	9/18/2003	Tropical Storm	NA	0	0
County-wide	11/13/2003	High Wind	60 kts. EG	0	0
Buttonwood	6/14/2004	Thunderstorm Wind	50 kts. EG	0	0
Williamsport	6/17/2004	Thunderstorm Wind	50 kts. EG	0	0
Jersey Shore, Trout Run	11/25/2004	Thunderstorm Wind	50 kts. EG	0	0
County-wide	1/5/2005	Winter Storm	NA	0	0
Northern Lycoming (zone)	1/22/2005	Winter Storm	NA	0	0
Northern Lycoming (zone)	2/21/2005	Winter Storm	NA	0	0
Picture Rocks	6/6/2005	Thunderstorm Wind	50 kts. EG	0	0
Lairdsville	7/13/2005	Thunderstorm Wind	50 kts. EG	0	0
Trout Run	7/26/2005	Thunderstorm Wind	50 kts. EG	0	0
Montgomery	8/2/2005	Thunderstorm Wind	50 kts. EG	0	0
Lairdsville, Loyalsockville	8/13/2005	Thunderstorm Wind	50 kts. EG	0	0
Williamsport	9/29/2005	Thunderstorm Wind	50 kts. EG	0	0

Table 4.3.9-4 Previous wind events over 50 knots (NCDC, 2020).

LOCATION	DATE	TYPE	WIND SPEED	DEATHS/ INJURIES	PROPERTY DAMAGE ($)
Hughesville, Waterville, Williamsport	11/6/2005	Thunderstorm Wind	50 kts. EG	0	0
County-wide	12/16/2005	Winter Storm	NA	0	0
County-wide	2/17/2006	High Wind	52 kts. EG	0	0
Montgomery, Williamsport	5/30/2006	Thunderstorm Wind	50 kts. EG	0	0
Jersey Shore	6/9/2006	Thunderstorm Wind	50 kts. EG	0	0
Loyalsockville, Montoursville, Williamsport	6/22/2006	Thunderstorm Wind	50 kts. EG	0	0
Hughesville	6/29/2006	Thunderstorm Wind	50 kts. EG	0	0
Williamsport	7/2/2006	Thunderstorm Wind	50 kts. EG	0	0
Williamsport	8/3/2006	Thunderstorm Wind	50 kts. EG	0	0
Lairdsville	8/25/2006	Thunderstorm Wind	50 kts. EG	0	0
Muncy	11/16/2006	Thunderstorm Wind	50 kts. EG	0	0
Southern Lycoming (zone)	12/1/2006	High Wind	71 kts. MG	1	$5,000
Southern Lycoming (zone)	2/13/2007	Winter Storm	NA	0	0
Newberry	6/8/2007	Thunderstorm Wind	50 kts. EG	0	0
Farragut	6/19/2007	Thunderstorm Wind	50 kts. EG	0	0
Muncy	8/3/2007	Thunderstorm Wind	50 kts. EG	0	0
Jersey Shore	9/27/2007	Thunderstorm Wind	50 kts. EG	0	0
Northern Lycoming (zone)	12/13/2007	Winter Storm	NA	0	0
County-wide	2/1/2008	Winter Storm	NA	0	0
Jersey Shore	6/16/2008	Thunderstorm Wind	50 kts. EG	0	0
Lairdsville	7/18/2008	Thunderstorm Wind	50 kts. EG	0	0
Northern Lycoming (zone)	9/14/2008	High Wind	50 kts. EG	0	0
Northern Lycoming (zone)	12/11/2008	Winter Storm	NA	0	0
County-wide	12/19/2008	Winter Storm	NA	0	0
Northern Lycoming (zone)	1/10/2009	Winter Storm	NA	0	0
County-wide	1/27/2009	Winter Storm	NA	0	0
County-wide	2/12/2009	High Wind	50 kts. MG	0	$20,000
Duboistown Borough	7/11/2009	Thunderstorm Wind	50 kts. EG	0	$5,000
Perryville	7/26/2009	Thunderstorm Wind	50 kts. EG	0	$5,000
Jersey Shore	8/9/2009	Thunderstorm Wind	50 kts. EG	0	$10,000
Barbours, Jersey Shore	8/18/2009	Thunderstorm Wind	50 kts. EG	0	$10,000

Table 4.3.9-4 Previous wind events over 50 knots (NCDC, 2020).

LOCATION	DATE	TYPE	WIND SPEED	DEATHS/ INJURIES	PROPERTY DAMAGE ($)
Northern Lycoming (zone)	10/15/2009	Winter Storm	NA	0	0
(IPT) Williamsport Ar	12/3/2009	Thunderstorm Wind	55 kts. MG	0	0
Southern Lycoming (zone)	2/9/2010	Winter Storm	NA	0	0
Northern Lycoming (zone)	2/25/2010	Winter Storm	NA	0	0
Newberry, Picture Rocks, Ralston	4/8/2010	Thunderstorm Wind	50 kts. EG	0	$15,000
Cedar Run, East Faxon, Larrys Creek	7/24/2010	Thunderstorm Wind	50 kts. EG	0	$15,000
Garden View, Jersey Shore, Muncy, (IPT) Williamsport Ar	9/22/2010	Thunderstorm Wind	70 kts. EG	2	$25,000
Montoursville	10/11/2010	Thunderstorm Wind	50 kts. EG	0	$5,000
Northern Lycoming (zone)	2/1/2011	Winter Storm	NA	0	0
Northern Lycoming (zone)	3/23/2011	Winter Storm	NA	0	0
Hughesville, Oregon Hill	5/26/2011	Thunderstorm Wind	70 kts. EG	0	$10,000
Lairdsville	5/27/2011	Thunderstorm Wind	50 kts. EG	0	$5,000
County-wide	6/9/2011	Thunderstorm Wind	78 kts. EG	0	$5,000
White Pine	5/29/2012	Thunderstorm Wind	50 kts. EG	0	$5,000
Garden View	6/1/2012	Thunderstorm Wind	50 kts. EG	0	$5,000
Clarkstown, Loyalsockville, Picture Rocks, Williamsport, (IPT) Williamsport Ar	7/7/2012	Thunderstorm Wind	50 kts. EG	0	$20,000
South Williamsport	7/15/2012	Thunderstorm Wind	50 kts. EG	0	$5,000
Jersey Shore, Linden, Marsh Hill, Newberry, (IPT) Williamsport Ar	7/26/2012	Thunderstorm Wind	51 kts. EG	0	$22,500
Powys, Waterville	8/9/2012	Thunderstorm Wind	50 kts. EG	0	$10,000
Clarkstown, Newberry	9/8/2012	Thunderstorm Wind	50 kts. EG	0	$5,000
County-wide	10/29/2012	High Wind	50 kts. EG	0	0
County-wide	12/26/2012	Winter Storm	NA	0	0
Halls, Montoursville, (IPT) Williamsport Ar	4/10/2013	Thunderstorm Wind	50 kts. EG	0	$15,000
Muncy, Picture Rocks	4/19/2013	Thunderstorm Wind	61 kts. EG	0	$15,000
Calvert, Cammal, Picture Rocks, Trout Run, Waterville	5/22/2013	Thunderstorm Wind	50 kts. EG	0	$11,000

Table 4.3.9-4 Previous wind events over 50 knots (NCDC, 2020).

LOCATION	DATE	TYPE	WIND SPEED	DEATHS/ INJURIES	PROPERTY DAMAGE ($)
Hughesville	6/24/2013	Thunderstorm Wind	50 kts. EG	0	$5,000
Hughesville, Newberry, Williamsport	7/7/2013	Thunderstorm Wind	50 kts. EG	0	$15,000
Williamsport	7/28/2013	Thunderstorm Wind	50 kts. EG	0	$2,000
County-wide	9/11/2013	Thunderstorm Wind	50 kts. EG	0	$7,000
County-wide	9/12/2013	Thunderstorm Wind	50 kts. EG	0	$7,000
County-wide	2/4/2014	Winter Storm	NA	0	0
Brookside, English Center	5/21/2014	Thunderstorm Wind	50 kts. EG	0	$2,000
Muncy, Unityville	5/27/2014	Thunderstorm Wind	50 kts. EG	0	$1,000
Hughesville, Muncy, South Williamsport	7/2/2014	Thunderstorm Wind	50	0	$4,500
Montoursville, Newberry, (IPT) Williamsport Ar	7/3/2014	Thunderstorm Wind	57	0	$3,000
Williamsport	7/8/2014	Thunderstorm Wind	50	0	$2,500
English Center	8/21/2014	Thunderstorm Wind	50	0	$500
Muncy	9/2/2014	Thunderstorm Wind	50	0	$500
Northern Lycoming (zone)	2/1/2015	Winter Storm	NA	0	$0
South Williamsport	6/8/2015	Thunderstorm Wind	50	0	$500
ELIMSPORT	6/23/2015	Thunderstorm Wind	50	0	$500
Clarkstown	6/30/2015	Thunderstorm Wind	50	0	$2,000
Clarkstown	9/4/2015	Thunderstorm Wind	50	0	$6,000
Southern Lycoming (zone)	2/15/2016	Winter Storm	NA	0	$0
Hughesville	2/24/2016	Thunderstorm Wind	50	0	$1,000
Montgomery, Moreland	6/28/2016	Thunderstorm Wind	87	0	$1,002,000
Montgomery	7/18/2016	Thunderstorm Wind	52	0	$2,000
Montgomery	8/1/2016	Thunderstorm Wind	50	0	$10,000
Barbours, Slate Run	8/13/2016	Thunderstorm Wind	50	0	$4,000
Elimsport, Montgomery, Muncy	9/18/2016	Thunderstorm Wind	78	0	$113,000
Northern Lycoming (zone)	1/23/2017	Winter Storm	NA	0	$0
Southern Lycoming (zone)	2/8/2017	Winter Storm	NA	0	$0
Northern Lycoming (zone)	2/9/2017	Winter Storm	NA	0	$0
County-wide	3/13/2017	Winter Storm	NA	0	$0

Table 4.3.9-4 Previous wind events over 50 knots (NCDC, 2020).

LOCATION	DATE	TYPE	WIND SPEED	DEATHS/ INJURIES	PROPERTY DAMAGE ($)
Cammal, Collomsville, Elimsport, Huntersville, Jersey Shore, Newberry, Nisbet	5/1/2017	Thunderstorm Wind	74	0	$34,000
Newberry	6/13/2017	Thunderstorm Wind	52	0	$3,000
Sylvan Dell	8/2/2017	Thunderstorm Wind	52	0	$4,000
Duboistown, Larryville, Pennsdale	8/4/2017	Thunderstorm Wind	61	0	$11,000
County-wide	4/4/2018	High Wind	52	0	$0
Hughesville, Steam Valley, OPP	5/15/2018	Thunderstorm Wind	52	0	$17,000
Moreland	7/25/2018	Thunderstorm Wind	61	0	$40,000
Clarkstown, Proctor	9/3/2018	Thunderstorm Wind	52	0	$0
County-wide	11/15/2018	Winter Storm	NA	0	$0
County-wide	1/19/2019	Winter Storm	NA	0	$0
Southern Lycoming (zone)	2/20/2019	Winter Storm	NA	0	$0
County-wide	2/24/2019	High Wind	52	0	$0
Muncy	4/14/2019	Thunderstorm Wind	52	0	$5,000
Balls Mills	5/19/2019	Thunderstorm Wind	52	0	$3,000
Barbours, Clarkstown, Jersey Shore	5/29/2019	Thunderstorm Wind	52	0	$4,000
Newberry	6/29/2019	Thunderstorm Wind	52	0	$4,000
Montoursville, (IPT) Williamsport Ar	7/2/2019	Thunderstorm Wind	54	0	$0
East Faxon, Williamsport	8/15/2019	Thunderstorm Wind	52	0	$1,000
Balls Mills, Jersey Shore	10/31/2019	Thunderstorm Wind	50	0	$0
Farragut	4/13/2020	Thunderstorm Wind	52	0	$4,000
Trout Run	6/10/2020	Thunderstorm Wind	52	0	$3,000
			Total	5	$1,577,500

4.3.9.4. Future Occurrence

Twenty-eight tornadoes were reported for Lycoming County for the entire 1950-2020 period on the NCDC Storm Events Database. Therefore, the annual probability of being in the path of a tornado in the 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. Most of Pennsylvania is susceptible to tornadoes of a magnitude of at most an EF-3. It can be assumed that future tornadoes will be similar in nature to those that have affected the County in the past. According to NCDC, there have been over 170 wind events in Lycoming County

between 1950 and 2020. The County experiences strong winds on frequent basis, and when those winds do strike, it can result in significant property damage, trees down, and utility outages.

In recent years, there have been increasing numbers of tornadoes and windstorms around Lycoming County in Pennsylvania. Because more windstorms have been seen in the central Pennsylvania region, it is possible that an increasing number of these events will be seen in the County. The probability of tornadoes and windstorms in Lycoming County can be considered *possible* as defined by the Risk Methodology probability criteria (see Table 4.4.1-1).

Changing climates may lead to increased tornado and windstorm events in the future. It is projected that the region's climate will become wetter and warmer characteristically. These conditions increase the likelihood of tornado and windstorm events. Climate Central projects that the greater region around State College and Wilkes Barre will double in warming intensity by 2050, and experience significantly more heatwaves in this time period. Precipitation is also projected to increase, which can contribute to the warm and wet conditions needed for tornado events (Climate Central, 2019).

4.3.9.5. 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 structure and overturn mobile homes. Past experiences with tornadoes in Lycoming County shows that death and injury are potential impacts.

Vulnerability to the effects of a tornado or windstorm is somewhat dependent upon the age of a structure. As building codes become more stringent, newer construction is more capable of enduring greater wind forces. All critical facilities in Lycoming County are at least somewhat vulnerable to tornadoes and windstorms. Since high wind events may affect the entire County, it is important to identify specific critical facilities and assets that are most vulnerable to the hazard. Evaluation criteria include age of the building (and what building codes may have been in effect at the time), type of construction, and condition of the structure (i.e., how well has the structure been maintained). Individual structure data was not available for this study, so it was difficult to determine the exact number and types of structures within Lycoming County that have heightened vulnerability to wind hazards.

In Lycoming County, high winds occur annually. The most common detrimental effects are interruptions in power supply and communication 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 Lycoming 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.

All structures and infrastructure might be exposed to the effects of a tornado or other high winds. Depending on 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. mobile 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, designed 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 4.3.7-5 below displays the number of manufactured housing units per municipality in Lycoming County. The highest proportions of structures on mobile home parcels are in Woodward Township (28.9%), Piatt Township (21.5%), Fairfield Township (21.1%), Wolf Township (20.7%), Salladasburg Borough (20.5%). All municipalities except Hughesville, Montoursville, and Picture Rocks Boroughs have at least one structure.

Table 4.3.9-5 Mobile homes per jurisdiction (ACS, 2018)

MUNICIPALITY	TOTAL STRUCTURES	NUMBER OF STRUCTURES ON MOBILE HOME PARCELS	PERCENT STRUCTURES ON MOBILE HOME PARCELS
Anthony Township	394	18	5%
Armstrong Township	550	54	10%
Bastress Township	264	6	2%
Brady Township	353	30	8%
Brown Township	430	10	2%
Cascade Township	332	21	6%
Clinton Township	1,541	76	5%
Cogan House Township	1056	34	3%

Table 4.3.9-5 Mobile homes per jurisdiction (ACS, 2018)			
MUNICIPALITY	TOTAL STRUCTURES	NUMBER OF STRUCTURES ON MOBILE HOME PARCELS	PERCENT STRUCTURES ON MOBILE HOME PARCELS
Cummings Township	850	35	4%
Duboistown Borough	730	5	1%
Eldred Township	973	105	11%
Fairfield Township	1,496	347	23%
Franklin Township	603	28	5%
Gamble Township	609	16	3%
Hepburn Township	1459	201	14%
Hughesville Borough	963	0	0%
Jackson Township	349	34	10%
Jersey Shore Borough	2,347	18	1%
Jordan Township	576	40	7%
Lewis Township	826	42	5%
Limestone Township	1406	45	3%
Loyalsock Township	5,426	44	1%
Lycoming Township	975	134	14%
McHenry Township	735	41	6%
McIntyre Township	434	43	10%
McNett Township	262	13	5%
Mifflin Township	588	56	10%
Mill Creek Township	317	21	7%
Montgomery Borough	811	1	0%
Montoursville Borough	2,258	0	0%
Moreland Township	591	22	4%
Muncy Borough	1,112	1	0%
Muncy Township	2009	439	22%
Muncy Creek Township	667	18	3%
Nippenose Township	566	60	11%
Old Lycoming Township	3106	148	5%
Penn Township	551	22	4%
Piatt Township	867	89	10%
Picture Rocks Borough	299	1	0%
Pine Township	559	42	8%
Plunketts Creek Township	701	47	7%
Porter Township	892	60	7%
Salladasburg Borough	145	21	14%
Shrewsbury Township	312	17	5%

Table 4.3.9-5 Mobile homes per jurisdiction (ACS, 2018)			
MUNICIPALITY	TOTAL STRUCTURES	NUMBER OF STRUCTURES ON MOBILE HOME PARCELS	PERCENT STRUCTURES ON MOBILE HOME PARCELS
South Williamsport Borough	2,898	0	0%
Susquehanna Township	737	39	5%
Upper Fairfield Township	928	102	11%
Washington Township	1320	67	5%
Watson Township	516	21	4%
Williamsport City	12,245	3	0%
Wolf Township	1,616	310	19%
Woodward Township	1,647	285	17%
Lycoming County Total	64,197	3,332	5%

Since tornado and windstorm events are typically localized, environmental impacts of these events are rarely widespread. The impacts of windstorms on the environment typically take place over a larger area. In either case, where these events occur, severe damage to plant species is likely. This includes uprooting or total destruction of trees and an increased threat of wildfire in areas where dead trees are not removed. Further, hazardous material facilities should meet design requirements for the wind zones identified in Figure 4.3.7-1 in order to prevent release of hazardous materials into the environment.

4.3.10. Wildfire

4.3.10.1. Location and Extent

A wildfire is an uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures. Wildfires often begin unnoticed and can spread quickly, creating dense smoke clouds. 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.

Wildland fires are most common in the spring (March to May) and fall (October to November) months. During spring months, the lack of leaves on the trees allows the sunlight to heat the existing leaves on the ground from the previous fall. The same theory applies for the fall; however, the dryer conditions are a more crucial factor.

Wildfire events 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.

Lycoming County is generally rural in nature, consisting of large tracts of agricultural, 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.

Pennsylvania Wilds (PA Wilds) is a popular hiking and camping destination in northern Pennsylvania. The vast forest network covers over 2 million acres and is partially located in Lycoming County. PA Wilds is known for the darkest skies in the country and attracts a large number of visitors at night for stargazing. Visitation to the PA Wilds in Lycoming County increased during the 2020 COVID Pandemic, when people were looking for safe recreational activities. The region is currently in a drought. Dry conditions coupled with increased visitation makes wildfires a higher risk. Additionally, there are cascade effects. For example, evacuation during a wildfire event is more difficult when there are a large number of visitors which increases traffic conditions.

4.3.10.2. 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 is the potential for severe erosion, silting of stream beds and reservoirs, and flooding due to ground-cover loss following a fire event.

Wildland fires in Lycoming County have generally been small and easily contained. There have been a few that have burned over 100 acres, but most are confined to 10 acres or less. The fact that Lycoming County's land use is mostly forest or agricultural has led to no property damage being done by these fires. The worst wildfire to occur within the County burned about 4,000 acres, though it caused no property damage, injuries, or deaths. However, the

County recognizes that wildfires of this magnitude will continue to occur in Lycoming County, and will have more devastating effects as development in or around wildlands increases.

In addition to the risk wildfires post 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.

The largest wildfire in Pennsylvania in recent years burned 10,000 acres in the north-central area of the Commonwealth. This fire was controlled within a week. It destroyed five cabins, but there was no loss of life. Another large wildfire burned 8,000 acres in the Poconos in 2016. About 100 people were evacuated and it took 130 firefighters to stop the blaze. Several other fires have burned over 2,000 acres each and again have been controlled within a week of the reported start. This is a potential worst-case scenario for wildfires in Lycoming County based on acreage, due to the large amounts of forested land in the County.

4.3.10.3. Past Occurrence

The U.S. Fire Administration (USFA) collects data from a variety of sources to provide a statistical analysis of fire incidents nationwide. According to the USFA, the number of fires and fire related injuries has continued to decline over the last several years. However, the number of fire related casualties and the economic losses from wildfire events have both begun to increase again. From 2008 to 2017, fires per million population declined 12.3% and injuries per million population declined 21.2%. However, in this same time frame deaths per million population increased 2.4% and dollar loss per capita increased 11.9% (USFA, 2019).

This data is confirmed by comparing it with the National Fire Protection Administration's (NFPA) data on national fire trends from 1977 to 2003. The NFPA data shows that in 1977, there were over 3,264,000 fires nationwide, resulting in over 5,800 civilian deaths and over 31,100 civilian injuries. In 2003, this number dropped to around 1,584,500 fires, around 3,900 civilian deaths, and around 18,100 civilian injuries nationwide (NFPA, 2004).

A 2019 study by the USFA showed the largest number of fires were classified as "outside/other" and accounted for 45 percent of all fires, while residential fires resulted in the highest percentage of fire deaths (80%), fire injuries (84%), and dollar loss (83%). Nonresidential properties, such as industrial and commercial establishments, institutions, and educational facilities, accounted for only 9 percent of all fires, but 29 percent of total dollar loss (NFPA, 2020).

From 1992 to 2001, Pennsylvania had an average fire death rate above the national average, with an average between 11 to 17 per million population. This is due primarily to the state's high population density. In 2001, Pennsylvania averaged 3.01 civilian deaths per 1,000 fires

and $22,609 in property loss per fire. In 2017, the USFA recorded a fire death rate of 13.9 per million for Pennsylvania. This was above the 2017 national average of 11.2 per million and ranked the Commonwealth as the twenty-eighth highest state that year (USFA, 2019).

Between 2002 and 2012, there have been 66 major wildfires in the Lycoming County, resulting in more than 5,000 acres of forest being destroyed. According to DCNR, the worst burning wildfire was 4,000 acres 18 acres in Brown Township in 2008. Table 4.3.10-1 lists all wildfire events in Lycoming County reported to DCNR from 2002 to 2012.

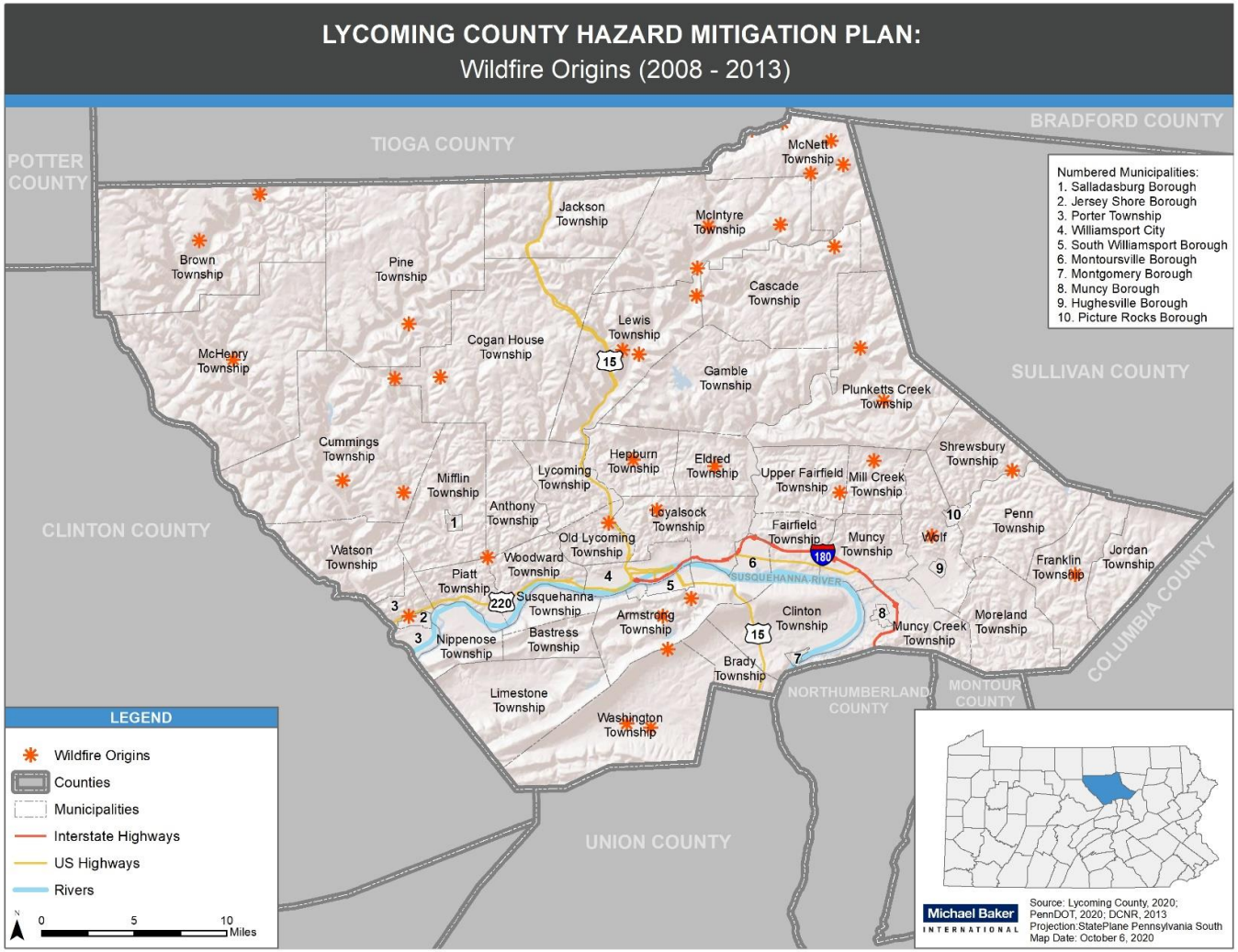
Table 4.3.10-1 Wildfire events reported to DCNR from 2002 to 2012.

YEAR	MUNICIPALITY	ACRES BURNED	YEAR	MUNICIPALITY	ACRES BURNED
2002	McHenry Township	1.7	2008	Lewis Township	0.4
2002	Cummings Township	129	2008	Lewis Township	0.5
2002	Cummings Township	0.8	2008	Loyalsock Township	2.5
2002	Cummings Township	7.6	2008	McIntyre Township	0.6
2004	Cummings Township	0.3	2008	McNett Township	4.8
2004	Cummings Township	0.6	2008	McNett Township	1.9
2005	Armstrong Township	0.8	2008	Mill Creek Township	10
2005	Moreland Township	1.3	2008	Penn Township	7
2005	McHenry Township	21.7	2008	Plunketts Creek	0.1
2005	McHenry Township	5.3	2008	Upper Fairfield	2
2006	Washington	0.8	2008	Wolf Township	6.1
2006	Cummings Township	605	2009	Armstrong Township	2
2006	Porter Township	0.1	2009	Brown Township	0.3
2006	Armstrong Township	0.1	2009	Cascade Township	62.3
2006	Clinton Township	0.3	2009	Franklin Township	2.4
2006	Williamsport	4.5	2009	Hepburn Township	1
2007	McHenry Township	0.1	2009	Jersey Shore Boro	4
2007	Mifflin Township	2	2009	Lewis Township	2.6
2007	Mifflin Township	10	2009	McHenry Township	10
2007	Cogan House	0.1	2009	McIntyre Township	0.5
2007	McHenry Township	0.1	2009	Washington Township	0
2007	Washington	2	2010	McIntyre Township	161
2007	Armstrong Township	0.1	2010	Washington Township	2.5
2007	Woodward Township	6	2010	Washington Township	0.3
2007	Cummings Township	135	2011	Cogan House	25
2007	Cummings Township	1.5	2011	Cogan House	15
2007	Moreland Township	0.7	2011	McNett Township	0.1
2007	McIntyre Township	0.1	2012	Anthony Township	29.6
2007	Lewis Township	0.2	2012	Cummings Township	10.3
2007	Armstrong Township	6	2012	Cummings Township	0.2
2008	Armstrong Township	0.1	2012	McNett Township	0.3

Table 4.3.10-1 Wildfire events reported to DCNR from 2002 to 2012.					
YEAR	MUNICIPALITY	ACRES BURNED	YEAR	MUNICIPALITY	ACRES BURNED
2008	Brown Township	4,000	2012	Old Lycoming	18
2008	Eldred Township	0.1	2012	Pine Township	50

Location information was available for wildfires from 2008-2013 from DCNR. Figure 4.3.8-1 identifies the origins of these wildfires. This map shows that wildfires have occurred all over Lycoming County, with the largest occurring in the portions with park land concentrations. Park lands, as wooded, remote spaces, are potentially more vulnerable to future wildfires.

Figure 4.3.10-1 Map showing location of wildfire events with known locations reported to DCNR in Lycoming County from 2008-2013 (PADCNR-BOF, 2013).



DCNR no longer reports wildfire data at the county level, but instead at the State Forest District level. Lycoming County lies in State Forest District 20 (Loyalsock). District 20 also includes Bradford and Sullivan Counties. This data shows wildfires at a regional level for Lycoming County. From 2012-2019, there were 213 wildfire events in Pennsylvania State Forest District 20 reported to the DCNR Bureau of Forestry (BOF). This number does not include wildfires that were not reported to the DCNR 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 Lycoming County. Table 4.3.10-2 lists wildfire events reported to the DCNR.

Table 4.3.10-2 Wildfire Events reported in PA State Forest Districts 20 from 2012-2019 (DCNR, 2019)

YEAR	TOTAL # OF FIRES	TOTAL AREA (ACRES)	% TOTAL FIRES	% TOTAL AREA (ACRES)
2012	41	177.0	5.7%	5.5%
2013	40	56.8	6.3%	3.2%
2014	49	113.3	5.6%	2.5%
2015	28	140.0	3.4%	3.4%
2016	16	46.9	1.9%	0.4%
2017	10	12.0	1.9%	0.7%
2018	18	27.6	2.6%	1.5%
2019	11	3.4	2.1%	0.5%

Notes: % Total Fires and % Total area represent percentages of the entire state of Pennsylvania.

4.3.10.4. Future Occurrence

Previous events indicate that wildfires will continue to occur yearly in Lycoming County. Therefore, the probability of a wildfire is estimated to be between 50 and 90 percent in any given year and can be considered *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.

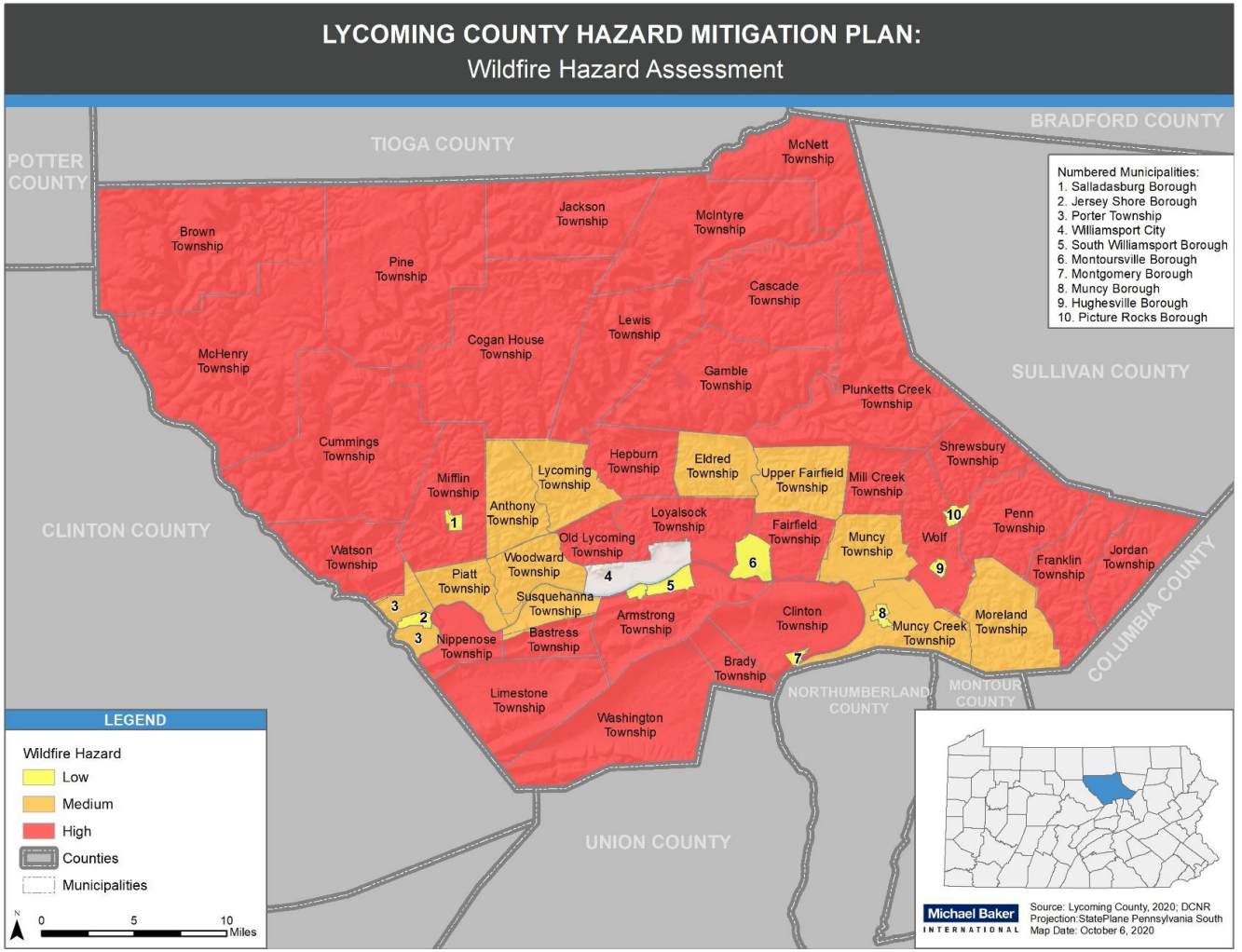
4.3.10.5. Vulnerability Assessment

The Pennsylvania Bureau of Forestry has conducted an independent wildfire hazard risk assessment for the various municipalities across Lycoming County. Results of that assessment are shown in Figure 4.3.8-2. *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, 31 jurisdictions in Lycoming County have a *high* wildfire rating. Eleven municipalities have a *medium* wildfire hazard potential, and eight municipalities have a *low* wildfire hazard potential. A wildfire hazard assessment was not completed for the City of Williamsport, though it is assumed that with the density of development and limited open space, the chance of wildfire in Williamsport is also low. 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.

In locations where homes are at risk for wildfires, the BOF's Wildland/Urban Interface Guidance Document is available to assist homeowners, community associations, local government, and developers to assess and mitigate the potential dangers of a wildfire. The guidance also provides information for developing an action plan in coordination with local emergency managers. Communities at risk for wildfires can adopt by local ordinance the "International Wildland-Urban Interface Code" of the Uniform Construction Code.

Figure 4.3.10-2 Map showing wildfire hazard by jurisdiction across Lycoming 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. Recognizing that these fires have the potential to spread relatively unopposed, the most vulnerable people and property are those within and near wooded areas.

Using this PADCNR assessment, the parcels and critical facilities most vulnerable to wildfire hazards are those located within the 31 high-rated jurisdictions. For the purpose of this document, that distance is defined as in or within 2 miles of state forests, state parks, and state game lands, as they are the largest continuous tracks of wooded land in Lycoming County. Table 4.3.10-3 shows the number of structures and critical facilities in wooded areas of Lycoming County, and Table 4.3.10-4 shows the number of structures vulnerable to wildfires by generalized property type. Cummings Township has the greatest number of structures in or near state recreation areas with 133. There is only one critical facility in the County located in or near state recreation areas. "Other" represents the greatest number of structures in or near state recreation areas by land use. This likely encompasses sheds, cabins, and other structures by forested areas, which is why there are less residential, commercial, and industrial structures at risk.

Table 4.3.10-3 Structures and Critical Facilities Located in and near State Parks, State Forests, and state game lands in Lycoming County, defined as in or within 2 Miles

MUNICIPALITY	TOTAL STRUCTURES	TOTAL STRUCTURES IN/NEAR STATE RECREATION AREAS	PERCENT STRUCTURES IN/NEAR STATE RECREATION AREAS	TOTAL CRITICAL FACILITIES	CRITICAL FACILITIES IN/NEAR STATE RECREATION AREAS	PERCENT CRITICAL FACILITIES IN/NEAR STATE RECREATION AREAS
Anthony Township	394	0	0%	4	0	0%
Armstrong Township	550	33	6%	6	0	0%
Bastress Township	264	0	0%	4	0	0%
Brady Township	353	5	1%	4	0	0%
Brown Township	430	90	21%	5	0	0%
Cascade Township	332	5	2%	2	0	0%
Clinton Township	1,541	9	1%	27	0	0%
Cogan House Township	1,056	2	0%	4	0	0%
Cummings Township	850	133	16%	4	0	0%
Duboistown Borough	730	0	0%	5	0	0%

Table 4.3.10-3 Structures and Critical Facilities Located in and near State Parks, State Forests, and state game lands in Lycoming County, defined as in or within 2 Miles

MUNICIPALITY	TOTAL STRUCTURES	TOTAL STRUCTURES IN/NEAR STATE RECREATION AREAS	PERCENT STRUCTURES IN/NEAR STATE RECREATION AREAS	TOTAL CRITICAL FACILITIES	CRITICAL FACILITIES IN/NEAR STATE RECREATION AREAS	PERCENT CRITICAL FACILITIES IN/NEAR STATE RECREATION AREAS
Eldred Township	973	0	0%	4	0	0%
Fairfield Township	1,496	0	0%	11	0	0%
Franklin Township	603	0	0%	5	0	0%
Gamble Township	609	3	0%	3	0	0%
Hepburn Township	1,459	0	0%	6	0	0%
Hughesville Borough	963	0	0%	12	0	0%
Jackson Township	349	3	1%	6	0	0%
Jersey Shore Borough	2,347	0	0%	21	0	0%
Jordan Township	576	0	0%	4	0	0%
Lewis Township	826	40	5%	5	0	0%
Limestone Township	1,406	3	0%	9	0	0%
Loyalsock Township	5,426	0	0%	38	0	0%
Lycoming Township	975	0	0%	2	0	0%
McHenry Township	735	98	13%	5	1	20%
McIntyre Township	434	44	10%	4	0	0%
McNett Township	262	16	6%	2	0	0%
Mifflin Township	588	0	0%	6	0	0%
Mill Creek Township	317	0	0%	3	0	0%
Montgomery Borough	811	0	0%	6	0	0%
Montoursville Borough	2,258	0	0%	24	0	0%
Moreland Township	591	0	0%	3	0	0%
Muncy Borough	1,112	0	0%	11	0	0%
Muncy Creek Township	2,009	1	0%	17	0	0%
Muncy Township	667	0	0%	9	0	0%

Table 4.3.10-3 Structures and Critical Facilities Located in and near State Parks, State Forests, and state game lands in Lycoming County, defined as in or within 2 Miles

MUNICIPALITY	TOTAL STRUCTURES	TOTAL STRUCTURES IN/NEAR STATE RECREATION AREAS	PERCENT STRUCTURES IN/NEAR STATE RECREATION AREAS	TOTAL CRITICAL FACILITIES	CRITICAL FACILITIES IN/NEAR STATE RECREATION AREAS	PERCENT CRITICAL FACILITIES IN/NEAR STATE RECREATION AREAS
Nippenose Township	566	0	0%	6	0	0%
Old Lycoming Township	3,106	0	0%	15	0	0%
Penn Township	551	0	0%	3	0	0%
Piatt Township	867	0	0%	1	0	0%
Picture Rocks Borough	299	0	0%	4	0	0%
Pine Township	559	14	3%	2	0	0%
Plunketts Creek Township	701	51	7%	4	0	0%
Porter Township	892	0	0%	4	0	0%
Salladasburg Borough	145	0	0%	2	0	0%
Shrewsbury Township	312	0	0%	1	0	0%
South Williamsport Borough	2,898	0	0%	18	0	0%
Susquehanna Township	737	0	0%	5	0	0%
Upper Fairfield Township	928	0	0%	8	0	0%
Washington Township	1,320	18	1%	7	0	0%
Watson Township	516	28	5%	1	0	0%
Williamsport, City of	12,245	3	0%	100	0	0%
Wolf Township	1,616	0	0%	15	0	0%
Woodward Township	1,647	0	0%	8	0	0%
Lycoming County Total	**64,197**	**599**	**1%**	**485**	**1**	**0%**

Table 4.3.10-4 Structures and Critical Facilities Located in and near State Parks, State Forests, and state game lands in Lycoming County by Generalized Property Type								
MUNICIPALITY	TOTAL STRUCTURES	AGRICULTURE	COMMERCIAL	INDUSTRIAL	OTHER	RESIDENTIAL	UNKNOWN	TOTAL VULNERABLE STRUCTURES
Anthony Township	394	0	0	0	0	0	0	0
Armstrong Township	550	1	3	0	29	0	0	33
Bastress Township	264	0	0	0	0	0	0	0
Brady Township	353	5	0	0	0	0	0	5
Brown Township	430	4	1	0	77	7	1	90
Cascade Township	332	0	0	0	5	0	0	5
Clinton Township	1,541	0	9	0	0	0	0	9
Cogan House Township	1,056	0	0	0	2	0	0	2
Cummings Township	850	3	111	0	1	18	0	133
Duboistown Borough	730	0	0	0	0	0	0	0
Eldred Township	973	0	0	0	0	0	0	0
Fairfield Township	1,496	0	0	0	0	0	0	0
Franklin Township	603	0	0	0	0	0	0	0
Gamble Township	609	0	0	0	3	0	0	3
Hepburn Township	1,459	0	0	0	0	0	0	0

Table 4.3.10-4 Structures and Critical Facilities Located in and near State Parks, State Forests, and state game lands in Lycoming County by Generalized Property Type								
MUNICIPALITY	TOTAL STRUCTURES	AGRICULTURE	COMMERCIAL	INDUSTRIAL	OTHER	RESIDENTIAL	UNKNOWN	TOTAL VULNERABLE STRUCTURES
Hughesville Borough	963	0	0	0	0	0	0	0
Jackson Township	349	3	0	0	0	0	0	3
Jersey Shore Borough	2,347	0	0	0	0	0	0	0
Jordan Township	576	0	0	0	0	0	0	0
Lewis Township	826	0	0	0	32	8	0	40
Limestone Township	1,406	0	0	0	3	0	0	3
Loyalsock Township	5,426	0	0	0	0	0	0	0
Lycoming Township	975	0	0	0	0	0	0	0
McHenry Township	735	7	1	0	59	30	1	98
McIntyre Township	434	3	1	1	28	11	0	44
McNett Township	262	0	0	0	15	1	0	16
Mifflin Township	588	0	0	0	0	0	0	0
Mill Creek Township	317	0	0	0	0	0	0	0
Montgomery Borough	811	0	0	0	0	0	0	0
Montoursville Borough	2,258	0	0	0	0	0	0	0
Moreland Township	591	0	0	0	0	0	0	0

Table 4.3.10-4 Structures and Critical Facilities Located in and near State Parks, State Forests, and state game lands in Lycoming County by Generalized Property Type								
MUNICIPALITY	TOTAL STRUCTURES	AGRICULTURE	COMMERCIAL	INDUSTRIAL	OTHER	RESIDENTIAL	UNKNOWN	TOTAL VULNERABLE STRUCTURES
Muncy Borough	1,112	0	0	0	0	0	0	0
Muncy Creek Township	2,009	1	0	0	0	0	0	1
Muncy Township	667	0	0	0	0	0	0	0
Nippenose Township	566	0	0	0	0	0	0	0
Old Lycoming Township	3,106	0	0	0	0	0	0	0
Penn Township	551	0	0	0	0	0	0	0
Piatt Township	867	0	0	0	0	0	0	0
Picture Rocks Borough	299	0	0	0	0	0	0	0
Pine Township	559	13	0	0	0	0	1	14
Plunketts Creek Township	701	10	0	0	33	7	1	51
Porter Township	892	0	0	0	0	0	0	0
Salladasburg Borough	145	0	0	0	0	0	0	0
Shrewsbury Township	312	0	0	0	0	0	0	0
South Williamsport Borough	2,898	0	0	0	0	0	0	0
Susquehanna Township	737	0	0	0	0	0	0	0
Upper Fairfield Township	928	0	0	0	0	0	0	0

Table 4.3.10-4 Structures and Critical Facilities Located in and near State Parks, State Forests, and state game lands in Lycoming County by Generalized Property Type								
MUNICIPALITY	TOTAL STRUCTURES	AGRICULTURE	COMMERCIAL	INDUSTRIAL	OTHER	RESIDENTIAL	UNKNOWN	TOTAL VULNERABLE STRUCTURES
Washington Township	1,320	0	0	0	17	1	0	18
Watson Township	516	4	10	0	11	3	0	28
Williamsport, City of	12,245	0	0	0	0	1	2	3
Wolf Township	1,616	0	0	0	0	0	0	0
Woodward Township	1,647	0	0	0	0	0	0	0
Lycoming County Total	**64,197**	**54**	**136**	**1**	**315**	**87**	**6**	**599**

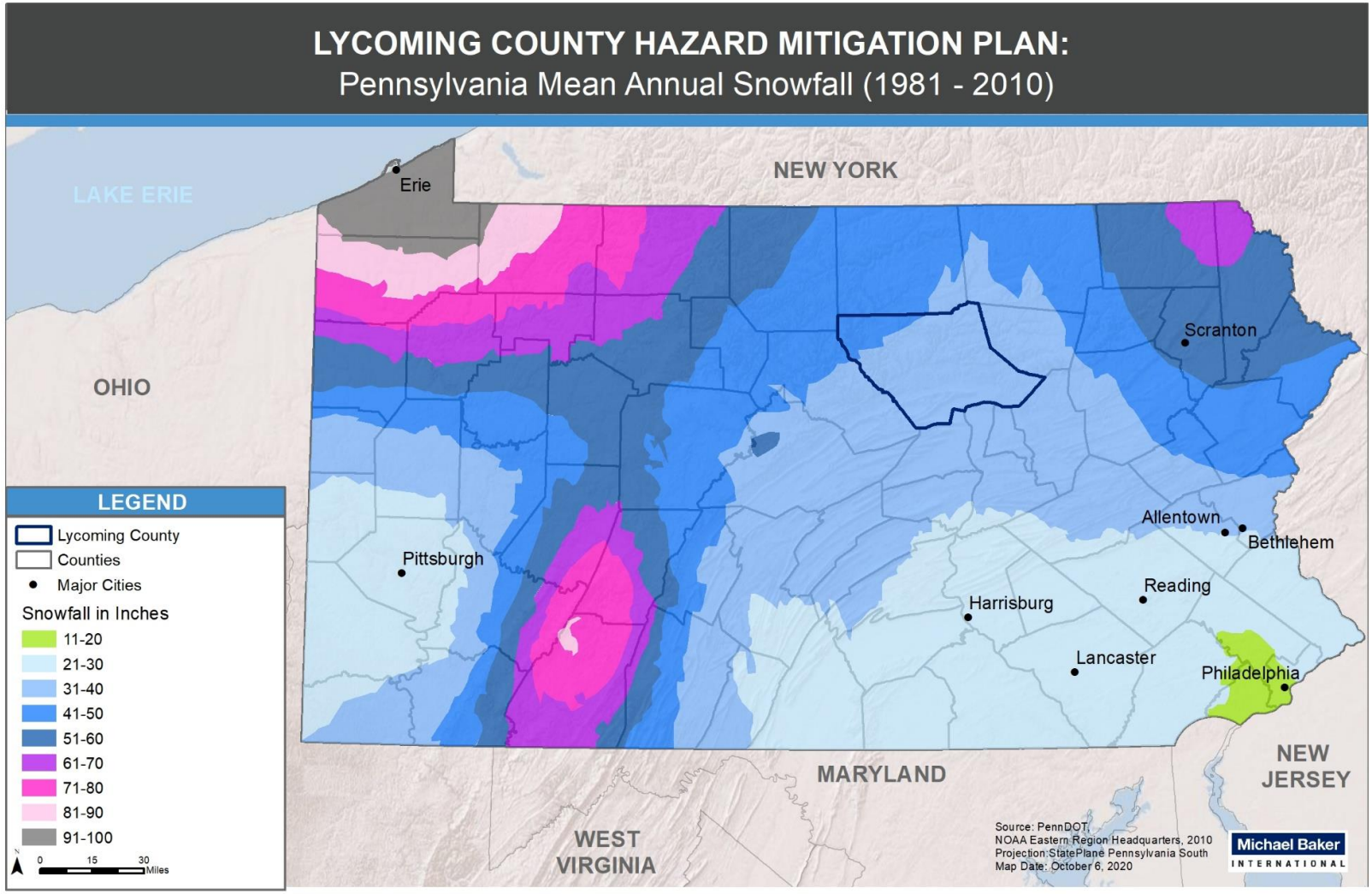
4.3.11. Winter Storm

4.3.11.1. Location and Extent

Heavy snow or ice occurs throughout the Commonwealth of Pennsylvania. Every municipality in Lycoming County is affected by these storms. Lycoming County experiences all levels of winter storms from ice storms and freezing rain to heavy snow and blizzards. Winter storms typically begin as low-pressure systems that move through Pennsylvania, following the jet stream. Average annual snowfall in Lycoming County ranges from 30 to 50 inches, with the higher snowfall occurring in the northwest portion of the County. See Figure 4.3.9-1 for the mean annual snowfall in Pennsylvania.

Storms tracking up the east coast tap into Atlantic moisture, whereas the Great Lakes supply the moisture and instability for heavy snow squalls in the northwest. Orographic lift enhances snowfall over higher elevations (note particularly higher average snowfall in Somerset County in the Allegheny Mountains). The snowfall season is November through April, and amounts are generally below one inch during October and May. The greatest monthly snowfalls occur in March as moisture supply begins to increase with rising temperatures.

Figure 4.3.11-1 Pennsylvania mean annual snowfall



4.3.11.2. Range of Magnitude

Winter storms consist of cold temperatures, heavy snow or ice and sometimes strong winds. Because these events are regular annual occurrences in Lycoming 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. Further, they can result in the closing of secondary roads, loss of utility services and depletion of oil heating supplies. Some rural areas of the County are susceptible to isolation during winter storms due to power and communication loss as well as road closings. Emergency medical, food, and fuel supplies are sometimes required during these storms.

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 twelve-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 35 mph 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 Lycoming County; however, storms that produce blizzard-like conditions are a common occurrence.

Severe Blizzard: Wind velocity of 45 miles per hour, temperatures of 10 degrees Fahrenheit or lower, a high density of blowing snow with visibility frequently measured in feet prevailing over an extended period time.

In Lycoming County, a devastating winter storm occurred in early January 1994. This storm caused record snowfall depths (in excess of 33 inches in some portions of the Commonwealth), strong winds, and sleet/freezing rains. Numerous storm-related power outages were reported, and as many as 600,000 residents were without electricity, in some cases for several days at a time. An intense ice storm followed that affected the Commonwealth and closed major arterial roads and downed trees and power lines. Utility crews from a five-state area were called to assist in power restoration repairs. Officials from PP&L stated that this was the worst winter storm in the history of the company, and related damage-repair costs exceeded $5,000,000.

Serious power supply shortages continued through mid-January because of record cold temperatures at many places, causing sporadic power generation outages across the Commonwealth. The entire Pennsylvania-New Jersey-Maryland grid and its partners in the District of Columbia, New York, and Virginia experienced 15- to 30-minute rolling blackouts, threatening the lives of people and the safety of the facilities in which they resided. Power and fuel shortages affecting Pennsylvania and the East Coast power grid system required the governor to recommend power conservation measures be taken by all commercial, residential, and industrial power consumers.

The record cold conditions resulted in numerous water-main breaks and interruptions of service to thousands of municipal and city water customers throughout the Commonwealth. Additionally, the extreme cold, in conjunction with accumulations of frozen precipitation, resulted in acute shortages of road salt. As a result, trucks were dispatched to haul salt from New York to expedite deliveries to PennDOT storage sites.

Environmental impacts often include damage shrubbery and trees due to heavy snow loading, ice build-up and/or high winds which can break limbs or even bring down large trees. An indirect effect of winter storms is the treatment of roadway surfaces with salt, chemicals, and other de-icing materials which can impair adjacent surface and ground waters. Another important secondary impact for winter storms is building or structure collapses; if there is a heavy snowfall or a significant accumulation over time, the weight of the snow may cause building damage or even collapse. Winter storms have a positive environmental impact as well; gradual melting of snow and ice provides groundwater recharge. However, abrupt high temperatures following a heavy snowfall can cause rapid surface water runoff and severe flooding.

4.3.11.3. Past Occurrence

The Commonwealth of Pennsylvania has a long history of severe winter weather. In the winter of 1993-1994, the state was hit by a series of protracted winter storms. The severity and nature of these storms, combined with record-breaking frigid temperatures, posed a major threat to the lives, safety, and well-being of Commonwealth residents and caused major disruptions to the activities of schools, businesses, hospitals, and nursing homes.

Lycoming County has experienced many major winter storms. In January 1978 and February 1992, emergencies were declared statewide because of heavy snow. In February 1978, March 1989, and March 1993, emergencies were declared due to blizzard conditions – high winds with snow. During January and February 1994, Pennsylvania experienced at least 17 regional or statewide winter storms. The consequences of these disasters resulted in the need for intervention by the president in an effort to alleviate the severity of the hardship and to aid the recovery of the hardest-hit counties.

In January 1996, another series of severe winter storms with 27- and 24-inch accumulated snow depths was followed by 50- to 60-degree temperatures, resulting in rapid melting and flooding. Lycoming County documented its greatest snowfall in history that year: 87.7 inches. Included in these storms was the blizzard of 1996, which dumped as much as 40 inches of snow on some parts of Pennsylvania. Many communities could not maintain emergency corridors necessary to sustain operations at critical health and safety facilities. President Clinton included the state in a list of federally declared disaster areas to receive funding for emergency snow removal.

Winter storm events in recent years have resulted in snow accumulations from 6-13 inches and significant ice coverage in parts of the County. The most common complications are bad travel conditions and road closures.

Table 4.3.9-1 presents a history of the winter storms that have affected Lycoming County. Table 4.3.9-2 summarizes these events to show the number of winter storm events each year from 1996 to 2019. Since 2010, Lycoming County has witnessed 6 heavy snow events and 15 winter storms.

Table 4.3.11-1 Previous winter storms events in Lycoming County from 1996-2014 (NCDC, 2020).

LOCATION	DATE	TYPE	PROPERTY DAMAGE ($)
Countywide	1/2/1996	Heavy Snow	0
Southern Lycoming (zone)	1/7/1996	Blizzard	0
Countywide	1/12/1996	Heavy Snow	0
Countywide	3/7/1996	Heavy Snow	0
Northern Lycoming (zone)	1/27/1997	Heavy Snow	0
Northern Lycoming (zone)	2/13/1997	Winter Storm	0
Countywide	3/14/1997	Ice Storm	0
Northern Lycoming (zone)	11/14/1997	Heavy Snow	0
Northern Lycoming (zone)	12/10/1997	Heavy Snow	0
Countywide	12/29/1997	Heavy Snow	0
Countywide	1/15/1998	Ice Storm	0
Countywide	1/22/1998	Ice Storm	0
Northern Lycoming (zone)	2/23/1998	Heavy Snow	0
Countywide	1/2/1999	Winter Storm	0
Countywide	1/8/1999	Winter Storm	0

Table 4.3.11-1 Previous winter storms events in Lycoming County from 1996-2014 (NCDC, 2020).

LOCATION	DATE	TYPE	PROPERTY DAMAGE ($)
Countywide	1/14/1999	Winter Storm	0
Countywide	2/7/1999	Heavy Snow	0
Northern Lycoming (zone)	3/6/1999	Heavy Snow	0
Northern Lycoming (zone)	3/21/1999	Heavy Snow	0
Countywide	1/25/2000	Heavy Snow	0
Countywide	1/30/2000	Heavy Snow	0
Countywide	2/13/2000	Ice Storm	0
Countywide	2/18/2000	Winter Storm	0
Countywide	12/13/2000	Winter Storm	0
Countywide	12/19/2000	Heavy Snow	0
Countywide	3/4/2001	Heavy Snow	$8,000
Countywide	1/6/2002	Heavy Snow	0
Countywide	12/5/2002	Heavy Snow	0
Countywide	12/10/2002	Ice Storm	0
Countywide	12/25/2002	Heavy Snow	0
Countywide	1/1/2003	Ice Storm	0
Countywide	1/2/2003	Heavy Snow	0
Countywide	2/16/2003	Heavy Snow	0
Countywide	12/14/2003	Heavy Snow	0
Southern Lycoming (zone)	1/27/2004	Heavy Snow	0
Countywide	2/3/2004	Heavy Snow	0
Countywide	3/16/2004	Heavy Snow	0
Countywide	1/5/2005	Winter Storm	0
Northern Lycoming (zone)	1/8/2005	Ice Storm	0
Northern Lycoming (zone)	1/22/2005	Winter Storm	0
Northern Lycoming (zone)	2/21/2005	Winter Storm	0
Countywide	3/1/2005	Heavy Snow	0
Northern Lycoming (zone)	10/25/2005	Heavy Snow	0
Countywide	12/9/2005	Heavy Snow	0
Countywide	12/16/2005	Winter Storm	0
Southern Lycoming (zone)	2/13/2007	Winter Storm	0
Northern Lycoming (zone)	2/13/2007	Heavy Snow	0
Countywide	3/16/2007	Heavy Snow	0
Northern Lycoming (zone)	4/15/2007	Heavy Snow	0
Northern Lycoming (zone)	12/2/2007	Ice Storm	0
Northern Lycoming (zone)	12/9/2007	Ice Storm	0
Northern Lycoming (zone)	12/13/2007	Winter Storm	0
Countywide	2/1/2008	Winter Storm	0
Southern Lycoming (zone)	2/12/2008	Ice Storm	0
Northern Lycoming (zone)	12/11/2008	Winter Storm	0

Table 4.3.11-1 Previous winter storms events in Lycoming County from 1996-2014 (NCDC, 2020).

LOCATION	DATE	TYPE	PROPERTY DAMAGE ($)
Countywide	12/19/2008	Winter Storm	0
Countywide	12/23/2008	Ice Storm	0
Countywide	1/6/2009	Ice Storm	0
Northern Lycoming (zone)	1/10/2009	Winter Storm	0
Countywide	1/27/2009	Winter Storm	0
Northern Lycoming (zone)	10/15/2009	Winter Storm	0
Southern Lycoming (zone)	2/9/2010	Winter Storm	0
Northern Lycoming (zone)	2/25/2010	Winter Storm	0
Northern Lycoming (zone)	2/1/2011	Winter Storm	0
Countywide	2/20/2011	Heavy Snow	0
Countywide	3/6/2011	Heavy Snow	0
Northern Lycoming (zone)	3/23/2011	Winter Storm	0
Southern Lycoming (zone)	10/29/2011	Heavy Snow	0
Countywide	12/26/2012	Winter Storm	0
Countywide	12/14/2013	Heavy Snow	0
Countywide	2/4/2014	Winter Storm	0
Countywide	2/13/2014	Heavy Snow	0
Southern Lycoming (zone)	11/25/2014	Heavy Snow	0
Northern Lycoming (zone)	2/1/2015	Winter Storm	0
Southern Lycoming (zone)	2/15/2016	Winter Storm	0
Northern Lycoming (zone)	1/23/2017	Winter Storm	0
Southern Lycoming (zone)	2/8/2017	Winter Storm	0
Northern Lycoming (zone)	2/9/2017	Winter Storm	0
Countywide	3/13/2017	Winter Storm	0
Countywide	11/15/2018	Winter Storm	0
Countywide	1/19/2019	Winter Storm	0
Southern Lycoming (zone)	2/20/2019	Winter Storm	0
		Total	**$8,000**

Table 4.3.11-2 **Table 4.3.11-3** Number of Winter Storm Events per year in Lycoming County (NCDC, 2020).

YEAR	NUMBER OF STORMS		YEAR	NUMBER OF STORMS
1996	4		2008	5
1997	6		2009	4
1998	3		2010	2
1999	6		2011	5
2000	6		2012	1
2001	1		2013	1
2002	4		2014	3
2003	4		2015	1
2004	3		2016	1

Table 4.3.11-2	Table 4.3.11-3 Number of Winter Storm Events per year in Lycoming County (NCDC, 2020).			
YEAR	NUMBER OF STORMS		YEAR	NUMBER OF STORMS
2005	8		2017	4
2006	0		2018	1
2007	7		2019	2
			Total	82

4.3.11.4. Future Occurrence

Data from NCDC shows that winter storms are a regular occurrence in Lycoming County. So, the probability of the occurrence of a damaging heavy snow or ice storm in Lycoming 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).

The severity and frequency of major winter storms is expected to remain fairly constant. However, due to increased dependence on various modes of transportation and use of public utilities for light, heat, and power, the disruption from these storms is more significant today than in the past. The future occurrence of climatic events cannot be predicted exactly. As noted in the table above, the County has been affected by one to four winter storm events each year from 2014 to 2019. Given this record of reported events, it is safe for planning purposes to assume that in an average year the County can expect to experience two winter storm events.

4.3.11.5. Vulnerability Assessment

In Lycoming County, wintertime snow accumulations are expected and normal. The most common, but potentially serious, effects of very heavy snowstorms with accumulations exceeding six or more inches in a 12-hour period are snow drifts causing road closures, traffic accidents, interruptions in power supply and communications, and the failure of inadequately designed and/or maintained roofing systems. Some rural areas of the County are susceptible to isolation due to the loss of telephone communications and road closings. Power failure and interruption of water supplies are common from ice storms, heavy snow, and blizzard conditions. All critical facilities in Lycoming County are vulnerable to winter storms.

Vulnerability to the effects of winter storms on buildings is somewhat dependent on the age of a building. 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. It is assumed that older structures are more vulnerable, but additional information on construction type and building codes enforced at time of construction would allow a more thorough assessment of the vulnerability of structures to winter storm impacts such as severe wind and heavy snow loading.

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.

All structures and infrastructure in Lycoming 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. Because all of Lycoming County has adopted the 2015 IBC and IRC, new construction will be able to withstand the weight of heavy snow or ice. Figure 4.3.9-2 shows the distribution of building ages in Lycoming County; about 37% of all buildings were constructed prior to 1940 in Lycoming County.

Figure 4.3.11-2 Age of structures for buildings with known ages (ACS, 2014-2018).

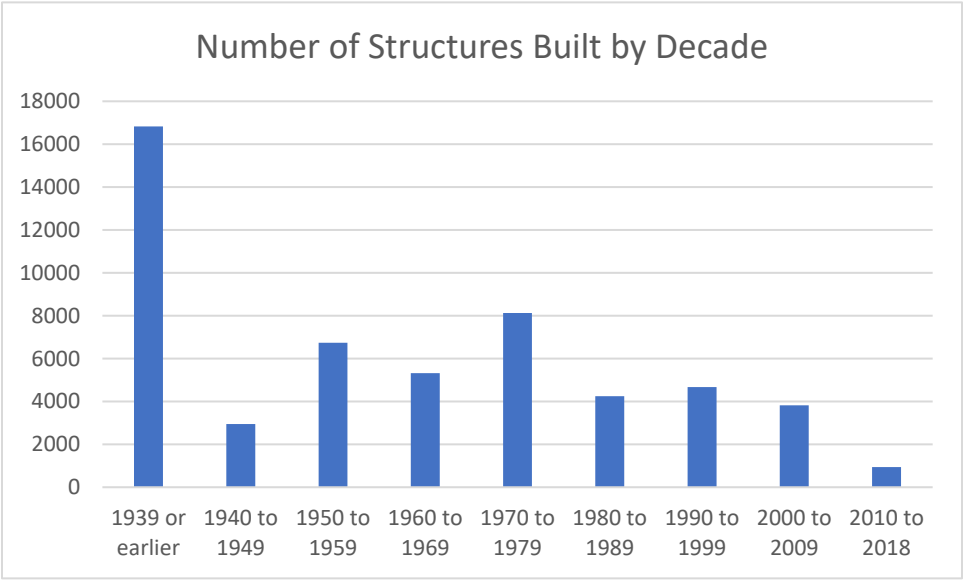


Table 4.3.9-3 below shows the number of housing units in Lycoming County built prior to 1940 according to the US Census Bureau's estimates. The following municipalities have the highest proportion of housing units built prior to 1940: Montgomery Borough (58.1%), Muncy Borough (57.1%), Jersey Shore Borough (56.3%), and the City of Williamsport (53.1%). The City of Williamsport, Jersey Shore Borough, and South Williamsport Borough all have over 1,000 residential structures built before 1940; 6,986, 1,111, and 1,068 structures respectively. These communities all have higher vulnerabilities to winter storm events from this analysis. While the U.S. Census provide estimates for residential structures, the age of non-residential structures is not available.

Table 4.3.11-4 Age of Housing Units in Lycoming County (ACS, 2018)		
MUNICIPALITY	NUMBER OF HOUSING UNITS BUILT PRIOR TO 1940	PERCENT OF TOTAL HOUSING UNITS
Anthony Township	96	25.1%
Armstrong Township	82	28.7%
Bastress Township	45	21.8%
Brady Township	14	6.9%
Brown Township	79	23.4%
Cascade Township	50	19.7%
Clinton Township	199	22.6%
Cogan House Township	118	24.0%
Cummings Township	78	18.7%
Duboistown Borough	182	33.6%
Eldred Township	119	13.8%
Fairfield Township	138	10.9%
Franklin Township	155	38.1%
Gamble Township	70	19.4%
Hepburn Township	251	19.8%
Hughesville Borough	465	47.0%
Jackson Township	75	34.4%
Jersey Shore Borough	1,111	56.3%
Jordan Township	140	31.6%
Lewis Township	171	32.5%
Limestone Township	127	15.9%
Loyalsock Township	612	12.3%
Lycoming Township	103	15.5%
McHenry Township	99	19.9%
McIntyre Township	124	44.3%
McNett Township	43	22.8%
Mifflin Township	103	22.6%
Mill Creek Township	64	21.6%
Montgomery Borough	384	58.1%
Montoursville Borough	494	24.5%
Moreland Township	78	20.1%
Muncy Borough	639	57.1%
Muncy Township	122	25.9%
Muncy Creek Township	389	24.2%
Nippenose Township	68	24.0%
Old Lycoming Township	267	11.4%
Penn Township	115	24.1%
Piatt Township	113	25.3%
Picture Rocks Borough	145	46.6%
Pine Township	129	36.6%

Table 4.3.11-4 Age of Housing Units in Lycoming County (ACS, 2018)		
MUNICIPALITY	NUMBER OF HOUSING UNITS BUILT PRIOR TO 1940	PERCENT OF TOTAL HOUSING UNITS
Plunketts Creek Township	162	32.3%
Porter Township	191	24.8%
Salladasburg Borough	41	36.6%
Shrewsbury Township	97	33.3%
South Williamsport Borough	1,068	36.9%
Susquehanna Township	97	19.7%
Upper Fairfield Township	104	13.0%
Washington Township	151	20.5%
Watson Township	61	16.7%
Williamsport City	6,986	53.1%
Wolf Township	127	10.1%
Woodward Township	231	22.9%
Lycoming County Total	17,172	32.2%

HUMAN-MADE HAZARDS

4.3.12. Dam Failure

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

4.3.13. Disorientation

4.3.13.1. Location and Extent

Pennsylvania Wilds (PA Wilds) is a popular recreational destination in northern Pennsylvania for activities such as hiking, camping, hunting, and fishing. The vast forest network covers over 2 million acres and is partially located in Lycoming County. PA Wilds is known for the darkest skies in the country and attracts a large number of visitors at night for stargazing. As a result, people can become lost or trapped in remote and rugged wilderness areas. People are much more likely to become lost at night, and this attraction increases the risk of disorientation occurring in Lycoming County. Visitation to the PA Wilds in Lycoming County increased during the 2020 COVID Pandemic, when people were looking for safe recreational activities. Search and rescue may be required for people who suffer from medical problems or injuries and those who become accidentally or intentionally disoriented. Search and rescue efforts are focused in and around state forest and state park lands (DCNR, 2020b).

Lycoming County is largely rural and heavily wooded with steep mountains and numerous rivers and streams. Popular outdoor recreational activities include biking, rock-climbing, hiking, hunting, fishing, and boating. Almost a third (32% or 392 square miles) of Lycoming County is comprised of state park, state forest, and state game lands. As of 2020, 77 percent of the county was forest and only 3 percent is considered urban, with agriculture and rural covering the rest of the area (LCEMA, 2020a). Figure 4.3.13-1 shows hiking trails across the County as well as State Forests, Parks, and Game Lands. These large swaths of state forests and rolling terrain make coordination across the County and cellular communication between individuals quite challenging. Disorientation is most likely to occur in areas of vast, open wilderness. With numerous trails and side, back roads in a region that is largely underserved by cellular coverage, it becomes quite easy to become lost and disoriented.

Another factor leading to people becoming lost or trapped in wilderness areas is their access to communication or wayfinding measures with devices over data or cellular networks. Figure 4.3.13-2 shows the range of cell towers throughout Lycoming County. As the map shows , many of the forested areas in the County are more than 8 miles from the closest cell tower. Due to the varying elevations throughout the County, many of these areas that are out of the 8-mile range most likely do not have great access to cell service, making them areas prone to disorientation.

Figure 4.3.13-1 Lycoming County areas potentially vulnerable to disorientation

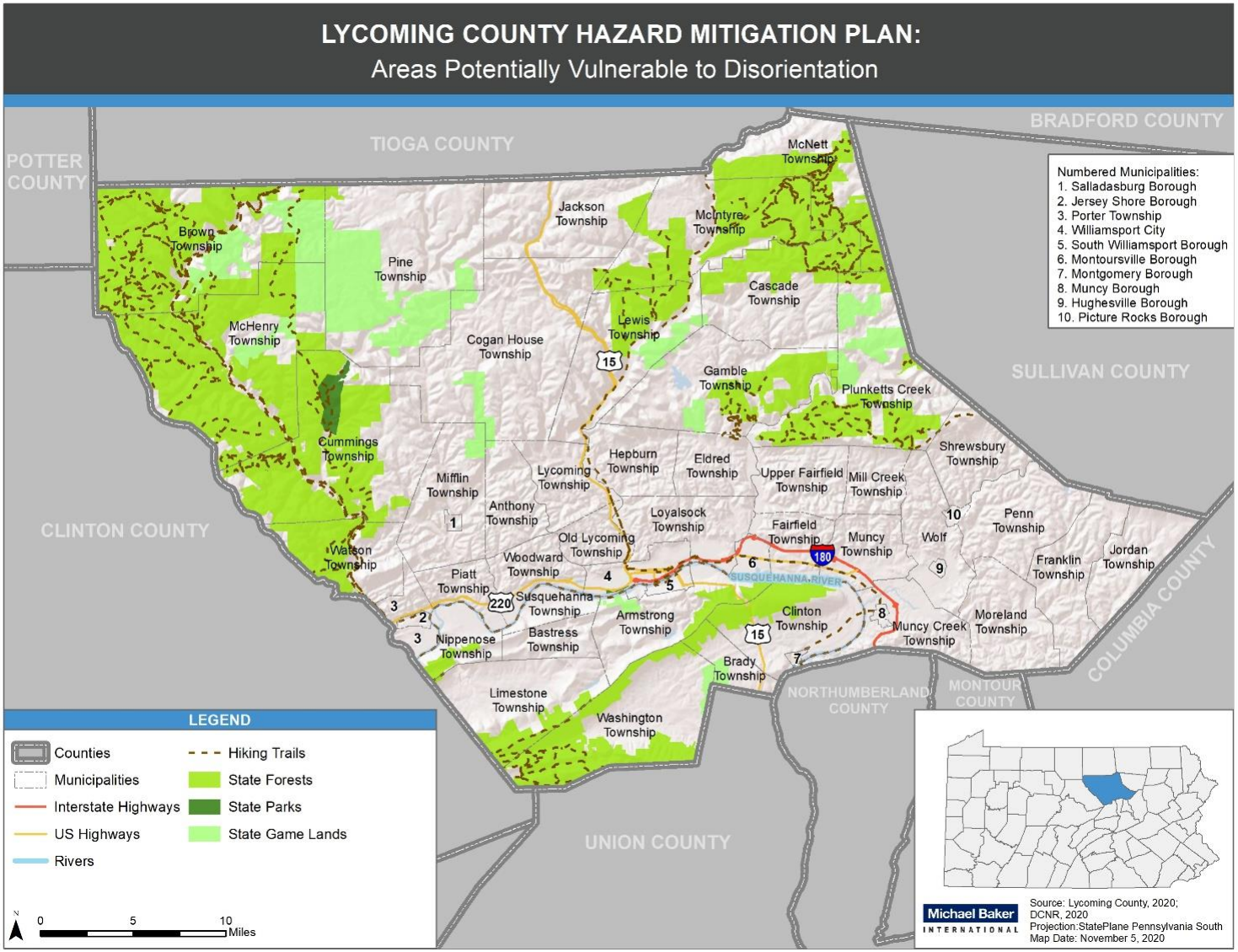
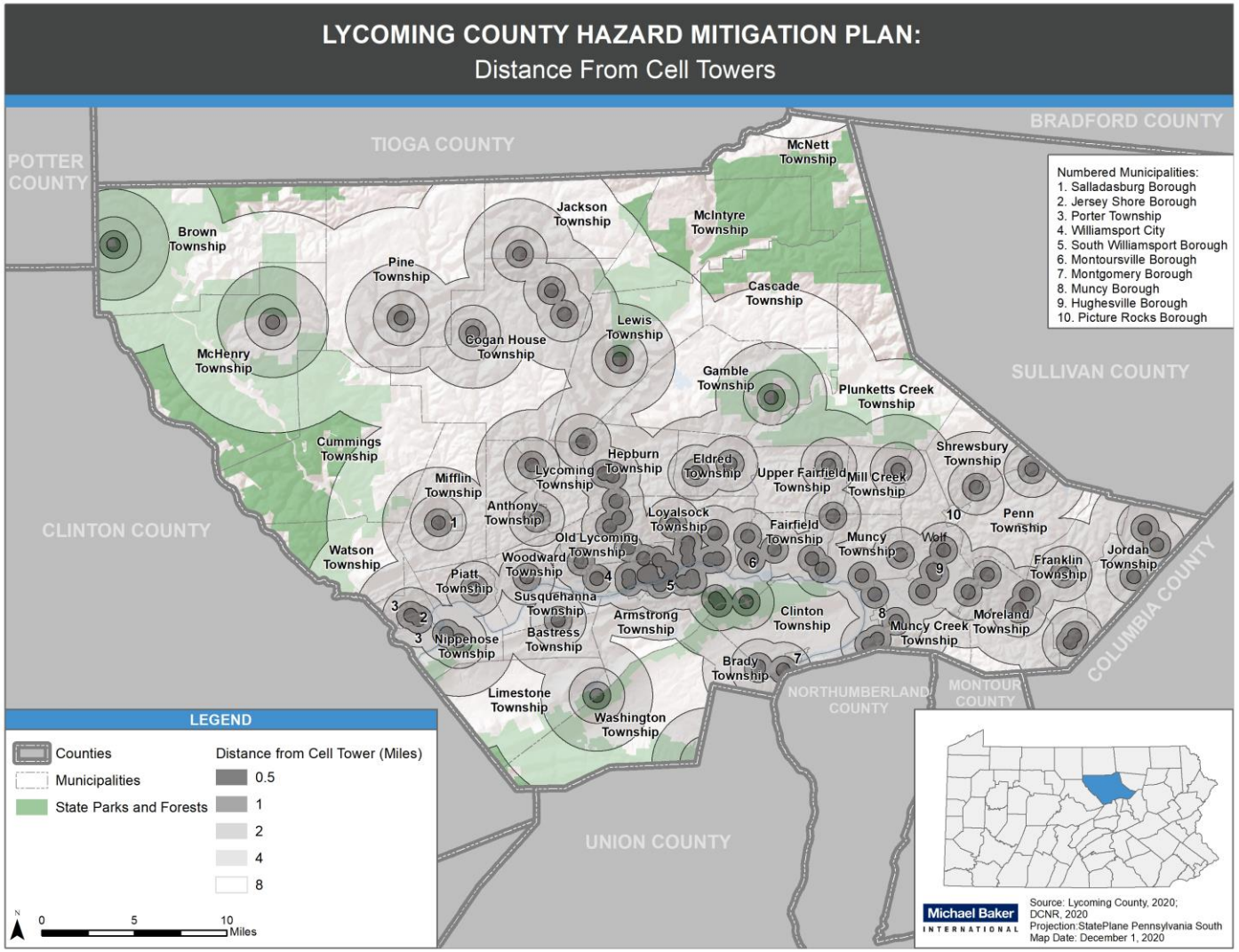


Figure 4.3.13-2 Cell Tower Range in Lycoming County



4.3.13.2. Range and Magnitude

A wide variety of factors can contribute to outcome of a search and rescue mission, but the most common dangers associated with disorientation in are lack of food, water, shelter, and medical care. Lycoming County generally has an abundance of water and during the warmer summer months shelter is less of a necessity than during winter months when extreme temperatures can pose a more serious threat. Age, physical fitness, and familiarity with the area can also have a bearing on the outcome. The worst-case scenario associated with disorientation involves serious injury or death.

4.3.13.3. Past Occurrence

While search-and-rescue (SAR) efforts are tracked by the DCNR, a detailed, comprehensive list of incidents involving disorientation and SAR is not available. However, given the numerous park lands, frequently used for recreational purposes, and sporadic cellular reception, it is expected that there have been and will continue to be lost hikers and persons over the years.

In October 2019, an 86-year old man with no health problems and an experienced outdoorsman and hunter got lost in the Moshannon State Forest in Clearfield County, PA. The man was lost for over 24 hours while more than 30 searchers worked overnight to find him. The hunter was found around 2 PM the next day in a deep ravine and remote portion of the area being searched. After becoming lost, the hunter traveled down a drainage he found thinking it would lead him to civilization. However, this assumption was incorrect in the Quehanna Wild Area where road and civilization are mostly in the flat mountain tops. The hunter fell numerous times on the rugged and steep terrain and got wet and cold from stream crossings (PA Environment News, 2019). This scenario points out that disorientation can occur to even experienced and prepared hikers.

4.3.13.4. Future Occurrence

It is impossible to predict when and where disorientation may occur. During times when activities such as hunting, hiking, biking, and camping increase, so does the likelihood of individuals becoming disoriented. Lycoming County continues to gain popularity as a tourist and recreational destination. Cherry Springs State Park in Potter and Lycoming Counties is famous for stargazing in the darkest skies in PA. During the COVID-19 pandemic in 2020 people increasingly visited trails and open spaces as a way to go outside while still maintaining social distancing protocols. Search and rescue operations throughout the County are predicted to continue but can be mitigated with appropriate actions, including improved cellular coverage and/or the installation of booster units at critical locations with weak signals. Based on available past occurrence data the probability of the County experiencing a disorientation incident is considered *possible* as defined by the Risk Factor Methodology probability criteria (see Table 4.4-1).

4.3.13.5. Vulnerability Assessment

Individuals are most likely to become disorientated in areas of vast, open wilderness. This is especially relevant as Lycoming County's limited cellular coverage inhibits residents and

visitor's ability to make calls, access maps, and look up pertinent weather information, if they are anywhere outside of Williamsport and primary road corridors. Children and the elderly are more vulnerable to the exposure of elements. Bikers, hunters, hikers, and All-terrain vehicle (ATV) riders are the most common victims of disorientation. Many outdoor, recreational activities commonly associated with disorientation take place during the warmer months of spring and summer and post a somewhat lesser risk because of the average temperature range during these seasons. The most dangerous period to become lost outdoors is during the winter months when heat and shelter are vital. Lycoming County often experiences winter storms and temperatures below freezing.

Cherry Springs State Park presents unique complications by drawing in hikers for the State's darkest skies. The park was created from some of the most remote portions of the Susquehannock State Forest. There is no lighting or infrastructure for miles around in order to prevent light pollution and preserve the dark skies. This also means there is likely little to no cell service. It is easy to get lost in the dark, and visitors should know their route well before entering the park. Signs, maps, and blaze/trail markings are used to help hikers; however, these may be difficult to see at night. Hikers entering Cherry Spring State Park and other remote forests at night are the most vulnerable to disorientation in Lycoming County.

While prevention is the best solution to disorientation, lessening the impacts of this hazard by identifying and quickly locating individuals that have become lost or injured is equally important. There are several resources available on a state and local level for responding to SAR events. The DCNR is the primary coordinator for SAR operation efforts on state lands within Pennsylvania. The agency is responsible for over two million acres of forest land (DCNR, 2020b).

The Lycoming County Emergency Management Agency (LCEMA) supports emergency operations planning for all 52 municipalities. This includes programs such as Fire Training Courses for all County Emergency Responders and the Flash Flood Warning volunteer program (LCEMA, 2020b). Search and rescue training and best practices are enhanced through these programs and increase the county's ability to respond to instances of lost persons or disorientation.

The PA DCNR also has resources available for search and rescue operations. For example, the agency has produced a guide for local officials to create a search-and-rescue team. The DCNR also provides rescue training and certificates for rescue team leaders and members (DCNR, 2020b).

4.3.14. Environmental Hazards: Natural Gas Drilling Incidents

4.3.14.1. Location and Extent

There are two main types of natural gas wells: conventional and unconventional. Conventional wells use traditional vertical drilling techniques, while unconventional wells use more recently developed horizontal drilling techniques that inject large quantities of high-pressured water mixed with sand and other additives to hydraulically fracture shale rock formations thousands of feet underground and release natural gas. This practice is more commonly known as fracking (PA DEP, 2017). The primarily shale rock formation in Lycoming County is the Marcellus Shale, which occurs at a depth of 5,000 to 8,000 feet (PA DEP-BOGM, 2010a). Both conventional and unconventional wells pose risks to groundwater and present a fire hazard. Brine and other pollutants can contaminate domestic drinking water wells near gas wells, and stray methane gas in the subsurface can migrate to wells and homes and ignite. Unconventional extraction poses additional risks including pollution of streams and surface water supplies.

With about 993 active natural gas drilling sites, and approximately another 700 well permits for sites that have not yet been drilled or have not materialized yet (as of November 2020) in the County, the release and combustion of a large quantity of natural gas is of particular concern, especially as this industry continues to grow. In just ten years, between 2010 and 2019, 1,820 permits for new wells were issued. See Table 4.3.14-1 for a breakdown of permits issued per year from 2010 to 2019, Table 4.3.14-1 for a breakdown of permits issued per municipality from 2010 to 2019, and Table 4.3.14-3 for current well status as of November 2020. The industry is highly regulated by the Pennsylvania DEP, and local response agencies have been trained to deal with accidents at the sites, but the threat of releases, fire, and explosions remains.

Table 4.3.14-1 New gas and combined oil & gas well permits issued in Lycoming County (DCNR).

YEAR	PERMITS
2006	0
2007	12
2008	50
2009	105
2010	224
2012	306
2013	297
2014	266
2015	82
2016	45
2017	54
2018	67
2019	66

Table 4.3.14-2 Distribution of new gas and combined oil & gas well permits issued from 2010 - 2019 (DCNR).			
MUNICIPALITY	NO. OF PERMITS ISSUED	MUNICIPALITY	NO. OF PERMITS ISSUED
Anthony Twp	15	Lycoming Twp	8
Cascade Twp	106	McHenry Twp	120
Cogan House Twp	335	McIntyre Twp	75
Cummings Twp	312	McNett Twp	34
Eldred Twp	55	Mifflin Twp	37
Fairfield Twp	9	Mill Creek Twp	2
Franklin Twp	56	Moreland Twp	14
Gamble Twp	145	Penn Twp	123
Hepburn Twp	35	Pine Twp	36
Jackson Twp	42	Plunketts Creek Twp	7
Jordan Twp	16	Shrewsbury Twp	4
Lewis Twp	133	Upper Fairfield Twp	61
Loyalsock Twp	1	Watson Twp	39
		Total	1,820

Table 4.3.14-3 Status of gas and combined oil & gas wells as of November 2020 (DCNR).	
PERMIT STATUS	NUMBER
Active	993
Plugged OG Well	109
Operator Reported Not Drilled	508
Regulatory Inactive Status	38
Proposed But Never Materialized	196

Figure 4.3.14-1 shows the location of the conventional gas wells and permits in Lycoming County. While, Figure 4.3.14-2 shows the location of the unconventional gas wells and permits in Lycoming County.

4.3.14.2. Range of Magnitude

Marcellus Shale play drilling has introduced a new set of hazards to the oil and gas industry in addition to the normal risks associated with natural gas extraction. The Marcellus Shale formation exists at a depth normally between 5,000 and 8,000 feet and holds trillions of cubic feet of natural gas. Extraction from this depth was previously not feasible, but as drilling technology has improved over the years, recovering natural gas from Marcellus Shale is now possible (PA DEP-BOGM, 2010a).

This extraction process is different from traditional natural gas extraction in that it often requires horizontal drilling. Horizontal drilling is accomplished by hydraulic fracturing, which

involves pumping one to eight million gallons of water, mixed with sand and other additives, including hydrochloric or muriatic acid, into the shale formation. The fluid or "frac fluid" that is recovered from this process must be properly treated as the water quality is very poor.

Frac fluid is extremely saline and can be three to six times as salty as sea water. Other contaminants can include barium, bromine, lithium strontium, sulfate, ammonium, and very high concentrations of total dissolved solids (TDS). There is also some concern about normally occurring radioactive materials present in shale and potentially present in recovered drilling fluid, but there is very little data available on the radioactivity of frac fluid in Pennsylvania (Kirby, 2010).

Currently there is no known technology to treat water with this level of salinity (Vidic, 2010). High levels of TDSs, though not harmful to humans, can be extremely harmful to aquatic life and can damage industrial equipment. Often recovered frac fluid is stored in earthen impoundments and after treatment is taken to a sewage treatment facility. There is concern surrounding the toxic solid waste that remains after frac fluid is treated.

Marcellus gas well drilling can have a variety of effects on the environment. For example, some areas have experienced stray methane gas in the subsurface; under certain conditions, this methane can migrate to private water supply wells and ultimately into a house or structure. Unmitigated methane can build to explosive concentrations. A proper well vent allows methane to vent to the atmosphere rather than build up to explosive levels. The risk of an explosion from stray methane varies from location to location based on site-specific conditions.

Surface waters and soil are sometimes polluted by brine, a salty wastewater product of gas well drilling, and from spills occurring at the drilling site or from a pipeline breach. This can spoil public drinking water supplies and be particularly detrimental to vegetation and aquatic animals.

Natural gas well fires occur when natural gas is ignited at the well site. Often, these fires erupt during drilling when a spark from machinery or equipment ignites the gas. The initial explosion and resulting flames have the potential to seriously injure or kill individuals in the immediate area. These fires are often difficult to extinguish due to the intensity of the flame and the abundant fuel source.

In addition to the traditional hazards associated with oil and gas well drilling, potential impacts from Marcellus Shale gas well drilling include the following:

- Surface water depletion from high consumptive use with low return rates affecting drinking water supplies and aquatic ecosystems and organisms;
- Contaminated surface and groundwater resulting from hydraulic fracturing and the recovery of contaminated hydraulic fracturing fluid;
- Mishandling of solid toxic waste

Figure 4.3.14-1 Conventional oil & gas well locations in Lycoming County.

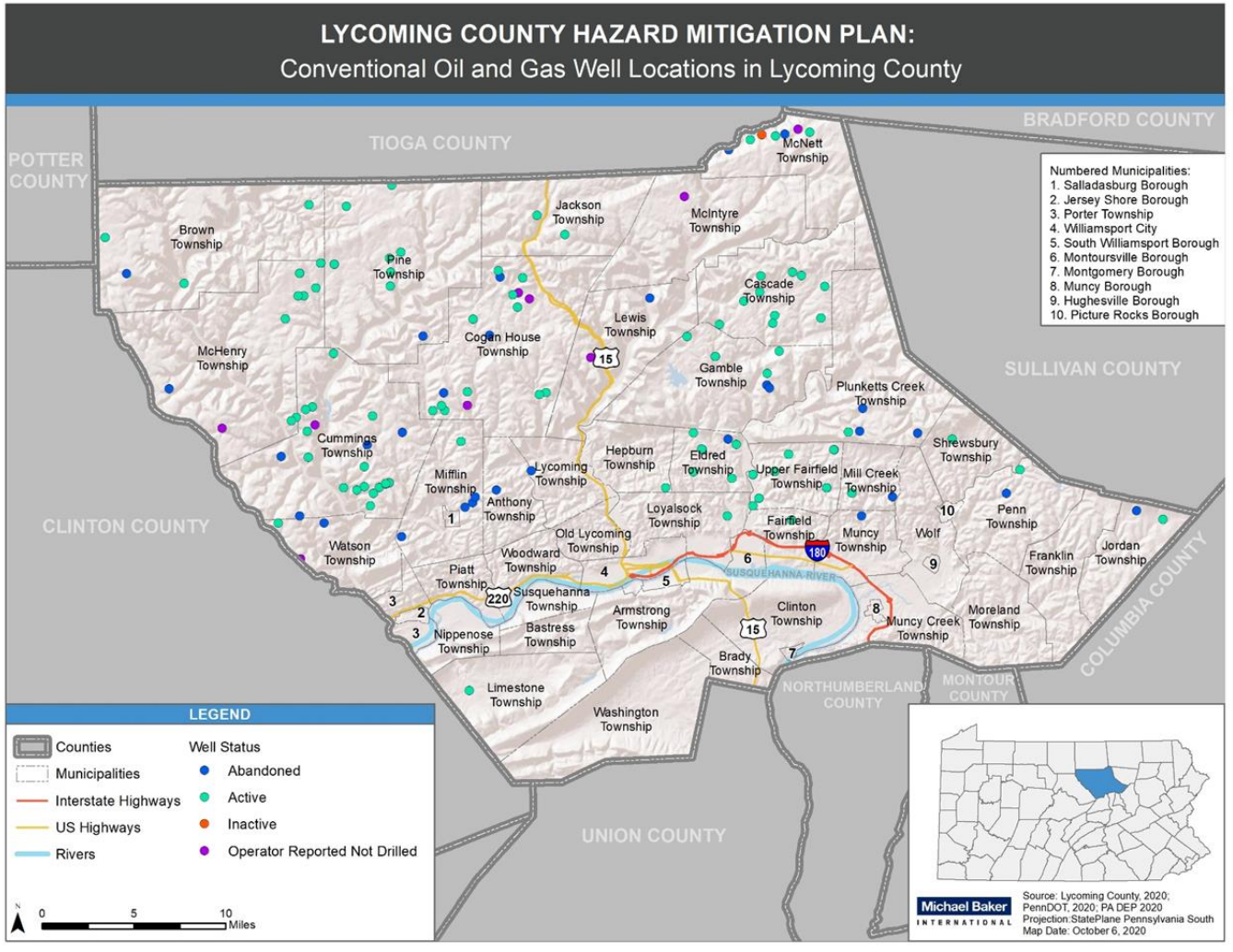
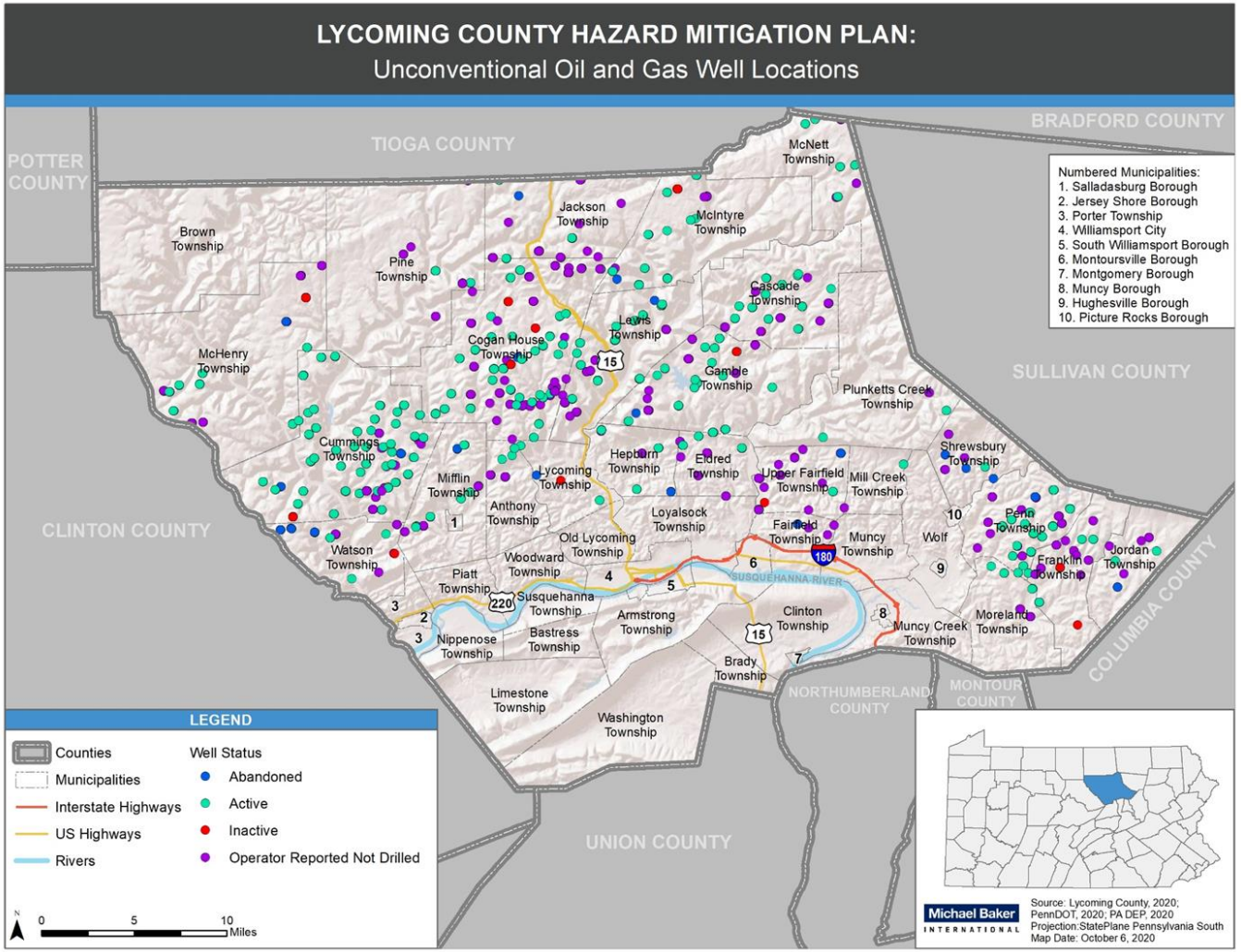


Figure 4.3.14-2 Unconventional oil & gas well locations in Lycoming County.



With a natural gas release, whether accidental or intentional, there are several potentially exacerbating or mitigating circumstances that will affect its severity or impact. Exacerbating conditions are characteristics that can enhance or magnify the effects of a hazard. Mitigating conditions, on the other hand, are characteristics of the target and its physical environment that can reduce the effects of a hazard. These conditions include the following:

- Weather conditions: affects how the hazard occurs and develops
- Micro-meteorological effects of buildings and terrain: alters dispersion of hazardous materials
- Shielding in the form of sheltering-in-place: protects people and property from harmful effects
- 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 varies with concentration of natural gas 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 a release can travel great distances, resulting in far-reaching effects on people and the environment.

Impacts of incidents at natural gas drilling sites can vary from relatively minor to catastrophic. If a large volume of natural gas escapes from a well at the surface, it will expand and spread over a large area. The potential for a major explosion of the gas exists; this explosion could kill hundreds of people, destroy property, spark wildland and urban fires, overwhelm the local EMS services and hospitals with the influx of casualties, force evacuations, close roads, cause utility outages (if a power or telephone transmission line is damaged), etc.

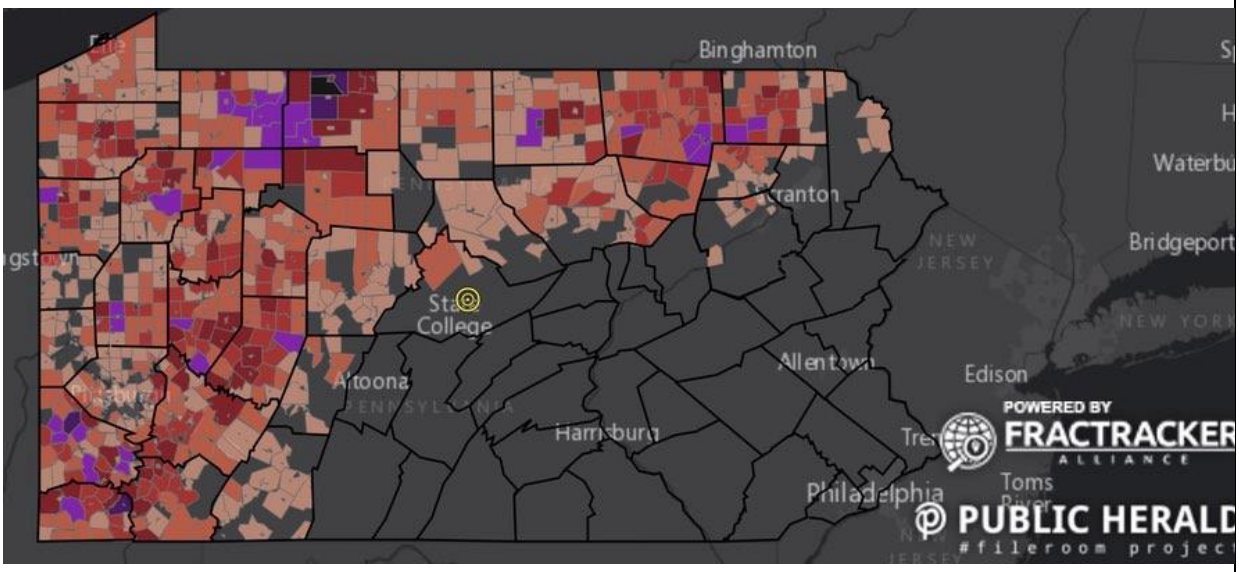
The impacts of oil and natural gas wells range in magnitude and extent. There are several potential impacts, including those on water, land, and air. Common accidents involving gas well sites include "blowouts," which are an explosion or failure of the rig, as well as the potential for chemical contamination. The water used for hydraulic fracturing is composed of 87 chemicals, some of which have the potential to cause a danger to health of life (PA DEP, 2010). Beyond the purely environmental impacts of Marcellus Shale drilling, Lycoming County is likely to see significant indirect effects on its transportation infrastructure and land cover.

4.3.14.3. Past Occurrence

There have been few reported accidents or incidents involving natural gas drilling. One incident was on July 28, 2009, a gas well in McNett Township leaked natural gas into the water table, where it spread into the Lycoming Creek, some smaller streams, and into the water supplies of four residents. No injuries or damage were reported. In addition, one incident related to gas transmission and gathering was documented for Lycoming County in the Pipeline and Hazardous Materials Safety Administration (PHMSA) database for January 2010 to the present. In June 2015 a gas line ruptured and about 113 million cubic feet of natural

gas was released before local personnel isolated the affected segment. About 150 people were evacuated, but no injuries or damage were reported. Aside from these leaks, there have been numerous complaints issued by residents specific to water issues. Between January 2004 and November 2016, PA DEP logged 242 total complaints and 110 specific to water. A map developed by Public Herald and FracTracker Alliance shows the distribution of complaints with highest densities in the center and southeast of the County (FracTracker, 2017).

Figure 4.3.14-3 Map of natural gas leak complaints in Pennsylvania (FracTracker, 2004-2016)



4.3.14.4. Future Occurrence

The likelihood of an emergency at a natural gas drilling site in Lycoming County cannot be determined at this time, as there is little historical data to analyze. However, the likelihood of an incident within the County is expected to increase as the number of well sites continues to climb.

Future emergencies will occur at well sites as well as along the natural gas transportation network. As drilling activities have increased, I-180 and US-220 have experienced increased truck traffic due to the natural gas industry. As more permits are issued, this traffic will increase further. Also, the County will face an increased risk of pipeline emergencies as the related infrastructure is put in place.

Numerous studies have examined the ramifications (primarily the significant impact fracking has on water quality) of drilling for natural gas in a region (the entirety of the Marcellus Shale) that acts as the water supply for over 22 million (Evans and Kiesecker, 2014). The increase of natural gas drilling in Lycoming County not only implies the increased risk of an incident (that can include a chemical release, a fire, and/or an explosion), but also increased development and deforestation, both which result in more stress on the existing (transportation)

infrastructure and impervious surface. The implications of the increased use of the transportation infrastructure are rather straightforward. The natural gas drilling process requires 2,300 to 4,000 truck trips per well (Cassidy, 2014), so that not only are there more trucks on the roads, but they are using roads often designed for heavy use. Increased use of the roads by heavy trucks can increase the wear-and-tear on the roads (which were, in most cases, not designed for that type of traffic) and subsequently increase the likelihood of traffic accidents.

Careful consideration of which roads are actually suitable for heavy, industrial use and improved safety measures (including more traffic signals and officers, or a planned trucking schedule) could help reduce traffic accidents and infrastructure degradation (Cassidy, 2014). Additionally, the industry could take responsibility for improving maintenance of the infrastructure and scheduling of their traffic so as to keep heavy truck flow to certain hours and thereby minimize accidents.

Impervious surfaces can increase the risk of flooding (as rain or run-off can no longer readily seep into the ground) and can prove exceedingly detrimental to maintaining a balanced ecosystem. Estimates vary slightly (based on location, technology, etc.), but the average footprint of a well pad is 1.3 hectares and the associated infrastructure is 10.3 hectares (Evans and Kiesecker, 2014; Environment America, 2013). If the indirect impacts are considered as well, this then the total land disturbance, and impact on the permeability of the ground, is 20.2 hectares (or about 50 acres) (Evans and Kiesecker, 2014). If this unit is applied to the number of new wells in the past five years in Lycoming County, then about 14,766 hectares (57 square miles), roughly 4% of the total area of the County, may have been disturbed by or converted to a fracking use.

The land that is affected by the natural gas industry is predominantly forested, so not only is there significant deforestation, but this deforestation means that 4% of the County has become impervious within 5 years due to the natural gas industry. If this trend continues, and the natural gas industry continues to expand, then not only will the likelihood of a natural gas incident increase, but transportation infrastructure accidents and flooding will become greater hazards as well. When planning for future development, there are several measures the County could take to help mitigate the impacts of natural gas drilling on transportation infrastructure and impervious surfaces.

If continued investment and development in the natural gas industry is inevitable, then the County could regulate new well pads siting locations. The design and process of a shale, horizontal well, is such that the placement of the well pad is much more flexible (as there are multiple lateral wells that extend to a greater area), and the siting has the ability to take impacts to natural habitats into account. In determining more ecologically appropriate locations that reduce potential runoff, the County could require a setback from streams and wetlands, as well as avoidance of development on areas with a steep slope. Additionally,

greater care and oversight could be taken to balance future well development with watershed needs and conservation goals.

On the whole, the probability of future natural gas drilling incident events can be considered *likely* according to the Risk Factor Methodology (see Table 4.4.2-1).

4.3.14.5. Vulnerability Assessment

Vulnerability to oil and gas well incidents is defined as being located within 1,000 yards of an unconventional oil or gas well. This buffer is what DEP uses as its "zone of culpability" for oil and gas well incidents. While explosions or other catastrophic incidents at an oil or gas well could cause property damage, of primary concern is the population living near these wells. Table 4.3.14-4 enumerates the populations living within 1,000 yards of an unconventional oil and gas well. This was calculated by intersecting the 2010 Census Block centroids with the zone of culpability as defined by DEP. This analysis indicates that over three quarters of the population of Cascade Township, Cogan House Township, Gamble Township, Penn Township, Shrewsbury Township, and Upper Fairfield Township are vulnerable to experiencing the impacts of an unconventional oil or gas well incident.

Table 4.3.14-4 Populations Vulnerable to Natural Gas Drilling Incidents.

MUNICIPALITY	TOTAL 2010 POPULATION	2010 POPULATION WITHIN 1,000 YARDS OF UNCONVENTIONAL OIL/GAS WELL*	PERCENT POPULATION WITHIN 1,000 YARDS OF UNCONVENTIONAL OIL/GAS WELL
Anthony Township	865	108	12%
Armstrong Township	681	0	0%
Bastress Township	546	0	0%
Brady Township	521	0	0%
Brown Township	96	0	0%
Cascade Township	413	117	28%
Clinton Township	3,682	0	0%
Cogan House Township	955	503	53%
Cummings Township	273	72	26%
Duboistown Borough	1,205	0	0%
Eldred Township	2,122	1,025	48%
Fairfield Township	2,791	664	24%
Franklin Township	933	277	30%
Gamble Township	756	419	55%

Table 4.3.14-4 Populations Vulnerable to Natural Gas Drilling Incidents.			
MUNICIPALITY	TOTAL 2010 POPULATION	2010 POPULATION WITHIN 1,000 YARDS OF UNCONVENTIONAL OIL/GAS WELL*	PERCENT POPULATION WITHIN 1,000 YARDS OF UNCONVENTIONAL OIL/GAS WELL
Hepburn Township	2,799	723	26%
Hughesville Borough	2,128	0	0%
Jackson Township	396	315	80%
Jersey Shore Borough	4,361	0	0%
Jordan Township	863	404	47%
Lewis Township	950	205	22%
Limestone Township	2019	0	0%
Loyalsock Township	11,026	223	2%
Lycoming Township	1,478	425	29%
McHenry Township	143	87	61%
McIntyre Township	520	4	1%
McNett Township	174	151	87%
Mifflin Township	1,070	170	16%
Mill Creek Township	604	7	1%
Montgomery Borough	1,605	0	0%
Montoursville Borough	4,616	0	0%
Moreland Township	943	323	34%
Muncy Borough	2,477	0	0%
Muncy Creek Township	3,474	0	0%
Muncy Township	1,089	0	0%
Nippenose Township	709	0	0%
Old Lycoming Township	4,935	180	4%
Penn Township	960	692	72%
Piatt Township	1,184	0	0%
Picture Rocks Borough	678	0	0%
Pine Township	294	60	20%
Plunketts Creek Township	684	10	1%

Table 4.3.14-4 Populations Vulnerable to Natural Gas Drilling Incidents.			
MUNICIPALITY	TOTAL 2010 POPULATION	2010 POPULATION WITHIN 1,000 YARDS OF UNCONVENTIONAL OIL/GAS WELL*	PERCENT POPULATION WITHIN 1,000 YARDS OF UNCONVENTIONAL OIL/GAS WELL
Porter Township	1,601	0	0%
Salladasburg Borough	238	0	0%
Shrewsbury Township	409	292	71%
South Williamsport Borough	6,379	0	0%
Susquehanna Township	1,000	0	0%
Upper Fairfield Township	1,823	1,388	76%
Washington Township	1,619	0	0%
Watson Township	537	267	50%
Williamsport, City of	29,381	0	0%
Wolf Township	2,907	26	1%
Woodward Township	2,199	0	0%
Lycoming County Total	**116,111**	**9,137**	**8%**

4.3.15. Levee Failure

4.3.15.1. Location and Extent

A levee is a man-made structure, often 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. When levees fail, floodwaters can rapidly flood streets and properties and trap people in buildings and cars. Levee failure has the potential to cause loss of life, property damage, and additional economic impacts through damage to infrastructure or agriculture.

According to the USACE National Levee Database (NLD), there are five major levee systems in Lycoming County, excluding spoil levees and systems less than 0.1 miles in length (Table 4.3.15-1). Four of these systems are located in the greater Williamsport area along the West Branch Susquehanna and its tributaries, and one is located in the community of Ralston along Lycoming Creek. 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 4.3.15-1 shows the entity responsible for constructing, operating, and maintaining the major levee systems in Lycoming County. Of the County's 14 miles of levee systems, 13.7 miles are located in the greater Williamsport area, and 12.6 miles are part of the Williamsport-South Williamsport flood risk project. The Williamsport-South Williamsport project consists of the Northeast Williamsport, Northwest Williamsport, and South Williamsport levee systems and was designed as a comprehensive project for the Borough of South Williamsport, City of Williamsport, and contiguous communities. Today this project also supports the Susquehanna River Walk, a four-mile paved trail that opened in 2009 and was built on top of the Northeast Williamsport and South Williamsport levee systems. Figure 4.3.15-1 shows the location of the Williamsport levees and levee-impacted areas.

Table 4.3.15-1 Levee and Floodwall Information for Lycoming County (USACE, 2020)

LEVEE SYSTEM NAME	SPONSOR	LENGTH (MI)	USACE REHABILITATION STATUS*	AUTHORIZATION CATEGORY
Bull Run	Township of Loyalsock	1.1	Active	PA DEP constructed, turned over to public sponsor operations and maintenance.
Northeast Williamsport**	City of Williamsport	4.0	Active	USACE Federally constructed, turned over to public sponsor operations and maintenance
Northwest Williamsport**	City of Williamsport	6.3	Active	USACE Federally constructed, turned over to public sponsor operations and maintenance.
South Williamsport**	Borough of South Williamsport	2.3	Active	USACE Federally constructed, turned over to public sponsor operations and maintenance.

Table 4.3.15-1 Levee and Floodwall Information for Lycoming County (USACE, 2020)

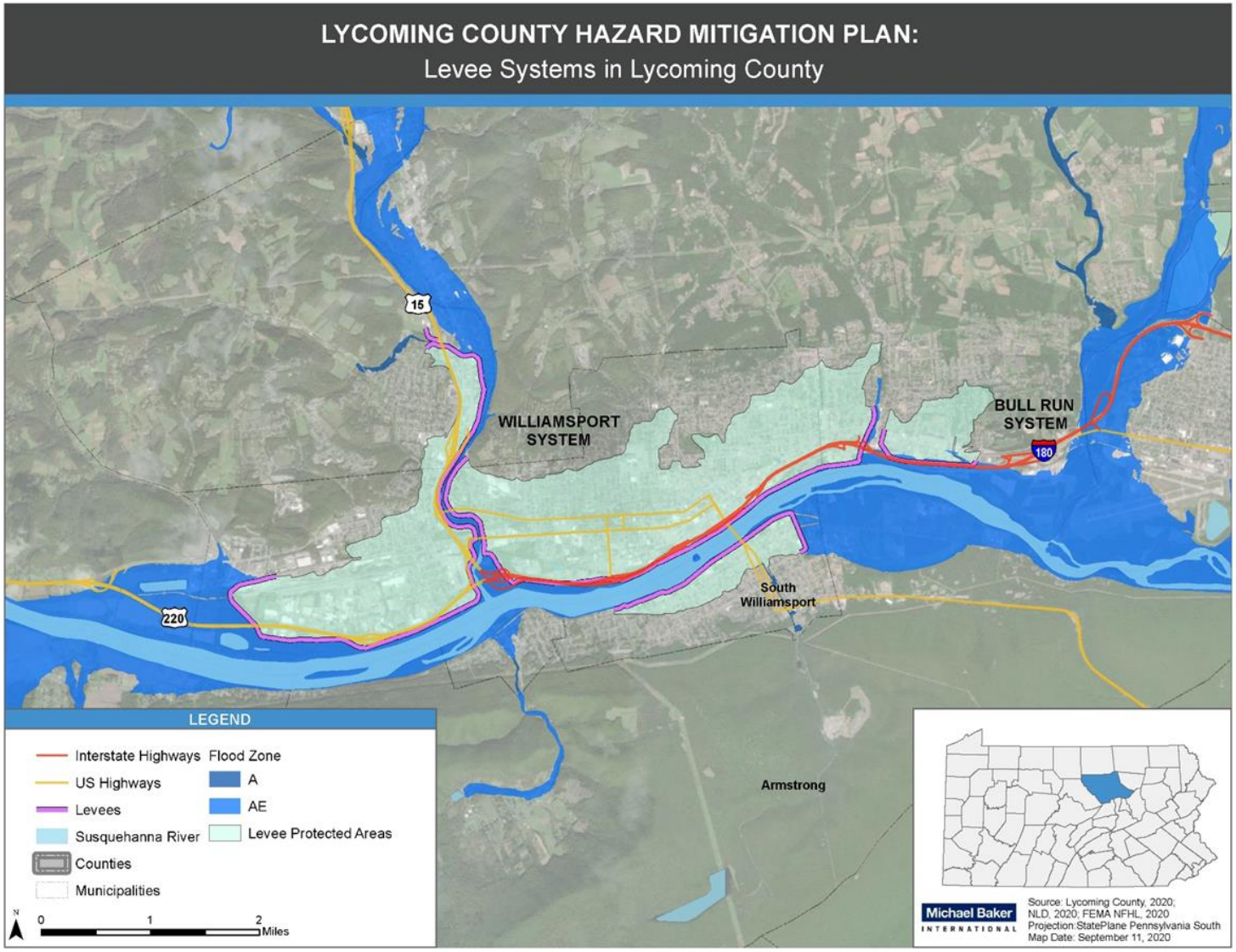
LEVEE SYSTEM NAME	SPONSOR	LENGTH (MI)	USACE REHABILITATION STATUS*	AUTHORIZATION CATEGORY
Ralston	McIntyre Township	0.3	Not Enrolled	Non-Federal Levee, Locally Operated and Maintained

**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. Participation in the Rehabilitation Program can happen in two ways. Federal levees are eligible after their construction, once the levee sponsor takes responsibility for operation and maintenance. Non-federal levees that are owned, operated, and maintained by public entities (not private levees) may participate in the program if they meet eligibility requirements.*

***Part of the Williamsport-South Williamsport Flood Risk Project*

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 Lycoming County became effective in June 2016 and show flood hazards in levee-impacted areas based on the best available data at that time

Figure 4.3.15-1 Levee Locations and Impact Areas in Lycoming County



4.3.15.2. Range of Magnitude

Areas landward of levee systems can experience flooding due to overtopping, interior drainage, back-ending, or breaches. Overtopping occurs when the flood height is higher than the levee crest; interior drainage flooding occurs when stormwater runoff collects in low-lying areas; back-ending occurs when water flows around the back of the levee outside of the edge of the levee system; and breaches occur when the volume or pressure from the water (or in some cases water seepage under the levee from piping or leakage) cause a levee reach to collapse.

The magnitude of the risk posed by levee failure depends on the flood hazard in an area, the design of the levee system, the structural condition of the levee system, and the amount of development landward of the levee system. In some instances, the flooding that occurs after a levee fails is worse than the flooding that would have occurred without a levee. Abrupt failure can release a flood wave that results in catastrophic loss. The City of Williamsport and Lycoming County are pursuing extensive repairs to the Williamsport-South Williamsport flood risk project to reduce the risk of levee failure in the downtown business district.

If a levee is tall enough, strong enough, and properly maintained and operated, it can be "accredited" by FEMA as reducing the risk from the 1-percent-annual-chance flood, and the levee-impacted area can be shown on FEMA flood maps as an area with reduced risk. While the federal requirement to purchase flood insurance does not apply in these areas, homes and businesses in areas mapped as "reduced risk due to levee" can still be flooded if the levee fails. It is critical that property owners understand their risk and take the appropriate steps to mitigate it.

4.3.15.3. Past Occurrence

The Williamsport-South Williamsport flood risk project was built after severe damage caused by the great flood of 1936. In 1955, the US Army Corps of Engineers estimated that Williamsport sustained $10.5 million in property damage from the 1936 flood, which is equivalent to nearly $100 million in 2020 dollars. The Bull Run levee was built following flooding associated with Tropical Storm Agnes in 1972.

4.3.15.4. Future Occurrence

Levee failure is influenced by the frequency and severity of flood events, and by levee operation and maintenance. As climate change brings more frequent heavy rains to the region, the probability of future levee failures is expected to increase. The typical design life of a levee is 50 years, and maintenance becomes more important as a levee ages. According to the NLD, the average levee age in Lycoming County is 65 years. In the absence of maintenance and repair, aging infrastructure could further increase the probability of future levee failures. Despite this increasing trend, the probability of future levee failures can be considered *unlikely* according to the Risk Factor Methodology (See Table 4.4.1-1).

4.3.15.5. Vulnerability Assessment

The 2018 Lycoming County Comprehensive Plan highlighted levee failure as "the single greatest threat to maintaining and pursuing economic resilience" for the municipalities in the greater Williamsport area. According to the plan, the Williamsport-South Williamsport flood risk project protects 40 percent of the $2.7 billion in real estate in the City of Williamsport, Old Lycoming Township, South Williamsport, and Loyalsock Township. The Plan notes that this includes not only residential properties, but commercial, industrial, and government properties as well. The area landward of the Bull Run levee system is also an economic driver for the greater Williamsport area and is known as the Golden Strip. The area landward of the 0.3-mile Ralston levee system in McIntyre Township is a residential area.

0.0.0.0.•••• shows the structures and critical facilities landward of Lycoming County levee systems that would be vulnerable to levee failure in the event of a 1-percent-annual-chance flood, and 0.0.0.0.•••• shows the property types within these levee-impacted areas. While it is unlikely that a levee failure event would flood every structure located in the levee-impacted areas at once, these tables show that a fairly large share of structures are at risk in the municipalities within the greater Williamsport area, including thousands of commercial and residential structures and nearly 200 industrial structures. Note that even more structures could be affected by a flood event larger than the 1-percent-annual-chance flood.

Table 4.3.15-2 Structures and Critical Facilities Vulnerable to Levee Failure.						
MUNICIPALITY	TOTAL STRUCTURES	TOTAL STRUCTURES VULNERABLE TO LEVEE FAILURE	PERCENT STRUCTURES VULNERABLE TO LEVEE FAILURE	TOTAL CRITICAL FACILITIES	CRITICAL FACILITIES VULNERABLE TO LEVEE FAILURE	PERCENT CRITICAL FACILITIES VULNERABLE TO LEVEE FAILURE
Loyalsock Township	5,426	1,094	20%	38	5	13%
McIntyre Township	434	30	7%	4	0	0%
Old Lycoming Township	3,106	409	13%	15	5	33%
South Williamsport Borough	2,898	925	32%	18	11	61%
Williamsport, City of	12,245	8,794	72%	10	79	79%
Lycoming County Total	**25,605**	**11,255**	**44%**	**96**	**100**	**54%**

Table 4.3.15-3 Structures Vulnerable to Levee Failure by Generalized Property Type.								
MUNICIPALITY	TOTAL STRUCTURES	AGRICULTURE	COMMERCIAL	INDUSTRIAL	OTHER	RESIDENTIAL	UNKNOWN	TOTAL VULNERABLE STRUCTURES
Loyalsock Township	5,426	0	243	14	7	828	2	1,094
McIntyre Township	434	0	0	0	0	30	0	30
Old Lycoming Township	3,106	0	186	6	13	204	0	409
South Williamsport Borough	2,898	0	197	19	10	695	4	925

Table 4.3.15-3 Structures Vulnerable to Levee Failure by Generalized Property Type.								
MUNICIPALITY	TOTAL STRUCTURES	AGRICULTURE	COMMERCIAL	INDUSTRIAL	OTHER	RESIDENTIAL	UNKNOWN	TOTAL VULNERABLE STRUCTURES
Williamsport, City of	12,245	1	2,038	121	187	6,430	17	8,794
Lycoming County Total	24,109	1	2,664	160	217	8,187	23	11,252

4.3.16. Nuclear Incident

4.3.16.1. 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 effect (US EPA, 2020b).

Following the accident at the Three Mile Island Nuclear Generating Station in 1979, the Nuclear Regulatory Commission (NRC) reexamined the role of emergency planning for protection of the public in the vicinity of nuclear power plants. The NRC issued regulations requiring that before a plant could be licensed to operate, the NRC must have "reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency." The regulations set forth 16 emergency planning standards and define the responsibilities of the licensee, and the state and local organizations involved in emergency response. The added feature of emergency planning to the NRC's "defense-in-depth" philosophy provides that, even in the unlikely event of a release of radioactive materials to the environment, there is reasonable assurance that actions can be taken to protect the population around nuclear power plants.

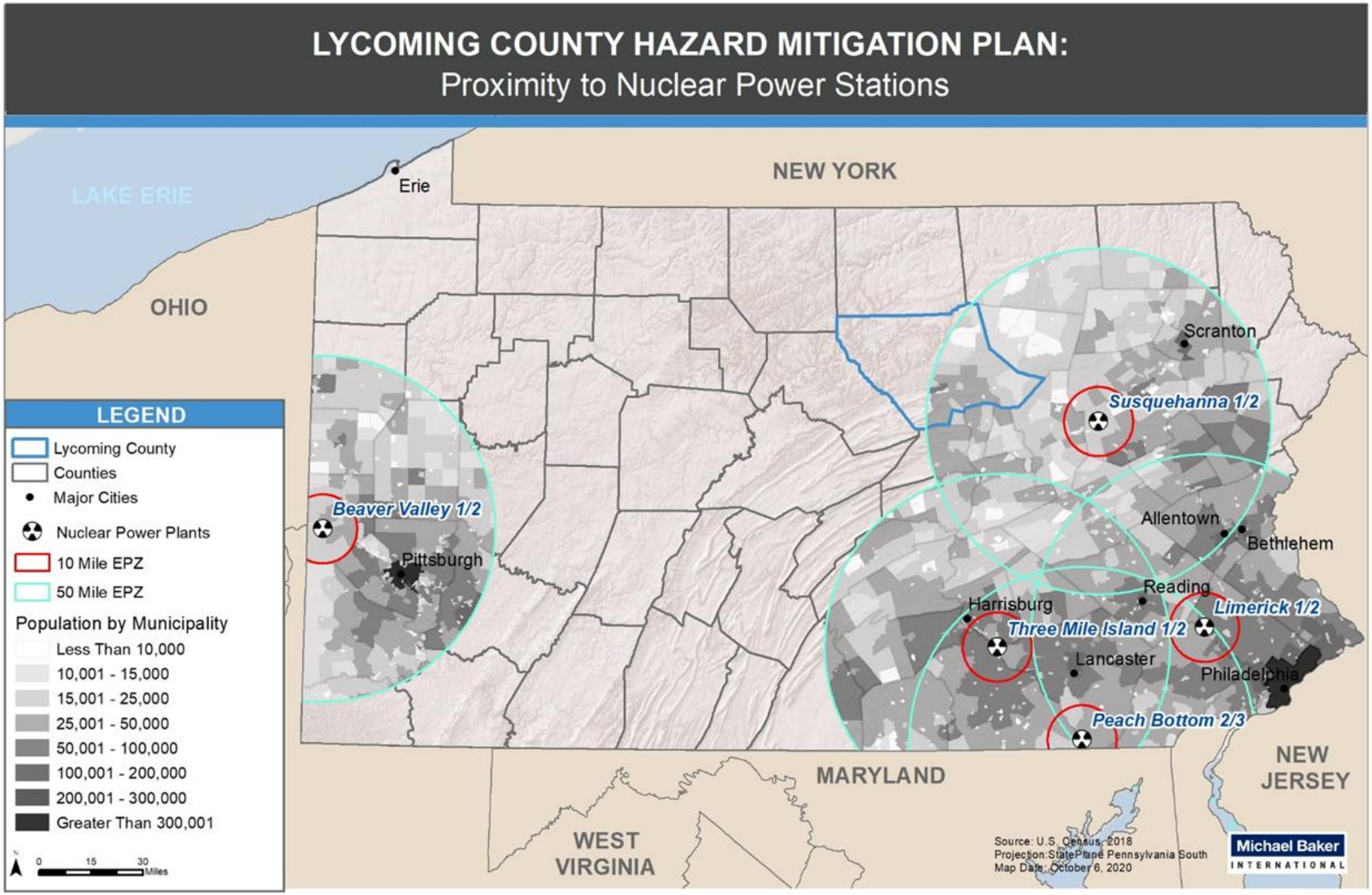
Through a Memorandum of Understanding (MOU), the NRC and FEMA share federal oversight for nuclear/radiological emergency response planning matters for licensed nuclear power plants. Their mutual efforts will be directed toward more effective plans and related preparedness measures at and in the vicinity of nuclear reactors and fuel cycle facilities. The MOU between the agencies was signed on January 14, 1980, in response to the president's decision of December 7, 1979, stating that FEMA will coordinate all federal planning for the off-site impact of nuclear/radiological emergencies; take the lead for assessing off-site nuclear/radiological emergency response plans and preparedness; make findings and determinations as to the adequacy and capability of implementing off-site plans; and communicate those findings and determinations to the NRC. The NRC reviews those FEMA findings and determinations, in conjunction with the NRC's on-site findings, to determine the overall state of emergency preparedness. A separate MOU, dated October 22, 1980, deals with NRC and FEMA cooperation and responsibilities in response to an actual or potential nuclear/radiological emergency. Operations Response Procedures have been developed that implement the provisions of the Incident Response MOU. These documents are intended to be consistent with the Federal Radiological Emergency Response Plan, which describes the relationships, roles, and responsibilities of federal agencies for responding to accidents involving peacetime nuclear/radiological emergencies.

The 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.

Portions of Lycoming County, including the City of Williamsport, fall within the Ingestion Exposure Pathway EPZ (within 50 miles) of the Susquehanna Steam Electric Station (SSES) in Luzerne County. This EPZ covers a radius around the plant that may receive some contamination in very small amounts in the event of a radioactive release. Thousands of County residents reside within this zone. The other four nuclear plants in Pennsylvania are more than 50 miles away from Lycoming County; this distance exceeds the Plume Exposure and Ingestion Exposure Pathway EPZs for radiological emergencies, so these other facilities are considered a minimal threat to the County. However, in the event of an emergency, evacuees from distant EPZs may seek shelter in Lycoming County. Figure 4.3.16-1 illustrates the location of the nuclear facilities in the Commonwealth and their associated plume and ingestion areas.

Figure 4.3.16-1 Location of Lycoming County in relation to Pennsylvania nuclear power stations, their Emergency Planning Zones (EPZs), and the population density of affected municipalities



4.3.16.2. Range of Magnitude

Nuclear accidents themselves are classified 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 damaged 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 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.

The Ingestion Exposure Pathway 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, 2020b). Lycoming County can expect some radioactive contamination in very small amounts in the case of a nuclear incident at the SSES in Luzerne County. 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. The Nuclear Regulatory Commission uses four classification levels for nuclear incidents (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 (PAGs).

- 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 PAGs, 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 PAGs for more than the immediate site area.

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

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 the incident, equipment malfunctions, design-related problems, and worker errors led to a partial meltdown of the TMI Unit 2 reactor core at TMI (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 (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 a number of 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.

4.3.16.3. Past Occurrence

There have been no failures at the Susquehanna Steam Electric Station in Luzerne County 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" (Tokuhata, 1980).

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 1979 continue 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 a tsunami that was generated by the earthquake. The flooding caused the failure of multiple generators meant to keep the systems operating safety 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 occurrence of certain cancers following the radiation exposure from the plans (WNA, 2020).

Following this incident, the United States NRC 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.

4.3.16.4. 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). Nuclear incident occurrences may also occur as a result of intentional actions; these acts are addressed under Section 4.3.17: Terrorism.

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* emergencies occur less frequently. For example, in 1997, there were 40 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 Lycoming County can be considered *unlikely* as defined by the Risk Factor methodology probability criteria (see Table 4.4.1-1).

4.3.16.5. Vulnerability Assessment

Thirty-seven municipalities in Lycoming County are located within the 50-mile Ingestion Exposure Pathway EPZ of the Susquehanna Steam Electric Station. These are shown in Figure 4.3.16-1. About half of the County is vulnerable to the contamination effects possible in a nuclear incident.

Table 4.3.16-1 Municipalities located within the 50-mile Ingestion Exposure Pathway EPZ of the Susquehanna Steam Electric Station

Armstrong Township	Lewis Township	Old Lycoming Township
Bastress Township	Limestone Township	Penn Township
Brady Township	Loyalsock Township	Picture Rock Borough
Cascade Township	Lycoming Township	Plunketts Creek Township
Clinton Township	McIntyre Township	Shrewsbury Township
Duboistown Borough	McNett Township	South Williamsport Borough
Eldred Township	Mill Creek Township	Susquehanna Township
Fairfield Township	Montgomery Borough	Upper Fairfield Township
Franklin Township	Montoursville Borough	Washington Township
Gamble Township	Moreland Township	City of Williamsport
Hepburn Township	Muncy Creek Township	Wolf Township
Hughesville Borough	Muncy Borough	
Jordan Township	Muncy Township	

The health effects reported from the psychological stress of individuals living in the immediate area will strain stress management and disaster psychology resources to the limit. Radionuclide ingestion by domesticated farm animals could force agricultural product embargos, placing severe strain on the economy. Radiological particulate contamination of the environment could impact natural resources; disrupt service delivery; and cause work cessation and evacuations. Other response measures that result from the event could damage the local economy. In the event of a release, national-level repercussions may produce anti-nuclear activism, widespread concern over public health, and a moratorium on new or renewed nuclear facilities around the nation.

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, 186,130 acres of farmland held in the County's 1,043 farms are vulnerable to radiological contamination in a nuclear incident. In 2017, the market value of all agricultural products of these farms exceeded $63 million (USDA, 2017).

Water contamination is also a concern in nuclear incidents. There are several public water suppliers that operate in Lycoming County or provide water to municipalities. Suppliers include the Lycoming County Water and Sewer Authority, Montgomery Water Authority, Muncy Borough Municipal Authority, Muncy State Correctional Institution, Williamsport Municipal Water Authority, Pennsylvania American, Jersey Shore Area Joint Water Authority, Hughesville Borough Water Authority, Limestone Township Water Authority, Montoursville

Water Authority, Ralston Area Joint Authority, Roaring Branch Waterworks, and Waterville Water Association.

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, however. 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 powdered 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 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.

4.3.17. Terrorism

4.3.17.1. Location and Extent

Following several serious international and domestic terrorist incidents during the 1990s and early 2000s, citizens across the United States paid increased attention to the potential for deliberate, harmful actions of individuals or groups. The term "terrorism" refers to intentional, criminal, malicious acts, but the functional definition of terrorism can be interpreted in many ways. Officially, terrorism is defined in the Code of Federal Regulations as "the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives" (28 CFR §0.85). Terrorist actions can occur as a result of a group, or due to a lone wolf or lone-actor terrorist. A lone-actor terrorist is someone who prepares and commits violent acts alone, outside of any command structure or without material assistance from any group. They may be influenced or motivated by the ideology and beliefs of an external group and may act in support of such group (US DHS, 2013).

The Federal Bureau of Investigation (FBI) characterizes terrorism as either domestic or international, depending on the origin, base, and objectives of the terrorist organization. However, the origin of the terrorist or person causing the hazard is far less relevant to mitigation planning than the hazard itself and its consequences.

Terrorism can refer to the use of weapons of mass destruction (WMD), including, biological, chemical, nuclear, and radiological weapons; arson, incendiary, explosive, and armed attacks; industrial sabotage and intentional hazardous materials releases; and "cyber-terrorism." Within these general categories, however, there are many variations. Particularly in the area of biological and chemical weapons, there is a wide variety of agents and ways for them to be disseminated.

Terrorism can take many forms:

- Agriterrorism,
- Arson/incendiary attack,
- Armed attack,
- Biological agent,
- Chemical agent,
- Cyberterrorism,
- Conventional bomb,
- Intentional hazardous materials or radiological releases, or
- Nuclear bombs.

The severity of terrorist incidents depends upon the type of method used, the proximity of the device to people, animals, or other assets, and the duration of exposure to the incident or device. For example, chemical agents are poisonous gases, liquids, or solids that have toxic effects on people, animals, or plants. Many chemical agents can cause serious injuries or death. Severity of injuries depends on the type and amount of the chemical agent used and the duration of exposure. Biological agents are organisms or toxins that have illness-producing effects on people, livestock, and crops. Because some biological agents cannot be easily detected and may take time to develop, it is difficult to know that a biological attack has occurred until victims display symptoms. In other cases, the effects are immediate. Those affected by a biological agent require the immediate attention of professional medical personnel. Some agents are contagious, and victims may need to be quarantined.

4.3.17.2. Range and Magnitude

The types of terrorist activity with the most relevance to Lycoming County include agriterrorism, intentional hazardous materials releases, and bomb threats. Agriterrorism is direct, intentional, generally covert contamination of food supplies or introduction of pests and/or disease agents to crops, livestock, or forestland. Lycoming County is semi-rural with the majority of its land area dedicated to forests. The County also has a number of SARA Title III facilities and major transportation routes that traverse the County, making intentional

hazardous materials release a potential threat to citizens and the environment. Bomb threats represent a simple way to disrupt activities at critical infrastructure facilities, major events, financial institutions, and schools.

Lycoming County has a long, storied history with the Little League World Series (LLWS) making it an inviting terrorist target. Despite no reported incidents of terrorism in this County, these events can occur in any location. The LLWS is a well-attended and publicized event with a single game attendance record of 45,000 spectators. A terrorist attack, such as the detonation of a vehicle-borne improvised explosive device, may cause hundreds and/or thousands of injuries and/or deaths. First responder services (such as EMS, fire, and police) may be delayed for an indefinite period of time due to ingress and egress challenges, resource availability and capabilities, emergency response coordination, and communication challenges. The willingness of terrorists to attack a family-oriented event will cause worldwide psychosocial and political ramifications. Lycoming County could suffer long-term economic consequences due to decreased attendance. Annually, the LLWS injects nearly $20 million in revenue into the local economy. The hospitality industry – lodging, restaurants, transportation, and fuel services – will experience negative economic effects resulting from a terror event.

4.3.17.3. Past Occurrence

The only terrorist events experienced by Lycoming County were bomb threats. Since 2012, there have been no bomb threats reported to PEMA and recorded in the PEMA Knowledge Center database (PEMA-KC). Cascade Township has reported a recent rise in bomb threats to their school.

4.3.17.4. Future Occurrence

The probability of terrorism occurring cannot be quantified with as great a level of accuracy as that of many natural hazards. Furthermore, these incidents generally occur at a specific location, such as a government building, rather than encompassing an area such as a floodplain. Thus, planning should be asset-specific, identifying potentially at-risk critical facilities and systems in the community. Once a comprehensive list of critical assets has been developed, it should be prioritized so that efforts can be directed to protect the most important assets first. Then, beginning with the highest-priority assets, the vulnerabilities of each facility or system to each type of hazard should be assessed.

For the purpose of developing a realistic prioritization of terrorism hazard mitigation projects, three elements should be considered in concert:

- Relative importance of the various facilities and systems in the asset inventory
- Vulnerabilities of those facilities
- Threats that are known to exist

Critical assets and infrastructures are systems whose incapacity or destruction would have a debilitating effect on the county:

- Government services
- Emergency services
- Water supply systems
- Transportation networks
- Telecommunications infrastructure
- Electrical power systems
- Gas and oil facilities

Lycoming County has many notable local landmarks and one major landmark of national significance: the site of the Little League World Series. The site has international significance, notably to children involved in Little League. In 2003, over 330,000 people visited the site during the 10-day Little League World Series. The symbolism of the site and the vulnerability of its users make it a possible target for future terrorist activity. Each year, federal, state, and local law enforcement and intelligence agencies collaborate to ensure that the site remains safe from terrorist attacks.

Additionally, the Marcellus Shale natural gas drilling industry includes many gas well sites within Lycoming County. Any of these sites could be a potential target for terrorism, especially by groups opposing the petroleum industry or natural conservation groups (e.g., the Earth Liberation Front, or ELF). On the whole, though, the probability of future terrorism events can be considered unlikely according to the Risk Factor Methodology.

4.3.17.5. Vulnerability

With the exception of the Little League World Series site and Marcellus Shale gas drilling sites described above, Lycoming County does not have facilities, buildings, or landmarks of national importance that are more likely to be terrorism targets than other areas in the United States. Notable County landmarks are of a local historical interest. Of greater concern to the community may be agriterrorism and intentional hazardous material releases. Intentional hazardous material releases are possible at the SARA Title III facilities found throughout the County and along the major transportation routes that traverse the County. These releases would affect population centers as well as water supply areas.

All critical infrastructure is vulnerable to acts of terrorism, especially those acts committed by local groups that know the communities' dependence on that infrastructure. Each critical facility must be individually assessed for its vulnerability to a terrorist or criminal event. The following checklist provides guidance on areas for examination in determining a facility's vulnerability to attack

Inherent vulnerability:

- Visibility – How aware is the public of the existence of the facility?
- Utility – How valuable might the place be in meeting the objectives of a potential terrorist?

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

Tactical vulnerability:

Site Perimeter

- Site planning and Landscape Design – Is the facility designed with security in mind – both site-specific and with regard to adjacent land uses?
- Parking Security – Are vehicle access and parking managed in a way that separates vehicles and structures?

Building Envelope

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

Facility Interior

- Architectural and Interior Space Planning – Does security screening cover all public and private areas?
- Mechanical Engineering – Are utilities and Heating, Ventilating and Air Conditioning (HVAC) systems protected and/or backed up with redundant systems?
- Electrical Engineering – Are emergency power and telecommunications available? Are alarm systems operational? Is lightning sufficient?
- Fire Protection Engineering – Are the building's water supply and fire suppression systems adequate, code-compliant and protected? Are on-site personnel trained appropriately? Are local first responders aware of the nature of the operations at the facility?
- Electronic and Organized Security – Are systems and personnel in place to monitor and protect the facility?

4.3.18. Transportation Incidents and Crashes

4.3.18.1. Location and Extent

For this analysis a transportation incident or crash is defined as an incident involving highway, air, and rail travel. Figure 4.3.18-1 shows the major highways, rail lines, and airports located throughout Lycoming County. U.S. Route 15 runs north/south, bisecting the County in the middle. Duboistown, South Williamsport, and Williamsport make up the area where three major roadways intersect: Interstate 180, U.S. Route 15, and U.S. Route 220. U.S. Route 15, which runs north/south from South Carolina into New York, is a major transportation corridor on the East Coast of the United States. Because of this, many commercial vehicles pass through the County on a daily basis.

Traffic and rail incidents can occur anywhere along their respective corridors in Lycoming County. Aviation incidents typically occur within 5 miles of take-off or landing but can occur countywide. Table 4.3.18-1 lists the different types of identified traffic and rail accidents.

Table 4.3.18-1 Identified Types of Traffic and Rail Incidents (PennDOT, 2018a; Federal Railroad Administration, 2020).

MODE	TYPE OF INCIDENT	DESCRIPTION
Traffic	Non-collision	A harmful event that does not involve a collision, such as a fire, explosion, or overturn.
	Angle	A crash in which two vehicles on opposite roadways collide at an intersection, driveway, or ramp.
	Rear-end	A crash in which vehicles traveling in the same direction on the same road collide.
	Head-on	A crash in which vehicles traveling in opposite directions on the same road collide.
	Sideswipe	A crash between two vehicles in which the sides of the vehicles engage.
	Hit fixed object	A collision in which a vehicle hits a stationary object on or adjacent to the roadway.
	Hit pedestrian	A collision between a motor vehicle and any person not in or upon the vehicle.
Rail	Derailment	An accident on a railway in which a train leaves the rails.
	Collision	An accident in which a train strikes something such as another train or highway motor vehicle.
	Other	Accidents caused by other circumstances like obstructions on rails, fire, or explosion.

Lycoming County is at high risk for traffic incidents and events of all degrees. Being an educational epicenter, home to several higher educational facilities makes the annual influx of drivers a fluid number rather than a fixed statistic. The Williamsport area has many attractions that also bring an increased number of drivers. The Little League World Series and Hall of

Fame bring in varying annual numbers of visitors from around the world. Figure 4.3.18-2 shows the traffic volume along major highways and roadways in Lycoming County.

Figure 4.3.18-1 Lycoming County's transportation network, including highways, rail, and aviation.

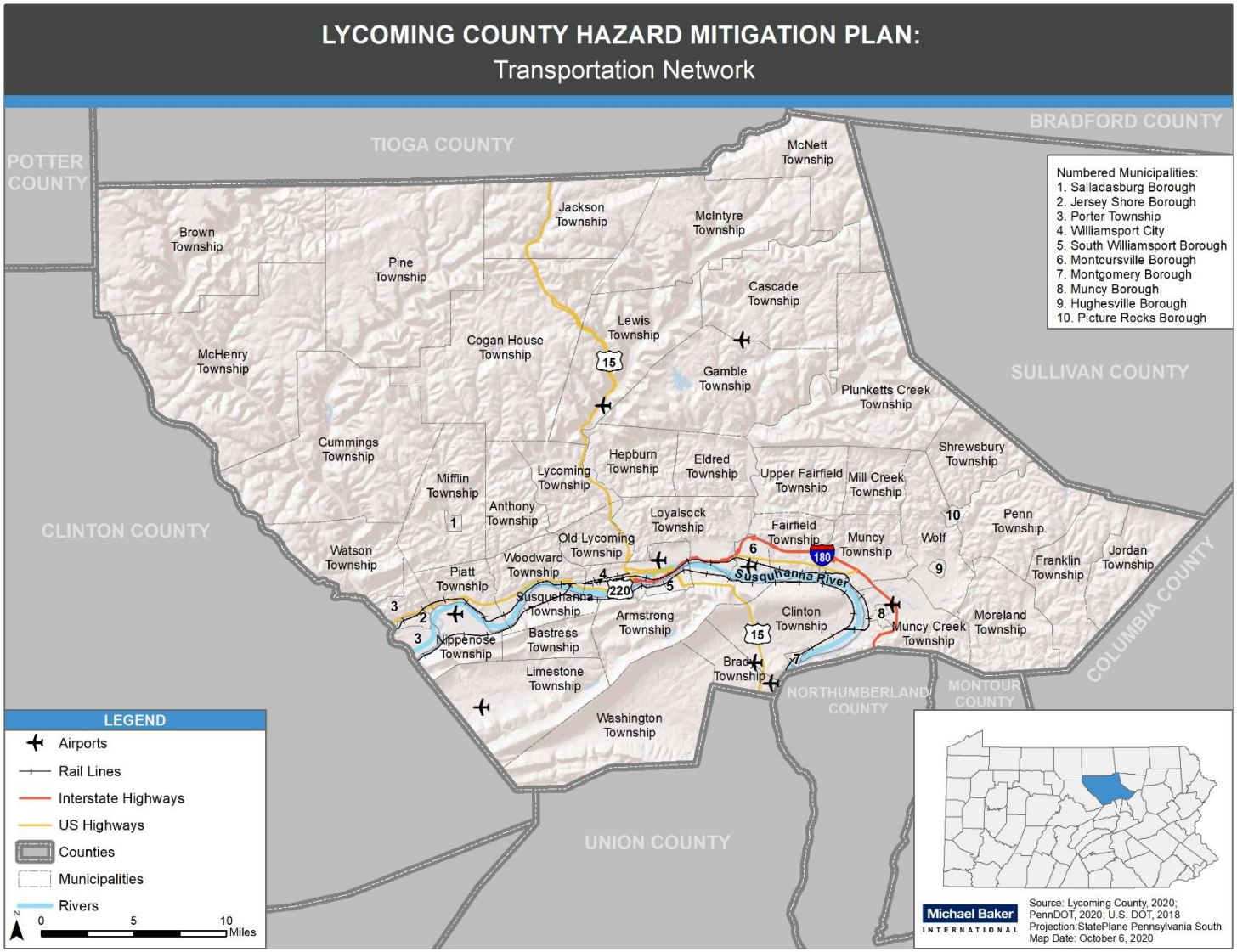


Figure 4.3.18-2 Traffic volume on state roads in Lycoming County.

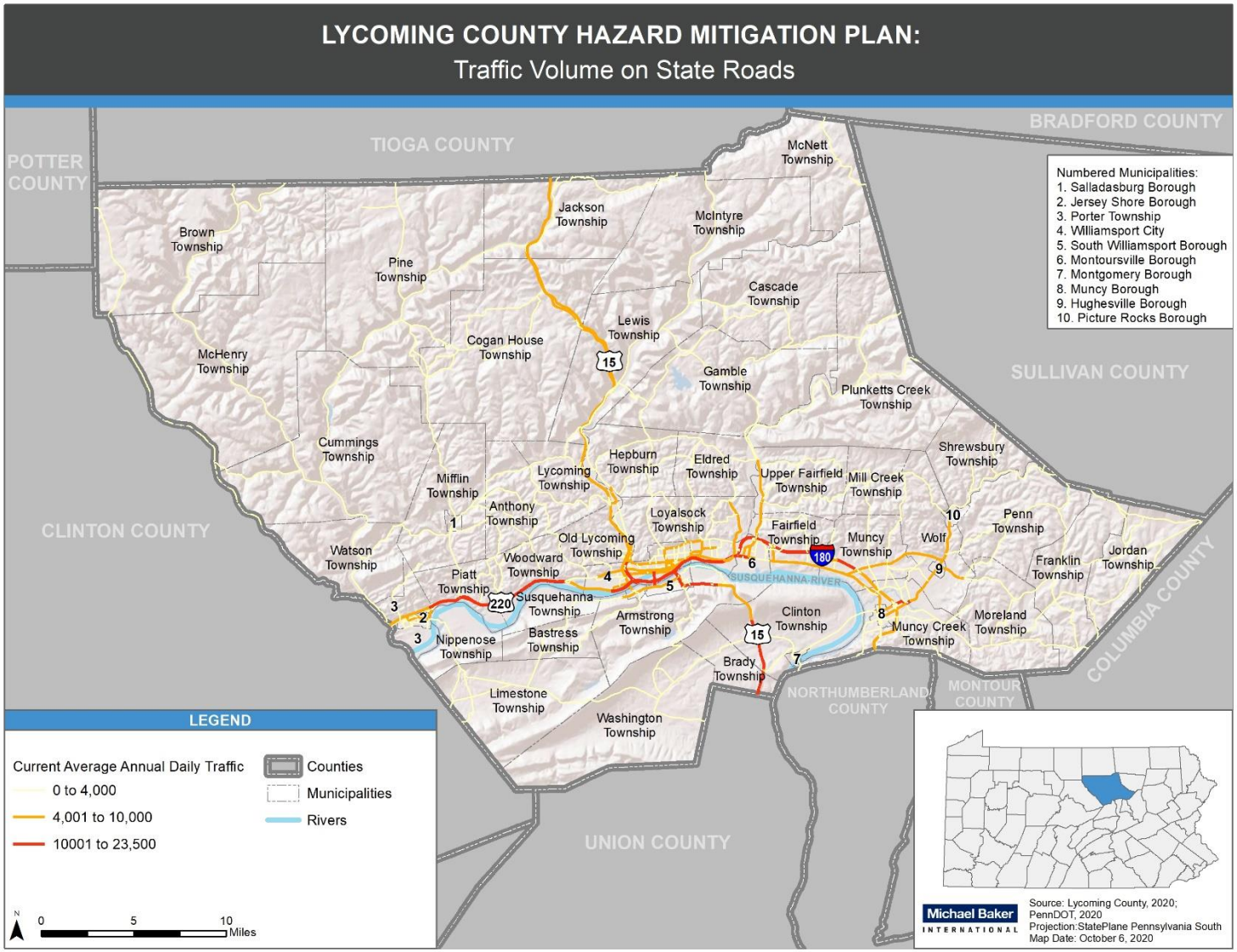


Figure 4.3.18-3 Lycoming County Transportation Incident Density (2015-2019)

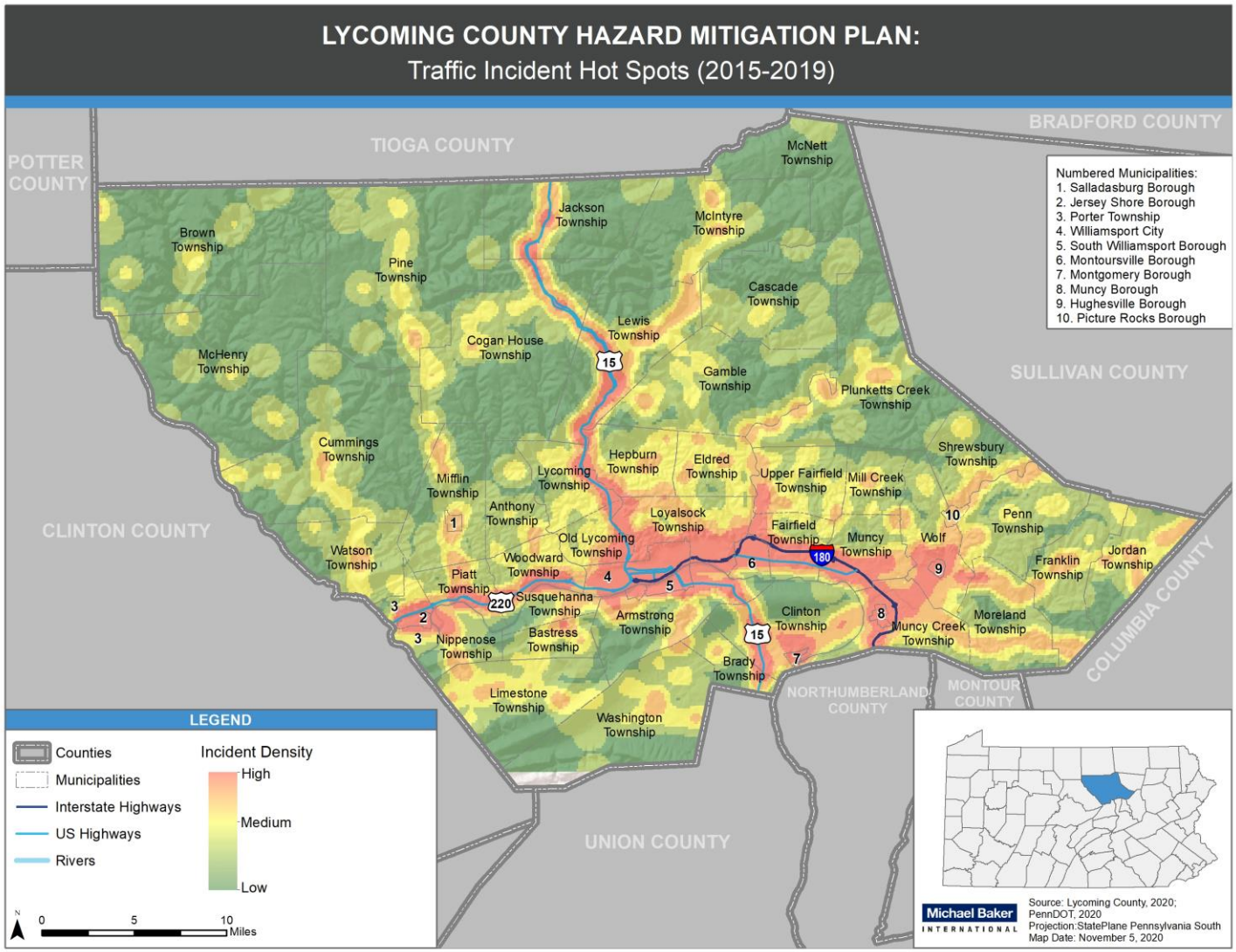


Figure 4.3.18-3 shows the density of vehicle crashes and incidents from 2015-2019 throughout Lycoming County. The highest concentration of incidents has occurred along state roads and highways, specifically Interstate 180, U.S. Route 15, and U.S. Route 220.

Transportation of hazardous materials on highways involves tanker trucks or trailers which are responsible for the greatest number of hazard material release incidents. There are over 120,000 miles of highway in the state and many of those are used to transport hazardous materials (PennDOT, 2018b). These roads also cross rivers and streams at many points and have the potential to pollute watersheds that serve as domestic water supplies for parts of the state.

Potential also exists for hazardous material releases to occur along rail lines as collisions and derailments of train cars can results in large spills. A number of severe rail events have reportedly occurred in Pennsylvania. The major rail line in Lycoming County runs along the Susquehanna River. Its lines lie in valleys next to stream beds, compounding the impact of rail-related releases and increasing the possibility of water contamination during a release.

Pipelines can also transport hazardous liquids and flammable substances such as natural gas. Incidents can occur when pipes corrode, when they are damaged during excavation, incorrectly operated, or damaged by other forces. There are approximately 35 miles of liquid pipeline and 266 miles of gas pipeline in Lycoming County (PA SHMP, 2018). In addition, hazardous materials can be transported by aircraft or by watercraft. Crashes, spills of materials, and fires on these vessels can pose a hazard.

4.3.18.2. Range of Magnitude

Traffic incidents and crashes are measured two ways. First, insurance companies look at the level of damage sustained to the vehicle. They identify them as undamaged, damage has occurred that is cost effective to repair, or the vehicle is considered a complete loss, as it would cost more to fix than it is currently worth. Secondly, deaths or injuries that have occurred as a result of the event must be considered. For the purpose of this community-oriented analysis, consideration of what damage has occurred to the motor vehicle is not included.

Significant passenger vehicle, air, and rail transportation accidents can result in a wide range of outcomes from damage solely to property to serious injury or death. The most serious transportation accidents include a release of hazardous material. As described in Section. 4.3.14, weather condition, micro-meteorological effect of buildings and terrain, and non-compliance with applicable codes can exacerbate these releases. Response time and quantity and type of material release also impact the severity of an accident.

Lycoming County is a hub of many major transportation routes and the City of Williamsport has become a base of intermodal transportation in the region. In the city, over 27,000 vehicles traverse the Market Street Bridge on a daily basis. An accident involving multiple vehicles would impact the local transportation infrastructure, as well as the freight and manufacturing

industry, and will force road closures for an undetermined period of time. A large number of casualties should be anticipated by emergency responders. Upon notification of a multi-vehicle accident, particularly when entrapment is reported, county hospitals should enact their medical surge capacity plans. During the road closure, vehicular traffic will be rerouted through secondary streets, increasing local traffic in the area.

Most car incidents are non-fatal and cause minor injuries or property damage. The majority of motor vehicle crashes are non-fatal in Pennsylvania, but PennDOT estimates that every hour nine people are injured in a car crash, and every seven hours someone dies as a result of a car crash (PennDOT, 2018a). Most fatal crashes occur in the summer months of June, July, and August.

Railway and roadway accidents in particular have the potential to result in hazardous materials release. Transportation incidents can also result in broader infrastructure damage. Like the range of magnitude, the environmental impacts of transportation accidents can vary greatly. In the case of a simple motor vehicle crash, train derailment, or aviation accident, the environmental impact is minimal. However, if the incident involves any type of vehicle moving chemicals or other hazardous materials, the impact will be considerably larger and may include an explosion or the release of potentially hazardous material. For a complete discussion of the environmental impacts of hazardous materials releases, see Section 4.3.14.

A worst-case scenario for transportation incidents in Lycoming County would be if a Bakken crude oil train was to derail and explode near Williamsport in the middle of the workday, when an increased number of people would be downtown. This kind of event, like the Lac-Megantic train derailment in Quebec in July 2013, would have no warning time (NASA, 2013). There would be the potential for serious loss of life and loss of property in the event of an explosion. The rail infrastructure would be damaged, and mass evacuations would be needed to reduce exposure to chemicals. An accident of this nature would not only cause environmental harm and endanger human health, but it would also cause a disruption of the economy in Lycoming County during recovery.

4.3.18.3. Past Occurrence

The most common transportation accidents in Lycoming County involve highway incidents involving motor vehicles. Vehicular transportation accidents like this are a daily occurrence throughout Pennsylvania. Table 4.3.18-2 shows PennDOT data on traffic incidents from 2003 to 2019, including the number of vehicle accidents, fatal crashes, crashes that cause injuries, and the incidents that result only in property damage. The number of incidents started to decrease in 2011. There was an increase of fatal crashed between 2014 and 2016, which has since decreased again.

Table 4.3.18-2 Total number of crashes, fatal crashes, and property damage-only crashes in Lycoming County (PennDOT, 2014-2019).

YEAR	TOTAL CRASHES	TOTAL FATAL CRASHES	TOTAL INJURY CRASHES	TOTAL PROPERTY DAMAGE-ONLY CRASHES
2003	1,271	13	580	678
2004	1,255	24	576	655
2005	1,148	17	561	570
2006	1,085	16	555	514
2007	1,313	20	627	666
2008	1,244	12	570	662
2009	1,162	15	554	593
2010	1,226	20	574	632
2011	1,324	19	619	686
2012	1,248	15	592	641
2013	1,187	9	496	682
2014	1,091	16	438	637
2015	1,161	21	481	659
2016	1,101	14	489	598
2017	1,089	9	458	622
2018	1,115	9	475	631
2019	1,000	9	431	560
Total	**20,020**	**258**	**9,076**	**10,686**

A comprehensive list of rail incidents and crashes in not available for Lycoming County. However, these incidents have led to fatalities and injuries in addition to environmental contamination. In July 2014, around a dozen train cars derailed in Nisbet spilling coal in from four from a 129-car train (NBC, 2014). In August 2014, two men died on impact when their pickup truck collided with a moving Norfolk Southern freight train in Clinton Township (Papa, 2014). In February 2020, a Lycoming Valley Railroad employee sustained severe injuries when a rail car ran over him (Beauge, 2020).

Crashes involving aircrafts have also occurred in Lycoming County. The Bureau of Aircraft Accidents Archives lists four accidents that resulted in injuries and fatalities in the City of Williamsport; in 1959, 1965, 1974, and 1991. Two of these incidents occurred during takeoff and two during landing (BAAA, 2020). In 2019, a small plane crashed near the Jersey Shore Airport in Nippenose Township resulting in two fatalities (Bohman, 2019).

4.3.18.4. Future Occurrence

Transportation incidents have little to no warning time and are nearly impossible to predict. While some roads or intersections may gain a reputation as being dangerous, and others are quantitatively shown to be so, this does not necessarily mean an incident will occur with any frequency or guarantee. It represents an elevation in the probability that an accident may occur. As such, it can be said with certainty that if no changes occur in the County then motor vehicle accidents are as likely to occur in the future as they were in the past.

It must also be taken into account that with the increase in development, associated mainly with the growth of the natural gas industry in Lycoming County, there will be more motor vehicles using its road network. This increase in traffic will also cause an increase in motor vehicle accidents. The areas with the greatest level of development, and those along major transportation routes, are likely to see an increase in both traffic and motor vehicle accidents as a secondary effect of that development.

As Table 4.3.18-1 shows, the amount of traffic incidents has remained relatively constant in recent years. Additionally, the trucking industry is expected to continue to grow increasing the number of long-haul trucks operating in the County on a daily basis. The increase in Bakken crude oil transportation by rail represents an increase in risk to future transportation incidents by rail. Based on all of these factors, the probability of transportation incidents and crashes in Lycoming County are characterized as *likely* according to the Risk Factor Methodology (see Table 4.4.1).

4.3.18.5. Vulnerability Assessment

A transportation related incident can occur on any stretch of road or railway in Lycoming County. However, severe incidents are more likely along highways such as Interstate 180, U.S. Route 15, and U.S. Route 220, which experience heavier traffic volumes including heavy freight vehicles. The combination of high traffic volume, severe winter weather in the County, and large numbers of hazardous materials haulers increase the chances of traffic accidents occurring.

Like highway incidents, rail incidents can impact population living near rail lines. Crude oil shipping across the United States has grown by a factor of seventeen in the last five years, increasing the risk for a derailment or rail accident to involve this material. Additionally, recent rail incidents from 2013 to 2015 have shown a high risk for trains carrying crude oil to explode upon derailment (FracTracker, 2020). The average rate of aviation accidents nation-wide is 8.47 accidents per 100,000 flight hours. Therefore, the likelihood of a serious aviation incident in the County is considered low.

Freight transportation through Lycoming County is facilitated through highways, freight railroads, and air service. The PennDOT Comprehensive Freight Movement Plan estimates that freight shipments through and within Pennsylvania are expected to increase 46% in tonnage and 95% in value from 2011 to 2040 (WATS MPO, 2018). Continued increases in

freight transportation require planning and regulatory efforts to ensure keep transportation routes safe.

Lycoming County's future population growth and land use will be significantly impacted by the safety and capacity of the transportation systems traversing the County. Most residents, visitors, and tourists will use automobiles as their primary transportation throughout the community. Immigration and commercial development are also largely dependent on motor vehicle transportation systems. As discussed in Section 4.3.13.4 increased heavy use of the roads by natural gas associated vehicles (an average of 44 trucks pass through a natural gas drilling site a day (Cassidy, 2014), will significantly impact and degrade the road infrastructure, resulting in thousands to millions of dollars of repair costs, as well as increased traffic fatalities. For example, a study by Resources for the Future shows that with one additional well drilled in a county, the number of accidents involving a fatality increase by 0.6 percent (Muehlenbachs and Krupnick, 2013).

All critical infrastructure within Lycoming County is vulnerable to traffic accidents, in that facility operators may be injured or delayed in performing their duties due to traffic accidents. Transportation infrastructure may be directly affected by being damaged during the accident.

Given the importance of motor vehicle traffic to the future of Lycoming County, traffic and road infrastructure planning must be a high priority for community planners and development officials. Given the opportunity to establish long-term traffic planning programs and mitigate accidents by improving safety at dangerous intersections, Lycoming County can greatly enhance the safety of its residents and visitors alike. Furthermore, taking the opportunity to learn from other high-growth areas, Lycoming County can take steps now to promote the proper balance between development and road infrastructure growth, to mitigate future problems.

PennDOT is undertaking a planning process to create four Regional Operation Plans (ROPs) in the Commonwealth. These plans will inventory existing ITS and Operations infrastructure, needs, vision, and goals to help guide district level transportation and response decisions. The Central Region's ROP, which includes Lycoming County, has not yet been completed, District 3-0 has implemented various ITS field devices to make the roadway system more efficient. Improvements include four dynamic message signs, two traffic cameras, two highway advisory radio broadcast locations, and four highway advisory beacons. These devices are helping District 3-0 better monitor and respond to incidents on the key transportation corridors throughout Lycoming County (WATS MPO, 2018).

4.3.19. Utility Interruption

4.3.19.1. Location and Extent

Utility interruptions include any impairment of the functioning of telecommunication, gas, electric, water, or waste networks. Interruptions or outages occur because of geomagnetic storms, fuel or resources shortage, electromagnetic pulses, information technology failures, transmission facility or linear utility accident, and major energy, power, or utility failure. The focus of utility interruptions as a hazard lies in fuel, energy, or utility failure. These kinds of interruptions rarely spontaneously occur on their own; this hazard is often secondary to other natural hazard events, particularly transportation crashes and incidents, lightning strikes, extreme heat or cold events, and coastal and winter storms. The causes for outages are usually downed power wires or utility poles as a result of inclement weather or vehicle accidents. Additionally, outages can be caused by blown transformers or tripped circuit breakers. Most often, there is no cause reported and power is restored within the hour.

Utility interruptions in Lycoming County occur regularly but are usually small-scale, localized incidents. Utility interruptions are possible anywhere there is utility service. Table 4.3.19-1 lists the major utility companies in Lycoming County. Water authorities are listed and discussed in Section 4.3.1.

Table 4.3.19-1 Major Utility Companies in Lycoming County (Williamsport/Lycoming Chamber of Commerce, 2019)

Company name	Type of Utility
Pennsylvania Power & Light (PPL)	Electric
Comcast Cable	Telecom
Cricket Wireless at One-Stop	
Hans CedarDale Satellite	
Russell Cellular	
Verizon	
Weaver Wireless Consultants	
UGI Utilities, Inc.	Gas
Superior Plus Energy Services	Oil

According to the 2018 5-year American Community Survey, in Lycoming County, 40.3% of housing units use gas as their heat source, followed by 27.1% of homes using fuel oil for heat, and 20.5% of homes using electric heat (ACS 2014-2018). As a result, an interruption in any of those utilities could affect a significant number of residents. In addition, an increasing reliance on internet access and telecommunications could also impact a large number of residents at any given time.

4.3.19.2. Range and Magnitude

The most severe utility interruptions will be regional or widespread power and telecommunications outages. With the loss of power, electrically powered equipment and systems will not be operational. Examples may include lighting; HVAC and ancillary support equipment; communication (i.e. public address systems, telephone, computer servers, and peripherals); ventilation systems; fire and security systems; refrigerators, sterilizers, trash compactors, office equipment; 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 service. However, this is most often a short-term nuisance rather than a catastrophic hazard.

The severity of a utility interruption can be compounded with extreme weather events, especially winter weather events. Interruptions can also be more severe for special needs populations that are dependent on electronic medical equipment. Utility interruptions can significantly hamper first responders in their efforts to provide aid in a compound disaster situation, especially with losses of telecommunications and wireless capabilities. Telecommunications interruptions will also hinder first responders' efforts. Additionally, an internet outage could be crippling to the economy, as many companies and government entities process payments and invoices electronically rather than with physical checks.

14 incidents that affected more than 150 residents were reported between 2005 and 2009. Of these incidents, half of them affected between 1,300 and 5,000 residents. An outage in Montgomery, Lycoming County, in July 2005 knocked out power for nearly 5,000 people in that area. The source of the outage was attributed to an individual who felled a tree, causing it to strike three electrical transmission lines. While no direct human casualties were reported to be associated with this event, it took some time before power was restored to customers.

In a possible worst-case scenario, a winter storm event causes widespread power outages, leaving citizens without heat in the midst of subzero temperatures. The power outage also means that elderly populations or others at risk of health problems due to the lack of heat are unable to call for assistance or leave their homes. Power lines are unable to be repaired because of the magnitude of the storm, and the power outage lasts for several days.

4.3.19.3. Past Occurrence

Power outages in Lycoming County have been caused by winter storms, wind, vehicle accidents, and other factors. Utility interruptions are largely minor, routine events, but there have been Presidential and Gubernatorial Disaster Declarations in which a utility interruption was a major component of a disaster. For example, the nation's gas shortage coupled with severe winter weather in January 1977 led to a President's Declaration of Emergency. Additionally, Hurricane Sandy caused widespread power outages and infrastructural damage in October 2012, leading to a Presidential Disaster Declaration.

Table 4.3.19-2 lists power outage incidents in the County from 2004 to 2009. There is no new data after 2009, because power outages are no longer reported and recorded the same way. However, it is reasonable to presume a similar frequency of outages occurring since. For example, in March 2014, there was an outage (caused by a tractor trailer knocking down several power lines) that affected 2,000 people in Lycoming County (Krize, 2014). Power outages are not an unusual occurrence, and can often be exacerbated in rural areas, because several "downed" lines can affect a large number of people.

Table 4.3.19-2 Power Outages in Lycoming County from 2004-2009 (PEMA PEIRS)

LOCATION	DATE	DESCRIPTION
Franklin Township	3/21/2004	Power outage due to a pole fire. PPL Electric responsible for outage. Power to pole was cut off so repairs can be conducted. Approximately 1,000 customers were affected.
Williamsport	12/23/2004	Transformer caught fire, causing 1,800 PPL Electric customers in the City of Williamsport to be without power.
Eldred & Hepburn Township	3/8/2005	Power outage from SR 87 at Warrensville to SR 973E to Hepburn Township. Approximately 1,300 PPL Electric customers were affected. No critical facilities affected.
Loyalsock Township	3/23/2005	Fallen trees and limbs affected unknown number of PPL Electric Company customers. Substation lost transformer. Lycoming County Communications on backup generator.
Jersey Shore Borough	4/22/2005	T/T knocked down power lines on Culver Street. Outage affected approximately 3,000 PPL Electric customers.
Clinton Township	6/28/2005	Power outage at SCI-Muncy due to failed power lines that feed prison. PPL Electric able to quickly restore one line. No security measures were compromised.
Williamsport	6/29/2005	Power outage at Center City Building. Possible source is a sparking electrical panel in the basement. 68 residents were evacuated.
Lewis Township	7/7/2005	Unknown number of PENNELEC customers without power.
Montgomery	7/20/2005	Individual takes down tree, hits three phase line. Estimated 3,000-5,000 without power.
Lewis Township	12/10/2005	Power outage affecting unknown number of First Energy customers in Lewis Township, Macintyre, Trout Run, Ralston areas, and Shriver's Tower Site. Tower is on back-up generator.
Countywide	2/25/2006	Power outage affecting northwest part of Lycoming County. Approximately 109 residents were affected.

Table 4.3.19-2 Power Outages in Lycoming County from 2004-2009 (PEMA PEIRS)		
LOCATION	DATE	DESCRIPTION
Brown Township	6/26/2006	Power and phones down across township, possibly from severe weather.
Williamsport	8/3/2006	Power outage in Linden Area affecting 527 PPL Electric customers. Woodward FD shelter as a precaution.
Williamsport	8/3/2006	Center City Apartments reporting internal electrical disruptions. Old Lycoming FD as shelter for displaced residents.
Pine Township	12/12/2006	Power outage in English Center. Unknown number of affected customers.
Muncy Creek Township	3/10/2007	Vehicle struck telephone pole on RT 422. 900 PPL Electric customers are without power.
Shrewsbury Township	6/11/2007	Rural Electric Substation lost feed and caused a power outage for Lycoming and Sullivan Counties.
Williamsport	6/25/2007	Problem at substation caused power outage. Occurred in eastern end of Williamsport and Loyalsock Township.
Muncy Township	7/15/2007	PPL Electric substation between Muncy and Montoursville reported transformer fire. Residential homes and traffic lights are affected.
Lycoming Township	11/13/2007	Unknown number of power outages were reported. 9-1-1 center on generator.
Cogan House Township	12/5/2007	Tri County Electric power outage. Unknown number of customers affected.
Muncy Township	12/11/2007	Power outage in Muncy Borough, Muncy Township, and Muncy Creek. 1,720 PPL Electric customers were affected. Muncy Valley Hospital was affected.
Pine Township	12/24/2007	Power outage affected unknown number Tri County REC in English Center Area of Pine Township.
Cummings Township	1/2/2008	Alleghany Power reported a fallen tree on lines in the Waterville Area.
Lewis Township	1/2/2008	Power outage affected one relay tower in county. First Energy responded.
Countywide	1/30/2008	Multiple power outages reported in Black Forest area.
Muncy Township	4/22/2008	Blown transformer at a substation. Muncy Valley Hospital was most likely affected.
Muncy and Wolf Townships	5/3/2008	Power outage affected 119 PPL Electric customers. No critical facilities were affected.
Cogan House and Pine Townships	5/21/2008	Power outage affecting unknown number of Tri-County customers in Cogan House and Pine Townships.

Table 4.3.19-2 Power Outages in Lycoming County from 2004-2009 (PEMA PEIRS)		
LOCATION	DATE	DESCRIPTION
Countywide	6/29/2008	Severe weather caused a phone/power outage in the northwest part of Lycoming County. Power outage is coming from Germania sub-station.
Williamsport	7/16/2008	Power outage triggered automatic fire alarm in a high-rise building on Lycoming Street. During cause investigation, a gas meter was charged at Williamsport Manor. This did not cause fire alarm or power outage. Both the high-rise and Williamsport Manor were evacuated.
Pine Township	8/2/2008	Power outage affecting approximately 400 Tri-County customers.
Williamsport	8/11/2008	Power outage affecting 80 homes in West Williamsport, no critical facilities reported.
Williamsport	8/15/2008	Power outage affecting 162 PPL Electric customers.
Williamsport	8/21/2008	Power outage affecting an unknown number of PPL Electric customers.
Muncy Creek Township	9/6/2008	Unknown source of power outage at Lycoming Mall Drive and John Brady Drive.
Muncy Creek Township	9/7/2008	Blown fuse on a utility box at Box Croft Trailer Park. 60 mobile homes affected.
Williamsport	10/10/2008	Power outage affecting approximately 358 PPL Electric customers.
Williamsport	10/22/2008	Approximately 2,888 PPL Electric customers without power. Williamsport Hospital and Williamsport Housing Authority 4 Elderly housing high-rise buildings affected.
Montoursville	10/25/2008	Blown transformer resulting in power outages for unknown number of PPL Electric customers.
Eldred Township	11/24/2008	Reported power outage for approximately 44 PPL Electric customers.
Cogan House Township	11/30/2008	Approximately 16 outages were reported in Cogan House Township and surrounding areas.
Old Lycoming Township	12/7/2008	209 PPL Electric customers without power.
McHenry Township	12/12/2008	Power outage in Waterville area, affecting Waterville Tower site.
Williamsport	12/30/2008	Large tree fell, downing 3 telephone poles with wires and transformers. Williamsport Hospital running on generators. Presbyterian Nursing Home was without power and required evacuation.
Pine Township	12/31/2008	Power outage in Pine Township, no reported accidents, critical facilities affected. Unknown number of affected individuals.

Table 4.3.19-2 Power Outages in Lycoming County from 2004-2009 (PEMA PEIRS)		
LOCATION	DATE	DESCRIPTION
Williamsport	1/28/2009	A tripped circuit breaker caused a power outage in Williamsport. Unknown number of PPL Electric customers were affected.
Clinton & Montgomery Townships	2/23/2009	Unknown number of PPL Electric Utility customers were affected. No cause reported, no critical facilities affected.
Pine Township	4/8/2009	Unknown number of Tri-County Rural Electric customers were affected. No cause reported.
Loyalsock Township	4/20/2009	Wires from a utility pole were removed to repair damage caused by earlier fire. Approximately 650 people were without power. Two nursing homes (The Meadows and Valley View on Warrensville Rd) were affected.
Mifflin Township	4/21/2009	Broken utility pole that housed transformer and wires. Approximately 900 people were without power.
Muncy Creek Township	4/25/2009	Approximately 3,000 PPL customers were without power. No cause was reported.
Lewis Township	5/27/2009	1,091 customers were affected for approximately 6 hours.

4.3.19.4. Future Occurrence

Utility interruptions will continue to occur annually with minimal impact. Widespread utility interruption events usually occur approximately once every five years, usually as a secondary effect of an extreme weather event. These interruptions should be anticipated, and first responders should be prepared during severe weather events. Research by the National Oceanic and Atmospheric Administration (NOAA) suggests that climate change may cause more extreme storms in Pennsylvania (Frankson et. al., 2017).

Power outages can be expected at any time of year, on a nearly monthly basis. Iced power lines; falling tree limbs due to ice, wind, or lightning strikes; and vehicle accidents damaging power lines, or their support poles can all be reasons for power outages. Based on data from 2005 to 2009, the County can expect between two and 23 major power outages each year, with an annual average of nine.

The region around Lycoming County is expected to see large increases in precipitation and numbers of very hot and very cold days (Climate Central, 2019). These factors can increase the occurrence of hazards such as flooding, hurricanes and tropical storms, landslides, tornados and windstorms, wildfires, and winter storms. Impacts from any of these hazards can lead to utility interruption on a range of scales. Overall, the future probability of utility interruptions can be considered *highly likely* according to the Risk Factor Methodology (See Table 4.4-1).

Aging infrastructure also brings risk in the form of potential utility interruptions, particularly for places like Lycoming County with aging infrastructure. In many utility systems, significant portions of the equipment and facilities date from the growth periods of the 1950s and 1960s that followed World War II. As this equipment ages, it deteriorates from the constant wear and tear of service. Eventually the equipment reaches a point at which it will either fail on its own or as a result of outside forces (storms, loads it was designed to handle but no longer can, etc.). These failures cause service interruptions and can require expensive emergency repairs. In addition, as repairs have taken place along transmission routes, there is often a mix of new and old equipment along the line, as repair and not replacement is generally the choice made to resolve an issue. For example, from 2013 to 2016, PP&L invested nearly $3 million on upgrades to local utility equipment and facilities to modernize its system and enhance reliability. These included rebuilding an underground electric vault in downtown Williamsport and replacing automated equipment at its South Williamsport substation (PPL, 2013). Several municipalities identified a decrease in future risk due to recently added lines. Continual upgrades are needed to reduce power outages, especially in more rural areas of the County.

The wholesale replacement of a system is not a feasible solution for utility companies. This would require the interruption of services while the replacement occurs, as well as accessing the existing system (which may lay under roads, private property, or other inconvenient places). Utility companies face the challenge of managing the issue of the aging infrastructure. They are tasked with reducing the effects of aging equipment while also controlling the deterioration of the existing system as much as possible. This balance will be tenuous as transmission equipment continues to age and break down. These breakdowns will likely lead to more frequent utility disruptions as time goes by.

4.3.19.5. Vulnerability Assessment

All jurisdictions are vulnerable on some level to utility interruptions, but because this hazard often occurs in conjunction with other hazards, jurisdictions that have been identified as more vulnerable to winter storms, windstorms, tornado, flooding, and other natural hazard events may be more vulnerable to a utility interruption.

Utility outages pose the greatest threat to special needs populations in Lycoming County. Resources such as electricity, communications, gas, and water supply are critical to ensure the health, safety, and general welfare of the citizenry. All critical infrastructure is vulnerable to the effects of a power outage. Special needs populations can be vulnerable to loss of heat or air conditioning during extreme heat; likewise, they can be vulnerable to periods of severe cold if they use electric heat and there is a power outage. The County checks on its special needs populations during times of extended power outage.

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 19 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:

Risk Factor Value = [(Probability x .30) + (Impact x .30) +
(Spatial Extent x .20) + (Warning Time x .10) + (Duration x .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	
PROBABILITY *What is the likelihood of a hazard event occurring in a given year?*	UNLIKELY	LESS THAN 1% ANNUAL PROBABILITY	1	30%
	POSSIBLE	BETWEEN 1% & 49.9% ANNUAL PROBABILITY	2	
	LIKELY	BETWEEN 50% & 90% ANNUAL PROBABILITY	3	
	HIGHLY LIKELY	GREATER THAN 90% ANNUAL PROBABILTY	4	
IMPACT *In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?*	MINOR	VERY FEW INJURIES, IF ANY. ONLY MINOR PROPERTY DAMAGE & MINIMAL DISRUPTION ON QUALITY OF LIFE. TEMPORARY SHUTDOWN OF CRITICAL FACILITIES.	1	30%
	LIMITED	MINOR INJURIES ONLY. MORE THAN 10% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE DAY.	2	
	CRITICAL	MULTIPLE DEATHS/INJURIES POSSIBLE. MORE THAN 25% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE WEEK.	3	
	CATASTROPHIC	HIGH NUMBER OF DEATHS/INJURIES POSSIBLE. MORE THAN 50% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR 30 DAYS OR MORE.	4	
SPATIAL EXTENT *How large of an area could be impacted by a hazard event? Are impacts localized or regional?*	NEGLIGIBLE	LESS THAN 1% OF AREA AFFECTED	1	20%
	SMALL	BETWEEN 1 & 10.9% OF AREA AFFECTED	2	
	MODERATE	BETWEEN 11 & 25% OF AREA AFFECTED	3	
	LARGE	GREATER THAN 25% OF AREA AFFECTED	4	
WARNING TIME *Is there usually some lead time associated with the hazard event? Have warning measures been implemented?*	MORE THAN 24 HRS	SELF-DEFINED	1	10%
	12 TO 24 HRS	SELF-DEFINED	2	
	6 TO 12 HRS	SELF-DEFINED	3	
	LESS THAN 6 HRS	SELF-DEFINED	4	
DURATION *How long does the hazard event usually last?*	LESS THAN 6 HRS	SELF-DEFINED	1	10%
	LESS THAN 24 HRS	SELF-DEFINED	2	
	LESS THAN 1 WEEK	SELF-DEFINED	3	
	MORE THAN 1 WEEK	SELF-DEFINED	4	

(NOTE: Levels of warning time and criteria that define them may be adjusted based on hazard addressed.)

(NOTE: Levels of warning time and criteria that define them may be adjusted based on hazard addressed.)

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 19 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.

Table 4.4.2-1 Ranking of hazard types based on Risk Factor methodology.

HAZARD RISK	HAZARD NATURAL (N) or MAN-MADE (M)	RISK ASSESSMENT CATEGORY					RISK FACTOR
		PROBABILITY (1-4)	IMPACT (1-4)	SPATIAL EXTENT (1-4)	WARNING TIME (1-4)	DURATION (1-4)	
HIGH	Flood, Flash Flood, Ice Jam (N)	4	3	3	2	3	3.2
	Winter Storm (N)	4	2	4	2	2	3.0
	Utility Interruption (M)	4	2	1	4	2	2.6
MODERATE	Drought (N)	2	2	3	1	4	2.3
	Transportation Incident (M)	4	1	1	4	1	2.2
	Nuclear Incident (M)	1	2	2	4	4	2.1
	Pandemic (N)	1	2	4	1	3	2.1
	Wildfire (N)	3	1	1	4	3	2.1
	Environmental Hazard (M)	3	1	1	4	2	2.0
	Dam Failure (M)	1	3	1	4	2	2.0
LOW	Tornado, Windstorm (N)	2	2	1	4	1	1.9
	Radon (N)	2	1	2	1	4	1.8
	Landslide (N)	2	2	1	3	1	1.8
	Earthquake (N)	1	1	3	4	1	1.7
	Hailstorm (N)	2	1	2	3	1	1.7
	Disorientation (M)	2	1	1	4	2	1.7
	Terrorism (M)	1	2	1	4	1	1.6
	Levee Failure (M)	1	2	1	4	1	1.6
	Subsidence, Sinkhole (N)	1	1	1	4	1	1.3

Based on these results, there are three *high* risk hazards, seven *moderate* risk hazards and nine *low* risk hazards in Lycoming 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 Lycoming County and whether their risk is

greater than (>), less than (<), or equal to (=) the risk factor assigned to the County as a whole. The table cells that are highlighted in blue were specifics updates provided by municipalities through the Hazard-Risk Evaluation forms, the Risk Assessment and Mitigation Solutions Workshop, and throughout the 2020 HMP update process. Items shaded in purple have been updated in the 2020 HMP update process through municipal outreach and participation.

Table 4.4.2-2	Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk																		
JURISDICTION	IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR																		
	Flood, Flash Flood, Ice Jam	Winter Storm (N)	Utility Interruption	Drought (N)	Transportation Incidents (M)	Nuclear Incidents (M)	Pandemic (N)	Wildfire (N)	Environmental Hazard (M)	Dam Failure (M)	Tornado, Windstorm (N)	Radon (N)	Landslide (N)	Earthquake (N)	Hailstorm (N)	Disorientation (M)	Terrorism (M)	Levee Failure (M)	Subsidence, Sinkhole (M)
	3.2	*3*	*2.6*	*2.3*	*2.2*	*2.1*	*2.1*	*2.1*	*2*	*2*	*1.9*	*1.8*	*1.8*	*1.7*	*1.7*	*1.7*	*1.6*	*1.6*	*1.3*
Anthony Township	=	=	=	=	=	<	=	=	=	=	=	=	=	=	=	=	=	=	=
Armstrong Township	=	=	=	=	=	=	=	=	<	=	=	=	=	=	=	=	=	=	=
Bastress Township	<	=	=	=	=	=	=	=	<	=	=	=	=	=	=	=	=	=	=
Brady Township	=	=	=	=	=	=	=	=	<	=	=	=	=	=	=	=	=	=	>
Brown Township	=	=	=	=	<	<	=	=	<	=	=	=	=	=	=	=	=	=	=
Cascade Township	>	=	>	=	<	=	=	=	=	=	=	=	=	=	=	=	=	=	=
Clinton Township	=	=	=	=	=	=	=	<	<	=	=	=	=	=	=	=	>	=	>
Cogan House Township	=	=	=	>	<	<	>	=	=	=	=	=	=	=	=	=	=	=	=
Cummings Township	=	=	=	=	<	<	=	=	=	=	=	=	=	=	=	=	=	=	=
Duboistown Borough	=	=	=	=	=	<	=	<	<	=	=	=	=	=	=	<	=	=	>
Eldred Township	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
Fairfield Township	=	=	=	=	>	=	=	=	=	=	=	=	=	=	=	=	=	=	>
Franklin Township	>	=	>	>	<	=	=	>	>	=	>	=	=	=	=	=	=	=	=

Table 4.4.2-2	Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk																		
JURISDICTION	IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR																		
	Flood, Flash Flood, Ice Jam	Winter Storm (N)	Utility Interruption	Drought (N)	Transportation Incidents (M)	Nuclear Incidents (M)	Pandemic (N)	Wildfire (N)	Environmental Hazard (M)	Dam Failure (M)	Tornado, Windstorm (N)	Radon (N)	Landslide (N)	Earthquake (N)	Hailstorm (N)	Disorientation (M)	Terrorism (M)	Levee Failure (M)	Subsidence, Sinkhole (M)
	3.2	*3*	*2.6*	*2.3*	*2.2*	*2.1*	*2.1*	*2.1*	*2*	*2*	*1.9*	*1.8*	*1.8*	*1.7*	*1.7*	*1.7*	*1.6*	*1.6*	*1.3*
Gamble Township	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
Hepburn Township	>	=	>	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
Hughesville Borough	=	=	=	=	=	=	=	<	<	=	=	=	=	=	=	<	=	=	=
Jackson Township	=	=	=	=	=	<	=	=	=	=	=	=	=	=	=	=	=	=	=
Jersey Shore Borough	=	=	<	>	=	<	=	<	<	=	=	=	=	=	=	<	=	=	=
Jordan Township	=	=	=	=	<	=	=	=	=	=	=	=	=	=	=	=	=	=	=
Lewis Township	=	=	<	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
Limestone Township	=	=	=	=	<	=	=	=	<	=	=	=	=	=	=	=	=	=	>
Loyalsock Township	=	=	=	=	>	=	=	=	<	=	=	=	=	=	=	=	=	=	>
Lycoming Township	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=

Table 4.4.2-2	Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk																		
JURISDICTION	IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR																		
	Flood, Flash Flood, Ice Jam	Winter Storm (N)	Utility Interruption	Drought (N)	Transportation Incidents (M)	Nuclear Incidents (M)	Pandemic (N)	Wildfire (N)	Environmental Hazard (M)	Dam Failure (M)	Tornado, Windstorm (N)	Radon (N)	Landslide (N)	Earthquake (N)	Hailstorm (N)	Disorientation (M)	Terrorism (M)	Levee Failure (M)	Subsidence, Sinkhole (M)
	3.2	*3*	*2.6*	*2.3*	*2.2*	*2.1*	*2.1*	*2.1*	*2*	*2*	*1.9*	*1.8*	*1.8*	*1.7*	*1.7*	*1.7*	*1.6*	*1.6*	*1.3*
McHenry Township	=	=	=	>	>	<	=	>	=	=	=	=	=	=	=	=	>	=	>
McIntyre Township	=	=	=	=	<	=	=	=	=	=	=	=	=	=	=	=	=	=	=
McNett Township	=	=	=	=	<	=	=	=	=	=	=	=	=	=	=	=	=	=	=
Mifflin Township	=	=	>	=	=	<	=	=	=	=	=	=	=	=	=	=	=	=	=
Mill Creek Township	=	=	=	=	<	=	=	=	=	=	=	=	=	=	=	=	=	=	=
Montgomery Borough	=	=	=	=	=	=	=	<	<	=	=	=	=	=	=	<	=	=	=
Montoursville Borough	=	=	=	=	=	=	=	<	<	=	=	=	=	=	=	<	=	=	>
Moreland Township	=	=	=	=	<	=	=	=	=	=	=	=	=	=	=	=	=	=	=
Muncy Borough	=	=	=	=	=	=	=	<	<	=	=	=	=	=	=	<	=	=	>

Table 4.4.2-2	Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk																		
JURISDICTION	IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR																		
	Flood, Flash Flood, Ice Jam	Winter Storm (N)	Utility Interruption	Drought (N)	Transportation Incidents (M)	Nuclear Incidents (M)	Pandemic (N)	Wildfire (N)	Environmental Hazard (M)	Dam Failure (M)	Tornado, Windstorm (N)	Radon (N)	Landslide (N)	Earthquake (N)	Hailstorm (N)	Disorientation (M)	Terrorism (M)	Levee Failure (M)	Subsidence, Sinkhole (M)
	3.2	*3*	*2.6*	*2.3*	*2.2*	*2.1*	*2.1*	*2.1*	*2*	*2*	*1.9*	*1.8*	*1.8*	*1.7*	*1.7*	*1.7*	*1.6*	*1.6*	*1.3*
Muncy Township	=	=	=	=	=	=	=	=	<	=	=	=	=	=	=	=	=	=	>
Muncy Creek Township	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
Nippenose Township	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
Old Lycoming Township	=	=	=	=	>	=	=	=	<	=	=	=	=	=	=	=	=	=	=
Penn Township	=	=	=	=	<	=	=	=	=	=	=	=	=	=	=	=	=	=	=
Piatt Township	=	=	=	=	=	<	=	=	<	=	=	=	=	=	=	=	=	=	>
Picture Rocks Borough	>	=	=	=	=	=	=	<	<	=	=	=	=	=	=	<	=	=	=
Pine Township	=	=	<	=	<	<	=	=	>	=	=	=	=	=	=	=	=	=	=
Plunketts Creek Township	=	=	=	=	<	=	=	=	=	=	=	=	=	=	=	=	=	=	=
Porter Township	=	=	=	=	>	<	=	=	<	=	=	=	=	=	=	=	=	=	>
Salladasburg Borough	=	=	=	=	=	<	=	<	<	=	=	=	=	=	=	<	=	=	=

Table 4.4.2-2	Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk																		
JURISDICTION	IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR																		
	Flood, Flash Flood, Ice Jam	Winter Storm (N)	Utility Interruption	Drought (N)	Transportation Incidents (M)	Nuclear Incidents (M)	Pandemic (N)	Wildfire (N)	Environmental Hazard (M)	Dam Failure (M)	Tornado, Windstorm (N)	Radon (N)	Landslide (N)	Earthquake (N)	Hailstorm (N)	Disorientation (M)	Terrorism (M)	Levee Failure (M)	Subsidence, Sinkhole (M)
	3.2	*3*	*2.6*	*2.3*	*2.2*	*2.1*	*2.1*	*2.1*	*2*	*2*	*1.9*	*1.8*	*1.8*	*1.7*	*1.7*	*1.7*	*1.6*	*1.6*	*1.3*
Shrewsbury Township	=	=	=	=	<	=	=	=	=	=	=	=	=	=	=	=	=	=	=
South Williamsport	=	=	=	<	>	=	=	<	<	=	=	=	=	=	=	=	>	=	>
Susquehanna Township	=	=	=	=	=	=	=	=	<	=	=	=	=	=	=	=	=	=	>
Upper Fairfield Township	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
Washington Township	=	=	=	=	<	=	=	=	<	=	=	=	=	=	=	=	=	=	>
Watson Township	=	=	=	>	<	<	=	=	=	=	=	=	=	=	>	=	=	=	>
Williamsport, City of	=	=	=	<	>	=	=	<	>	=	=	=	=	=	=	=	=	=	>
Wolf Township	=	=	=	=	=	=	=	=	<	=	=	=	=	=	=	=	=	=	=
Woodward Township	=	=	=	=	=	<	=	=	<	=	=	=	=	=	=	=	=	=	=

Key stakeholders and several members of the Hazard Mitigation Planning Team also provided input on the evaluation of jurisdictional risk for each hazard, as seen below in Table 4.4.2-3.

Table 4.4.2-3 Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk																			
Other Partners	**IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR**																		
	Flood, Flash Flood, Ice	**Winter Storm (N)**	**Utility Interruption**	**Drought (N)**	**Transportation Incidents**	**Nuclear Incidents (M)**	**Pandemic (N)**	**Wildfire (N)**	**Environmental Hazard (M)**	**Dam Failure (M)**	**Tornado, Windstorm**	**Radon (N)**	**Landslide (N)**	**Earthquake (N)**	**Hailstorm (N)**	**Disorientation (M)**	**Terrorism (M)**	**Levee Failure (M)**	**Subsidence, Sinkhole (M)**
	3.2	***3***	***2.6***	***2.3***	***2.2***	***2.1***	***2.1***	***2.1***	***2***	***2***	***1.9***	***1.8***	***1.8***	***1.7***	***1.7***	***1.7***	***1.6***	***1.6***	***1.3***
PA DEP Northcentral Office	>	=	=	=	=	=	=	=	>	>	>	=	=	=	=	=	=	=	=
PA DCNR Loyalsock State Forest	>	=	>	=	=	=	=	=	=	=	>	=	=	=	<	=	=	=	>
PA College of Technology	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
Lycoming Creek Watershed Association	>	<	=	>	=	=	=	=	>	=	=	=	=	=	<	=	=	=	=

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 Lycoming County are estimated to equal $740.38 million. Residential occupancies make up 42.26% 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 $743.63 million. This scenario estimates that about 1,350 buildings will be at least moderately damaged. This is over 68% of the total number of buildings in the scenario. There are an estimated 200 buildings that will be completely destroyed.

In addition, an estimated 3,32 households would be displaced, and 5,548 people would require shelter. Essential facilities would largely remain undamaged in this scenario, but three fire stations, three police stations, two schools, and two emergency operations centers are estimated to have at least moderate damage. Of these facilities, two fire stations, three police stations, two schools, and one emergency operations centers would experience 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 Lycoming County. Previous flood events listed in

Below, Figure 4.4.3-1 shows Hazus modeled potential flood losses in Lycoming 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. However, due to the topography of Lycoming County, flood losses can be expected in every municipality.

Figure 4.4.3-1 Hazus Modeled Flood Loss in Lycoming County

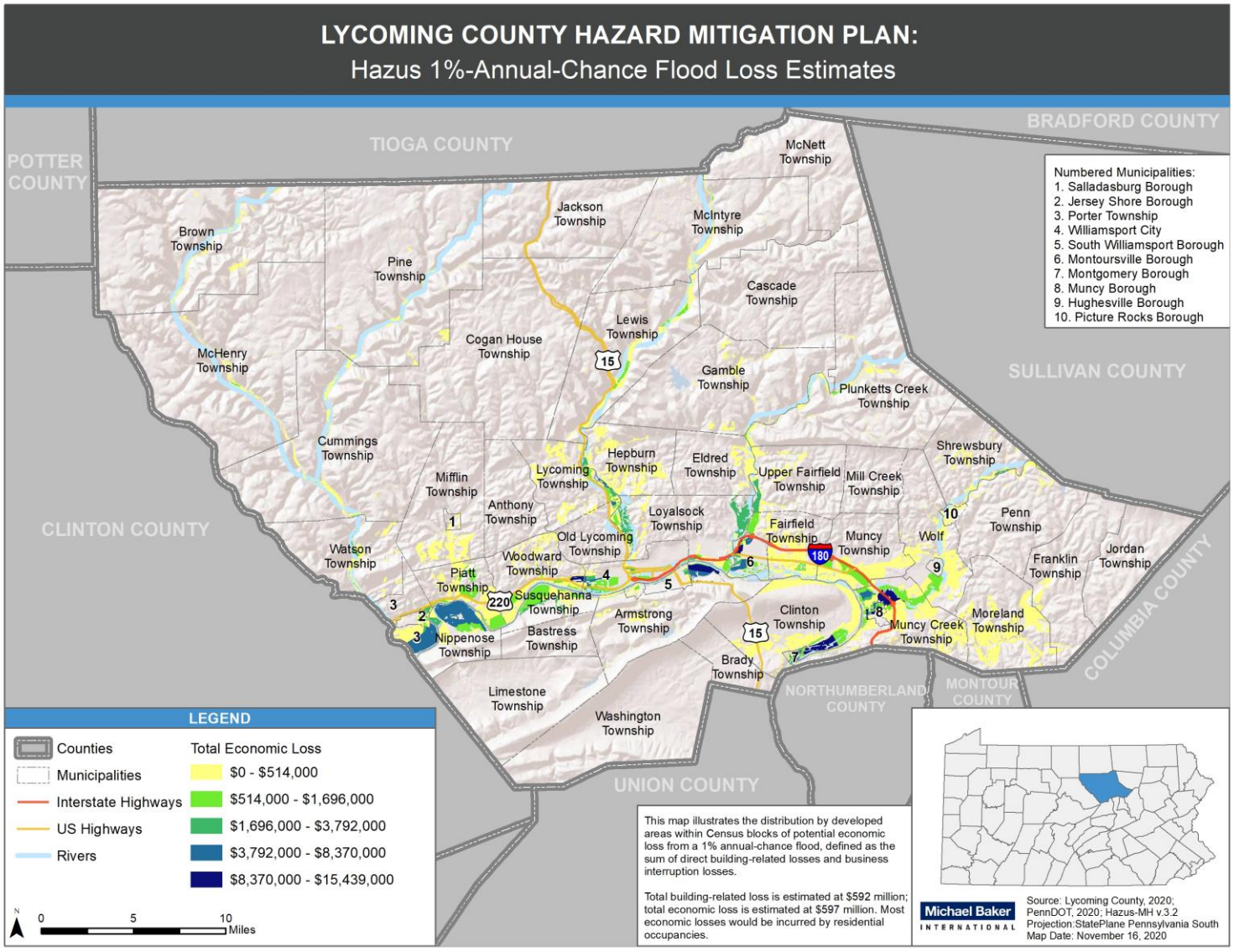
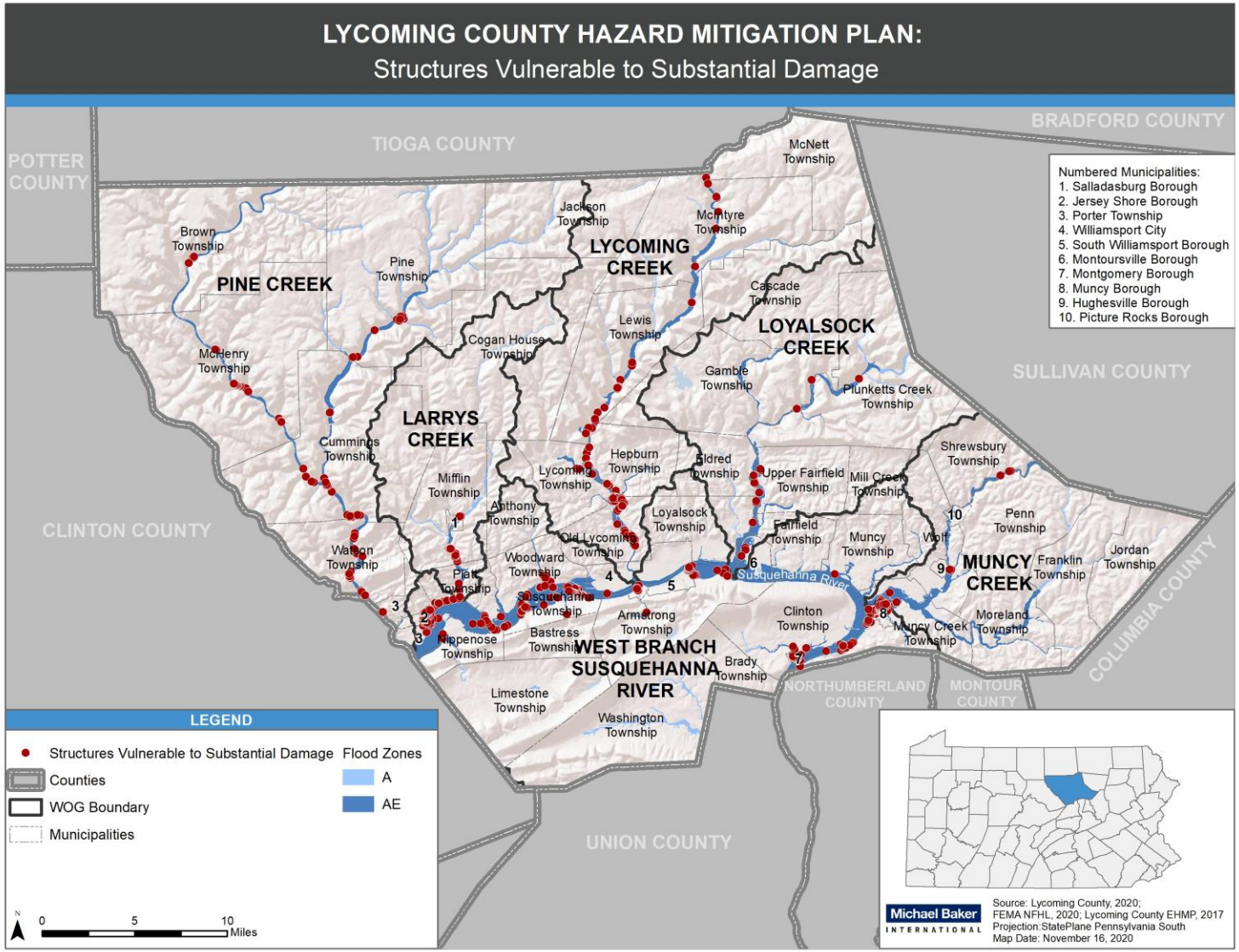


Figure 4.4.3-2 Substantial Damage in Lycoming County



In 2017 Lycoming County participated in an Enhanced Hazard Mitigation Planning effort that looked at substantial damage throughout the County. Figure 4.4.3-2 above shows the results of the study identifying areas of Lycoming County that are vulnerable to substantial damage.

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. Lycoming 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.

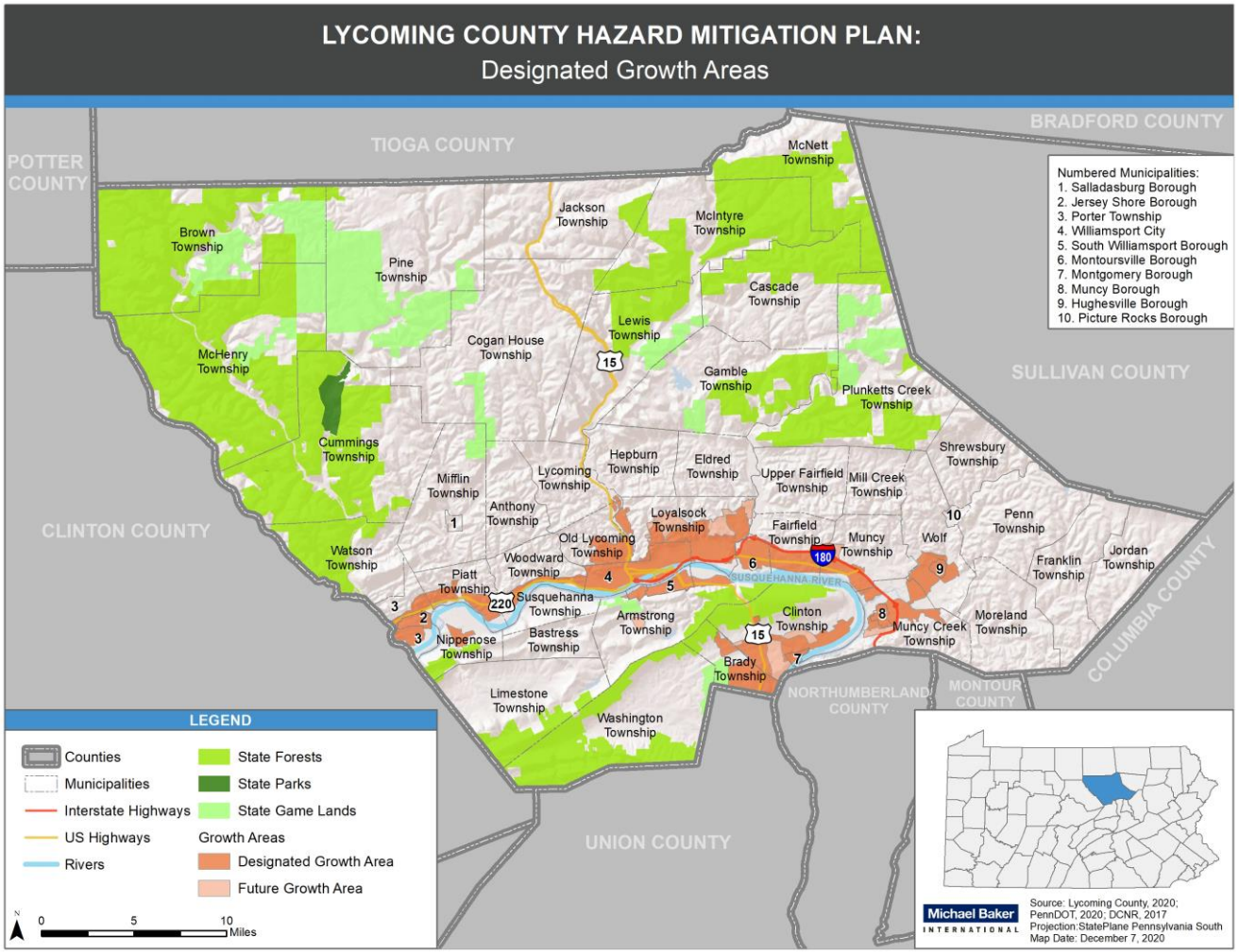
Population change is a main indicator of vulnerability change in Lycoming County. As discussed in Section 2.3, the total population of Lycoming County is estimated to have decreased by 3 percent from 2000-2010, indicating the overall population of the County has decreased. Ten municipalities increased in population while forty-two 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. Larger populations result in increased vulnerability to hazards such as wildfires, floods, and winter storms as more people will be impacted.

Roughly seventeen percent of Lycoming 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.

Section 2.4 discusses plans for future development in Lycoming County's Comprehensive Plan. Most of the county's growth is confined to areas along the Susquehanna River. The rest of the county is rural and is planned to remain that way.

While there are plans in place for future development, there are also many land development regulations in place to protect Lycoming County's natural, historic, and environmentally sensitive areas. This plan for protection is illustrated in Figure 4.4.4-1, 2018 Designated Growth Areas, taken from the 2018 Comprehensive Plan Update. As the map shows, the county has designated areas along the Susquehanna River for development. Over time, there is a plan for future growth to expand slightly on these areas, but development is planned to be designated to primarily this area of the county. Therefore, the area along the Susquehanna River is more vulnerable to hazards and will continue to be because that is where most of the population and structures are in the county.

Figure 4.4.4-1 Designated Growth Areas for Lycoming County



The rural nature of the county impacts vulnerability because 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 Brown Township, McHenry Township, and McNett Township face increased vulnerability to winter storms due to isolation, access issues, and longer emergency response times.

There is also a County Zoning and Subdivision Ordinance that many municipalities have chosen to adopt. Within this ordinance there are regulations for floodplain management that exceed federal standards. This ordinance is detailed in the Capability Assessment Section (5.2.1).

In 2018 Lycoming County completed a Long-Range Transportation Plan Update. Every five years, as required by federal law, the Lycoming County Department of Planning and Community Development updates the Williamsport Area Transportation Study (WATS) Metropolitan Planning Organization (MPO) Long Range Transportation Plan (LRTP). The current LRTP was adopted December 17, 2018 (Lycoming County, 2018).The Long-Range Transportation Plan is acknowledged as being "critical toward achieving the county's comprehensive plan vision over the 20 year planning horizon by realizing managed and well planned growth and development through the adoption of sound public policies that target strategic infrastructure investments consistent with federal, state and local planning factors" (Long Range Plan, 2018). The integration of both plans will influence future development in the county and its concentrated plan for growth. 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.

Lycoming County also has a Stormwater Management Plan that was developed in 2010 that focuses on encouraging best management practices that help enforce environmentally sensitive development and encourage development that will limit runoff. As of 2010 all 52 municipalities have adopted this plan. Encouraging better development practices in relation to stormwater management could help make communities less vulnerable to the impacts of flooding.

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, Lycoming 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.

Lycoming County has a number of resources it can access to implement hazard mitigation initiatives including emergency response measures, local planning and regulatory tools, administrative assistance and technical expertise, fiscal capabilities, and participation in local, regional, state, and federal programs. The presence of these resources enables community resiliency through actions taken before, during, and after a hazard event.

The 2015 HMP update included a capability assessment survey developed based on FEMA and PEMA guidance and shortened from the 2010 HMP capability assessment survey to collect the most essential capability information. The survey asked about the most common plans, tools, and programs found in Lycoming County communities; about staff and personnel resources; and ended with a self-assessment of capabilities. Municipalities were asked to complete the information to the best of their ability.

For the 2020 HMP update, the capability assessment survey was developed based on the most recent FEMA and PEMA guidance, and similar to the 2015 capability assessment survey asked about the common plans and programs; staff and personnel resources; and a self-assessment of capabilities.

To aid municipalities in completing the 2020 Capability Assessment Survey, a copy of their 2015 Capability Assessment Survey was provided if a survey was completed. If a municipality did not complete a survey for the 2015 HMP Update, they were provided with a blank survey.

The Capability Assessment Survey was provided in both hard copy (at meetings) and electronic format (via e-mail and the project website) to each municipality. In addition, Lycoming County Emergency Agency and Department of Planning and Community Development identified county-level capabilities.

The capability assessment is a good tool to identify local capabilities and to recognize gaps and weaknesses that can be addressed through future mitigation actions. The results of the capability assessment provide useful 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 2010 and 2015 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:

5.2. Capability Assessment Findings

5.2.1. Planning and Regulatory Capability

Lycoming County and participating jurisdictions have several planning and regulatory tools in place to support the goals of hazard mitigation planning. Additionally, these regulations provide opportunities for further mitigating the potentially negative effects of natural hazards.

5.2.1.1. Plans and Regulations

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 Lycoming 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 Lycoming 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 subsections below provide details on the types of major plans and ordinances that Lycoming County and local municipalities use to support the goals of this hazard mitigation plan and provide opportunities for further mitigating the potentially negative effects of natural hazards through regulation.

Comprehensive Plan

- A comprehensive plan is a policy document that states objectives and guides the future growth and physical development of a municipality. The comprehensive plan is a blueprint for housing, transportation, community facilities, utilities, and land use. It examines how the past led to the present and charts the community's future path. Pennsylvania's MPC (Act 247 of 1968), as reauthorized and amended, requires counties to prepare and maintain a county comprehensive plan and to update it every 10 years. Local municipalities may prepare, but are not required by the MPC to prepare, a comprehensive plan.
- With regard to hazard mitigation planning, Section 301(a)2 of the MPC requires comprehensive plans to include a plan for land use, which, among other provisions, suggests that the Plan give consideration to floodplains and other areas of special hazards and other similar uses. The MPC also requires comprehensive plans to include a plan for community facilities and services and recommends considering storm drainage and floodplain management.
- The Lycoming County Comprehensive Plan (2006) was recently updated in 2017. The County identified eight priority issues with most being related to hazard mitigation planning in some capacity. Specifically, the following priority issues can begin to be addressed through the HMP goals and mitigation actions:
  - Priority #1: infrastructure does not meet the needs of all areas of the County such as utilities
  - Priority #4: flooding, the primary threat to life, properties, and communities through Lycoming County
  - Priority #5: current land use regulations and enforcement do not consistently and adequately meet community visions and respond to changing conditions
  - Priority #7: water quality is vital, but is vulnerable to a multitude of threats
  - Priority #8: Drugs, particularly heroin and opioids, are creating significant social, economic, public health, and safety problems across the County
- The County has made it a priority to steer future development away from the SFHA. The Comprehensive Plan Update referenced the 2015 HMP by highlighting the listed 5,500 structures were in the SFHA. From the 2015 HMP to the 2018 Comprehensive Plan Update, the County has reduced that number to 4,188 structures. The County, through collaboration with municipal officials, will use zoning to concentrate and guide development within the identified growth areas; restore natural floodplains through acquisition and demolition; preserve open space, natural resources, and farmland; and

coordinate land use development to provide for mixed use development and brownfields redevelopment. Lastly related to floodplain management, the Comprehensive Plan Update incorporates the process highlighted in the HMP to acquire properties.

- In addition, the 2018 Update notes the importance of preserving open space for agriculture and the decrease in acreage from the Marcellus natural gas boom. Although there has been a decrease in acreage, the County has experienced a 32% increase in production over a 10-year period.
- The HAZUS modeling results were even incorporated in the update. Specifically, the number of buildings and their aggregate total replacement value of $7,427,019 (2014 dollars); the number of essential facilities; and that over 61% of facilities will be moderately damages.
- Utility projects completed in the last five years were also highlighted, including the construction of a $6 million water and sewer expansion project in the US-15 corridor and a Montoursville/ Muncy Regional Water System upgrade well house completed in 2017. To take advantage of natural gas availability, River Valley Transit (RVT) developed a Compressed Natural Gas (CNG) fueling station. RVT currently has a fleet of 33 buses with 18 being fueled with CNG. By the end of 2022, all of RVT's buses will be CNG fueled. CNG offers a 25% reduction in carbon emissions versus gasoline and also has the possibility to have much lower fuel costs than gasoline.
- There are also six multi-municipal regional plans designed to address specific issues and characteristics of the following areas within the County: Muncy Creek (2017), Montoursville/Muncy (2017), US-220/I-99 (2017), US-15 (2017), Greater Williamsport Alliance (2017), and Lower Lycoming Creek (2017). These multi-municipal comprehensive plans account for 26 of the 52 municipalities.
- Similar to the County Comprehensive Plan, these regional plans also focus on priority issues with overlap of the County Plan such as drugs; flooding; water quality and stormwater infrastructure; multi-modal transportation systems such as the airport; and future land use regulations. Hazards such as floodplains and steep slopes were critical issues all of these plans. It is interesting to note most municipalities mentioned the fragmentation of local government in Pennsylvania is a barrier to efficient delivery of public services and project execution. Planning processes should be used to bring municipalities together to share resources and ideas despite operating and governing individually.
- All municipalities are covered, in some capacity, under one or more comprehensive plans adopted by the County of Lycoming. The following is a link to the comprehensive plans available via the County's home page: http://www.lyco.org/dotnetnuke/Home/PlanningandCommunityDevelopment/ComprehensivePlans/tabid/310/Default.aspx

Zoning Ordinances

- Zoning ordinances allow for local municipalities to regulate the use of land to protect the interest and safety of the general public. In Pennsylvania, the MPC establishes authority to for communities to zone. Zoning ordinances can be designed to address unique conditions or concerns within a given community but must be based in maintaining public health and safety in a community. They may be used to create buffers between structures and high-risk areas, limit the type or density of development, and/or require land development to consider specific hazard vulnerabilities.
- Zoning ordinances contain both a map that delineates zoning districts and text documenting the regulations that apply in each zoning district. Lycoming County has adopted a county zoning ordinance that covers municipalities that do not have their own ordinance. The County Partnership Zoning Ordinance covers specifics relating to floodplain management, wind energy development, airport hazard areas, steep and severe slopes, carbonate geology, and woodland protection (wildfire prevention standards). All municipalities in Lycoming County have zoning ordinances.

Subdivision Regulations

- Subdivision and land development ordinances (SALDOs) are intended to regulate the development of housing, commercial, industrial, or other uses, including associated public infrastructure, as land is subdivided into buildable lots for sale or future development. Within these ordinances, guidelines on how land will be divided, the placement and size of roads and the location of infrastructure can reduce exposure of development to hazard events.
- Article V of the MPC authorizes municipalities to prepare, enact, and enforce a subdivision and land development ordinance, including regulations to control the layout of streets, minimum lot sizes, and the provision of utilities. The objectives of a subdivision and land development ordinance are to do the following:
- Coordinate street patterns
- Ensure that adequate utilities and other improvements are provided in a manner that will not pollute streams, wells, and/or soils
- Reduce traffic congestion
- Provide sound design standards as a guide to developers, elected officials, planning commissions, and other municipal officials
- The Lycoming County Planning Commission has the authority to approve, approve with conditions, or disapprove all subdivisions and land developments that occur in municipalities that do not have an ordinance.
- In cases where municipalities have their own subdivision and land development ordinance, plans must be submitted to the County Planning Commission for review, and the Planning Commission provides comments to the municipality within 30 days. All municipalities in Lycoming County have subdivision regulations.

Floodplain Management Ordinances

- Municipalities can help regulate construction in floodplains through floodplain ordinances and floodplain management plans. Floodplain management plans describe how the community will reduce the impact of flood events through preventive and corrective actions. Through administration of floodplain ordinances, municipalities can ensure that all new construction or substantial improvements to existing structures located in a floodplain are flood-proofed, dry-proofed, or built above anticipated flood elevations. The NFIP establishes minimum ordinance requirements which must be met for that community to participate in the program.
- All 52 municipalities in Lycoming County have enacted floodplain ordinances. The following municipalities participate in the County Zoning Partnership:

  - Bastress Township
  - Brown Township
  - Cascade Township
  - Cogan House Township
  - Cummings Township
  - Gamble Township
  - Jackson Township
  - Jordan Township
  - Lewis Township
  - Limestone Township
  - McHenry Township
  - McIntyre Township
  - McNett Township
  - Mifflin Township
  - Moreland Township
  - Muncy Township
  - Penn Township
  - Piatt Township
  - Plunketts Creek Township
  - Salladasburg Borough

The County's zoning ordinance exceeds federal requirements for floodplain management by: prohibiting the conversion, improvement, expansion or construction of mobile home parks, hospitals, nursing homes, jails, or prisons; prohibiting all construction within the floodway, except for public improvements that would not increase the base flood elevation (BFE); requiring one and one-half feet of freeboard for all new construction or substantial improvement of residential structures within the floodplain; non-residential structures must be flood proofed; prohibiting fully enclosed structures (basements) below freeboard and requiring partially enclosed structures to allow for the movement of floodwaters and the stabilization of exterior walls; requiring the elevation of critical mechanical utilities above the freeboard and elevation where possible of non-critical utilities; prohibiting the storage of hazardous materials and substances in excess of 550 gallons in the floodplain.

Stormwater Management Plan or Ordinance

- The proper management of stormwater runoff can improve conditions and decrease the chance of flooding. The Pennsylvania legislature enacted the Stormwater Management Act (Act 167 if 1978), commonly called Act 167, requiring counties to develop stormwater management plans for designated watersheds. This planning effort results in sound engineering standards and criteria being incorporated into local codes and ordinances to manage stormwater runoff from new development in a coordinated, watershed-wide approach. Without such planning, stormwater is either

not controlled by municipal ordinances, or is addressed on a site-by-site or municipal boundary basis. Municipalities within the same watershed may require different levels of stormwater control. The result is often the total disregard of downstream impacts or the compounding of existing flooding problems.

- Act 167 Stormwater Management Plans are intended to improve stormwater management practices, mitigate potential negative impacts from future land uses, and improve the condition of impaired waterways. This type of plan provides local ordinances that incorporate standards and criteria to manage and maintain peak runoff flows throughout the combined watersheds as development occurs. Also, it is not the intent of this plan to solve existing flooding or runoff problems, but to identify for future correction and assure problems do not get worse. More specifically, this plan does not require municipalities to correct existing drainage problems.
- Municipalities have an obligation to implement the criteria and standards developed in each watershed stormwater management plan by amending or adopting laws and regulations for land use and development. The implementation of stormwater management criteria and standards at the local level is necessary, since municipalities are responsible for local land use decisions and planning. The degree of detail in the ordinances depends on the extent of existing and projected development. Municipalities within rapidly developing watersheds will benefit from the watershed stormwater management plan and will use the information for sound land use considerations. A watershed stormwater management plan is designed to aid the municipality in setting standards for the land uses it has proposed. A major goal of the watershed plan and the attendant municipal regulations is to prevent future drainage problems and avoid the aggravation of existing problems.
- The Department of Planning and Community Development reports that all 52 municipalities have adopted the Lycoming County Stormwater Management Plan dated May 6, 2010. The Stormwater Management Plan highlights both non-structural best management practices (BMPs) and structural BMPs Non-structural examples include reducing impervious pavement, maintaining natural swales and filter strips, and enforcing environmentally sensitive development, and structural examples include retention basins, vegetated roofs, and runoff reuse.

Building Codes

- Building codes are important in mitigation, because codes are developed for regions of the country in consideration of the hazards present within that region. Consequently, structures that are built to applicable codes are inherently resistant to many hazards such as strong winds, floods, and earthquakes, and can help mitigate regional hazards like wildfires. In 2003, the Commonwealth of Pennsylvania implemented the Uniform Construction Code (UCC) (Act 45 of 1999), a comprehensive building code that establishes minimum regulations for most new construction, including additions and renovations to existing structures.

- The UCC applies to almost all buildings, excluding manufactured and industrialized housing (which are covered by other laws), agricultural buildings, and certain utility and miscellaneous buildings. The UCC has many advantages in requiring builders to use materials and methods that have been professionally evaluated for quality and safety, as well as requiring inspections of completed work to ensure compliance.
- If a municipality has "opted in," all UCC enforcement is local, except where municipal (or third party) code officials lack the certification necessary to approve plans and inspect commercial construction for compliance with UCC accessibility requirements. If a municipality has "opted out," the Department of Labor and Industry is responsible for all commercial code enforcement in that municipality. The Department of Labor and Industry also has sole jurisdiction for all state-owned buildings no matter where they are located.
- Local residential and nonresidential code officials were required to register and obtain certification within three and five years, respectively. While some municipalities in Lycoming County had already instituted building codes prior to the mandate by the Commonwealth, all municipalities and the County have spent considerable time and resources retraining and becoming certified in the new requirements and revamping their administrative and enforcement procedures. With the exception of three municipalities, Cummings, Gamble, and McHenry, all other municipalities have opted in. Except for the City of Williamsport and Loyalsock Township, municipalities in Lycoming County have hired a third-party contractor to enforce building codes.

Emergency Management

- In Lycoming County emergency management is a comprehensive, integrated program of mitigation, preparedness, response, and recovery for all types of emergencies and disasters. In Pennsylvania, Emergency Management begins at the municipal level, as required by the PA Emergency Management Service Code. Every county, city, borough, and township in the Commonwealth is required to have an emergency management coordinator selected by the elected officials of the jurisdiction. The ultimate responsibility for Emergency Management always rests with the chief elected officials and governing body; however, the Emergency Management Coordinator's role is to develop plans, conduct training, and coordinate all available resources in the community pre- and post-disaster.
- The responsibilities of the EMC are outlined in the Pennsylvania Code, Title 35 §7503:
    - Prepare and maintain a current disaster emergency management plan
    - Establish, equip, and staff an emergency operations center (EOC)
    - Provide individual and organizational training programs
    - Organize and coordinate all locally available manpower, materials, supplies, equipment, and services necessary for disaster emergency readiness, response, and recovery

  - Adopt and implement precautionary measures to mitigate the anticipated effects of a disaster
  - Cooperate and coordinate with any public and private agency or entity
  - Provide prompt information regarding local disaster emergencies to appropriate Commonwealth and local officials or agencies and the general public
  - Participate in all tests, drills, and exercises, including remedial drills and exercises, scheduled by the applicable agency or by the federal government
- All 52 municipalities in Lycoming County have EMCs. It is not uncommon that one EMC covers multiple municipal jurisdictions. Effective partnerships are created in advance of a disaster by the Emergency Management Coordinator through the development of a proactive, comprehensive emergency operations plan and other planning, training, and exercise programs.
- During a disaster, response and recovery efforts are coordinated from an Emergency Operations Center that is staffed by paid and volunteer personnel and representatives from all emergency service departments and agencies involved in operations. When two or more municipalities are involved in a disaster, the county can assume overall emergency coordination. When two or more counties are involved in a disaster, the state can assume overall coordination. When two or more states are involved in a disaster, the federal government can assume overall coordination. The responsibility and authority for emergency management always lies with the lowest level of government affected, and a unified incident command system is implemented that is all inclusive yet is never meant to usurp local authority.

5.2.1.2. 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.

All 52 municipalities in Lycoming County 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.

Table 5.2.1-1 NFIP Participation in Lycoming County (FEMA CIS 2020).

MUNICIPALITY	DATE ENTERED THE NFIP	# POLICIES	IS THE COMMUNITY IN GOOD STANDING?
Anthony Township	12/1/86	2	Yes
Armstrong Township	9/28/79	11	Yes
Bastress Township	9/24/84	0	Yes

Table 5.2.1-1 NFIP Participation in Lycoming County (FEMA CIS 2020).

MUNICIPALITY	DATE ENTERED THE NFIP	# POLICIES	IS THE COMMUNITY IN GOOD STANDING?
Brady Township	7/16/79	1	Yes
Brown Township	3/2/81	5	Yes
Cascade Township	12/1/86	1	Yes
City of Williamsport	12/1/77	27	Yes
Clinton Township	9/28/79	11	Yes
Cogan House Township	6/1/87	0	Yes
Cummings Township	9/17/80	36	Yes
Duboistown Borough	3/1/77	13	Yes
Eldred Township	9/17/80	15	Yes
Fairfield Township	6/1/81	8	Yes
Franklin Township	6/1/87	2	Yes
Gamble Township	9/30/80	9	Yes
Hepburn Township	2/17/82	22	Yes
Hughesville Borough	10/15/81	6	Yes
Jackson Township	1/1/91	0	Yes
Jersey Shore Borough	3/5/76	146	Yes
Jordan Township	12/1/86	2	Yes
Lewis Township	3/2/83	32	Yes
Limestone Township	6/1/87	2	Yes
Loyalsock Township	5/16/77	64	Yes
Lycoming Township	9/17/80	48	Yes
McHenry Township	8/15/80	11	Yes
McIntyre Township	11/4/81	18	Yes
McNett Township	12/23/83	0	Yes
Mifflin Township	4/17/85	8	Yes
Mill Creek Township	3/2/79	1	Yes
Montgomery Borough	6/15/78	38	Yes
Montoursville Borough	8/15/77	15	Yes
Moreland Township	3/2/81	1	Yes
Muncy Borough	2/16/77	84	Yes
Muncy Creek Township	9/30/80	58	Yes
Muncy Township	8/19/87	4	Yes
Nippenose Township	4/15/80	13	Yes
Old Lycoming Township	4/15/77	70	Yes
Penn Township	8/15/90	1	Yes
Piatt Township	4/1/80	14	Yes
Picture Rocks Borough	9/5/90	8	Yes
Pine Township	9/17/80	6	Yes
Plunketts Creek Township	8/2/82	50	Yes
Porter Township	1/14/77	22	Yes

Table 5.2.1-1 NFIP Participation in Lycoming County (FEMA CIS 2020).			
MUNICIPALITY	DATE ENTERED THE NFIP	# POLICIES	IS THE COMMUNITY IN GOOD STANDING?
Salladasburg Borough	1/5/79	4	Yes
Shrewsbury Township	12/15/90	7	Yes
South Williamsport Borough	4/15/77	23	Yes
Susquehanna Township	9/28/79	13	Yes
Upper Fairfield Township	9/17/80	13	Yes
Washington Township	12/1/86	3	Yes
Watson Township	10/15/80	28	Yes
Wolf Township	12/2/80	19	Yes
Woodward Township	9/28/79	14	Yes
Total		1,009	

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 Lycoming County have either adopted a stand-alone ordinance or have arranged for County administration of floodplain regulations.

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 for property owners in both the SFHA and non-SFHA. 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 categories: Public Information, Mapping and Regulations, Flood Damage Reduction, and Flood Preparedness.

Jersey Shore Borough (CRS Class 9) is the only municipality participating in this program. Input provided during the mitigation solutions workshop indicates that the administrative documentation procedures and their associated costs may be a hindrance to municipalities in using this program.

5.2.1.3. Administrative and Technical Capability

Administrative capability is described by an adequacy of departmental and personnel resources for the implementation of mitigation-related activities. Technical capability relates to an adequacy of knowledge and technical expertise of local government employees or the ability to contract outside resources for this expertise to effectively execute mitigation activities. Common examples of skill sets and technical personnel needed for hazard mitigation include: planners with knowledge of land development/management practices, engineers or professionals trained in construction practices related to buildings and/or infrastructure (e.g. building inspectors), planners or engineers with an understanding of natural and/or human caused hazards, emergency managers, floodplain administrators, land surveyors, scientists familiar with hazards in the community, staff with the education or expertise to assess community vulnerability to hazards, personnel skilled in geographic information systems, resource development staff or grant writers, fiscal staff to handle complex grant application processes.

Based on 26 capability assessment surveys received, municipalities in Lycoming County overall reported moderate administrative and technical staff needed to conduct hazard mitigation-activities. This is an improvement from the 2015 HMP in which most municipalities reported limited administrative and technical capabilities. The Lycoming Creek Watershed Association, Clinton Township, and Loyalsock Township reported high administrative and technical capability. There seems to be sufficient emergency management staff across the County.

Engineering

A municipal engineer performs duties as directed in the areas of construction, reconstruction, maintenance, and repair of streets, roads, pavements, sanitary sewers, bridges, culverts, and other engineering work. The municipal engineer reviews and/or prepares plans, specifications, and estimates of the work undertaken within the municipality. All 52 municipalities have contracted with a private engineer for consultation in this area.

When staff who are responsible for community planning or engineering the structures on which people rely are familiar with the hazards that can impact the community, there is a great potential for synergy. These staff members will design the communities and structures with hazard impacts in mind, resulting in more sustainable communities and stronger structures. Twenty-eight municipalities responding indicated that they have such capabilities. Although some individual municipalities do not have a staff member with an understanding of hazards (natural or otherwise), the County Planning Department will provide consultation in many facets of planning and employ a hazard reduction planner whose focus is the mitigation of natural hazards. Porter Township and Pine Township reported using the County's resources.

Lewis Township; Franklin Township; Jersey Shore Borough; Cogan House Township; Clinton Township; City of Williamsport; Muncy Creek Township; Picture Rocks Borough; Watson Township; Brady Township; Loyalsock Township; and Old Lycoming Township reported having an engineering resource. Limestone Township reported not having engineering staff. Susquehanna Township is currently working on having engineering capabilities.

Floodplain Administrator

Floodplain Administrators (FPAs) are experts in the rules and regulations of development in a floodplain and can provide vast amounts of information on the risks and impacts of building within those hazard areas. They are an integral part of the mitigation planning team and can make recommendations based on the needs and conditions of the community. All 52 municipalities participate in the NFIP and have a designated FPA. Those municipalities that are under the County Zoning Ordinance utilize the County FPA. In some municipalities floodplain management duties are a component of a current job rather than a separate position. For Lycoming County, it is not out of the ordinary for a municipal official to hold more than one title. Those municipalities that noted having a Floodplain Administrator often listed their municipal engineer or contracted engineering firm, code enforcement officer, or municipal manager as responsible.

Grant-writing Staff or Other Fiscal Staff

Few communities have the financial resources that are required to implement all of their potential programs (e.g., mitigation measures). Therefore, they must rely on grants and other fundraising opportunities to obtain the money necessary to perform mitigation projects. Many

grants are competitive, and individuals can provide donations to a vast array of causes, so the community must demonstrate that it can use those funds better than other applicants. This may be difficult but having a specialist on staff will likely increase the community's chances of receiving funding. The Lycoming County Department of Planning and Community Development often provides assistance on grant writing, especially when it involves multi-municipal initiatives. Lewis Township reported using the County's personnel.

Many of the funding streams that can be used for hazard mitigation have substantial management and reporting requirements. Employing or having access to staff specializing in grants management will help the community ensure that it does not lose a grant opportunity because it did not meet the administrative requirements of that grant. While only 13 municipalities noted this capability in the survey, Lycoming staff is well versed in grants management and provides assistance to local municipalities.

Jersey Shore Borough and Clinton Township contract their grant-writing capability, Pine Township City of Williamsport, Susquehanna Township, Loyalsock Township have someone on staff, and Porter Township, Picture Rocks Borough, Limestone Township, Franklin Township, Cogan House Township, Watson Township, and Brady Township reported not having grant-writing resources.

Staff with Experience Using Mapping (GIS) Software

Spatial and tabular data are linked in a computerized, visual format through the use of sophisticated GIS technology. Through GIS projects, it is possible to accomplish environmental restoration, economic development, Smart Growth land use planning, infrastructure development, and training to use GIS for decision support. Lycoming County has GIS capabilities that can assist the municipalities as reported by Porter Township, Lewis Township, and Cogan House Township. The County has a very sophisticated and comprehensive system database and is undertaking various initiatives to make GIS more accessible and useable by local municipalities. The County now provides municipalities, and their residents, access to an ESRI based interactive web map which contains relevant land use, assessment, and floodplain layers/data. Additional web maps can be produced or customized upon request. The interactive web map can be accessed at the following link: https://lyco.maps.arcgis.com/apps/webappviewer/index.html?id=158b4d8fbf8248ab8ad20574dc790b73.

Susquehanna Township noted they are working towards having a GIS resource. Of the 26 responses, the remaining 22 capability assessment surveys reported having someone on staff or did not have the resource. It would be extremely beneficial for the County to contact municipalities directly to let them know there are opportunities for GIS assistance.

County Planning Department

In Pennsylvania, planning responsibilities traditionally have been delegated to each county and local municipality through the municipal planning commission (MPC).

A planning agency acts as an advisor to the governing body on matters of community growth and development. A governing body may appoint individuals to serve as legal and engineering advisors to the planning agency. In addition to the duties and responsibilities authorized by Article II of the MPC, a governing body may, by ordinance, delegate approval authority to a planning agency for subdivision and land development applications. A governing body has considerable flexibility, not only as to which powers and duties are assigned to a planning agency, but also as to what form an agency will possess. A governing body can create a planning commission, a planning department, or both.

The purpose of the Lycoming County Planning and Community Development Department is to receive and make recommendations on public and private proposals for development, and to prepare and administer planning regulations. Subdivision and land development plans are also reviewed and approved by the Lycoming County Planning and Community Development Department, which works in conjunction with the municipal planning commissions, where applicable. Lycoming County Planning and Community Development Department activities and continuous education of commission members is very serious business in this County. The County supports training for members by covering the costs for attendance at training sessions and attendance at state and national planning conferences. The development of the Lycoming County Comprehensive Plan and the six multi-municipal plans facilitated an environment of collaboration between the County Planning and Community Development Department and the local municipalities that has now resulted in more coordination between local planning initiatives and County planning initiatives.

Municipal Planning Commission

The MPC conveys the planning authority and establishes the requirements that a municipality must follow. Of the 52 municipalities, 31 indicated that they have planners with appropriate knowledge of land development and management practices.

Scientists Familiar with the Hazards of the Community

Natural and human-made hazards' characteristics and impacts can be highly technical. Meteorology, aerodynamics, fluid dynamics, physics and health physics, chemistry, and several other scientific fields are involved in determining the impacts of a hazard event. Having access to a scientist who can describe the technical aspects of hazards in lay terms is important to having a sound mitigation strategy. Only three municipalities reported that they have access to this technical capability. However, the Pennsylvania College of Technology, an affiliated institution of Penn State University, is located in Williamsport. It could provide significant academic support by offering related programs in the following: architectural technology, residential construction technology, building construction technology, construction

management, civil engineering technology, forest technology, and landscape architecture technology. The Clean Water Institute at Lycoming College is another resource (see http://www.lycoming.edu/biologydept/cwi/).

Staff with the Education or Expertise to Assess the Community's Vulnerability to Hazards

The basis of hazard mitigation is hazard identification and vulnerability assessment. Conducting the vulnerability assessment is a complicated process. Planners must know where to find data on the hazards and their impacts and the characteristics of the community. More importantly, they must be able to combine these two sets of knowledge to make the analysis useful. Twenty-five municipalities responded that this capability is addressed. However, the Lycoming County Department of Planning and Community Development has a hazard reduction planner on staff who can provide this expertise.

Within Lycoming County, administrative and technical capability varies widely between the municipalities due mainly to population size and resources. Even neighboring municipalities may exhibit extreme variations in technical capability.

5.2.1.4. Financial Capability

In general, the more financial resources a municipality has, the more technically capable it will be from a resource availability perspective. This is not necessarily the case, however when analyzing technical capability from a knowledge/skill level perspective. As such, technical capability must be analyzed by each municipality prior to implementing any hazard mitigation activity. It is important to note; however, that much like fiscal capability, shortfalls in technical capability may be overcome by cooperative arrangements, coordinated efforts, and/or resource efficiency.

Financial capability is important to the implementation of hazard mitigation activities. Every jurisdiction must operate within the constraints of limited financial resources. During the 1960s and 1970s, state and federal grants-in-aid were available to finance many programs, including street improvements, water and sewer facilities, airports, and parks and playgrounds. During the early 1980s, there was a significant change in federal policy, based on rising deficits and a political philosophy that encouraged states and local governments to raise their own revenues for capital programs, resulting in the need to identify alternate means to augment revenue. After the COVID-19 pandemic, communities across the country will face new challenges in balancing community economic recovery while also implementing hazard mitigation.

Capital Improvement Program

Based on Capability Assessment Survey responses, fiscal capabilities of Lycoming County local municipalities vary greatly from community-to-community. Of the 26 responses, 50% reported moderate fiscal capabilities followed by 27% with limited and 23% with high capabilities.

The capital improvement plan is a multiyear policy guide that identifies needed capital projects and is used to coordinate the financing and timing of public improvements. Capital improvements relate to streets, stormwater systems, water distribution, sewage treatment, and other major public facilities. A capital improvement plan should be prepared by the respective county's planning commission and should include a capital budget. This budget identifies the highest priority projects recommended for funding in the next annual budget. The capital improvement plan is dynamic and can be tailored to specific circumstances. According to the survey, only seven municipalities responded that they have a capital improvement plan, and most responded that they did not know if they had one or did not have one. Watson Township reported having a capital improvement plan under development.

Impact Fees from Unconventional Gas Drilling

The Oil and Gas Act (Act 13 of 2012) presented major changes to the oil and gas industry in Pennsylvania, including the authorization for local governments to adopt an impact fee and the provision of stronger environmental protections. For example, oil and gas well pad setbacks from private water wells, streams, and buildings increased; bond amounts for catastrophic accidents increased; and public accessibility of information related to chemicals used onsite improved (Pittsburg Post-Gazette, 2012). A portion of the impact fees goes to county conservation districts, the Pennsylvania Fish and Boat Commission, the Pennsylvania Public Utility Commission, the Pennsylvania Department of Environmental Protection, the PEMA, the Pennsylvania Office of State Fire Commissioner, and the Pennsylvania Department of Transportation in order to address statewide issues (PA PUC, 2012). A portion of the impact fees goes to local municipalities to address water, wastewater, and road infrastructure maintenance and improvements; emergency preparedness; environmental programs; tax reductions; increased safe/affordable housing; employee training; or planning initiatives.

Lycoming County has proposed to use Act 13 funds to help rehabilitate the flood control structure in partnership with the Township of McIntyre, which would provide flood protection to the Village of Ralston and South Ralston. Under the proposed agreement, the county would cover half of all fees associated with the project (Lycoming County Department of Planning and Community Development, 2015).

Community Development Block Grants (CDBGs)

These grants are designed to assist the vulnerable populations within the community by ensuring affordable housing, creating jobs, and providing direct services. The amount of each grant is determined by a formula that accounts for the community's need, poverty, population, housing, and comparison to other areas. The annual appropriation is divided among the states and local jurisdictions (referred to as "non-entitlement communities" and "entitlement communities"). The following are entitlement communities:

- Central cities of Metropolitan Statistical Areas (MSAs)
- Cities with at least 50,000 people
- Some urban counties with at least 200,000 people
- States provide CDBG funds to non-entitlement jurisdictions.

The majority of CDBG funds are required to be spent to benefit low- and moderate-income people. Also, there is a set of national objectives for the program, including addressing existing conditions that pose a threat to the health and welfare of the community (e.g., low-income housing in a floodplain). All municipalities within Lycoming County have access to CDBG funding, be it directly through the federal or state government or through a competitive county selection process.

To date, CDBG funding has not been allocated to hazard mitigation projects in Lycoming County however the County is partnering with Success Through Engagement Partnerships (STEP) to pursue grant funding through CDBG-DR for a housing rehabilitation project that will involve primary homeowner occupied residences affected by tropical storm Lee. If funding is granted, the project will involve elevations, utility retrofits, and possibly some new construction/additions.

Gas/Electric Utility Fees

In the same way that special taxes can be levied to fund mitigation projects, another avenue for financing a project that a community may utilize is to dedicate a portion of homeowners' gas and electric utilities fees to upgrade and maintain the related infrastructure. Burying transmission lines, thereby mitigating from the effects of winds and ice storms, is expensive. These fees help to offset that cost. Only Fairfield Township reported using this approach.

Water and Sewer Authority Fees

Water authorities are multipurpose authorities with water projects, many of which operate both water and sewer systems. The financing of water systems for lease back to the municipality is among the principal activities of the local government facilities' financing authorities. An operating water authority issues bonds to purchase existing facilities or to construct, extend, or improve a system. The primary source of revenue is user fees based on metered usage. The cost of constructing or extending water supply lines can be funded by special assessments against abutting property owners. Tapping fees also help fund water system capital costs. Water utilities are directly operated by municipal governments and by privately owned public utilities regulated by the Pennsylvania Public Utility Commission. The PADEP has a program to assist with consolidation of small individual water systems to make system upgrades more cost effective.

Sewer authorities include multipurpose authorities with sewer projects. The authorities issue bonds to finance acquisition of existing systems or to finance construction, extension, and improvements. Sewer authority operating revenues originate from user fees. The fee frequently is based on the amount of water consumed, and payment is enforced by the ability to terminate service or the imposition of liens against real estate. In areas with no public water supply, flat rate charges are calculated on average use per dwelling unit.

There are four sewer authorities operating in Lycoming County, including the Williamsport Sanitary Authority, Lycoming County Water and Sewer Authority, West Branch Regional Authority and the Hughesville-Wolf Township Municipal Authority. A key objective of this effort involves the elimination of WWTPs from the floodplain which has been completed with the regionalization of Muncy and Montgomery into West Branch Regional Authority and the new sewer plant constructed in 2015. In addition, there are seven public water supply authorities, including Hughesville Borough Authority, Jersey Shore Area Joint Water Authority, Lycoming County Water and Sewer Authority, Montgomery Water Authority, Muncy Borough Municipal Authority, Williamsport Municipal Water Authority, Montoursville Borough, Ralston Area Joint Authority, Waterville Water Association and Detailed information can be found in the 2001 Lycoming County Water Supply Plan at http://www.lyco.org/Portals/1/PlanningCommunityDevelopment/Documents/EDPS_PDFs/WSP_Final_Report.pdf.

Development Impact Fees

Development impact fees are one-time fees assessed to offset the cost of providing public services to a new development. In Pennsylvania, impact fee programs may be established for capital improvements associated with transportation infrastructure in accordance with section 505-A of the Pennsylvania Municipalities Planning Code and the Pennsylvania Transportation Partnership Act. This program would allow for investments in highway infrastructure to reduce hazard risks. In addition, Pennsylvania Act 203 of 1990: Municipalities Authorities Act Amendments, allows water and sewer authorities to charge tapping fees for infrastructure improvements to connect adjacent properties to systems. However, this authorization would only have limited value in addressing hazards. In other states, such impact fees may be dedicated to providing the related new water or sewer infrastructure, roads, parks and recreational areas, libraries, schools, etc. The new infrastructure may be less vulnerable to hazard impacts.

General Obligation, Revenue, and/or Special Tax Bonds

Jurisdictions may simply decide to dedicate general fund or similar financing to implement hazard mitigation projects. Eleven of the municipalities surveyed indicated they have such capabilities.

State and Federal Financial Resources and Grant Programs

The decision and capacity to implement mitigation-related activities is often strongly dependent on availability of local financial 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 leverage state or federal mitigation grant funding opportunities that require local-match contributions.

State funding sources that may be available for hazard mitigation planning activities at the time the HMP update was prepared include but are not limited to the following (DCED, 2020).

- CFA/DCED Abandoned Mine Drainage Abatement and Treatment Program
- CFA/DCED Baseline Water Quality Data Program
- CFA/DCED First Industries Fund
- CFA/DCED Flood Mitigation Program
- CFA/DCED H2O PA Flood Control Projects
- CFA/DCED H2O PA High Hazard Unsafe Dam Projects
- CFA/DCED H2O PA Water Supply, Sanitary Sewer and Storm Water Projects
- CFA/DCED Orphan or Abandoned Well Plugging Program
- CFA/DCED PA Small Water and Sewer
- CFA/DCED Sewage Facilities Program
- CFA/DCED Watershed Restoration Protection Program
- DCED Business Financing Programs
- DCED Keystone Communities Program
- DCED Local Government Capital Project Loan Program
- DCED Municipal Assistance Program
- DCED/DEP Coal Refuse Energy and Reclamation Tax Credit Program
- DCED/DEP Private Dam Financial Assurance Program
- DCNR Community Conservation Partnerships Program
- DEP Growing Greener Plus Grants Program
- PennDOT Pennsylvania Infrastructure Bank (PIB) Loan
- Pennsylvania Infrastructure Investment Authority (PENNVEST)
- Pennsylvania Redevelopment Assistance Capital Program (RACP)

Federal funding sources that may be available for hazard mitigation planning activities at the time the HMP update was prepared include but are not limited to the following.

- Appalachian Regional Commission (ARC) POWER Initiative Grant Program
- Department of Commerce (DOC)/Economic Development Authority (EDA) Construction Grant Program
- EDA Construction Grant Post Approval Process Tool for Grant Recipients (Version 5.0)
- https://www.eda.gov/tools/grantee-information/

- Department of Energy Weatherization Assistance Program
- Department of Homeland Security Grant Program (HSGP)
- Department of Transportation/Federal Highway Administration Emergency Relief Program
- DOC/EDA Planning Grants
- DOC/EDA Technical Assistance Grants FY 2016 – FY 2019 EDA PLANNING PROGRAM AND LOCAL TECHNICAL ASSISTANCE PROGRAM
- DOC/EDA Revolving Loan Fund (ACEDC RLF recipient)
- FEMA Community Assistance Program – State Support Services Element (CAP-SSSE)
- FEMA Community Disaster Loan Program
- FEMA NFIP Community Rating System
- FEMA Emergency Management Performance Grants (EMPG)
- FEMA Environmental Planning and Historic Preservation Program (EHP)
- FEMA Flood Mitigation Assistance Program
- FEMA Hazard Mitigation Grant Program (HMGP)
- FEMA Individuals and Households Program (IHP)
- FEMA National Dam Safety Program
- FEMA National Flood Insurance Program
- FEMA Pre-Disaster Mitigation Program (PDM)
- FEMA Public Assistance Program (PA)
- FEMA Regional Catastrophic Preparedness Grant Program
- Housing and Urban Development (HUD) 5(H) Homeownership Program
- HUD Community Development Block Grant (CDBG)
- HUD Disaster Housing Assistance Program (DHAP)
- HUD/Federal Housing Administration (FHA) Title I Property Improvement Loans
- HUD/FHA Section 203(h) Mortgage Insurance for Disaster Victims
- HUD/FHA Section 203(k) Rehabilitation Mortgage Insurance
- HUD Partnership for Advancing Technology in Housing
- HUD Section 108 Loan Guarantee Programs
- Internal Revenue Service Casualty Loss-Special Disaster Provisions
- NOAA National Weather Service StormReady® Program
- USDA Natural Resources Conservation Service (NRCS) Easement Programs
- Small Business Administration Disaster Loan Programs
- United States Army Corps of Engineers (USACE) General Investigation (GI)
- USACE Continuing Authorities Program
- USACE Flood Plain Management Services Program (FPMS)
- USACE Inspection of Completed Works Program (ICW)
- USACE National Levee Safety Program
- USACE Planning Assistance to States
- USACE Rehabilitation and Inspection Program (RIP)

- United States Department of Agriculture (USDA)/Farm Service Agency (FSA) Emergency Conservation Program
- USDA/FSA Emergency Farm Loans
- USDA/Emergency Forest Restoration Program (EFRP)
- USDA Non-insured Crop Disaster Assistance Program (NAP)
- USDA/NRCS Emergency Watershed Protection Program
- USDA/NRCS Watershed Protection and Flood Prevention Program
- USDA Home Renovation Loans
- USDA/Rural Housing Service (RHS) Community Facilities Loans and Grants
- USDA/RHS Rural Housing Assistance
- USDA/RHS Section 502 Single-Family Housing Direct and Guaranteed Loans
- USDA/RHS Single Family Housing Repair Loans & Grants
- USDA/RHS Mutual Self-Help Housing Technical Assistance Grants
- USDA/Risk Management Agency Federal Crop Insurance Program
- USDA/Rural Development Business & Industry Loan Guarantees

5.2.1.5. 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 USA® or StormReady® and activities conducted as part of hazard awareness campaigns, such as Tornado or Flood Awareness Month. Some communities have their own public information or communications office to handle outreach initiatives. Overall, programs not relating to certification are not common within the County.

Firewise USA® Program

The National Fire Protection Association (NFPA) administers the Firewise USA® Program to encourage local solutions for safety by involving homeowners in taking individual responsibility for preparing their homes from the risk of wildfire. The program provides resources to help homeowners learn how to adapt to living with wildfire and encourages neighbors to work together to take action to prevent losses. The national Firewise USA® Recognition Program has nearly 1,000 active member communities in 40 states, as well as a participation retention rate of 80 percent over the past decade. The program, aimed at homeowners, provides specific criteria for communities regarding wildfire preparedness, and offers national recognition for their work. According to the PA DCNR, Firewise USA® has replaced Firewise Communities which was discontinued in 2019.

Only four Pennsylvania communities participate in NFPA Firewise USA, none are in Lycoming County. No municipalities reported Firewise Communities designation. Lycoming County will assist communities in the establishment of a Firewise community rating for the local

municipality in cooperation with the Department of Conservation and Natural Resources Bureau of Forestry. The Tanker Task Force is also part of this initiative. The County also provides resource for training through the Bureau of Forestry and community colleges.

StormReady®

StormReady® is an education and outreach program that helps arm communities with the communication and safety skills needed to save lives and property before, during, and after an event. All of Pennsylvania's 67 counties meet enrollment criteria.

The County of Lycoming was certified as Storm Ready in 2000 under this national program. In 2009, Lycoming County renewed its Storm Ready Community designation with the NWS and PEMA officials from Central Region. This entailed a thorough inspection of numerous documents and file information by the NWS. Cogan House Township is a StormReady community and the City of Williamsport is a supporter.

Flood Ready

Flood Ready is a webpage on the County website that provides local officials and residents with current stream and rainfall gauge information, emergency road closings along with a link to PennDOT District 3-0 traffic information. The website allows for the timely delivery of information that has the potential to inform and protect first responders, residents and business owners from adverse events. For example, the public can use the site to better understand safe travel routes in the event of an emergency or storm event by viewing the state and municipal road closures in the county. The portal also provides access to real-time data on precipitation levels and stream heights that can provide advance warning in the event of flooding.

At the height of the thunderstorm Lee the Flood Ready website had 83,869 hits before crashing on September 8, 2011. Normal site traffic ranges from 300 to 500 hits per month and is typically utilized by outdoorspeople such as fisherman and kayakers.

NOAA Weather-Ready Nation (WRMN) Ambassador

NOAA WRMN Ambassador is a designation that Lycoming County has achieved which recognizes NOAA partners that are improving resilience against extreme weather events. Partners help unify efforts across government, non-profits, academia, and private industry toward making the community and the nation more ready. According to NOAA, Ambassadors:

- Promote Weather-Ready Nation messages and themes to their stakeholders;
- Engage with NOAA personnel on potential collaboration opportunities;
- Share their success stories of preparedness and resiliency; and
- Serve as an example by educating employees on workplace preparedness

NOAA supports Ambassadors by:

- Providing outreach content about creating a Weather-Ready Nation;
- Exploring innovative approaches for collaboration; and
- Assisting with StormReady/TsunamiReady opportunities

Farmland Preservation

Farmland preservation measures are important to hazard mitigation. Preserved farms protect soil from erosion and prevent the contamination of local surface water. In addition, farms and forest land are important for recharging the community's aquifer and providing habitat for local wildlife. Lycoming County has a very active agricultural land preservation program overseen by a seven-member board. The County Conservation District administers the program.

Lycoming Parcel Viewer

This program allows users to map parcel, floodplain, soil, and zoning information among other things, from the County website at http://lycomap.lyco.org/.

The Lycoming County Flood Map Viewer, https://lyco.maps.arcgis.com/apps/webappviewer/index.html?id=a5c92a3a7b794affb1199fecd129fd3e, is a tool available for more in-depth information related to flooding. This is a helpful tool for Lycoming County residents to more accurately assess their level of flood risk.

Lycoming County Department of Public Safety maintains a Gas Well/Energy Development Information page that includes vehicle identification, rescue/response guidance, and important industry related terms and definitions at http://www.lyco.org/PublicSafety/GasWellEnergyDevelopmentInformation.aspx.

The Lycoming County Emergency Management Agency coordinates and supports the following programs:

- Emergency Operations Planning for all 52 municipalities
- Fire Training Courses for all County Emergency Responders
- Specialized training for Municipal EMA Coordinators
- Emergency planning assistance to public, private and government agencies
- Drought Management Task Force
- Flash Flood Warning volunteer program
- Auxiliary Communications Service volunteer amateur radio program
- Radiological Emergency Response volunteer program
- Firefighting Foam Bank administration
- SKYWARN weather observation volunteer program
- National Weather Service assistance and cooperation

- Project Impact support
- Damage Assessment program
- Emergency Alert System Warning Program

5.2.1.6. Community Political Capability

One of the most difficult capabilities to evaluate involves the political will of a jurisdiction to enact meaningful policies and projects designed to mitigate hazard events. The adoption of hazard mitigation measures may be viewed as an impediment to growth and economic development. In many cases, mitigation may not generate interest among local officials when compared with competing priorities. Therefore, the local political climate must be considered when designing mitigation strategies, as it could be the most difficult hurdle to overcome in accomplishing the adoption or implementation of specific actions. The capability assessment survey was used as means to record how municipalities rated community political capability. Of the 26 responding municipalities, six reported high political capabilities, 10 with moderate, and 10 with limited capabilities.

5.2.2. Plan Integration

Plan integration recognizes that hazard mitigation is most effective when it works in concert with other plans, regulations, and programs. Per FEMA, plan integration is described as the regular consideration and management of hazard risks in a community's existing planning framework. Plan integration is the process by which communities critically analyze their existing planning framework and align efforts to build a safer, smarter community. Plan integration involves a two-way exchange of information and incorporation of ideas and concepts between hazard mitigation plans (state and local) and other community plans. Specifically, plan integration involves the incorporation of hazard mitigation principles and actions into community plans and community planning mechanisms into hazard mitigation plans (FEMA, 2015).

In Pennsylvania, integrating hazard mitigation into planning tools is afforded through the Municipalities Planning Code in that protecting and promoting safety and health is a purpose of the code. Further, a purpose of the Municipalities Planning Code is "to minimize such problems as may presently exist or which may be foreseen," which is the focus of hazard mitigation planning.

When developing the HMP, the County Comprehensive Plan, EOP, and various land use ordinances and regulations provided key information. These documents are referenced where appropriate throughout the plan and links to the documents are included in Appendix A: Bibliography.

Moving forward, each of these documents should not be treated as unrelated and updated separately. The County and each participating municipality are responsible for incorporating the specific mitigation actions recommended in this Plan into the necessary planning documents, including the appropriate comprehensive plan, the County EOP, and any land use ordinances and regulations.

For example, zoning and other land use regulations can be amended to reflect the newly identified hazard areas, to ensure that development in those areas is minimized or at least conducted in a way that otherwise mitigates against the effects of hazards (e.g., requiring structures built in the floodplain to be elevated). As proposed changes to building codes are presented, their potential for mitigating damage due to hazards will be examined, and the changes will only be adopted if they are shown to lower risk. Changes to stormwater management plans will incorporate identified mitigation actions and will encourage increased participation in the NFIP.

Plan integration is not only accomplished through the MPC and planning tools such as comprehensive plans and zoning ordinances, but through capital improvement planning, area plans such as highway corridors and downtown plans, functional plans like stormwater and open space plans, and public and stakeholder outreach and education. This section highlights key opportunities for plan integration in Lycoming County.

Lycoming County Comprehensive Plan

The Lycoming County Planning and Community Development Department is responsible for maintaining and updating the County Comprehensive Plan and the County Subdivision and Land Development Ordinance. The Planning Commission meets monthly to review, discuss, and comment on municipal subdivision and land development plans. It uses this information to identify necessary revisions and to amend both the Comprehensive Plan and the Subdivision and Land Development Ordinance. The Planning Commission's meetings are open to the public and are advertised according to the Pennsylvania Sunshine Act (65 PA C.S.A.). All 52 municipalities are covered by the County Comprehensive Plan.

Technical assistance on community planning matters is provided to the Lycoming County Planning Commission and the County Board of Commissioners through the Lycoming County Planning and Community Development Department. The Planning and Community Development Department administers the County Comprehensive Plan, along with the County Subdivision and Land Development Ordinance. The Planning and Community Development Department also performs technical reviews of municipal subdivision and land development plans, municipal floodplain ordinances, municipal stormwater management plans and ordinances, and other community planning and development matters.

The 2015 HMP stated the next comprehensive plan update would include informal cross-referencing reviews of the planned development or regulatory activity with the provisions of the HMP. As stated in section 5.2.1.1, the 2018 Comprehensive Plan Update successfully incorporated data from the 2015 HMP and emphasized the importance of avoiding development in the SFHA and reducing the number of existing structures in the SFHA. The 2020 HMP update was also able to note the County's success in reducing the number of structures in the SFHA. It is recommended the 2018 Comprehensive Plan be updated to include the 2020 HMP mapping, data, and HAZUS results. In addition, the 2020 HMP emphasizes projects that addressed the priority issues regarding stormwater infrastructure

and open space management and by introducing the hazard Opioid Addiction in the hazard profiles.

Article III of the Pennsylvania Municipalities Planning Code (Act 247 of 1968, as reenacted and amended) requires all Pennsylvania counties (except Philadelphia) to adopt a comprehensive plan and update it at least every 10 years. Coupling this requirement with the DMA 2000-required five-year update cycle for HMPs, when possible, will allow the County to better integrate the County Comprehensive Plan and Multi-Jurisdictional HMP planning processes and strengthen public participation for both efforts.

Emergency Operations Plan

The Pennsylvania Emergency Management Services Code, Title 35, requires all political jurisdictions in the Commonwealth to have an emergency operations plan (EOP), an emergency management coordinator (EMC), and an emergency operations center (EOC).

Lycoming County's EOP is an all-hazards plan that complies with the National Incident Management System (NIMS) and is the basis for a coordinated and effective response to any disaster that may affect lives and property in Lycoming County. The EOP, or portions thereof, would be implemented when emergency circumstances warrant it. All 52 municipalities have local EOPs in place, though several municipalities need to update their EOPs to the most recent PEMA-approved format. The Lycoming County EOP was recently revised in February 2020 and references the County's vulnerabilities to hazard identified in the 2015 HMP, HVA.

Lycoming County's EOP is administered by the County's Department of Public Safety. It assigns responsibility to all response organizations, not only for training and preparedness, but also for response and recovery. Specific annexes, referred to as Emergency Support Function (ESF) documents, have been developed to address specific natural and technological hazards that may require an added level of coordination. A mitigation plan that is added as an addendum to an EOP can enhance the recovery process. In order to comply with the PEMA's annual work plan, units of local government are required to prepare and submit a hazard vulnerability analysis, which identifies and assesses the community's risk to natural and human-induced hazards.

The development of Marcellus Shale gas that requires drilling and use of water containing hazardous constituents, construction and maintenance of gas lines, and the movement of heavy equipment has created a suite of new hazards to be accounted for in emergency operations planning. Pennsylvania adopted Act 9 of 2012, mandating that DEP establish standards for well safety, and more specifically for emergency response for unconventional well sites. Lycoming County has an Emergency Response Plan for Unconventional Well Sites.

Lycoming County Comprehensive Recreation, Parks, & Open Space/Greenway Plan

Open space management plans are designed to protect the natural environment of the community. They describe how the community will manage woodlands, grasslands, and trails

without sacrificing the economic goals of the community. These areas are most widely used for recreational purposes, but also serve as the primary habitat for a number of species of plants and animals.

Lycoming County adopted a Recreation, Parks, and Open Space/Greenway Plan in April 2008. It is recommended for the County to pursue and update to this Plan that can correlate with the open space management issues identified in the 2018 Comprehensive Plan and goals and mitigation actions related to stormwater and natural systems protection.

Natural Resource Protection Plan

Natural resource protection plans are designed to protect woodlands, steep slopes, waterways, floodplains, wetlands, and coastal buffers through prohibiting or severely limiting development in these areas. Emergency managers and community planners have been made more and more aware of the benefits of protecting these areas as mitigation measures over the last few decades. Natural resource protection is covered in the Recreation, Parks, and Open Space/Greenway Plan (2008), the County Comprehensive Plan (2018), and multi-municipal regional plans.

Lycoming County Act 167 Stormwater Management Plan

Act 167 requires that all stormwater management plans include an analysis of present and projected land development in flood hazard areas, and its sensitivity to damages from future flooding or increased runoff. In drafting the Lycoming County Act 167 Stormwater Management Plan, this HMP's hazard profile on floods, flash floods, and ice jams was consulted to identify the location and extent of flooding, range of magnitude, past occurrences, likelihood of future occurrences, and vulnerability assessment due to flooding events. The floodplain maps included in this HMP were also used as a reference to meet Act 167 requirements.

In addition, Act 167 requires the identification of existing and proposed state, federal, and local flood control projects located in the watershed and their design capacities.

Like the HMP, stormwater management plans must be reviewed (and revised, if necessary) every five years. The stormwater management plan was adopted and approved in September 2010. As both plans are maintained by the Lycoming County Planning and Community Development Department, information gathered in the revision of one plan will be incorporated into the revision of the other.

Evacuation Plan

Evacuation is one of the most widely used methods of protecting the public from hazard impacts. The easiest way to minimize death and injury due to a hazard event is to remove as many people as possible from its path. Evacuation plans include descriptions of the area(s) being evacuated, the demographics and characteristics of people within those area(s),

transportation routes to safe areas, and how the community will support those individuals who do not have access to their own transportation. The County EOP noted above addresses various evacuation situations, such as evacuation plans for dam safety, hazardous material spills, and radiation releases. Emergency Action Plans developed for dams contain evacuation plans, and each municipality's EOP includes identification of traffic and access control points.

Disaster Recovery Plan

A Disaster Recovery Plan (DRP) is a comprehensive set of measures and procedures that ensure essential, mission-critical resources and infrastructure are maintained or backed up by alternatives during various stages of a disaster. The DRP is another step to ensure the preparedness and ability to respond quickly and effectively to restore the community's essential services. The DRP addresses the public sector's responsibilities, including temporary shelter, refuse disposal, overall damage assessment, restoration of utility services, reconstruction priorities, financial assistance, and dealing with emergency demands. In Lycoming County, the DRP is a component of the EOP.

During disasters, the Lycoming County Planning and Community Development Department staff has a supporting role in staffing the EOC to coordinate information, supply transportation information, coordinate housing efforts for disaster victims, and conduct public damage assessment.

Historic Preservation Plan

These plans describe how the community will preserve the historic structures and areas within it. Since these structures pre-date building codes and modern community planning requirements, many of them are especially vulnerable to a variety of hazards. A historic preservation plan may include measures to retrofit or relocate historic treasures out of hazard impact areas. Five municipalities have indicated that they have historic preservation plans.

Old Mill Corridor Plan

The Old Mill Corridor Plan is one section of the Lycoming County Municipal Corridor Plans (the other section addressing the I-80 Corridor in Williamsport, Pennsylvania). This plan is "designed to provide a comprehensive understanding of the future use and redevelopment potential of the Old Mill Corridor in Montgomery Borough. In creating this plan, both the Lycoming County Comprehensive Plan and the HMP were consulted. From these plans, the County determined that the Old Mill Corridor exists almost entirely in the 1%-chance floodplain, and as such is subject to Montgomery Borough's floodplain regulations. The Old Mill Corridor Plan lists several restrictions on development in the corridor based on those regulations, including elevation of the first floor 1.5 feet above the base flood elevation (BFE), prohibition of basements or crawl spaces below grade, and elevation of utilities above the BFE.

There is no required maintenance schedule for this plan. It will be reviewed and updated on an as-needed basis during its implementation. Any changes will be in consonance with the HMP and the Comprehensive Plan.

Chesapeake Bay Pollutant Reduction Plan (CBPRP)

As required by the Williamsport Area Joint MS4 NPDES Permit, the Lycoming County MS4 Coalition developed a CBPRP in April 2015. The open space created through the hazard mitigation buyout program was listed as a priority best management practice (BMP) for consideration as riparian buffer restoration and/or tree planting activities moving forward as part of the MS4 permit. Riparian buffer restoration is an effective method of reducing water volume and pollutant discharge to waterways. Buffers create habitat, promote infiltration, and reduce pollution runoff by providing a minimum distance between the water resource and development. At locations of open space restoration associated with the flood-prone property buyout program, riparian buffer restoration is recommended. These sites will be investigated to determine the feasibility of revegetating the properties with native trees and shrubs.

Act 537 Sewage Facilities Planning

Pennsylvania Act 537, the Sewage Facilities Planning Act, requires municipalities to develop and implement comprehensive official plans that provide for the resolution of existing sewage disposal problems, provide for the future sewage disposal needs of new land development, and provide for the future sewage disposal needs of the municipality. This planning process is designed to protect the health, welfare, and safety of all Pennsylvanians by protecting the Commonwealth's water resources. While these plans are designed to manage health risks, the planning process associated with keeping these plans current and applicable requires consideration of how local hazards may impact on a community's ability to implement these plans in a cost-effective manner. Some hazards that can affect the sewage facilities planning process and implementation include flooding, drought, and terroristic sabotage. In Lycoming County, the key issue of concern is flooding and how it impacts various wastewater treatment plants (WWTPs) and planned expansions.

Lycoming County has seven WWTPs. In recent years, the nutrient reduction mandates associated with the Chesapeake Bay cleanup, and consent orders relating to Combined Sewer Overflows (CSO) and Inflow and Infiltration (I&I) problems, have placed renewed attention on the condition of wastewater infrastructure in the County. Two of the plants, Lycoming County Water and Sewer Authority (LCWSA) and Hughesville-Wolf Authority (HWA), are relatively new, modern WWTPs that are located in secure areas not threatened by flooding. The two plants operated by the Williamsport Sanitary Authority (WSA) are located behind the City's levees and are thus protected from flood hazards. However, three of the County's plants located in borough population centers are at significant risk of flooding. Fortunately, all three of these plants are currently undergoing planning to reduce hazard exposure. The Jersey Shore Borough plant will be closed down in the coming years and a new plant built out of the

floodplain. The Borough of Montgomery is also considering upgrading its plant and considering possible regional solutions.

In addition to the County's WWTPs, the community collection systems that serve as tributaries to the WSA plants (Loyalsock and Old Lycoming Townships, and South Williamsport and Duboistown Boroughs), are being upgraded to reduce the I&I conditions that currently contribute to the CSO problem in the City of Williamsport.

Erosion and Sedimentation Control

The Pennsylvania Department of Environmental Protection (PA DEP) Rules and Regulations Chapter 102: Erosion and Sediment Control requires persons proposing or conducting earth disturbance activities to develop, implement, and maintain Best Management Practices (BMPs) to minimize the potential for accelerated erosion and sedimentation. The BMPs are designed to protect, maintain, reclaim and restore water quality of Commonwealth waters in order to protect the health, welfare, and safety of all Pennsylvanians.

Section 102.5 requires that permits be issued by the PADEP for certain earth disturbance activities that exceed certain threshold levels depending on the type of activity. Steep slopes, sinkholes, and hazardous materials are examples of some hazards that may be an integral consideration in the permit application review process. In many instances the program is administered by the County Conservation District. In Lycoming County, the Conservation District does administer the program.

The County Conservation District has always been a very critical partner in the management and protection of natural resources so critical to the economic health of Lycoming County. The Conservation District is in the forefront of efforts to implement BMPs that will protect local waterways and the Chesapeake Bay. Floodplain restoration is one very interesting BMP that is being looked at since it not only can reduce erosion that contributes nutrient loads to the waterways, but can also reduce flooding hazards.

Drought Planning

Under management of the Lycoming County Department of Public Safety, the County maintains a drought task force to deal with drought emergencies. Included in its review is maintenance of the Tanker Task Force, up-to-date listing of water surveys, and list of well drilling companies.

Coroner's Office Response Planning

The Coroner's office has developed a response plan for disasters involving mass casualties. The University of Pittsburgh Medical Center (UPMC) and the County of Lycoming have invested over $220,000 to develop the forensic center located at the Williamsport Hospital Campus. The forensic center houses the morgue area for providing autopsy services, dental x-ray equipment for providing dental identification services, a family viewing area, office space,

radio and telephone communications equipment, and a 13′ x 16′ refrigerated cooler with a capacity of approximately 20 decedents. Muncy Valley Hospital has refrigeration to hold two decedents. Additional refrigerated decedent holding areas throughout the County include space for four at Spitler Funeral Home, three at Maneval Funeral Home, and four at McCarty Thomas Funeral Home. In the event the need for space exceeds the 44 available spaces, there is a regional response plan to make regional resources available or to bring in refrigerated trucks. The local plan is coordinated by the County of Lycoming Coroner, and the regional response would be coordinated by the Pennsylvania State Coroners Association president and regional vice presidents.

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 Lycoming 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 6 goals and 18 objectives identified in the 2015 Lycoming County Hazard Mitigation Plan Update. The Steering Committee reviewed goals and objectives during a Steering Committee Review Meeting on September 17, 2020. The review of the goals and objectives is summarized below in Table 6.1-1.

Table 6.1-1 List and review summary of 2015 mitigation strategy goals and objectives.

Goal 1: Prevent hazards from impacting the community.	
Objective 1.A: Work with the municipalities to create and/or update land use regulations (e.g., zoning, subdivision, and land development).	**Review:** The HMPT agreed that this goal should be continued into the 2020 plan but adjusted to include additional focus on providing technical assistance. Objectives 1.A, 1.B, 1.C, 1.D, and 1.E have been continued into the 2020 plan.
Objective 1.B: Complete and/or update stormwater management plans for all the watersheds in the County.	
Objective 1.C: Promote municipal participation in the NFIP and CRS.	
Objective 1.D: Evaluate hazard impacts and potential preventive measures.	
Objective 1.E: Maintain permit tracking.	
Goal 2: Protect the people, property, and environment in hazard areas.	
Objective 2.A: Acquire properties within hazard areas.	**Review:** The HMPT agreed that this goal should be continued into the 2020 plan. Objectives 2.A, 2.B, and 2.C have been continued into the 2020 plan.
Objective 2.B: Retrofit structures to withstand hazard impacts.	
Objective 2.C: Relocate structures to outside of hazard areas.	

Table 6.1-1 List and review summary of 2015 mitigation strategy goals and objectives.	
Objective 2.D: Ensure future public facilities can withstand hazard impacts.	
Goal 3: Maintain and enhance emergency services capabilities in the community.	
Objective 3.A: Conduct and enhance emergency planning activities.	Review: The HMPT agreed that this goal should be continued. Objectives 3.A and 3.B have been continued into the 2020 plan.
Objective 3.B: Improve alert and warning systems.	
Goal 4: Protect natural resources within the hazard areas.	
Objective 4.A: Protect natural functions of waterways.	Review: The HMPT agreed that this goal should be continued. Objectives 4.A and 4.B have been continued into the 2020 plan, and an objective was added to focus on preventing wildfires.
Objective 4.B: Protect watersheds in the County.	
Goal 5: Ensure continuity of emergency management services during hazard events.	
Objective 5.A: Promote personal mitigation measures to the general public.	Review: The HMPT agreed that this goal should be continued. Objectives 5.A, 5.B, and 5.C have been continued into the 2020 plan.
Objective 5.B: Promote public awareness of previous hazard impacts.	
Objective 5.C: Conduct community outreach regarding hazard mitigation.	
Goal 6: Implement structural projects to reduce the impacts of hazards.	
Objective 6.A: Maintain infrastructure.	Review: The HMPT agreed that this goal should be continued. Objectives 6.A and 6.B have been continued into the 2020 plan.
Objective 6.B: Design and implement flood control projects.	

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 15, 2020. 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 2015 Plan were distributed for the October 2020 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 2010 Plan
- "Cancelled" – Actions that were terminated.
- "Deferred" – Actions that had not been initiated since the adoption of the 2015 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 2015 Mitigation Action Plan

Community	Action #	Addressed Hazard(s)	Mitigation Action	Status			
				Completed	Canceled	Deferred	Ongoing
Lycoming County	1	Utility Interruption; Tornado, Windstorm; Hailstorm, Winter Storm	Initiate meeting with providers of electric power, land developers, and contractors to examine the cost and potential sources of funding for burying power lines.				
Lycoming County	2	Utility Interruption; Tornado, Windstorm; Hailstorm, Winter Storm	Develop language for potential inclusion in subdivision regulations requiring new power and communications (telephone, cable television) lines to be buried.				
Lycoming County	3	Wildfire	Educate citizens and business owners about removing flammable vegetation or combustible materials from the immediate vicinity of buildings in wooded areas.				
Lycoming County	4	Drought; Environmental Hazards	Provide workshops for farmers regarding livestock management and crop survival during times of drought, and/or water supply interruption.				
Lycoming County	5	Drought	Provide education for residents about water-saving landscaping techniques.				

Lycoming County	6	Earthquake	Provide information to schools, prisons, and nursing homes about the Great California Shake-Out and encourage participation in this educational program about surviving the immediate effects of an earthquake.				
Lycoming County	7	Earthquake	Provide information to residents and business owners to examine the interior of structures to identify objects that may fall in the event of an earthquake (e.g., tall file cabinets, water heaters). Include information about anchoring.				X
Lycoming County	8	Flood, Flash Flood, & Ice Jam; Tornado, Windstorm; Wildfire; Winter Storm	After a flood event or windstorm provide information on alternatives to reconstruction of structures that sustain damages more than or equal to 50% of value to property owners.				X
Lycoming County	9	Wildfire	Adopt Firewise program.				
Lycoming County	10	Utility Interruption; Environmental Hazards	Meet with Lycoming County Water and Sewer Authority (LCWSA) to review the LCWSA Integrated Contingency Plan to facilitate integration into hazard mitigation planning, emergency response, and other planning mechanisms in the County.				
Lycoming County	11	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Lycoming County	12	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Lycoming County	13	Flood, Flash Flood, Ice Jam; Dam Failure	Obtain inundation information for areas near dams from the Pennsylvania Department of Environmental Protection, as it becomes available.				
Lycoming County	14	Radon Exposure	Encourage homeowners to install appropriate devices to monitor and reduce radon exposure in homes.				X
Lycoming County	15	Flood, Flash Flood, Ice Jam	Transfer information submitted on hard copies hazard mitigation project opportunity forms to the hazard mitigation project opportunity spreadsheet.				
Lycoming County	16	Flood, Flash Flood, Ice Jam	Obtain additional structure/property data from tax assessor and complete an enhanced HAZUS analysis and incorporate vulnerability information into the HMP.	X			
Anthony Township	1	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X

Anthony Township	2	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Armstrong Township	1	Utility Interruption; Flood, Flash Flood, Ice Jam; Terrorism	Disseminate pertinent information to municipal officials and residents as needed regarding local contingency planning for water and wastewater facilities once Lycoming County Water and Sewer Authority complete the Integrated Contingency Plan which includes information on more than 35 facilities.				X
Armstrong Township	2	Transportation Accident; Environmental Hazard	Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.	X			X
Armstrong Township	3	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Armstrong Township	4	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Bastress Township	1	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Bastress Township	2	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Brady Township	1	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Brady Township	2	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Brown Township	1	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Brown Township	2	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Cascade Township	1	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Cascade Township	2	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
City of Williamsport	1	Flood, Flash Flood, Ice Jam	Furnish and install a permanent log picker with electrical distribution system at the Grafius Run Trash Rack at Highland Terrace similar to the one located at Freedom Road and Market Street.				
City of Williamsport	2	Flood, Flash Flood, Ice Jam	Obtain Levee accreditation (PAL) as part of Risk MAP.				X

City of Williamsport	3	Flood, Flash Flood, Ice Jam	Determine feasibility and/or BCA of 43 online Project Opportunity Forms submitted by homeowners for buyout/elevation projects.				X
City of Williamsport	4	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
City of Williamsport	5	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Clinton Township	1	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Clinton Township	2	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Cogan House Township	1	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Cogan House Township	2	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Cummings Township	1	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Cummings Township	2	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Duboistown Borough	1	Utility Interruption; Flood, Flash Flood, Ice Jam; Terrorism	Disseminate pertinent information to municipal officials and residents as needed regarding local contingency planning for water and wastewater facilities once Lycoming County Water and Sewer Authority complete the Integrated Contingency Plan which includes information on more than 35 facilities.				X
Duboistown Borough	2	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Duboistown Borough	3	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Eldred Township	1	Transportation Accident; Environmental Hazard	Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.	X			X
Eldred Township	2	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Eldred Township	3	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X

Fairfield Township	1	Utility Interruption; Flood, Flash Flood, Ice Jam; Terrorism	Disseminate pertinent information to municipal officials and residents as needed regarding local contingency planning for water and wastewater facilities once Lycoming County Water and Sewer Authority complete the Integrated Contingency Plan which includes information on more than 35 facilities.				X
Fairfield Township	2	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Fairfield Township	3	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Franklin Township	1	Transportation Accident; Environmental Hazard	Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.	X			X
Franklin Township	2	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Franklin Township	3	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Gamble Township	1	Transportation Accident; Environmental Hazard	Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.	X			X
Gamble Township	2	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Gamble Township	3	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Hepburn Township	1	Transportation Accident; Environmental Hazard	Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.	X			X
Hepburn Township	2	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Hepburn Township	3	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Hughesville Borough	1	Flood, Flash Flood, Ice Jam	Determine feasibility and/or BCA of 43 online Project Opportunity Forms submitted by homeowners for buyout/elevation projects.				X

Hughesville Borough	2	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Hughesville Borough	3	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Jackson Township	1	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Jackson Township	2	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Jersey Shore Borough	1	Flood, Flash Flood, Ice Jam	Determine feasibility and/or BCA of 43 online Project Opportunity Forms submitted by homeowners for buyout/elevation projects.				X
Jersey Shore Borough	2	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Jersey Shore Borough	3	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Jordan Township	1	Transportation Accident; Environmental Hazard	Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.	X			X
Jordan Township	2	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Jordan Township	3	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.	X			X
Lewis Township	1	Transportation Accident; Environmental Hazard	Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.	X			X
Lewis Township	2	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Lewis Township	3	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Limestone Township	1	Subsidence and Sinkhole	Examine the possibility of amending/developing local zoning ordinances to direct new development away from areas underlain with carbonate bedrock.				X
Limestone Township	2	Utility Interruption; Flood, Flash	Disseminate pertinent information to municipal officials and residents as needed regarding local contingency planning for water and wastewater				X

		Flood, Ice Jam; Terrorism	facilities once Lycoming County Water and Sewer Authority complete the Integrated Contingency Plan which includes information on more than 35 facilities.				
Limestone Township	3	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Limestone Township	4	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Loyalsock Township	1	Flood, Flash Flood, Ice Jam	Obtain Levee accreditation (PAL) as part of Risk MAP.	X			
Loyalsock Township	2	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Loyalsock Township	3	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Lycoming Township	1	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Lycoming Township	2	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
McHenry Township	1	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
McHenry Township	2	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
McIntyre Township	1	Transportation Accident; Environmental Hazard	Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.	X			X
McIntyre Township	2	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
McIntyre Township	3	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
McNett Township	1	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
McNett Township	2	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Mifflin Township	1	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Mifflin Township	2	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X

Mill Creek Township	1	Transportation Accident; Environmental Hazard	Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.	X			X
Mill Creek Township	2	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Mill Creek Township	3	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Montgomery Borough	1	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Montgomery Borough	2	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Montoursville Borough	1	Utility Interruption; Flood, Flash Flood, Ice Jam; Terrorism	Disseminate pertinent information to municipal officials and residents as needed regarding local contingency planning for water and wastewater facilities once Lycoming County Water and Sewer Authority complete the Integrated Contingency Plan which includes information on more than 35 facilities.				X
Montoursville Borough	2	Flood, Flash Flood, Ice Jam	Obtain Levee accreditation (PAL) as part of Risk MAP.	X			X
Montoursville Borough	3	Flood, Flash Flood, Ice Jam	Determine feasibility and/or BCA of 43 online Project Opportunity Forms submitted by homeowners for buyout/elevation projects.				X
Montoursville Borough	4	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Montoursville Borough	5	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Moreland Township	1	Transportation Accident; Environmental Hazard	Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.	X			X
Moreland Township	2	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Moreland Township	3	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Muncy Borough	1	Flood, Flash Flood, Ice Jam; Winter Storm, Utility	Conduct a housing stock survey of the community as part of "Project Resilience"	X			

		Interruption, Tornado, Windstorm, Earthquake					
Muncy Borough	2	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Muncy Borough	3	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Muncy Creek Township	1	Utility Interruption; Flood, Flash Flood, Ice Jam; Terrorism	Disseminate pertinent information to municipal officials and residents as needed regarding local contingency planning for water and wastewater facilities once Lycoming County Water and Sewer Authority complete the Integrated Contingency Plan which includes information on more than 35 facilities.				X
Muncy Creek Township	2	Flood, Flash Flood, Ice Jam	Determine feasibility and/or BCA of 43 online Project Opportunity Forms submitted by homeowners for buyout/elevation projects.				X
Muncy Creek Township	3	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Muncy Creek Township	4	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Muncy Township	1	Utility Interruption; Flood, Flash Flood, Ice Jam; Terrorism	Disseminate pertinent information to municipal officials and residents as needed regarding local contingency planning for water and wastewater facilities once Lycoming County Water and Sewer Authority complete the Integrated Contingency Plan which includes information on more than 35 facilities.				X
Muncy Township	2	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Muncy Township	3	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Nippenose Township	1	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Nippenose Township	2	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Old Lycoming Township	1	Flood, Flash Flood, Ice Jam	Obtain Levee accreditation (PAL) as part of Risk MAP.				X
Old Lycoming Township	2	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X

Old Lycoming Township	3	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Penn Township	1	Utility Interruption; Flood, Flash Flood, Ice Jam; Terrorism	Disseminate pertinent information to municipal officials and residents as needed regarding local contingency planning for water and wastewater facilities once Lycoming County Water and Sewer Authority complete the Integrated Contingency Plan which includes information on more than 35 facilities.				X
Penn Township	2	Transportation Accident; Environmental Hazard	Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.	X			X
Penn Township	3	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Penn Township	4	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Piatt Township	1	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Piatt Township	2	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Picture Rocks Borough	1	All Hazards	Post relevant notices of future plans and proposed mitigation actions on municipal bulletin.				X
Picture Rocks Borough	2	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Picture Rocks Borough	3	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Pine Township	1	Transportation Accident; Environmental Hazard	Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.	X			X
Pine Township	2	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Pine Township	3	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Plunketts Creek Township	1	Wildfire	Install dry hydrants at water's edge along Loyalsock Creek.				X

Plunketts Creek Township	2	Disorientation; All Hazards	Work with local carriers to expand and Improve cellular coverage.				X
Plunketts Creek Township	3	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Plunketts Creek Township	4	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Porter Township	1	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Porter Township	2	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Salladasburg Borough	1	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Salladasburg Borough	2	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Shrewsbury Township	1	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Shrewsbury Township	2	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
South Williamsport Borough	1	Flood, Flash Flood, Ice Jam	Obtain Levee accreditation (PAL) as part of Risk MAP.				X
South Williamsport Borough	2	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
South Williamsport Borough	3	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Susquehanna Township	1	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Susquehanna Township	2	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Upper Fairfield Township	1	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Upper Fairfield Township	2	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Washington Township	1	Transportation Accident; Environmental Hazard	Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.	X			X

Washington Township	2	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Washington Township	3	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Watson Township	1	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Watson Township	2	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Wolf Township	1	Flood, Flash Flood, Ice Jam	Install/replace/repair culverts previously identified as problem areas Township-wide.				X
Wolf Township	2	Utility Interruption; Flood, Flash Flood, Ice Jam; Terrorism	Disseminate pertinent information to municipal officials and residents as needed regarding local contingency planning for water and wastewater facilities once Lycoming County Water and Sewer Authority complete the Integrated Contingency Plan which includes information on more than 35 facilities.				X
Wolf Township	3	Transportation Accident; Environmental Hazard	Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.	X			X
Wolf Township	4	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Wolf Township	5	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X
Woodward Township	1	Transportation Accident; Environmental Hazard	Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.	X			X
Woodward Township	2	Flood, Flash Flood, Ice Jam	Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	X			X
Woodward Township	3	Flood, Flash Flood, Ice Jam	Identify, acquire, and demolish structure with the highest relative vulnerabilities.				X

Mitigation Success

A great deal of mitigation progress has been made on hazard mitigation projects and actions in Lycoming County.

Flood Summits

Since 2006, members of Lycoming County's planning staff, the Conservation District, and stakeholders have gathered to organize and educate municipal officials in on a semi-annual basis. Topics include history of development and stream dynamics, watershed preservation, floodplain management and mapping, permitting, hazard mitigation, stormwater management, floodplain permitting, and others. The Flood Summits produced targeted outreach as described below:

2015 NFIP-HFIAA Outreach

On February 18 and February 19, 2015, the Lycoming County Department of Planning and Community Development (PCD) held two National Flood Insurance Program (NFIP) and Homeowner Flood Insurance Affordability Act (HFIAA) outreach meetings at the Pennsylvania College of Technology Madigan Library. The meetings were formatted for zoning officers, township supervisors, borough council members, and other municipal officials, real estate agents, insurance agents, and other professions that deal with floodplain, and flood insurance issues.

The PCD coordinated with FEMA, PEMA, and DCED, and Mr. Richard Sobota, FEMA Region III National Flood Insurance Program Insurance (NFIP) Specialist, Mr. Daniel Fitzpatrick, DCED National Flood Insurance Program State Coordinator, and Mr. Dave Bollinger; FEMA Mitigation Outreach Coordinator attended the meetings, and provided information and presentations to attendees.

The presentations by DCED and FEMA focused on the history of the NFIP, the need for zoning and land use regulations to enhance community safety, how flood insurance protects property owners, and other topic areas relating to flood insurance and floodplain management.

The meetings were well attended with over forty (40) attendees from various Lycoming County municipalities, insurance companies, realty companies, and property management and construction companies.

On February 25 and February 26, 2015, the PCD held flood opportunity meetings for Lycoming County residents to discuss potential mitigation options for properties affected by the Biggert-Waters Flood Insurance Reform Act of 2012. The goal of these meetings was to educate residents on potential upcoming mitigation funding, and seek public input on outstanding housing-resiliency efforts or unfinished public infrastructure projects.

The meetings were fairly well attended and provided Lycoming County residents with the opportunity to ask questions about the NFIP, different mitigation funding programs, and express their concerns on continued mitigation, and resiliency efforts in Lycoming County.

2019 NFIP-HFIAA Outreach

On April 18, 2019, the PCD held two NFIP-HFIA outreach meetings at the Trade & Transit II Michael Ross Room. The PCD again collaborated with PEMA, FEMA, and DCED to conduct the meetings. The first meeting, held from 1:00 – 3:00 p.m. were again formatted for zoning officers, township supervisors, borough council members, and other municipal officials, real estate agents, insurance agents, and other professions that deal with floodplain, and flood insurance issues.

The second meeting, held from 6:00 – 8:00 p.m. was formatted towards area residents and property owners to review NFIP regulations, changes to HFIAA, the importance of flood insurance and the permitting process if performing work in the floodplain. Both meetings were well attended with over fifty (50) individuals attending between both sessions.

In March 2019, the PCD attended the West Branch Susquehanna Builders Assoc. Home Show at Lycoming College with an information table. The Home Show is a very well attended local event typically drawing between 800 – 1,200 attendees. The PCD had representatives from the Development Services division (zoning, land use, subdivision, etc.) and the hazard mitigation section man the table for all three days of the 2019 Home Show events.

PCD staff presented information on the requirement for zoning permits prior to performing any work in the floodplain, promoted the Lycoming County Tax Parcel Viewer and Lycoming County Flood Map Viewer as tools to gauge one's flood risk, spoke to residents, insurance representatives, realtors and builders about multiple issues relating to flood insurance and mitigation opportunities.

PCD staff planned to attend the 2020 Home Show, however, due to the onset of COVID-19 and the Stay At Home guidance, the 2020 Home Show was cancelled. At present, the 2021 Home Show is planned to be held in the spring of 2021. At this time, PCD is planning to have information and representation at the event.

Projects and Programs

Pier 87 Project

In 2011, the Pier 87 Bar/Restaurant was completely destroyed by the flooding from Tropical Storm Lee. Lycoming County Planning and Community Development staff presented an idea of moving the new structure farther back away from the creek and elevating well above the BFE. The owners of Pier 87 built a new structure on piers and utilized their former slab-on-grade foundation as an outdoor seating area to add capacity to the venue and take advantage of the scenic Loyalsock Creek.

Bridge Bundling Program

Many bridges in Lycoming County are shorter than the 20' that requires state inspection. In Pennsylvania, bridges 8' or shorter are considered a culvert. Bridges between 8' and 20' do

not have associated required inspections but can cause potentially dangerous conditions to anyone on/ nearby. The Lycoming County Bridge Bundling Program is responsible for all small bridge inspections. 17 municipalities are also involved in the bundling program. As the County inspects the bridges, hydrology is considered. Many of the bridges previously built are likely only able to withstand a 50-year storm. Rehabilitated bridges are expected to withstand at least a 100-year storm event.

Removal of the Sewer Plants from the Floodplain

March 2015 marked the culmination of a 3-year project to build a new sewer plant to combine the Montgomery Borough, Muncy Borough, Clinton Township, and Muncy Creek Township sewer sheds into one singular, centrally located plant. This plant was built out of the flood zone, and the old plants that had been flooded out numerous times were demolished. In 2014, the Tiadaghton Valley Municipal Authority in Jersey Shore completed construction on their new wastewater plant above the base flood elevation (BFE).

Table 6.1-2 Hazard Mitigation Grant Program Funded Acquisitions Since 2014 (FEMA 2020)

Municipality	Structure Type	Federally Obligated	Year Approved	Project Type

6.2. Mitigation Goals and Objectives

Based on results of the review of the 2015 HMP mitigation goals and objectives established, several goals and objectives were improved 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 6 goals and 19 objectives identified.

Table 6.2-1 List of 2020 mitigation strategy goals and objectives.

GOAL 1	**Prevent hazards from impacting the community by focusing on providing technical assistance and building more capacity at the municipal level.**
Objective 1.1	Work with the municipalities to create and/or update land use regulations (e.g., zoning, subdivision, and land development).
Objective 1.2	Complete and/or update stormwater management plans for all the watersheds in the County.
Objective 1.3	Promote municipal participation in the NFIP and CRS.
Objective 1.4	Evaluate hazard impacts and potential preventive measures.
Objective 1.5	Maintain permit tracking.
GOAL 2	**Protect the people, property, and environment in hazard areas.**
Objective 2.1	Acquire properties within hazard areas.

Table 6.2-1	List of 2020 mitigation strategy goals and objectives.
Objective 2.2	Retrofit structures to withstand hazard impacts.
Objective 2.3	Relocate structures to outside of hazard areas.
Objective 2.4	Ensure future public facilities can withstand hazard impacts.
GOAL 3	Maintain and enhance emergency services capabilities in the community.
Objective 3.1	Conduct and enhance emergency planning activities.
Objective 3.2	Improve alert and warning systems.
GOAL 4	Protect natural resources within the hazard areas.
Objective 4.1	Protect natural functions of waterways.
Objective 4.2	Protect watersheds in the County.
Objective 4.3	Protect forestry resources and prevent wildfires.
GOAL 5	Ensure that stakeholder groups have the necessary information to mitigate against hazard impacts.
Objective 5.1	Promote personal mitigation measures to the general public.
Objective 5.2	Promote public awareness of previous hazard impacts.
Objective 5.3	Conduct community outreach regarding hazard mitigation.
GOAL 6	Implement structural projects to reduce the impacts of hazards.
Objective 6.1	Maintain infrastructure.
Objective 6.2	Design and implement flood control projects.

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. Table 6.3-1 provides a matrix identifying the mitigation techniques used for each hazard in the County. The specific actions associated with these techniques are included in Table 6.4-1.

Table 6.3-1 Mitigation techniques used for the hazards in Lycoming County.

HAZARD	MITIGATION TECHNIQUE			
	LOCAL PLANS AND REGULATIONS	EDUCATION AND AWARENESS PROGRAMS	NATURAL SYSTEMS PROTECTION	STRUCTURAL AND INFRASTRUCTURE PROJECTS
Drought	✓	✓	✓	✓
Terrorism	✓	✓		✓
Dam Failure	✓	✓		✓
Earthquake	✓	✓		✓
Flood, Flash Flood, Ice Jam	✓	✓	✓	✓
Hailstorm	✓	✓		✓
Environmental Hazards	✓	✓		✓
Landslide	✓	✓		✓
Levee Failure	✓	✓		✓
Nuclear Incidents	✓	✓		
Pandemic	✓	✓		
Disorientation	✓	✓		
Radon Exposure	✓	✓		✓
Subsidence and Sinkhole	✓	✓		✓

Table 6.3-1 Mitigation techniques used for the hazards in Lycoming County.				
HAZARD	MITIGATION TECHNIQUE			
	LOCAL PLANS AND REGULATIONS	EDUCATION AND AWARENESS PROGRAMS	NATURAL SYSTEMS PROTECTION	STRUCTURAL AND INFRASTRUCTURE PROJECTS
Tornado and Windstorm	✓	✓		✓
Transportation Incidents	✓	✓		✓
Utility Interruption	✓	✓		
Wildfire	✓	✓	✓	✓
Winter Storm	✓	✓		✓

6.4. Mitigation Action Plan

A kick-off meeting for the 2020 Lycoming County Hazard Mitigation Plan Update was held on August 27, 2020 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 15, 2020, 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 2015 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 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 2020 Hazard Mitigation Actions	
ACTION NO: 1	**Initiate meeting with providers of electric power, land developers, and contractors to examine the cost and potential sources of funding for burying power lines.**

COMMUNITY: Lycoming County	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Utility Interruption; Tornado, Windstorm; Hailstorm, Winter Storm
Lead Agency/Department:	Lycoming County Planning & Community Development, Lycoming County Dept. of Public Safety
Implementation Schedule:	1-2 years
Funding Source:	Lycoming County Annual Budget
ACTION NO: 2	**Develop language for potential inclusion in subdivision regulations requiring new power and communications (telephone, cable television) lines to be buried.**
COMMUNITY: Lycoming County	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Utility Interruption; Tornado, Windstorm; Hailstorm, Winter Storm
Lead Agency/Department:	Lycoming County Planning & Community Development
Implementation Schedule:	3–5 years depending on outcome of meetings with developers and electric companies
Funding Source:	Borough, Township, & Lycoming County Annual Budgets
ACTION NO: 3	**Educate citizens and business owners about removing flammable vegetation or combustible materials from the immediate vicinity of buildings in wooded areas.**
COMMUNITY: Lycoming County	
Category:	Education and Awareness Program
Hazard(s) Addressed:	Wildfire
Lead Agency/Department:	Lycoming County Planning & Community Development, Chiefs of Municipal fire departments
Implementation Schedule:	1-2 years
Funding Source:	FEMA Fire Prevention and Safety Grant (FP&S)
ACTION NO: 4	**Provide workshops for farmers regarding livestock management and crop survival during times of drought, and/or water supply interruption.**
COMMUNITY: Lycoming County	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	Drought; Environmental Hazards

Lead Agency/Department:	Lycoming County Planning & Community Development, Lycoming County Conservation District
Implementation Schedule:	Annually
Funding Source:	USDA, Pennsylvania Dept. of Agriculture, Lycoming County Annual Budget
ACTION NO: 5	**Provide education for residents about water-saving landscaping techniques.**
COMMUNITY: Lycoming County	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	Drought
Lead Agency/Department:	Lycoming County Conservation District
Implementation Schedule:	Annually
Funding Source:	Lycoming County Annual Budget
ACTION NO: 6	**Provide information to schools, prisons, and nursing homes about the Great California Shake-Out and encourage participation in this educational program about surviving the immediate effects of an earthquake.**
COMMUNITY: Lycoming County	
Category:	Education and Awareness Program
Hazard(s) Addressed:	Earthquake
Lead Agency/Department:	Lycoming County Dept. of Public Safety, Lycoming County Planning & Community Development
Implementation Schedule:	Annually
Funding Source:	PEMA
ACTION NO: 7	**Provide information to residents and business owners to examine the interior of structures to identify objects that may fall in the event of an earthquake (e.g., tall file cabinets, water heaters). Include information about anchoring.**
COMMUNITY: Lycoming County	
Category:	Education and Awareness Program

Hazard(s) Addressed:	Earthquake
Lead Agency/Department:	Lycoming County Dept. of Public Safety, Chiefs of Municipal fire departments
Implementation Schedule:	3 years.
Funding Source:	FEMA, Lycoming County
ACTION NO: 8	**After a flood event or windstorm provide information on alternatives to reconstruction of structures that sustain damages more than or equal to 50% of value to property owners.**
COMMUNITY: Lycoming County	
Category:	Structure and Infrastructure Projects; NFIP
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam; Tornado, Windstorm; Wildfire; Winter Storm
Lead Agency/Department:	Lycoming County EMA, Lycoming County Planning & Community Development
Implementation Schedule:	5 years
Funding Source:	FEMA HMGP, Lycoming County
ACTION NO: 9	**Adopt Firewise Program.**
COMMUNITY: Lycoming County	
Category:	Local Plans and Regulations; Natural Systems Protection
Hazard(s) Addressed:	Wildfire
Lead Agency/Department:	DCNR, Lycoming County Conservation District, Lycoming County Planning & Community Development
Implementation Schedule:	5-year rotation for hazard fuel mitigation projects; Annually for public education projects and training; Three years for updates on Emergency Action Plans
Funding Source:	U.S. Forest Service, DCNR
ACTION NO: 10	**Meet with Lycoming County Water and Sewer Authority (LCWSA) to review the LCWSA Integrated Contingency Plan to facilitate integration into hazard mitigation planning, emergency response, and other planning mechanisms in the County.**
COMMUNITY: Lycoming County	

Category:	Local Plans and Regulations
Hazard(s) Addressed:	Utility Interruption; Environmental Hazards
Lead Agency/Department:	Lycoming County Water and Sewer Authority; Lycoming County Planning and Community Development
Implementation Schedule:	6 months
Funding Source:	Staff Time
ACTION NO: 11	**Obtain inundation information for areas near dams from the Pennsylvania Department of Environmental Protection, as it becomes available.**
COMMUNITY: Lycoming County	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Dam Failure
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Multi-year, ongoing
Funding Source:	HMGP
ACTION NO: 12	**Encourage homeowners to install appropriate devices to monitor and reduce radon exposure in homes.**
COMMUNITY: Lycoming County	
Category:	Education and Outreach
Hazard(s) Addressed:	Radon Exposure
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Multi-year, ongoing
Funding Source:	HMGP
ACTION NO: 13	**Transfer information submitted on hard copies hazard mitigation project opportunity forms to the hazard mitigation project opportunity spreadsheet.**
COMMUNITY: Lycoming County	
Category:	Local Plans and Regulations

Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development
Implementation Schedule:	1-year
Funding Source:	Staff Time
ACTION NO: 14	**Obtain additional structure/property data from tax assessor and complete an enhanced HAZUS analysis and incorporate vulnerability information into the HMP.**
COMMUNITY: Lycoming County	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development
Implementation Schedule:	1-year
Funding Source:	BRIC
ACTION NO: 15	**Provide additional maintenance for State Parks and State Forests.**
COMMUNITY: Lycoming County	
Category:	Structure and Infrastructure; Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Environmental Hazard; Winter Storm
Lead Agency/Department:	Lycoming County, Lycoming County Conservation District
Implementation Schedule:	Ongoing
Funding Source:	DCNR
Larrys Creek Watershed	
ACTION NO: 16	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Anthony Township	
Category:	Local Plans and Regulations

Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 17	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Anthony Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 18	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Cogan House Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 19	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Cogan House Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam

Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 20	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Cogan House Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 21	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Cummings Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 22	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Cummings Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities

Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 23	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Lycoming Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 24	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Lycoming Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 25	**Removal of hazardous trees.**
COMMUNITY: Mifflin Township	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Tornado, Windstorm; Winter Storm
Lead Agency/Department:	Mifflin Township
Implementation Schedule:	Ongoing
Funding Source:	Staff time

ACTION NO: 26	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Mifflin Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 27	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Mifflin Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 28	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Mifflin Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP

ACTION NO: 29	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Piatt Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 30	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Piatt Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 31	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Piatt Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 32	**Reconstruction of embankment and roadway narrowing on English Run Road to prevent stream erosion.**

COMMUNITY: Pine Township	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Transportation Incident
Lead Agency/Department:	Pine Township
Implementation Schedule:	As funding becomes available.
Funding Source:	Act 13 Fund, Highway Aid
ACTION NO: 33	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Pine Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 34	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Pine Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 35	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Pine Township	

Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 36	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Porter Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 37	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Porter Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 38	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Salladasburg Borough	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam

Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 39	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Salladasburg Borough	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 40	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Watson Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 41	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Watson Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing

Funding Source:	HMGP
Loyalsock Creek Watershed	
ACTION NO: 42	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Cascade Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 43	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Cascade Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 44	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Cascade Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing

Funding Source:	HMGP
ACTION NO: 45	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Eldred Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 46	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Eldred Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 47	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Eldred Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP

ACTION NO: 48	**Disseminate pertinent information to municipal officials and residents as needed regarding local contingency planning for water and wastewater facilities once Lycoming County Water and Sewer Authority complete the Integrated Contingency Plan which includes information on more than 35 facilities.**
COMMUNITY: Fairfield Township	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Department of Planning and Community Development; Municipalities as needed
Implementation Schedule:	1 year
Funding Source:	HMGP, General Fund
ACTION NO: 49	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Fairfield Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 50	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Fairfield Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP

ACTION NO: 51	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Gamble Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 52	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Gamble Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 53	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Gamble Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP

ACTION NO: 54	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Hepburn Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 55	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Hepburn Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 56	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Hepburn Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP

ACTION NO: 57	**Reduce flood risk through clean up and removal of downed trees, branches, and debris in Shoemaker Run and Slacks Run.**
COMMUNITY: Lewis Township	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lewis Township
Implementation Schedule:	2 years
Funding Source:	Municipality
ACTION NO: 58	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Lewis Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 59	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Lewis Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time

ACTION NO: 60	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Lewis Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 61	**Obtain Levee accreditation (PAL) as part of Risk MAP.**
COMMUNITY: Loyalsock Township	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Levee Failure
Lead Agency/Department:	Municipalities
Implementation Schedule:	1 year
Funding Source:	General Fund
ACTION NO: 62	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Loyalsock Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 63	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**

COMMUNITY: Loyalsock Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 64	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Loyalsock Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 65	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: McNett Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 66	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: McNett Township	
Category:	Structure and Infrastructure (NFIP)

Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 67	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Mill Creek Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 68	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Mill Creek Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 69	**Maintain and enforce floodplain management ordinance.**
COMMUNITY: Montoursville Borough	
Category:	Local Plans and Regulations (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Montoursville Borough

Implementation Schedule:	Ongoing
Funding Source:	HMGP, General Fund
ACTION NO: 70	**Disseminate pertinent information to municipal officials and residents as needed regarding local contingency planning for water and wastewater facilities once Lycoming County Water and Sewer Authority complete the Integrated Contingency Plan which include information on more than 35 facilities.**
COMMUNITY: Montoursville Borough	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Department of Planning and Community Development; Municipalities as needed
Implementation Schedule:	1 year
Funding Source:	HMGP, General Fund
ACTION NO: 71	**Obtain Levee accreditation (PAL) as part of Risk MAP.**
COMMUNITY: Montoursville Borough	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Levee Failure
Lead Agency/Department:	Municipalities
Implementation Schedule:	1 year
Funding Source:	General Fund
ACTION NO: 72	**Determine feasibility and/or BCA of 43 online Project Opportunity Forms submitted by homeowners for buyout/elevation projects.**
COMMUNITY: Montoursville Borough	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Department of Planning and Community Development; Municipalities as needed

Implementation Schedule:	1 year
Funding Source:	HMGP, General Fund
ACTION NO: 73	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Montoursville Borough	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 74	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Montoursville Borough	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 75	**Install dry hydrants at water's edge along Loyalsock Creek.**
COMMUNITY: Plunketts Creek Township	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Wildfire
Lead Agency/Department:	Plunkett's Creek Township, Lycoming County Planning & Community Development
Implementation Schedule:	As funding becomes available
Funding Source:	FEMA/HMGP; PEMA; Municipality

ACTION NO: 76	**Work with local carriers to expand and Improve cellular coverage.**
COMMUNITY: Plunketts Creek Township	
Category:	Structure and Infrastructure Project
Hazard(s) Addressed:	Disorientation; All Hazards
Lead Agency/Department:	Plunkett's Creek Township; Lycoming County Department of Planning and Community Development
Implementation Schedule:	Ongoing
Funding Source:	EPMD; corporate
ACTION NO: 77	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Plunketts Creek Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 78	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Plunketts Creek Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 79	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**

COMMUNITY: Shrewsbury Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 80	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Shrewsbury Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 81	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Shrewsbury Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 82	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Upper Fairfield Township	

Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 83	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Upper Fairfield Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 84	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Upper Fairfield Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 85	**Install/replace/repair culverts previously identified as problem areas Township-wide.**
COMMUNITY: Wolf Township	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam

Lead Agency/Department:	PennDOT, Lycoming County Planning & Community Development
Implementation Schedule:	As funds become available.
Funding Source:	PennDOT, FEMA, Lycoming County
ACTION NO: 86	**Disseminate pertinent information to municipal officials and residents as needed regarding local contingency planning for water and wastewater facilities once Lycoming County Water and Sewer Authority complete the Integrated Contingency Plan which include information on more than 35 facilities.**
COMMUNITY: Wolf Township	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Department of Planning and Community Development; Municipalities as needed
Implementation Schedule:	1 year
Funding Source:	HMGP, General Fund
ACTION NO: 87	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Wolf Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 88	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Wolf Township	
Category:	Local Plans and Regulations

Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 89	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Wolf Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
Lycoming Creek Watershed	
ACTION NO: 90	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Anthony Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 91	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Anthony Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam

Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 92	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Cascade Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 93	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Cascade Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 94	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Cascade Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities

Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 95	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Cogan House Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 96	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Cogan House Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 97	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Cogan House Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing

Funding Source:	HMGP
ACTION NO: 98	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Eldred Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 99	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Eldred Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 100	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Eldred Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP

ACTION NO: 101	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Gamble Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 102	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Gamble Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 103	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Gamble Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP

ACTION NO: 104	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Hepburn Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 105	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Hepburn Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 106	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Hepburn Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP

ACTION NO: 107	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Jackson Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 108	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Jackson Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 109	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Jackson Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP

ACTION NO: 110	**Reduce flood risk through clean up and removal of downed trees, branches, and debris in Shoemaker Run and Slacks Run.**
COMMUNITY: Lewis Township	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lewis Township
Implementation Schedule:	2 years
Funding Source:	Municipality
ACTION NO: 111	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Lewis Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 112	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Lewis Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time

ACTION NO: 113	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Lewis Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 114	**Obtain Levee accreditation (PAL) as part of Risk MAP.**
COMMUNITY: Loyalsock Township	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Levee Failure
Lead Agency/Department:	Municipalities
Implementation Schedule:	1 year
Funding Source:	General Fund
ACTION NO: 115	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Loyalsock Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 116	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**

COMMUNITY: Loyalsock Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 117	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Loyalsock Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 118	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Lycoming Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 119	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Lycoming Township	
Category:	Structure and Infrastructure (NFIP)

Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 120	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: McIntyre Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 121	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: McIntyre Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 122	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: McIntyre Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam

Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 123	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: McNett Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 124	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: McNett Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 125	**Obtain Levee accreditation (PAL) as part of Risk MAP.**
COMMUNITY: Old Lycoming Township	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Levee Failure
Lead Agency/Department:	Municipalities
Implementation Schedule:	1 year

Funding Source:	General Fund
ACTION NO: 126	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Old Lycoming Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 127	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Old Lycoming Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 128	**Furnish and install a permanent log picker with electrical distribution system at the Grafius Run Trash Rack at Highland Terrace similar to the one located at Freedom Road and Market Street.**
COMMUNITY: City of Williamsport	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	The City of Williamsport
Implementation Schedule:	1-year
Funding Source:	HMGP

ACTION NO: 129	**Obtain Levee accreditation (PAL) as part of Risk MAP.**
COMMUNITY: City of Williamsport	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Levee Failure
Lead Agency/Department:	Municipalities
Implementation Schedule:	1 year
Funding Source:	General Fund
ACTION NO: 130	**Determine feasibility and/or BCA of 43 online Project Opportunity Forms submitted by homeowners for buyout/elevation projects.**
COMMUNITY: City of Williamsport	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Department of Planning and Community Development; Municipalities as needed
Implementation Schedule:	1 year
Funding Source:	HMGP, General Fund
ACTION NO: 131	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: City of Williamsport	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 132	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**

COMMUNITY: City of Williamsport	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 133	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Woodward Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 134	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Woodward Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 135	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Woodward Township	

Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
Muncy Creek Watershed	
ACTION NO: 136	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Franklin Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 137	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Franklin Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 138	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Franklin Township	

Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 139	**Determine feasibility and/or BCA of 43 online Project Opportunity Forms submitted by homeowners for buyout/elevation projects.**
COMMUNITY: Hughesville Borough	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Department of Planning and Community Development; Municipalities as needed
Implementation Schedule:	1 year
Funding Source:	HMGP, General Fund
ACTION NO: 140	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Hughesville Borough	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 141	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Hughesville Borough	
Category:	Structure and Infrastructure (NFIP)

Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 142	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Jordan Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 143	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Jordan Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 144	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Jordan Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam

Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 145	**Examine the possibility of amending/developing local zoning ordinances to direct new development away from areas underlain with carbonate bedrock.**
COMMUNITY: Limestone Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Subsidence and Sinkhole
Lead Agency/Department:	Zoning Official for Township or Borough
Implementation Schedule:	3-5 years
Funding Source:	Borough, Township, and Lycoming County Annual Budgets
ACTION NO: 146	**Disseminate pertinent information to municipal officials and residents as needed regarding local contingency planning for water and wastewater facilities once Lycoming County Water and Sewer Authority complete the Integrated Contingency Plan which includes information on more than 35 facilities.**
COMMUNITY: Limestone Township	
Category:	Local Plans and Regulations; Education and Awareness
Hazard(s) Addressed:	Utility Interruption; Flood, Flash Flood, Ice Jam; Terrorism
Lead Agency/Department:	Lycoming County Water and Sewer Authority, Lycoming County Department of Planning and Community Development; Municipalities
Implementation Schedule:	1 year
Funding Source:	Staff Time; General Fund
ACTION NO: 147	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Limestone Township	
Category:	Local Plans and Regulations

Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 148	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Limestone Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 149	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Mill Creek Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 150	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Mill Creek Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities

Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 151	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Moreland Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 152	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Moreland Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 153	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Moreland Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing

Funding Source:	HMGP
ACTION NO: 154	**Disseminate pertinent information to municipal officials and residents as needed regarding local contingency planning for water and wastewater facilities once Lycoming County Water and Sewer Authority complete the Integrated Contingency Plan which include information on more than 35 facilities.**
COMMUNITY: Muncy Creek Township	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Department of Planning and Community Development; Municipalities as needed
Implementation Schedule:	1 year
Funding Source:	HMGP, General Fund
ACTION NO: 155	**Determine feasibility and/or BCA of 43 online Project Opportunity Forms submitted by homeowners for buyout/elevation projects.**
COMMUNITY: Muncy Creek Township	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Department of Planning and Community Development; Municipalities as needed
Implementation Schedule:	1 year
Funding Source:	HMGP, General Fund
ACTION NO: 156	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Muncy Creek Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)

Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 157	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Muncy Creek Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 158	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Muncy Creek Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 159	**Disseminate pertinent information to municipal officials and residents as needed regarding local contingency planning for water and wastewater facilities once Lycoming County Water and Sewer Authority complete the Integrated Contingency Plan which include information on more than 35 facilities.**
COMMUNITY: Muncy Township	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Department of Planning and Community Development; Municipalities as needed

Implementation Schedule:	1 year
Funding Source:	HMGP, General Fund
ACTION NO: 160	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Muncy Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 161	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Muncy Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 162	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Muncy Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing

Funding Source:	HMGP
ACTION NO: 163	**Disseminate pertinent information to municipal officials and residents as needed regarding local contingency planning for water and wastewater facilities once Lycoming County Water and Sewer Authority complete the Integrated Contingency Plan which include information on more than 35 facilities.**
COMMUNITY: Penn Township	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Department of Planning and Community Development; Municipalities as needed
Implementation Schedule:	1 year
Funding Source:	HMGP, General Fund
ACTION NO: 164	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Penn Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 165	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Penn Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities

Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 166	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Penn Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 167	**Post relevant notices of future plans and proposed mitigation actions on municipal bulletin.**
COMMUNITY: Picture Rocks Borough	
Category:	Education and Awareness
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	Borough
Implementation Schedule:	Annually
Funding Source:	Staff Time
ACTION NO: 168	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Picture Rocks Borough	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time

ACTION NO: 169	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Picture Rocks Borough	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 170	**Install dry hydrants at water's edge along Loyalsock Creek.**
COMMUNITY: Plunketts Creek Township	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Wildfire
Lead Agency/Department:	Plunkett's Creek Township, Lycoming County Planning & Community Development
Implementation Schedule:	As funding becomes available
Funding Source:	FEMA/HMGP; PEMA; Municipality
ACTION NO: 171	**Work with local carriers to expand and Improve cellular coverage.**
COMMUNITY: Plunketts Creek Township	
Category:	Structure and Infrastructure Project
Hazard(s) Addressed:	Disorientation; All Hazards
Lead Agency/Department:	Plunkett's Creek Township; Lycoming County Department of Planning and Community Development
Implementation Schedule:	Ongoing
Funding Source:	EPMD; corporate
ACTION NO: 172	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Plunketts Creek Township	

Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 173	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Plunketts Creek Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 174	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Shrewsbury Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 175	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Shrewsbury Township	
Category:	Local Plans and Regulations

Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 176	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Shrewsbury Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 177	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Washington Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 178	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Washington Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam

Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 179	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Washington Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 180	**Install/replace/repair culverts previously identified as problem areas Township-wide.**
COMMUNITY: Wolf Township	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	PennDOT, Lycoming County Planning & Community Development
Implementation Schedule:	As funds become available.
Funding Source:	PennDOT, FEMA, Lycoming County
ACTION NO: 181	**Disseminate pertinent information to municipal officials and residents as needed regarding local contingency planning for water and wastewater facilities once Lycoming County Water and Sewer Authority complete the Integrated Contingency Plan which include information on more than 35 facilities.**
COMMUNITY: Wolf Township	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam

Lead Agency/Department:	Lycoming County Department of Planning and Community Development; Municipalities as needed
Implementation Schedule:	1 year
Funding Source:	HMGP, General Fund
ACTION NO: 182	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Wolf Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 183	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Wolf Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 184	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Wolf Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities

Implementation Schedule:	Ongoing
Funding Source:	HMGP
Pine Creek Watershed	
ACTION NO: 185	**Radio communications equipment upgrade for fire company.**
COMMUNITY: Brown Township	
Category:	Education and Awareness
Hazard(s) Addressed:	Urban Fire and Explosion; Wildfire
Lead Agency/Department:	Brown Township
Implementation Schedule:	Ongoing
Funding Source:	Regional Assistance Grant
ACTION NO: 186	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Brown Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 187	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Brown Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing

Funding Source:	HMGP
ACTION NO: 188	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Cogan House Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 189	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Cogan House Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 190	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Cogan House Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP

ACTION NO: 191	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Cummings Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 192	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Cummings Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 193	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Jackson Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time

ACTION NO: 194	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Jackson Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 195	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Jackson Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 196	**Determine feasibility and/or BCA of 43 online Project Opportunity Forms submitted by homeowners for buyout/elevation projects.**
COMMUNITY: Jersey Shore Borough	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Department of Planning and Community Development; Municipalities as needed
Implementation Schedule:	1 year
Funding Source:	HMGP, General Fund

ACTION NO: 197	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Jersey Shore Borough	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 198	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Jersey Shore Borough	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 199	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Jersey Shore Borough	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 200	**Replace underground culvert pipe that is deteriorating under Old State Road.**

COMMUNITY: McHenry Township	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Subsidence, Sinkhole
Lead Agency/Department:	McHenry Township; Township Supervisors; Township Engineer
Implementation Schedule:	1 year
Funding Source:	Municipality
ACTION NO: 201	**Reconstruction of embankment and roadway on Truman Run to prevent future erosion.**
COMMUNITY: McHenry Township	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Subsidence, Sinkhole
Lead Agency/Department:	McHenry Township; Township Supervisors; Township Engineer
Implementation Schedule:	1 year
Funding Source:	Municipality
ACTION NO: 202	**Hire Regional Police Department to assist patrolling of increased tourism and traffic on Route 414.**
COMMUNITY: McHenry Township	
Category:	Local Plans and Regulation
Hazard(s) Addressed:	Transportation Incident; Terrorism
Lead Agency/Department:	McHenry Township; Township Supervisors
Implementation Schedule:	Ongoing
Funding Source:	Municipality
ACTION NO: 203	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: McHenry Township	
Category:	Local Plans and Regulations

Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 204	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: McHenry Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 205	**Removal of hazardous trees.**
COMMUNITY: Mifflin Township	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Tornado, Windstorm; Winter Storm
Lead Agency/Department:	Mifflin Township
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 206	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Mifflin Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard

Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 207	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Mifflin Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 208	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Mifflin Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 209	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Nippenose Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing

Funding Source:	Staff time
ACTION NO: 210	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Nippenose Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 211	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Piatt Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 212	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Piatt Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time

ACTION NO: 213	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Piatt Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 214	**Reconstruction of embankment and roadway narrowing on English Run Road to prevent stream erosion.**
COMMUNITY: Pine Township	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Transportation Incident
Lead Agency/Department:	Pine Township
Implementation Schedule:	As funding becomes available.
Funding Source:	Act 13 Fund, Highway Aid
ACTION NO: 215	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Pine Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 216	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**

COMMUNITY: Pine Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 217	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Pine Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 218	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Porter Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 219	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Porter Township	
Category:	Structure and Infrastructure (NFIP)

Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 220	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Watson Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 221	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Watson Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
West Branch Susquehanna River Watershed	
ACTION NO: 222	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Anthony Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam

Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 223	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Anthony Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 224	**Disseminate pertinent information to municipal officials and residents as needed regarding local contingency planning for water and wastewater facilities once Lycoming County Water and Sewer Authority complete the Integrated Contingency Plan which includes information on more than 35 facilities.**
COMMUNITY: Armstrong Township	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Department of Planning and Community Development; Municipalities as needed
Implementation Schedule:	1 year
Funding Source:	HMGP, General Fund
ACTION NO: 225	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Armstrong Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects

Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 226	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Armstrong Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 227	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Armstrong Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 228	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Bastress Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities

Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 229	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Bastress Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 230	**Elevation and reconstruction of 1,000 feet of Turnback Road, including pavement reclamation, geotextile reinforcement, installation of 60-foot-long culverts, roadway embankment, guide rails and more.**
COMMUNITY: Brady Township	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Subsidence, Sinkhole
Lead Agency/Department:	Brady Township
Implementation Schedule:	3 years
Funding Source:	CFA - Multi-Modal Transportation Fund, General Fund
ACTION NO: 231	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Brady Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing

Funding Source:	Staff time
ACTION NO: 232	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Brady Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 233	**Increase community outreach and education in hazard mitigation process and preparedness.**
COMMUNITY: Clinton Township	
Category:	Education and Awareness
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	Clinton Township
Implementation Schedule:	Ongoing
Funding Source:	Staff Time
ACTION NO: 234	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Clinton Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 235	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**

COMMUNITY: Clinton Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 236	**Disseminate pertinent information to municipal officials and residents as needed regarding local contingency planning for water and wastewater facilities once Lycoming County Water and Sewer Authority complete the Integrated Contingency Plan which includes information on more than 35 facilities.**
COMMUNITY: Dubiostown Borough	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Department of Planning and Community Development; Municipalities as needed
Implementation Schedule:	1 year
Funding Source:	HMGP, General Fund
ACTION NO: 237	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Dubiostown Borough	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time

ACTION NO: 238	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Dubiostown Borough	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 239	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Dubiostown Borough	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 240	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Eldred Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 241	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**

COMMUNITY: Eldred Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 242	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Eldred Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 243	**Disseminate pertinent information to municipal officials and residents as needed regarding local contingency planning for water and wastewater facilities once Lycoming County Water and Sewer Authority complete the Integrated Contingency Plan which includes information on more than 35 facilities.**
COMMUNITY: Fairfield Township	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Department of Planning and Community Development; Municipalities as needed
Implementation Schedule:	1 year
Funding Source:	HMGP, General Fund
ACTION NO: 244	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**

COMMUNITY: Fairfield Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 245	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Fairfield Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 246	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Hepburn Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 247	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Hepburn Township	

Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 248	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Hepburn Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 249	**Determine feasibility and/or BCA of 43 online Project Opportunity Forms submitted by homeowners for buyout/elevation projects.**
COMMUNITY: Jersey Shore Borough	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Department of Planning and Community Development; Municipalities as needed
Implementation Schedule:	1 year
Funding Source:	HMGP, General Fund
ACTION NO: 250	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Jersey Shore Borough	

Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 251	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Jersey Shore Borough	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 252	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Jersey Shore Borough	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 253	**Examine the possibility of amending/developing local zoning ordinances to direct new development away from areas underlain with carbonate bedrock.**
COMMUNITY: Limestone Township	
Category:	Local Plans and Regulations

Hazard(s) Addressed:	Subsidence and Sinkhole
Lead Agency/Department:	Zoning Official for Township or Borough
Implementation Schedule:	3-5 years
Funding Source:	Borough, Township, and Lycoming County Annual Budgets
ACTION NO: 254	**Disseminate pertinent information to municipal officials and residents as needed regarding local contingency planning for water and wastewater facilities once Lycoming County Water and Sewer Authority complete the Integrated Contingency Plan which includes information on more than 35 facilities.**
COMMUNITY: Limestone Township	
Category:	Local Plans and Regulations; Education and Awareness
Hazard(s) Addressed:	Utility Interruption; Flood, Flash Flood, Ice Jam; Terrorism
Lead Agency/Department:	Lycoming County Water and Sewer Authority, Lycoming County Department of Planning and Community Development; Municipalities
Implementation Schedule:	1 year
Funding Source:	Staff Time; General Fund
ACTION NO: 255	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Limestone Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 256	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Limestone Township	
Category:	Structure and Infrastructure (NFIP)

Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 257	**Obtain Levee accreditation (PAL) as part of Risk MAP.**
COMMUNITY: Loyalsock Township	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Levee Failure
Lead Agency/Department:	Municipalities
Implementation Schedule:	1 year
Funding Source:	General Fund
ACTION NO: 258	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Loyalsock Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 259	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Loyalsock Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam

Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 260	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Loyalsock Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 261	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Lycoming Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 262	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Lycoming Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing

Funding Source:	HMGP
ACTION NO: 263	**Removal of hazardous trees.**
COMMUNITY: Mifflin Township	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Tornado, Windstorm; Winter Storm
Lead Agency/Department:	Mifflin Township
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 264	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Mifflin Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 265	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Mifflin Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time

ACTION NO: 266	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Mifflin Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 267	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Mill Creek Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 268	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Mill Creek Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 269	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**

COMMUNITY: Montgomery Borough	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 270	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Montgomery Borough	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 271	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Montgomery Borough	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 272	**Maintain and enforce floodplain management ordinance.**
COMMUNITY: Montoursville Borough	
Category:	Local Plans and Regulations (NFIP)

Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Montoursville Borough
Implementation Schedule:	Ongoing
Funding Source:	HMGP, General Fund
ACTION NO: 273	**Disseminate pertinent information to municipal officials and residents as needed regarding local contingency planning for water and wastewater facilities once Lycoming County Water and Sewer Authority complete the Integrated Contingency Plan which include information on more than 35 facilities.**
COMMUNITY: Montoursville Borough	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Department of Planning and Community Development; Municipalities as needed
Implementation Schedule:	1 year
Funding Source:	HMGP, General Fund
ACTION NO: 274	**Obtain Levee accreditation (PAL) as part of Risk MAP.**
COMMUNITY: Montoursville Borough	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Levee Failure
Lead Agency/Department:	Municipalities
Implementation Schedule:	1 year
Funding Source:	General Fund
ACTION NO: 275	**Determine feasibility and/or BCA of 43 online Project Opportunity Forms submitted by homeowners for buyout/elevation projects.**
COMMUNITY: Montoursville Borough	
Category:	Structure and Infrastructure Projects, NFIP

Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Department of Planning and Community Development; Municipalities as needed
Implementation Schedule:	1 year
Funding Source:	HMGP, General Fund
ACTION NO: 276	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Montoursville Borough	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 277	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Montoursville Borough	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 278	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Muncy Borough	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard

Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 279	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Muncy Borough	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 280	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Muncy Borough	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 281	**Disseminate pertinent information to municipal officials and residents as needed regarding local contingency planning for water and wastewater facilities once Lycoming County Water and Sewer Authority complete the Integrated Contingency Plan which include information on more than 35 facilities.**
COMMUNITY: Muncy Creek Township	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam

Lead Agency/Department:	Lycoming County Department of Planning and Community Development; Municipalities as needed
Implementation Schedule:	1 year
Funding Source:	HMGP, General Fund
ACTION NO: 282	**Determine feasibility and/or BCA of 43 online Project Opportunity Forms submitted by homeowners for buyout/elevation projects.**
COMMUNITY: Muncy Creek Township	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Department of Planning and Community Development; Municipalities as needed
Implementation Schedule:	1 year
Funding Source:	HMGP, General Fund
ACTION NO: 283	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Muncy Creek Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 284	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Muncy Creek Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam

Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 285	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Muncy Creek Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 286	**Disseminate pertinent information to municipal officials and residents as needed regarding local contingency planning for water and wastewater facilities once Lycoming County Water and Sewer Authority complete the Integrated Contingency Plan which include information on more than 35 facilities.**
COMMUNITY: Muncy Township	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Department of Planning and Community Development; Municipalities as needed
Implementation Schedule:	1 year
Funding Source:	HMGP, General Fund
ACTION NO: 287	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Muncy Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects

Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 288	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Muncy Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 289	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Muncy Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 290	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Nippenose Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities

Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 291	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Nippenose Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 292	**Obtain Levee accreditation (PAL) as part of Risk MAP.**
COMMUNITY: Old Lycoming Township	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Levee Failure
Lead Agency/Department:	Municipalities
Implementation Schedule:	1 year
Funding Source:	General Fund
ACTION NO: 293	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Old Lycoming Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time

ACTION NO: 294	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Old Lycoming Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 295	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Piatt Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 296	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Piatt Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 297	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**

COMMUNITY: Piatt Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 298	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Porter Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 299	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Porter Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 300	**Obtain Levee accreditation (PAL) as part of Risk MAP.**
COMMUNITY: South Williamsport Borough	
Category:	Structure and Infrastructure Projects, NFIP

Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Levee Failure
Lead Agency/Department:	Municipalities
Implementation Schedule:	1 year
Funding Source:	General Fund
ACTION NO: 301	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: South Williamsport Borough	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 302	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: South Williamsport Borough	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 303	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: South Williamsport Borough	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam

Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 304	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Susquehanna Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 305	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Susquehanna Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 306	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Susquehanna Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities

Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 307	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Upper Fairfield Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 308	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Upper Fairfield Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 309	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Upper Fairfield Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing

Funding Source:	HMGP
ACTION NO: 310	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Washington Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 311	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Washington Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 312	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Washington Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP

ACTION NO: 313	**Furnish and install a permanent log picker with electrical distribution system at the Grafius Run Trash Rack at Highland Terrace similar to the one located at Freedom Road and Market Street.**
COMMUNITY: City of Williamsport	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	The City of Williamsport
Implementation Schedule:	1-year
Funding Source:	HMGP
ACTION NO: 314	**Obtain Levee accreditation (PAL) as part of Risk MAP.**
COMMUNITY: City of Williamsport	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Levee Failure
Lead Agency/Department:	Municipalities
Implementation Schedule:	1 year
Funding Source:	General Fund
ACTION NO: 315	**Determine feasibility and/or BCA of 43 online Project Opportunity Forms submitted by homeowners for buyout/elevation projects.**
COMMUNITY: City of Williamsport	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Department of Planning and Community Development; Municipalities as needed
Implementation Schedule:	1 year
Funding Source:	HMGP, General Fund

ACTION NO: 316	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: City of Williamsport	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 317	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: City of Williamsport	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 318	**Install/replace/repair culverts previously identified as problem areas Township-wide.**
COMMUNITY: Wolf Township	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	PennDOT, Lycoming County Planning & Community Development
Implementation Schedule:	As funds become available.
Funding Source:	PennDOT, FEMA, Lycoming County

ACTION NO: 319	**Disseminate pertinent information to municipal officials and residents as needed regarding local contingency planning for water and wastewater facilities once Lycoming County Water and Sewer Authority complete the Integrated Contingency Plan which include information on more than 35 facilities.**
COMMUNITY: Wolf Township	
Category:	Structure and Infrastructure Projects, NFIP
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Department of Planning and Community Development; Municipalities as needed
Implementation Schedule:	1 year
Funding Source:	HMGP, General Fund
ACTION NO: 320	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Wolf Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 321	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Wolf Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing

Funding Source:	Staff time
ACTION NO: 322	**Identify, acquire, and demolish structure with the highest relative vulnerabilities.**
COMMUNITY: Wolf Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP
ACTION NO: 323	**Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.**
COMMUNITY: Woodward Township	
Category:	Local Plans and Regulations; Structural and Infrastructure Projects
Hazard(s) Addressed:	Transportation Incident; Environmental Hazard
Lead Agency/Department:	Municipalities; Lycoming County (outreach)
Implementation Schedule:	3 years
Funding Source:	Staff time
ACTION NO: 324	**Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.**
COMMUNITY: Woodward Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County, Municipalities
Implementation Schedule:	Ongoing
Funding Source:	Staff time

ACTION NO: 325	Identify, acquire, and demolish structure with the highest relative vulnerabilities.
COMMUNITY: Woodward Township	
Category:	Structure and Infrastructure (NFIP)
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Lycoming County Planning and Community Development, municipalities
Implementation Schedule:	Ongoing
Funding Source:	HMGP

At least one mitigation action was established for each hazard in Lycoming County. More than one action is identified for several hazards. Every participating jurisdiction has at least one mitigation action.

These mitigation actions have either been carried over from the 2015 HMP or captured during the planning process for the 2020 HMP update. During the development of this plan, there were key findings and takeaways that demonstrated further potential for future mitigation actions. These potential mitigation actions have been outlined in Table 6.4-3 below.

Table 6.4-2 Potential Mitigation Actions for Lycoming County

IMPACTED MUNICIPALITIES	POTENTIAL MITIGATION ACTION
Countywide	Evaluate and prioritize actions and efforts related to High-Hazard Potential Dams (HHPD) that are cost effective and reduce risks from HHPDs.
Brown Township	Work with township to implement wildfire control and safety measures to reduce risk of future wildfires.
Brown Township, Cummings Township, McHenry Township, Plunketts Creek	Support municipal efforts to move structures and critical facilities out of state recreation areas that are vulnerable to wildfires.
Limestone Township, Washington Township	Support municipal efforts to move critical facilities out of subsidence-prone areas.
Loyalsock Creek Watershed, Pine Creek Watershed	Work with watershed organizations to develop a communication strategy for tourism, informing visitors of hazard risks in the area.
City of Williamsport, Jersey Shore Borough, Montgomery Borough, Muncy Borough, South Williamsport Borough	Help coordinate and facilitate awareness campaigns to educate homeowners and renters residing in homes built prior to 1940 on their higher level of risk for substantial damage from hazards.
Fairfield Township, Piatt Township, Salladasburg Borough, Wolf Township, Woodward Township	Assist municipalities in tornado and wind storm safety for communities with high percentages of mobile homes.

Table 6.4-2 Potential Mitigation Actions for Lycoming County	
IMPACTED MUNICIPALITIES	POTENTIAL MITIGATION ACTION
Countywide	Evaluate and prioritize actions and efforts related to High-Hazard Potential Dams (HHPD) that are cost effective and reduce risks from HHPDs.
Cogan House Township, Cummings Township	Support municipal inspections of new gas and oil/gas wells to reduce the risk of subsidence.
Cogan House Township, Cummings Township	Collaborate with oil/gas corporations and municipalities to identify suitable industrial use roadway corridors and prioritize roadway safety improvements.
Cascade Township, Cogan House Township, Gamble Township, Penn Township, Shrewsbury Township, Upper Fairfield Township	Help municipalities build awareness amongst homeowners, homebuilders, and real estate companies and agents on the risks of unconventional oil/gas well incidents.
City of Williamsport, South Williamsport Borough	Work with the City of Williamsport and South Williamsport Borough to support the Levee Rehabilitation Program.
South Williamsport Borough	Support rehabilitation of the Frank E. Heller Dam.

Table 6.4-1 lists 184 mitigation actions, many of which 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 6.4-3 presents the cumulative results of the prioritization of mitigation actions.

Table 6.4-3 Mitigation Action Prioritization

MITIGATION ACTIONS	MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					PRIORITY
NAME	EFFECTIVENESS	EFFICIENCY	MULTI-HAZARD MITIGATION	ADDRESSES HIGH RISK HAZARD	ADDRESSES CRITICAL COMMUNICATIONS/ INFRASTRUCTURE	
Meet with Lycoming County Water and Sewer Authority (LCWSA) to review the LCWSA Integrated Contingency Plan to facilitate integration into hazard mitigation planning, emergency response, and other planning mechanisms in the County.	2	2	3	3	3	2.5
Disseminate pertinent information to municipal officials and residents as needed regarding local contingency planning for water and wastewater facilities once Lycoming County Water and Sewer Authority complete the Integrated Contingency Plan which includes information on more than 35 facilities.	2	2	3	3	3	2.5

Table 6.4-3 Mitigation Action Prioritization

MITIGATION ACTIONS	MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					PRIORITY
NAME	EFFECTIVENESS	EFFICIENCY	MULTI-HAZARD MITIGATION	ADDRESSES HIGH RISK HAZARD	ADDRESSES CRITICAL COMMUNICATIONS/ INFRASTRUCTURE	
Develop language for potential inclusion in subdivision regulations requiring new power and communications (telephone, cable television) lines to be buried.	2.5	1.5	3	3	3	2.5
Obtain Levee accreditation (PAL) as part of Risk MAP.	3	2.5	1	3	3	2.5
Identify, acquire, and demolish structure with the highest relative vulnerabilities.	3	3	1	3	2	2.5
Obtain inundation information for areas near dams from the Pennsylvania Department of Environmental Protection, as it becomes available.	2	2	3	3	3	2.5
Initiate meeting with providers of electric power, land developers, and contractors to examine the cost and potential sources of funding for burying power lines.	2	1.5	3	3	3	2.4
Work with local carriers to expand and Improve cellular coverage.	2	1.5	3	3	3	2.4
Increase community outreach and education in hazard mitigation process and preparedness.	2	1.5	3	3	3	2.4

Table 6.4-3 Mitigation Action Prioritization

MITIGATION ACTIONS	MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					PRIORITY
NAME	EFFECTIVENESS	EFFICIENCY	MULTI-HAZARD MITIGATION	ADDRESSES HIGH RISK HAZARD	ADDRESSES CRITICAL COMMUNICATIONS/ INFRASTRUCTURE	
Furnish and install a permanent log picker with electrical distribution system at the Grafius Run Trash Rack at Highland Terrace similar to the one located at Freedom Road and Market Street.	2	3	1	3	3	2.4
Obtain additional structure/property data from tax assessor and complete an enhanced HAZUS analysis and incorporate vulnerability information into the HMP.	2	2	2	3	3	2.3
Elevation and reconstruction of 1,000 feet of Turnback Road, including pavement reclamation, geotextile reinforcement, installation of 60-foot-long culverts, roadway embankment, guide rails and more.	3	2.5	2	1	2	2.2
Install/replace/repair culverts previously identified as problem areas Township-wide	2.5	2	2	3	1.5	2.2
After a flood event or windstorm provide information on alternatives to reconstruction of structures that sustain damages more than or equal to 50% of value to property owners.	2.5	2.5	1	3	1	2.1
Reduce flood risk through clean up and removal of downed trees, branches, and debris in Shoemaker Run and Slacks Run.	2.5	2.5	1	3	1	2.1

Table 6.4-3 Mitigation Action Prioritization

MITIGATION ACTIONS	MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					PRIORITY
NAME	EFFECTIVENESS	EFFICIENCY	MULTI-HAZARD MITIGATION	ADDRESSES HIGH RISK HAZARD	ADDRESSES CRITICAL COMMUNICATIONS/ INFRASTRUCTURE	
Update/revise, and adopt floodplain management ordinance as part of NFIP compliance and Risk MAP.	2.5	2	1	3	2	2.1
Conduct a housing stock survey of the community as part of "Project Resilience"	2	2	1	3	2.5	2
Replace underground culvert pipe that is deteriorating under Old State Road.	2	2	1	3	2.5	2
Reconstruction of embankment and roadway narrowing on English Run Road to prevent stream erosion.	2	2	1	3	2.5	2
Reconstruction of embankment and roadway on Truman Run to prevent future erosion.	2	2	1	3	2.5	2
Integrate deficient locally owned bridge (20 feet or longer) projects, identified in the Lycoming County WATS Long Range Transportation Plan, currently classified as status inactive and deemed essential for public use, into local planning.	2.5	1.5	2	1	3	2
Educate citizens and business owners about removing flammable vegetation or combustible materials from the immediate vicinity of buildings in wooded areas.	2	3	1	1	2	2

Table 6.4-3 Mitigation Action Prioritization						
MITIGATION ACTIONS	MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					PRIORITY
NAME	EFFECTIVENESS	EFFICIENCY	MULTI-HAZARD MITIGATION	ADDRESSES HIGH RISK HAZARD	ADDRESSES CRITICAL COMMUNICATIONS/ INFRASTRUCTURE	
Determine feasibility and/or BCA for 43 online Project Opportunity Forms submitted by homeowners for buyout/elevation projects.	2.5	2	1	3	1	1.9
Provide workshops for farmers regarding livestock management and crop survival during times of drought, and/or water supply interruption.	1.5	2	2.5	2	1	1.9
Provide education for residents about water-saving landscaping techniques.	1.5	2	2	2	1.5	1.8
Post relevant notices of future plans and proposed mitigation actions on municipal bulletin	1.5	1.5	3	2	1	1.8
Provide information to residents and business owners to examine the interior of structures to identify objects that may fall in the event of an earthquake (e.g., tall file cabinets, water heaters). Include information about anchoring.	2	2	1	1	1	1.5
Install dry hydrants at water's edge along Loyalsock Creek.	2	2	1	1	1	1.5
Maintain and enforce floodplain management ordinance.	2	2	1	1	1	1.5
Removal of hazardous trees.	2	2	1	1	1	1.5

Table 6.4-3 Mitigation Action Prioritization						
MITIGATION ACTIONS	MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					PRIORITY
NAME	EFFECTIVENESS	EFFICIENCY	MULTI-HAZARD MITIGATION	ADDRESSES HIGH RISK HAZARD	ADDRESSES CRITICAL COMMUNICATIONS/ INFRASTRUCTURE	
Examine the possibility of amending/developing local zoning ordinances to direct new development away from areas underlain with carbonate bedrock.	3	1	1	1	1	1.4
Provide information to schools, prisons, and nursing homes about the Great California Shake-Out and encourage participation in this educational program about surviving the immediate effects of an earthquake.	1.5	1.5	1	1	1	1.3
Radio communications equipment upgrade for fire company.	1.5	1.5	1	1	1	1.3
Adopt Firewise Program.	1.5	1.5	1	1	1	1.3
Provide additional maintenance for State Parks and State Forests.	1.5	1.5	1	1	1	1.3
Hire Regional Police Department to assist patrolling of increased tourism and traffic on Route 414.	1.5	1.5	1	1	1	1.3
Encourage homeowners to install appropriate devices to monitor and reduce radon exposure in homes.	1.5	1.5	1	1	1	1.3

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 Lycoming County and all participating jurisdictions. This HMP Update is intended to be a 'living document'. Plan adoption, though important, 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. This Chapter establishes a method to monitor how the Plan will be evaluated and maintained in the future.

7.2. Monitoring, Evaluating, and Updating the Plan

Hazard mitigation planning in Lycoming County is the responsibility of all levels of government (i.e., County and local), as well as the citizens of the County. As listed in FEMA 386-4, the planning team (the Lycoming County Hazard Mitigation Steering Committee) must continuously monitor and document the progress of the Plan's recommended actions. The Lycoming County Hazard Mitigation Steering Committee (listed in Section 3.2), under the direction of the Lycoming County Planning and Community Development Department, will be responsible for maintaining this Multi-Jurisdictional HMP. The Steering Committee will meet annually and following each emergency declaration, with the purpose of reviewing the Plan. The Steering Committee will lead annual reviews of the HMP. Each year, the County will solicit new projects from the municipalities by sending out Project Opportunity Forms and informing the municipalities of the opportunity to update their mitigation measures.

Each review process will ensure that the Hazard Vulnerability Analysis and Risk Assessment reflect current conditions in the County and the municipalities, the Capability Assessment accurately reflects local circumstances, and the hazard mitigation strategies are updated based on the County's damage assessment reports and local mitigation project priorities. The Steering Committee will complete a Progress Report to evaluate the status and accuracy of the HMP and record the Steering Committee's findings. The Lycoming County Planning and Community Development Department will maintain a copy of these records.

As directed by FEMA 386-4, the Progress Report will include the following information: the hazard mitigation action's objectives; who the lead and supporting agencies responsible for implementation are; how long the project should take, including a delineation of the various stages of work along with timelines (milestones should be included); whether the resources needed for implementation, funding, staff time, and technical assistance are available, or if other arrangements must be made to obtain them; the types of permits or approvals necessary to implement the action; details on the ways the actions will be accomplished within the organization, and whether the duties will be assigned to agency staff or contracted out; and the current status of the project, identifying any issues that may hinder implementation.

The HMP must be updated on a five-year cycle. This HMP will be updated and resubmitted to FEMA for approval within the five-year period. The monitoring, evaluating, and updating of the Plan every five years will rely heavily on the outcomes of the annual Steering Committee meetings.

7.3. Continued Public Involvement

The Lycoming County Planning and Community Development Department will ensure that the HMP is posted and maintained on the County website, and will continue to encourage public review and comment on the plan through information posted to the website and public notices in the local newspaper.

The citizens of Lycoming County are encouraged to submit their comments to elected officials and/or members of the Hazard Mitigation Steering Committee. To promote public participation, Lycoming County welcomed comments on the HMP for a 30-day period. This offered the public the opportunity to share their comments and observations. All comments received will be maintained and considered by the Hazard Mitigation Steering Committee when updating the HMP.

The County also hosts the Flood Ready site on its County portal and the HMP project website will remain active through 2021.

Lycoming County will continue to reach out to municipalities via telephone, mail, and e-mail regarding mitigation projects, especially those municipalities that did not submit projects for inclusion in this HMP. Any additional Hazard Mitigation Project Opportunity Forms received during the life of this five-year HMP will be incorporated into the Plan as an interim, updated and included in the next five-year Plan update.

8. Plan Adoption

The Plan was submitted to the Pennsylvania State Hazard Mitigation Planner on XXXX XX, 2020.

This section of the plan includes copies of the local adoption resolutions passed by Lycoming 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.

Lycoming County Hazard Mitigation Plan

County Adoption Resolution

Resolution No. _____

Lycoming County, Pennsylvania

WHEREAS, the municipalities of Lycoming County, Pennsylvania, are most vulnerable to natural and human-made 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, Lycoming County acknowledges the requirement 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 Lycoming County Hazard Mitigation Plan has been developed by the Lycoming County Planning and Community Development Department and the Lycoming County Emergency Management Agency, in cooperation with other County departments, local municipal officials, and the citizens of Lycoming County, and

WHEREAS, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Lycoming County Hazard Mitigation Plan, and

WHEREAS, the Lycoming County Hazard Mitigation Plan recommends mitigation activities that will reduce losses to life and property affected by both natural and human-made hazards that face the County and its municipal governments,

NOW THEREFORE BE IT RESOLVED by the governing body for the County of Lycoming that:

- The Lycoming County 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 Lycoming County Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

ADOPTED, this _____ day of _____, 2021

ATTEST: LYCOMING COUNTY COMMISSIONERS

_____ By _____

By _____

By _____

Lycoming County Hazard Mitigation Plan

Municipal Adoption Resolution

Resolution No. _____

<Borough/Township of Municipality Name>, Lycoming County, Pennsylvania

WHEREAS, the *<Borough/Township of Municipality Name>*, Lycoming County, Pennsylvania, is most vulnerable to natural and human-made 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 requirement 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 Lycoming County Hazard Mitigation Plan has been developed by the Lycoming County Planning and Community Development Department and the Lycoming County Emergency Management Agency in cooperation with other County departments, and officials and citizens of *<Borough/Township of Municipality Name>*, and

WHEREAS, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Lycoming County Hazard Mitigation Plan, and

WHEREAS, the Lycoming County Hazard Mitigation Plan recommends mitigation activities that will reduce losses to life and property affected by both natural and human-made hazards that face the County and its municipal governments,

NOW THEREFORE BE IT RESOLVED by the governing body for the *<Borough/Township of Municipality Name>*:

- The Lycoming County Hazard Mitigation Plan is hereby adopted as the official Hazard Mitigation Plan of the *<Borough/Township>*, and
- The respective officials and agencies identified in the implementation strategy of the Lycoming County Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

ADOPTED, this _____ day of _____, 2021

ATTEST: *<BOROUGH/TOWNSHIP OF MUNICIPALITY NAME>*

_____ By _____

By _____

By _____