

# Forest County Hazard Mitigation Plan Update



December 2020

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# 1. Introduction

## 1.1 Background

The Forest County Commissioners assigned the Forest County Conservation District and Planning Department with the primary responsibility to update the hazard mitigation plan. A local hazard mitigation planning team was developed. The team was comprised of the Forest County Conservation District & Planning Department Board of Directors. This updated HMP will provide another solid foundation for the Forest County Hazard Mitigation Program.

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

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

## 1.2 Purpose

The purpose of this All-Hazard Mitigation Plan (HMP) is:

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

## 1.3 Scope

This Forest County Multi-Jurisdictional Hazard Mitigation Plan (HMP) serves as a framework for saving lives, protecting assets, and preserving the economic viability of Forest County and the 9 municipalities located in Forest County. The HMP outlines actions designed to address and reduce the impact of a full range of natural hazards facing Forest County, including flooding,

tornados, hurricanes/tropical storms, and severe winter weather. Human-caused hazards are also addressed. These include, for example, transportation accidents, hazardous materials spills, and civil disorder. A multi-jurisdictional planning approach was utilized for the Forest County HMP update, thereby eliminating the need for each municipality to craft its own approach to hazard mitigation and its own planning document. Further, this type of planning effort results in a common understanding of the hazard vulnerabilities throughout the county, a comprehensive list of mitigation projects, common mitigation goals and objectives, and an evaluation of a broad capabilities assessment examining policies and regulations throughout the county and its municipalities. Each municipality that elected to be part of the multi-jurisdictional planning effort adopted the HMP by resolution.

## 1.4 Authority and Reference

Authority for this plan originates from the following federal sources:

- Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C., Section 322, as amended
- Code of Federal Regulations (CFR), Title 44, Parts 201 and 206
- Disaster Mitigation Act of 2000, Public Law 106-390, as amended
- National Flood Insurance Act of 1968, as amended, 42 U.S.C. 4001 *et seq.*

Authority for this plan originates from the following Commonwealth of Pennsylvania sources:

- Pennsylvania Emergency Management Services Code. Title 35, Pa C.S. Section 101
- Pennsylvania Municipalities Planning Code of 1968, Act 247 as reenacted and amended by Act 170 of 1988
- Pennsylvania Stormwater Management Act of October 4, 1978. P.L. 864, No. 167

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

- FEMA 386-1: *Getting Started*. September 2002
- FEMA 386-2: *Understanding Your Risks: Identifying Hazards and Estimating Losses*. August 2001
- FEMA 386-3: *Developing the Mitigation Plan*. April 2003
- FEMA 386-4: *Bringing the Plan to Life*. August 2003
- FEMA 386-5: *Using Benefit-Cost Review in Mitigation Planning*. May 2007
- FEMA 386-6: *Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning*. May 2005
- FEMA 386-7: *Integrating Manmade Hazards into Mitigation Planning*. September 2003
- FEMA 386-8: *Multijurisdictional Mitigation Planning*. August 2006
- FEMA 386-9: *Using the Hazard Mitigation Plan to Prepare Successful Mitigation Projects*. August 2008
- FEMA *Local Multi-Hazard Mitigation Planning Guidance*. July 1, 2008

- FEMA National *Fire Incident Reporting System 5.0: Complete Reference Guide*. January 2008

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

- PEMA: *Hazard Mitigation Planning Made Easy!*
- PEMA Mitigation Ideas: *Potential Mitigation Measures by Hazard Type: A Mitigation Planning Tool for Communities*. March 6, 2009
- PEMA: *Standard Operating Guide*. February 10, 2012

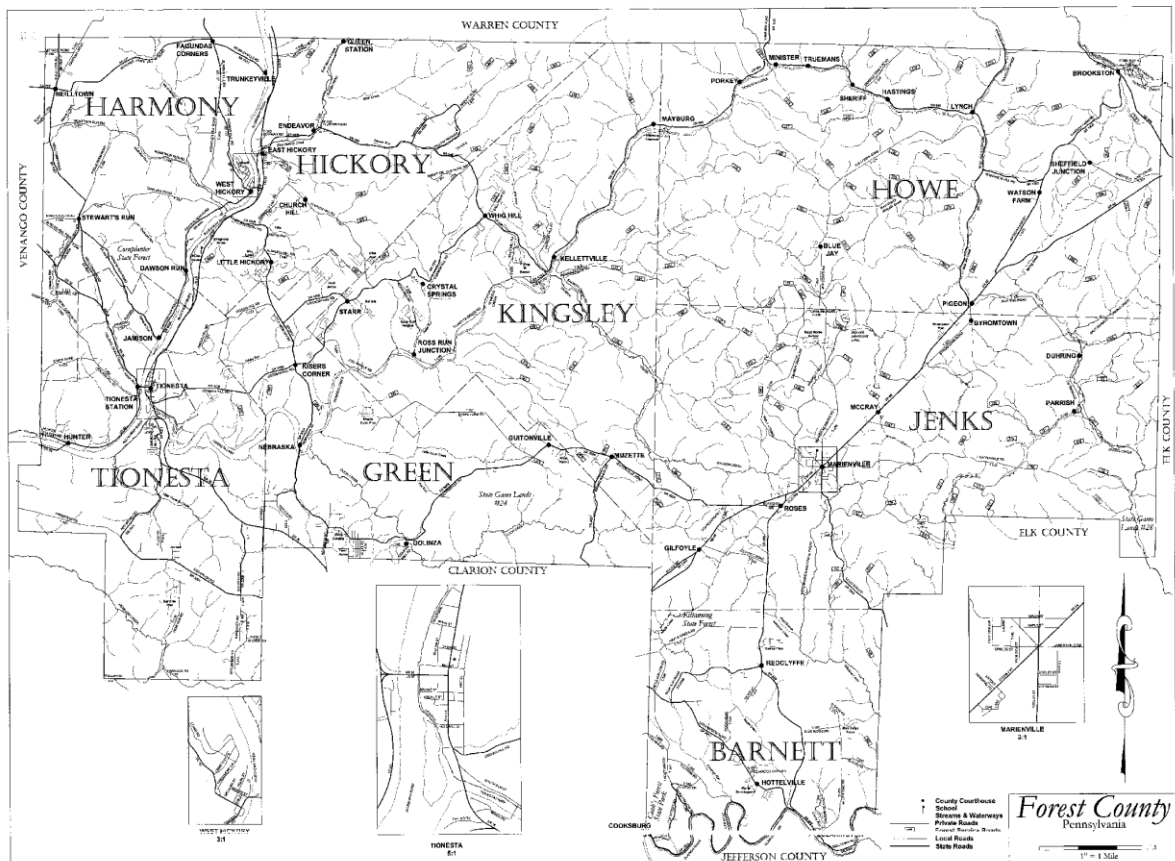
The following document produced by the National Fire Protection Association (NFPA) provided additional guidance for updating this plan:

- NFPA 1600: *Standard on Disaster/Emergency Management and Business Continuity Programs*. 2010

## 2. Community Profile

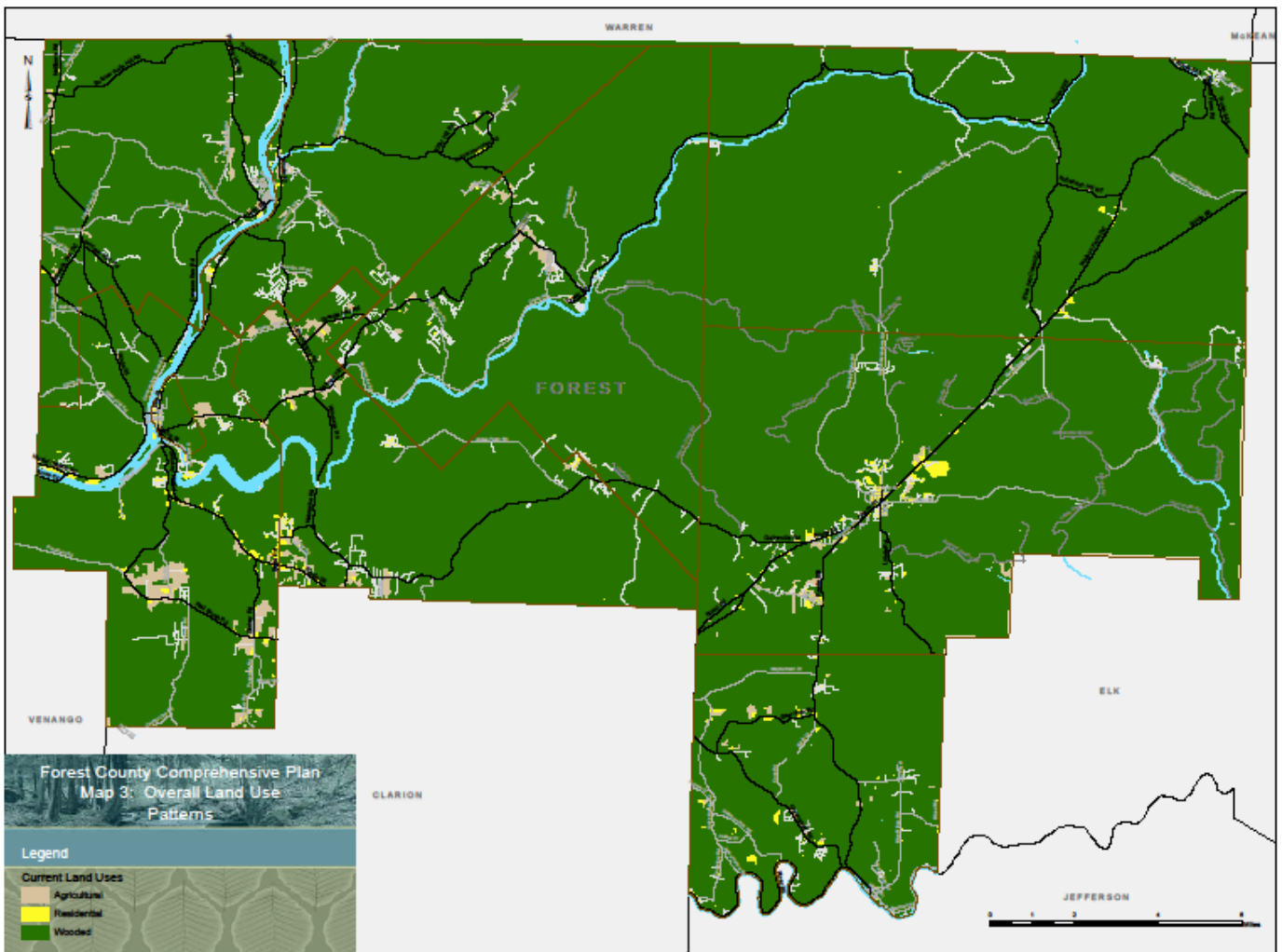
### 2.1 Geography and the Environment

Forest County was created on April 11, 1848, from part of Jefferson County. The county was enlarged on October 31, 1866, when part of Venango County was incorporated into Forest County. Forest County is a rural eighth-class county in western Pennsylvania. The county seat is Tionesta Borough. According to the U.S. Census Bureau, the county has a total area of 431 square miles. 428 square miles are land and 3 square miles are water. The 2018 population was 7,279 people. Of this population, more than 2,325 are incarcerated in the state correctional institute located north of Marienville known as SCI Forest and an additional 128 are located at the Abraxas Foundation northwest of Marienville. Forest County is composed of 1 borough and 8 townships.



Nestled in the west central part of the Allegheny Plateau, Forest County remains a pristine rural area of forests, valleys and streams. Counties bordering Forest County are Clarion County to the south, Elk County to the east, Jefferson County to the south, McKean County to northeast, Venango County to the west and Warren County to the north.

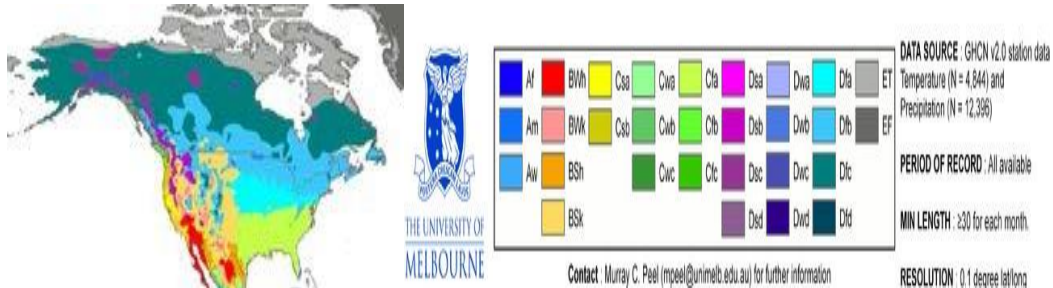
Forest County has a forest area of over 398 square miles which is 93% of the county. Allegheny National Forest, State Game Lands 24, Cornplanter State Forest and part of Cook Forest State Park make up a majority of the county land. These areas include facilities for boating, camping, fishing, hunting, mountain biking, ATV trails, snowmobile trails and swimming.



Forest County is located in the west central part of the state on the Allegheny Plateau. The Allegheny Plateau consists geologically of the region drained by the Allegheny and Clarion Rivers. Tionesta, Maple, Spring, Salmon, Little Tionesta, East Hickory, Otter, West Hickory, Minister Creeks are tributaries of these rivers.



The Koppen-Geiger Climate Areas map classifies Forest County, and the rest of Pennsylvania, as Humid Continental (See Figure 2.1-1). While counties of Pennsylvania share many weather similarities, there are also a few unique characteristics to certain regions.



Forest County is located in the northwest region of Pennsylvania. The weather patterns and climatic conditions of Forest County are a major risk factor. The county’s weather extremes are the primary contributors to many of the county’s natural hazard events, including flash floods, hurricanes, tropical depressions, blizzards, tornados, drought, high wind and lightning.

## 2.2 Community Facts

The timber industry, agriculture, education, selected service in state and county government and tourism are some of the top industries in Forest County. Forest County ranks high in the state in timberland percentage; while Pennsylvania leads the nation in hardwood growing stock. The highest quality hardwood species indigenous to Forest County include: ash, soft maple, hard maple, red oak and black cherry.

Natural gas exploration is a renewed industry in Forest County. For years, conventional shallow gas well sites have been drilled. Now the unconventional well sites are starting to bring economic opportunity and a concern for potential environmental impacts to Forest County. Forest County lies at the edge of the Marcellus Shale but within the heart of the Utica Shale. Initial test well sites for the Utica Shale in Forest County have revealed positive findings. If unconventional wells prove to be profitable, infrastructure development to process and move the gas will follow. The chief effects will be to water resources, impacts on the county’s roads and changes to the scenic landscape. With this is the potential secondary effect to include economic development and population growth.

Forest County has over 2,236 people in the workforce. A significant percentage of the skilled workforce is employed in surrounding areas at large manufacturing operations.

**Table 2.2-1: Forest County Top Employers**

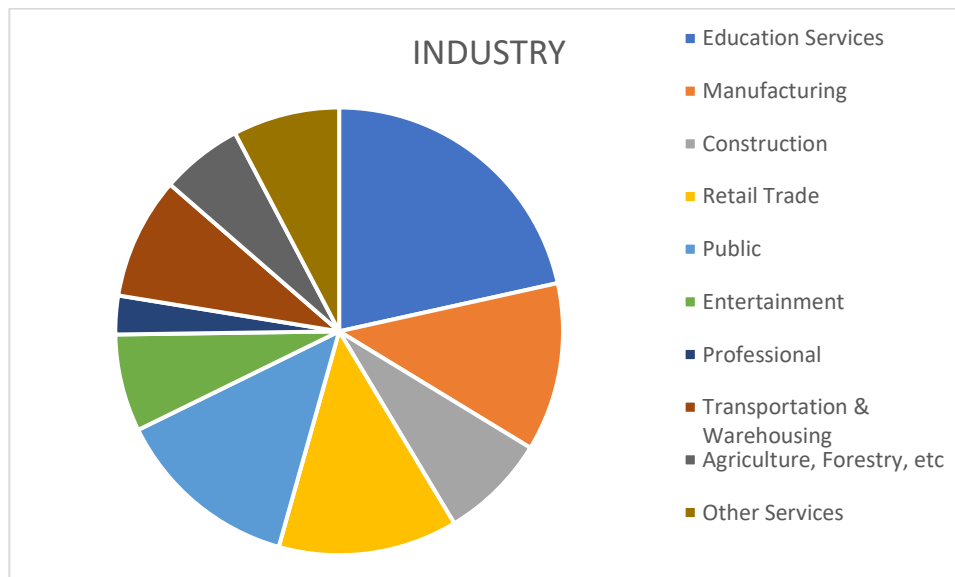
Company	Industry
Commonwealth of Pennsylvania	Public Services
Forest County School District	Education Services
Forest County	Public Administration
Cornell Abraxas Group, Inc.	Education Services
Industrial Timber and Land Company (ITL)	Timber Industry
Pennsylvania General Energy	Natural Gas Industry
Windsor, Inc.	Healthcare
U.S. Department of Agriculture, Forestry Service	Public Administration
Joseph Muccio Transportation	Transportation Services
Taylor Diversion Programs, Inc	Support program for at-risk youth

Source: Northwest PA Commission Regional Freight Study Final Report

Occupation within Forest County is classified under the following categories with the associated percentage of civilians employed at 16 years of age and over:

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

Education services, healthcare, and social assistance; public administration; retail trade; manufacturing and arts, entertainment and recreation were classified as the largest employers during the 2018 Census; encompassing over half of the workers.



Source: 2018 US Census Information – Forest County Pennsylvania

## 2.3 Population and Demographics

Forest County is classified politically as an eighth-class county. The 2018 population was 7,279 people. Forest County is composed of 1 borough and 8 townships. The populations per municipality are identified in table 2.3-1 below. Jenks Township has 4,757 people but 2,325 are located at SCI Forest. SCI Forest is a State Prison which opened in Forest County in 2004. SCI Forest is comprised of a 64-acre compound with 26 buildings including 11 housing units, three inmate dining halls, hospital, education and religious complex, warehouse, utility plant and administration building. In addition, there are two large recreational yards and individual recreation areas for each housing unit. This prison is the explanation for the large population diversity in Forest County. The Demographics have not changed noticeably since the 2014 HMP update.

In Forest County 667 residents are under the age of 18, 6,721 are age 18-64 and, 1,575 are age 65 or older. The median age is 39.2 within the county. In accordance with the 2017 census, 4,617 were white, 2,362 were black/African American, and 421 were “other” race.

There were 1,631 households in 2018. 66% were married couples. The average household size is 2 and the average family size is 2.6. Forest County has a median household income of \$38,383.00 with a median per capita income of \$15,360.00.

**Table 2.3-1: Forest County Municipality Populations**

Municipality	Population	Municipality	Population
Barnett Township	249	Jenks Township	4,757
Green Township	309	Kingsley Township	237
Harmony Township	382	Tionesta Borough	483
Hickory Township	344	Tionesta Township	463
Howe Township	257		

Source: 2017/18 Census Bureau

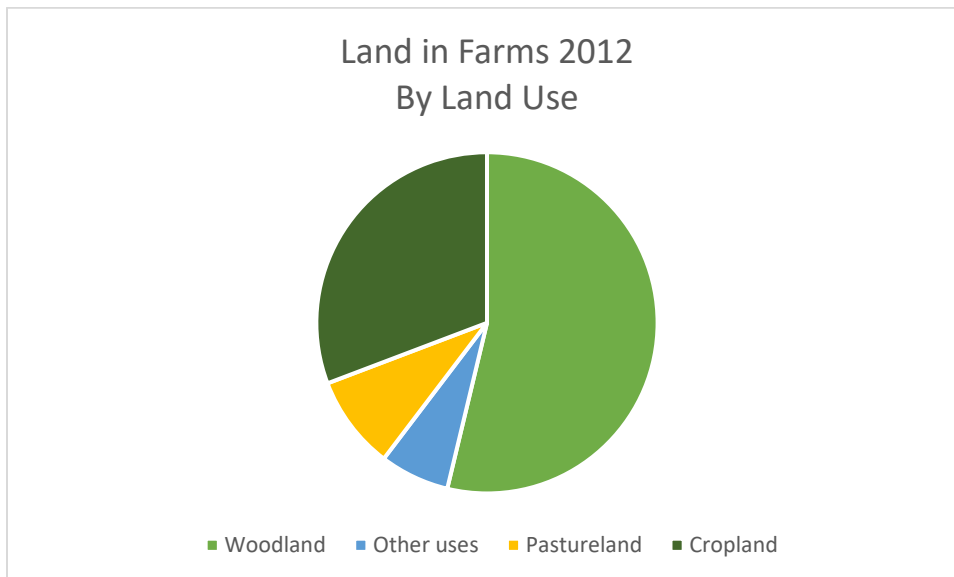
There are five major transportation routes within the county: US 62; and State Routes 36, 66, 899, and 666. Although it is off the Interstate network, Interstates 80 and 79 are accessible at less than 50 miles away. Forest County has 491 miles of highways of which 329 miles of highway are Pennsylvania Department of Transportation and other federal highways and 162 miles are considered local roadways of the townships and boroughs. There are 297 miles of national forest system roads in Forest County. This network is extremely important due to the large amount of tourism and hunting that occurs in Forest County.

Troop C, Marienville Station of the Pennsylvania State Police provides law enforcement coverage to Forest County; as there are no township or borough police agencies within the county. The Forest County Sheriff has countywide jurisdiction as well. There are three fire stations and two EMS stations. Even though there are no hospitals within Forest County, there are numerous hospitals in close proximity to the county.

## 2.4 Land Use and Development

According to the 2019 U.S. Census, Forest County has a total of 8,727 housing units. Of the available housing units only 85.9% are occupied. Forest County is known as one of Pennsylvania's best kept secrets and a rural retreat area. The majority of these housing units were built in 1970-1979, with a 15.2% increase between 1960 and 1969. From 2005 or later there was only an increase of 1.4% of housing units built.

The total number of farms as of 2012 is 56 farms. (US Department of Agriculture, [www.agcensus.usda.gov](http://www.agcensus.usda.gov)) The average size of a Forest County farm is 148 acres. The average market value of products sold per farm in Forest County is \$36,833.00.



## 2.5 Data Sources and Limitations

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

- Forest County Hazard Vulnerability Analysis.
- Forest County Comprehensive Plan.
- Forest County Assessment Department data.
- Forest County Subdivision and Land Development Ordinance.
- Forest County Open Space Management Plan.
- Forest County digital tax assessment data

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

- U.S. Census Bureau.
- National Climatic Data Center (NCDC).

- National Oceanic and Atmospheric Administration (NOAA).
- Pennsylvania Department of Conservation and Natural Resources.
- Pennsylvania Groundwater Information System.
- Pennsylvania Emergency Incident Reporting System.
- Pennsylvania Emergency Management Agency.

The countywide Digital Flood Insurance Rate Maps (DFIRM), were used for all flood risk analysis and estimation of loss. The Forest DFIRMs were approved and effective in November 26, 2010. The DFIRM database provides flood frequency and elevation information used in the flood hazard risk assessment. Other Forest County GIS datasets including road centerlines, parcels, and structures were utilized in conjunction with the DFIRM. In addition to the county's existing spatial datasets, the Forest County 9-1-1 Coordinator developed a database and maps of the county's critical facilities, special needs populations, transportation systems, and hazardous materials facilities. Potential losses were then analyzed by using existing county tax assessment data and DFIRM data.

#### Geographic Information Systems (GIS) Data

GIS data was utilized in risk assessment, estimation of loss and the development of map products for the hazard mitigation plan update. A core foundation of data was available from the Forest County 9-1-1 Department and Forest County Conservation District and Planning Department. Some data was downloaded from the Pennsylvania Spatial Data Access (PASDA) and utilized. The following is a list of existing GIS data that was utilized in the plan update process and a list of new GIS data that was developed to complete the mitigation plan update. **All new and existing data was utilized to complete the update of the 2020 Forest County Hazard Mitigation Plan.**

#### Existing Forest County GIS Data Used:

- Structures
- Road Centerlines
- Driveways
- Tax Parcels
- Municipality Boundaries
- Digital Flood Insurance Rate Maps
- Watershed and Sub-sheds
- Lakes and Streams

## 3 Planning Process

### 3.1 Update Process and Participation Summary

The Forest County Hazard Mitigation Plan update began in August of 2017. The Forest County Commissioners were able to secure a hazard mitigation grant to start the process. The grant was not awarded and signed until December of 2018. The Forest County Conservation District and Planning Department was identified as the lead agency for the Forest County Hazard Mitigation Plan Update. The planning process involved a variety of key decision makers and stakeholders within Forest County. Forest County decided to have the updated plan drafted by the Executive Director of the Forest County Conservation District & Planning Department.

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

Several public meetings with local elected officials were held, as well as work sessions and in-progress review meetings with the Forest County Local Planning Team and staff. Several letters and emails were sent to Townships requesting documents and surveys be completed and returned to the Planning Commission. Green Township did not respond initially. The Planning Director went to a Township meeting to get the documents completed and incorporated into the plan before final edits were completed. At each of the public meetings, respecting the importance of local knowledge, municipal officials were strongly encouraged to submit hazard mitigation project opportunity forms, complete their respective portions of the capability's assessment, and review and eventually adopt the county hazard mitigation plan. Forest County will continue to work with all local municipalities to collect local hazard mitigation project opportunities.

The public was invited to comment on the Plan, which was placed on the County web site, [www.co.forest.pa.us](http://www.co.forest.pa.us). Written comments were requested, but no public response was received.

The HMP planning process consisted of:

- Applying for and receiving a Hazard Mitigation Planning Grant (HMPG) to fund the planning project.
- Involving elected and appointed county and municipal officials in a series of meetings.
- Identifying capabilities and reviewed the information with the municipalities.
- Identifying hazards.

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

## 3.2 The Planning Team

The 2020 Forest County Hazard Mitigation Plan Update was led by the Forest County Project Team. The Forest County Project Team provided guidance and leadership for the overall project. Table 3.2-1 outlines the individuals that comprised this team.

<b>Name</b>	<b>Organization</b>	<b>Position</b>
Basil Huffman	Forest County	Commissioner
Robert Snyder	Forest County	Commissioner
Mark Kingston	Forest County	Commissioner
	Forest County	Emergency Management Coordinator
Curt Kiefer	Forest County	9-1-1 Coordinator, Chief Assessor
Donna Lynn Zofcin	Forest County Conservation District and Planning Department	Director

The stakeholders listed in Table 3.2-2 served on the 2020 Forest County Hazard Mitigation Local Planning Team, demonstrating their commitment to actively participate in the planning process by attending meetings, completing assessments, surveys, and worksheets, and/or submitting comments.

<b>Name</b>	<b>Organization</b>	<b>Position</b>
Basil Huffman	Forest County	Commissioner
Robert Snyder	Forest County	Commissioner
Mark Kingston	Forest County	Commissioner
	Forest County	Emergency Management
Curt Kiefer	Forest County	9-1-1 Coordinator
Donna Lynn Zofcin	Forest County Conservation District and Planning Department	Director
Robert Summers	Howe Township, Forest County Conservation District and Planning Department Board	Supervisor, Board Chairman
Robert Wagner	Tionesta Township, Forest County Conservation District and Planning Department	Supervisor, Board Director
Elton Kline	Forest County Conservation District and Planning Department	Board Director
Leonard Hetrick	Forest County Conservation District and Planning Department	Board Director
Todd Huth	Forest County Conservation District and Planning Department	Board Director
Jeff Arnold	Forest County Conservation District and Planning Department	Board Director
Rory Summers	Howe Township, Forest County Conservation District and Planning Department	Road Master, Associate Board Director



### 3.3 Meetings and Documentation

Table 3.3-1: Forest County HMP Process - Timeline			
Date	Action	Attendees	Description
10/17/2018	Forest County Township Convention  (Meeting)	Forest County Commissioners Forest County 9-1-1 Forest County Conservation District and Planning Barnett Township Supervisors Harmony Township Supervisors Howe Township Secretary Jenks Township Supervisors Kingsley Township Supervisors Tionesta Township Supervisors	Identified the Hazard Mitigation Plan Update was in progress and correspondence and information requests would be sent to the Townships for their response.
01/17/19	Correspondence	Recipients: Barnett Township, Green Township, Harmony Township, Hickory Township, Howe Township, Jenks Township, Kingsley Township, Tionesta Township, Tionesta Borough	Hazard Mitigation Capability Assessment Surveys with the Capability Self-Assessment Matrix were distributed to all Townships with a cover letter stressing the importance of completing the forms in a timely manner.
01/24/19	Forest County Conservation District & Planning Department Meeting	Forest County Commissioner Forest County Conservation District and Planning Department Board	Hazard Mitigation Capability Assessment Surveys were distributed to the Board Members for their completion.
12/27/2019	Correspondence	Recipients: Barnett Township, Green Township, Harmony Township, Hickory Township, Howe Township, Jenks Township, Kingsley Township, Tionesta Township, Tionesta Borough	Municipality Hazard Identification and Risk Evaluation Worksheets and Hazard Mitigation Project Opportunity Forms
05/15/2019	Forest County Township Convention  (Meeting)	Forest County Commissioners Forest County Emergency Management Agency Forest County GIS Department Forest County Assessment Department Forest County Conservation District and Planning	Identified the Hazard Mitigation Plan Update was in progress and correspondence and information requests would be sent to the Townships for their response.
7/28/2020	Correspondence	Recipients: Forest County Conservation District and Planning Department Board	Hazard Prioritization Table Hazard Prioritization Matrix spreadsheet
10/8/2020	Correspondence	Recipients: Forest County Conservation District and Planning Department Board	Forest County Mitigation Goals and Objectives Review  Forest County 2020 Mitigation Action Plan
3/9/2021	Green Township Meeting	Green Township Supervisors: Pat Kline, Bede Meisel, Robert Wagner Green Township Secretary: Carla Woodside Green Township Building Permit Officer: Carl Haberman Forest County Planner: Donna Lynn Zofcin	Municipality Hazard Identification and Risk Evaluation worksheet  Hazard Mitigation Project Opportunity Form  Capability Assessment Survey

## 3.4 Public and Stakeholder Participation

Forest County engaged numerous stakeholders and encouraged public participation during the HMP update process.

The tools listed below were distributed with meeting invitations, provided directly to municipalities to complete and return to the Forest County Conservation District Office or at meetings to solicit information, data, and comments from both local municipalities and other key stakeholders. Responses to these worksheets and surveys are included in specific appendices at the end of the hazard mitigation plan update.

1. **Risk Assessment Hazard Identification and Risk Evaluation Worksheet:** Capitalizes on local knowledge to evaluate the change in the frequency of occurrence, magnitude of impact, and/or geographic extent of existing hazards, and allows communities to evaluate hazards not previously profiled using the Pennsylvania Standard List of Hazards. Located in **Appendix G**.
2. **Capability Assessment Survey:** Collects information on local planning, regulatory, administrative, technical, fiscal and political capabilities that can be included in the countywide mitigation strategy. Located in **Appendix F**.
3. **Municipal Project Opportunity Forms and Mitigation Actions:** Copies of the previous mitigation opportunity forms that were included in the current HMP were provided to the municipalities for review and amendment. The previous mitigation actions were provided and reviewed at update meetings. New municipal project opportunity forms are included as well. Located in **Appendix I**.

Forest County invited all contiguous counties to review the 2020 draft hazard mitigation plan. A letter was sent to the emergency management coordinator in Clarion, Elk, Crawford, Venango and Warren Counties on December 18, 2020. Copies of these letters are included in **Appendix C**.

### 3.5 Multi-Jurisdictional Planning

Forest County used an open, public process to prepare this HMP. Meetings and letters to municipal officials were conducted to inform and educate them about the requirements for local hazard mitigation plans. In turn, municipal officials provided information related to existing codes and ordinances, the risks and impacts of known hazards on local infrastructure and critical facilities, and recommendations for related mitigation opportunities. The pinnacle to the municipal involvement process was the adoption of the final plan. Please refer to **Appendix C** for documentation of the public participation in the planning process. Table 3.5-1 reflects the municipality participation in meetings during the update process. Table 3.5-2 reflects the municipality participation by completing worksheets, surveys and forms.

**Table 3.5-1: Municipality Participation in Hazard Mitigation Update Meetings/Mailings**

Municipality	Capability and Risk Assessment Municipal Mailing 01/17/2019	Capability and Risk Assessment Township Meeting 03/9/2021	
Barnett Township	X		
Green Township		X	
Harmony Township			
Hickory Township	X		
Howe Township	X		
Jenks Township	X		
Kingsley Township	X		
Tionesta Borough	X		
Tionesta Township			

Municipality	Risk Assessment Hazard Identification and Risk Evaluation Worksheet	Hazard Mitigation Opportunity Form Review and Updates
Barnett Township	X	X
Green Township	X	X
Harmony Township	X	
Hickory Township		
Howe Township	X	
Jenks Township	X	
Kingsley Township	X	X
Tionesta Borough	X	X
Tionesta Township	X	

All municipalities within Forest County have adopted the 2014 Forest County Hazard Mitigation Plan as the municipal hazard mitigation plan. It is anticipated that all municipalities will adopt the 2020 Forest County Hazard Mitigation Plan Update.

## **3.6 Existing Planning Mechanisms**

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

Information from several of these documents has been incorporated into this plan and mitigation actions have been developed to further integrate these planning mechanisms into the hazard mitigation planning process. In particular, information on identified development constraints and potential future growth areas was incorporated from the Forest County Comprehensive Plan so that vulnerability pertaining to future development could be established. (This was done for the 2014 Plan Update and is still consistent for the 2020 update.) The Forest County Hazard Vulnerability Analysis provided extensive information on past occurrences, vulnerability, and risk in the last five years, including anecdotal information. Floodplain management ordinance information was used to aid in the establishment of local capabilities in addition to participation in the national flood insurance program (NFIP).

# 4 Risk Assessment

## 4.1 Update Process Summary

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

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

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

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

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

The Forest County Local Planning Team reviewed and assessed the change in risk for all natural and man-made hazards identified in the 2014 hazard mitigation plan. The team utilized the Hazard Identification and Risk Evaluation worksheet that was provided by the Pennsylvania Emergency Management Agency.

The Forest County Project Team met, emailed, or spoke with municipalities and provided guidance on how to complete the municipal hazard identification and risk evaluation worksheet. Seven (7) municipalities returned a completed worksheet. An eighth municipality was met with and completed the worksheet prior to the final edits of the Plan being completed. This information was combined with the county information to develop an overall list of hazards that would need profiled.

## 4.2 Hazard Identification

### 4.2.1 Table of Presidential Disaster Declarations

Year	Declaration Date	Disaster Types	Disaster Number	Public Assistance	Individual Assistance
2020	Jan-20	Covid-19 Pandemic	4506	All 67 Counties	None
2018	Nov-18	Flood	4408	Bradford, Columbia, Lackawanna, Lycoming, Montour, Northampton, Schuylkill, Sullivan, Susquehanna, Tioga, Wyoming	None
2016	Dec-16	Flood	4292	Bradford, Centre, Lycoming, Sullivan	None
2016	Mar-16	Snow	4267	Adams, Bedford, Berks, Blair, Bucks, Chester, Cumberland, Dauphin, Fayette, Franklin, Fulton, Juniata, Lancaster, Lebanon, Lehigh, Montgomery, Northampton, Perry, Philadelphia, Schuylkill, Somerset, Westmoreland, York	None
2014	Feb-14	Severe Ice Storm	EM-3367	Bucks, Chester, Delaware, Lancaster, Montgomery, Philadelphia, York	None
2013	Oct-13	Severe Storm(s)	4149	Allegheny, Centre, Clearfield, Clinton, Crawford, Fayette, Huntingdon, Jefferson, Lawrence, Venango, Wayne	None
2012	01/13	Hurricane Sandy	4099	Bedford, Bucks, Cameron, Dauphin, Forest, Franklin, Fulton, Huntingdon, Juniata, Monroe, Northampton, Philadelphia, Pike, Potter, Somerset, Sullivan, Wyoming	None

Year	Declaration Date	Disaster Types	Disaster Number	Public Assistance	Individual Assistance
2011	09/12	Tropical Storm Lee	4030	Adams, Bedford, Berks, Bradford, Bucks, Chester, Columbia, Dauphin, Huntingdon, Juniata, Lackawanna, Lancaster, Lebanon, Luzerne, Lycoming, Mifflin, Montgomery, Montour, Northampton, Northumberland, Perry, Schuylkill, Snyder, Sullivan, Susquehanna, Tioga, Union, Wayne, Wyoming, and York.	Adams, Berks, Bradford, Bucks, Chester, Columbia, Cumberland, Dauphin, Delaware, Huntingdon, Lancaster, Lebanon, Luzerne, Lycoming, Monroe, Montgomery, Montour, Northampton, Northumberland, Perry, Philadelphia, Schuylkill, Snyder, Sullivan, Susquehanna, Union, Wyoming, and York.
2011	09/03	Hurricane Irene	4025	Bucks, Chester, Delaware, Lehigh, Luzerne, Monroe, Montgomery, Northampton, Philadelphia, Pike, Sullivan, Susquehanna, Wayne, and Wyoming.	Bucks, Chester, Delaware, Lehigh, Luzerne, Monroe, Montgomery, Northampton, Philadelphia, Sullivan, and Wyoming.
2011	07/13	Severe Storms and Flooding	4003	Bradford, Lycoming, Sullivan, Tioga, and Wyoming County	None
2010	04/16	Severe Winter Storms and Snowstorms	1898	Adams, Allegheny, Armstrong, Beaver, Bedford, Blair, Butler, Cambria, Chester, Cumberland, Dauphin, Delaware, Fayette, Franklin, Fulton, Greene, Huntingdon, Indiana, Juniata, Lancaster, Lebanon, Perry, Philadelphia, Somerset, Westmoreland, York	None
2007	02/23	Severe Storms and Flooding	1684	Bradford, Lackawanna, Luzerne, Schuylkill, Sullivan, Susquehanna, Wayne, Wyoming	None

Year	Declaration Date	Disaster Types	Disaster Number	Public Assistance	Individual Assistance
2006	06/30	Severe Storms, Flooding, and Mudslides	1649	Bradford, Bucks, Columbia, Luzerne, Northampton, Northumberland, Pike, Susquehanna, Wyoming	Berks, Bradford, Carbon, Chester, Dauphin, Franklin, Lackawanna, Lancaster, Lebanon, Luzerne, Monroe, Montgomery, Montour, Pike, Schuylkill, Susquehanna, Wayne, Wyoming
2005	04/14	Severe Storms and Flooding	1587	None	Bradford, Bucks, Columbia, Luzerne, Monroe, Northampton, Pike, Wayne, Wyoming



Year	Declaration Date	Disaster Types	Disaster Number	Public Assistance	Individual Assistance
2004	09/19	Tropical Depression Ivan	1557	Allegheny, Armstrong, Beaver, Bedford, Blair, Bradford, Bucks, Butler, Cameron, Carbon, Centre, Clarion, Clearfield, Clinton, Columbia, Cumberland, Dauphin, Elk, Franklin, Fulton, Green, Huntingdon, Indiana, Jefferson, Juniata, Lackawanna, Lawrence, Lebanon, Lehigh, Luzerne, Lycoming, Mifflin, Monroe, Montour, Northampton, Northumberland, Perry, Pike, Potter, Schuylkill, Snyder, Somerset, Sullivan, Susquehanna, Tioga, Union, Washington, Wayne, Westmoreland, Wyoming and York for debris removal and emergency protective measures and Allegheny, Armstrong, Beaver, Bedford, Blair, Bradford, Bucks, Butler, Cameron, Carbon, Centre, Clarion, Clearfield, Clinton, Columbia, Cumberland, Dauphin, Fulton, Greene, Huntingdon, Indiana, Jefferson, Juniata, Lackawanna, Lebanon, Luzerne, Lycoming, Mifflin, Monroe, Montour, Northampton, Northumberland, Perry, Philadelphia, Pike, Potter, Schuylkill, Snyder, Somerset, Sullivan, Susquehanna, Tioga, Union, Washington, Wayne, Westmoreland, Wyoming, York	Allegheny, Armstrong, Beaver, Bedford, Blair, Bradford, Bucks, Butler, Cameron, Carbon, Centre, Chester, Clarion, Clearfield, Clinton, Columbia, Crawford, Cumberland, Dauphin, Delaware, Elk, Franklin, Fulton, Green, Huntingdon, Indiana, Jefferson, Juniata, Lackawanna, Lawrence, Lebanon, Lehigh, Luzerne, Lycoming, Mifflin, Monroe, Montgomery, Montour, Northampton, Northumberland, Perry, Philadelphia, Pike, Potter, Schuylkill, Snyder, Somerset, Sullivan, Susquehanna, Tioga, Union, Washington, Wayne, Westmoreland, Wyoming, York

Year	Declaration Date	Disaster Types	Disaster Number	Public Assistance	Individual Assistance
2004	09/19	Severe Storms and Flooding associated with Tropical Depression Frances	1555	None	Beaver, Bedford, Blair, Butler, Crawford, Erie, Huntingdon, Lawrence, Warren, Washington
2004	08/06	Severe Storms and Flooding	1538	None	Delaware, Montgomery, Philadelphia
2003	09/26	Tropical Storms Henri and Isabel, and Related Severe Storms and Flooding	1497	None	Chester
2003	08/23	Severe Storms, Tornadoes, and Flooding	1485	Clarion, Crawford, Forest, Lackawanna, Lawrence, Mercer, McKean, Potter, Tioga, Venango, Warren, Wayne, Wyoming	Blair, Crawford, Lackawanna, Lawrence, McKean, Mercer, Potter, Tioga, Venango, Warren, Wayne
2001	06/22	Tropical Storm Allison	1383	None	Bucks, Montgomery
1999	09/22	Tropical Depression Dennis and Flash Flooding	1298	None	Dauphin, Lycoming, Northumberland, Snyder, Union
1999	09/18	Hurricane Floyd	1294	Bucks, Chester, Delaware, Lancaster, Montgomery, Philadelphia, York	Bucks, Chester, Delaware, Lancaster, Montgomery, Philadelphia, York
1999	09/01	Severe Storms and Flooding	1289	None	McKean
1998	06/08	Flooding, Severe Storms, and Tornadoes	1219	None	Allegheny, Beaver, Berks, Pike, Somerset, Susquehanna, Wyoming

Year	Declaration Date	Disaster Types	Disaster Number	Public Assistance	Individual Assistance
Public Assistance/Individual Assistance data not available prior to 1998					
1996	12/23	Severe Storms/Flooding	1149	Tioga	
1996	09/13	Hurricane Fran	1138	Cumberland, Huntingdon, Juniata, Mifflin, Montgomery, Perry	
1996	07/26	Flooding	1330	Armstrong, Blair Cambria, Clarion, Clearfield, Crawford, Greene, Indiana, Jefferson, Mercer, Venango	
1996	06/18	Flooding	1120	Adams, Beaver, Bedford, Bucks, Cambria, Crawford, Franklin, Huntingdon	
1996	01/21	Flooding	1093	Statewide	
1996	01/13	Blizzard	1085	Statewide	
1994	03/10	Winter Storm, Severe Storm	1015	No County Assistance Data Available	
1986	06/05	Severe Storms, Flooding	766	Allegheny	
1985	11/09	Severe Storms, Flooding	754	Allegheny, Fayette, Greene, Somerset, Washington, Westmoreland	
1985	10/08	Hurricane Gloria	745	Lackawanna, Luzerne, Monroe, Wayne, Wyoming, Susquehanna	
1985	06/03	Severe Storms, High Winds, Tornadoes	737	Erie, Crawford, Warren, McKean, Mercer, Venango, Forest, Butler, Beaver, Clearfield, Lycoming, Union, Northumberland	
1984	08/27	Severe Storms, Flooding	721	Armstrong, Allegheny, McKean, Westmoreland, Bedford, Blair, Somerset	
1981	06/15	Severe Storms, Flooding	641	Venango, Clarion, Mercer, Jefferson, Crawford	
1980	08/19	Severe Storms, Flooding	629	Armstrong, Butler, Clarion	
1977	07/21	Severe Storms, Flooding	537	Bedford, Cambria, Clearfield, Crawford, Indiana, Jefferson, Somerset, Westmoreland	

Year	Declaration Date	Disaster Types	Disaster Number	Public Assistance	Individual Assistance
1976	10/20	Severe Storms, Flooding	523	Adams, Bradford, Columbia, Cumberland, Dauphin, Franklin, Juniata, Lackawanna, Lancaster, Lebanon, Luzerne, Mifflin, Northumberland, Perry, Schuylkill, Snyder, Sullivan, Susquehanna, Wayne, Wyoming, York	
1976	07/07	High Winds, Flash Floods	513	Tioga	
1975	09/26	Severe Storms, Heavy Rains, Flooding	485	Adams, Berks, Bradford, Centre, Clinton, Columbia, Cumberland, Dauphin, Franklin, Juniata, Lackawanna, Lancaster, Lebanon, Luzerne, Lycoming, Mifflin, Montour, Northampton, Perry, Potter, Schuylkill, Snyder, Sullivan, Susquehanna, Tioga, Union, Wayne, Wyoming, York	
1973	07/17	Severe Storms, Flooding	400	Berks, Bucks, Chester, Columbia, Delaware, Lancaster, Monroe, Montgomery, Northampton, Wayne, Westmoreland	
1972	09/28	Heavy Rains, Flooding	355	Indiana	
1972	06/23	Tropical Storm Agnes	340	All 67 Counties	
1971	09/18	Floods	312	Bucks, Chester, Delaware, Montgomery, Philadelphia	
1969	08/19	Severe Storms, Flooding	273	Carbon, Monroe, Schuylkill	
1965	08/18	Water Shortage	206	Numerous Communities Statewide	
1959	01/23	Flood	89	Luzerne (Pittston)	
1956	08/09	Storm	61	Beaver, Greene, Washington	
1956	05/21	Severe Storms	58	Western Counties	
1956	03/15	Flood	51	Warren, Venango	
1955	08/20	Floods, Rains	40	Northeastern Counties	

## 4.2.2 Summary of Hazards

The Forest County Local Planning Team (LPT) was provided the Pennsylvania Standard List of Hazards to be considered for evaluation in the 2020HMP Update. Following a review of the hazards considered in the 2014 HMP and the standard list of hazards, the Local Planning Team decided that the 2020 plan should identify, profile, and analyze eighteen (18) hazards. Table 4.2.2-1 contains a complete list of the 18 hazards that have the potential to impact Forest County as identified through previous risk assessments. Hazard profiles are included in Section 4.3 for each of these hazards.

<b>Table 4.2.2-1 Identified Hazards for the Forest County HMP Update</b>	
<b>Natural Hazard</b>	<b>Hazard Description</b>
<b>Drought</b>	Drought is a natural climatic condition which occurs in virtually all climates, the consequence of a natural reduction in the amount of precipitation experienced over a long period of time, usually a season or more in length. High temperatures, prolonged winds, and low relative humidity can exacerbate the severity of drought. This hazard is of particular concern in Pennsylvania due to the presence of farms as well as water-dependent industries and recreation areas across the Commonwealth. A prolonged drought could severely impact these sectors of the local economy, as well as residents who depend on wells for drinking water and other personal uses. (National Drought Mitigation Center, 2006).
<b>Earthquake</b>	An earthquake is the motion or trembling of the ground produced by sudden displacement of rock usually within the upper 10-20 miles of the Earth's crust. Earthquakes result from crustal strain, volcanism, landslides, or the collapse of underground caverns. Earthquakes can affect hundreds of thousands of square miles, cause damage to property measured in the tens of billions of dollars, result in loss of life and injury to hundreds of thousands of persons, and disrupt the social and economic functioning of the affected area. Most property damage and earthquake-related deaths are caused by the failure and collapse of structures due to ground shaking which is dependent upon amplitude and duration of the earthquake. (FEMA, 1997).
<b>Flood, Flash Flood, Ice Jam</b>	Flooding is the temporary condition of partial or complete inundation on normally dry land and it is the most frequent and costly of all hazards in Pennsylvania. Flooding events are generally the result of excessive precipitation. General flooding is typically experienced when precipitation occurs over a given river basin for an extended period of time. Flash flooding is usually a result of heavy localized precipitation falling in a short time period over a given location, often along mountain streams and in urban areas where much of the ground is covered by impervious surfaces. The severity of a flood event is dependent upon a combination of stream and river basin topography and physiography, hydrology, precipitation and weather patterns, present soil moisture conditions, the degree of vegetative clearing as well as the presence of impervious surfaces in and around flood-prone areas. (NOAA, 2009). Winter flooding can include ice jams which occur when warm temperatures and heavy rain cause snow to melt rapidly. Snow melt combined with heavy rains can cause frozen rivers to swell, which breaks the ice layer on top of a river. The ice layer often breaks into large chunks, which float downstream, piling up in narrow passages and near other obstructions such as bridges and dams. All forms of flooding can damage infrastructure (USACE, 2007).

**Table 4.2.2-1 Identified Hazards for the Forest County HMP Update**

Natural Hazard	Hazard Description
<b>Hurricanes, Tropical Storms</b>	Hurricanes, tropical storms, and nor'easters are classified as cyclones and are any closed circulation developing around a low-pressure center in which the winds rotate counter-clockwise (in the Northern Hemisphere) and whose diameter averages 10-30 miles across. While most of Pennsylvania is not directly affected by the devastating impacts cyclonic systems can have on coastal regions, many areas in the state are subject to the primary damaging forces associated with these storms including high-level sustained winds, heavy precipitation, and tornadoes. Areas in southeastern Pennsylvania could be susceptible to storm surge and tidal flooding. The majority of hurricanes and tropical storms form in the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico during the official Atlantic hurricane season (June through November). (FEMA, 1997).
<b>Invasive Species</b>	An invasive species is a species that is not indigenous to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health. These species can be any type of organism: plant, fish, invertebrate, mammal, bird, disease, or pathogen. Infestations may not necessarily impact human health, but can create a nuisance or agricultural hardships by destroying crops, defoliating populations of native plant and tree species, or interfering with ecological systems (Governor's Invasive Species Council of Pennsylvania, 2009).
<b>Landslide</b>	A landslide is the downward and outward movement of slope-forming soil, rock, and vegetation reacting to the force of gravity. Landslides may be triggered by both natural and human-caused changes in the environment, including heavy rain, rapid snow melt, steepening of slopes due to construction or erosion, earthquakes, and changes in groundwater levels. Mudflows, mudslides, rock falls, rockslides, and rock topples are all forms of a landslide. Areas that are generally prone to landslide hazards include previous landslide areas, the bases of steep slopes, the bases of drainage channels, developed hillsides, and areas recently burned by forest and brush fires. (Delano & Wilshusen, 2001).
<b>Lightning Strikes</b>	Lightning is a discharge of electrical energy resulting from the build-up of positive and negative charges within a thunderstorm. The flash or "bolt" of light usually occurs within clouds or between clouds and the ground. A bolt of lightning can reach temperatures approaching 50,000°F. On average, 89 people are killed each year by lightning strikes in the United States. Within Pennsylvania, the annual average number of thunder and lightning events a given area can expect ranges between 40-70 events per year (FEMA, 1997).
<b>Pandemic</b>	A pandemic occurs when infection from of a new strain of a certain disease, to which most humans have no immunity, substantially exceeds the number of expected cases over a given period of time. Such a disease may or may not be transferable between humans and animals. (Martin & Martin-Granel, 2006).
<b>Radon Exposure</b>	Radon is a cancer-causing natural radioactive gas that you can't see, smell, or taste. It is a large component of the natural radiation that humans are exposed to and can pose a serious threat to public health when it accumulates in poorly ventilated residential and occupation settings. According to the USEPA, radon is estimated to cause about 21,000 lung cancer deaths per year, second only to smoking as the leading cause of lung cancer (EPA 402-R-03-003: EPA Assessment..., 2003). An estimated 40% of the homes in Pennsylvania are believed to have elevated radon levels (Pennsylvania Department of Environmental Protection, 2009).

**Table 4.2.2-1 Identified Hazards for the Forest County HMP Update**

Natural Hazard	Hazard Description
<p><b>Tornado, Wind Storm</b></p>	<p>A wind storm can occur during severe thunderstorms, winter storms, coastal storms, or tornadoes. Straight-line winds such as a downburst have the potential to cause wind gusts that exceed 100 miles per hour. Based on 40 years of tornado history and over 100 years of hurricane history, FEMA identifies western and central Pennsylvania as being more susceptible to higher winds than eastern Pennsylvania. (FEMA, 1997). A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud extending to the ground. Tornadoes are most often generated by thunderstorm activity (but sometimes result from hurricanes or tropical storms) when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. The damage caused by a tornado is a result of high wind velocities and wind-blown debris. According to the National Weather Service, tornado wind speeds can range between 30 to more than 300 miles per hour. They are more likely to occur during the spring and early summer months of March through June and are most likely to form in the late afternoon and early evening. Most tornadoes are a few dozen yards wide and touch down briefly, but even small, short-lived tornadoes can inflict tremendous damage. Destruction ranges from minor to catastrophic depending on the intensity, size, and duration of the storm. Structures made of light materials such as mobile homes are most susceptible to damage. Waterspouts are weak tornadoes that form over warm water and are relatively uncommon in Pennsylvania. Each year, an average of over 800 tornadoes is reported nationwide, resulting in an average of 80 deaths and 1,500 injuries (NOAA, 2002). Based on NOAA Storm Prediction Center Statistics, the number of recorded F3, F4, &amp; F5 tornadoes between 1950-1998 ranges from &lt;1 to 15 per 3,700 square mile area across Pennsylvania (FEMA, 2009). A water spout is a tornado over a body of water (American Meteorological Society, 2009).</p>
<p><b>Wild Fire</b></p>	<p>A wildfire is a raging, uncontrolled fire that spreads rapidly through vegetative fuels, exposing and possibly consuming structures. Wildfires often begin unnoticed and can spread quickly, creating dense smoke that can be seen for miles. Wildfires can occur at any time of the year, but mostly occur during long, dry hot spells. Any small fire in a wooded area, if not quickly detected and suppressed, can get out of control. Most wildfires are caused by human carelessness, negligence, and ignorance. However, some are precipitated by lightning strikes and in rare instances, spontaneous combustion. Wildfires in Pennsylvania can occur in fields, grass, brush, and forests. 98% of wildfires in Pennsylvania are a direct result of people, often caused by debris burns (PA DCNR, 1999).</p>
<p><b>Winter Storm</b></p>	<p>Winter storms may include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. A winter storm can range from a moderate snowfall or ice event over a period of a few hours to blizzard conditions with wind-driven snow that lasts for several days. Many winter storms are accompanied by low temperatures and heavy and/or blowing snow, which can severely impair visibility and disrupt transportation. The Commonwealth of Pennsylvania has a long history of severe winter weather. (NOAA, 2009).</p>

Man-Made Hazards	Hazard Description
Civil Disturbance	<p>Civil disturbance hazards encompass a set of hazards emanating from a wide range of possible events that cause civil disorder, confusion, strife, and economic hardship. Civil disturbance hazards include the following:</p> <ul style="list-style-type: none"> <li><b>Famine;</b> involving a widespread scarcity of food leading to malnutrition and increased mortality (Robson, 1981).</li> <li><b>Economic Collapse, Recession;</b> Very slow or negative growth, for example (Economist, 2009).</li> <li><b>Misinformation;</b> erroneous information spread unintentionally (Makkai, 1970).</li> <li><b>Civil Disturbance, Public Unrest, Mass Hysteria, Riot;</b> group acts of violence against property and individuals, for example (18 U.S.C. § 232, 2008).</li> <li><b>Strike, Labor Dispute;</b> controversies related to the terms and conditions of employment, for example (29 U.S.C. § 113, 2008).</li> </ul>
Dam Failure	<p>A dam is a barrier across flowing water that obstructs, directs, or slows down water flow. Dams provide benefits such as flood protection, power generation, drinking water, irrigation, and recreation. Failure of these structures results in an uncontrolled release of impounded water. Failures are relatively rare, but immense damage and loss of life is possible in downstream communities when such events occur. Aging infrastructure, hydrologic, hydraulic and geologic characteristics, population growth, and design and maintenance practices should be considered when assessing dam failure hazards. The failure of the South Fork Dam, located in Johnstown, PA, was the deadliest dam failure ever experienced in the United States. It took place in 1889 and resulted in the Johnstown Flood which claimed 2,209 lives (FEMA, 1997). Today there are approximately 3,200 dams and reservoirs throughout Pennsylvania (Pennsylvania Department of Environmental Protection, 2009).</p>
Disorientation	<p>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 (DCNR, 2009).</p>
Environmental Hazards	<p>Environmental hazards are hazards that pose threats to the natural environment, the built environment, and public safety through the diffusion of harmful substances, materials, or products. Environmental hazards include the following:</p> <ul style="list-style-type: none"> <li><b>Hazardous material releases;</b> at fixed facilities or as such materials are in transit and including toxic chemicals, infectious substances, biohazardous waste, and any materials that are explosive, corrosive, flammable, or radioactive (PL 1990-165, § 207(e)).</li> <li><b>Air or Water Pollution;</b> the release of harmful chemical and waste materials into water bodies or the atmosphere, for example (National Institute of Health Sciences, July 2009; Environmental Protection Agency, Natural Disaster PSAs, 2009).</li> <li><b>Superfund Facilities;</b> hazards originating from abandoned hazardous waste sites listed on the National Priorities List (Environmental Protection Agency, National Priorities List, 2009).</li> <li><b>Manure Spills;</b> involving the release of stored or transported agricultural waste, for example (Environmental Protection Agency, Environmental Impacts of..., 1998).</li> <li><b>Product Defect or Contamination;</b> highly flammable or otherwise unsafe consumer products and dangerous foods (Consumer Product Safety Commission, 2003).</li> </ul>



Man-Made Hazards	Hazard Description
<b>Transportation Accidents</b>	<p>Transportation accidents can result from any form of air, rail, water, or road travel. It is unlikely that small accidents would significantly impact the larger community. However, certain accidents could have secondary regional impacts such as a hazardous materials release or disruption in critical supply/access routes, especially if vital transportation corridors or junctions are present. (Research and Innovative Technology Administration, 2009). Traffic congestion in certain circumstances can also be hazardous. Traffic congestion is a condition that occurs when traffic demand approaches or exceeds the available capacity of the road network. This hazard should be carefully evaluated during emergency planning since it is a key factor in timely disaster or hazard response, especially in areas with high population density. (Federal Highway Administration, 2009).</p>
<b>Utility Interruption</b>	<p>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:</p> <ul style="list-style-type: none"> <li><b>Geomagnetic Storms;</b> including temporary disturbances of the Earth’s magnetic field resulting in disruptions of communication, navigation, and satellite systems (National Research Council et al., 1986).</li> <li><b>Fuel or Resource Shortage;</b> resulting from supply chain breaks or secondary to other hazard events, for example (Mercer County, PA, 2005).</li> <li><b>Electromagnetic Pulse;</b> originating from an explosion or fluctuating magnetic field and causing damaging current surges in electrical and electronic systems (Institute for Telecommunications Sciences, 1996).</li> <li><b>Information Technology Failure;</b> due to software bugs, viruses, or improper use (Rainer Jr., et al, 1991).</li> <li><b>Ancillary Support Equipment;</b> electrical generating, transmission, system-control, and distribution-system equipment for the energy industry (Hirst &amp; Kirby, 1996).</li> <li><b>Public Works Failure;</b> damage to or failure of highways, flood control systems, deep-water ports and harbors, public buildings, bridges, dams, for example (United States Senate Committee on Environment and Public Works, 2009).</li> <li><b>Telecommunications System Failure;</b> Damage to data transfer, communications, and processing equipment, for example (FEMA, 1997)</li> <li><b>Transmission Facility or Linear Utility Accident;</b> liquefied natural gas leakages, explosions, facility problems, for example (United States Department of Energy, 2005)</li> <li><b>Major Energy, Power, Utility Failure;</b> interruptions of generation and distribution, power outages. for example (United States Department of Energy, 2000).</li> </ul>

## 4.3 Hazard Profiles

### 4.3.1 Drought

#### 4.3.1.1 Location and Extent

Although a severe drought could have a devastating impact on the entire community it was determined to be the least likely to occur. However, communities in Forest County could potentially experience problems associated with drought conditions. The biggest concern in these communities is the high demand on the water supply and below average rainfall for recharge of aquifers and reservoirs.

The main type of drought that could be included in this all-hazard mitigation plan is a hydrological drought. A hydrological drought occurs when surface and subsurface water levels drop, such as in streams, rivers, lakes, and reservoirs.

Some preliminary discussion of the impact of drought and potential solutions can be found in the Comprehensive planning document titled the State Water Plan. This document was published over twenty years ago and is dated. The State has been authorized by the legislature to rewrite this plan and it is expected to inventory existing and potential drought mitigation strategies and options that may avoid or lessen the consequences of prolonged hydrologic drought.

#### 4.3.1.2 Range of Magnitude

Droughts have hit the Commonwealth seven times within the last 30 years. The Commonwealth has been most vulnerable to hydrologic and water management droughts. Hydrologic droughts generally entail a reduction of stream flows, reduction in lake/reservoir storages and the lowering of ground water levels. Water management droughts are a result of abnormally dry periods and the failure to adhere to water management practices during these times. During the summer of 1983, the worst drought in 20 years occurred, causing over \$196 million in damages to the state's crops. Severe droughts have also occurred during 2001 and 2002. Droughts can impact all of the municipalities.

#### 4.3.1.3 Past Occurrence

Forest County has most recently experienced drought emergencies and water supply deficiencies during the droughts of 1998 and 2002, which resulted in a Governor's Declaration. Drought conditions would impact forests covering Forest County. The potential for wildfire would increase dramatically during extended drought conditions. In 1985 a tornado course ran through the Jamieson Run Valley resulting in large numbers of blown down trees. After two years of drying that fuel load was subject to a wildfire which affected 150 acres of ground. The fire happened after several weeks of dry weather and strong winds, but was caused by human carelessness with debris burning during high winds. This set of conditions is ideal for wildfires to occur. The only feasible mitigation of wildfire potential is proper forest management practices; however, due to the presence of the Allegheny National Forest, local officials have little ability to cause proper forest management practices on governmental properties. A Forest County Wildfire Plan, under the National Fire Plan Program was completed in June of 2014 and attached as Appendix L.

#### 4.3.1.1 Future Occurrence

It would be very difficult to forecast the future frequency and severity of drought emergencies in Forest County. However, a drought situation could cause major shortages in private and public water supplies and crop damage on an extensive basis.

#### 4.3.1.2 Vulnerability Assessment

Although difficult to combat a drought, they may be made less threatening if all municipalities in the county utilize proper land use development controls (building restrictions on watershed areas, etc.), erosion controls, enforce irrigation regulations, plan for emergency conservation, and if possible, locate alternate sources of water.

Also, expansion of current municipal water service areas would provide more opportunity for spring/well reliant residents to secure a dependable water source but may remain impractical due to the dispersal of housing habitations, rugged terrain and prohibitive costs.

Worst case scenario would be a drought across the county affecting all water resources and during the growing season.

Public water service is not available in portions of Forest County. Public water service is available in portions of Jenks Township and Tionesta Borough. Public water service is not available to all residents of the county. Most areas rely on private domestic wells. Residents or water authorities that use private domestic wells are more vulnerable to droughts because their drinking water can literally dry up. Table 4.3.1-1 shows the number of domestic wells per municipality; there are a total of 1,221 domestic wells in the county. It is important to note that the well data was obtained from the Pennsylvania Groundwater Information System (PaGWIS). PaGWIS relies on voluntary submissions of well record data by well drillers; as a result, it is not a complete database of all domestic wells in the county. This is the most complete dataset of domestic wells available.

<b>Table 4.3.1-1: Domestic wells per municipality in Forest County</b>	
<b>MUNICIPALITY</b>	<b>DOMESTIC WELLS</b>
Barnett Township	130
Green Township	246
Harmony Township	275
Hickory Township	123
Howe Township	117
Jenks Township	145
Kingsley Township	314
Tionesta Borough	54
Tionesta Township	229
<b>TOTAL</b>	<b>1633</b>

**Table 4.3.1-2: Drought Preparation Phases**

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

Drought vulnerability maps are located in Appendix H-1.

## 4.3.2 Earthquake

### 4.3.2.1 Location and Extent

Earthquakes are geological events that involve movement or shaking of the crust of the earth. Earthquakes are measured in terms of their magnitude and intensity (instrumental – Catastrophic). Earthquakes can cause devastating destruction to the manmade environment.

Earthquakes are relatively infrequent and uncommon in Forest County but there is existing data to indicate that earthquake activity has occurred in Forest County but causing minimal damage, if any.

Northwestern Pennsylvania’s vulnerability to earthquakes decreases from west to east. The effects of earthquake (if the hazard exists) could potentially be anything from detected only on seismographs to ground water wells collapsing to total destruction, trees falling, ground rises and falls in waves.

### 4.3.2.2 Range of Magnitude

Earthquakes are caused by a sudden slip of a fault caused by the dynamic pressure of the earth’s plates pushing together on both sides of the fault over time. The strength of an earthquake is determined by the size of the slip and how close the slip occurred to the surface. The most active faults are along the Pacific Coast, although some smaller, less active, faults exist in the Eastern United States. The Richter Scale describes the magnitude of an earthquake and can be seen on the next page in table 4.3.2-1.

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

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

Seismic waves are the vibrations from earthquakes that travel through the Earth; they are recorded on instruments called seismographs. Seismographs record a zigzag trace that shows the varying amplitude of ground oscillations beneath the instrument. Sensitive seismographs, which greatly magnify these ground motions, can detect strong earthquakes from sources anywhere in the world. The time, locations, and magnitude of an earthquake can be determined from the data recorded by seismograph stations.

The Richter magnitude scale was developed in 1935 by Charles F. Richter of the California Institute of Technology as a mathematical device to compare the size of earthquakes. The magnitude of an earthquake is determined from the logarithm of the amplitude of waves recorded by seismographs. Adjustments are included for the variation in the distance between the various seismographs and the epicenter of the earthquakes. On the Richter Scale, magnitude is expressed in whole numbers and decimal fractions. For example, a magnitude 5.3 might be computed for a moderate earthquake, and a strong earthquake might be rated as magnitude 6.3. Because of the logarithmic basis of the scale, each whole number increase in magnitude represents a tenfold increase in measured amplitude; as an estimate of energy, each whole number step in the magnitude scale corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number value.

At first, the Richter Scale could be applied only to the records from instruments of identical manufacture. Now, instruments are carefully calibrated with respect to each other. Thus, magnitude can be computed from the record of any calibrated seismograph.

Earthquakes with magnitude of about 2.0 or less are usually called micro-earthquakes; they are not commonly felt by people and are generally recorded only on local seismographs. Events with magnitudes of about 4.5 or greater - there are several thousand such shocks annually - are strong enough to be recorded by sensitive seismographs all over the world. Great earthquakes, such as the 1964 Good Friday earthquake in Alaska, have magnitudes of 8.0 or higher. On the average, one earthquake of such size occurs somewhere in the world each year. The Richter Scale has no upper limit. Recently, another scale called the moment magnitude scale has been devised for more precise study of great earthquakes.

The Richter Scale is not used to express damage. An earthquake in a densely populated area which results in many deaths and considerable damage may have the same magnitude as a shock in a remote area that does nothing more than frighten the wildlife. Large-magnitude earthquakes that occur beneath the oceans may not even be felt by humans.

#### 4.3.2.1 Past Occurrence

There have been no recorded earthquakes occurring in Forest County, however on December 31, 2011 a 4.0 earthquake occurred around Youngstown, Ohio; August 31, 2011 a 5.9 earthquake occurred in Virginia and in January 2007, a 2.5 earthquake occurred just north of Meadville. Parts of the county experienced some of the shock waves from these minor earthquakes that have occurred around the region. Forest County has no earthquake building codes, therefore, should the county experience a substantial earthquake, it would be reasonable to expect that there could be extensive property and infrastructure damage and a significant loss of life.

#### 4.3.2.2 Future Occurrence

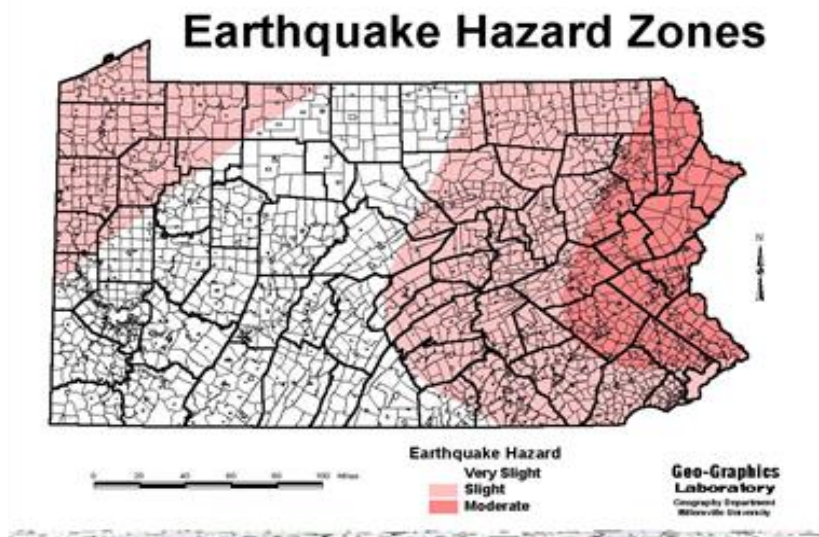
The probability of such an event occurring is unlikely. Forest County does not sit on any fault lines. A risk factor of 2.2 has been assigned to this hazard utilizing the risk factor assessment tool.

#### 4.3.2.3 Vulnerability Assessment

According to Millersville University's seismic risk study, Forest County has a very slight-to-slight risk of earthquakes.

Due to the low probability of an earthquake of sufficient destructive power in Forest County, dollar values of damage cannot be estimated with any relevancy. The only possible worst-case scenario would involve a strong earthquake that damages a dam sufficiently to result in failure. In that case, the problem of damage is from flooding rather than direct damage to property due to the earthquake. The damage from a flood has had dollar values determined elsewhere in this plan.

Figure 4.3.2-2



### 4.3.3 Flood, Flash Flood, and Ice Jams

#### 4.3.3.1 Location and Extent

With its ability to roll boulders the size of cars, tear out trees, and destroy buildings and bridges, flooding is the leading cause of death among all types of natural disasters throughout the United States. Typically, the result of heavy precipitation, snowmelts, and ice jams, major flood events can last several days or even weeks. Unfortunately, many homeowners fail to realize that the average insurance policy does not cover flooding. For this reason, floods are a costly and dangerous hazard.

A property's vulnerability to a flood is dependent upon its location in the floodplain. The properties that reside along the banks of a waterway are the most vulnerable. The property within the floodplain is broken into sections depending on its distance from the waterway. The 10-year flood zone is the area that has a 10 percent chance of being flooded every year. However, this label does not mean that this area cannot flood more than once every 10 years. It just designates the probability of a flood of this magnitude every year. Further away from this area is the 50-year floodplain. This area includes all of the 10- year floodplain plus additional property. The probability of a flood of this magnitude occurring during a one-year period is two percent. A summary of flood probability is shown in table 4.3.3-1.

<b>Flood Recurrence Intervals</b>	<b>Chance of Occurrence</b>
10-year	10.00%
50-year	2.00%
100-year	1.00%
500-year	0.20%

*Source: Federal Emergency Management Agency*

The National Flood Insurance Program (NFIP) publishes flood insurance rate maps. These maps identify the 1% annual chance of flood area. Special Flood Hazard Area (SFHA) and Base Flood Elevations (BFE) are developed from the 1% annual chance flood event. Structures located in the SFHA have a 26% chance of flooding in a 30-year period. The SFHA serves as the primary regulatory boundary used by county and municipal governments. Federal floodplain management regulations and mandatory flood insurance purchase requirements apply to the following high-risk special flood hazard areas in Table 4.3.3-2.

<b>4.3.3-2: Special Flood Hazard Area High Risk Zones</b>	
<b>Zone</b>	<b>Description</b>
A	Areas subject to inundation by the 1% annual chance flood event. Because detailed hydraulic analysis has not been performed, no base flood elevations or flood depths are shown
AE	Areas subject to inundation by the 1% annual chance flood event determined by detailed methods. BFEs are shown within these zones.
AH	Areas subject to inundation by the 1% annual chance shallow flooding (usually areas of ponding) where average depths are 1-3 feet. BFEs derived from detailed hydraulic analysis are shown in this zone.
<b>4.3.3-2: Special Flood Hazard Area High Risk Zones</b>	
<b>Zone</b>	<b>Description</b>
AO	Areas subject to inundation by the 1% annual chance shallow flooding (usually sheet flow on sloping terrain) where average depths are 1-3 feet. Average flood depths derived from detailed hydraulic analysis are shown within this zone.
AR	Areas that result from the decertification of a previously accredited flood protection system that is determined to be in the process of being restored to provide base flood protection.
Source: Federal Emergency Management Agency	

In the past, heavy rains have caused most of Forest County’s flood problems. Heavy rains cause small creeks and streams to overflow their banks, which leads to road closures. Flooding poses the biggest threat to those who reside or conduct business in the floodplain. The most significant hazard exists for businesses in the floodplain that process, use, and/or store hazardous materials. A flood could potentially allow for hazardous materials to leak out of these areas. As the water recedes it would spread the hazardous materials throughout the area. Also threatened are the agricultural areas in the floodplain. Most flood damage to property and structures located in the floodplain is caused by water exposure to the interior, high velocity water and debris flow.

4.3.3.1      Range of Magnitude

Potential flooding impacts range from very low to catastrophic depending on the type and location of flooding. The maximum threat of flooding in Forest County is estimated by looking at potential loss data and repetitive loss data, both analyzed in the risk assessment portion of the Hazard Mitigation Plan.

A repetitive loss property is defined by FEMA as any insurable building for which two or more claims of more than \$1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling 10-year period, since 1978. A flooding event in Forest County could cause great monetary damage, as it has in the past. The Hazard Mitigation Assistance program defines Repetitive Loss as having incurred flood-related damage on 2 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 flood event; and, at the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage.



Barnett Township has the highest estimated potential loss due to flooding among all Forest County municipalities at \$3,737,662.00 in market value. Hickory Township has the second highest estimated potential loss due to flooding at approximately \$2,106,212.00.

The potential for loss of life and injuries to occur in these areas is high. Additionally, the long-term impact severe flooding could have on the health and safety of the citizens is high. Depending on the scope and magnitude of the flooding, the likelihood of long-term economic disruption is possible. Flooding may have a moderate impact on property, facilities, and infrastructure with varying levels of damage to structures in the affected area. Mobile homes are especially threatened by high water levels. Basic services may experience moderate impacts, as disruptions for short periods of time could occur. Government operations are expected to continue without disruption. The environmental impact should be minimal, unless hazardous materials are released as a result of the flooding.

Power failures are the most common secondary effect associated with flooding. Coupled with a shortage of critical services and supplies, power failures could cause a public health emergency. Disruption in traffic flow may cause a transportation accident. Flooding also has the potential to cause other hazards, such as landslides, hazardous material spills, and dam failures.

Industrial, commercial, and public infrastructure facilities can become inundated with flood waters, threatening the continuity of government and business. The special needs population must be tracked and identified in flooding situations, as they are often home-bound.

Severe flooding can have long-term secondary effects on the population, economy, and infrastructure of Forest County. Escalating costs of damage to private structures and the frequency of flooding can cause permanent population displacement. Small businesses that contribute to the local economy may close if they are unable to recover from the disaster. Disruption to the commerce and/or transportation modes can have an adverse effect on municipal economies in affected areas. Critical infrastructure, such as sewage and water treatment facilities, can be severely damaged. This can have a significant effect on public health. High flood waters can cause sewage systems to fail, overflow, and contaminate groundwater and drinking water.

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.

#### 4.3.3.1      Past Occurrence

Forest County has experienced numerous flood events in the past. The flooding and flash flooding were caused by a variety of storms, tropical storms, ice jams and other issues. The most significant occurrence of flooding is due to heavy storms with rain.

The greatest impact of flooding occurs at least once annually along the Clarion River in Barnett Township. The River Road meanders from Route 36 to Route 899 directly adjacent to the Clarion River in many locations. Storm events that produce increased amounts of rain over a long period of time are the main cause of river flooding in this area. The Clarion River is located in the Clarion River watershed. This watershed encompasses numerous counties to the north and northeast. When large regional type rain or snowmelt events occur, the Clarion River is prone to flood in this area.

Numerous flood events have occurred along the River Road in Barnett Township. This area is home to numerous residents and is an extremely populated tourist area during the summertime. Flooding events in this area could be a major issue. Most of the past damage that has occurred is erosion of the stream banks. Erosion areas that the River Road is close to the stream bank causes damage to the roadway and roadway closures. These closures are costly to the municipality and increase the public safety risk to the residents and tourists. Barnett Township representatives have been conducting research on possible mitigation projects and actions to increase public safety and decrease damage costs in this area.

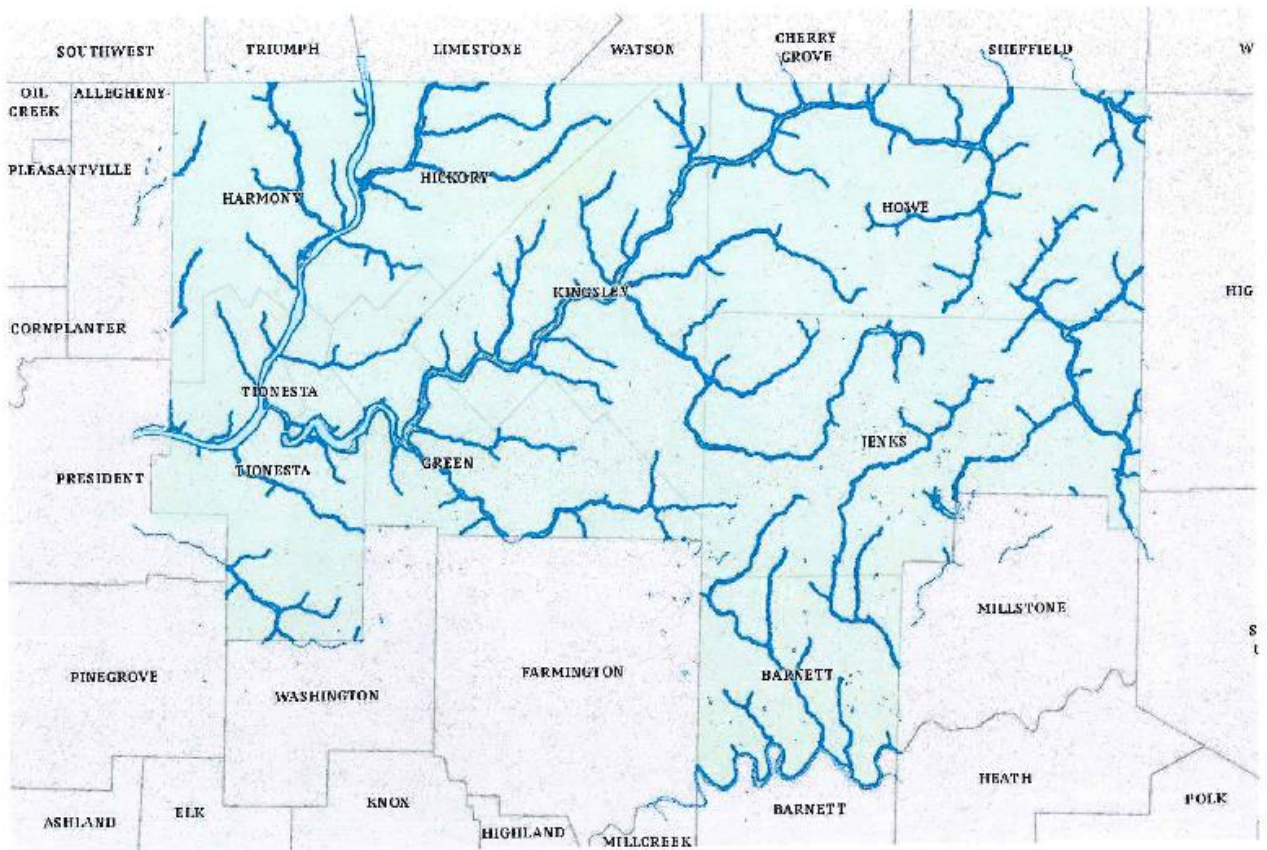
In addition to the aforementioned past flood events, the National Flood Insurance Program identifies properties that frequently experience flooding. *Repetitive loss properties* are structures insured under the NFIP which have had at least two paid flood losses of more than \$1,000 over any ten-year period since 1978. A property is considered a *severe repetitive loss property* either when there are at least four losses each exceeding \$5,000 or when there are two or more losses where the building payments exceed the property value.

MUNICIPALITY	NFIP Policies	MUNICIPALITY	Repetitive Loss Properties
Barnett Township	15	Barnett Township	0
Green Township	0	Green Township	0
Harmony Township	4	Harmony Township	0
Hickory Township	7	Hickory Township	0
Howe Township	3	Howe Township	2
Jenks Township	1	Jenks Township	0
Kingsley Township	1	Kingsley Township	1
Tionesta Borough	1	Tionesta Borough	0
Tionesta Township	0	Tionesta Township	0
TOTAL	32	TOTAL	3

4.3.3.1 Future Occurrence

Flooding is a frequent problem throughout Pennsylvania. The probability of a flooding event impacting Forest County is likely. Forest County experiences some degree of flooding annually. The threat of flooding is compounded in the late winter and early spring months, as melting snow can overflow streams, creeks, and tributaries, increasing the amount of groundwater, clogging stormwater culverts and bridge openings. The NFIP recognizes the 1%-annual-chance flood, also known as the *base flood*, as the standard for identifying properties subject to federal flood insurance purchase requirements. A 1%-annual-chance flood is a flood which has a 1% chance of occurring over a given year. The digital flood insurance rate maps (DFIRMs) are used to identify areas subject to the 1% annual-chance flooding.

**Forest County Flood Zones**



### 4.3.3.2      Vulnerability Assessment

#### *River and Stream Flooding:*

Forest County is vulnerable to flooding events. Flooding puts the entire population at some level of risk, whether through the flooding of homes, businesses, places of employment, or the road, sewer, and water infrastructure. High floodwaters can devastate homeowners with both property damage and property loss. Forest County’s population is also vulnerable to the secondary effects of flooding. Power loss can leave citizens without heat for extended periods of time. The transportation infrastructure of the county can be severely crippled by flooding events which can endanger citizens attempting to travel or evacuate the area, as well as leave those remaining without goods and services.

Forest County’s economy is highly vulnerable to flooding events. The potential impacts on the economy presented by this hazard can lead to long-term economic disruption, especially among small businesses. Flooding can destroy the physical structures, merchandise, and equipment essential for business operation. Secondary effects of flooding include power outages and transportation accidents. Power outages can stop a business from operating while transportation accidents can hinder the supply of essential goods, services, and supplies.

Minor flooding events in Forest County present a moderate vulnerability to the environment. For the most part, flooding is a natural occurrence and, alone, cannot do much harm to the environment. However, the environment is vulnerable to the secondary effects of flooding such as hazardous material spills. For example, flooding can result in contamination when raw sewage, animal waste, chemicals, pesticides, or other hazardous materials are suspended and transported through flood waters to sensitive habitats, neighborhoods, or business settings. Events such as these require major clean-up and remediation efforts.

Table 4.3.3-5 identifies the critical facilities within Forest County that are located within the special flood hazard area and the assessed value of the building. Table 4.3.3-6 identifies the quantity of residences and commercial structures that are located in the special flood hazard area. The critical facilities and structures were identified using county GIS data. Maps of critical facilities in each municipality are located in **Appendix E**. Critical facilities are facilities that if damaged would present an immediate threat to life, public health and safety.

<b>Table 4.3.3-5 Forest County Critical Facilities in the Special Hazard Flood Area</b>		
<b>Name</b>	<b>Facility Type</b>	<b>Building Assessed Value</b>
Barnett Township Office	Government	\$21,780.00
Howe Township Office	Government	\$47,590.00
<b>Source: Forest County GIS</b>		

**Table 4.3.3-6 Forest County Residences and Commercial Structures in the Special Hazard Flood Area**

Municipality	Residential Structures	Commercial Structures	Building Assessed Value Totals
Barnett Township	34	10	\$1,017,510
Harmony Township	4	0	\$34,140
Hickory Township	56	6	\$614,570
Howe Township	10	2	\$89,890
Jenks Township	0	6	\$61,080
Kingsley Township	7	1	\$123,730
Tionesta Township	4	0	\$40,800
<i>Source: Forest County GIS</i>			

Forest County is vulnerable to flooding that causes loss of lives, property damage, and road closures. For purposes of assessing vulnerability, the county focused on community assets that are located in the 1%-annual-chance floodplain. While greater and smaller floods are possible, information about the extent and depths for this floodplain is available for all municipalities countywide, thus providing a consistent basis for analysis. Flood vulnerability maps for each applicable local municipality, showing the 1%-annual-chance flood hazard area and addressable structures, critical facilities and transportation routes within it, are included in **Appendix D**. These maps were created using FEMA countywide preliminary digital data.

A risk factor was determined for each municipality in Forest County utilizing the summary of risk factor approach document for flooding. Table 4.3.3-7 outlines the risk assessment categories. With each category a level, criteria and index were applied along with a weight value. The results for each municipality are identified in Table 4.3.3-8. Risk Factors identified as high risk have risk factors greater than or equal to 2.5. Risk Factors ranging from 2.0 to 2.4 are considered moderate risk hazards. Hazards with Risk Factors less than 2.0 are considered low risk. According to the default weighting scheme applied, the highest possible risk factor value is 4.0.

**Table 4.3.3-7**

**Summary of Risk Factor (RF) Approach**

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

**Table 4.3.3-8 Flooding Risk Factor Results per Municipality**

FLOODING HAZARD PER MUNICIPALITY	RISK ASSESSMENT CATEGORY					RISK FACTOR (RF)
	PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	
Barnett Township	3	2	2	3	3	2.5
Green Township	1	1	1	4	2	1.4
Harmony Township	3	1	1	4	2	2.0
Hickory Township	4	1	1	4	3	2.3
Howe Township	3	1	1	4	3	2.1
Jenks Township	1	1	1	4	2	1.4
Kingsley Township	4	2	1	3	3	2.6
Tionesta Borough	3	1	1	4	2	2.0
Tionesta Township	2	1	1	3	2	1.6

*Flash Flooding:*

Flash flooding can occur anywhere within Forest County when the conditions are right. Locations that are more populated and have more impervious ground have a higher vulnerability to flash flooding. During the risk assessment process numerous resources were utilized to determine flash flooding locations. Municipalities were asked to identify locations within the municipality that are prone to frequent flash flooding. The National Climatic Data Center was also queried to determine flash flood vulnerable areas. This data is reflected in Table 4.3.3-3 above.

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

- Cooksburg
- East Hickory
- Marienville
- Tionesta
- West Hickory

The Forest County Hazard Mitigation Team will continue to work with municipalities to identify vulnerable flash flooding locations and identify vulnerable special needs population and critical facilities.

*Ice Jam Flooding:*

Ice jam flooding affects two specific locations within Forest County. East Hickory and Cooksburg are the most vulnerable locations in the county. East Hickory is a residential community with some commercial activity. They are located along the Allegheny River and can be greatly impacted with ice jams. Cooksburg is a location that is high in tourism and the businesses that support tourism. There are also residents that live in this area. Cooksburg is located along the Clarion River. The River Road, which meanders along the Clarion River, is vulnerable to the ice jam flooding. The

Cooksburg area is directly off of state route 36 and the village of Cooksburg is the most vulnerable. When ice jam flooding occurs in the Cooksburg area, emergency service access is highly compromised and all residents and visitors are jeopardized. The ice jam flooding also causes erosion to the river banks in the area as well.

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

#### 4.3.4 Hurricane and Tropical Storm

##### 4.3.4.1 Location and Extent

Hurricanes, tropical storms, and windstorms will occur in the county in the summer and fall months. Most hurricanes that approach Forest County have been downgraded to tropical storms or tropical depressions by the time they reach the county. Heavy rain and flooding produced by a hurricane, tropical storm, or tropical depression will have the greatest impact on the county. Impacts of these events are normally county wide in nature and affect numerous counties at one time.

Tropical storm systems that impact Forest County develop in the tropical and sub-tropical waters of the Atlantic Ocean or Gulf of Mexico. Rarely the center of circulation of these storm systems move inland and pass through Forest County. Most of the impacts to Forest County are from systems that have been downgraded to tropical depressions. These storms have the ability to produce high volumes of rainfall that cause flash flooding initially and then follow with stream and river flooding. Hurricanes and tropical storms affect Forest County regularly.

##### 4.3.4.2 Range of Magnitude

Hurricanes and tropical storms affect all of Forest County. These hazards usually have a regional impact as opposed to only affecting Forest County. Flooding and power outages are major secondary effects of hurricanes and tropical storms. Heavy rain can lead to large amounts of ground water that cannot be contained by streams and creeks. Power outages can be caused by high continuous winds that cause power lines to fail. Tropical Storm Frances in 2004 caused the most significant flooding and damage in Forest County.

Tropical cyclones with maximum sustained winds of less than 39 miles per hour are called tropical depressions. A tropical storm is a cyclone with maximum sustained winds between 39- 74 miles per hour. A hurricane is a cyclone with sustained winds of 74 miles per hour or greater. Hurricanes are classified as category 1 through category 5. Category 1 has maximum sustained winds of 74-95 miles per hour. A category 5 hurricane has maximum sustained winds of greater than or equal to 156 miles per hour.



The Saffir-Simpson Hurricane Scale is the most common tool used to classify tropical storms and hurricanes. Table 4.3.4-1 outlines the categorization of these events.

Table 4.3.4-1

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

4.3.3.1 Past Occurrence

The National Climatic Data Center was queried for tropical depressions, tropical storms and hurricanes that have occurred in Forest County. No events were identified for Forest County in this resource.

There are two significant tropical events that have impacted Forest County in the past. Tropical Storm Agnes occurred in 1972. Agnes was a system that impacted Forest County with large amounts of rain. The rain fall that occurred in Forest County caused local flash flooding and eventually stream and river flooding. Hurricane Sandy resulted in a strong wind storm for Forest County.

Table 4.3.4-2 outlines other tropical storm events that have affected Forest County.

<b>Table 4.3.4-2: Tropical storm events affecting Forest County</b>	
<b>Year</b>	<b>Event</b>
2012	Hurricane Sandy
2006	Tropical Depression Ernesto
2004	Tropical Depression Frances
2003	Tropical Storm Isabel
1999	Hurricane Floyd
1972	Tropical Storm Agnes

#### 4.3.4.3      Future Occurrence

There is an unlikely probability of hurricanes and tropical storms affecting Forest County. A risk factor of 1.8 has been determined for this hazard based on the risk factor assessment tool. Hurricanes and tropical storms occur with relatively high frequency with 12.1 tropical storms and 6.4 hurricanes predicted annually for the North Atlantic basin, according to the National Climatic Data Center. The eastern portions of Pennsylvania are more likely to experience hurricanes and tropical storms.

#### 4.3.4.5      Vulnerability Assessment

A vulnerability assessment for hurricanes and tropical storms focuses on the impacts of flooding and severe wind. Therefore, the assessment of vulnerability is addressed in section 4.3.3.5 for flooding impacts and section 4.3.10.5 for wind damage.

The 2013 Pennsylvania Hazard Mitigation Plan, section 4.3.7 of the hurricane, tropical storm and nor'easter hazards profile identifies that Forest County has a less than 6% annual risk of an Atlantic Basin hurricane or tropical storm occurring.

### **4.3.5**      Invasive Species

#### 4.3.5.1      Location and Extent

An invasive species is a species that is not indigenous to a given ecosystem and that, when introduced to a nonnative environment, is likely to cause economic or environmental harm, or pose a hazard to human health. The Commonwealth of Pennsylvania, including Forest County, plays host to a number of invasive pathogens, insects, plants, invertebrates, fish, and higher mammals. Forest County is host to the Allegheny National Forest and Cook Forest State Park.

These species have largely been introduced by the actions of humans. Common pathways for invasive species threats include the unintentional release of species, the movement of goods and equipment that may unknowingly harbor species, smuggling, ship ballast, hull fouling, and escape from cultivation (Governor's Invasive Species Council, 2010). Invasive species threats are generally divided into two main subsets:

**Aquatic** invasive species (AIS) are a subset that impact aquatic ecosystems. Aquatic invasive species are defined in this document as non-native species that threaten the diversity or abundance of native species, the ecological stability of infested waters, human health and safety, or commercial, agriculture, aquaculture, or recreational activities dependent on such waters. The Commonwealth's varied geology and topography contribute to the large variety of aquatic and estuarine habitats. Pennsylvania encompasses six different landforms, ranging from coastal plain to the Appalachian Mountains. The Commonwealth hosts more than 84,000 miles of streams and shares five major watersheds with other states and Canada. According to the National Wetland Inventory, there are a total of 729,535 wetland acres found in more than 160,000 wetlands across the state.

**Terrestrial** invasive species (TIS) are a subset that impact primarily terrestrial ecosystems. Estimates of the number of non-native species that have been introduced into the United States vary widely (from 5,000 to as many as 50,000). Terrestrial ecosystems in Pennsylvania include a rich variety of community types and cover a range extending from nearly aquatic wetlands along our coasts and myriad rivers, lakes, and streams, to mountain tops. Terrestrial species are those species that complete their lifecycle on land vs. in an aquatic environment. Three groups of organisms have been successful in adapting to dry, terrestrial environments: vascular plants, arthropods and higher vertebrates.

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

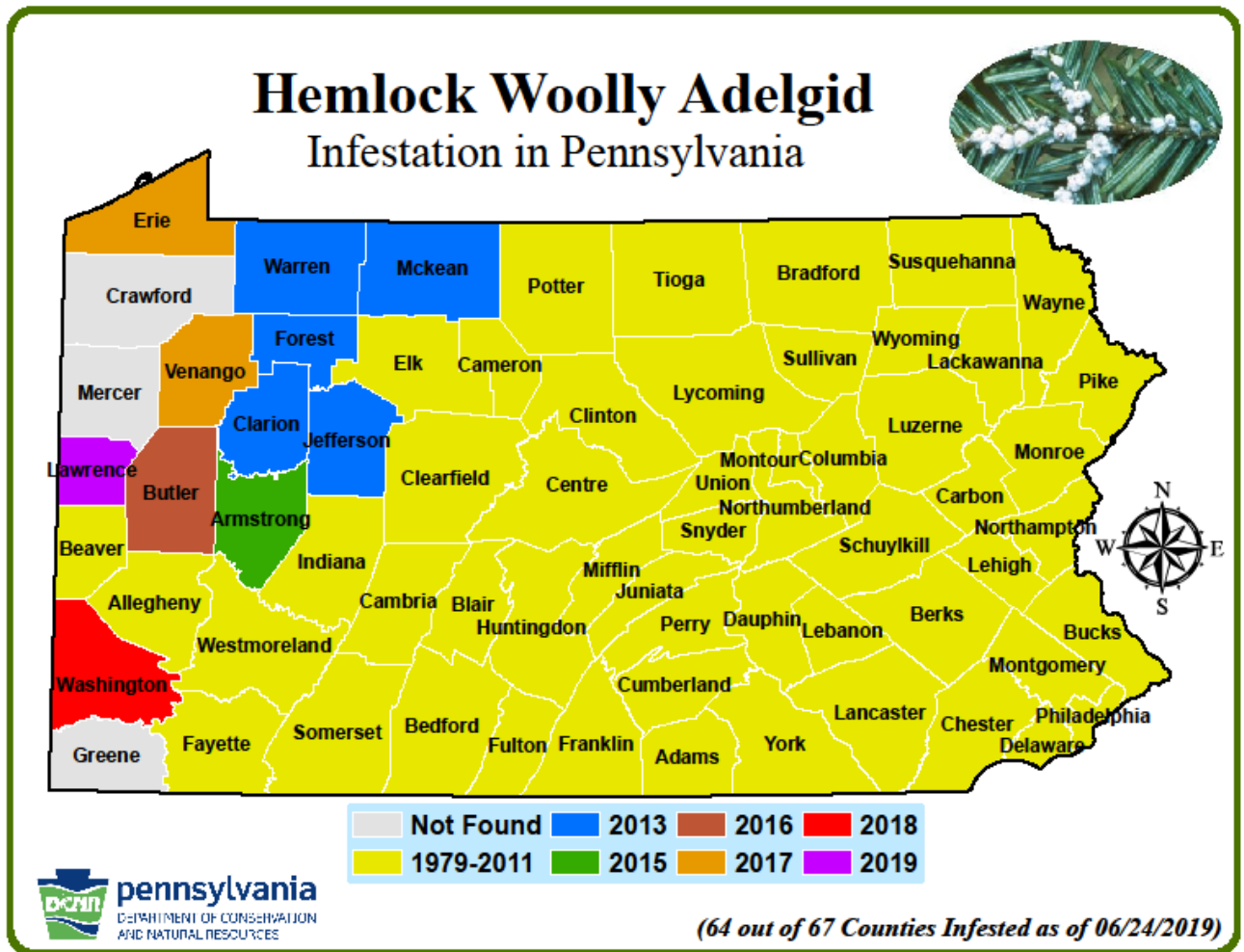
Adelges tsugae, the hemlock woolly adelgid (HWA), is a fluid-feeding insect that feeds on hemlock trees throughout eastern North America, including Pennsylvania. The egg sacs of these insects look like the tips of cotton swabs clinging to the undersides of hemlock branches.

Hemlock woolly adelgid was introduced from Asia into the Pacific Northwest in 1924. It was probably introduced into the northeastern US in the 1950's, and it was first discovered in Pennsylvania in 1967. This insect has been damaging hemlock ever since, and it is spreading. To date, 49 counties in Pennsylvania including Forest County have been infested with this insect.

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

Other factors can influence the impact of the hemlock woolly adelgid. Other insects, such as elongate hemlock scale, hemlock borer, and spittlebugs, which are also found on hemlock, can compound the impact of hemlock woolly adelgid. Drought and fungi, such as Fabrella or Korfia tsugae can weaken hemlock and cause it to become more susceptible to insect damage. Low winter temperatures, cold snaps (episodes of freezing and thawing), and heavy thunderstorms can reduce populations of the hemlock woolly adelgid. Particularly in the mountains, it is not uncommon to find hemlocks where the insect has been killed on the top third of the trees, where it's colder and windier, but survive on the bottom two-thirds. On the other hand, mild winters can result in sharp increases in hemlock woolly adelgid populations.

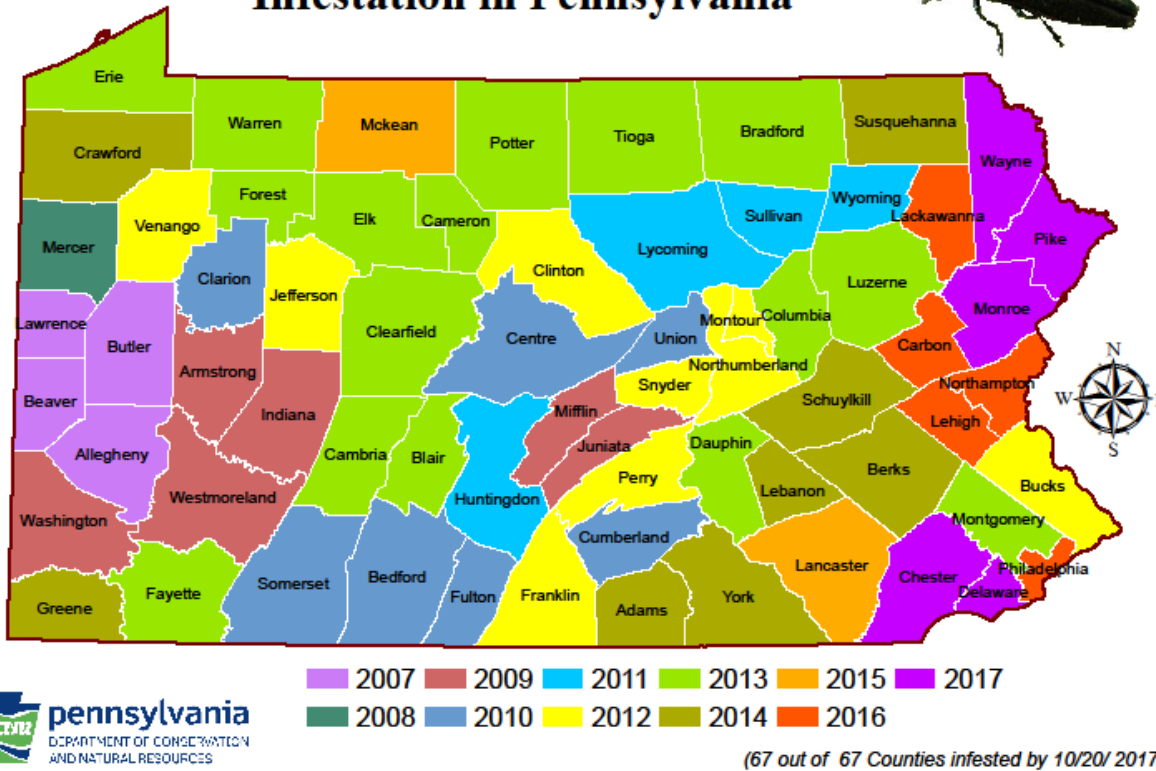
PA DCNR is currently attempting to map ecologically significant hemlock stands in our state, in order to detect new infestations, focus our control efforts and predict areas most vulnerable to hemlock woolly adelgid. We are using a variety of remote-sensing and ground-based techniques to accomplish this objective. Remote sensing technologies are also being evaluated for monitoring hemlock woolly adelgid. DCNR is cooperating with Rutgers to expand an algorithm developed for using Landsat imagery to detect changes in hemlock health in NJ to PA. DCNR and USFS are working with cooperators to determine if hyperspectral images taken from helicopters can detect new infestations along the leading edge and in isolated patches.



<http://na.fs.fed.us/fhp/hwa/maps/distribution.shtm>

The location and extent of these invasive threats depends on the preferred habitat of the species as well as the species' ease of movement and establishment

# Emerald Ash Borer Infestation in Pennsylvania

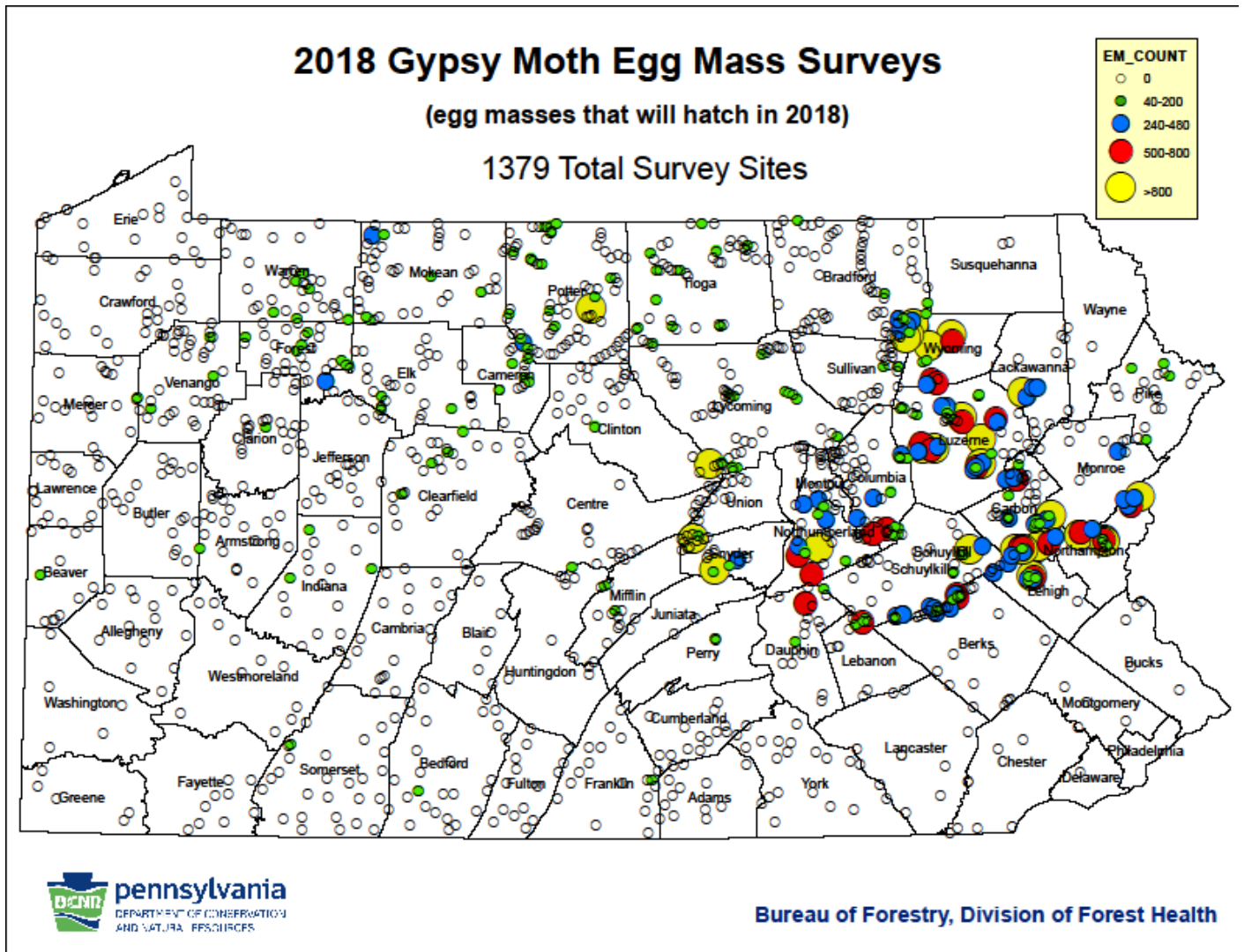


<http://www.dcnr.state.pa.us/conservationscience/invasivespecies/>

The gypsy moth, *Lymantria dispar*, is one of North America's most devastating forest pests. The species originally evolved in Europe and Asia and has existed there for thousands of years. In either 1868 or 1869, the gypsy moth was accidentally introduced near Boston, MA by E. Leopold Trouvelot. About 10 years after this introduction, the first outbreaks began in Trouvelot's neighborhood and in 1890 the State and Federal Government began their attempts to eradicate the gypsy moth. These attempts ultimately failed and since that time, the range of gypsy moth has continued to spread. Every year, isolated populations are discovered beyond the contiguous range of the gypsy moth but these populations are eradicated or they disappear without intervention. It is inevitable that gypsy moth will continue to expand its range in the future.

The gypsy moth is known to feed on the foliage of hundreds of species of plants in North America but its most common hosts are oaks and aspen. Gypsy moth hosts are located through most of the coterminous US but the highest concentrations of host trees are in the southern Appalachian Mountains, the Ozark Mountains, and in the northern lake states.

Gypsy moth populations are typically eruptive in North America; in any forest stand densities may fluctuate from near 1 egg mass per ha to over 1,000 per ha. When densities reach very high levels, trees may become completely defoliated. Several successive years of defoliation, along with contributions by other biotic and abiotic stress factors, may ultimately result in tree mortality. In most northeastern forests, less than 20% of the trees in a forest will die but occasionally tree mortality may be very heavy.

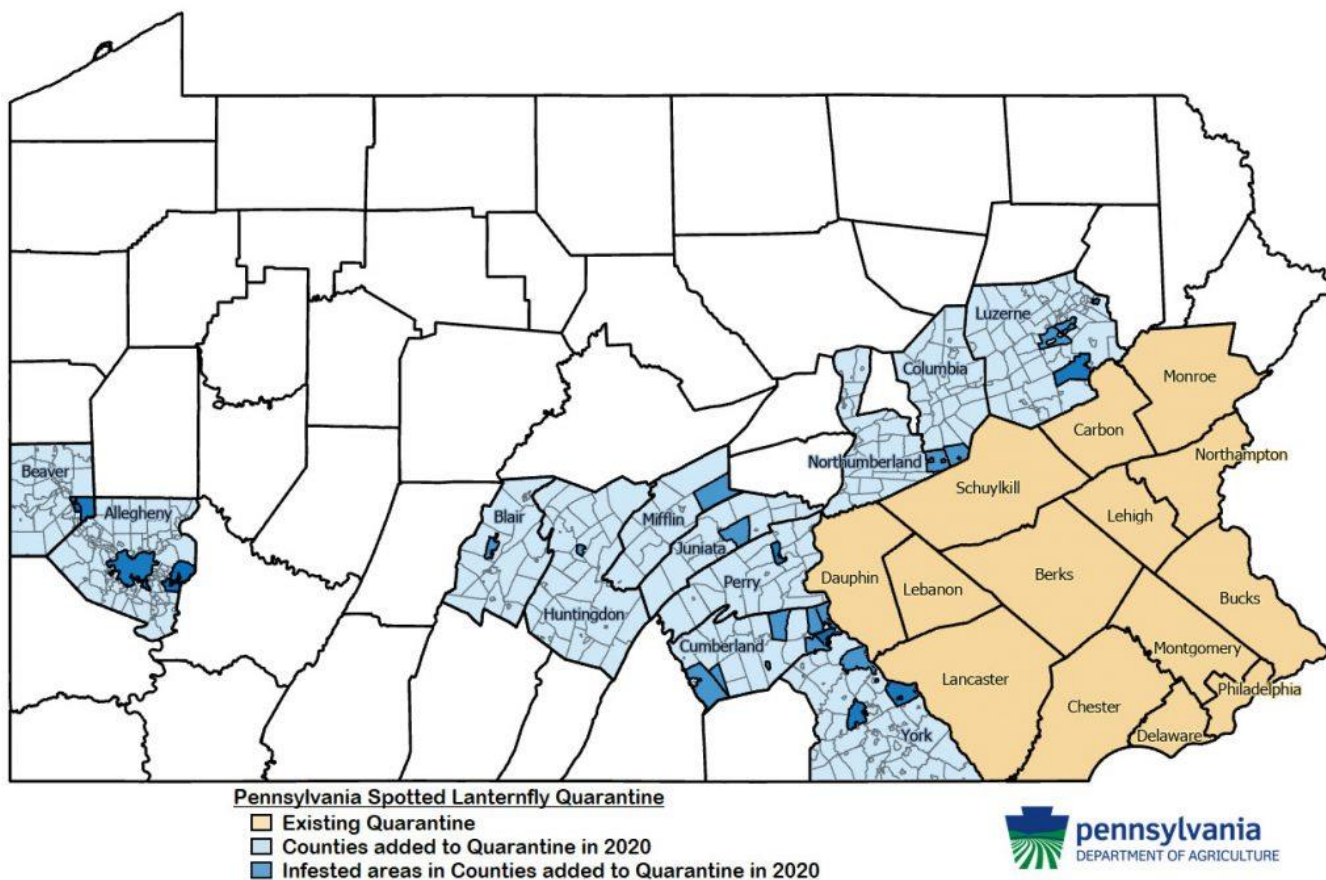


<http://www.dcnr.state.pa.us/conservationscience/invasivespecies/>

The Spotted Lanternfly (SLF), *Lycorma delicatula* (White), is an invasive planthopper native to China, India, and Vietnam. It was first discovered in Pennsylvania in Berks County and has spread to other counties in the southeast portion of the Commonwealth. This insect has the potential to greatly impact agricultural crops such as grapes, hops, and hardwoods. It is also reducing the quality of life for people living in heavily infested areas.

Penn State University and Extension, United States Department of Agriculture (USDA), and PA Department of Agriculture (PDA) have joined forces to control and contain the spread of SLF. Penn State University is leading the research efforts currently underway to answer the many questions we have about the insect's biology, pesticide studies, and the ability of the insect to adapt to the environment of Pennsylvania. USDA and PDA are actively treating locations where SLF has been reported. USDA is treating on the outer edges where the

populations are small and will begin to move inward towards the center of the quarantine. PDA is treating areas where the population numbers are high and is targeting high risk pathways which may contribute to moving the insect to other locations. AS funding is available, both USDA and PDA will work on properties for treatment. PDA is also surveying all counties in the state outside the quarantine looking for SLF.



4.3.5.2     Range of Magnitude

The magnitude of invasive species threats ranges from nuisance to widespread killer. Some invasive species are not considered agricultural pests and do not harm humans. Other invasive species can cause significant changes in the composition of Pennsylvania’s ecosystems. For example, the Emerald Ash Borer has a 99 percent mortality rate for any ash tree it infects. This and other forest-feeding invasive species could have a significant economic impact in the county, since it hosts a large base of logging and forest-based tourism. Still, more invasive species can cause widespread illness or death in humans.

There is a wide range of environmental impacts caused by invasive species. The aggressive nature of many invasive species can cause significant reductions in biodiversity by crowding out native species. This can affect the health of individual host organisms as well as the overall well-being of the affected ecosystem. Beyond causing human, animal, and plant harm, there are secondary impacts of invasive species that go beyond harm to host species and ecosystems, particularly in the case of invasive species that attack forests. Forests prevent soil degradation and erosion, protect watersheds, stabilize slopes, and absorb carbon dioxide emissions. The key role of forests in the hydrologic system means that if forest land is wiped out, the effects of erosion and flooding will be amplified. There would also be an impact on agricultural harvests.

The magnitude of an invasive species threat is generally amplified when the ecosystem or host species is already stressed, such as in times of drought. The already weakened state of the native ecosystem causes it to more easily succumb to an infestation. A worst-case example could be the Hemlock Woolly Adelgid causing reduced biodiversity, increased wildfire potential and thermal harm to small stream cold water fisheries and habitats.

#### 4.3.5.3      Past Occurrence

Invasive species have been entering Pennsylvania since the arrival of early European settlers. A 2013 Forest Health Report shows the presence of Emerald Ash Borer. The Hemlock Woolly Adelgid was found in Forest County in 2013. This Japanese native was introduced into the Eastern United States in the 1950s, and is currently established in 16 Eastern States from Georgia to Maine. It was first discovered in Pennsylvania in 1967 and is now found in 44 counties in the eastern two-thirds of the State. The Spotted Lanternfly has not reached Forest County, or the North Western part of the state.

#### 4.3.5.4      Future Occurrence

According to the PISC, the probability of future occurrence for invasive species threats is on the rise because of the growing volume of transported goods, increasing technology, efficiency, and speed of transportation and expanding international trade agreements. Expanded global trade has created opportunities for many organisms to be transported to and establish themselves in new countries and regions. Furthermore, it is claimed by some that climate change could contribute to the introduction of new invasive species. As maximum and minimum seasonal temperatures change, pests are able to establish themselves in previously inhospitable climates. This also gives introduced species an earlier start and increases the magnitude of their growth. This may shift the dominance of ecosystems in the favor of nonnative species.

In order to combat the increase in future occurrences, the PISC, which is a collaboration of state agencies, public organizations, and federal agencies, released the Invasive Species Management Plan in April 2010. This plan outlines the Commonwealth's goals for the management of the spread of nonnative invasive species, as well as creates a framework for responding to threats through research, action, and public outreach and communication. More information on the species management plan can be found online at [www.invasivespeciescouncil.com](http://www.invasivespeciescouncil.com). It is reasonable to assume that both Emerald Ash Borer and Hemlock Woolly Adelgid will continue to have a presence in Forest County.



#### 4.3.5.5      Vulnerability Assessment

Forest County's exact vulnerability will depend on the invasive species in question. In general, though, the National Invasive Species Information Center has identified the following characteristics of areas that are more likely to be invaded:

- Lack of natural predators or diseases that kept the species under control in its native environment
- Present vacant ecological niches that can be exploited by nonnative species
- Generally lacking in species diversity
- Lack of a multi-tiered canopy (in the case of invasive plants)

Due to the current presence of invasive species in the county, it is clear that the county is vulnerable to invasive species. Forest County is in an active zone in the Commonwealth that is vulnerable to invasive species. Due to the instances and extent of the current infestation, it is reasonable to project that the county's vulnerability will increase.

#### **4.3.6**      Landslides

##### 4.3.6.1      Location and Extent

According to the United States Geological Survey (USGS), landslides are major geologic hazards that occur in all 50 states, cause \$1-2 billion in damages and result in an average of more than 25 fatalities each year. (USGS, 1997) Landslides often occur with other natural hazards such as earthquakes and floods.

Landslides are not viewed as a serious risk in Forest County due to the relatively flat topography of the upland areas but they can occur due to the hill and valley areas of Forest County. Areas of steep slopes associated with the banks of major and minor watercourses in the county could, and do, collapse under heavy rainfall producing localized landslides. The common scenario for increase in landslide potential is steep slopes, shallow soils saturated with water, and forested hillsides. The potential of damage to lives or property from this type of natural hazard is low to medium. A high percentage of residential development in Forest County does occur in areas that fit the parameters that are necessary for landslides to occur. During high rainfall events the potential for landslides increases significantly. Expected normal impacts due to landslides involve transportation and communication rather than damage to buildings or loss of life. Landslides cross roadways affecting normal transportation and also emergency services. The following areas have been prone to landslides and rockslides in the past; Route 36 on the Tionesta Dam Hill, Route 62 near the Hickory Narrows, Route 666 Near Endeavor, Mayburg and the Warren County Line, Route 2002 River Road in Cooksburg and Route 3004 near Nebraska Bridge. During the summer of 2006, the Pigeon Hill Road was closed due to sheet flow flooding resulting in minor landslides covering portions of the roadway. Landslides also cause telephone and electric service interruptions, which can dramatically affect emergency services as well.

Although landslides may occur anywhere in Pennsylvania, only 15 to 18 percent of the commonwealth’s land area is naturally prone to landslides. Landslide incidences in Forest County should remain low but due to localized conditions may cause periodic damage and create unsafe conditions for limited timeframes. Mitigation of landslides may not be possible at site but must involve emergency services planning and warning to citizens of possible dangerous conditions resulting from landslides. Local geologic conditions must be considered when assessing landslide potential. Slope is a primary factor as well as rock type and fracturing or faulting of the consolidated rock layers. Historically, landslides have had minor impacts on Forest County, but due to the foregoing discussed conditions, landslides could have major impacts on the county.

4.3.6.2      Range of Magnitude

Most of Forest County is in the high to moderate susceptibility area of Pennsylvania; however, only one major landslide has been recorded up to and including 2012. According to HazardMaps.gov, 80% of Forest County has a high susceptibility to landslides. Historically actual landslides occur infrequently.

4.3.6.3      Past Occurrence

Two areas of historic landslides exist in Forest County – Route 62 North in Hickory Township, locally known as the ‘Narrows’, and Route 36 South of Tionesta, locally known as the ‘Dam Hill’. Slides in these two areas are due to the steepness of slope in relation to road placement. Historically, slides in these two areas are minor, amounting to less than five cubic yards of rocky material. Both areas are state routes and maintained by PennDOT. The roadway footprint was designed by PennDOT engineers and they are aware of the historic problems. Alternate traffic routes are available for both sites. Each route is traveled daily by PennDOT personnel and regular monitoring of hillside conditions occurs. Due to the geologic conditions, flat laying, non- sloping layers of hard sandstone and shales, major slope failure is unlikely.

<b>State Route</b>	<b>Local Name</b>	<b>Segment/Offset Location</b>	<b>Hazard</b>
36	Tionesta Dam Hill	100/1500 to 120/0000	Rock Slide
62	Hickory narrows	230/0000 to 240/2848	Rock Slide
666	Endeavor	30/1300 to 40/2274	Rock Slide
666	Mayburg	280/0000 to 290/1200	Rock Slide
666	Near Warren Co. Line	540/1050 to 540/1250	Active Slide
2002	River Road, Cooksburg	10/0000 to 160/2575	Flooding (Clarion River)
3004	Nebraska Bridge	140/1850 to 150/2000	Flooding (Tionesta Lake)

#### 4.3.6.4      Future Occurrence

The frequency of landslides occurring in the county is expected to remain low, and the effects of these incidences will continue to pose a threat to the county. If population and development would increase in Forest County, the number of persons and properties vulnerable to the effects of landslides may increase. A risk factor of 1.6 has been assigned to this hazard utilizing the risk factor assessment tool.

#### 4.3.6.5      Vulnerability Assessment

Some measures do exist to lessen the dangers of landslides. These measures include the Storm Water Management Plan and local ordinances (zoning and subdivision, etc.) that place limitations on construction or development, monitoring construction practices; prepare studies of slide prone areas, erosion protection measures, and drainage considerations. A basic rule of thumb is to know where landslide areas exist and to avoid building on, through, or near them (leave them undisturbed). Worst case scenario would be major landslide total damages could exceed 1 million dollars. A landslide vulnerability map is located in **Appendix H-2**

### 4.3.7            Lightning Strike

#### 4.3.7.1      Location and Extent

Lightning is a massive electrostatic discharge between electrically charged regions within clouds, or between a cloud and the Earth's surface. The charged regions within the atmosphere temporarily equalize themselves through a lightning flash, commonly referred to as a strike if it hits an object on the ground. There are three primary types; from a cloud to itself (intra-cloud or IC); from one cloud to another cloud (CC) and finally between a cloud and the ground (CG). Although lightning is always accompanied by the sound of thunder, distant lightning may be seen but be too far away for the thunder to be heard.

Lightning occurs approximately 40–50 times a second worldwide, resulting in nearly 1.4 billion flashes per year.

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

#### 4.3.7.2      Range of Magnitude

Severe thunderstorms can cause significant damage and can be life threatening. While thunderstorms can kill with lightning, severe thunderstorms can also produce large hail and damaging winds. Only a small percent of thunderstorms become severe. Downbursts from severe thunderstorms can have winds as high as 168 mph but most range from 60-80 mph. Forest County gets 25 to 32 days per year with lightning. Lightning can cause severe injury and is fatal in some cases. Deaths and injuries to livestock and other animals, thousands of forest and brush fires, as well as millions of dollars in damage to buildings, communications systems, power lines, and electrical systems are also the result of lightning.

#### 4.3.7.3      Past Occurrence

Thunderstorms and lightning occur many times each year. Lightning has been responsible for 11 deaths and 312 injuries in Pennsylvania between the years of 2003-2012. Pennsylvania is ranked 26<sup>th</sup> in the United States of Cloud-To-Ground flash Densities. During 2012 The National Lightning Detection Network (NLDN) recorded 393,759 Cloud-To-Ground flashes. In Tionesta during a 2005 lightning storm 1 person was killed and 7 were injured.

#### 4.3.7.4      Future Occurrence

Lightning strikes and thunderstorms are expected during and around the spring and summer months. These events have occurred in Forest County in the past and will continue to occur in the future, although multiple casualties or deaths are highly unlikely. A risk factor of 2.2 has been assigned to this hazard utilizing the risk factor evaluation tool.

#### 4.3.7.5      Vulnerability Assessment

The potential for lightning strikes and thunderstorms exists in all municipalities in Forest County. Events being held outdoors during the summer months are particularly vulnerable to lightning strikes. Due to the recreational land use in the forests and waterways in Forest County the potential for death or injury is ever present.

A lightning vulnerability map is located in **Appendix H-3**.

### **4.3.8**      Pandemic

#### 4.3.8.1      Location and Extent

A pandemic is a disease that attacks or affects the population of an extensive area. This is sometimes an entire country or continent. Each year, different strains of influenza are labeled as potential pandemic threats, for example. Although recently brought under control, Severe Acute Respiratory Syndrome (SARS) has shown the potential of becoming a pandemic. Neither the World Health Organization nor the Center for Disease Control and Prevention (CDC) has classified SARS.

#### 4.3.8.2      Range of Magnitude

Public health emergencies typically occur on a regional basis. Sources include infected animals, contaminated food, and improperly prepared food. While the whole county is vulnerable to a public health emergency, the likely source of a severe infection may be a farm or restaurant.

Other locations that may incite a pandemic would be areas of congregated large populations. These locations are within the town of Marienville; the Snyder Memorial Nursing Home with the possibility of 100 residents; and State Correctional Institution, SCI Forest, with a capacity to hold 2,200 inmates. Also, the Abraxas Foundation could be a concern in regard to pandemic. Abraxas provides drug and alcohol treatment for boys and girls, intensive open residential program, social training and education programs. Abraxas is a 200-bed staff secure residential facility. Others at risk within these locations are the employees and visitors that have a daily exposure to the residents or inmates.

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

The May 2013 Hazard Vulnerability Analysis for Forest County lists the following concerns:

**Influenza** – More commonly known as the “flu”, is an infectious disease of birds and mammals caused by RNA viruses. The flu can lead to pneumonia, even for person who are usually very healthy. Typically, influenza is transmitted through the air by coughs or sneezes. It can also be transmitted by direct contact with bird droppings or nasal secretions, or through contact with contaminated surfaces. Yearly, influenza spreads around the world in seasonal epidemics, resulting in about three to five million cases of severe illness yearly; and approximately 250,000 to 500,000 deaths.

**Smallpox** – This was an infectious disease unique to humans, caused by either of two virus variants, *Variola major* and *Variola minor*. The last naturally occurring case of smallpox (*Variola minor*) was diagnosed in October 1977. *Variola major* is the more severe and has an overall mortality rate of 30 to 35 percent. *Variola minor* only has a mortality rate of 1 percent. Long-term complications of *Variola major* include characteristic scars. Less common complications are blindness, and limb deformities due to arthritis and osteomyelitis.

**West Nile Virus** – Is found in temperate and tropical regions of the world and is a mosquito-borne zoonotic arbovirus. It was first identified in the West Nile sub-region in the East African nation of Uganda in 1937. It was considered a minor risk to humans until an outbreak in Algeria in 1994. At that time there were cases of West Nile Virus that caused encephalitis. The virus has spread globally. In 2012, West Nile Virus killed 286 people in the United States.

Most of the West Nile virus infections in humans are subclinical, which cause no symptoms. In the approximately 20 percent of infections to humans where symptoms do occur, the time from infection to appearance of symptoms is between 2 to 15 days. Less than 1 percent of the cases are severe and result in neurological disease. Currently there is no vaccine against West Nile virus infection.

#### 4.3.8.3      Past Occurrence

##### Influenza

Forest County was impacted with the H1N1 virus during 2009. Forest County Emergency Management Agency coordinated with the Pennsylvania Department of Health (DOH) in securing two locations within Forest County to set up vaccination clinics. However, DOH decided to have the residents of Forest County travel to Pleasantville, Venango County for their H1N1 vaccination clinic.

Smallpox – The World Health Organization (WHO) certified the eradication of smallpox in 1979. This is due to the vaccination campaigns throughout the 19<sup>th</sup> and 20<sup>th</sup> centuries.

West Nile virus – The West Nile virus has been found in the mosquito populations in the county. However, there have been no reports of incidents involving the human population within Forest County.

COVID-19 – The Covid-19 pandemic struck nationwide in 2020. Forest County’s rural setting became a haven for urbanites trying to escape the pandemic. As a result, real estate in Forest County sold at a premium. Many dilapidated camps were demolished and re-built, and blight areas were cleaned up. The highest numbers of Covid-19 infections were located in Abraxas, Snyder Memorial Home, and SCI Forest.

#### 4.3.8.4      Future Occurrence

A possible probability of a widespread pandemic public health emergency is every 10 years or less with varying degrees of severity. Minor outbreaks of less serious communicable disease, such as influenza, occur much more frequently. Forest County is vulnerable to these diseases and infections since people commute from the larger urban areas to the county for recreation and sport related activities. As well as, Forest County residents that commute to larger urban areas for employment. SCI Forest also brings in a large number of inmates and visitors to the county from other parts of the state.

In China, health officials urge health care workers to prepare for the possible re-emergence of the deadly H7N9 bird flu in the fall of 2013. This virus has killed one-third of the patients hospitalized. Researchers suggest that the H7N9 is deadlier than the 2009 H1N1 swine flu virus. Smallpox – Any smallpox outbreak would be considered an act of terrorism.

#### 4.3.8.5      Vulnerability Assessment

The probability of a pandemic even occurring in Forest County is unlikely. However, it is extremely difficult to predict a pandemic. Many scientists believe it is only a matter of time until the next influenza pandemic occurs. The severity of the next pandemic cannot be predicted, but modeling studies suggest the impact of a pandemic on the United States could be substantial. In the absence of any control measures (vaccination or drugs), it has been estimated that in the United States, a “medium-level” pandemic could cause 89,000-207,000 deaths, 314,000-734,000 hospitalizations, 18-42 million outpatient visits, and another 20-47 million sick people. Between 15 to 35 percent of the U.S. population could be affected by an influenza pandemic, and the economic impact could range from \$71.3 to \$166.5 billion.

Influenza pandemics are different from many of the threats for which public health and health-care systems are currently planning. A pandemic will last much longer than most public health emergencies and may include “waves” of influenza activity separated by months (in 20th Century pandemics, a second wave of influenza activity occurred 3 to 12 months after the first wave). The numbers of healthcare workers and first responders available to work will likely be reduced; they will be at high risk of illness from exposure in the community and in healthcare settings. Some may have to miss work to care for ill family members. Resources in many locations could be limited, depending on the severity and spread of an influenza pandemic.

Because of these differences and the expected size of an influenza pandemic, it is important to plan preparedness activities that will permit a prompt and effective public health response. The U.S. Department of Health and Human Services (HHS) supports pandemic influenza activities in the areas of surveillance (detection), vaccine development and production, strategic stockpiling of antiviral medications, research, and risk communications. In May 2005, the U.S. Secretary of HHS created a multi-agency National Influenza Pandemic Preparedness and Response Task Group.

This unified initiative involves CDC and many other agencies (international, national, state, local, and private) in planning for a potential pandemic. Its responsibility includes revision of a U.S. National Pandemic Influenza Response and Preparedness Plan.

A pandemic vulnerability map is located in **Appendix H-4**.

#### **4.3.9** Radon Exposure

##### [4.3.9.1](#) [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 Mr. Stanley Watras frequently exceeded expected radiation levels, yet only natural, no 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 (EPA) or even the 67 pCi/L limit for uranium miners.

As a result of this event, the Reading Prong section of Pennsylvania where Watras lived became the focus of the first large-scale radon scare in the world. Radon is a noble gas that originates by the natural radioactive decay of uranium and thorium. Like other noble gases (e.g., helium, neon, and argon), radon forms essentially no chemical compounds and tends to exist as a gas or as a dissolved atomic constituent in groundwater.

Two isotopes of radon are significant in nature,  $^{222}\text{Rn}$  and  $^{220}\text{Rn}$ , formed in the radioactive decay series of  $^{238}\text{U}$  and  $^{232}\text{Th}$ , respectively. The isotope thoron (i.e.  $^{220}\text{Rn}$ ) has a half-life (time for decay of half of a given group of atoms) of 55 seconds, barely long enough for it to migrate from its source to the air inside a house and pose a health risk. However, radon (i.e.  $^{222}\text{Rn}$ ), which has a half-life of 3.8 days, is a widespread hazard. The distribution of radon is correlated with the distribution of radium (i.e.  $^{226}\text{Ra}$ ), its immediate radioactive parent, and with uranium, its original ancestor. Due to the short half-life of radon, the distance that radon atoms can travel from their parent before decay is generally limited to distances of feet or tens of feet.

Three sources of radon in houses are now recognized: 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.

##### [4.3.9.2](#) [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 (USEPA, 2010). The main hazard is actually from the radon daughter products ( $^{218}\text{Po}$ ,  $^{214}\text{Pb}$ ,  $^{214}\text{Bi}$ ), which may become attached to lung tissue and induce lung cancer by their radioactive decay.

## Past Occurrence

Current data on abundance and distribution of radon in Pennsylvania houses is considered incomplete and potentially biased, but some general patterns exist. Values exceeding the EPA guideline of 4 pCi/L occur in all regions of the Commonwealth. Glaciated areas in northern Pennsylvania tend to have relatively low frequencies of elevated radon, perhaps because of thin soils and incomplete weathering. The Appalachian Plateaus province in western Pennsylvania also appears to have lower than average radon, as does the Atlantic Coastal Plain near Philadelphia and other areas having a shallow water table. The highest proportion of elevated values is in a zone extending from central Pennsylvania to southeastern Pennsylvania, and in the Reading Prong. High values in the latter area are attributed to known uranium-rich granitic gneisses (Smith, 1976; Gunderson et al., 1988), accentuated by local factors such as shear zones, and include a surprising number of extremely high radon values (>200 pCi/L). Elevated radon values in the larger, northwest-southeast trending zone are not understood, but may represent some combination of black shale (Martinsburg Formation), limestone soil, and deep weathering. Information average radon levels by zip code in Pennsylvania can be obtained from the DEP at: [http://www.dep.state.pa.us/RadiationProtection\\_Apps/Radon/](http://www.dep.state.pa.us/RadiationProtection_Apps/Radon/)

### 4.3.9.3 Future Occurrence


Radon exposure is inevitable given present soil, geologic, and geomorphic factors across Pennsylvania. 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. A risk factor of 2.5 has been assigned to this hazard utilizing the risk factor assessment tool.

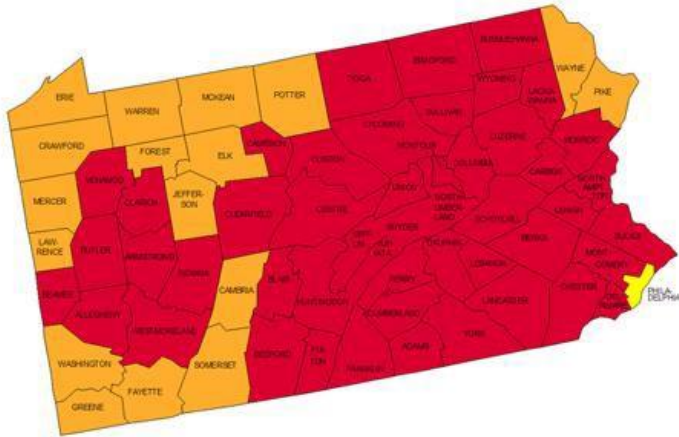
### 4.3.9.4 Vulnerability Assessment

According to the EPA 1993 Pennsylvania Radon Zones, Forest County falls in to Zone 2 which has a moderate potential for Radon exposure. 4.3.9-1 identifies each county in Pennsylvania and the potential for radon exposure. 4.3.9-2 identifies by zip code the percentage above the minimum exposure threshold of 4 pCi/L.

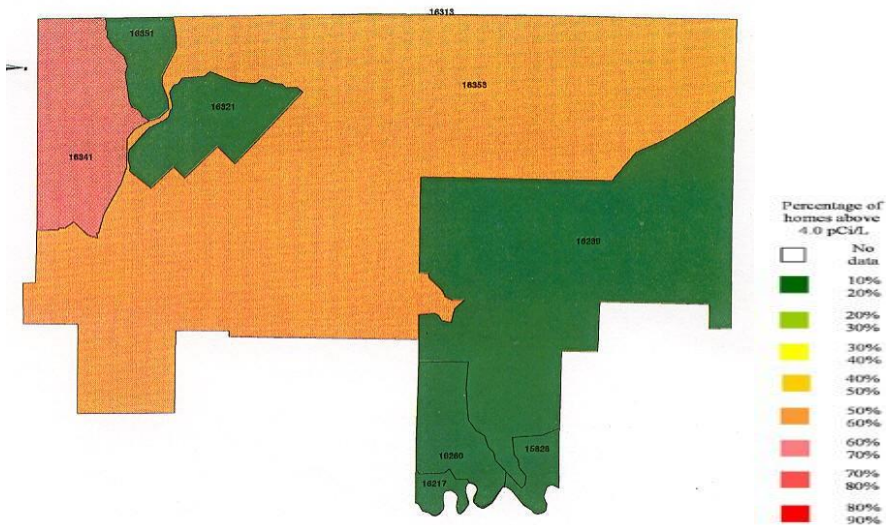


### 4.3.9-1: Pennsylvania Radon Zones

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



### 4.3.9-2: Forest County Zip Codes Percentage Above 4 Curies per Liter



[www.wpb-radon.com/PA\\_radon\\_map.html](http://www.wpb-radon.com/PA_radon_map.html)

## 4.3.10 Tornadoes and Windstorms

### 4.3.10.1 Location and Extent

#### Tornadoes

Tornadoes may occur in the Commonwealth during the spring and summer months. In the past 125 years, records show that about 250 Tornadoes have been reported in 58 of the 67 counties in Pennsylvania. The National Weather Service estimates the Commonwealth will experience 10 Tornadoes annually. Tornadoes are measured on the Enhanced Fujita Scale by focusing on their wind speed. This scale is shown below in table 4.3.10-1.

As stated by the National Climatic Data Center (NCDC), “wind speeds in Tornadoes range from values below that of hurricane speeds to more than 300 miles per hour.” The NCDC continues by reporting that, “the maximum winds in Tornadoes are often confined to extremely small areas, and vary tremendously over short distances.” This is the reason that one house will be completely demolished by a tornado, and the house next to it might be untouched. Additionally, the forward motion of Tornadoes can range from speeds between 0 and 50 miles per hour.

**Table 4.3.10-1: Enhanced Fujita Scale (EF-Scale) categories with associated wind speeds and description of damages.**

<u>EF-SCALE NUMBER</u>	<u>WIND SPEED (mph)</u>	<u>F-SCALE NUMBER</u>	<u>TYPE OF DAMAGE POSSIBLE</u>
<b>EF0</b>	65–85	F0-F1	<b>Minor damage:</b> Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e., those that remain in open fields) are always rated EF0.
<b>EF1</b>	86-110	F1	<b>Moderate damage:</b> Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
<b>EF2</b>	111–135	F1-F2	<b>Considerable damage:</b> Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
<b>EF3</b>	136–165	F2-F3	<b>Severe damage:</b> Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
<b>EF4</b>	166–200	F3	<b>Devastating damage:</b> Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
<b>EF5</b>	>200	F3-F6	<b>Extreme damage:</b> Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m (300 ft.); steel reinforced concrete structure badly damaged; high-rise buildings have significant structural deformation.

### Windstorms

Windstorms are more frequent with thunderstorms than with hurricanes or tornadoes in Western Pennsylvania. A microburst is a very-localized column of sinking air, capable of producing damaging opposing and straight-line winds at the surface.

#### **Illustration 4.3.10-2 Microburst**

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



A Wind Shear is usually found when a violent weather front is moving through; wind speeds have been recorded up to 100 mph. Wind Shear is defined as a difference in wind speed and direction over a relatively short distance in the atmosphere.

#### 4.3.10.2     Range of Magnitude

While it is difficult to pinpoint the exact locations at the greatest risk of a tornado, the southeast, southwest and northwest sectors of the Commonwealth are more prone to tornadoes. Forest County lies in the northwest sector of Pennsylvania. Tornadoes can have varying secondary effects. The most common is power failure. The severe wind strength can dismantle power sources. Structural damage can also be significant. Hazardous material spills can occur if a tornado comes near a holding tank, or the spill stems from a traffic accident caused by high winds.

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

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

#### 4.3.10.3     Past Occurrence

Forest County has witnessed 4 tornadoes since 1950. Table 4.3.10-3 outlines previous tornadoes in Forest County. The tornado on May 31, 1985 was an F4 that resulted in 7 deaths, 30 injuries and over \$750,000.00 in damage to property. On this same date in 1985 there were 20 different tornadoes in northwest Pennsylvania (including 1-F5, 6-F4s, 5-F3s, and 4-F2s). There were 65 fatalities, hundreds injured, and property damages in the hundreds of millions of dollars.

**Table 4.3.10-3 Tornado History for Forest County**

Date	Time	Fujita scale	Injuries	Deaths
May 31, 1985	4:30 P.M.	F-4	30	7
August 28, 1994	2:40 P.M.	F-1	0	0
August 19, 2001	1:55 P.M.	F-1	0	0
May 1, 2017	2:30 P.M.	F-1	0	0

4.3.10.4 Future Occurrence

The probability of a disastrous tornado hitting Forest County is ranked as possible. A risk factor of 2.1 has been assessed to this hazard utilizing the risk factor assessment tool. Three tornadoes have occurred in Forest County since 1985. Windstorms, straight line winds and winds associated with a severe thunderstorm occur on a more frequent basis. The local planning team ranked this hazard separate from tornadoes since the wind events occur more often in Forest County. The local planning team identified the probability of a windstorm event as highly likely. A risk factor of 2.7 has been assigned to this hazard utilizing the risk factor assessment tool.

4.3.10.5 Vulnerability Assessment

Tornadoes can occur at any time of the year, with peak months in the northern part of the United States during the summer. Tornadoes are most likely to occur between 3 P.M and 9 P.M. but have been known to occur at all hours of the day or night.

Other factors that impact the amount of damage caused by a tornado are the strength of the tornado, the time of day, and the area of impact. Usually, these distinct funnel clouds are localized phenomena impacting a small area. However, the high winds of tornadoes make them one of the most destructive natural hazards.

Other associated dangers that accompany thunderstorms that can produce tornadoes are:

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

The critical facilities of Forest County are highly vulnerable to tornadoes. While many severe storms can cause exterior damage to structures, tornadoes can completely destroy structures, along with surrounding infrastructure, and abruptly halt operations. Severe storms often accompany tornadoes and can be just as threatening to the critical facilities within the county. Many secondary effects from these disasters can jeopardize the operation of these critical facilities as well. Power outages can leave facilities functionless, which can have a crippling effect on the infrastructure supporting the population of the county.

Tornadoes present a high social vulnerability in Forest County. With a storm’s ability to destroy structures, citizens and their possessions are often left at the will of the storm. Numerous secondary

effects can also spawn from tornadoes; among these, power outages, transportation accidents, hazardous material spills, and flooding can be the most frequent. The special needs population is vitally at risk when faced with tornadoes. Without assistance to evacuate, they may be unable to prepare themselves or their homes and other possessions to safely weather the storm.

The economy of Forest County is highly vulnerable to tornadoes. While there may be limited impact on the financial and commercial systems of the economy, these storms and the damage they cause can disrupt business for the long term. The local economy can be crippled if buildings or supporting infrastructure are destroyed in the storm. The secondary effects of tornadoes can also take a toll on business. Power outages can create work stoppages while transportation accidents and road closings can limit the transportation of goods and services. Also, flooding cannot be discounted as it can destroy the physical structures, merchandise, and equipment essential for business operation.

Forest County's environment is moderately vulnerable to tornadoes. Like many natural disasters, tornadoes alone will have little impact on the local ecosystems. However, similar to other hazards, secondary effects can impact the environment. Most notably, hazardous material spills can pollute ground water systems and vegetation. These situations often require extensive clean-up and mitigation efforts.

A proper warning system is vital for the public to be informed of what to do and where to go. Forest County is a rural county and with that comes tourism. Numerous hikers and hunters visit Forest County annually. In the event of a tornado or severe storm, these tourists have limited emergency notification measures.

Forest County is also highly vulnerable to windstorms. Power outages and blown down trees are the most likely secondary effect of these storms. The local planning team has identified windstorms to be more frequent than tornadoes. Windstorms have impacted critical infrastructure and closed vital state highways in the past. State Route 66 and State Route 899 have been identified to have increased vulnerability.

Forest County is also more vulnerable economically to windstorms. Windstorms can impact tracts of hardwood and softwood lumber. At times, the storms can blow down large pockets of trees in a specific geographic area. The loss of these trees can be considered a financial loss to landowners and the lumber industry due to their value.

Maps identifying tornado past occurrences and vulnerable areas to tornadoes and wind events are located in **Appendix H-5**.

### 4.3.11 Wildfire

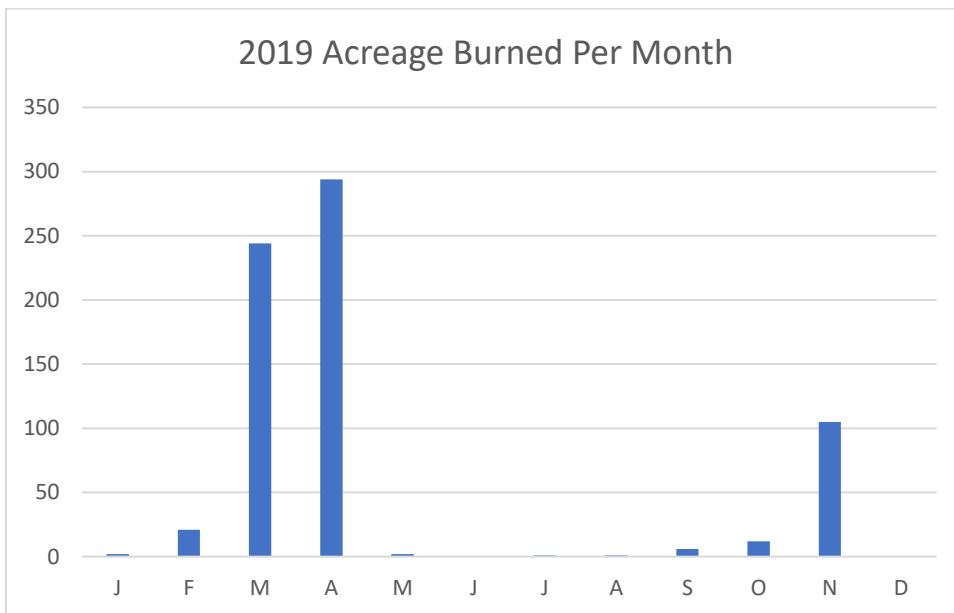
#### 4.3.11.1 Location and Extent

The most frequent causes of devastating wildfires are droughts, arson, and human carelessness. Wildfires occur throughout wooded and open vegetation areas in Forest County. Small fires can rapidly escalate to large fires if undetected. Forest County is home to the Allegheny National Forest and the Cooks Forest State Park. These two large wooded areas could be impacted with wildfires.

During the drought of 1999, almost 8,500 acres of forest were burned in Pennsylvania. During the spring of 2001, 2,549 acres of Pennsylvania forestland were burned. Pennsylvania will lose around 10,000 acres of forestland per year because of wildfires. Nationally, in 2003, wildfires burned five million acres in the United States (National Interagency Fire Center). Ninety two percent of Pennsylvania wildfires burn less than ten acres.

Table 4.3.11-1 shows the wildfire acreage burned during each month occurring in Pennsylvania.

Table 4.3.11-1



Source: PA DCNR

4.3.11.2     Range of Magnitude

The forested areas of the county are at the greatest risk for wildfires. Forest County must be watchful of wildfires that could severely hinder farming, logging, or food processing. Wildfires usually occur following prolonged periods of dry weather; and with approximately 93 percent of Forest County covered in forests a wildfire could prove to be costly.

If an urban fire or wildfire is not contained, certain secondary hazards may affect Forest County. Power outages may be the most prevalent of these hazards. Environmental hazards could also result from a wildfire or urban fire. Forest County recognizes the danger of wildfires and has developed a Firewise Plan for the county.

The United States Forest Service utilizes the Wildland Fire Assessment System to classify the dangers of wildfire. Table 4.3.11-2 identifies each threat classification and provides a description of the level.

<b>Table 4.3.11-2: U.S. Forest Service - Wildland Fire Assessment System</b>	
<b>Lo w (L)</b>	Fuels do not ignite readily from small firebrands although a more intense heat source, such as lightning, may start fires in duff or punky wood. Fires in open cured grasslands may bum freely a few hours after rain, but woods fires spread slowly by creeping or smoldering, and burn in irregular fingers. There is little danger of spotting.
<b>Moderate (M)</b>	Fires can start from most accidental causes, but with the exception of lightning fires in some areas, the number of starts is generally low. Fires in open cured grasslands will burn briskly and spread rapidly on windy days. Timber fires spread slowly to moderately fast. The average fire is of moderate intensity, although heavy concentrations of fuel, especially draped fuel, may burn hot. Short-distance spotting may occur, but is not persistent. Fires are not likely to become serious and control is relatively easy.
<b>High (H)</b>	All fine dead fuels ignite readily and fires start easily from most causes. Unattended brush and campfires are likely to escape. Fires spread rapidly and short-distance spotting is common. High-intensity burning may develop on slopes or in concentrations of fine fuels. Fires may become serious and their control difficult unless they are attacked successfully while small.
<b>Very High (VH)</b>	Fires start easily from all causes and, immediately after ignition, spread rapidly and increase quickly in intensity. Spot fires are a constant danger. Fires burning in light fuels may quickly develop high intensity characteristics such as long-distance spotting and fire whirlwinds when they burn into heavier fuels.
<b>Extreme (E)</b>	Fires start quickly, spread furiously, and burn intensely. All fires are potentially serious. Development into high intensity burning will usually be faster and occur from smaller fires than in the very high fire danger class. Direct attack is rarely possible and may be dangerous except immediately after ignition. Fires that develop headway in heavy slash or in conifer stands may be unmanageable while the extreme burning condition lasts. Under these conditions the only effective and safe control action is on the flanks until the weather changes or the fuel supply lessens.

#### 4.3.11.3 Past Occurrences

The Pennsylvania Department of Conservation of Natural Resources (DCNR) Bureau of Forestry tracks forest fires by forest districts. Forest County is located in the Cornplanter Forest District (D-14) and the Kittanning Forest District (D-8). According to DCNR, there were only 17 fires within the Forest District 14 in 2013 that burned 21.9 acres and there were 56 fires within the Forest District 8 that burned 235.1 acres. Since the forest districts encompass more than just Forest County, it is unknown how many of these fires actually occurred in Forest County. No major forest fires have ever been recorded in Forest County.

#### 4.3.11.4 Future Occurrence

Wildfires have a possible probability of occurring on an annual basis. A risk factor of 2.2 has been assigned to the wildfire hazard utilizing the risk factor assessment tool provided by the Pennsylvania Emergency Management Agency. The Forest County Draft Firewise Plan identifies the county overall as a moderate risk.

No significant wildfires have occurred in Forest County's recorded history. Weather conditions play a major role in the occurrence of these wild fires. Dry conditions with decreased humidity are an ideal scenario for a wild fire.

The Forest County Emergency Management Agency coordinates countywide burn bans when the conditions are ideal for wildfires. Public information and press releases are issued to help decrease the risk of a major fire thus reducing the possibility of future occurrences. Forest County EMA disseminates all red flag warnings.

#### 4.3.11.5 Vulnerability

Although no significant wildfires have been recorded by the Pennsylvania Department of Conservation and Natural Resources – Bureau of Forestry (PA DCNR-BOF) and the National Climatic Data Center (NCDC) for Forest County, all areas of the county can be prone to wildfires. The size and impact of a wildfire depends on its location, climate conditions, and the response of firefighters. If the right conditions exist, these factors can usually mitigate the effects of wildfires. During a drought, wildfires can be devastating. Lightning strikes are another cause of wildfires. However, human carelessness and negligence is the leading factor, causing 98 percent of wildfires in Pennsylvania.

Wildfires are most common in the spring (March – May) and fall (October – 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.



Firefighters and other first responders are vulnerable to forest fires. Traffic accidents during a response and then the impacts of fighting the fire once on scene are examples of the first responder vulnerabilities.

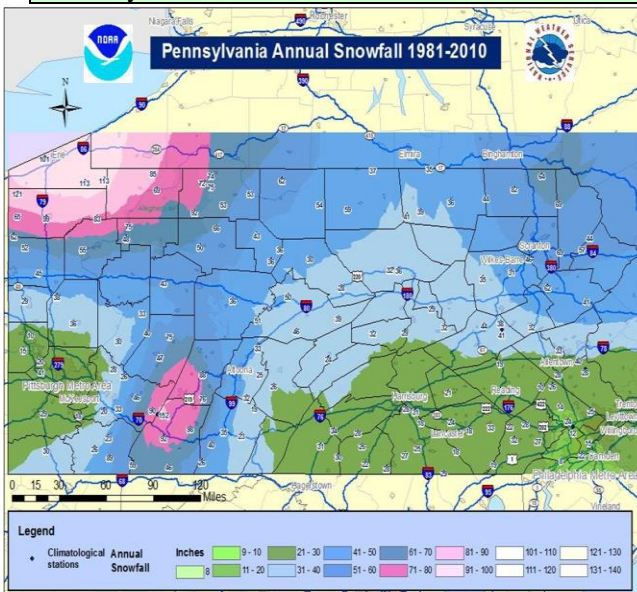
In accordance with the 2013 Pennsylvania Hazard Mitigation Plan, The Pennsylvania Department of Conservation of Natural Resources, Bureau of Forestry conducts jurisdictional assessments of wildfire hazard throughout the Commonwealth. The last analysis was completed in 2009 and was conducted with the best available information. Hazard is defined by fuel, topography and local weather which jurisdictions are most vulnerable to wildfires. All municipalities within Forest County except Barnett Township are identified as high hazard classification. Barnett Township is listed as medium class.

### 4.3.12 Winter Storms

#### 4.3.12.1 Location and Extent

Winter storms with excessive snow and ice and frigid temperatures can occur on average five times a year in Forest County. Every county in Pennsylvania shares these hazards. However, the northern tier, western counties and mountainous regions seem to experience storms more frequently and with a greater severity. Figure 4.3.12-1 shows the annual snowfall amounts for locations in Pennsylvania.

**Figure 4.3.12-1**  
**Pennsylvania Annual Snowfall 1981-2010**



\*National Weather Service

4.3.12.2      Range of Magnitude

Winter storms are usually a county-wide hazard. Winter storms consist of cold temperatures, heavy snow or ice, sleet and sometimes strong winds. Due to their regular occurrence, these storms are considered hazards only when they result in damage to specific structures or cause disruption to traffic, communications, electric power, or other utilities.

During the winter months about a fourth of the precipitation occurs in Forest County as snow; with about a 20 percent chance of precipitation on any day. The snow fall is generally from late November to early April, with the greatest monthly amounts occurring in December and January. The month of March usually records the greatest individual storm amounts, as the moisture in the air increases.

Flooding and power outages are major secondary effects of winter storms and winter weather. Melting snow can lead to large amounts of ground water that cannot be contained by streams and creeks. Power outages can be caused by large amounts of snow or ice that weighs on power lines.

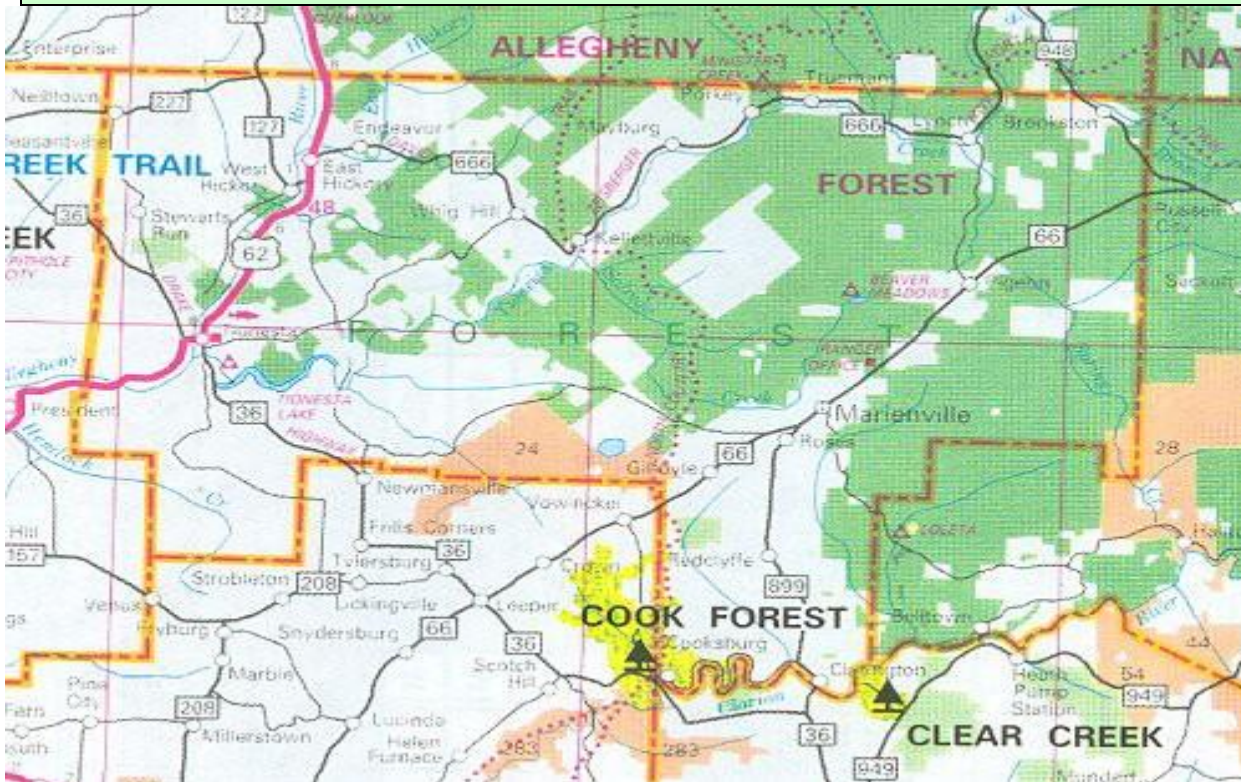
A winter storm can adversely affect roadways, utilities, business activities, and can cause frostbite or loss of life. These storms may include one or more of the following weather events outlined in table 4.3.12-2:

<b>Table 4.3.12-2: Winter weather events</b>	
<b>Weather Event</b>	<b>Classification</b>
<b><u>Heavy Snowstorm</u></b>	Accumulations of four inches or more in a six-hour period, or six inches or more in a twelve-hour period.
<b><u>Sleet Storm</u></b>	Significant accumulations of solid pellets which form from the freezing of raindrops or partially melted snowflakes causing slippery surfaces posing hazards to pedestrians and motorists.
<b><u>Ice Storm</u></b>	Significant accumulations of rain or drizzle freezing on objects (trees, power lines, roadways, etc.) as it strikes them, causing slippery surfaces and damage from the sheer weight of ice accumulation.
<b><u>Blizzard</u></b>	Wind velocity of 35 miles per hour or more, temperatures below freezing, considerable blowing snow with visibility frequently below one-quarter mile prevailing over an extended period of time.
<b><u>Severe Blizzard</u></b>	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.

The majority of Forest County populations are within two municipalities: Tionesta and Marienville. Tionesta is located along SR 36 with US 62 traversing north to south. Marienville is situated along SR 66. There are other routes, to include township and state, within Forest County as well. Most of the routes on the eastern portion of the county are within the Allegheny National Forest.

Figure 4.3.12-3

Map of Forest County showing transportation routes



4.3.12.3 Past Occurrence

Forest County is vulnerable to an array of winter weather. This weather has the ability to close businesses, close schools, and block and damage roadways throughout the county. The average snowfall is 60-80 inches per year depending upon location within the county.

4.3.12.4 Future Occurrence

The probability of winter weather and winter storms occurring in Forest County is highly likely, with expected annual events. Approximately thirty-five winter storm events occur across Pennsylvania and about three to five in Forest County annually. A risk factor of 2.7 has been assigned to this hazard utilizing the risk factor assessment tool.

#### 4.3.12.5      Vulnerability Assessment

Forest County is vulnerable to winter weather. The economic impacts from snow removal, road and infrastructure repair, etc. impart a great strain on the budgets and material resources of local municipalities. Along with municipalities, other vulnerable entities in the county include businesses and utility companies. Drivers experience automobile accidents and homeowners experience property damage from heavy snow and ice. Municipalities are burdened with snow and ice removal, businesses are constantly losing income from closures, and utility companies are tasked with repairing the damage done to critical infrastructure (fallen power lines, water main breaks, etc.).

A winter weather vulnerability map is located in **Appendix H-6**.

### **4.3.13**      Civil Disturbance

#### 4.3.13.1      Location and Extent

Throughout the history of the Commonwealth, riots have occurred infrequently. However, as seen in other parts of the country, riots can cause significant property damage, injury, and loss of life. Civil disorders vary widely in size and scope, and impact is generally low. Forest County has two locations where a civil disturbance is possible: State Correction Institute Forest which is located north of the town of Marienville and the Abraxas Foundation which is located northwest of Marienville.

#### 4.3.13.2      Range of Magnitude

Forest County's greatest threat to civil disorder would occur in the State Correctional Institute (SCI) Forest, home of the Forest County state prison. The next highest threat would be the Abraxas Foundation. Citizens, property, and infrastructure in and around the Marienville area could be affected if a large-scale disorder were to take place. SCI Forest staff are trained to handle emergencies that do arise inside the facility. Most times, SCI Staff mitigates the issue with no need for outside resources.

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

#### 4.3.13.3      Past Occurrence

Major civil disorders have occurred in Forest County at the SCI Forest and Abraxas facilities. SCI Forest handles low scale issues on an annual basis. No large-scale issues have been noted. The Abraxas Foundation has also managed incidents in the past. On February 22, 2008, two individuals were charged for their actions during separate riots at the facility. Three juveniles and five other individuals would eventually be charged as well. PSP Tionesta assisted with the incident.

4.3.13.4      Vulnerability Assessment

Minor civil disobedience and public disorder is something that may occur, but with minimal impact. These events may be sparked for various reasons and seriousness of the event may well be exacerbated by how authorities handle the crowd. The Marienville area is more vulnerable than any other geographic portion of the county. This vulnerability is due to the State Correctional Institute Forest and Abraxas Foundation in that area.

A civil disorder vulnerability map is located in **Appendix H-7**.

**4.3.14**      Dam Failure

4.3.14.1      Location and Extent

Dam failures are usually a secondary effect of massive rainfall and flooding and occur when too much water enters the spillway system. This will occur with little or no warning. Spring thaws, severe thunderstorms, and heavy rainfall are also contributory factors. Poor engineering or poor maintenance may also cause dam failures. The Pennsylvania Department of Environmental Protection and the U.S. Army Corps of Engineers award permits for dams and also shares inspection responsibilities. Inspection results are characterized as either safe or unsafe. Dams are evaluated on categories such as slope instability, excessive seepage, and inadequate spillways.

Dams are classified in terms of hazard potential as: high, significant, or low, with high-hazard dams requiring Emergency Action Plans. There is only one dam in Forest County that requires an Emergency Action Plan. Table 4.3.14-1 lists an inventory of Forest County high-hazard and significant-hazard dams identified on the National Inventory of Dams. Additional dams may be present in Forest County but a list of these dams is not available. An inventory of all dams in Forest County would be extremely beneficial in the development of mitigation strategies in the future. A mitigation strategy to inventory all dams in Forest County will be developed.

<b>Dam Name</b>	<b>River</b>	<b>Owner</b>	<b>Hazard Level</b>	<b>EAP Completed</b>
Tionesta Dam	Tionesta Lake	Army Corps of Engineers	High	Yes

4.3.14.2      Range of Magnitude

Forest County is home to one dam that requires an emergency action plan. The municipalities where this high-hazard dam is located is at the greatest risk for a significant dam failure. Flooding is the most common secondary effect of dam failure. If the dam failure is severe, a large amount of water will enter the downstream body of water and overflow the stream banks for miles. Depending on the contents of the water and the path it takes, there may be significant environmental vulnerability.

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

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

#### 4.3.14.3      Past Occurrence

There have been no high hazard dam failures in Forest County. Other small dam failures have occurred over the years with very limited impacts.

#### 4.3.14.4      Future Occurrence

Minor dam failures occur quite frequently. However, they often go unnoticed and cause little or no damage or effects on the general population. A risk factor of 2.7 has been assigned to this hazard utilizing the risk factor assessment tool. Significant dam failures occur much less frequently. The probability of a significant dam failure in Forest County is unlikely to occur. Dam failures are often a secondary effect, resulting from another hazard, such as heavy rainfall from a hurricane or tropical storm.

#### 4.3.14.5      Vulnerability Assessment

There is always the possibility any dam could fail; however, the probability is unlikely in Forest County. According to PEMA, minor dam failures occur every year, but their impact is minimal. Usually they are gradual, low volume releases that are unexpected, and do not cause loss of life or damage to the environment.

No significant hazard or low hazard dams have been identified in Forest County. The local planning team anticipates that some agricultural dams may be present throughout Forest County. The local planning team will develop a hazard mitigation strategy to inventory and document all dams throughout the county and possibly in other counties that would impact Forest County during a failure.

Forest County is identified to be affected by the Kinzua Dam and the East Branch Dam in the event that a failure would occur at these facilities. The Forest County Emergency Management Agency has specific plans for these two dams. Inundation area, downstream notification of residents/businesses and other critical components are identified in these plans.

A dam failure vulnerability map for the Tionesta Dam is located in **Appendix H-8**.

### **4.3.15**      Disorientation

#### 4.3.15.1      Location and Extent

Disorientation is the loss of one's sense of direction, position, or relationship with one's surroundings. This can also be defined as mental confusion or impaired awareness. In Forest County, disorientation can vary from a missing child to a person lost on the waterways. Emergency services will be expected to search for missing or disoriented persons at all times of the year and in all types of conditions. Disorientation events have the potential to take place throughout the county.

#### 4.3.15.2      Range of Magnitude

All ranges of the population, from age to social status, would be at a maximum threat to disorientation as 93% percent of land use is forests in Forest County. The county has state game-lands, state parks, state forests and National Forests. The rural setting of Forest County attracts a large number of hunters annually. Many of the hunters come from the urban areas and do not always have the skills or resources to adequately navigate the woods. There are annual events that require first responders to respond and search for lost hunters.

#### 4.3.15.3      Past Occurrence

The table 4.3.15-1 below depicts the events that required emergency service personnel to be utilized for search and rescue of disoriented persons. The people that were disoriented but did not require emergency service personnel to assist them are not accounted for and it is difficult to determine the frequency of occurrence. Records of past occurrences are not well documented.

#### 4.3.15.4      Future Occurrence

The probability of a disorientation event is highly likely. Citizens should be aware of their surroundings, although the very young and those with mental incapacities will always be at a higher risk. Hunters should be aware of the areas that they hunt. Maps and other resources would enhance the hunter's capabilities to navigate safely. A risk factor of 2.5 has been assigned to this hazard.

#### 4.3.15.5      Vulnerability Assessment

Disorientation events are typically a local event, but sometimes may span across municipality and county borders as state game lands and forests lie within numerous municipalities. A search and rescue operation can take place in all types of settings, to include a village, a park, forested lands, or lakes and ponds. Due to the rural nature of Forest County and seasonal dwellings many people are not familiar with the area. Many people enter the forests and waterways to enjoy recreational activities, not aware of their surroundings.

A disorientation vulnerability map is located in **Appendix H-9**.

### **4.3.16**      Environmental Hazards

#### 4.3.16.1      Location and Extent

One of the greatest threats to those who reside in the Commonwealth is the constant production, storage, use, and transportation of hazardous materials. The release of these materials from a facility is less dangerous than the release of these materials while being transported. Hazardous materials

include flammable liquids, solids, gasses, combustible liquids, explosives, blasting agents, radioactive materials, oxidizing materials, corrosive materials, poisons, refrigerated liquids, hazardous waste/substances, and other regulated material. With the multiple forms of transportation in Forest County, hazardous materials such as chemicals, fuels, and other hazardous materials are frequently transported through the county. The carriers of hazardous materials, however, must have response plans in place in the event of an accident.

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

Any facility in Pennsylvania that uses, manufactures, or stores hazardous materials must comply with Title III of the Superfund Amendments and Reauthorization Act (SARA). This is also known as the Emergency Planning and Community Right-to-Know Act (EPCRA). They must also comply with the reporting requirements, as amended, in Pennsylvania’s Hazardous Materials Emergency Planning and Response Act (1990-165). The community right-to-know reporting requirements keep communities abreast of the presence and release of chemicals at individual facilities.

EPCRA was designed to ensure that state and local communities are prepared to respond to potential chemical accidents through Local Emergency Planning Committees (LEPCs). LEPCs are charged with developing emergency response plans for SARA Title III facilities; these plans cover the location and extent of hazardous materials, establish evacuation plans, response procedures, methods to reduce the magnitude of a materials release, and establish methods and schedules for training and exercises. Information about the chemicals that are being manufactured or processed in facilities can be found in the

U.S. Environmental Protection Agency’s (USEPA) Toxic Release Inventory (TRI) database ([http://www.epa.gov/enviro/geo\\_data.html](http://www.epa.gov/enviro/geo_data.html)).

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

Table 4.3.16-1 lists the SARA Title III facilities located in Forest County, as well as whether or not the facility resides in the floodplain. Forest County has a total of 4 SARA facilities. None of the SARA facilities are located within the floodplain.

<b>Table 4.3.16-1: Forest County SARA Facilities</b>		
<b>Name</b>	<b>Location</b>	<b>Located within the 100-year Floodplain</b>
Jenks Township Waste Treatment Plant	Marienville, Jenks Township	No
Pennsylvania – Aqua America, Inc.	Marienville, Jenks Township	No
Tionesta Borough Water Treatment Plant	Tionesta Borough	No
Tionesta Water Company	Tionesta Borough	No

**Source:** Forest County Emergency Management Agency



#### 4.3.16.2      Range of Magnitude

Hazardous material releases can contaminate air, water and soils, possibly resulting in death and/or injuries. Dispersion can take place rapidly when transported by water and wind. While often accidental, releases can occur as a result of human carelessness, intentional acts, or natural hazards. When caused by natural hazards, these incidents are known as secondary events. Hazardous materials can include toxic chemicals, radioactive materials, infectious substances and hazardous wastes. Such releases can affect nearby populations and contaminate critical or sensitive environmental areas. The county has over 268 miles of State and Federal roads. The major transportation network in the county includes State Routes 36, 62, 66, 666, 899, and 948. All of these routes carry extremely heavy truck traffic and are a constant potential scene of a hazardous materials incident.

There are many oil/natural gas wells and pipelines throughout the county. Shell oil has one main line and many small collection lines. Tennessee Gas Pipelines has a pumping station with 2 large lines within the county. There are plans for more pipelines for the county. Gas and Oil wells are still operational in the county. Recent advances in drilling technology and rising natural gas prices have attracted new interest in the gas located in the Marcellus shale formation. The Marcellus Shale is a rock formation that underlies all of Forest County at a depth of 5,000 to 8,000 feet.

#### 4.3.16.3      Past Occurrence

The National Response Center lists 3 HazMat instances occurring in Forest County between 2014 and 2020. Most hazardous spills occur on highways. According to the Bureau of Transportation Statistics, in 2000, of the 1,115 spills in Pennsylvania, 1,065 happened on highways. These spills cost the Commonwealth approximately \$2.5 million. With Forest County having the Marcellus shale formation there has been an increase in this type of well drilling. This type of well drilling brings with it different hazards not seen with shallow well drilling. There have been incidents involving wells in the past including well heads being struck, gas migrating into water wells and gas migrating into structures.

#### 4.3.16.4      Future Occurrence

The overall probability of Forest County experiencing an environmental hazard is possible. A risk factor of 2.4 has been assigned to this hazard utilizing the Risk Factor methodology probability criteria. The increase in drilling activities increases the potential for incidents. The occurrence of this event is high, however; the potential for a large-scale event is present.

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

Fixed facility hazardous material releases do occur but not as frequently as transportation incidents.

The Local Emergency Planning Commission (LEPC) for Forest County maintains and updates emergency plans for SARA Title III facilities throughout the county. The county LEPC also identifies the facilities that must report the Tier II chemicals for their facility through the Hazardous Materials Emergency Planning and Response Act (1990-165) as amended.

#### 4.3.16.5      Vulnerability Assessment

A hazardous materials spill can be the result of human carelessness, an intentional act, or a natural hazard. Human carelessness occurs predominantly during the manufacturing, transporting, or storing of the material. An intentional act would be considered either a terrorist act, criminal act, or act of vandalism. A hazardous materials spill can be a secondary effect of a natural hazard (e.g., flooding, earthquake, or severe weather). Transportation routes make Forest County susceptible to hazardous material spills.

Extracting natural gas from the Marcellus Shale formation requires both vertical and horizontal drilling, combined with a process known as 'hydraulic fracturing.' To drill these wells requires 3-4 acres of land for roads and drilling pad. There is a large number of employees, amount of equipment and supplies, additionally, drilling rigs are much larger than standard well drilling rigs. These sites have many hazards including confine spaces, high angle drill rigs, chemicals, radioactive materials, explosives and high-pressure equipment. After the well is drilled, cased and cemented to protect groundwater and the escape of natural gas and other fluids, drillers pump large amounts of water mixed with sand and other fluids into the shale formation under high pressure to fracture the shale around the well, which allows the natural gas to flow freely to the well bore. The amount of water typically required for hydraulic fracturing ranges from about one million gallons for a vertical well to approximately five million gallons for a vertical well with a horizontal lateral. This used water creates issues in itself in that the water contains contaminants such as brine, radioactive materials and other chemicals. Also, Forest County has some underground coal mines that are not mapped. These can lead to issues in the well drilling process.

Crucial factors in a hazardous materials spill include location, weather conditions, and response. The location of a spill is critical for several reasons. The material could spill in a highly populated area, leak into a waterway, or be spilled in some other area that would cause other secondary effects. Those who are closest to the spill are the greatest at risk, but some hazardous materials can travel great distances. Weather conditions play a large role with even mild breezes carrying hazardous gases and fumes long distances. Air temperature is also a determining factor of how far the material will travel by air. Contaminated waterways and even rainfall can have a negative impact on the scope of the spill. Finally, the response to the incident can determine the extent of the damage. If the closest response team is miles from the incident, the material may have time to spread into the ground and waterways or in the air. However, all of these factors depend on the type of material that is released.

Environmental hazard vulnerability maps are located in **Appendix H-10**.

<b>Table 4.3.16-2: Forest County Gas and Oil Wells</b>		
<b>Year</b>	<b>Permits</b>	<b>Drilled</b>
2013	297	154
2014	216	76
2015	69	22
2016	17	4
2017	16	6
2018	35	22
2019	32	11
2020	12	11
<b>Forest County Marcellus Shale Gas Wells</b>		
<b>Year</b>	<b>Permits</b>	<b>Drilled</b>
2013	16	4
2014	1	0
2015	0	0
2016	0	0
2017	0	0
2018	0	0
2019	1	0
2020	0	0

**4.3.17** Transportation Accidents

4.3.17.1 Location and Extent

Transportation accidents will claim more lives annually and cause more injuries than any other hazard. With rail, air, and highway transportation available all over Pennsylvania, every county in the Commonwealth is susceptible to this hazard. Forest County is served by one U.S. Highway (U.S. Route 62) and Pennsylvania State Routes 36, 66, 666, 899 and 948. Forest County has 329 miles of state-maintained highways and nearly 162 miles of locally owned roads. Hazardous materials travel through Forest County daily.

Forest County has no general aviation airport within its boundaries. However, a major airway out of Greater Pittsburgh International Airport is directly over the county.

Forest County has a vast number of pipelines in the county. Most of the pipelines are due to the natural gas exploration and extraction. Most of the pipelines are located underground but their locations that are located above ground and pose a risk for release. Shell oil has one main line and

many small collection lines. Tennessee Gas Pipelines has a pumping station with 2 large lines within the county. There are plans for more pipelines for the county. There are no active railroads in the county.

#### 4.3.17.2      Range of Magnitude

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

Automobile accidents can occur on any roadway. Typically, the higher speeds and more heavily traveled roads, such as U.S. 62, State Routes 36 and 66 experience a higher percentage of the county's automobile accidents. These traffic accidents are most common during periods of inclement weather. Significant pipeline accidents are not very common. The most vulnerable areas are those with pipelines running through or along hillsides. Mudslides and falling rocks can cause pipeline breaks. Hazardous material spills are the most common secondary effect of transportation accidents.

#### 4.3.17.3      Past Occurrence

Forest County has witnessed fewer than the state average in automobile accidents from 2012- 2017. There were 41 fatal accidents in Forest County between 2004 and 2018.

Forest County has experienced no aviation accidents recorded by the Federal Aviation Administration (FAA) since 1990.

#### 4.3.17.4      Future Occurrence

The probability of a transportation accident is highly likely. Automobile accidents, both minor and fatal, will occur more frequently than a pipeline incident or an aviation accident. Roadway accidents occur annually, often with limited impact. The exploration and extraction of natural gas in Forest County may lead to an increase of truck and heavy equipment traffic in Forest County. A risk factor of 2.6 has been assigned to this hazard utilizing the risk factor methodology probability criteria.

#### 4.3.17.5      Vulnerability Assessment

The vulnerability for a highway accident is directly related to the population and traffic density of that area. The more populated an area the more vulnerable it is to an accident. U.S. Route 62 and Pennsylvania State Routes 36, 66, 666, 899 and 948 carry the largest volumes of traffic.

Forest County's vulnerability to a pipeline break depends on its vulnerability to three other hazards: floods, earthquakes, and landslides. Each of these hazards tends to be the primary hazard, while the pipeline break is the secondary hazard. Other hazards that affect pipelines, that are not as frequent in Forest County, include hurricanes and tornadoes.

A transportation vulnerability map is located in **Appendix H-11**.

## 4.3.18 Utility Interruptions

### 4.3.18.1 Location and Extent

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

### 4.3.18.2 Range of Magnitude

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

The county must account for its special needs' population during times of extended utility failure.

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

### 4.3.18.3 Past Occurrence

In August 2003, a widespread power outage occurred as a result of a disruption to the power grids in states to the north and east of Pennsylvania and then cascading into the Commonwealth. Early reports estimated the total number customer affected in Pennsylvania at over 100,000. Three municipalities within Forest County were without power for approximately twelve hours as a result of the blackout. Parts of several municipalities were without power for as long as 48 to 72 hours.

### 4.3.18.4 Future Occurrence

The probability of a large-scale and extended utility failure is highly likely. Utility interruptions are difficult to predict. Most utility interruptions are secondary to severe weather. Citizens should always be prepared for these hazards. A risk factor of 3.0 has been assigned to this hazard utilizing the Risk Factor methodology probability criteria.

#### 4.3.18.5      Vulnerability Assessment

##### *Electric*

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

When power shortages or failures do occur, they are typically on a regional scale, not simply in a single county. Causes and potential causes include infrastructure failure, sabotage, human error, and worker strikes. Also, power outages are often a secondary effect of severe weather. Power outages can damage both homes and businesses. Often, power outages will result in spoiled refrigerated inventories, affecting both residences and businesses.

Electric service is provided throughout Forest County by First Energy, Allegheny Power, United Electric, Central Electric, GPU Energy and Warren Electric Cooperative.

##### *Water*

Water contamination can occur naturally, by human error, or intentionally. Occasionally, releases of manure and milk into the water supply can cause contamination. Overflows from sewage systems and lagoons on farms can also cause contamination of groundwater and drinking water. There are also times when accidental spills and releases of hazardous materials contaminate water. Water supplies along transportation routes may be affected by hazardous materials spills.

Water distribution can be affected in three ways: the amount of water available; the quality of the water; and the viability of the physical components of the distribution systems. The quantity of water depends on nature. Humans, on the other hand, are primarily responsible for the maintenance of water quality. Since Forest County is a rural county, a majority of the residential water comes from wells. Well contamination or water shortages due to drought would pose a high vulnerability.

Municipal and public water services are provided by Tionesta Borough, Pennsylvania American Water Company and Rhodes.

##### *Gas*

Natural gas is primarily provided by, UGI Central Penn Gas Inc., Columbia Gas, National Fuel and Orwell.

##### *Communications*

Cellular communications and coverage are sporadic in the county. Drastic elevation changes, topography issues and a lack of cellular towers in the county lead to a decreased ability to use cellular communications. Cellular communications infrastructure has grown over the past 7 years with additional towers being erected but is still limited.

The primary carrier for land line communications is Verizon. Verizon provides service to most of the municipalities within Forest County. Windstream does provide service to areas in Howe Township and Venus Telephone Company provides service in areas of Tionesta Township.

A utilities vulnerability map is located in **Appendix H-12**

## 4.4 Hazard Vulnerability Summary

### 4.4.1 Methodology

Ranking hazards helps communities set goals and priorities for mitigation based on their vulnerabilities. A risk factor (RF) is a tool used to measure the degree of risk for identified hazards in a particular planning area. The RF can also assist local community officials in ranking and prioritizing hazards that pose the most significant threat to a planning area based on a variety of factors deemed important by the planning team and other stakeholders involved in the hazard mitigation planning process. The RF system relies mainly on historical data, local knowledge, general consensus from the planning team, and information collected through development of the hazard profiles included in Section 4.3. The RF approach produces numerical values that allow identified hazards to be ranked against one another; the higher the RF value, the greater the hazard risk.

RF values were obtained by assigning varying degrees of risk to five categories for each of the hazards profiled in the HMP update. Those categories include *probability*, *impact*, *spatial extent*, *warning time*, and *duration*. Each degree of risk was assigned a value ranging from one to four. The weighting factor agreed upon by the planning team is shown in Table 4.4-1. 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 following example equation:

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

Table 4.4-1 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: Summary of Risk Factor approach used to rank hazard risk.**

RISK ASSESSMENT CATEGORY	DEGREE OF RISK			WEIGHT VALUE
	LEVEL	CRITERIA	INDEX	
<b>PROBABILITY</b> <i>What is the likelihood of a hazard event occurring in a given year?</i>	<b>UNLIKELY</b>	LESS THAN 1% ANNUAL PROBABILITY	<b>1</b>	<b>30%</b>
	<b>POSSIBLE</b>	BETWEEN 1 & 10% ANNUAL PROBABILITY	<b>2</b>	
	<b>LIKELY</b>	BETWEEN 10 & 100% ANNUAL PROBABILITY	<b>3</b>	
	<b>HIGHLY LIKELY</b>	100% ANNUAL PROBABILITY	<b>4</b>	



**Table 4.4-1: Summary of Risk Factor approach used to rank hazard risk.**

RISK ASSESSMENT CATEGORY	DEGREE OF RISK			WEIGHT VALUE
	LEVEL	CRITERIA	INDEX	
<b>IMPACT</b> <i>In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?</i>	<b>MINOR</b>	VERY FEW INJURIES, IF ANY. ONLY MINOR PROPERTY DAMAGE & MINIMAL DISRUPTION ON QUALITY OF LIFE. TEMPORARY SHUTDOWN OF CRITICAL FACILITIES.	<b>1</b>	<b>30%</b>
	<b>LIMITED</b>	MINOR INJURIES ONLY. MORE THAN 10% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE DAY.	<b>2</b>	
	<b>CRITICAL</b>	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.	<b>3</b>	
	<b>CATASTROPHIC</b>	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.	<b>4</b>	
<b>SPATIAL EXTENT</b> <i>How large of an area could be impacted by a hazard event? Are impacts localized or regional?</i>	<b>NEGLIGIBLE</b>	LESS THAN 1% OF AREA AFFECTED	<b>1</b>	<b>20%</b>
	<b>SMALL</b>	BETWEEN 1 & 10% OF AREA AFFECTED	<b>2</b>	
	<b>MODERATE</b>	BETWEEN 10 & 50% OF AREA AFFECTED	<b>3</b>	
	<b>LARGE</b>	BETWEEN 50 & 100% OF AREA AFFECTED	<b>4</b>	
<b>WARNING TIME</b> <i>Is there usually some lead time associated with the hazard event? Have warning measures been implemented?</i>	<b>MORE THAN 24 HRS</b>	SELF-DEFINED	<b>1</b>	<b>10%</b>
	<b>12 TO 24 HRS</b>	SELF-DEFINED	<b>2</b>	
	<b>6 TO 12 HRS</b>	SELF-DEFINED	<b>3</b>	
	<b>LESS THAN 6 HRS</b>	SELF-DEFINED	<b>4</b>	
<b>DURATION</b> <i>How long does the hazard event usually last?</i>	<b>LESS THAN 6 HRS</b>	SELF-DEFINED	<b>1</b>	<b>10%</b>
	<b>LESS THAN 24 HRS</b>	SELF-DEFINED	<b>2</b>	
	<b>LESS THAN 1 WEEK</b>	SELF-DEFINED	<b>3</b>	
	<b>MORE THAN 1 WEEK</b>	SELF-DEFINED	<b>4</b>	

#### 4.4.2 Ranking Results

Using the methodology described in Section 4.4.1, Table 4.4-2 lists the Risk Factor calculated for each of the seventeen (17) potential hazards identified in the 2020 HMP. Hazards identified as *high* risk have risk factors greater than 2.5. Risk Factors ranging from 2.0 to 2.4 were deemed *moderate* risk hazards. Hazards with Risk Factors 1.9 and less are considered *low*. Based on these results, there are Three (3) *high* risk hazards, seven (7) *moderate* risk hazards and seven (7) *low* risk hazards in Forest County. Mitigation actions were developed for all high, moderate, and low risk hazards (see Section 6.4). The threat posed to life and property for moderate and high-risk hazards is considered significant enough to warrant the need for establishing hazard-specific mitigation actions. Mitigation actions related to future public outreach and emergency service activities are identified to address low risk hazard events.

TABLE 4.4-2: FOREST COUNTY HAZARD RANKING BASED ON RF METHODOLOGY							
HAZARD RISK	HAZARD NATURAL(N) OR MAN-	RISK ASSESSMENT CATEGORY					RISK FACTOR (RF)
		PROBABILITY	ECONOMIC IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	
HIGH	Winter Storms	2.83	1.5	3.33	2.16	2.5	2.6
	Pandemic	2.33	2.33	3.33	1.16	3.83	2.6
	Tornadoes and Windstorms	2.5	2.5	2.66	3	1.5	2.5
MODERATE	Invasive Species	3.16	1.3	3	1.16	3.16	2.4
	Flood, Flash Flood, and Ice Jams	2.66	2.16	2	2.66	2.5	2.4
	Wildfire	1.83	2	2.16	3.66	2.66	2.2
	Dam Failure	1.16	2.83	2	3	2.16	2.1
	Transportation	2.67	1.83	1.17	3.67	1.33	2.1
	Drought	1.83	1.5	2.83	1	4	2
	Lightning Strike	2.83	1.3	1.6	3.16	1	2
LOW	Earthquake	1	1.83	2.5	3.5	1.2	1.8
	Environmental	1.6	1.3	1.5	2.5	2.67	1.7
	Landslides	1.83	1.16	1.16	3.5	1.6	1.7
	Hurricane and Tropical Storm	1.3	1.3	1.6	1	2	1.4
	Radon Exposure	1.66	1	1	1	2.83	1.4
	Civil Disturbance	1	1.33	1.16	2.5	2	1.4
	Disorientation	1.5	1.16	1	2.6	1.6	1.3

### 4.4.3 Potential Loss Estimates

Flooding is a high-risk natural hazard in Forest County. The estimation of potential loss in this assessment focuses on the monetary damage that could result from flooding. The potential property loss was determined for each municipality and for the entire county. The following primary datasets were utilized for this estimated potential loss analysis: Flood Insurance Rate Maps, Forest County Structures, Forest County Municipal Boundaries and the Forest County Tax Assessment Database.

The Forest County Assessment Office houses a dataset with the total assessed value for each tax parcel throughout the county. Estimated potential losses were calculated by first determining what tax parcels and structures were intersected by the 1% annual chance floodplain. Once the impacted parcel and structures were identified, then primary residence structures and commercial structures were identified. Forest County has a large amount of seasonal structures that are located in the 1% annual chance special flood hazard area. These seasonal structures were not included in the estimation of loss. The county assessed value for all primary residences and commercial structures located in the 1% annual chance special flood hazard area was determined. The total of both land assessed value and the building assessed value provides a total assessed value for that property. The total assessed value for each parcel in a municipality was tallied to derive the total assessed value per municipality for every structure that was located in the 1% annual chance special flood hazard area. Total market value for the land and structure located in the SFHA was calculated by multiplying the assessed value by the common level ratio of 5.56. Market value was tallied per municipality.

Table 4.4-3 outlines the potential flooding losses for each municipality. Losses shown here can only be viewed as estimates and as potential, based on the random occurrence of flood conditions and limited data. Assessed value and market value data include those based on a point within a two-dimensional (latitude and longitude) plane. This data, however, does not include attribute information on first-floor flood elevations, which is essential to assess the base flood elevation's impact on the county's infrastructure. Further, this analysis assumes a total loss for any parcel intersected by the floodplain. As a result of these limitations, the estimates are likely overstated, but to what degree the potential losses are overstated cannot be determined. In Forest County there are 25 commercial structures and 115 residential structures located in the SFHA.

<b>Table 4.4-3 Forest County Potential Flooding Loss Estimates per Municipality</b>			
<b>Municipality</b>		<b>Total Assessment Value</b>	<b>Total Market Value</b>
Barnett Township		\$1,115,720.00	\$6,203,403.20
Green Township		\$0.00	\$0.00
Harmony Township		\$37,690.00	\$209,556.40
Hickory Township		\$628,720.00	\$3,495,683.20
Howe Township		\$98,140.00	\$545,658.40
Jenks Township		\$65,640.00	\$364,958.40
Kingsley Township		\$235,760.00	\$1,310,825.60
Tionesta Borough		\$0.00	\$0.00
Tionesta Township		\$40,800.00	\$226,848.00
<b>Total</b>		<b>\$2,222,470.00</b>	<b>\$12,356,933.20</b>

#### 4.4.4 Future Development and Vulnerability

Development in Forest County has been identified as human driven for years. Humans needed to hunt wildlife to survive, so influxes occurred as Forest County was being discovered. During the 1900's, tanneries, chemical works, grist mills, sand factories and sawmills were the main business. These businesses and trades supported the World Wars. Since that time, business and land development has changed.

Camps and non-resident structures have always out-numbered the amount of permanent structures. Recently, people are retiring to these camps and creating demographic shifts. The older populations are increasing while the younger populations are decreasing. A decline in factories and businesses has driven the younger population out of the county also.

Most of the land in Forest County is owned by the government or by timber companies. Very little private developable land exists in the county. The private land that is capable of being developed has increased in cost due to the Marcellus gas boom. New rules and regulations dictate how land may be developed in the county. The subdivision ordinance does not allow for lots to be below one acre in size. New sewage requirements have been implemented to decrease water pollution. New construction codes have changed the way previous land and area may have been developed in this rural county. All of these items have led to decreased development. With the passing of the Forest County Stormwater Ordinance, townships are notified when there is construction located in the floodplain. It is then the township's responsibility to enforce their floodplain ordinance to reduce the building's flood vulnerability.

Land use in Forest County has remained stable for over 30 years. Currently, the county is divided into three categories of land use. These categories are designated growth area, future growth area and rural resource area. Only 1 percent of the county's land area is used for developed land uses.

## 5. Capability Assessment

### 5.1 Update Process Summary

The capability assessment is an evaluation of Forest County's governmental structure, political framework, legal jurisdiction, fiscal status, policies and programs, regulations and ordinances, and resource availability. Each category is evaluated for its strengths and weaknesses in responding to, preparing for, and mitigating the effects of the profiled hazards. The capability assessment has two components: an inventory of the county's and municipalities' mission, programs, and policies; and an analysis of their capacity to execute them. A capability assessment is an integral part of the hazard mitigation planning process. Here, the county and municipalities identify, review, and analyze what they are currently doing to reduce losses, and identify the framework necessary to implement new mitigation actions. This information will help the county and municipalities evaluate alternative mitigation actions and address shortfalls in the mitigation plan.

A capabilities assessment matrix/questionnaire was provided to the municipalities during the planning process by mail and email and were discussed at meetings of Forest County officials. These meetings were designed to seek input from key county and municipal stakeholders on legal, fiscal, technical, and administrative capabilities of all jurisdictions. As such, the capabilities assessment helps guide the implementation of mitigation projects and will help evaluate the effectiveness of existing mitigation measures, policies, plans, practices, and programs.

Throughout the planning process, the mitigation local planning team considered the county's nine municipalities. Pennsylvania municipalities have their own governing bodies, pass and enforce their own ordinances and regulations, purchase equipment, and manage their own resources, including critical infrastructure. These capability assessments, therefore, consider the various characteristics and capabilities of municipalities under study. Additionally, NFPA 1600 recommends that a corrective action program be established to address shortfalls and provide mechanisms to manage the capabilities improvement process.

The evaluation of the categories listed above – political framework, legal jurisdiction, fiscal status, policies and programs, and regulations and ordinances – allows the mitigation planning team to determine the viability of certain mitigation actions. The capability assessment analyzes what Forest County and its municipalities have the capacity to do and provides an understanding of what must be changed to mitigate loss.

Forest County has a number of resources it can access to implement hazard mitigation initiatives including emergency response measures, local planning and regulatory tools, administrative assistance and technical expertise, fiscal capabilities, and participation in local, regional, state, and federal programs. The presence of these resources enables community resiliency through actions taken before, during, and after a hazardous event. While the capability assessment serves as a good instrument for identifying local capabilities, it also provides a means for recognizing gaps and weaknesses that can be resolved through future mitigation actions. The results of this assessment lend critical information for developing an effective mitigation strategy.

## 5.2 Capability Assessment Findings

### 5.2.1 Emergency Management

The Forest County Emergency Management Agency coordinates county-wide emergency management efforts. Each municipality has a designated local emergency management coordinator who possesses a unique knowledge of the impact hazard events have on their community.

The Emergency management Services Code (PA Title 35) requires that all municipalities in the Commonwealth have a Local Emergency Operations Plan (EOP) which is updated every two years. According to the capability assessment surveys completed by municipal leaders, some of the municipalities in the county have adopted by resolution the Forest County Emergency Operations Plan (EOP) as the municipal plan and some of the municipalities have adopted or are in the process of developing a municipal EOP.

### 5.2.2 Participation in the National Flood Insurance Program (NFIP)

Floodplain management is the operation of programs or activities that may consist of both corrective and preventive measures for reducing flood damage, including but not limited to such things as emergency preparedness plans, flood control works, and flood plain management regulations. The Pennsylvania Floodplain Management Act (Act 166) requires every municipality identified by the Federal Emergency Management Agency (FEMA) to participate in the National Flood Insurance Program (NFIP) and permits all municipalities to adopt floodplain management regulations. It is in the interest of all property owners in the floodplain to keep development and land usage within the scope of the floodplain regulations for their community. This helps keep insurance rates low and makes sure that the risk of flood damage is not increased by property development.

The Pennsylvania DCED provides communities, based on their CFR, Title 44, Section 60.3 level of regulations, with a suggested ordinance document to assist municipalities in meeting the minimum requirements of the NFIP along with the Pennsylvania Flood Plain Management Act (Act 166). These suggested or model ordinances contain provisions that are more restrictive than state and federal requirements. Suggested provisions include, but are not limited to:

- Prohibiting manufactured homes in the floodway.
- Prohibiting manufactured homes within the area measured 50 feet landward from the top-of bank of any watercourse within a special flood hazard area.
- Special requirements for recreational vehicles within the special flood hazard area.
- Special requirement for accessory structures.
- Prohibiting new construction and development within the area measured 50 feet landward from the top-of bank of any watercourse within a special flood hazard area.
- Providing the County Conservation District an opportunity to review and comment on all applications and plans for any proposed construction or development in any identified floodplain area.

Act 166 mandates municipal participation in and compliance with the NFIP. It also establishes higher regulatory standards for new or substantially improved structures which are used for the production or storage of dangerous materials (as defined by Act 166) by prohibiting them in the floodway. Additionally, Act 166 establishes the requirement that a Special Permit be obtained prior to any construction or expansion of any manufactured home park, hospital, nursing home, jail and prison if said structure is located within a special flood hazard area.

The NFIP's Community Rating System (CRS) provides discounts on flood insurance premiums in those communities that establish floodplain management programs that go beyond NFIP minimum requirements. Under the CRS, communities receive credit for more restrictive regulations; acquisition, relocation, or flood-proofing of flood-prone buildings; preservation of open space; and other measures that reduce flood damages or protect the natural resources and functions of floodplains.

The CRS was implemented in 1990 to recognize and encourage community floodplain management activities that exceed the minimum NFIP standards. Section 541 of the 1994 Act amends Section 1315 of the 1968 Act to codify the Community Rating System in the NFIP. The section also expands the CRS goals to specifically include incentives to reduce the risk of flood-related erosion and to encourage measures that protect natural and beneficial floodplain functions. These goals have been incorporated into the CRS, and communities now receive credit toward premium reductions for activities that contribute to them.

Under the Community Rating System, flood insurance premium rates are adjusted to reflect the reduced flood risk resulting from community activities that meet a minimum of three of the following CRS goals:

- Reduce flood losses
- Protect public health and safety
- Reduce damage to property
- 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 Community Rating System classes. Class 1 requires the most credit points and gives the largest premium reduction; Class 10 receives no premium reduction. CRS premium discounts on flood insurance range from five percent for Class 9 communities up to 45 percent for Class 1 communities. The CRS recognizes 18 creditable activities, organized under four categories: Public Information, Mapping and Regulations, Flood Damage Reduction, and Flood Preparedness.

Forest County and all of its nine municipalities participate in the NFIP. None of the municipalities participate in the NFIP-CRS program. Table 5.2-1 identifies each municipality for floodplain compliancy and NFIP participation.

**Table 5.2-1: Summary of planning tools adopted by each municipality in Forest County; Forest County Planning Department 2020**

COMMUNITY	COMPREHENSIVE PLAN	BUILDING CODE	NFIP PARTICIPANT	FLOODPLAIN ORDINANCE	SUBDIVISION & LAND DEVELOPMENT ORDINANCE	ZONING ORDINANCE
Barnett Township	Yes, County	Yes	Yes	Yes, 11/20/2010	Yes, County	No
Green Township	Yes, County	Yes	Yes	Yes, No date	Yes, County	No
Harmony Township	Yes, County	Yes	Yes	Yes, 11/22/2010	Yes, County	No
Hickory Township	Yes, County	Yes	Yes	Yes, 11/8/2010	Yes, County	No
Howe Township	Yes, County	Yes	Yes	Yes, 11/10/10	Yes, County	No
Jenks Township	Yes, County	Yes	Yes	Yes, 11/22/2010	Yes, County	No
Kingsley Township	Yes, County	Yes	Yes	Yes, 2010	Yes, County	No
Tionesta Borough	Yes, County	Yes	Yes	Yes, 11/16/2010	Yes, County	Yes, Borough
Tionesta Township	Yes, County	Yes	Yes	Yes	Yes, County	No



### 5.2.3 Planning and Regulatory Capability

Municipalities have the authority to govern more restrictively than state and county minimum requirements; as long as they are in compliance with all criteria established in the Pennsylvania Municipalities Planning Code (MPC) and their respective municipal codes. Municipalities can develop their own policies and programs and implement their own rules and regulations to protect and serve their local residents. Local policies and programs are typically identified in a comprehensive plan, implemented through a local ordinance, and enforced by the governmental body or its appointee.

Municipalities regulate land use via the adoption and enforcement of zoning, subdivision and land development, building codes, building permits, floodplain management, and/or stormwater management ordinances. When effectively prepared and administered, these regulations can lead to an opportunity for hazard mitigation. For example, the National Flood Insurance Program (NFIP) established minimum floodplain management criteria. Adoption of the Pennsylvania Floodplain management Act (Act 166 of 1978) established higher standards. A municipality must adopt and enforce these minimum criteria to be eligible for participation in the NFIP. Municipalities have the option of adopting a single-purpose ordinance or incorporating these provisions into their zoning, subdivision and land development, or building codes; thereby mitigating the potential impacts of local flooding. This Capability Assessment details the existing Forest County and municipal legal capabilities to mitigate the profiled hazards. It identifies the county's and the municipalities' existing planning documents and their hazard mitigation potential. Hazard mitigation recommendations are, in part, based on the information contained in the assessment.

#### *Building Codes*

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

The code applies to almost all buildings, excluding manufactured and industrialized housing (which are covered by other laws), agricultural buildings, and certain utility and miscellaneous buildings. The UCC has many advantages. It requires builders to use materials and methods that have been professionally evaluated for quality and safety, as well as inspections to ensure compliance.

The initial election period, during which all of Pennsylvania's 2,565 municipalities were allowed to decide whether the UCC would be administered and enforced locally, officially closed on August 7, 2004. The codes adopted for use under the UCC are the 2003 International Codes issued by the International Code Council (ICC). Supplements to the 2003 codes have been adopted for use over the years since.

If a municipality has "opted in", all UCC enforcement is local, except where municipal (or third party) code officials lack the certification necessary to approve plans and inspect commercial

construction for compliance with UCC accessibility requirements. If a municipality has “opted out”, the PA Department of Labor and Industry is responsible for all commercial code enforcement in that municipality; and all residential construction is inspected by independent third-party agencies selected by the owner. The Department also has sole jurisdiction for all state-owned buildings no matter where they are located. Historical buildings may be exempt from such inspections, and Act 45 provides quasi-exclusion from UCC requirements.

The municipalities in Forest County adhere to the standards of the Pennsylvania Uniform Construction Code (Act 45). All of Forest County’s municipalities have “opted in”.

### *Zoning Ordinance*

Article VI of the Municipalities Planning Code (MPC) authorizes municipalities to prepare and enact zoning to regulate land use. Its regulations can apply to: the permitted use of land; the height and bulk of structures; the percentage of a lot that may be occupied by buildings and other impervious surfaces; yard setbacks; the density of development; the height and size of signs; the parking regulations. A zoning ordinance has two parts, including the zoning map that delineates zoning districts and the text that sets forth the regulations that apply to each district.

### *Subdivision Ordinance*

Subdivision and land development ordinances include regulations to control the layout of streets, the planning of lots, and the provision of utilities and other site improvements. The objectives of a subdivision and land development ordinance are to: coordinate street patterns; assure adequate utilities and other improvements are provided in a manner that will not pollute streams, wells and/or soils; reduce traffic congestion; and provide sound design standards as a guide to developers, the elected officials, planning commissions, and other municipal officials. Article V of the Municipality Planning Code authorizes municipalities to prepare and enact a subdivision and land development ordinance. Subdivision and land development ordinances provide for the division and improvement of land.

### *Stormwater Management Plan/Stormwater Ordinance*

The proper management of stormwater runoff can improve conditions and decrease the chance of flooding. Pennsylvania’s Storm Water Management Act (Act 167) confers on counties the responsibility for development of watershed plans. The Act specifies that counties must complete their watershed stormwater plans within two years following the promulgation of these guidelines by the DEP, which may grant an extension of time to any county for the preparation and adoption of plans. Counties must prepare the watershed plans in consultation with municipalities and residents. This is to be accomplished through the establishment of a Watershed Plan Advisory Committee. The counties must also establish a mechanism to periodically review and revise watershed plans so they are current. Plan revisions must be done every five years or sooner, if necessary.

Municipalities have an obligation to implement the criteria and standards developed in each watershed stormwater management plan by amending or adopting laws and regulation for land use and development. The implementation of stormwater management criteria and standards at the local level are necessary, since municipalities are responsible for local land use decisions and planning. The degree of detail in the ordinances depends on the extent of existing and projected

development. The watershed stormwater management plan is designed to aid the municipality in setting standards for the land uses it has proposed. Municipalities within rapidly developing watersheds will benefit from the watershed stormwater management plan and will use the information for sound land use considerations. A major goal of the watershed plan and the attendant municipal regulations is to prevent future drainage problems and avoid the aggravation of existing problems.

There are 4 watersheds in Forest County: Tionesta Creek, Oil Creek, Upper Clarion River, and Lower Clarion River. Forest County Conservation District & Planning Department administers the Forest County Stormwater Management Ordinance Revised on behalf of all 9 municipalities under an annual MOU.

### *Comprehensive Plan*

A comprehensive plan is a policy document that states objectives and guides the future growth and physical development of a municipality. The comprehensive plan is a blueprint for housing, transportation, community facilities, utilities, and land use. It examines how the past led to the present and charts the community's future path. The Pennsylvania Municipalities Planning Code (MPC Act 247 of 1968, as reauthorized and amended) requires counties to prepare and maintain a county comprehensive plan. In addition, the MPC requires counties to update the comprehensive plan every 10 years.

With regard to hazard mitigation planning, Section 301.a(2) of the Municipality Planning Code requires comprehensive plans to include a plan for land use, which, among other provisions, suggests that the plan give consideration to floodplains and other areas of special hazards and other similar uses. The MPC also requires comprehensive plans to include a plan for community facilities and services, and recommends giving consideration to storm drainage and floodplain management.

Forest County has a county comprehensive plan that is dated May 2013.

Article III of the Municipality Planning Code (MPC) enables municipalities to prepare a comprehensive plan; however, development of a comprehensive plan is voluntary. Tionesta Borough within Forest County has a comprehensive plan, and the remaining municipalities utilize the county comprehensive plan.

### *Capital Improvements Plan*

The Capital Improvements Plan is a multi-year policy guide that identifies needed capital projects and is used to coordinate the financing and timing of public improvements. Capital improvements relate to streets, stormwater systems, water distribution, sewage treatment, and other major public facilities. A Capital Improvements Plan should be prepared by the respective county's planning department and should include a capital budget. This budget identifies the highest priority projects recommended for funding in the next annual budget. The Capital Improvements Plan is dynamic and can be tailored to specific circumstances. There are no municipalities within Forest County that have an identified Capital Improvements Plan.

### *Emergency Operations Plan*

Title 35, the Pennsylvania Emergency Management Services Code, requires all political jurisdictions to prepare, maintain and keep current a disaster emergency management plan for the prevention and minimization of injury and damage caused by disaster; prompt and effective response to disaster; and disaster emergency relief and recovery of consonance with the Pennsylvania Emergency Management Plan.

Forest County's Emergency Operations Plan (EOP) is an "all hazards" plan, 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 Forest County. The EOP, or portions thereof, would be implemented when emergency circumstances warranted. Forest County's EOP was adopted in July 2017.

#### **5.2.4** Administrative and Technical Capability

There is one (1) borough and eight (8) townships within Forest County. Each of these municipalities conducts its daily operations and provides various community services according to local needs and limitations. Some of these municipalities have formed cooperative agreements and work jointly with their neighboring municipalities to provide services such as police protection, fire and emergency response, infrastructure maintenance and water supply management. Others choose to operate on their own. Municipalities vary in staff size, resource availability, fiscal status, service provision, constituent population, overall size, and vulnerability to the profiled hazards.

### *County Planning Department*

In Pennsylvania, planning responsibilities traditionally have been delegated to each county and local municipality through the Municipalities Planning Code (MPC). A planning agency acts as an advisor to the governing body on matters of community growth and development. A governing body may appoint individuals to serve as legal or engineering advisors to the planning agency. In addition to the duties and responsibilities authorized by Article II of the MPC, a governing body may, by ordinance, delegate approval authority to a planning agency for subdivision and land development applications. A governing body has considerable flexibility, not only as to which powers and duties are assigned to a planning agency, but also as to what form an agency will possess. A governing body can create a planning commission, a planning department, or both. In Forest County the Planning Department is combined with the Forest County Conservation District.

### *Municipal Engineer*

A municipal engineer performs duties as directed in the areas of construction, reconstruction, maintenance and repair of streets, roads, pavements, sanitary sewers, bridges, culverts, and other engineering work. The municipal engineer prepares plans, specifications and estimates of the work undertaken by the township. Forest County Townships contract municipal engineers as needed.

### *Personnel Skilled in GIS or FEMA HAZUS Software*

A geographic information system (GIS) is an integrated, computer-based system designed to capture, store, edit, analyze and display geographic information. Some examples of uses for GIS technology

in local government are: land records management, land use planning, infrastructure management, and natural resources planning. A GIS automates existing operations such as map production and maintenance, saving a great deal of time and money. The GIS also includes information about map features such as the capacity of a municipal water supply or the acres of public land. Forest County has a 9-1-1 Coordinator that is skilled in GIS. There are no personnel in the county that are skilled in HAZUS.

#### *Emergency Management Coordinator*

Emergency Management is a comprehensive, integrated program of mitigation, preparedness, response, and recovery for emergencies/disasters of any kind. No public or private entity is immune to disasters, and no single segment of society can meet the complex needs of a major emergency or disaster on its own.

A municipal emergency management coordinator is responsible for emergency management – preparedness, response, recovery, and mitigation within his/her respective authority having jurisdiction (AHJ). The responsibilities of the emergency management coordinator are outlined in PA Title 35 §7503:

- Prepare and maintain a current disaster emergency management plan
- Establish, equip, and staff an emergency operations center
- Provide individuals and organizational training programs
- Organize and coordinate all locally available manpower, materials, supplies, equipment, and services necessary for disaster emergency readiness, response, and recovery
- Adopt and implement precautionary measures to mitigate the anticipated effects of a disaster
- Cooperate and coordinate with any public and private agency or entity
- Provide prompt information regarding local disaster emergencies to appropriate Commonwealth and local officials or agencies and the general public
- Participate in all tests, drills and exercises, including remedial drills and exercises, scheduled by the agency or by the federal government

Title 35 requires Forest County and its municipalities to have an emergency management coordinator.

#### **5.2.5** Fiscal Capability

Fiscal capability is significant to the implementation of hazard mitigation activities. Every jurisdiction must operate within the constraints of limited financial resources. The following information pertains to various financial assistance programs relevant to hazard mitigation.

### *State and Federal Grants*

During the 1960s and 1970s, state and federal grants-in-aid were available to finance a large number of municipal programs, including streets, water and sewer facilities, airports, parks and playgrounds. During the early 1980s, there was a significant change in federal policy, based on rising deficits and a political philosophy that encouraged states and local governments to raise their own revenues for capital programs. The result has been a growing interest in “creative financing”.

### *Capital Improvement Financing*

Because most capital investments involve the outlay of substantial funds, local governments can seldom pay for these facilities through annual appropriations in the annual operating budget. Therefore, numerous techniques have evolved to enable local government to pay for capital improvements over a time period exceeding one year. Public finance literature and state laws governing local government finance classify techniques that are used to finance capital improvements. The techniques include: revenue bonds; lease-purchase, authorities and special district; current revenue (pay-as-you-go); reserve funds; and tax increment financing.

### *Indebtedness through General Obligation Bonds*

Some projects may be financed with general obligation bonds. With this method, the jurisdiction's taxing power is pledged to pay interest and principal to retire debt. General obligation bonds can be sold to finance permanent types of improvements, such as schools, municipal buildings, parks, and recreation facilities. Voter approval may be required.

### *Municipal Authorities*

Municipal authorities are most often used when major capital investments are required. In addition to sewage treatment, municipal authorities have been formed for water supply, airports, bus transit systems, swimming pools, and other purposes. Joint authorities have the power to receive grants, borrow money, and operate revenue generating programs. Municipal authorities are authorized to sell bonds, acquire property, sign contracts, and take similar actions. Authorities are governed by authority board members, who are appointed by the elected officials of the member municipalities.

### *Sewer Authorities*

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

### *Water Authorities*

Water authorities are multi-purpose authorities with water projects, many of which operate both water and sewer systems. The financing of water systems for lease back to the municipality is among the principal activities of the local government facilities' financing authorities. An operating water authority issues bonds to purchase existing facilities or to construct, extend, or improve a system. The primary

source of revenue is user fees based on metered usage. The cost of construction or extending water supply lines can be funded by special assessments against abutting property owners. Tapping fees also help fund water system capital costs. Water utilities are also directly operated by municipal governments and by privately owned public utilities regulated by the PA Public Utility Commission. The PA Department of Environmental Protection has a program to assist with consolidating small water systems to make system upgrades more cost effective.

#### *Circuit Riding Program (Engineer)*

The Circuit Riding Program is an example of intergovernmental cooperation. This program offers municipalities the ability to join together to accomplish a common goal. The circuit rider is a municipal engineer who serves several small municipalities simultaneously. These are municipalities that may be too small to hire a professional engineer for their own operations, yet need the skills and expertise the engineer offers. Municipalities can jointly obtain what no one municipality could obtain on its own.

#### *NFPA 1600 – Standard on Disaster/Emergency Management and Business Continuity*

NFPA 1600 recommends a responsive financial management and administrative framework that complies with the authority having jurisdiction's (AHJ) program requirements and is uniquely linked to disaster/emergency operations. The framework should provide for maximum flexibility to expeditiously request, receive, manage, and apply funds in a non-emergency and emergency environment to ensure the timely delivery of assistance. The program should also be capable of capturing financial data for future costs recovery, as well as identifying and accessing alternative funding sources and managing budgeted and specially appropriated funds. It is equally important to have procedures in place that will allow an entity to expedite financial decision making and ensure proper accounting occurs.

### **5.2.6 Political Capability**

One of the most difficult capabilities to evaluate involves the political will of a jurisdiction to enact meaningful policies and projects designed to mitigate hazard events. The adoption of hazard mitigation measures may be seen as an impediment to growth and economic development. In many cases, mitigation may not generate interest among local officials when compared with competing priorities. Therefore, the local political climate must be considered when designing mitigation strategies, as it could be the most difficult hurdle to overcome in accomplishing the adoption or implementation of specific actions.

The *Capability Assessment Survey* was used to capture information on each jurisdiction's political capability. Survey respondents were asked to identify examples of political capability, such as guiding development away from hazard areas, restricting public investments or capital improvements within hazard areas, or enforcing local development standards that go beyond minimum state or federal requirements (i.e. building codes, floodplain management ordinances, etc...). These examples were used to guide respondents in scoring their community on a scale of "unwilling" (0) to "very willing" (5) to adopt policies and programs that reduce hazard vulnerabilities. Of the nine municipalities that responded, scores ranged from 0-5 with an average score of 4.0

### 5.2.7 Self-Assessment

In addition to the inventory and analysis of specific local capabilities, the *Capability Assessment Survey* required each local jurisdiction to conduct its own self-assessment of its capability to effectively implement hazard mitigation activities. As part of this process, county and municipal officials were encouraged to consider the barriers to implementing proposed mitigation strategies in addition to the mechanisms that could enhance or further such strategies. In response to the survey questionnaire, local officials classified each of the capabilities as either “L= limited” “M= moderate” or “H= high.” Table 5.2-2 summarizes the results of the self- assessment survey.

**Table 5.2-2: Forest County Capability Self-Assessment Matrix**

Municipality Name	Capability Category			
	Planning and Regulatory Capability	Administrative and Technical Capability	Fiscal Capability	Community Political Capability
Barnett Township	H	L	M	H
Green Township	L	L	L	L
Harmony Township	Did not participate in this survey			
Hickory Township	H	H	L	H
Howe Township	Did not participate in this survey			
Jenks Township	H	L	L	H
Kingsley Township	H	H	L	L
Tionesta Borough	H	H	L	H
Tionesta Township	Did not participate in this survey			



### 5.2.8 Existing Limitations

Funding has been identified as the largest limitation for a municipality to complete mitigation activities. The acquisition of grants is the best way to augment this process for the municipalities. The county and municipalities representatives will need to rely on regional, state and federal partnerships for future financial assistance. Development of intra-county regional partnerships and intra-municipality regional partnerships will bolster this process.

## 6. Mitigation Strategy

### 6.1 Update Process Summary

Mitigation *goals* are general guidelines that explain what the county wants to achieve. Goals are usually expressed as broad policy statements representing desired long-term results. Mitigation *objectives* describe strategies or implementation steps to attain the identified goals. Objectives are more specific statements than goals; the described steps are usually measurable and can have a defined completion date. There were five goals and no objectives identified in the 2008 hazard mitigation plan. The 2014 Forest County Hazard Mitigation Plan Update has five goals and twenty objectives. Objectives have been added and arranged in order to associate them with the most appropriate goal. These changes are noted in Table 6.1-1. A list of these goals and objectives as well as a review summary based on comments received from stakeholders who participated in the HMP update process is included in Table 6.1-1. These reviews are based on the *5-Year Hazard Mitigation Plan Review Worksheet*, which includes a survey on existing goals and objectives, completed by the Local Planning Team. Municipal officials then provided feedback on the changes to the goals and objectives via a Mitigation Strategy Update meeting which was held on November 14, 2013. The Local Planning Team met on October 22, 2020 at the regular Forest County Conservation District & Planning Department Board meeting and approved the Forest County Mitigation Goals and Objectives as written. Copies of these meetings and all documentation associated with the meetings are located in **Appendix C**.

Actions provide more detailed descriptions of specific work tasks to help the county and its municipalities achieve prescribed goals and objectives. Forest County Representatives were unable to provide any of the previous actions that were associated with the 2008 Forest County Hazard Mitigation Plan. Research was completed to attempt to retrieve any previous actions. The mitigation actions appendix of the 2008 hazard mitigation plan was blank. No digital or hard copy outlining these actions was ever discovered. The hazard mitigation project team and the local planning team stated that new actions would be developed as part of the hazard mitigation plan update for 2014. The hazard mitigation project team and the local planning team stated that no changes were necessary for 2020.

**Table 6.1-1: Forest County Mitigation Goals and Objectives Review Worksheet**

1.1	Develop brochures, pamphlets and other handouts to high and moderate risk hazards
1.2	Utilize public service announcements and local newspapers
1.3	Coordinate workshops to increase awareness
1.4	Utilize websites and other multimedia resources to disseminate public information in reference to hazard mitigation
1.5	Publicize the hazard mitigation plan and encourage participation
<b>GOAL 2</b>	<i>Integrate hazard mitigation concepts into local planning efforts.</i>
2.1	Incorporate risk assessment and hazard mitigation principles into the county comprehensive plan
2.2	Increase working relationships with county, state and other government agencies that are dedicated to the preservation and restoration of natural areas and their natural functions
2.3	Review county or municipal plans to incorporate hazard mitigation principles
<b>GOAL 3</b>	<i>Protect public health and safety by increasing public warning and communication capabilities.</i>
3.1	Review and enhance effectiveness of warning systems in Forest County
3.2	Explore emergency notification systems and research grant opportunities
3.3	Review cellular phone coverage in the county

**Table 6.1-1: Forest County Mitigation Goals and Objectives Review Worksheet**

<b>GOAL 4</b>	<i>Reduce the potential impact of identified natural and man-made hazards.</i>
4.1	Enhance mapping capabilities with hazard mitigation concepts and data
4.2	Enhance and enforce uniformed construction codes at the municipal level
4.3	Identify special needs citizens and facilities
4.4	Protect infrastructure and critical facilities from identified hazards
<b>GOAL 5</b>	<i>Reduce current and future risk from flooding and flash flooding</i>
5.1	Update floodplain regulations in accordance with the Department of Community and Economic Development (DCED) Pennsylvania State Floodplain model ordinance
5.2	Encourage municipal participation in the national flood insurance program (NFIP)
5.3	Research possible mitigation projects to reduce flooding and flash flooding
5.4	Remove or relocate existing structures in the flood hazard areas
5.5	Implement project opportunities and other structural projects to reduce flooding risk
5.6	Develop, implement and enforce a county stormwater management plan

## 6.2 Mitigation Goals and Objectives

Based on results of the goals and objectives evaluation exercise and input from the local planning team, a list of five goals and twenty corresponding objectives was developed. Table 6.2-1 details the mitigation goals and objectives established for the 2014 Forest County Hazard Mitigation Plan Update. The mitigation goals and objectives remain the same for the 2020 Forest County Hazard Mitigation Plan Update.

Table 6.2-1: Forest County 2020 Goals and Objectives	
<b>GOAL 1</b>	<i>Increase public awareness of existing hazards and conduct public outreach</i>
Objective 1.1	Develop brochures, pamphlets and other handouts for high and moderate risk hazards
Objective 1.2	Utilize public service announcements and local newspapers
Objective 1.3	Coordinate workshops and public event presentation to increase awareness
Objective 1.4	Utilize websites and other multimedia resources to disseminate public information in reference to hazard mitigation
Objective 1.5	Publicize the hazard mitigation plan and encourage participation
<b>GOAL 2</b>	<i>Integrate hazard mitigation concepts into local planning efforts</i>
Objective 2.1	Incorporate risk assessment and hazard mitigation principles into the county comprehensive plan
Objective 2.2	Increase working relationships between county, state and other government agencies
Objective 2.3	Review county or municipal plans to incorporate hazard mitigation principles
<b>GOAL 3</b>	<i>Protect public health and safety by increasing public warning and communication capabilities</i>
Objective 3.1	Review and enhance effectiveness of warning systems in Forest County
Objective 3.2	Explore emergency notification systems and research grant opportunities
Objective 3.3	Review cellular phone coverage and leverage the wireless providers to increase coverage in the county
<b>GOAL 4</b>	<i>Reduce the potential impact of identified natural and man-made hazards</i>
Objective 4.1	Enhance mapping capabilities with hazard mitigation concepts and data
Objective 4.2	Enhance and enforce uniformed construction codes at the municipal level
Objective 4.3	Identify special needs citizens and facilities
Objective 4.4	Protect infrastructure and critical facilities from identified hazards
<b>GOAL 5</b>	<i>Reduce current and future risk from flooding and flash flooding</i>
Objective 5.1	Update floodplain regulations in accordance with the Department of Community and Economic Development (DCED) Pennsylvania State Floodplain model ordinance
Objective 5.2	Encourage and educate municipalities on participation in the national flood insurance program (NFIP)
Objective 5.3	Research additional mitigation projects or actions and implement municipal mitigation project opportunities as grant funding is available
Objective 5.4	Explore the removal or relocation of existing structures in the flood hazard areas
Objective 5.5	Develop or amend plans and ordinances to help reduce the risk of flooding

## 6.3 Identification and Analysis of Mitigation Techniques

The Pennsylvania Emergency Management Agency standard operating guide for hazard mitigation provides a comprehensive list of hazard mitigation ideas. Forest County used this guide to identify mitigation techniques and develop mitigation actions. There are four categories of mitigation actions which Forest County considered in developing its Mitigation Action Plan. A designation of how each category will protect or reduce the impact of specific hazards on new and existing buildings is included in each section. Those four categories of mitigation actions are:

**6.3.1 Local Plans and Regulations:** These actions include government authorities, policies, or codes that influence the way land and buildings are developed and built. Some examples are: Comprehensive Plans, Land Use Ordinances, Subdivision regulations, Development review, Building codes and enforcement, NFIP and CRS, Capital improvement programs, Open space preservation, Stormwater management regulations and master plans.

**6.3.2 Structure and Infrastructure:** These actions involve modifying existing structures and infrastructure or constructing new structures to reduce hazard vulnerability. Some examples are: Acquisitions and elevations of flood prone structures, utility undergrounding, Structural retrofits, Floodwalls and retaining walls, Detention and retention structures, Bridges and culverts, Safe rooms.

**6.3.3 Natural Systems Protection:** These actions minimize damage and losses and also preserve or restore the functions of natural systems. Some examples are: Sediment and erosion control, Stream corridor restoration, Forest Management, Conservation easements, Wetland restoration and preservation.

**6.3.4 Education and Awareness:** These actions inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them and may also include participation in national programs. Some examples are: Radio or television spots, websites with maps and information, Real Estate disclosure, Training, NFIP outreach, Storm Ready, Firewise Communities.

Table 6.3-1 provides a matrix identifying the mitigation techniques used for the moderate and high-risk hazards in the county. The specific actions associated with these techniques are included in Table 6.4-1.

<b>Table 6.3-1 Forest County Mitigation Strategy Technique Matrix</b>				
<b>HAZARD</b>	<b>MITIGATION TECHNIQUE</b>			
	<b>Local Plans and Regulations</b>	<b>Structure and Infrastructure</b>	<b>Natural Systems Protection</b>	<b>Education and Awareness</b>
Drought				X
Earthquake				X
Flood, Flash Flood, and Ice Jams	X	X	X	X
Hurricane and Tropical Storm		X	X	X
Invasive Species				X
Landslides	X	X	X	X
Lightning Strike				X
Pandemic				X
Radon Exposure				X
Tornadoes and Windstorms		X	X	X
Wildfire	X			X
Winter Storms				X
Civil Disturbance				X
Dam Failure		X		X
Disorientation				X
Environmental Hazards	X		X	X
Transportation Accidents			X	X

## 6.4 Mitigation Action Plan

The Forest County Hazard Mitigation Local Planning Team (LPT) immediately began work on the mitigation strategy section of the 2020 HMP update after the risk assessment section was completed. The LPT started this section by reviewing the 2014 HMP mitigation strategy section. A review of the previous goals, objectives, actions and project opportunities documented in the 2014 HMP was conducted. The next step the LPT completed was the reviewing and updating of actions identified in the 2014 HMP update. The LPT reviewed and approved all of this information at the Forest County Conservation District Board Meeting on October 22, 2020.

The LPT identified the following accomplishments since the development of the 2014 Forest County Hazard Mitigation Plan. Those accomplishments are identified in the following bullet items:

- The Forest County Subdivision and Land Development Ordinance was updated and adopted. (The Forest County Stormwater Ordinance was incorporated into the Updated SALDO)
- The Forest County Stormwater Ordinance was revised and adopted by the County.
- A Forest County Community Wildfire Protection Plan was adopted by the County.
- Work with cellular telephone providers was conducted to add coverage throughout the county to enhance public safety.
- Dirt, Gravel, & Low Volume Program funding was increased to decrease flooding along roads that intersect with streams.

The municipalities were notified of draft mitigation actions and encouraged to provide new mitigation actions that could be incorporated into the plan. Municipalities were solicited for new project opportunities.

The previous 2014 HMP was not integrated into any planning mechanisms or updates.

Table 6.4-1 is the 2020 Forest County Mitigation Action Plan. Table 6.4-2 is a matrix that identifies the county and/or municipalities responsible for which mitigation actions in the new mitigation action plan.



**Table 6.4-1: Forest County 2020 Mitigation Action Plan**

Action Number	Mitigation Actions		Hazard Vulnerability	Benefit/Cost Prioritization			Implementation			Estimated Cost
	Category	Description/Action Items		High	Medium	Low	Schedule	Funding	Responsibility	
1.1.1	Education and Awareness	Conduct outreach to educate the public to report suspicious activities around gas well sites and transmission gas lines.	Environmental Hazards and Utility Interruptions	X			2020-2024	Local	County EMA and State Police	Under \$500
1.1.2	Education and Awareness	Develop a brochure to educate the public about the dangers of radon and the impacts in Forest County.	Radon		X		2020-2024	PDM or HMGP	County EMA	\$500-\$1,000
1.1.3	Education and Awareness	Ensure maps are available at key tourist and recreational areas for public access to decrease disorientation.	Disorientation		X		2020-2024	Local	County EMA and Assessment Office	\$500-\$1,000
1.1.4	Education and Awareness	Develop a brochure to encourage farmers to implement soil and water conservation practices that foster soil health and improve soil quality to help increase resiliency and mitigate the impacts of droughts.	Drought		X		2020-2024	Local	Forest County Planning Team	Under \$500
1.1.5	Education and Awareness	Develop a brochure to educate the public about identifying and reporting the presence of Invasive Species.	Invasive Species			X	2020-2024	Local	Forest County Planning Team	Under \$500
1.2.1	Education and Awareness	Develop public service announcements to utilize prior to winter storms that identify risks and how to prepare for storms	Winter Storms		X		2020-2024	Local	County EMA	Under \$500
1.2.2	Education and Awareness	Contact the Pennsylvania Department of Health to assist with public service announcements that identify how individuals and families can be immunized against communicable diseases like the flu	Pandemic		X		2020-2024	Local	County EMA	Under \$500
1.3.1	Education and Awareness	Work with insurance companies to conduct free workshops on how to protect residential components from the impact of lightning strikes	Lightning Strikes		X		2020-2024	Local	County EMA	Under \$500
2.1.1	Local Plans and Regulations	Complete a review of the current county comprehensive plan to identify hazard mitigation concepts and strategies from the 2020 mitigation plan and then place them in the comprehensive plan through an addendum	All Hazards	X			2020-2024	Local	Forest County Planning Team	Under \$500

**Table 6.4-1: Forest County 2020 Mitigation Action Plan**

Action Number	Mitigation Actions		Hazard Vulnerability	Benefit/Cost Prioritization			Implementation			Estimated Cost
	Category	Description/Action Items		High	Medium	Low	Schedule	Funding	Responsibility	
2.3.1	Education and Awareness	Conduct a commodity flow study to determine hazardous materials that are transported through Forest County	Transportation Accidents		X		2020-2024	HMEP	Forest County Planning Team	\$5,000
2.3.2	Local Plans and Regulations	Incorporate Stormwater Management BMPs into the next update of the County Stormwater Plan that support a comprehensive approach to collecting, treating, and even reusing water to help mitigate drought	Drought	X			2020-2024	Local	Forest County Planning Department	Unknown
2.3.3	Local Plans and Regulations	Ensure any zoning ordinances encourage higher densities outside of known hazard areas	All Hazards		X		2020-2024	Local	Municipalities	\$500
2.3.4	Local Plans and Regulations	Expand the Emergency Action Plan to include responses to threats of Civil Disturbance	Civil Disturbance			X	2020-2024	Local	County EMA	Under \$500
3.1.1	Education and Awareness	Encourage NOAA alert radio use by homeowners, businesses and special needs facilities	All Hazards		X		2020-2024	Local	County EMA	\$500
3.1.2	Education and Awareness	Educate the citizens and visitors of Forest County to what the audible siren alerts mean	Tornadoes and Windstorms		X		2020-2022	Local	County EMA	Under \$500
3.2.1	Education and Awareness	Research grant opportunities to purchase an emergency notification system	All Hazards	X			2020-2024	Local	County EMA	Under \$500
3.2.2	Education and Awareness	Improve hazard warnings and evacuation notices to residents/business owners with an emergency notification system	Flooding, Tornado and Winter Storms			X	2020-2024	PDM, FMA, HMGP	County EMA	\$25,000 - \$50,000

**Table 6.4-1: Forest County 2020 Mitigation Action Plan**

Action Number	Mitigation Actions		Hazard Vulnerability	Benefit/Cost Prioritization			Implementation			Estimated Cost
	Category	Description/Action Items		High	Medium	Low	Schedule	Funding	Responsibility	
3.3.1	Structure and Infrastructure	Review cellular coverage and emergency services access in the Cooks Forest Area and contact cellular companies to champion improvements in this high tourist area	All Hazards		X		2020-2024	Local	County EMA	Under \$500
3.3.3	Structure and Infrastructure	Conduct meetings with the landline telephone companies to ensure all back-up solutions and technologies receive maintenance to ensure operations during emergencies and utility outages.	All Hazards/Utility Interruptions	X			2020-2024	Local	County EMA	Under \$500
4.1.1	Education and Awareness	Develop and maintain a database to track community vulnerability to landslides	Landslides			X	2020-2024	Local	Forest County Planning Team	Under \$500
4.1.2	Education and Awareness	Perform an analysis of potentially affected areas for the Tionesta Dam	Dam Failure		X		2020-2024	Local	County EMA	\$4,000
4.2.1	Structure and Infrastructure	Encourage municipalities to adopt and enforce updated building code provisions to reduce Earthquake, and Hurricane and Tropical Storm damage to structures.	Earthquake, Hurricane and Tropical Storm			X	2020-2024	Local	Forest County Planning Team	Under \$500
4.3.1	Education and Awareness	Identify special needs groups and individuals for planning and emergency response by contacting human service agencies and other agencies that can assist with this task	All Hazards/Utility Interruptions		X		2020-2022	Local	County EMA, Area Agency on Aging, and Human Services	\$1000
4.3.2	Education and Awareness	Develop an outreach program to identify special needs population and then develop a system to document individuals throughout the county by municipality	All Hazards			X	2020-2024	Local	Forest County Human Services	\$5,000
4.4.1	Structure and Infrastructure	Review high risk dam emergency plans annually	Dam Failure	X			2020-2024	Local	County EMA/ Army Corp of Engineers	Under \$500

**Table 6.4-1: Forest County 2020 Mitigation Action Plan**

Action Number	Mitigation Actions		Hazard Vulnerability	Benefit/Cost Prioritization			Implementation			Estimated Cost
	Category	Description/Action Items		High	Medium	Low	Schedule	Funding	Responsibility	
4.4.3	Local Plans and Regulations	Encourage continuity of operations planning for businesses in the county by providing brochures outlining requirements	All Hazards		X		2020-2024	Local	County EMA/ Forest County Planning Team	\$500
4.4.4	Local Plans and Regulations	Update the countywide Firewise Plan	Wildfire		X		2020-2024	Local	County EMA and Forest County	\$500
5.2.3	Education and Awareness	Conduct National Flood Insurance Program community workshops and provide brochures that provide information and incentives for property owners to acquire flood insurance	Flooding	X			2020-2024	Local	County EMA	\$500
5.4.1	Structure and Infrastructure	Acquire land with structures that repetitively flood or are designated as repetitive loss properties and deed the property to the municipality, raise Elevations and Demolition/Reconstruction of affected properties	Flooding			X	As soon as grant funding is available	FMA, HMGP	Municipal Governments	Varies
5.4.2	Structure and Infrastructure	Support and assist municipal governments with the protection or removal of repetitive loss properties	Flooding			X	2020-2024	FMA, HMGP	County EMA and Municipal Governments	Varies
5.5.1	Local Plans and Regulations	Continue to implement and revise as necessary the Forest County storm water management plan which covers all municipalities	Flooding	X			2020-2024	PDM, FMA, HMGP	County Planning Department	\$500-\$1,000

**Table 6.4-2: Hazard Mitigation Actions – Municipal Checklist**

Municipality	Mitigation Actions													
	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.2.1	1.2.2	1.3.1	2.1.1	2.3.1	2.3.2	2.3.3	2.3.4	3.1.1
Forest County	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Barnett Township								x				x		x
Green Township								x				x		x
Harmony Township								x				x		x
Hickory Township								x				x		x
Howe Township								x				x		x
Jenks Township								x				x		x
Kingsley Township								x				x		x
Tionesta Borough								x				x		x
Tionesta Township								x				x		x

**Table 6.4-2: Hazard Mitigation Actions – Municipal Checklist**

Municipality	Mitigation Actions									
	3.1.2	3.2.1	3.2.2	3.3.1	3.3.3	4.1.1	4.1.2	4.2.1	4.3.1	4.3.2
Forest County	X	X	X	X	X	X	X	X	X	X
Barnett Township	X		X					X		X
Green Township	X		X					X		X
Harmony Township	X		X					X		X
Hickory Township	X		X					X		X
Howe Township	X		X					X		X
Jenks Township	X		X					X		X
Kingsley Township	X		X					X		X
Tionesta Borough	X		X					X		X
Tionesta Township	X		X					X		X

**Table 6.4-2: Hazard Mitigation Actions – Municipal Checklist**

Municipality	Mitigation Actions									
	4.4.1	4.4.3	4.4.4	5.2.3	5.4.1	5.4.2	5.5.1			
Forest County	X	X	X	X	X	X	X			
Barnett Township			X	X	X	X	X			
Green Township			X	X	X	X	X			
Harmony Township			X	X	X	X	X			
Hickory Township			X	X	X	X	X			
Howe Township			X	X	X	X	X			
Jenks Township			X	X	X	X	X			
Kingsley Township			X	X	X	X	X			
Tionesta Borough			X	X	X	X	X			
Tionesta Township			X	X	X	X	X			

*National Flood Insurance Program (NFIP) Related Mitigation Actions*

FEMA requires that every participating jurisdiction that either participates in the NFIP or has identified Special Flood Hazard Areas (SFHAs) have at least one specific action in its mitigation action plan that relates to continued compliance with the NFIP. Action numbers; 5.2.1 and 5.2.3 comply for Forest County and all its municipalities.

*Evaluate and Prioritize Mitigation Actions*

Each Hazard Mitigation Action was evaluated utilizing the Multi-Objective Mitigation Action Prioritization Method, developed by the State Hazard Mitigation Planning Team to prioritize and score hazard mitigation actions.

MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION METHOD		
Mitigation Action Ranking Criteria	Criteria Description	Weight Value
Effectiveness	The extent to which an action reduces the vulnerability of people and property.	20%
Efficiency	The extent to which time, effort, and cost is well used as a means of reducing vulnerability.	30%
Multi-Hazard Mitigation	The action reduces vulnerability for more than one hazard.	20%
Addresses High Risk Hazard	The action reduces vulnerability for people and property from a hazard(s) identified as high risk.	15%
Addresses Critical Communications/Critical Facilities	The action pertains to the maintenance of critical functions and structures such as transportation, supply chain management, data circuits, etc.	15%

Applying these mitigation action assessment criteria will result in an overall score between 0 and 3 where a score of 0 is of the lowest priority and a score of 3 is of the highest priority. Mitigation actions can be categorized as High, Medium, and Low as follows:

Prioritization Category	Prioritization Score
High	2.5 - 3.0
Medium	1.9 - 2.4
Low	0 - 1.8

Table 6.4-3 Shows the results of the mitigation action prioritization.



**Table 6.4-3 MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION MATRIX**

MITIGATION ACTION		EFFECTIVENESS (20%)	EFFICIENCY (30%)	MULTI-HAZARD MITIGATION (20%)	ADDRESS HIGH RISK HAZARD (15%)	ADDRESS CRITICAL COMMUNICATION FACILITIES (15%)	TOTAL SCORE
1.1.1	Conduct outreach to educate the public to report suspicious activities around gas well sites and transmission gas lines.	3	2	0	0	2	1.5
1.1.2	Develop a brochure to educate the public about the dangers of radon and the impacts in Forest County.	3	3	0	0	0	1.5
1.1.3	Ensure maps are available at key tourist and recreational areas for public access to decrease disorientation.	3	2	0	0	0	1.2
1.1.4	Develop a brochure to encourage farmers to implement soil and water conservation practices that foster soil health and improve soil quality to help increase resiliency and mitigate the impacts of droughts	2	1.5	1	0	0	1.05
1.1.5	Develop a brochure to educate the public about identifying and reporting the presence of invasive species.	1.5	1.5	1	1	0.5	1.175
1.2.1	Develop public service announcements to utilize prior to winter storms that identify risks and how to prepare for storms	3	3	3	3	3	3
1.2.2	Contact the Pennsylvania Department of Health to assist with public service announcements that identify how individuals and families can be immunized against communicable diseases like the flu	2	2	1	2	0	1.5
1.3.1	Work with insurance companies to conduct free workshops on how to protect residential components from the impact of lightning strikes	3	3	0	0	0	1.5
2.1.1	Complete a review of the current county comprehensive plan to identify hazard mitigation concepts and strategies from the 2020 mitigation plan and then place them in the comprehensive plan through an addendum	2	2	3	3	3	2.5
2.3.1	Conduct a commodity flow study to determine hazardous materials that are transported through Forest County	1.5	1.5	0.5	0.5	1.5	1.15

**Table 6.4-3 MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION MATRIX**

MITIGATION ACTION		EFFECTIVENESS (20%)	EFFICIENCY (30%)	MULTI-HAZARD MITIGATION (20%)	ADDRESS HIGH RISK HAZARD (15%)	ADDRESS CRITICAL COMMUNICATION FACILITIES (15%)	TOTAL SCORE
2.3.2	Incorporate Stormwater Management BMPs into the next update of the County Stormwater Plan that support a comprehensive approach to collecting, treating, and even reusing water to help mitigate drought	3	3	3	3	3	3
2.3.3	Ensure any zoning ordinances encourage higher densities outside of known hazard	3	3	3	3	3	3
2.3.4	Expand the Emergency Action Plan to include responses to threats of Civil Disturbance	1.5	2.5	1.5	0.5	0	1.425
3.1.1	Encourage NOAA alert radio use by homeowners, businesses and special needs facilities	2	2	2	2	2	2
3.1.2	Educate the citizens and visitors of Forest County to what the audible siren alerts mean	3	3	3	3	2	2.85
3.2.1	Research grant opportunities to purchase an emergency notification system	2	2	2	2	2	2
3.2.2	Improve hazard warnings and evacuation notices to residents/business owners with an emergency notification system	2	2	2	2	2	2
3.3.1	Review cellular coverage and emergency services access in the Cooks Forest Area and contact cellular companies to champion improvements in this high tourist area	2	1	1	1	1	1.2
3.3.3	Conduct meetings with the landline telephone companies to ensure all back- up solutions and technologies receive maintenance to ensure operations during emergencies and utility outages.	2	2	3	3	3	2.5
4.1.1	Develop and maintain a database to track community vulnerability to landslides	1	1	1.5	0.5	1.5	1.1
4.1.2	Perform an analysis of potentially affected areas for the Tionesta Dam	1.5	1.5	1.5	2.5	1.5	1.65

**Table 6.4-3 MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION MATRIX**

MITIGATION ACTION		EFFECTIVENESS (20%)	EFFICIENCY (30%)	MULTI-HAZARD MITIGATION (20%)	ADDRESS HIGH RISK HAZARD (15%)	ADDRESS CRITICAL COMMUNICATION FACILITIES (15%)	TOTAL SCORE
4.2.1	Encourage municipalities to adopt and enforce updated building code provisions to reduce Earthquake, Hurricane and Tropical Storm damage to structures.	2.5	5.5	1.5	0.5	1.5	1.85
4.3.1	Identify special needs groups and individuals for planning and emergency response by contacting human service agencies and other agencies that can assist with this task	3	2	2	2	1	2.05
4.3.2	Develop an outreach program to identify special needs population and then develop a system to document individuals throughout the county by municipality	3	2	2	2	1	2.05
4.4.1	Review high risk dam emergency plans annually	2	2	0	0	1	1.15
4.4.3	Encourage continuity of operations planning for businesses in the county by providing brochures outlining requirements	3	2	2	2	2	2.2
4.4.4	Update the countywide Firewise Plan	0.5	1.5	0.5	0.5	0.5	0.8
5.2.3	Conduct National Flood Insurance Program community workshops and provide brochures that provide information and incentives for property owners to acquire flood insurance	2	2	2	1	1	1.7
5.4.1	Acquire land with structures that repetitively flood or are designated as repetitive loss properties and deed the property to the municipality	1	1	0	0	0	0.5
5.4.2	Support and assist municipal governments with the protection or removal of repetitive loss properties	1	1	0	0	0	0.5
5.5.1	Continue to implement and revise as necessary the Forest County storm water management plan which covers all municipalities	2	3	2	2	1	2.15

## 7. Plan Maintenance

### 7.1 Update Process Summary

Monitoring, evaluating and updating this plan, is critical to maintaining its value and success in Forest County's hazard mitigation efforts. Ensuring effective implementation of mitigation activities paves the way for continued momentum in the planning process and gives direction for the future. This section explains who will be responsible for maintenance activities and what those responsibilities entail. It also provides a methodology and schedule of maintenance activities including a description of how the public will be involved on a continued basis. The Forest County HMP Local Planning Team decided to continue the current maintenance procedures. The 2014 HMP update established a review of the plan within 30 days of a disaster event in addition to continuing with an annual plan evaluation. This HMP update also defined the municipalities' role in updating and evaluating the plan. Finally, the 2014 HMP Update encouraged continued public involvement and how this plan may be integrated into other planning mechanisms in the county.

### 7.2 Monitoring, Evaluating, and Updating the Plan

Hazard mitigation planning in Forest County is a responsibility of all levels of government (i.e., county and local), as well as the citizens of the county. The Forest County Local Planning Team will be responsible for maintaining this Multi-Jurisdictional HMP. The Local Planning Team will meet annually and following each emergency declaration to review the plan. Every municipality that has adopted this plan will also be afforded the opportunity to provide updated information or information specific to hazards encountered during a disaster after a disaster declaration. Each review process will ensure that the hazard vulnerability data and risk analysis reflect current conditions of the county, that the capabilities assessment accurately reflects local circumstances, and that the hazard mitigation strategies are updated based on the county's damage assessment reports and local mitigation project priorities. The HMP must be updated on a five-year cycle. An updated HMP must be completed and approved by the end of the five-year period. The monitoring, evaluating, and updating of the plan every five years will rely heavily on the outcomes of the annual HMP Planning Team meetings.

The Forest County Local Planning Team will complete a Hazard Mitigation Progress Report to evaluate the status and accuracy of the Multi-Jurisdictional HMP, and record the local planning team's review process. The Forest County Emergency Management Agency will maintain a copy of these records and place them in **Appendix J** of this plan. Forest County will continue to work with all municipalities regarding hazard mitigation projects, especially those municipalities that did not submit projects for inclusion in this plan.

## 7.3 Incorporation into Other Planning Mechanisms

### [Forest County Comprehensive Plan](#)

Article III of the Pennsylvania Municipalities Planning code (Act 247 of 1968, as reenacted and amended) requires all Pennsylvania counties (except Philadelphia) to adopt a comprehensive plan and update it at least every 10 years. The Forest County Commissioners adopted the updated Forest County Comprehensive Plan in May 2013.

The Forest County Conservation District and Planning Department is responsible for maintaining and updating the Forest County Comprehensive Plan and the County Subdivision and Land Development Ordinance. It uses this information to identify necessary revisions and to amend both the Comprehensive Plan and the Subdivision and Land Development Ordinance.

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

The next scheduled complete update of the comprehensive plan will be by 2023, based on the municipalities planning code's 10-year review cycle. Certain sections of the county comprehensive plan may be updated prior to 2023. Coupling this requirement with the DMA 2000-required five-year update cycle for county hazard mitigation plans, when possible, will allow the county to better integrate the Forest County Comprehensive Plan and the Forest County Hazard Mitigation Plan planning processes and strengthen public participation for both efforts.

The risk assessment section 4.3.1 through 4.3.20, Section 4.4.4 and the mitigation strategy section 6 of the Forest County Hazard Mitigation Plan will provide valuable information for the update of the next comprehensive plan and any section specific updates prior to 2023. Consideration and incorporation of data from this plan will ensure the inclusion of hazard mitigation practices in this county comprehensive plan.

### [Forest County Emergency Operations Plan](#)

The Pennsylvania Emergency Management Services Code, 35 PA C.S. Sections 7701-7707, as amended, requires each county and municipality to prepare, maintain, and keep current an Emergency Operations Plan (EOP). Forest County Emergency Management Agency is responsible for preparing and maintaining the County's EOP, which applies to both the county and municipal emergency management operations and procedures.

The EOP is reviewed at least biennially. Whenever portions of the plan are implemented in an emergency event or training exercise, a review is performed and changes are made where necessary. These changes are then distributed to the county's municipalities.

The complete risk assessment section, mitigation actions and mitigation project opportunities identified in the Forest County Hazard Mitigation Plan will assist with hazard specific risk and vulnerability. Understanding the risks and vulnerability in the county and municipalities will allow for emergency management and other response agencies to better direct planning, response and recovery aspects.

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

#### *Plan Interrelationships*

Ensuring consistency between these planning mechanisms is critical. In fact, Section 301 (4.1) of the Pennsylvania Municipalities Planning Code requires that comprehensive plans include a discussion of the interrelationships among their various plan components, “which may include an estimate of the environmental, energy conservation, fiscal, economic development, and social consequences on the environment.”

To that end, Forest County and its municipalities must ensure that the components of the hazard mitigation plan are integrated into existing community planning mechanisms and are generally consistent with goals, policies, and recommended actions. Forest County and the hazard mitigation planning team will utilize the existing maintenance schedule of each plan to incorporate the goals, policies, and recommended actions as each plan is updated. The 2014 update was not integrated into any plans as the only plan that was updated since 2014 was the Subdivision and Land Development Ordinance.

## **7.4 Continued Public Involvement**

The Forest County Planning Department will ensure that the 2020 Forest County Hazard Mitigation Plan is posted and maintained on the Forest County website and will continue to encourage public review and comment on the plan. The Forest County website that the plan will be located at is as follows: [www.co.forest.pa.us](http://www.co.forest.pa.us)

The citizens of Forest County are encouraged to submit their comments to elected officials and/or members of the Forest County HMP Local Planning Team. To promote public participation, the Forest County Local Planning Team will post a public comment form as well as the Hazard Mitigation Project Opportunity Form on the county’s website. These forms will offer the public various opportunities to supply their comments and observations. All comments received will be maintained and considered by the Forest County Hazard Mitigation Planning Team.

## 8. Plan Adoption

### 8.1 Resolutions

In accordance with federal and state requirements, the governing bodies of each participating jurisdiction must review and adopt by resolution, the 2020 Forest County Hazard Mitigation Plan. Copies of the adopting resolutions are included in this plan in **Appendix K**. FEMA Region III in Philadelphia is the final approval authority for the Hazard Mitigation Plan. PEMA also reviews the plan before submission to FEMA.