

**Certification of Annual Review Meetings**

YEAR	DATE OF MEETING	PUBLIC OUTREACH ADDRESSED?*	SIGNATURE
2015			
2016			
2017			
2018			
2019			

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

## Record of Changes

DATE	DESCRIPTION OF CHANGE MADE, MITIGATION ACTION COMPLETED, OR PUBLIC OUTREACH PERFORMED	CHANGE MADE BY (PRINT NAME)	CHANGE MADE BY (SIGNATURE)
09/02/2014	Updated profiles for all hazards from the previous mitigation plan and added extreme temperatures, invasive species and radon exposure. Updated the mitigation action plan and worked with the municipalities to develop new project opportunities.	Michael T. Rearick	
12/17/2014	Completed additional revisions required by FEMA. Updated hazard profiles. Added the Levee Failure profile.	Michael T. Rearick	

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

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# **1. Introduction**

## **1.1 Background**

The Bradford County Board of Commissioners, in response to the Disaster Mitigation Act of 2000 (DMA 2000), spearheaded a county-wide hazard mitigation planning effort to prepare, adopt, and implement a multi-jurisdictional Hazard Mitigation Plan (HMP) for Bradford County and all of its 51 municipalities. The Bradford County Department of Public Safety was charged by the County Board of Commissioners to prepare the 2009 plan. The 2009 HMP has been utilized and maintained during the 5 year life cycle. The 2009 HMP was a foundation for the recovery and mitigation efforts after Tropical Storm Lee in 2011.

On June 27, 2013, the Bradford County Commissioners were successful in securing hazard mitigation grant funding to update the county hazard mitigation plan. The funding was available due to federal response and mitigation from severe flooding in 2011 and the subsequent issuance of a presidential disaster declaration in Pennsylvania. The Bradford County Commissioners again assigned the Bradford County Department of Public Safety with the primary responsibility to update the hazard mitigation plan. MCM Consulting Group, Inc. was selected and hired to complete the update of the HMP. A local hazard mitigation planning team was developed. The team was comprised of government leaders and citizens from Bradford County. This updated HMP will provide another solid foundation for the Bradford 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 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 Bradford County Multi-Jurisdictional Hazard Mitigation Plan (HMP) serves as a framework for saving lives, protecting assets, and preserving the economic viability of Bradford County and the 51 municipalities located in Bradford County. The HMP outlines actions designed to address and reduce the impact of a full range of natural hazards facing Bradford County. 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 Bradford 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.*

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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*. 2007



## **2. Community Profile**

### **2.1 Geography and the Environment**

Bradford County was established February 21, 1810, from parts of Lycoming and Luzerne counties and located in the northeastern portion of Pennsylvania. Originally, Bradford County was called Ontario County. It was reorganized and separated from Lycoming County on October 13, 1812. Bordered by Tioga County on the west; Lycoming County on the southwest; Sullivan County to the south; Wyoming County on the southeast; Susquehanna County to the east; and to the north by Chemung and Tioga counties, New York. Bradford County is in a region known as the Endless Mountains. Like much of rural Pennsylvania, natural resources have been the foundation of the county's economy and way of life since its establishment. Residents today still enjoy a predominantly rural landscape of forested hills and mountains, agricultural valleys, and small towns and villages at rural crossroads. It is the second largest county in Pennsylvania, with a total land area of approximately 1,151 square miles and a total water area of nine square miles. Bradford County is a sixth class county governed by three elected commissioners and is divided into 14 boroughs and 37 townships. A base map of Bradford County is located at the end of this profile.

The Koppen-Geiger system chart classifies Pennsylvania (to include Bradford County) as a Continental/micro-thermal climate; with a scheme of warm summer continental climate. While the 67 counties of Pennsylvania share many weather similarities, there are also a few unique characteristics to certain regions. Typically the northern counties of Pennsylvania have colder temperatures and more snow in the winter.

The weather patterns and climatic conditions of Bradford County are a major hazard mitigation risk factor. The county's weather extremes are the primary contributors to many of the natural hazard events within the county; to included flash floods, hurricanes and tropical storms, winter storms, tornadoes, drought, extreme temperatures, and high wind. Table 2.1-1 provides the most applicable, long-term data for Bradford County.

In addition to the devastating effects weather can have on specific hazards, weather often impedes emergency response. Due to the direct impact on mobility, severe winter weather and flash flooding are two of the county's biggest weather-related vulnerabilities. Weather will always play a large part in any disaster response, requiring emergency planning to account for all weather variations, regardless of the event.

According to the Bradford County Comprehensive Plan there is an annual mean temperature of 48.7° and the annual precipitation is 37.7 inches.

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<b>Table 2.1-1 Area Averages and Records</b>							
<b>Month</b>	<b>Average High (F)</b>	<b>Average Low (F)</b>	<b>Mean Temperature</b>	<b>Record High</b>	<b>Record Low</b>	<b>Maximum Precipitation (inches)</b>	<b>Minimum Precipitation (inches)</b>
<b>January</b>	39.7	25.6	32.7	73 (1950 & 1932)	-22 (1994)	8.01 (1979)	0.43 (1981)
<b>February</b>	38.7	24.9	31.8	78 (1997)	-13 (1899)	5.93 (1981)	0.39 (2002)
<b>March</b>	46.5	30.8	38.6	87 (1998)	5 (1984 & 1900)	6.61 (1936)	0.25 (1910)
<b>April</b>	63.3	42.4	52.8	93 (1985 & 1915)	11 (1923)	10.4 (2011)	0.70 (1989)
<b>May</b>	72.9	51.8	62.3	96 (1996 & 1925)	28 (1996, 1966, 1931)	9.91 (1919)	0.80 (1964)
<b>June</b>	81.4	62.9	72.2	104 (1925)	36 (1987 & 1907)	16.8 (1972)	0.66 (1966)
<b>July</b>	86.1	69.7	77.9	106 (1936)	43 (1965)	9.65 (1992)	0.75 (1909)
<b>August</b>	84.0	66.0	75.0	104 (1918)	45 (1976)	10.67 (1933)	0.53 (1995)
<b>September</b>	76.3	57.6	66.9	102 (1953)	30 (1963)	18.43 (2011)	0.65 (1986)
<b>October</b>	63.6	47.5	55.6	97 (1941)	23 (1969)	9.87 (1976)	0.02 (1924)
<b>November</b>	49.4	32.0	40.7	84 (1950)	10 (1929)	7.20 (1972)	0.41 (1909)
<b>December</b>	45.7	31.9	38.8	75 (1998 & 1984)	-8 (1960)	7.51 (1983)	0.23 (1955)
<i>Source: The National Weather Service – Williamsport Climate Location – records from 1888 to 2013</i>							

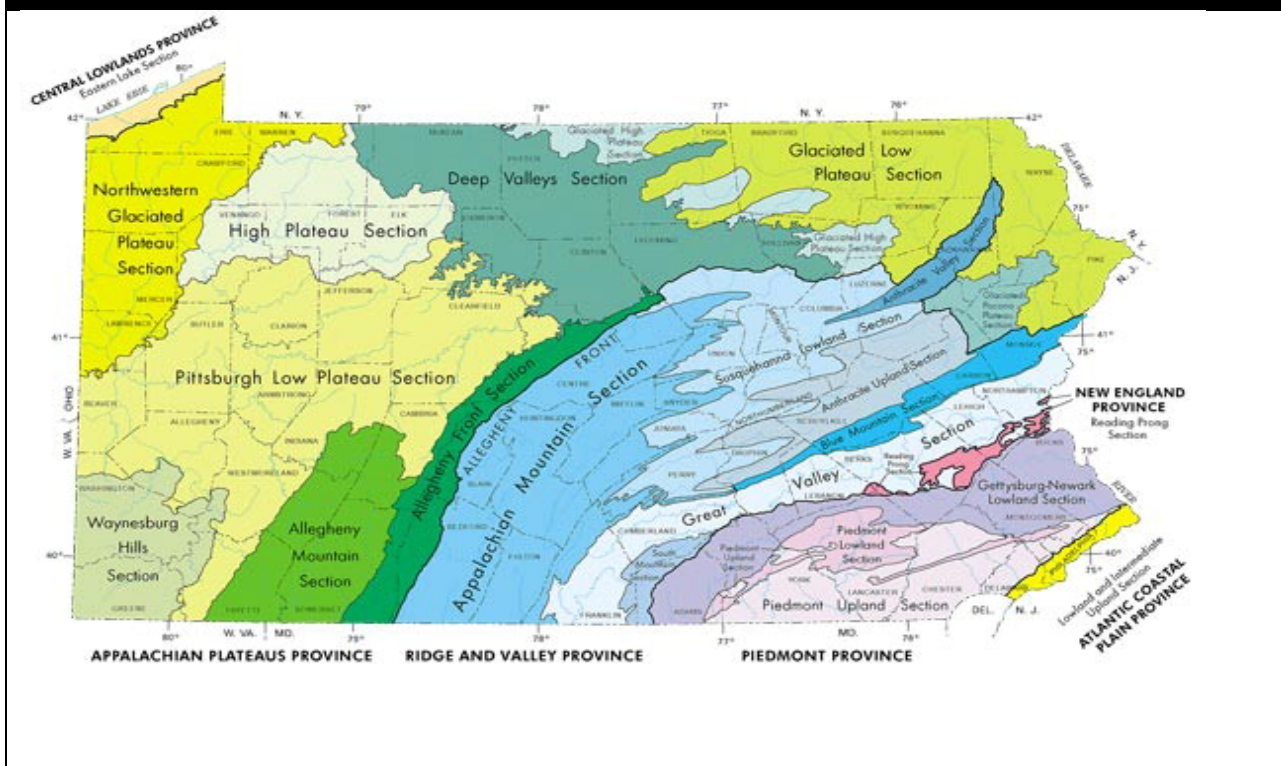
The majority of the county is located within the Glaciated Low Plateau Section of the Appalachian Plateaus Province. The elevation range in Bradford County is from 600 to 2380 feet above sea level. Mineral resources found in Bradford County include flagstone, gravel, sand, sandstone, natural gas, and coal.

The North Branch of the Susquehanna River flows into Pennsylvania through Bradford County. Other major waterways and watersheds in the county are Chemung River, Sugar Creek, Towanda Creek, Wyalusing Creek and Wysox Creek.

## Bradford County 2015 Hazard Mitigation Plan

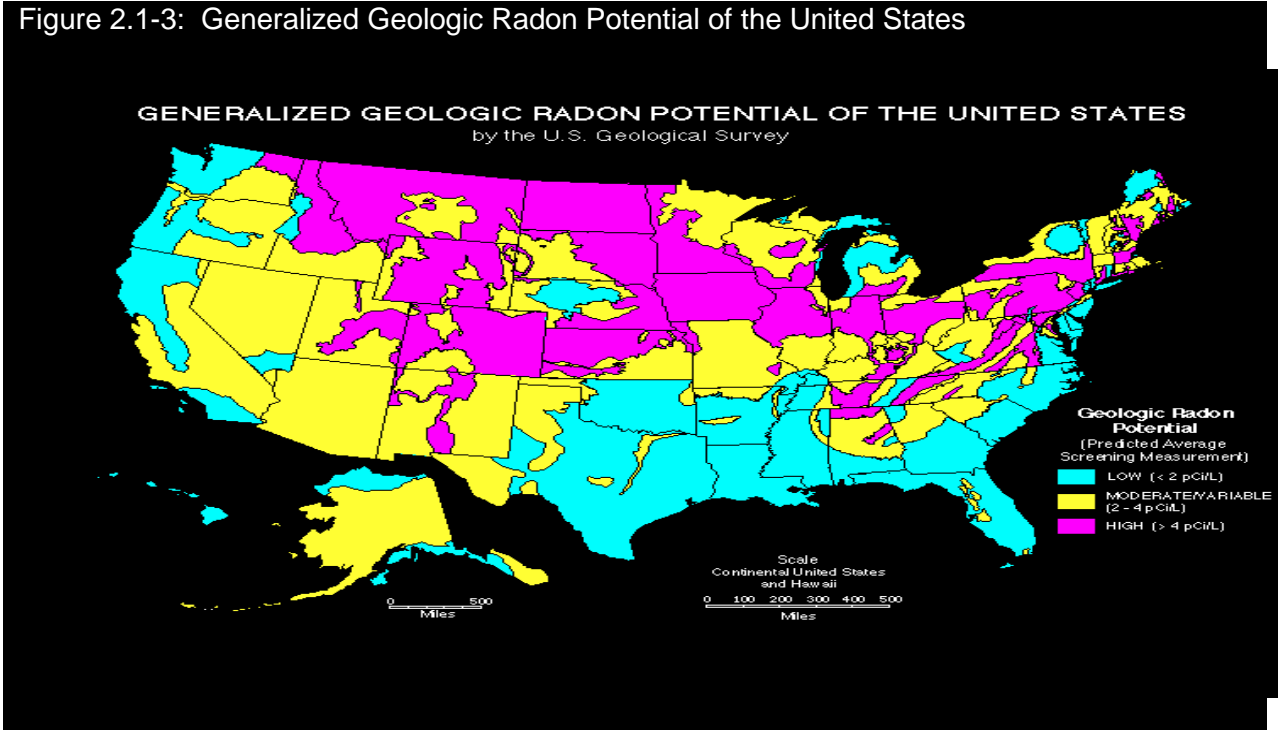
Bradford County is located in the Northern Tier of Pennsylvania, and most of the county lies in the Glaciated Low Plateau Section as shown in Figure 2.1-2. Glaciation in northeastern Pennsylvania was left by the Ontario lobe glacier coming from the northwest. Presumably, due to the more rugged topography in northeastern Pennsylvania, erosion is a more dominant process. The topography consists of rounded hills and broad to narrow valleys, all of which have been modified by glacial erosion and deposition. Sandstone and siltstone form the majority of the bedrock in this region. Geologic formations can restrict the nature and extent of surface development. They can also affect the quality and quantity of groundwater.

**Figure 2.1-2: Physiographic Provinces of Pennsylvania**



Radon gas is naturally occurring, colorless, odorless, inert, but radioactive. It forms as a product of the natural decay of uranium. No individual location can be assumed to be safe unless proven so by testing. Bradford County is identified as having a high-level of radon source rock, as identified by Figure 2.1-3.

Figure 2.1-3: Generalized Geologic Radon Potential of the United States



**2.2 Community Facts**

Bradford County’s economy mixture is made up of manufacturing, education, health and social services and agriculture. Manufacturing leads the county with employment but agriculture is the leading industry by revenue with dairy and veal.

There is a rich history as farmers and forestland owners cleared timber from their lands from the 1840s into the 20<sup>th</sup> century. This raw timber floated downstream on streams and rivers, milled and supplied seaboard cities with building materials for construction up and down the east coast. Land, rail, and mill owners built many of the county’s towns and villages from the prosperity in timber. Across the county Victorian architecture can be found in abundance, and is due to the wealth of the residents during the time of prosperity in the lumber industry.

When the timber peak declined and the lumber companies moved south, the communities they supported faced economic collapse. Even though wages declined and jobs disappeared, agriculture was still strong and moving into commercial production.

## Bradford County 2015 Hazard Mitigation Plan

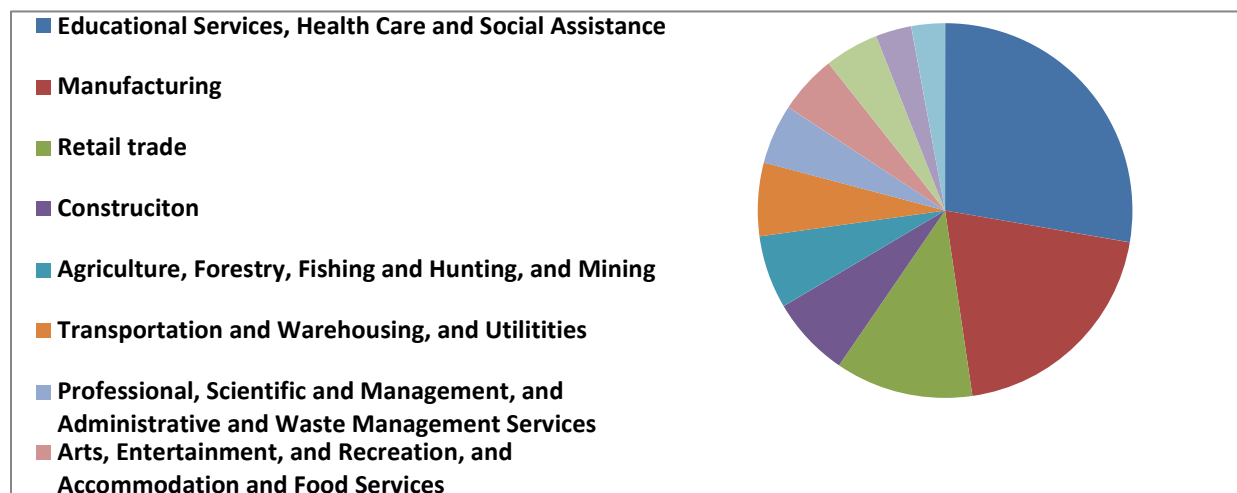
Employment centers are located in Towanda-Wysox, Athens-Sayre-South Waverly, Wyalusing, and Troy-Canton.

According to 2010 Census data, the major employment industries in Bradford County are illustrated in Figure 2.2-1 and include the population employed in these industries as estimated in the 2009-2011 American Community Survey.

According to the Bradford County Comprehensive Plan, small businesses categorized as micro-businesses, consisting of 1-4 employees; within Bradford County accounts for 56.4 percent of the businesses. Five percent of the county's residents work at home.

Table 2.2-1 Bradford County Major Employment Industries (2009-2011 American Community Survey 3-Year Estimates)

Chart shows breakdown by industry type



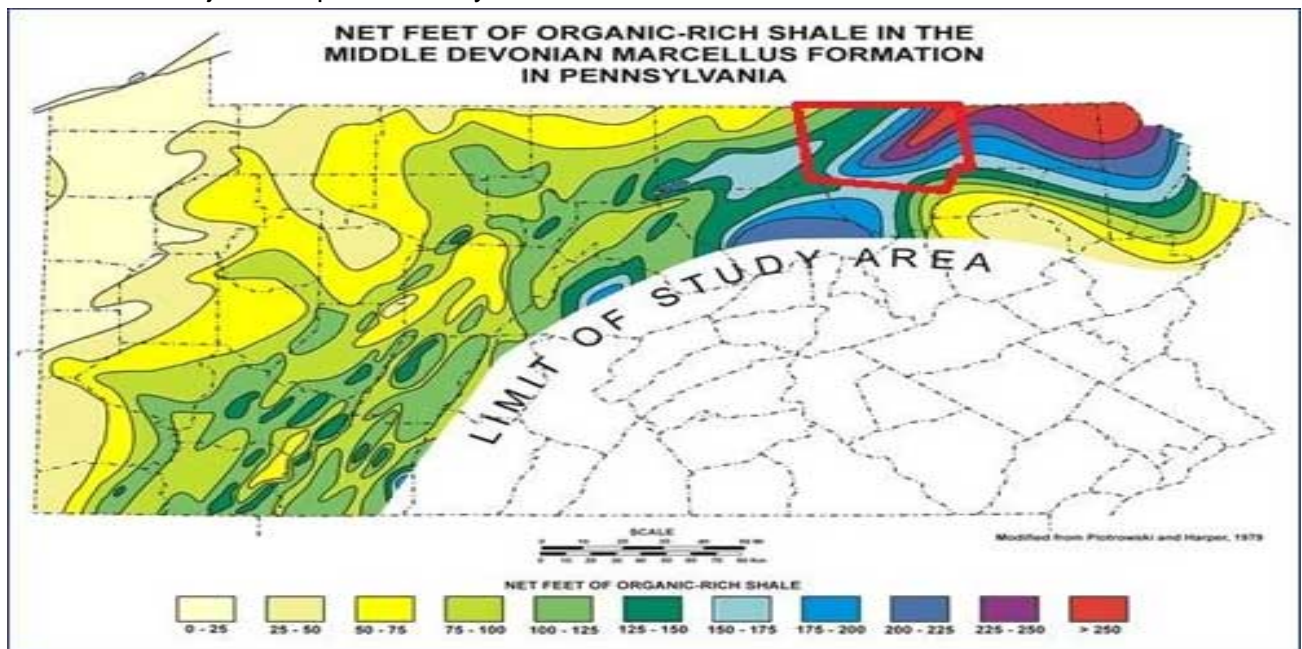
### Marcellus Shale Gas Industry

Unconventional Marcellus Shale gas exploration became prevalent in 2008. Bradford County has the highest number of natural gas drilling wells in the state of Pennsylvania. The influx of natural gas company employees, corporate staffing and subcontractors has had a significant impact on the county's infrastructure. Gas industry growth can be validated by growth activity. DEP reports the number of permitted gas wells in the county has increased from 47 in July, 2008, to 2,348 as of October 2013. As of October, 2013, there are 23 compressor stations (facilities that pressurize and transport natural gas), 115 water impoundments (sites used to store freshwater), 45 water withdrawals, 3 water treatment facilities, with an additional 3 more permitted water treatment facilities. There are 77.8 miles of permanent water lines, 767.4 miles

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of temporary permitted waterlines, 599.9 miles of gathering lines that are built, and 336.3 miles of gathering lines that are proposed. Valley Energy, a local energy corporation, owns 33.1 miles of service lines that provide natural gas to the Sayre and Athens area. In addition to the Valley Energy lines, there are 128.8 miles of additional transport lines built.

The industry's impact on social and economic progression has also taken noticeable effect. In December 2012, the Towanda-based Central Bradford Progress Authority; which covers Bradford, Susquehanna, Wyoming and Sullivan counties announced plans to use \$1 million in new federal economic aid to provide existing businesses that are developing new products and services to meet the demands of the drilling boom in Northeast Pennsylvania. The goal is to help small businesses find opportunities supplying the Marcellus Shale drilling industry by financing 10 business loans and creating 150 jobs with the \$1 million available through a federal small business jobs act passed last year.



### Marcellus Shale Concentration in Pennsylvania

There are three hospitals located in Bradford County, five local Guthrie clinics and one Arnot Health Clinic. The following Guthrie Health Systems owned hospitals are:

1. Towanda Memorial Hospital
2. Robert Packer Hospital
3. Troy Community Hospital

Education in Bradford County is provided in seven public districts and seven private institutions. There are 10 public libraries within the county. There are also four satellite institutions (no main campus) of higher education in the county, these are:

1. Keystone College
2. Lackawanna College
3. Mansfield University/ Robert Packer Department of Health Sciences – Nursing Program
4. Penn State Wilkes-Barre Northern Tier Center

**2.3 Population and Demographics**

Recent conditions and trends show that the total number of residents in Bradford County is slightly higher than it was just over 100 years ago. The 1900 census reported 59,400 persons and in 2010 the census reported 62,622 persons.

Bradford County residents have chosen suburban and rural living over urban neighborhoods found in the county’s boroughs. While the total county population count was relatively stable, more dramatic changes have occurred between the municipalities. Eighty percent of Bradford County’s municipalities experienced population increases between 1970 and 2010. The majority of the remaining municipalities that lost population were boroughs.

The criteria used by the United States Census Bureau decreased accuracy of the data and did not appropriately account for the Bradford County population. Between 2009 and 2012 Bradford County experienced dramatic increases in job classifications such as mining, quarrying, and oil and gas extraction. The oil and gas industry increased by 1,016.7% or 915 workers; the construction industry increased by 99.8% (539 workers); transportation and warehousing increased by 101.4% (646 workers); and real estate and rental and leasing increased by 600% (528 workers) in terms of employment during this period. Overall, from the second quarter of 2009 to the same period in 2012, Bradford County gained 3,357 jobs. It is believed by common knowledge that the current census does not reflect the additions of these workers as many were considered as non-residential workers when counted. These results were disputed with no resolution by the Census Bureau. Projections of future increase or decrease of Bradford County population cannot be accurately determined due to the accuracy of the data. Table 2.3-1 identifies the population by municipality for Bradford County from 1990 to 2010.

<b>Table 2.3-1 Population for Bradford County, 1990 -2010</b>			
<b>Municipality</b>	<b>1990</b>	<b>2000</b>	<b>2010</b>
<b>BRADFORD COUNTY</b>	<b>60,967</b>	<b>62,761</b>	<b>62,622</b>
Alba Borough	170	186	157
Albany Township	927	927	911
Armenia Township	134	134	180
Asylum Township	981	1,097	1,058
Athens Borough	3,468	3,415	3,367
Athens Township	4,755	5,058	5,251
Burlington Borough	479	182	156

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**Table 2.3-1 Population for Bradford County, 1990 -2010**

Municipality	1990	2000	2010
Burlington Township	705	799	791
Canton Borough	1,966	1,807	1,976
Canton Township	2,099	2,084	2,143
Columbia Township	1,077	1,162	1,196
Franklin Township	557	698	723
Granville Township	837	873	950
Herrick Township	647	676	754
LeRaysville Borough	336	318	290
Leroy Township	610	627	718
Litchfield Township	1,296	1,307	1,320
Monroe Borough	540	514	554
Monroe Township	1,235	1,271	1,250
New Albany Borough	306	306	356
North Towanda Township	909	927	1,132
Orwell Township	1,107	1,097	1,159
Overton Township	157	187	247
Pike Township	684	657	671
Ridgebury Township	2,026	1,982	1,978
Rome Borough	475	382	441
Rome Township	1,043	1,221	1,191
Sayre Borough	5,791	5,813	5,587
Sheshequin Township	1,211	1,300	1,348
Smithfield Township	1,520	1,538	1,498
South Creek Township	1,229	1,261	1,128
South Waverly Borough	1,049	987	1,027
Springfield Township	1,118	1,167	1,124
Standing Stone Township	436	596	642
Stevens Township	401	414	437
Sylvania Borough	203	200	219
Terry Township	871	942	992
Towanda Borough	3,242	3,024	2,919
Towanda Township	1,133	1,131	1,149
Troy Borough	1,262	1,508	1,354
Troy Township	1,797	1,645	1,149
Tuscarora Township	996	1,072	1,131
Ulster Township	1,295	1,340	1,337
Warren Township	927	1,025	959
Wells Township	1,018	1,278	814
West Burlington Township	417	782	696
Wilmot Township	1,057	1,177	1,204
Windham Township	862	967	933
Wyalusing Borough	686	564	596
Wyalusing Township	1,235	1,341	1,242
Wysox Township	1,685	1,763	1,721

Source: U.S. Census Bureau and Bradford County Data Resource Book 2012



## ***Bradford County 2015 Hazard Mitigation Plan***

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### **Population and Employment Centers**

#### Towanda Area:

The Towanda area includes three municipalities: Towanda Borough which is the county seat, Towanda Township and North Towanda Township. The larger areas of employment for these municipalities include: Memorial Hospital, Bradford County government, Global Tungsten & Powders (GTP), and Dupont. Towanda Borough has a historic district that includes its main street business district and adjacent residential areas.

#### Troy/Canton Area:

The Troy/Canton area includes five municipalities: Troy Borough, Troy Township, Alba Borough, Canton Township and Canton Borough. The larger areas of employment for these municipalities include: Troy Hospital and Martha Lloyd School.

#### Sayre/Athens/South Waverly In Pennsylvania and Town of Barton and Village of Waverly in New York Area:

This area is known as “The Valley”. Athens Township has grown tremendously in the past two years. The area has grown to the point that the infrastructure cannot support additional growth. The sewage system will be upgraded by 2015. Until these upgrades are complete, no additional growth can occur in Athens Township. The following is a list of new businesses that have developed in Athens Township over the past 2 years: Microtel, Comfort Inn, Candlewood Inn & Suites, Fairfield Inn, Super Walmart, Chesapeake Energy East Coast headquarters (and 5 of their subsidiary companies), Nomac Housing Facility (gas worker ‘dorm’), Senior Healthcare Solutions (nursing home), Seaboard International, Five Star Equipment and Williams Ford.

#### Wyalusing:

Wyalusing consists of Wyalusing Borough and Wyalusing Township. The largest of employment for these municipalities include: Cargill meat packing plant, one of the biggest beef processing plants on the east coast. Wyalusing also has a newspaper, The Rocket Courier, which was founded in 1887.

#### Wysox Area:

Wysox has a total area of approximately 23 square miles and is located across the Susquehanna River from Towanda. The larger areas of employment include: hotels such as a Comfort Inn and a Fairfield Inn, Jeld-Wen Incorporated, and Kmart.

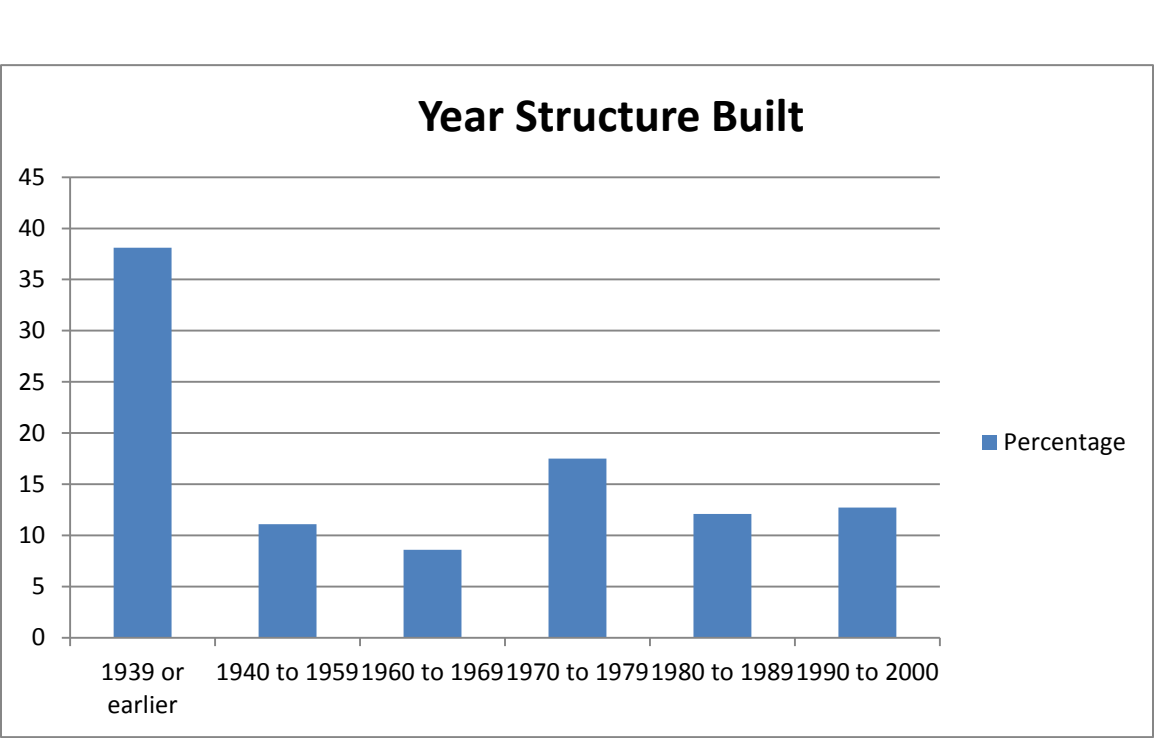
**2.4 Land Use and Development**

Bradford County is the second largest county in the Commonwealth of Pennsylvania with 1,151 square miles (736,640 acres). Approximately 59 percent (433,000 acres) of the county has forest cover. The predominate hardwoods are oak, maple, cherry, and ash. Predominate softwoods are hemlock and pine. The estimated value of standing timber is in excess of \$287 million according to the Bradford County Comprehensive Plan.

Housing units within the county per 2009 studies show 70 percent as single unit structures, 12 percent multi-unit structures, and 18 percent are mobile homes. Approximately 18,000 or three-quarters of these units are owner-occupied. According to the 2010 Bradford County Comprehensive Plan, approximately 40 percent of the housing units were built from 1939 and earlier, shown in Table 2.4-1. It is unknown if any of the homes were built in the special flood hazard area.

**Table 2.4-1**

**Age of Housing Units in Bradford County**



Source: U.S. Census Bureau

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According to the Bradford County Comprehensive Plan the county was ranked 8<sup>th</sup> in Pennsylvania agriculture in 1997. The value of agricultural products sold in 1997 was nearly \$97 million. Approximately 90 percent of this value was earned through livestock sales; the remaining percentage was earned through crop sales. While the number of farms in Bradford County has decreased, individual farm acreage has increased. The average farm size is approximately 199 acres, according to the County’s Agricultural Land Preservation Board.

In 2012, Bradford County had approximately 1,629 farms. The market value of products sold during 2012 was nearly \$129 million. Livestock sales equated to \$99 million of the overall \$129 million of product sales. The estimated market value of land and buildings per farm was \$700,259.

The size of animal herd operations and the number of farms per municipality was not available. It should be noted that the natural gas industry has impacted the quantity of herds in the county over the past years. Farmers that receive profits from gas extraction and sales do not have the number of herd as they may have 10 years ago.

There are approximately 6,000 acres of surface water in Bradford County, with the Susquehanna River and its tributaries being the primary source. Also, scattered throughout the county are natural and man-made ponds and lakes. There are eleven watershed organizations within the county. These are listed in Table 2.4-2.

<b>Table 2.4-2: Bradford County Watershed Organizations</b>
Bradford County Lakes & Ponds Organization
Center for Watershed Stewardship
Chesapeake Bay Foundation
Laning Creek Watershed Association
Mehoopany Creek Watershed Association
PA Cleanways
PA Organization for Watersheds and Rivers
PA Rivers Resource Advisory Council
Penn York Bentley Creek Watershed Association
Schrader Creek Watershed Association
Seeley Creek Watershed Association
Stream Restoration, Inc.
The Alliance for Aquatic Resource Monitoring
Tioga River Watershed Reclamation Projects Inc.
Towanda Creek Watershed Association
Upper Susquehanna Coalition
Wyalusing Creek Watershed Association
Wysox Creek Watershed Association

## Bradford County 2015 Hazard Mitigation Plan

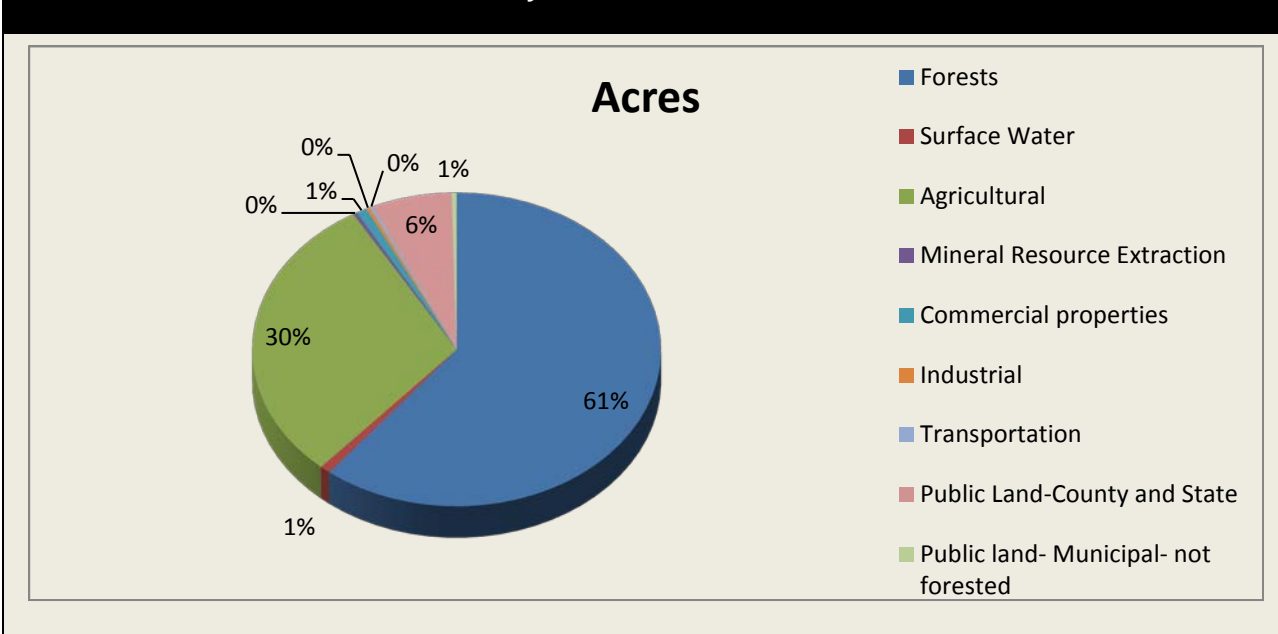
According to Pennsylvania Department of Labor and Industry, Pennsylvania lost 147.2 thousand jobs between April 2008 and February 2010; and from January 2011 to July 2013 had gained 86.6 thousand jobs, or an estimated 58.8 recovery percentage. The major employers and services are listed in the Bradford County Data Resource Book 2012. The top employers in Bradford County are listed in Table 2.4-3

**Table 2.4-3: Top Employers in Bradford County**

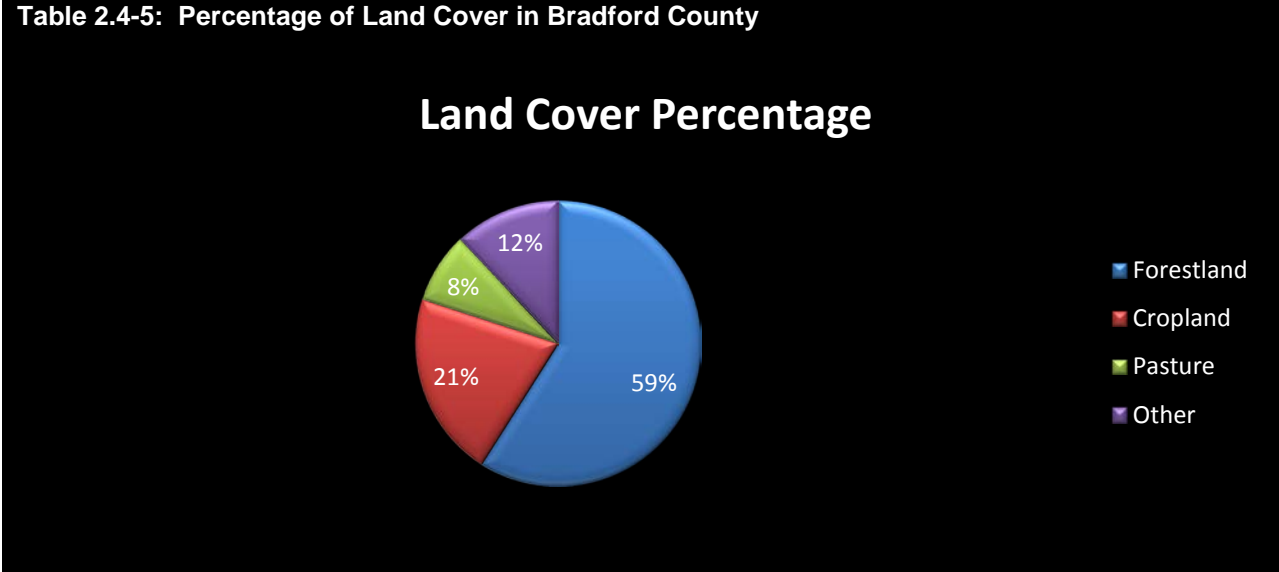
Robert Packer Hospital, Inc., Sayre
Cargill Meat Solutions Corporation, Beef Processing, Wyalusing
Guthrie Clinic LTD, Sayre
Global Tungsten Powders, Chemicals, Towanda
County Government, Towanda
E I Dupont De NeMours and Co, Photo Chemicals, Towanda
Dandy Mini Marts Inc. Convenient Store, multiple locations within Bradford County
Memorial Hospital Inc. & Skilled Nursing Unit, Towanda
Jeld-Wen Incorporated, Wysox
Athens Area Schools
<b>Source: Bradford County Data Resource Book 2012</b>

Table 2.4-4 shows the percentage of land use within Bradford County. Table 2.4-5 (shown below) illustrates the land cover in Bradford County. This information was extracted from the Bradford County Comprehensive Plan 2010. A Bradford County land use map is located at the end of this profile.

**Table 2.4-4: Land Use in Bradford County**



**Table 2.4-5: Percentage of Land Cover in Bradford County**



**2.5 Data Sources and Limitations**

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

- Bradford County Comprehensive Plan obtained through the Planning Department.
- Bradford County Data Resource Book 2012.
- Bradford County Natural Area Inventory 2005.
- Bradford County Open Space Plan
- Bradford County Subdivision and Land Development Ordinance.
- Bradford County Natural Gas Primer Updates.
- Digital tax assessment data obtained through the Assessment Department.
- Geographic Information Systems (GIS) data from the Planning Department.

The preliminary countywide Digital Flood Insurance Rate Maps (DFIRM), were used for all flood risk analysis and estimation of loss. The DFIRM database provides flood frequency and elevation information used in the flood hazard risk assessment. Other Bradford County GIS datasets including road centerlines, parcels, and structures were utilized in conjunction with the DFIRM. Potential losses were then analyzed by using existing county tax assessment data and DFIRM data. Risk Map data was not available to Bradford County during the plan update process. The preliminary DFIRM data that was used for this plan update became effective on October 15, 2014. The most current DFIRM data was used for the update of this plan.

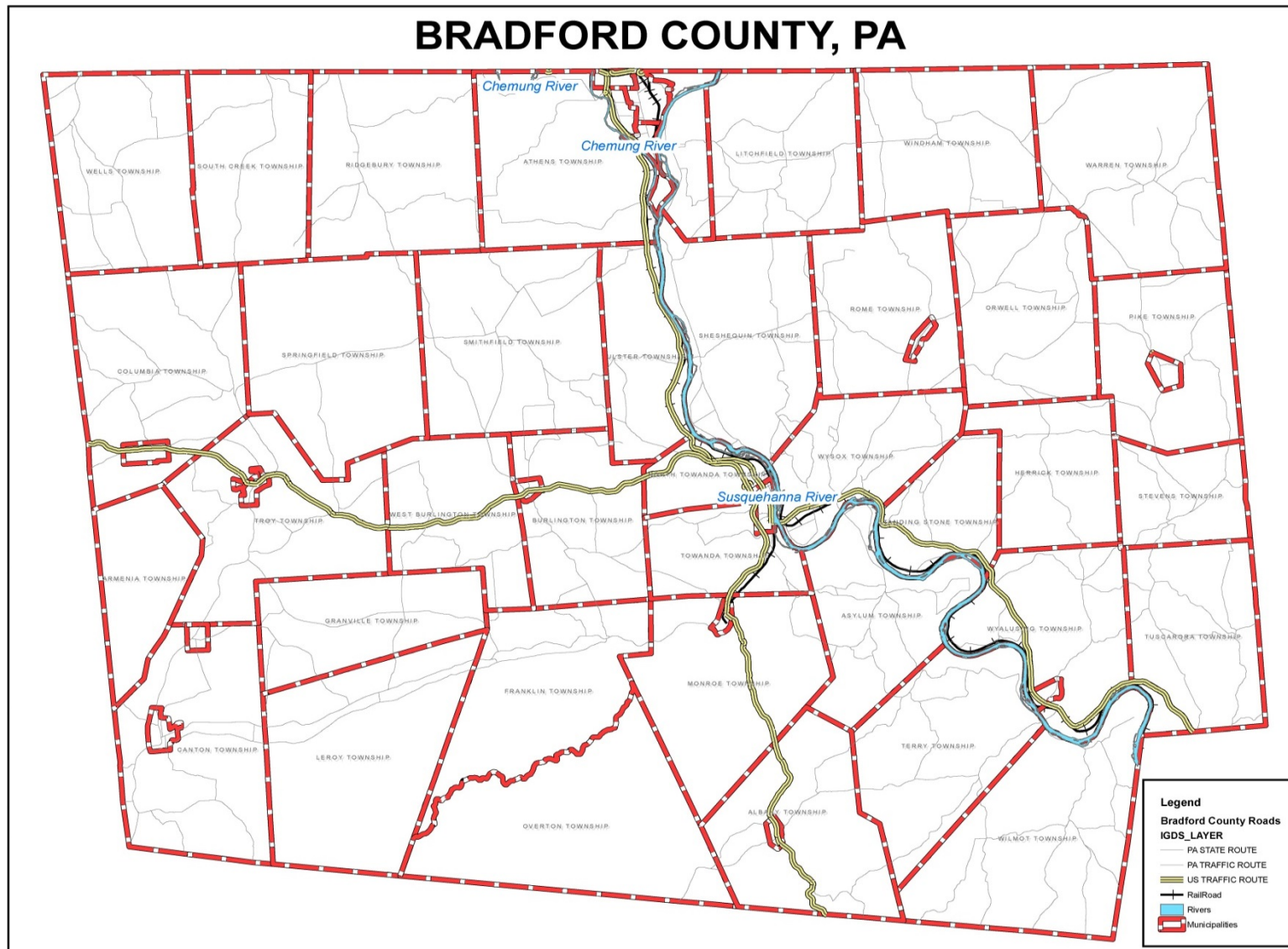
No previous HAZUS data was available during the update process.

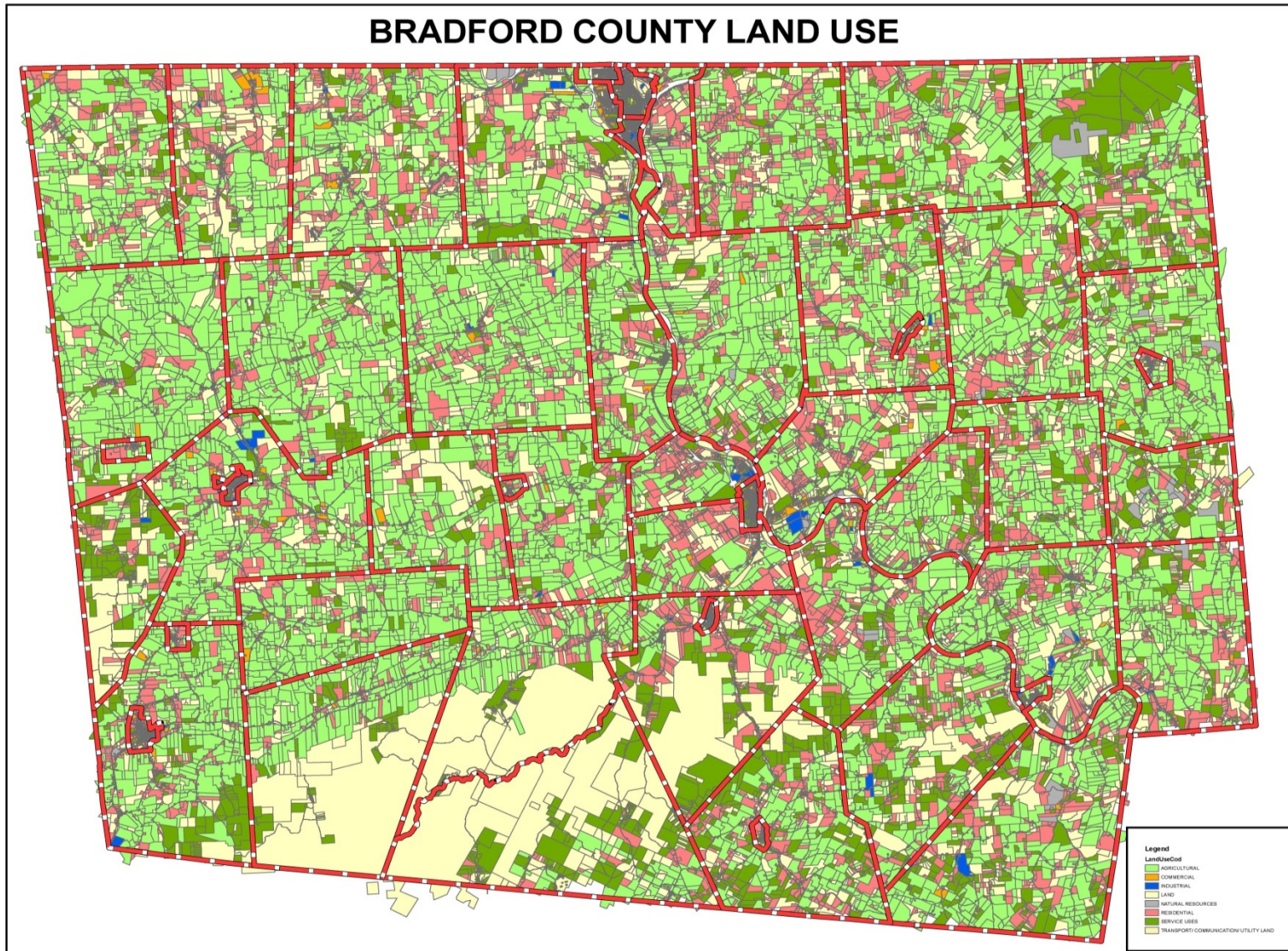
## Bradford County 2015 Hazard Mitigation Plan

### 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 Bradford County Planning Department. This department manages the GIS for Bradford County. The following is a list of existing GIS data that was utilized in the plan update process. No new GIS layers were developed.

Bradford County existing GIS data used for the mitigation plan update	
GIS Data Layer	GIS Data Layer
<ul style="list-style-type: none"> <li>• Address Points</li> <li>• Parcel Polygons</li> <li>• Road Centerlines</li> <li>• Railroads</li> <li>• County Boundaries</li> <li>• County Maintained Bridges</li> <li>• Municipality Maintained Bridges</li> <li>• TIP Bridges</li> <li>• Building Footprints</li> <li>• Cell Towers</li> <li>• Wind Towers</li> <li>• Towers</li> <li>• Fire Hydrants</li> <li>• Dry Hydrants</li> <li>• LiDAR Contours 10 foot intervals</li> <li>• Rivers</li> <li>• Streams</li> <li>• Lakes, Ponds, Swamps</li> <li>• Quarry Sites</li> <li>• Current FEMA Flood Zones</li> <li>• Proposed FEMA Flood Zones</li> <li>• Schools</li> <li>• School Districts</li> <li>• Sewer Areas</li> <li>• Soils</li> <li>• State Gameland</li> <li>• Wetlands</li> <li>• Watersheds - 8 digit</li> <li>• Dams</li> <li>• EMA POD Locations</li> <li>• EMA Shelters</li> <li>• EMT Garages</li> <li>• Fire Halls</li> <li>• Fire Companies</li> <li>• Fire Hydrants</li> <li>• Landing Zones</li> <li>• LEPC Facilities</li> <li>• Gas Related Points (Gas Wells, Compressor Stations, Communication Towers, Meter Stations)</li> </ul>	<ul style="list-style-type: none"> <li>• Natural Gas Lines and Water Lines</li> <li>• Gas Access Roads</li> <li>• DEP Approved Permits</li> <li>• Bike Paths</li> <li>• Bradford County Parks</li> <li>• Community Buildings</li> <li>• Hunting/ Fishing</li> <li>• Libraries</li> <li>• Municipal Building</li> <li>• Museums</li> <li>• Pisgah Trails</li> <li>• Pisgah View Points</li> <li>• Round Top Hiking Trails</li> <li>• Senior Centers</li> <li>• State Forests</li> <li>• View Points</li> <li>• Wyalusing Museum Area</li> <li>• Electric Poles</li> <li>• Electric Lines</li> <li>• Substations</li> <li>• Boat Launches</li> <li>• Bradford Geology</li> <li>• Campgrounds</li> <li>• Cemeteries</li> <li>• Churches</li> <li>• Closed Bridges</li> <li>• Conservancy Lands</li> <li>• Contours (10ft, 20ft, 25ft, 60ft)</li> <li>• Landuse</li> <li>• Farms</li> <li>• Hotels/ Motels</li> <li>• Hurricane Ivan Damage</li> <li>• PEMA June 2006 Flood Zones</li> <li>• Bradford 2011 Flood Data</li> <li>• Police Departments</li> <li>• Post Offices</li> <li>• Pump Stations</li> <li>• Restaurants</li> <li>• State Forest</li> <li>• Street Lights</li> </ul>







### **3. Planning Process**

#### **3.1 Update Process and Participation Summary**

The Bradford County Hazard Mitigation Plan update began in June 2013. The Bradford County Commissioners were able to secure a hazard mitigation grant to start the process. The Bradford County Department of Public Safety was identified as the lead agency for the Bradford County Hazard Mitigation Plan Update. The planning process involved a variety of key decision makers and stakeholders within Bradford County. Bradford County immediately determined that the utilization of a contracted consulting agency would be necessary to assist with the plan update process. MCM Consulting Group, Inc. was selected as the contracted consulting agency to complete the update of the hazard mitigation plan. The core hazard mitigation team, which was referred to as the project team, included Bradford County officials from the Commissioners' Office, Bradford County Department of Public Safety and MCM Consulting Group, Inc.

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

MCM Consulting Group, Inc. (MCM) assisted Bradford County in coordinating and leading public involvement meetings, local planning team meetings, analysis, and the writing of the Hazard Mitigation Plan (HMP) Update. The Bradford County Local Planning Team worked closely with MCM with writing and reviewing the HMP. MCM conducted project meetings and local planning team meetings throughout the process. Meeting agendas, meeting minutes and sign in sheets were developed and maintained for each meeting conducted by MCM. These documents are detailed in **Appendix C** of this plan.

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

# Bradford County 2015 Hazard Mitigation Plan

The HMP planning process consisted of:

- Applying for and receiving a Hazard Mitigation Planning Grant (HMPG) to fund the planning project.
- Announcing the initiative via press releases and postings on the county website.
- Involving elected and appointed county and municipal officials in a series of meetings, training sessions, and workshops.
- Identifying capabilities and review the information with the municipalities.
- Identifying hazards and review the information with the municipalities.
- Assessment of risk and analyzing vulnerabilities.
- Identifying mitigation strategies, goals, and objectives.
- Developing an implementation plan.
- Announce completion via press releases and postings on the county website.
- Plan adoption at a public meeting of the Bradford County Board of Commissioners.
- Plan submission to FEMA and PEMA.

MCM Consulting Group, Inc. assisted Bradford County through the HMP update process. The 2015 Bradford County HMP was completed in July 2014. The 2015 plan follows an outline developed by PEMA in 2009 which provides a standardized format for all local HMPs in the Commonwealth of Pennsylvania. As a result, the format of the 2015 Bradford County HMP contrasts with the 2009 HMP, but all information that was still current was carried over into the new plan. These changes are summarized in Table 3.1-1. Additional update summaries are provided in each section of the plan.

<b>Table 3.1-1: Summary of changes to the format of the 2009 and 2015 versions of the Bradford County HMP.</b>	
<b>2009 HMP SECTION</b>	<b>2014 SECTION</b>
Foreward	Section 1
I. Introduction	Section 1
I-A. County Profile	Section 2
I-B. Hazard Mitigation Planning and The Disaster Mitigation Act of 2000	Section 3
II. Natural Hazards	Section 4.3
II-A. Floods	Section 4.3.4
II-B. Winter Storms	Section 4.3.11
II-C. Hurricanes, Tornadoes and Windstorms	Section 4.3.5
II-D. Droughts and Water Supply Deficiencies	Section 4.3.1
II-E. Earthquakes	Section 4.3.2
II-F. Wildfires	Section 4.3.12
Appendixes	Section 8
References	Section 1 and Section 8

**3.2 The Planning Team**

The 2015 Bradford County Hazard Mitigation Plan Update was led by the Bradford County Project Team. The Bradford County Project Team provided guidance and leadership for the overall project. The project team assisted MCM Consulting Group, Inc. with dissemination of information and administrative tasks. Table 3.2-1 outlines the individuals that comprised this team.

<b>Table 3.2-1: Bradford County Hazard Mitigation Plan Update Project Team</b>		
<b>Name</b>	<b>Organization</b>	<b>Position</b>
Robert Barnes	Bradford County Department of Public Safety	Director
Jo Ann Daly	Bradford County Department of Public Safety	Emergency Management Coordinator
Averill Bolster	Bradford County Department of Public Safety	Administrative Assistant
Michael T. Rearick	MCM Consulting Group, Inc.	Senior Consultant

In order to represent the county, the Bradford County Project Team developed a diversified list of potential Local Planning Team (LPT) members. Members that participated in the 2009 hazard mitigation plan were highly encouraged to participate. The project team then conducted outreach to the prospective members, provided a description of duties and tasks and solicited participation. The LPT worked throughout the process to plan and hold meetings, collect information, and conduct public outreach.

The stakeholders listed in Table 3.2-2 served on the 2015 Bradford 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>Table 3.2-2: Bradford County Hazard Mitigation Plan Update Local Planning Team</b>		
<b>Name</b>	<b>Organization</b>	<b>Position</b>
Daryl Miller	Bradford County Commissioner	Elected Official/county
Robert Barnes	Bradford County Department of Public Safety	Director
Jo Ann Daly	Bradford County Department of Public Safety	Emergency Management Coordinator
Averill Bolster	Bradford County Department of Public Safety	Administrative Assistant
Derrick Hall	Greater Valley EMS	Emergency Response/EMS
Robin Smith	Athens Township	Local Government
Steven Gobble	Towanda Area Schools	Education

## Bradford County 2015 Hazard Mitigation Plan

<b>Name</b>	<b>Organization</b>	<b>Position</b>
Gary Wilcox	Williams Oil / BC LEPC	Emergency Response, HazMat, local industry
Richard Lasko	Bradford County Planning	GIS Specialist
Scott Molnar	Bradford County Planning	GIS Supervisor
Raymond Stolinias	Bradford County Planning	Director
Sarah Reichard	Bradford County Planning	Planner
Brian Wibirt	Bradford County Sheriff	Emergency Response/ Law Enforcement
Steven Bixby	DuPont Inc.	Industry, Emergency Response Fire
Donna Roof	Bradford County Assessment	Assessor

### 3.3 Meetings and Documentation

Several public meetings with local elected officials and the local planning team were held. At each of the public meetings, municipal officials were strongly encouraged to submit hazard mitigation project opportunity forms, complete their respective portions of the capability assessment and risk assessment, and adopt the multi-jurisdictional HMP. Table 3.3-1 lists the meetings held during the HMP planning process, which organizations and municipalities attended and the topic that was discussed at each meeting. All meeting agendas, sign-in sheets, presentation slides, any other documentation is located in **Appendix C**.

A final public meeting was held on July 30, 2014 to present the draft plan and invite public comments. The meeting was advertised in the local newspaper and also made available digitally on the Bradford County web site at: [www.bradfordcountypa.org](http://www.bradfordcountypa.org). The public comment period remained open until August 30, 2014. All public comments were to be submitted in writing to Robert Barnes at the Bradford County Department of Public Safety. No public comments were received.

## Bradford County 2015 Hazard Mitigation Plan

Table 3.3-1: Bradford County HMP Process - Timeline			
Date	Meeting	Attendees	Description
06/25/2013	Bradford County Hazard Mitigation Plan (HMP) Kick-Off Meeting	Bradford County Department of Public Safety MCM Consulting Group, Inc.	Identified challenges and opportunities as they relate to fulfilling the DMA 2000 requirements. Identified existing studies and information sources relevant to the Hazard Mitigation Plan. Identified stakeholders, including the need to involve local officials.
07/24/2013	Local Planning Team Kick-Off Meeting	Bradford County Commissioners Bradford County Department of Public Safety Bradford County Assessment Department Bradford County Planning Department Bradford County Sheriff's Office Athens Township Greater Valley EMS DuPont Towanda School District MCM Consulting Group, Inc.	Defined hazard mitigation planning and identified roles and responsibilities. Discussed the 2009 hazard mitigation plan and defined a timeline to complete the update.
08/26/2013	Municipality Capability Assessment Meeting, West of Council Governments	Bradford County EMA Bradford County Planning Department Alba Borough Armenia Township Athens Township Burlington Township Canton Borough Canton Township Columbia Township Granville Township LeRoy Township Sylvania Borough Troy Township Wells Township MCM Consulting Group, Inc.	Provided an overview of hazard mitigation planning and the municipal requirements. Discussed the 2015 plan update process. Completed a review of the capabilities assessment section and the municipal capability assessment survey.
09/05/2013	Municipality Capability Assessment Meeting, East of Council Governments	Bradford County EMA Bradford County Planning Department Litchfield Township Rome Township Tuscarora Township Warren Township Wyalusing Township MCM Consulting Group, Inc.	Provided an overview of hazard mitigation planning and the municipal requirements. Discussed the 2015 plan update process. Completed a review of the capabilities assessment section and the municipal capability assessment survey.
10/28/2013	Municipality Risk Assessment Meeting, West of Council Governments	Bradford County EMA Bradford County Planning Department Armenia Township Athens Township Canton Township Columbia Township Granville Township North Towanda Township South Creek Township Troy Township Wells Township MCM Consulting Group, Inc.	Provided an overview of hazard mitigation planning and the municipal requirements. Discussed the 2015 plan update process. Completed a review of the risk assessment section and the municipal hazard identification and risk evaluation worksheet.

## Bradford County 2015 Hazard Mitigation Plan

**Table 3.3-1: Bradford County HMP Process - Timeline**

Date	Meeting	Attendees	Description
11/07/2014	Municipality Risk Assessment Meeting, East Council of Governments	Bradford County EMA Bradford County Planning Department Asylum Township Litchfield Township Stevens Township Terry Township Tuscarora Township Warren Township Wyalusing Township Wyalusing Borough MCM Consulting Group, Inc.	Provided an overview of hazard mitigation planning and the municipal requirements. Discussed the 2015 plan update process. Completed a review of the risk assessment section and the municipal hazard identification and risk evaluation worksheet.
02/26/2014	Public Meeting	Bradford County EMA MCM Consulting Group, Inc. No public participation	Conducted a public meeting to review the draft risk assessment section of the Bradford County Hazard Mitigation Plan update.
03/26/2014	Mitigation Strategy Meeting with Municipal Officials	Bradford County EMA Alba Borough Albany Township Armenia Township Athens Township Burlington Borough Burlington Township Canton Borough Columbia Township Granville Township Herrick Township Litchfield Township Overton Township MCM Consulting Group, Inc.	Educated county and local elected officials on the hazard mitigation planning process. Presented the findings of the hazard vulnerability analysis and risk assessment. Sought input for mitigation projects throughout the county. Distributed Hazard Mitigation Project Opportunity Forms.
03/27/2014	Mitigation Strategy Meeting with Municipal Officials	Bradford County EMA Asylum Township Canton Township Franklin Township LeRaysville Borough Monroe Borough Monroe Township Orwell Township Ridgebury Township Sayre Borough Sheshequin Township Smithfield Township South Waverly Township Springfield Township Stevens Township Sylvania Borough Warren Township MCM Consulting Group, Inc.	Educated county and local elected officials on the hazard mitigation planning process. Presented the findings of the hazard vulnerability analysis and risk assessment. Sought input for mitigation projects throughout the county. Distributed Hazard Mitigation Project Opportunity Forms.

## Bradford County 2015 Hazard Mitigation Plan

Table 3.3-1: Bradford County HMP Process - Timeline			
Date	Meeting	Attendees	Description
03/28/2014	Mitigation Strategy Meeting with Municipal Officials	Bradford County EMA Athens Borough LeRoy Township South Creek Township Rome Township Terry Township Towanda Borough Towanda Township Troy Borough Troy Township Tuscarora Township Ulster Township Wells Township West Burlington Township Wilmot Township Wyalusing Borough Wyalusing Township Wysox Township MCM Consulting Group, Inc.	Educated county and local elected officials on the hazard mitigation planning process. Presented the findings of the hazard vulnerability analysis and risk assessment. Sought input for mitigation projects throughout the county. Distributed Hazard Mitigation Project Opportunity Forms.
04/02/2014	Mitigation Strategy Meeting with Municipal Officials	Bradford County EMA North Towanda Township Pike Township	Educated county and local elected officials on the hazard mitigation planning process. Presented the findings of the hazard vulnerability analysis and risk assessment. Sought input for mitigation projects throughout the county. Distributed Hazard Mitigation Project Opportunity Forms.
05/28/2014	Public Meeting	Bradford County EMA MCM Consulting Group, Inc. <b>No participation by the public</b>	Conducted a public meeting to review the draft mitigation strategy section of the Bradford County Hazard Mitigation Plan update.
07/30/2014	Bradford County Hazard Mitigation Plan – Draft Plan Review Public Meeting	Bradford County EMA MCM Consulting Group, Inc. <b>No participation by the public</b>	An update of the hazard mitigation planning process was delivered. The Draft HMP was reviewed with all attendees. Attendees were informed about the timeline and their opportunity to review the entire draft plan and provide written comments for inclusion into the plan.

### **3.4 Public and Stakeholder Participation**

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

The tools listed below were distributed with meeting invitations, provided directly to municipalities to complete and return to the Bradford County Department of Public Safety or distributed 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 portions and sections 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.
- 2. Capability Assessment Survey:** Collects information on local planning, regulatory, administrative, technical, fiscal and political capabilities that can be included in the countywide mitigation strategy.
- 3. Municipal Project Opportunity Forms and Mitigation Actions:** Copies of the 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.

A schedule that provided appropriate opportunities for public comment was utilized during the review and drafting process. Any public comment that was received during public meetings or during the draft review of the plan were documented and included in the plan. Copies of newspaper public meeting notices, website posted public notices and other correspondence are included in **Appendix C** of this plan.



**3.5 Multi-Jurisdictional Planning**

Bradford County used an open, public process to prepare this HMP. Meetings and letters to municipal officials were conducted to inform and educate them about Disaster Mitigation Act of 2000 and its 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 3.3-1 above reflects the municipality participation in meetings during the update process. Table 3.5-1 reflects the municipality participation by completing worksheets, surveys and forms.

<b>Table 3.5-1: Municipality Participation in Worksheets, Surveys and Forms</b>			
<b>Municipality</b>	<b>Capability Assessment Survey</b>	<b>Risk Assessment Hazard Identification and Risk Evaluation Worksheet</b>	<b>Hazard Mitigation Opportunity Form Review and Updates</b>
Alba Borough	X	X	X
Albany Township		X	X
Armenia Township	X	X	X
Asylum Township	X	X	X
Athens Borough	X	X	X
Athens Township	X	X	X
Burlington Borough	X	X	
Burlington Township		X	X
Canton Borough	X	X	X
Canton Township	X	X	X
Columbia Township	X	X	X
Franklin Township	X	X	X
Granville Township	X	X	X
Herrick Township	X	X	X
LeRaysville Borough	X	X	X
LeRoy Township	X	X	X
Litchfield Township	X	X	X
Monroe Borough	X	X	X
Monroe Township	X	X	X
New Albany Borough	X	X	
North Towanda Township	X	X	X
Orwell Township		X	

## Bradford County 2015 Hazard Mitigation Plan

<b>Table 3.5-1: Municipality Participation in Worksheets, Surveys and Forms</b>			
<b>Municipality</b>	<b>Capability Assessment Survey</b>	<b>Risk Assessment Hazard Identification and Risk Evaluation Worksheet</b>	<b>Hazard Mitigation Opportunity Form Review and Updates</b>
Overton Township	X	X	
Pike Township	X	X	X
Ridgebury Township	X	X	X
Rome Borough	X	X	X
Rome Township	X	X	
Sayre Borough	X	X	X
Sheshequin Township	X	X	X
Smithfield Township	X	X	X
South Creek Township	X	X	X
South Waverly Borough	X	X	
Springfield Township	X	X	
Standing Stone Township	X	X	
Stevens Township	X	X	X
Sylvania Borough	X	X	X
Terry Township	X	X	X
Towanda Borough	X	X	X
Towanda Township			
Troy Borough	X	X	X
Troy Township	X	X	X
Tuscarora Township			X
Ulster Township	X	X	X
Warren Township	X	X	X
Wells Township	X	X	
West Burlington Township	X		X
Wilmot Township	X	X	X
Windham Township	X	X	X
Wyalusing Borough	X	X	X
Wyalusing Township	X	X	X
Wysox Township	X	X	X

All municipalities within Bradford County have adopted the 2009 Bradford County Hazard Mitigation Plan as the municipal hazard mitigation plan. It is anticipated that all municipalities will adopt the 2015 Bradford 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 Bradford County Comprehensive Plan, Bradford County Emergency Operations Plan, local emergency operation plans, local zoning ordinances, and the local subdivision and land development ordinance.

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 Bradford County Comprehensive Plan so that vulnerability pertaining to future development could be established. The 2009 Bradford County Hazard Mitigation Plan, Risk Assessment Section 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. Bradford County does not maintain a biennial HVA. The risk assessment section of the county hazard mitigation plan is the recognized HVA for the county.

The Bradford County Local Planning Team reviewed and assessed the change in risk for all natural and man-made hazards identified in the 2009 hazard mitigation plan. The mitigation planning team then identified hazards that were outlined within the 2013 Pennsylvania Hazard Mitigation Plan but not included in the 2009 Bradford County Hazard Mitigation Plan that could impact Bradford County. The team utilized the Hazard Identification and Risk Evaluation worksheet that was provided by the Pennsylvania Emergency Management Agency. The Bradford County Project Team met with municipalities and provided guidance on how to complete the municipal hazard identification and risk evaluation worksheet. Forty Eight (48) municipalities out of fifty one (51) returned a completed worksheet. This information was combined with the county information to develop an overall list of hazards that would need profiled.

Once the natural and man-made hazards were identified and profiled, the local planning team then completed a vulnerability assessment for each hazard. An inventory of vulnerable assets was completed utilizing GIS data and local planning team knowledge. The team used the most recent Bradford County assessment data to estimate loss to particular hazards. Risk Factor was then assessed to each profiled hazard utilizing the hazard prioritization matrix. This assessment allows the county and its municipalities to focus on and prioritize local mitigation efforts on areas that are most likely to be damaged or require early response to a hazard event.

#### **4.2 Hazard Identification**

##### **4.2.1 Table of Presidential Disaster Declarations**

Table 4.2.1-1 presents a list of all Presidential and Governor's Disaster Declarations that have affected Bradford County from 1954 through 2013, according to the Pennsylvania Emergency Management Agency.

## Bradford County 2015 Hazard Mitigation Plan

<b>Table 4.2.1-1: Bradford County Presidential Disaster Declarations and Gubernatorial Declarations and Proclamations</b>			
<b>Date</b>	<b>Hazard Event</b>	<b>Action</b>	
		<b>Presidential</b>	<b>Gubernatorial</b>
June 2013	High Winds, Thunderstorms, Heavy Rain, Tornado, Flooding		Declaration of Emergency
October 2012	Hurricane Sandy	Presidential declaration	Declaration of Emergency
April 2012	Spring Winter Storms		Declaration of Emergency
September 2011	Remnants of Tropical Storm Lee	Presidential Declaration of Emergency	Declaration of Emergency
July 2011	Severe Storms and Flooding	Presidential declaration	
January 2011	Severe Winter Storm		Declaration of Emergency
February 2010	Severe Winter Storm		Declaration of Emergency
April 2007	Severe Storm		Declaration
April 2007	Severe Winter Storm		Declaration of Emergency
February 2007	Severe Winter Storm		Declaration of Emergency
November 2006	Flooding	Presidential Declaration of Emergency	
September 2006	Tropical Depression Ernesto		Declaration of Emergency
June 2006	Flooding	Presidential Declaration of Emergency	
April 2005	Severe Storms, Flooding and Mudslides	Presidential Declaration	
September 2005	Hurricane Katrina	Presidential Declaration of Emergency	Declaration of Emergency
September 2004	Tropical Depression Ivan	Presidential declaration	
July 1999	Drought		Declaration
January 1996	Severe Winter Storms	Presidential declaration	
January 1996	Flooding	Presidential declaration	
September 1995	Drought		Declaration
August 1994	Flooding		Declaration
January 1994	Severe Winter Storms	Presidential declaration	
March 1993	Blizzard	Presidential Emergency Declaration	
February 1978	Blizzard		Declaration
January 1978	Heavy Snow		Declaration
October 1976	Flood	Presidential declaration	
September 1975	Flood (Eloise)	Presidential declaration	
February 1974	Truckers Strike		Declaration
June 1972	Flood (Agnes)	Presidential declaration	
February, 1972	Heavy Snow		Declaration
January, 1966	Heavy Snow		Declaration

**Bradford County 2015 Hazard Mitigation Plan**

**Table 4.2.1-1: Bradford County Presidential Disaster Declarations and Gubernatorial Declarations and Proclamations**

Date	Hazard Event	Action	
		Presidential	Gubernatorial
September, 1955	Drought		Declaration

*Source: Pennsylvania Emergency Management Agency*

**4.2.2 Summary of Hazards**

The Bradford County Local Planning Team (LPT) was provided the Pennsylvania Standard List of Hazards to be considered for evaluation in the 2015 HMP Update. Following a review of the hazards considered in the 2009 HMP and the standard list of hazards, the Local Planning Team decided that the 2015 plan should identify, profile, and analyze twenty (20) hazards. These hazards include all the hazards profiled in the 2009 county mitigation plan. Table 4.2.2-1 contains a complete list of the 20 hazards that have the potential to impact Bradford County as identified through previous risk assessments, the Bradford County Hazards Vulnerability Analysis, and input from those that participated in the 2015 HMP update. Hazard profiles are included in Section 4.3 for each of these hazards.

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

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

**Bradford County 2015 Hazard Mitigation Plan**

<b>Table 4.2.2-1 Identified Hazards for the Bradford County HMP Update</b>	
<b>Natural Hazard</b>	<b>Hazard Description</b>
<b>Flood, Flash Flood, Ice Jam</b>	<p>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).</p>
<b>Hurricanes, Tropical Storms</b>	<p>Hurricanes, tropical storms, and nor'easters are classified as cyclones and are any closed circulation developing around a low-pressure center in which the winds rotate 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).</p>
<b>Invasive Species</b>	<p>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).</p>
<b>Landslide</b>	<p>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 &amp; Wilshusen, 2001).</p>
<b>Pandemic &amp; Infectious Diseases</b>	<p>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 &amp; Martin-Granel, 2006).</p>

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

Natural Hazard	Hazard Description
<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).
<b>Tornado, Wind Storm</b>	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, & F5 tornadoes between 1950-1998 ranges from <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).
<b>Winter Storm</b>	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).
<b>Wildfire</b>	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).



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Man-Made Hazards	Hazard Description
<p><b>Civil Disturbance</b></p>	<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>
<p><b>Dam Failure</b></p>	<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>
<p><b>Environmental Hazards</b></p>	<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>

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<b>Man-Made Hazards</b>	<b>Hazard Description</b>
<b>Nuclear Incidents</b>	<p>Nuclear accidents generally refer to events involving the release of significant levels of radioactivity or exposure of workers or the general public to radiation (FEMA, 1997). Nuclear accidents/incidents can be placed into three categories: 1) Criticality accidents which involve loss of control of nuclear assemblies or power reactors, 2) Loss-of-coolant accidents which result whenever a reactor coolant system experiences a break or opening large enough so that the coolant inventory in the system cannot be maintained by the normally operating make-up system, and 3) Loss-of-containment accidents which involve the release of radioactivity. The primary concern following such an incident or accident is the extent of radiation, inhalation, and ingestion of radioactive isotopes which can cause acute health effects (e.g. death, burns, severe impairment), chronic health effects (e.g. cancer), and psychological effects. (FEMA, 1997).</p>
<b>Terrorism</b>	<p>Terrorism is use of force or violence against persons or property with the intent to intimidate or coerce. Acts of terrorism include threats of terrorism; assassinations; kidnappings; hijackings; bomb scares and bombings; cyber-attacks (computer-based); and the use of chemical, biological, nuclear and radiological weapons. (FEMA, 2009).</p>
<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>Urban Fires/Explosions</b>	<p>An urban fire involves a structure or property within an urban or developed area. For hazard mitigation purposes, major urban fires involving large buildings and/or multiple properties are of primary concern. The effects of a major urban fire include minor to significant property damage, loss of life, and residential or business displacement. Explosions are extremely rapid releases of energy that usually generate high temperatures and often lead to fires. The risk of severe explosions can be reduced through careful management of flammable and explosive hazardous materials. (FEMA, 1997).</p>

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<p><b>Man-Made Hazards</b></p>	<p><b>Hazard Description</b></p>
<p><b>Utility Interruption</b></p>	<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, deepwater 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>
<p><b>Levee Failure</b></p>	<p>A levee is a human-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control or divert the flow of water so as to provide protection from temporary flooding (Interagency Levee Policy Review Committee, 2006). Levee failures or breaches occur when a levee fails to contain the floodwaters for which it is designed to control or floodwaters exceed the height of the constructed levee.</p>

**4.3 Hazard Profiles**

**4.3.1 Drought**

**4.3.1.1 Location and Extent**

Droughts have typically been regional climatic events that have occurred in Bradford County. Impacts from droughts are felt across the county and across Pennsylvania. Drought conditions can impact localized areas within Bradford County or droughts can impact regionally, such as groups of counties or the entire Mid-Atlantic region.

There are three different types of droughts that can be broadly defined as a period of time of prolonged dryness that contributes to the depletion of ground and surface water. A meteorological drought is a deficiency in moisture in the atmosphere. This will have very little effect on the crops and water supply depending on the conditions beforehand. An agricultural drought inhibits the growth of crops because of a moisture deficiency in the soil. This type of drought, if persistent, can lead to the third type of drought, which is a hydrologic drought. A hydrologic drought is basically a prolonged period of time without rainfall. This type of drought can have adverse effects on agriculture, streams, lakes, and groundwater levels. Leaving areas with little moisture, droughts are often one of the leading contributing factors to wildfires.

Agricultural and forest lands constitute the two single largest land cover types and together cover roughly 85 percent of the county, according to the Bradford County Comprehensive Plan. Bradford County has a predominant rural landscape of forested hills and mountains, agricultural valleys, and small towns and villages at rural crossroads. There are approximately 6,000 acres of surface water in Bradford County, with the Susquehanna River and its tributaries as the primary source. The Susquehanna River, part of the Susquehanna River Basin, traverses from north to south through the county. There are natural and man-made ponds and lakes scattered throughout the county. Table 4.3.1-2 identifies watershed inventories and watershed organizations for Bradford County.

<b>Table 4.3.1-2: Bradford County Watershed Organizations</b>
Bradford County Lakes & Ponds Organization
Center for Watershed Stewardship
Chesapeake Bay Foundation
Laning Creek Watershed Association
Mehoopany Creek Watershed Association
PA Cleanways
PA Organization for Watersheds and Rivers
PA Rivers Resource Advisory Council
Penn York Bentley Creek Watershed Association
Schrader Creek Watershed Association
Seeley Creek Watershed Association

<b>Table 4.3.1-2: Bradford County Watershed Organizations</b>
Stream Restoration, Inc.
The Alliance for Aquatic Resource Monitoring
Tioga River Watershed Reclamation Projects Inc.
Towanda Creek Watershed Association
Upper Susquehanna Coalition
Wyalusing Creek Watershed Association
Wysox Creek Watershed Association

**4.3.1.2 Range of Magnitude**

A drought condition would seriously affect farmlands, as approximately 41 percent of Bradford County’s land use is devoted to agriculture production. Due to the size of the county, it is possible to have a drought condition in one part of the county, while other areas of the county are not experiencing serious drought conditions.

Wildfires are the most severe cascading effect associated with drought. Wildfires can devastate wooded and agriculture areas, threatening natural resources and farm production facilities. Prolonged drought conditions can have a lasting impact on the economy and can cause major ecological changes, such as increases in scrub growth, flash flooding, and soil erosion.

Long-term water shortages during severe drought conditions can have a significant impact on agribusiness, public utilities, and other industries reliant on water for production services. Drought can cause municipalities to enforce water rationing and distribution. Local water rationing, although not a drought phase; is characterized by local municipalities, with the approval of the PA Emergency Management Council, implementing local water rationing to share a rapidly dwindling or severely depleted water supply in designated water supply service areas. This strains the availability of consumable water for the community. It also increases the county’s vulnerability to other hazards, such as severe weather, extreme heat, and public health emergencies. The special needs population of the county also must be considered during drought conditions. Phases of drought preparedness in Pennsylvania in order of increasing severity are listed in Table 4.3.1-2.

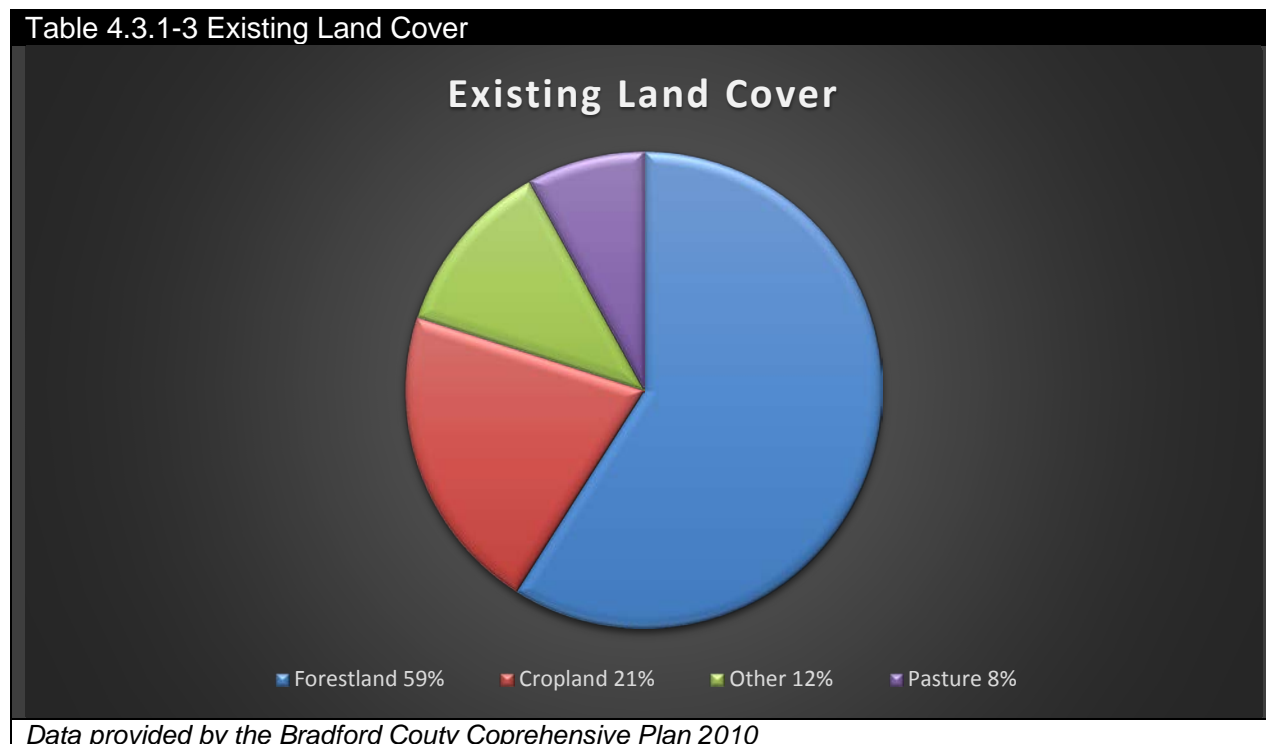
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**Table 4.3.1- 2: Drought Preparation Phases**

	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%

Source: PA Department of Environmental Protection

The rural farming areas of Bradford County are most at risk when a drought occurs. A drought can prove to be financial burden with 21% of the county’s land use devoted to crop cultivation. Table 4.3.1-3 outlines the existing land use in Bradford County.



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Environmental impacts of drought include:

- Increased desertification – damage to animal species
- Reduction and degradation of fish and wildlife habitat
- Lack of feed and drinking water
- Disease
- Increased predation
- Loss of wildlife in some areas
- Increased stress to endangered species
- Damage to plant species
- Increased number and severity of fires
- Wind and water erosion of soil.

Economic impacts of drought include:

- Loss of national economic growth, slowing down of economic development
- Damage to crop quality, less food production
- Increase in food prices
- Increased importation of food (higher costs)
- Insect infestation
- Plant disease
- Loss from dairy and livestock production
- Unavailability of water and feed for livestock which leads to high livestock mortality rates
- Disruption of reproduction cycles (breeding delays or unfilled pregnancies)
- Increased predation
- Range fires and wildland fires
- Damage to fish habitat, loss from fishery production
- Income loss for farmers and others affected
- Unemployment from production declines
- Loss to recreational and tourism industry
- Loss of hydroelectric power
- Loss of navigability of rivers and canals.

Social impacts of drought include:

- Food shortages
- Loss of human life from food shortages, heat, suicides, violence
- Mental and physical stress
- Water use conflicts
- Political conflicts
- Social unrest
- Public dissatisfaction with government regarding drought response
- Inequity in the distribution of drought relief
- Loss of cultural sites
- Reduced quality of life which leads to changes in lifestyle
- Increased poverty
- Population migrations

**4.3.1.3 Past Occurrence**

Bradford County has experienced drought events. Table 4.3.1-4 identifies drought events that have occurred from 1980 through 2012. A total of 5 drought emergencies occurred during this time period: 1980, 1991, 1992, 1995 and 1999.

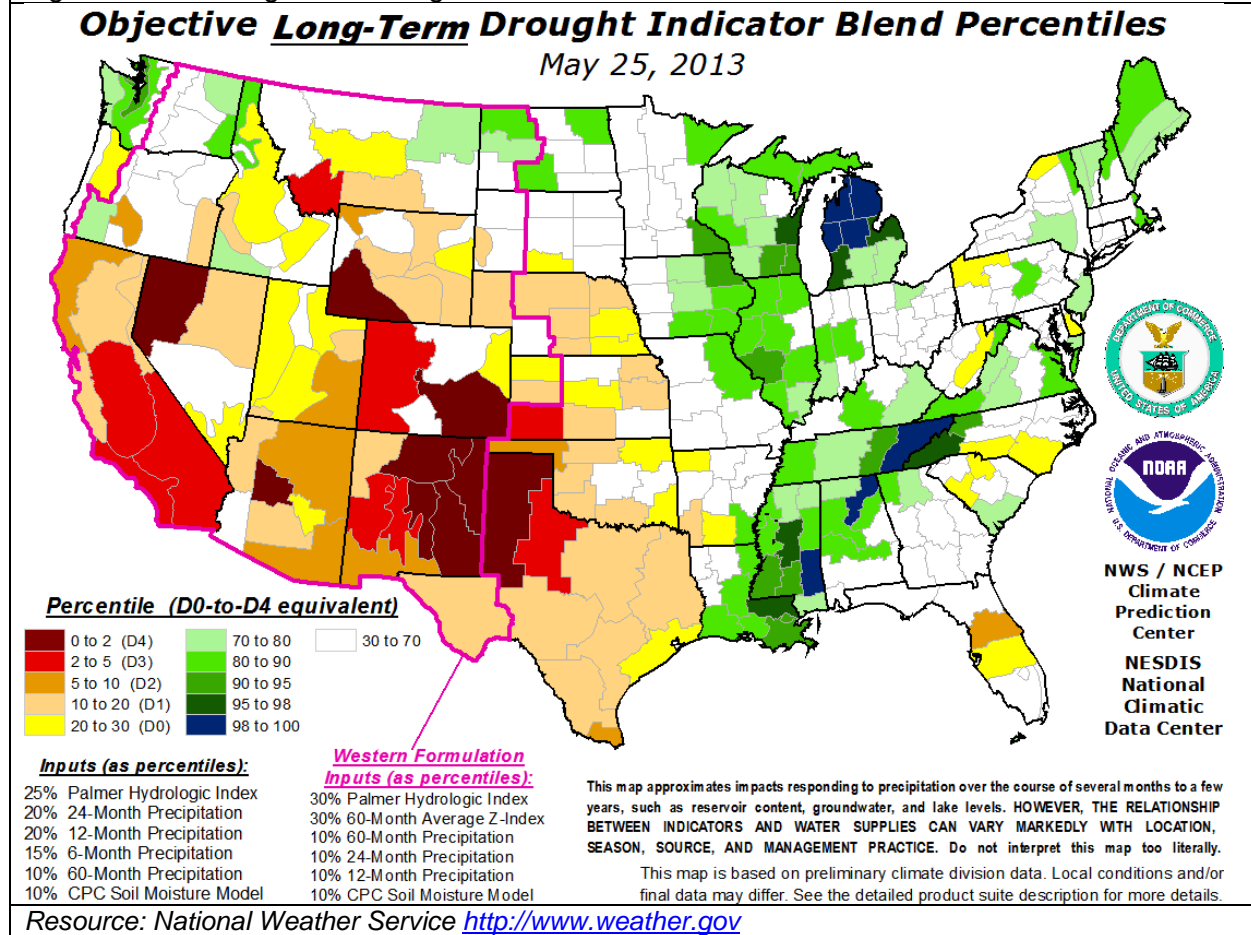
<b>Table 4.3.1-4: Bradford County Drought Event History 1980 - 2012</b>	
<b>Year</b>	<b>Watch/Warning/Emergency</b>
1980	Emergency
1988	Watch and Warning
1991	Warning and Emergency
1992	Warning and Emergency
1995	Warning and Emergency
1997	Watch
1998	Watch and Warning
1999	Watch, Warning and Emergency
2000	Watch
2001	Watch
2002	Watch
2006	Watch
2007	Watch
2010	Watch
2011	Watch
Pennsylvania Department of Environmental Protection	

**4.3.1.4 Future Occurrence**

The probability of a drought event occurring in Bradford County is possible. A risk factor of 2.2 was assigned to drought using the risk factor assessment tool provided by the Pennsylvania Emergency Management Agency. Figure 4.3.1-5 is a map that is a long term indicator for drought.



Figure 4.3.1-5 Long Term Drought Indicator



**4.3.1.5 Vulnerability Assessment**

Drought vulnerability is dependent upon the duration of the event and area of impact. However, other factors contribute to the severity of a drought. Unseasonably high temperatures, prolonged winds, and low humidity can heighten the impact of a drought. Droughts are not uncommon in Bradford County.

The effects of a drought are:

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

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Droughts can have adverse effects on farms and other water-dependent industries. This can result in a local economic loss. The size of animal her operations and the number of farms per municipality was not available for this mitigation plan update. From a societal perspective, public safety is an issue in terms of consumable water not being available, as well as water for fire protection and emergency services.

Public or municipal water service is available in 17 municipalities in Bradford County. Those municipalities are listed in Table 4.3.1-6.

<b>Table 4.3.1-6 Municipal Water Service in Bradford County</b>	
<b>Municipality</b>	<b>Full/Partial</b>
Athens Borough	Full
Athens Township	Partial
Canton Borough	Full
Canton Township	Partial
LeRaysville Borough	Full
Monroe Borough	Full
Monroe Township	Partial
New Albany Borough	Full
North Towanda Township	Partial
Sayre Borough	Full
South Waverly Borough	Full
Towanda Borough	Full
Towanda Township	Partial
Troy Borough	Full
Ulster Township	Partial
Wyalusing Borough	Full
Wyalusing Township	Partial
<b>Source: Bradford County Comprehensive Plan</b>	

As indicated, 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 4.3.1-7 shows the number of domestic wells per municipality. There are a total of 4,967 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.

The Bradford County Planning Department completed a review of the data from the PaGWIS and compared this information with GIS data that was available. The local planning team anticipates that the 4,967 domestic wells is a low number of domestic wells for the county. It was determined that 11,407 addressable structures receive municipal water service in the county and that 21,557 addressable structures must utilize domestic wells or springs for water.

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It is unknown how many of the 21,557 structures share a water source. This is merely a theoretical estimation. Additional research will be completed in the future.

<b>Table 4.3.1-7: Domestic wells per municipality in Bradford County</b>	
<b>MUNICIPALITY</b>	<b>DOMESTIC WELLS</b>
Alba Borough	16
Albany Township	113
Armenia Township	56
Asylum Township	97
Athens Borough	96
Athens Township	470
Burlington Borough	44
Burlington Township	73
Canton Borough	58
Canton Township	106
Columbia Township	95
Franklin Township	52
Granville Township	117
Herrick Township	75
LeRaysville Borough	3
Leroy Township	42
Litchfield Township	210
Monroe Borough	10
Monroe Township	63
New Albany Borough	5
North Towanda Township	93
Orwell Township	124
Overton Township	74
Pike Township	56
Ridgebury Township	296
Rome Borough	71
Rome Township	110
Sayre Borough	228
Sheshequin Township	440
Smithfield Township	220
South Creek Township	84
South Waverly Borough	9
Springfield Township	151
Standing Stone Township	56

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<b>Table 4.3.1-7: Domestic wells per municipality in Bradford County</b>	
<b>MUNICIPALITY</b>	<b>DOMESTIC WELLS</b>
Stevens Township	57
Sylvania Borough	3
Terry Township	138
Towanda Borough	23
Towanda Township	53
Troy Borough	13
Troy Township	116
Tuscarora Township	53
Ulster Township	122
Warren Township	103
Wells Township	42
West Burlington Township	49
Wilmot Township	97
Windham Township	77
Wyalusing Borough	32
Wyalusing Township	104
Wysox Township	242
Unknown	80
<b>TOTAL</b>	<b>4,967</b>

Source: Pennsylvania Groundwater Information System

Drought vulnerability maps are located in **Appendix H-1**.

**4.3.2 Earthquake**

**4.3.2.1 Location and Extent**

An earthquake is the sudden motion or trembling in the earth caused by an abrupt release of slowly accumulating strain, which results in ground shaking, surface faulting, and ground failures. Most areas of the United States are subject to earthquakes, and they occur literally thousands of times a year. Most earthquake occurrences result in little or no damage.

Earthquake rates in the northeastern United States are 100 times lower than in California. Those that do occur are typically felt over a much broader region than earthquakes of the same magnitude in the western United States; and as such, the area of damage could be larger in the northeast from an earthquake of the same magnitude in the west. A magnitude 4.0 eastern U.S. earthquake typically can be felt as far as 60 miles from its epicenter, but it infrequently causes damage near its source. A magnitude 5.5 eastern U.S. earthquake, although uncommon, can be felt as far as 300 miles from its epicenter, and cause damage as far away as 25 miles from its epicenter.

Historically, earthquakes in Pennsylvania are very rare, and have caused very little damage with no reported injuries or casualties. Since the Commonwealth does not reside on an active fault, many of the earthquakes that do occur are from deep within the earth’s crust. In most cases, these are non-measurable events. The Ramapo Fault System (Table 4.3.2-1) spans more than 185 miles in New York, New Jersey, and eastern Pennsylvania. This fault zone has had some small earthquakes.

**Table 4.3.2-1 Ramapo Fault System in Pennsylvania**

The Ramapo Fault Line in relation to Bradford County, Pennsylvania



Source: [www.bing.com/images](http://www.bing.com/images) Ramapo Fault line in Pennsylvania

**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 below 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.

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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.

Another earthquake intensity measurement is the modified Mercalli Scale. This scale is a measure of the severity of ground shaking at a particular point. There are twelve Mercalli intensities, represented by Roman numerals. The intensities are subjective because they are based upon damage incurred by the buildings and the effects felt by the people in localized areas. Intensity is usually greatest at the epicenter of an earthquake and decreases with distance from the epicenter. Each earthquake has only one magnitude, although it may have several intensities.

<b>Scale</b>	<b>Intensity</b>
<b>I. Instrumental</b>	Generally not felt by people unless in favorable conditions.
<b>II. Weak</b>	Felt only by a couple of people that are sensitive, especially on the upper floors of buildings. Delicately suspended objects may swing slightly.
<b>III. Slight</b>	Felt quite noticeably by people indoors, especially on the upper floors of buildings. Standing automobiles may rock slightly.
<b>IV. Moderate</b>	Felt indoors by many to all people, and outdoors by few people. Dishes, windows, and doors are disturbed. Walls make cracking sounds.
<b>V. Rather Strong</b>	Felt inside by most or all, and outside. Dishes and windows may break and bells will ring.
<b>VI. Strong</b>	Felt by everyone, outside or inside. Windows, dishes, glassware are broken; books fall off shelves; some heavy furniture is moved or overturned; a few instances of fallen plaster. Damage slight to moderate to poorly designed buildings.
<b>VII. Very Strong</b>	Difficult to stand. Furniture is broken. Damage is light in buildings of good design and construction; slight to moderate in ordinarily built structures; considerable damage in poorly build or badly designed structures.
<b>VIII. Destructive</b>	Damage slight in structures of good design. Damage will be great in poorly built structures.
<b>IX. Violent</b>	General panic. Damage slight to moderate (possibly heavy) in well-designed structures. Some buildings may be shifted off foundations.
<b>X. Intense</b>	Many well-built structures destroyed, collapsed, or moderately to severely damaged. Large landslides.

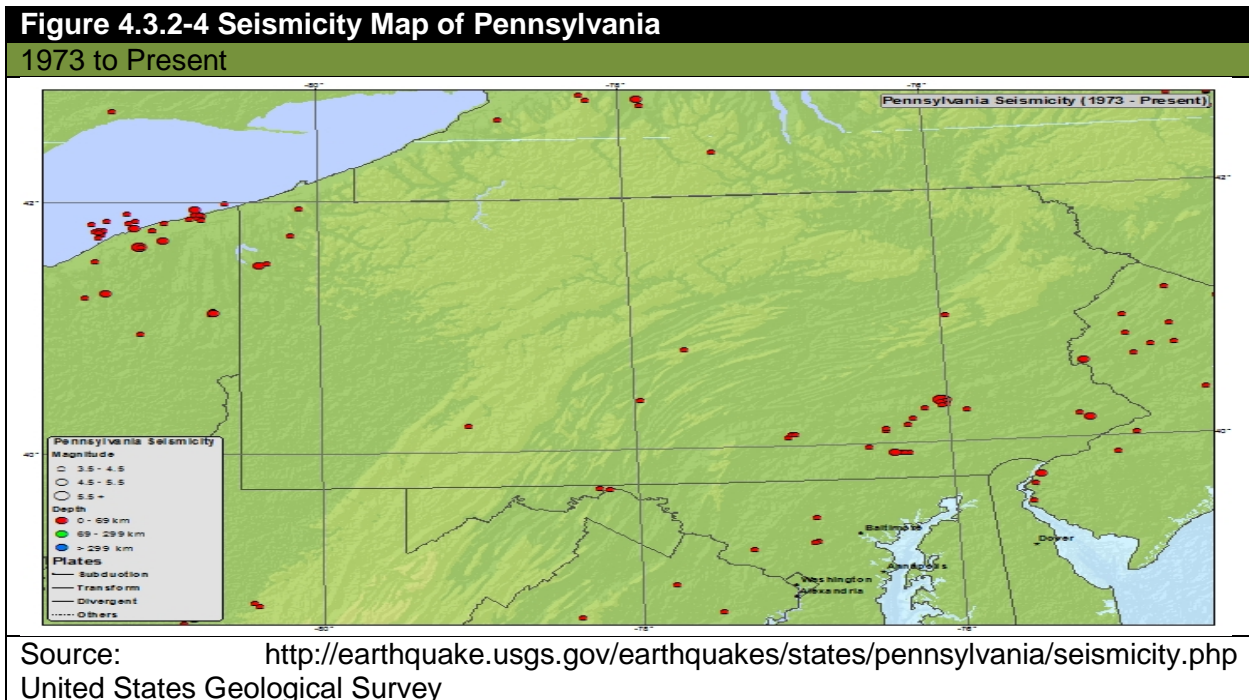
Table 4.3.2-3 Mercalli Scale	
Scale	Intensity
<b>XI. Extreme</b>	Few, if any structures remain standing. Numerous landslides, cracks and deformation of the ground.
<b>XII. Catastrophic</b>	Total destruction. Lines of sight and level distorted. Objects thrown into the air. The ground moves in waves or ripples. Large amounts of rock move position. Landscape altered, or leveled by several meters. Even the routes of rivers can be changed.

Source: en.wikipedia.org/wiki/Mercalli\_intensity\_scale

Because Bradford County does not rest on a major fault, no one area is at a great threat to experience an earthquake. Secondary effects of earthquakes can be very serious concerns. Even minor quakes can cause power outages, as well as hazardous material spills, dam failures, and landslides.

**4.3.2.3 Past Occurrence**

Bradford County has not had an earthquake epicenter. However, minor tremors were felt in October 1983 (5.3), April 1984 (4.1), November 1988 (6.0) and February 3, 2001 (2.9). There were no damages or injuries reported in the county from any of these tremors. Figure 4.3.2-4 is a seismicity map of Pennsylvania from 1973 to present.





**4.3.2.4 Future Occurrence**

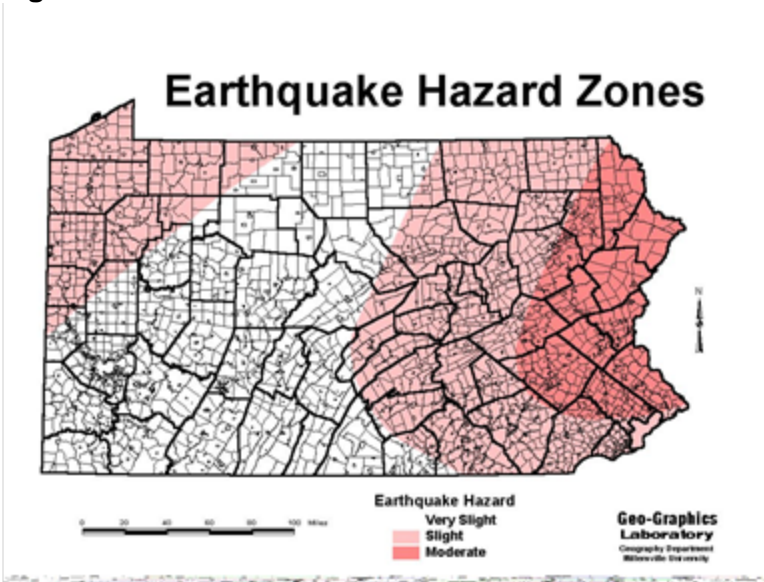
The probability of an earthquake striking Bradford County is unlikely; as Bradford County does not lie on a major fault line. A risk factor of 2.2 has been determined.

**4.3.2.5 Vulnerability Assessment**

Bradford County is at low risk to experience an earthquake. However, minor tremors have been experienced during the past several years. The county is located in a zone where minor earthquake damage may be expected. If an earthquake of significant magnitude were to strike Bradford County, or nearby counties, some secondary effects could be utilities failure, dam failures, fire, landslides, subsidence, and transportation accidents (especially pipeline breaks).

The northeastern U.S. has many known faults, but numerous smaller or deeply buried faults probably remain undetected. Essentially all of the known faults have not been active for perhaps 90 million years or more. Also, the locations of the known faults are not well determined at earthquake depths. Given the current geological and seismological data, it is difficult to determine if a known fault is still active today and could produce a modern earthquake. The best guide to earthquake hazard in the northeastern U.S. is probably the locations of past earthquakes themselves.

**Figure 4.3.2-2**



**4.3.3 Extreme Temperatures**

**4.3.3.1 Location and Extent**

Extreme temperatures can be devastating to any area. Extreme heat can cause sunburn, heat cramps, heat exhaustion, heat stroke, and dehydration. Likewise, extreme cold can cause hypothermia and frostbite. Bradford County is located in the northeastern portion of Pennsylvania. July is the warmest month and temperatures range from the upper 70's to middle 80's. January is the coldest month of the year. Temperatures range from the teens to 30's. Temperatures can vary across Bradford County due to the vast elevation changes in topography.

**4.3.3.2 Range of Magnitude**

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

Created by the National Weather Service, the Heat Index (HI), is a chart which accurately measures apparent temperature of the air as it increases with the relative humidity. The Heat Index can be used to determine what effects the temperature and humidity can have on the population.

**Table 4.3.3-1 Heat Index**

**NOAA's National Weather Service**  
**Heat Index**  
Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

**Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity**

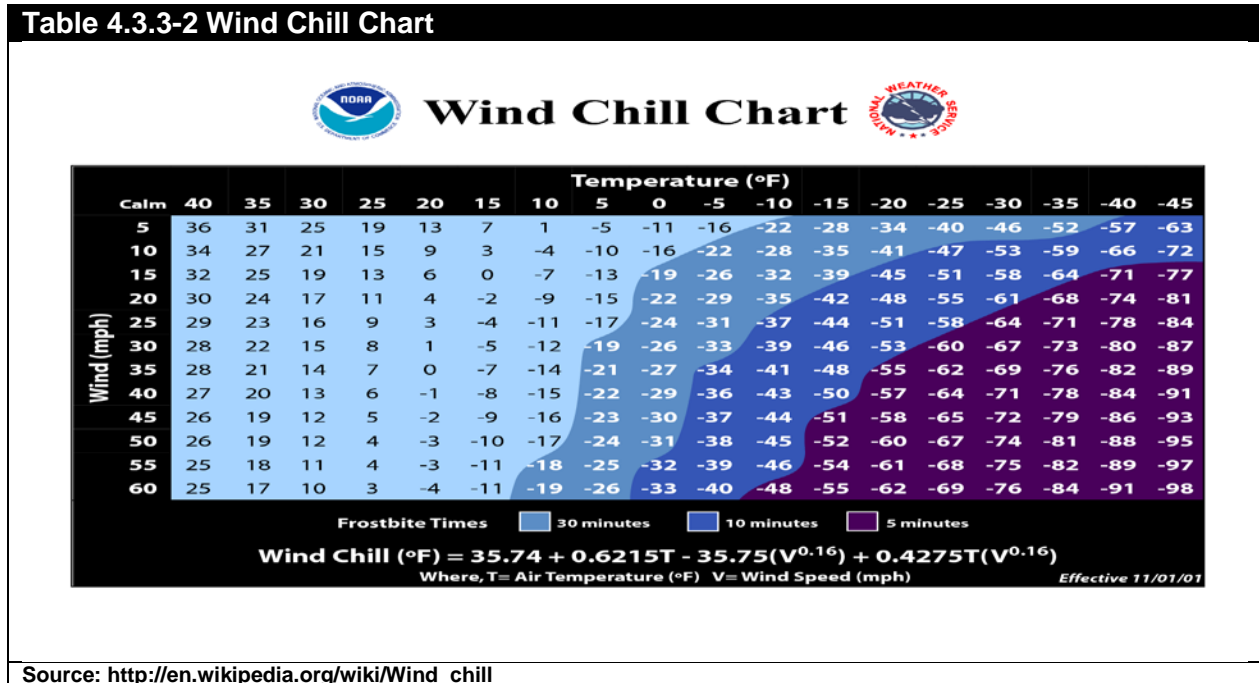
Caution
  Extreme Caution
  Danger
  Extreme Danger

Source: [www.nws.noaa.gov/os/heat/index](http://www.nws.noaa.gov/os/heat/index)

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The National Weather Service Wind Chill Temperature index uses advances in science, technology, and computer modeling to provide the dangers from winter winds and freezing temperatures.

**Table 4.3.3-2 Wind Chill Chart**



Source: [http://en.wikipedia.org/wiki/Wind\\_chill](http://en.wikipedia.org/wiki/Wind_chill)

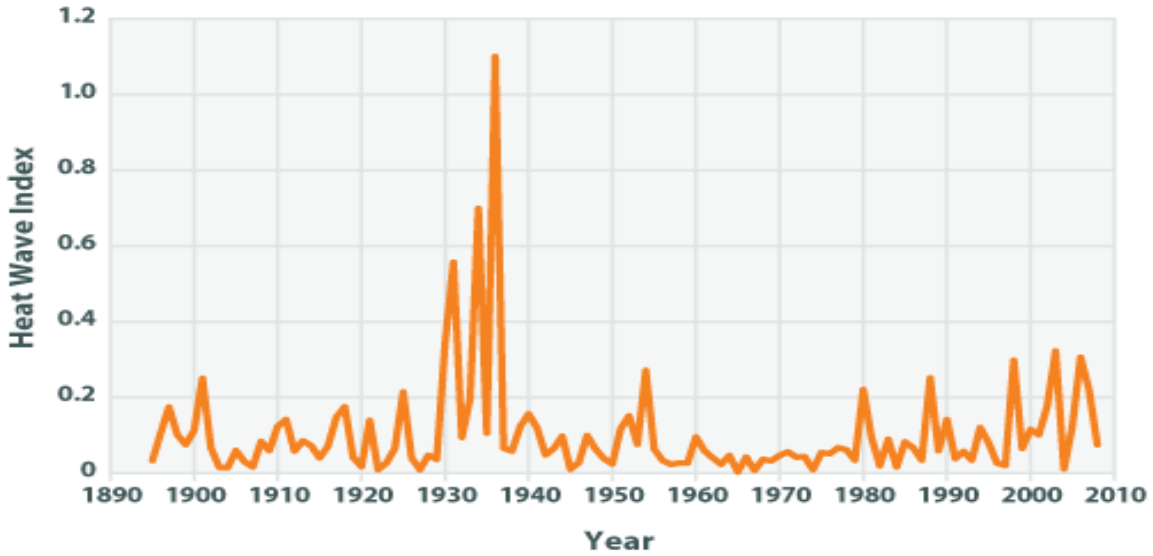
### 4.3.3.3 Past Occurrence

Bradford County has had more occurrences of extreme cold incidents than extreme heat. This is due to the geographic location of the county. Although exact data for Bradford County is limited below, it is the assumption that the county experienced the effects of extreme temperatures more in the past.

**Table 4.3.3- U.S. Annual Heat Wave Index 1895 to 2008**

Depicting the heat wave temperatures from the July 9-10, 1936 heat wave

**Figure 1. U.S. Annual Heat Wave Index, 1895–2008**



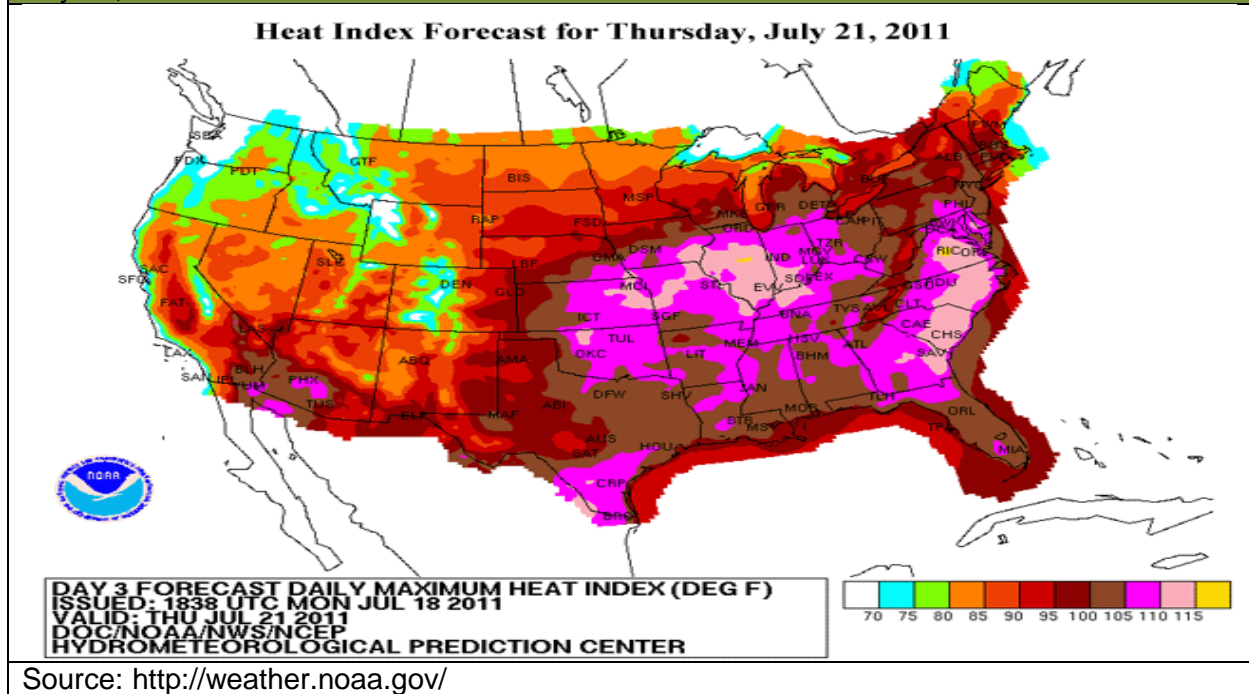
Source:

<http://www.bing.com/images/search?q=july+1936+heat+wave&qpv=1&qpvt=july+1936+heat+wave&FORM=IGRE>

In 2011, Pennsylvania experienced record-breaking heat in 19 counties and a total of 45 broken heat records. Figure 4.3.3-4 shows the temperatures for July 21, 2011.

**Table 4.3.3-4**

July 21, 2011



The extreme temperatures hazard is generally a regional problem, and not necessarily confined to only Bradford County. Bradford County has experienced Table 4.3.3-5 reflects extreme temperatures for Bradford County in the past.

**Table 4.3.3-5: Bradford County Extreme Temperatures**

Location	Date	Type	Deaths	Injuries
Bradford County	09/28/2000	Extreme Cold/Wind Chill	0	0
Bradford County	05/17/2002	Extreme Cold/Wind Chill	0	0
Bradford County	01/07/2014	Extreme Cold/Wind Chill	0	0
Bradford County	07/21/2011	Excessive Heat	0	0

Source: National Climatic Data Center

### **4.3.3.4 Future Occurrence**

The probability of extreme temperatures occurring in Bradford County is possible. A risk factor of 2.4 has been assigned to this hazard utilizing the risk factor methodology probability criteria provided by the Pennsylvania Emergency Management Agency.

Extreme temperatures will occur in the future. Prediction of these events will continue to be enhanced with new technology and better recording of previous data and events.

### **4.3.3.5 Vulnerability Assessment**

Extreme temperatures are usually a regional hazard when they occur. The elderly and young people are most vulnerable to extreme temperatures due to their mobility challenges and disabilities. Extreme temperatures impact utilities. Increase cost to consumers sometimes leads to an inability for the consumer to afford the costs. Extreme temperatures increase the demand for utility services. Subsequently, this will cause a decrease in availability of these services or failure of the system. A decrease or failure of the utility system during extreme temperature events puts the population at great risk.

**4.3.4 Flood, Flash Flood, and Ice Jams**

**4.3.4.1 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.

The National Flood Insurance Program (NFIP) publishes flood insurance rate maps. These maps identify the 1% annual chance of flood area (100 year flood plain). 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:

<b>4.3.4-1: 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 have not been performed, no base flood elevations or flood depths are shown
AE	Areas subject to inundation by the 1% annual chance flood event determined by detailed methods. BFEs are shown within these zones.
AH	Areas subject to inundation by the 1% annual chance shallow flooding (usually areas of ponding) where average depths are 1-3 feet. BFEs derived from detailed hydraulic analysis are shown in this zone.

**4.3.4-1: Special Flood Hazard Area High Risk Zones**

Zone	Description
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 Bradford 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.

Bradford County is prone to two types of floods:

- Riverine Flood – Occurs in the floodplain of a stream, creek or river when the amount of water and the rate at which it is moving increases. The amount and rate is usually influenced by rapid snowmelt or intense rainfall.
- Flash Flood – These floods are usually short in duration and occur in somewhat localized areas. The floods are more unpredictable and if they occur at night can cause panic and loss of life.

**4.3.4.2 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 Bradford 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.

Monroe Borough has the highest estimated potential loss due to flooding among all Bradford County municipalities at \$9,139,100 in market value. Athens Borough has the second highest estimated potential loss due to flooding at approximately \$6,953,600. Ridgebury Township ranks third with \$4,608,750. This data is further described in Section 4.4-3 and in Table 4.4-5 on pages 157-160.



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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 transportation accidents. Flooding also has the potential to cause other hazards, such as landslides, hazardous material releases, 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 Bradford 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.

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### 4.3.4.3 Past Occurrence

Bradford County has experienced numerous flood events since 1972. The flooding and flash flooding was caused by a variety of storms, tropical storms and other issues. The most significant occurrence of flooding is due to storms with heavy rain. A summary of the flood history of Bradford County since 1972 is noted below in Table 4.3.4-2. Flooding data from 1972 to 1996 has limited information available. The National Climatic Data Center (NCDC) was queried to determine flooding and flash flooding history. All types marked as flooding were riverine type flooding and all types marked as flash flooding were flash flooding locations identified by NCDC.

**Table 4.3.4-2: Bradford County Flood Event History**

Date	Location	Type	Deaths
1972	Bradford County, Countywide	Flooding	0
01/19/1996	Bradford County, Countywide	Flooding and Flash Flooding	0
11/09/1996	Bradford County, Countywide	Flooding	0
12/01/1996	Bradford County, Countywide	Flash Flooding	0
12/02/1996	Bradford County, Countywide	Flooding	0
01/08/1998	Bradford County, Countywide	Flooding	0
06/13/1998	Bradford County North East Portion	Flash Flooding	0
01/24/1999	Bradford County, Countywide	Flooding	0
02/27/2000	Bradford County, Countywide	Flooding	0
04/04/2000	Bradford County, Countywide	Flash Flooding	0
05/10/2000	Bradford County, North Central Portion	Flash Flooding	0
07/30/2000	Bradford County, New Albany	Flash Flooding	0
03/30/2001	Bradford County, Countywide	Flash Flooding	0
04/03/2001	Bradford County, Ulster	Flash Flooding	0
04/09/2001	Bradford County, Countywide	Flooding	0
06/16/2001	Bradford County, Central Portion	Flash Flooding	0
06/23/2001	Bradford County, Countywide	Flash Flooding	0
03/26/2002	Bradford County, Rome	Flash Flooding	0
03/27/2002	Bradford County, Countywide	Flooding	0
05/28/2002	Bradford County, Countywide	Flash Flooding	0
03/21/2003	Bradford County, Countywide	Flooding	0
05/01/2003	Bradford County, Countywide	Flash Flooding	0
06/21/2003	Bradford County, Countywide	Flash Flooding	0
08/09/2003	Bradford County, Countywide	Flash Flooding	0
09/04/2003	Bradford County, Countywide	Flash Flooding	0
10/29/2003	Bradford County, Countywide	Flooding	0
12/12/2003	Bradford County, Countywide	Flooding	0
03/06/2004	Bradford County, Countywide	Flooding	0
05/13/2004	Bradford County, Monroeeton and Troy	Flash Flooding	0
07/23/2004	Bradford County, Wilawana	Flash Flooding	0
07/27/2004	Bradford County, Litchfield	Flash Flooding	0
07/31/2004	Bradford County, Big Pond	Flash Flooding	0
09/17/2004	Bradford County, Countywide	Flash Flooding	0
09/18/2004	Bradford County, Countywide	Flooding	0
01/14/2005	Bradford County, Countywide	Flooding	0
03/28/2005	Bradford County, Countywide	Flooding	0

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**Table 4.3.4-2: Bradford County Flood Event History**

Date	Location	Type	Deaths
04/02/2005	Bradford County, Countywide	Flooding and Flash Flooding	0
06/10/2005	Bradford County, Sayre	Flash Flooding	0
10/25/2005	Bradford County, Countywide	Flooding	0
11/29/2005	Bradford County, Countywide	Flooding	0
11/30/2005	Bradford County, Countywide	Flooding	0
12/01/2005	Bradford County, Countywide	Flooding	0
01/18/2006	Bradford County, Burlington, Sayre and Monroeton	Flooding and Flash Flooding	0
06/27/2006	Bradford County, Countywide	Flooding and Flash Flooding	0
11/16/2006	Bradford County, Countywide	Flooding and Flash Flooding	0
03/15/2007	Bradford County, Athens and Towanda	Flooding	0
03/25/2007	Bradford County, Athens	Flooding	0
03/05/2008	Bradford County, Evergreen and Liberty Corners	Flash Flooding	0
01/25/2010	Bradford County, Leona, Towanda Airport, South Warren	Flash Flooding	0
03/10/2011	Bradford County, Canton	Flash Flooding	0
04/16/2011	Bradford County, West Burlington	Flash Flooding	0
04/25/2011	Bradford County, Countywide	Flash Flooding	0
04/28/2011	Bradford County, Columbia Crossroads	Flash Flooding	0
05/19/2011	Bradford County, Mosherville	Flash Flooding	0
09/07/2011	Bradford County, Countywide	Flooding and Flash Flooding	1
09/29/2011	Bradford County, North Towanda	Flash Flooding	0
06/23/2013	Bradford County, Milan	Flash Flooding	0

The most recent flood event was recorded from September 4, 2011 through September 10, 2011 in Bradford County. Heavy rainfall from the remnants of Tropical Storm Lee produced widespread flooding, flash flooding and river flooding. Tropical Storm Lee formed over the Gulf of Mexico on September 1, 2011 and moved up the eastern coast of the United States. The five-day storm rainfall totals for September 5 to September 9 were generally 5-8 inches of rain over the mid-section of central Pennsylvania and 8-12 inches of rain in the Susquehanna Valley region.

Major flooding from the remnants of Tropical Storm Lee occurred in Bradford County. Rome, Towanda, Macedonia, Wysox, Monroeton, East Athens, Powell, and Windham Center all reported significant flooding. Numerous roads were closed in the county due to flooding from creeks and streams. Numerous buildings were destroyed, suffered major damage and suffered minor damage. The total number of impacted structures was not available. Pennsylvania Governor Corbett requested a presidential declaration from President Obama on September 12, 2011 due to the large amount of damage throughout the Commonwealth of Pennsylvania. A presidential declaration was received for individual assistance and public assistance on September 13, 2011. This flooding event was the most significant and costly event for Bradford County since Tropical Storm Agnes and is currently the most expensive in Bradford County history.

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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. As of December 17, 2013, there are 15 repetitive loss properties and 5 severe repetitive loss properties in Bradford County. Table 4.3.4-3 shows the number of severe repetitive loss properties per municipality in the red column and the repetitive loss properties by municipality in the remaining columns. A map is also included in **Appendix D**.

**Table 4.3.4-3: Summary of NFIP Policies, Severe Repetitive Loss and Repetitive Loss properties by municipality**

MUNICIPALITY	NFIP POLICIES	SEVERE REPETITIVE LOSS	REPETITIVE LOSS 2-4 FAMILY	REPETITIVE LOSS SINGLE FAMILY	SUM OF REPETITIVE LOSS PROPERTIES
Alba Borough	0	0	0	0	0
Albany Township	9	0	0	0	0
Armenia Township		0	0	0	0
Asylum Township	14	0	0	3	3
Athens Borough	229	0	0	0	0
Athens Township	63	4	0	6	6
Burlington Borough	6	0	0	0	0
Burlington Township	1	0	0	0	0
Canton Borough	6	0	0	0	0
Canton Township	3	0	0	0	0
Columbia Township	7	0	0	0	0
Franklin Township	7	0	0	0	0
Granville Township	0	0	0	0	0
Herrick Township	0	0	0	0	0
LeRaysville Borough	2	0	0	0	0
LeRoy Township	1	0	0	0	0
Litchfield Township	5	0	0	0	0
Monroe Borough	66	0	0	0	0
Monroe Township	35	0	0	0	0
New Albany Borough	3	0	0	0	0
North Towanda Township	4	0	0	0	0

**Bradford County 2015 Hazard Mitigation Plan**

**Table 4.3.4-3: Summary of NFIP Policies, Severe Repetitive Loss and Repetitive Loss properties by municipality**

MUNICIPALITY	NFIP POLICIES	SEVERE REPETITIVE LOSS	REPETITIVE LOSS 2-4 FAMILY	REPETITIVE LOSS SINGLE FAMILY	SUM OF REPETITIVE LOSS PROPERTIES
Orwell Township	9	0	0	0	0
Overton Township	0	0	0	0	0
Pike Township	0	0	0	0	0
Ridgebury Township	34	0	0	0	0
Rome Borough	5	0	0	0	0
Rome Township	5	0	0	0	0
Sayre Borough	32	0	0	0	0
Sheshequin Township	26	0	0	0	0
Smithfield Township	7	0	0	0	0
South Creek Township	30	0	0	0	0
South Waverly Borough	8	0	0	0	0
Springfield Township	1	0	0	0	0
Standing Stone Township	9	0	0	0	0
Stevens Township	4	0	0	1	1
Sylvania Borough	7	0	0	0	0
Terry Township	12	0	0	3	3
Towanda Borough	34	0	0	0	0
Towanda Township	6	0	0	0	0
Troy Borough	6	0	0	0	0
Troy Township	12	0	0	0	0
Tuscarora Township	7	0	0	0	0
Ulster Township	19	1	0	1	1
Warren Township	16	0	0	0	0
Wells Township	4	0	0	0	0
West Burlington Township	2	0	0	0	0
Wilmot Township	27	0	0	0	0
Windham Township	5	0	0	0	0
Wyalusing	0	0	0	0	0

**Table 4.3.4-3: Summary of NFIP Policies, Severe Repetitive Loss and Repetitive Loss properties by municipality**

MUNICIPALITY	NFIP POLICIES	SEVERE REPETITIVE LOSS	REPETITIVE LOSS 2-4 FAMILY	REPETITIVE LOSS SINGLE FAMILY	SUM OF REPETITIVE LOSS PROPERTIES
Borough					
Wyalusing Township	36	0	0	0	0
Wysox Township	18	0	0	1	1
<b>TOTAL</b>	842	5	0	15	15

**4.3.4.4 Future Occurrence**

Flooding is a frequent problem throughout Pennsylvania. The probability of a flooding event impacting Bradford County is high. Bradford 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 or 100 year flood*, as the standard for identifying properties subject to federal flood insurance purchase requirements. A 1%-annual-chance flood is a flood which has a 1% chance of occurring over a given year. The DFIRMs are used to identify areas subject to the 1%-annual-chance flooding. Areas subject to 2% and 10% annual chance events are not shown on maps; however, water surface elevations associated with these events are included in the flood source profiles contained in the Flood Insurance Study Report. Table 4.3.4-4 shows a range of flood recurrence intervals and associated probabilities of occurrence.

<b>Table 4.3.4-4: Flooding recurrence intervals and associated probabilities</b>	
RECURRENCE INTERVAL	CHANCE OF OCCURRENCE IN ANY GIVEN YEAR (%)
10 year	10%
50 year	2%
100 year	1%
500 year	0.2%

**4.3.4.5 Vulnerability Assessment**

**River and Stream Flooding:**

Bradford County is highly 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. Bradford 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.

Bradford 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 and agriculture. Flooding can destroy the physical structures, merchandise, and equipment essential for business operation. Flooding can also destroy prime farmland and crops. 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 Bradford 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 releases. 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 4.3.4-5 identifies the critical facilities within Bradford County that are located within the special flood hazard area. These facilities were identified using county GIS data. Critical facilities are facilities that if damaged would present an immediate threat to life, public health and safety. No schools, government buildings or hospitals were identified in the SFHA.

<b>Table 4.3.4-5 Bradford County Critical Facilities in the Special Flood Hazard Area</b>				
<b>Name</b>	<b>Facility Type</b>	<b>Location</b>	<b>Assessed Value</b>	<b>Market Value</b>
Williams Oil	Tier II Facility	Towanda Borough	\$11,650	\$23,300

*Source: Bradford County Planning Department*

Bradford 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 special flood hazard area. While greater and smaller floods are possible, information about the extent and depths for this area is available for all municipalities

**Bradford County 2015 Hazard Mitigation Plan**

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countywide, thus providing a consistent basis for analysis. Flood vulnerability maps for each applicable local municipality, showing the special 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 Bradford County utilizing the summary of risk factor approach document for flooding. Table 4.3.4-6 outlines the risk assessment categories. With each category a level, criteria and index was applied along with a weight value. The results for each municipality are identified in Table 4.3.4-7. 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.



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**Table 4.3.4-6: Summary of Risk Factor Approach**

<b>Risk Assessment Category</b>	<b>Degree of Risk</b>			<b>Weight Value</b>
	<b>Level</b>	<b>Criteria</b>	<b>Index</b>	
<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	1	<b>30%</b>
	<b>POSSIBLE</b>	BETWEEN 1% & 49.9% ANNUAL PROBABILITY	2	
	<b>LIKELY</b>	BETWEEN 50% & 90% ANNUAL PROBABILITY	3	
	<b>HIGHLY LIKELY</b>	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>	<b>MINOR</b>	VERY FEW INJURIES, IF ANY. ONLY MINOR PROPERTY DAMAGE & MINIMAL DISRUPTION ON QUALITY OF LIFE. TEMPORARY SHUTDOWN OF CRITICAL FACILITIES.	1	<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.	2	
	<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.	3	
	<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.	4	
<b>SPATIAL EXTENT</b> <i>How large of an area could be impacted by a hazard event? Are impacts localized or regional?</i>	<b>NEGLECTIBLE</b>	LESS THAN 1% OF AREA AFFECTED	1	<b>20%</b>
	<b>SMALL</b>	BETWEEN 1 & 10.9% OF AREA AFFECTED	2	
	<b>MODERATE</b>	BETWEEN 11 & 25% OF AREA AFFECTED	3	
	<b>LARGE</b>	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>	<b>MORE THAN 24 HRS</b>	SELF-DEFINED	1	<b>10%</b>
	<b>12 TO 24 HRS</b>	SELF-DEFINED	2	
	<b>6 TO 12 HRS</b>	SELF-DEFINED	3	
	<b>LESS THAN 6 HRS</b>	SELF-DEFINED	4	
<b>DURATION</b> <i>How long does the hazard event usually last?</i>	<b>LESS THAN 6 HRS</b>	SELF-DEFINED	1	<b>10%</b>
	<b>LESS THAN 24 HRS</b>	SELF-DEFINED	2	
	<b>LESS THAN 1 WEEK</b>	SELF-DEFINED	3	
	<b>MORE THAN 1 WEEK</b>	SELF-DEFINED	4	

## Bradford County 2015 Hazard Mitigation Plan

**Table 4.3.4-7 Flooding Risk Factor Results per Municipality**

FLOODING HAZARD PER MUNICIPALITY	RISK ASSESSMENT CATEGORY					RISK FACTOR (RF)
	PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	
Alba Borough	2	2	2	3	4	2.3
Albany Township	2	3	2	4	1	2.4
Armenia Township	2	2	1	4	1	1.9
Asylum Township	3	4	2	1	3	2.9
Athens Borough	3	4	3	1	3	3.1
Athens Township	3	4	2	1	3	2.9
Burlington Borough	2	1	2	4	1	1.8
Burlington Township	3	4	2	4	1	3
Canton Borough	3	4	2	4	2	3.1
Canton Township	3	4	2	4	1	3
Columbia Township	2	2	2	4	1	2.1
Franklin Township	3	2	2	2	1	2.2
Granville Township	2	1	2	4	1	1.8
Herrick Township	2	1	1	4	1	1.6
LeRaysville Borough	2	1	2	4	1	1.8
LeRoy Township	3	2	2	4	2	2.5
Litchfield Township	2	1	2	4	1	1.8
Monroe Borough	3	4	4	3	2	3.4
Monroe Township	3	3	2	3	1	2.6
New Albany Borough	2	2	2	4	1	2.1
North Towanda Township	3	2	2	3	3	2.5
Orwell Township	2	1	2	4	1	1.8
Overton Township	2	1	2	4	1	1.8
Pike Township	2	1	2	4	1	1.8
Ridgebury Township	3	3	2	4	2	2.8
Rome Borough	3	2	4	4	2	2.9
Rome Township	3	2	2	4	1	2.4
Sayre Borough	3	4	2	1	3	2.9
Sheshequin Township	3	4	3	1	3	3.1
Smithfield Township	2	2	2	4	1	2.1
South Creek Township	2	3	2	4	1	2.4
South Waverly Borough	2	1	2	4	3	2

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**Table 4.3.4-7 Flooding Risk Factor Results per Municipality**

FLOODING HAZARD PER MUNICIPALITY	RISK ASSESSMENT CATEGORY					RISK FACTOR (RF)
	PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	
Springfield Township	2	2	2	4	1	2.1
Standing Stone Township	3	4	2	1	3	2.9
Stevens Township	3	2	2	4	1	2.4
Sylvania Borough	2	3	4	4	1	2.8
Terry Township	3	4	2	1	3	2.9
Towanda Borough	3	4	2	1	3	2.9
Towanda Township	3	3	2	3	3	2.8
Troy Borough	2	3	2	4	1	2.4
Troy Township	2	2	2	4	1	2.1
Tuscarora Township	2	2	2	4	1	2.1
Ulster Township	3	4	2	1	3	2.9
Warren Township	2	3	2	4	1	2.4
Wells Township	2	2	2	4	1	2.1
West Burlington Township	2	2	2	4	1	2.1
Wilmot Township	3	4	2	1	3	2.9
Windham Township	2	3	2	4	1	2.4
Wyalusing Borough	3	4	3	3	3	3.3
Wyalusing Township	3	4	2	3	3	3.1
Wysox Township	3	4	3	3	4	3.4

Bradford County classified flooding into three sub categories. These are river flooding, flash flooding, and ice jam flooding. There is a possible probability of river and stream flooding affecting Bradford County, with a risk factor of 2.6 being assigned utilizing the risk factor assessment tool provided by the Pennsylvania Emergency Management Agency.

**Flash Flooding:**

Flash flooding has a likely probability within Bradford County, with a risk factor of 2.5 being associated. Flash flooding can occur anywhere within Bradford 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

## **Bradford County 2015 Hazard Mitigation Plan**

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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 4.3.4-2 above.

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

- Athens
- Litchfield
- Milan
- Monroeton
- New Albany
- North Towanda
- Rome
- Sayre
- Towanda
- Troy
- Ulster
- West Burlington

The Bradford 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. This will be a continuous process during the 2015-2020 mitigation plan period. As new data is developed, new special needs facilities appear and new critical facilities appear the interface between flash flooding locations and the new data will be analyzed to identify new vulnerability.

### **Ice Jam Flooding:**

There is a possible probability that an ice jam flooding incident will affect Bradford County; and a risk factor of 2 assigned using the risk factor assessment tool. Areas along the Susquehanna River, Chemung River, Sugar Creek, Towanda Creek, Wyalusing Creek and Wysox Creek are the most vulnerable to ice jam flooding.

The Bradford 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. This will be a continuous process during the 2015-2020 mitigation plan period. As new data is developed, new special needs facilities appear and new critical facilities appear the interface between flash flooding locations and the new data will be analyzed to identify new vulnerability.

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**4.3.5 Hurricane/Tropical Storm**

**4.3.5.1 Location and Extent**

Hurricanes, tropical storms, and windstorms will occur in the county in the spring and summer months. Most hurricanes that approach Bradford County are eventually downgraded to tropical storms or tropical depressions by the time they reach northeastern Pennsylvania. 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.

Nor'easter is a macro-scale storm along the upper East Coast of the United States; it gets its name from the direction the wind is coming from. Nor'easters can cause severe coastal flooding, coastal erosion, hurricane force winds or blizzard conditions; these conditions are usually accompanied with very heavy rain or snow, depending on when the storm occurs.

**4.3.5.2 Range of Magnitude**

Hurricanes and tropical storms affect all of Bradford County. These hazards usually have a regional impact instead of just affecting Bradford 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. The Saffir-Simpson Hurricane Scale is the most common tool used to classify tropical storms and hurricanes. Table 4.3.5-1 outlines the categorization of these events.

**Table 4.3.5-1 Saffir-Simpson Hurricane Scale**

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

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**4.3.5.3 Past Occurrence**

Table 4.3.5-2 lists all of the hurricanes and tropical storms that have affected Pennsylvania from 1954 to 2012.

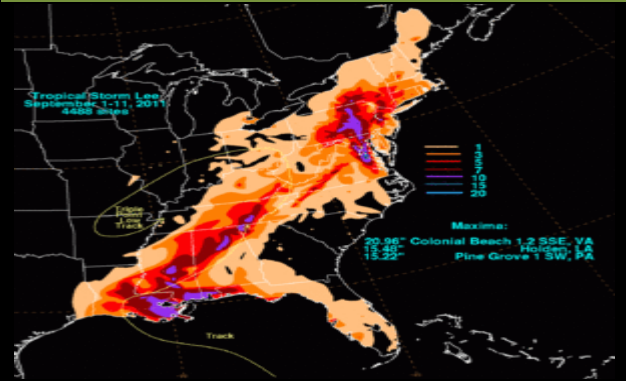
<b>Table 4.3.5-2 Past occurrence of Hurricane and Tropical Storms in Pennsylvania</b>		
<b>Date</b>	<b>Classification of Storm in PA or Name</b>	<b>Damages</b>
10-15-1954	<i>Hurricane Hazel</i>	Tropical force winds, 6+ inches of rain in some areas.
8-1-1955	<i>Hurricanes Connie &amp; Diane</i>	Tropical force winds, 10 inches of rain
6-21-1972	<i>Hurricane Agnes</i>	Widespread rains of 6-12 inches with local amounts up to 19 inches
9-6-1979	<i>Tropical Storm David</i>	Tropical force winds, 5 inches of rain
9-1987	<i>Tropical Depression Nine</i>	5 inches to part of the state
9-26-1992	<i>Tropical Storm Danielle</i>	Tropical force winds
8-18-1994	<i>T.D. Beryl</i>	
8-29/31-1999	Tropical Depression <i>Hurricane Dennis</i>	Tropical depression winds, 5 inches of rain
9-16-1999	<i>Tropical Storm Floyd</i>	6 deaths in PA, 10 inches of rain in the eastern part of the state. Storm surge of 2.8 feet in Philadelphia
6-16-2001	<i>Tropical Storm Allison</i>	10 inches of rain in parts of Philadelphia. 241 homes destroyed and 7 died in Philadelphia.
9-2003	Remnants <i>Tropical Storm Henri</i>	Rain and \$3.5 million in damages. 12 homes destroyed 380 majorly damaged power outages for PECO customers
9-17-2003	<i>Hurricane Isabel</i>	1 death in Lancaster Co. and strong winds to parts of the state
9-1/2-2006	<i>Tropical Depression Ernesto</i>	Caused 2.5 to 3 inches of rain in parts of the south-western portion of the state
6-4-2007	<i>Tropical Depression Barry</i>	Caused 1.66 inches of rain in the Philadelphia area
9-6-2008	<i>Tropical Storm Hanna</i>	An EF1 tornado was confirmed that touched down in Allentown
9-14-2008	<i>Hurricane Ike</i>	Caused 180,000 Western PA customers to be without power, wind gusts over 70 mph. One person killed in Oil City.
8-28-2011	<i>Hurricane Irene</i>	Left 706,000 people without power in Eastern PA, Killed 5 across the state. Flood waters raised the Schuylkill River. Winds were nearly 70 mph along the coast and 40-60 mph inland.
9-5-2011	<i>Tropical Storm Lee</i>	6-10 inches of rain with some areas receiving over 14 inches.
10-29-2012	<i>Hurricane Sandy</i>	\$65 billion in damages to the United States.

Tropical Storm Lee had the worst impact on Bradford County in history. Tropical Storm Lee had a severe impact on Bradford County starting September 5, 2011. Bradford County had already been drenched from Hurricane Irene just one week prior to Tropical Storm Lee. Towanda and other surrounding communities received between 6 – 14 inches of rain. Alba Borough recorded the highest amount of rain for the period at just over 9 inches of rain fall. Although the recorded amount was 9 inches, other locations in the county received up to 14 inches of rain locally. According to the National Weather Service, over 2,000 people were evacuated and 3,000 homes and businesses flooded during the multi-day event. Over half of these structures

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received major damage or were considered uninhabitable. Almost every road in the county received some type of damage with most damage being considered major. Bradford County's Agricultural Community received severe damage of over \$7 million dollars in crop damage. Many of the rural farms were wiped out by the damage. One death resulted from the flood in Bradford County. An elderly Towanda woman who refused to evacuate her home was exposed to flood waters and died from hypothermia as a result. Table 4.3.5-3 shows the rainfall totals from Tropical Storm Lee.

**Table 4.3.5-3**  
Rainfall totals from Tropical Storm Lee across the Eastern and Southeastern United States



Source: [www.ncdc.noaa.gov](http://www.ncdc.noaa.gov)

Bradford County was also impacted with Hurricane Agnes in 1972. The remnants of Agnes slowly moved across Pennsylvania. Rainfall of 7 to 10 inches was noted across the Commonwealth with some areas reporting 18 inches locally. Damage occurred on many major roadways. The Tozers Bridge in Athens was washed away.

### **4.3.5.4 Future Occurrence**

There is a possible probability of hurricanes and tropical storms affecting Bradford County, with expected annual events. A risk factor of 2.4 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 Pennsylvania Hazard Mitigation Plan has identified the southeast portion of Bradford County to have a 6% annual probability of a hurricane or tropical storm occurring. Bradford County overall has a less than 6% annual chance of a hurricane or tropical storm occurring.

### **4.3.5.5 Vulnerability Assessment**

The economy of Bradford County is highly vulnerable to hurricanes and tropical storms. These storms can halt business temporarily, and, if extensive damage is incurred, long-term business stoppages can occur. Secondary effects such as flooding and power loss put the citizens of Bradford County in danger. Flooding can destroy the physical structures, merchandise, and

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equipment essential for business operation. Power outages can suspend businesses and leave homes without heat and electricity or communications.

There is a low environmental vulnerability to hurricanes and tropical storms in Bradford County. The storms themselves are natural events and present little to no threat to the environment. However, with flooding as one of the major secondary effects of hurricanes and tropical storms, they can have an indirect negative effect on Bradford County. With high winds and heavy rain produced by these storms, some level of hazardous material releases may occur as a result of flooding or traffic accidents. The severity of the environmental damage depends on the storm's strength and duration.

Bradford County's critical facilities are moderately vulnerable to hurricanes and tropical storms. These strong weather storms can cause great physical damage to property while making it difficult for county personnel to travel to the critical facilities, if necessary. Further, secondary effects such as flooding, power outages, and disruption or closings of transportation routes can also affect critical facility operations.



### 4.3.6 Invasive Species

#### 4.3.6.1 Location and Extent

An invasive species is a species that is not indigenous to a given ecosystem and that, when introduced to a nonnative environment, is likely to cause economic or environmental harm, or pose a hazard to human health. The Commonwealth of Pennsylvania, including Bradford County, plays host to a number of invasive pathogens, insects, plants, invertebrates, fish, and higher mammals. Bradford County is in the PADCNR #20 Loyalsock District. It includes Mt. Pisgah 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:

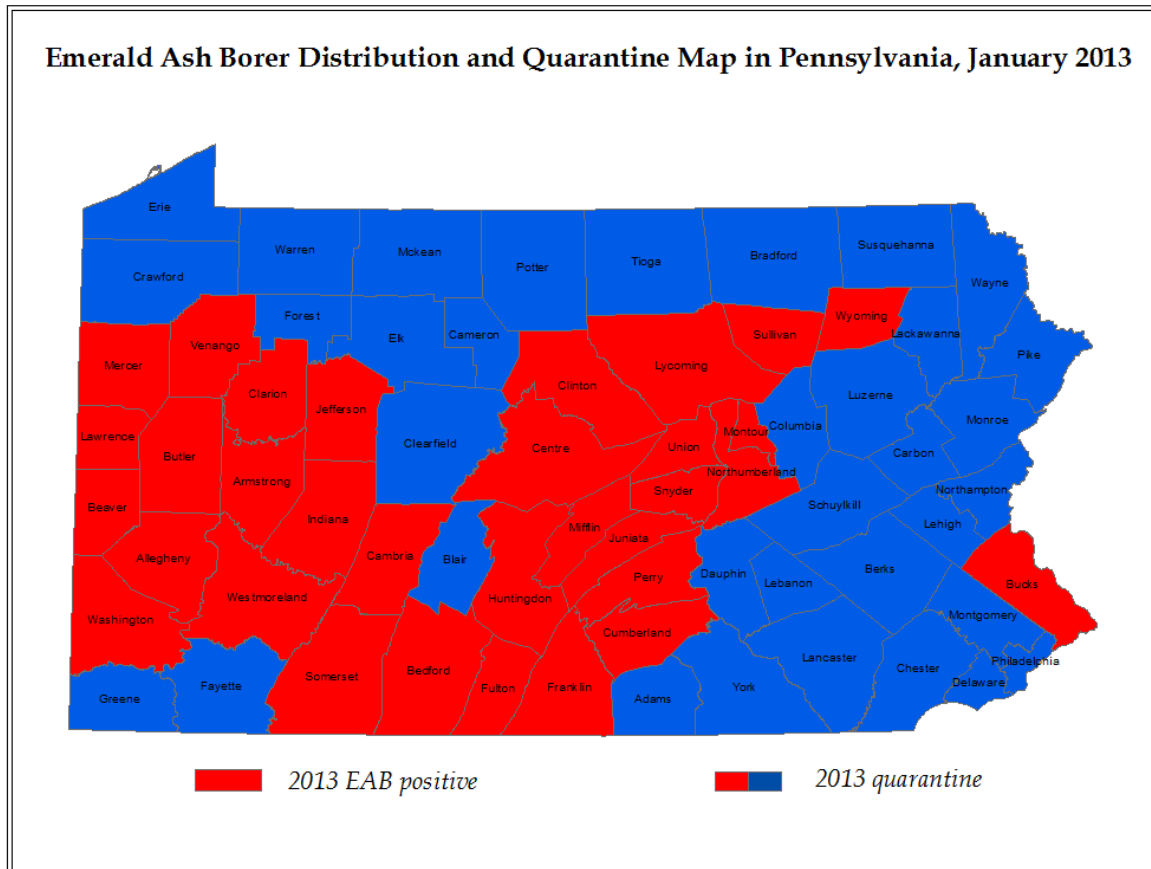
**Aquatic** invasive species (AIS) are a subset that impact aquatic ecosystems. Aquatic invasive species are defined in this document as non-native species that threaten the diversity or abundance of native species, the ecological stability of infested waters, human health and safety, or commercial, 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.

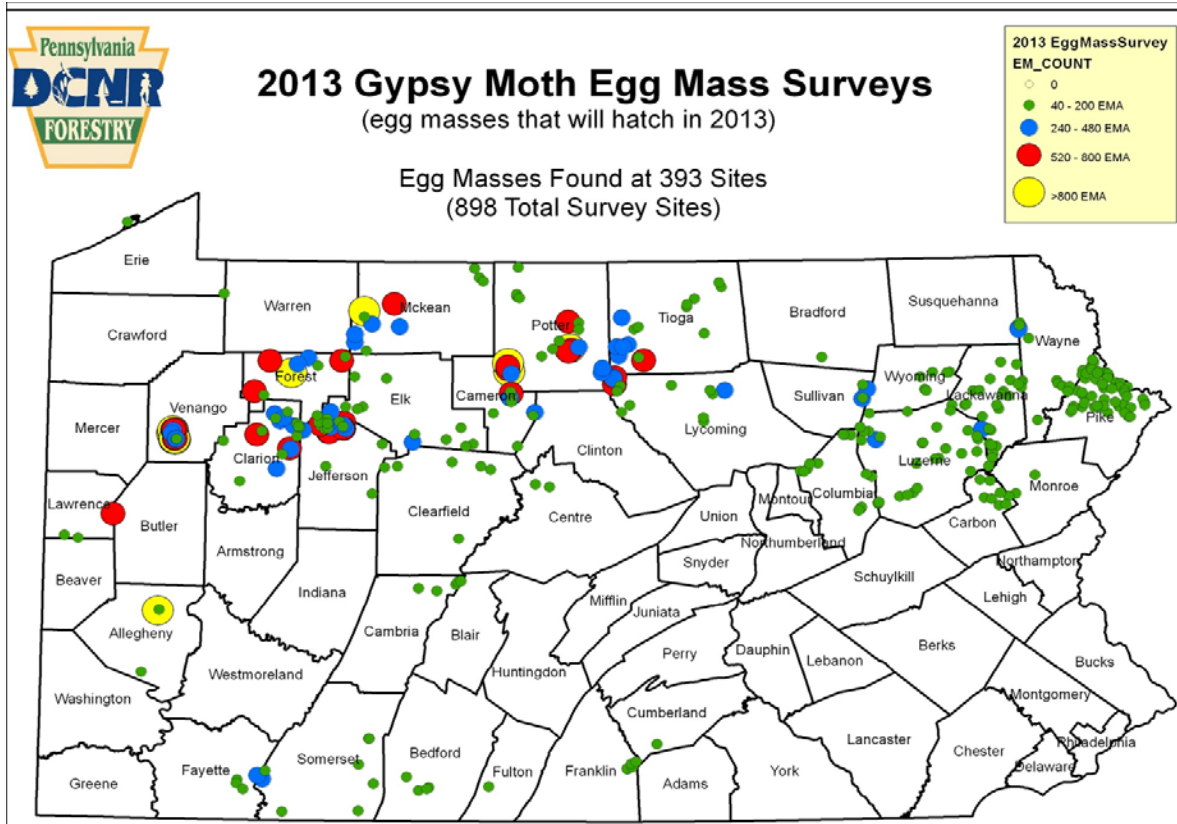
The Governor's Invasive Species Council of Pennsylvania (PISC), the lead organization for invasive species threats, has identified over 100 species threats that are or could potentially become significant in Pennsylvania. Of these threats, County and municipal leaders believe that the most significant 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, and vascular plants, especially Goats'-Rue.

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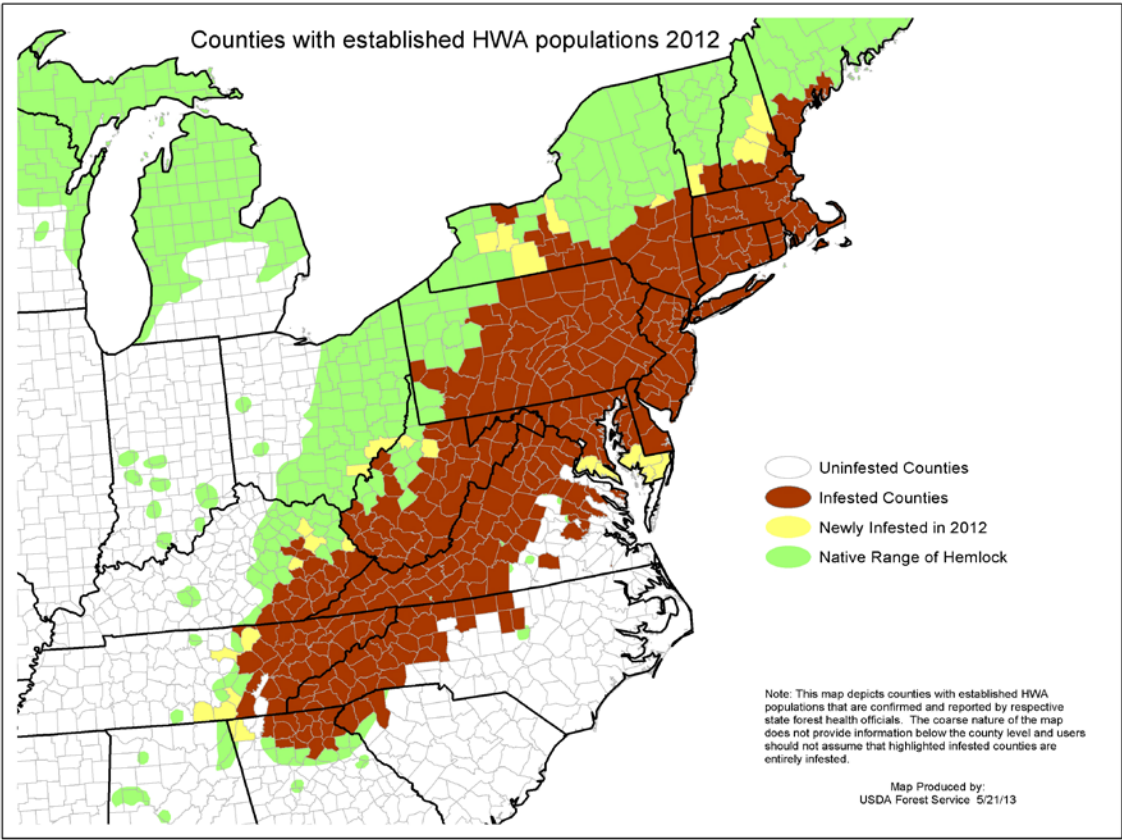
The location and extent of these invasive threats depends on the preferred habitat of the species as well as the species' ease of movement and establishment. For example in 2011 the Emerald Ash Borer was found in Bradford, Lycoming and Wyoming Counties.



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



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



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

**4.3.6.2 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 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.

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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. An example of a possible worst-case scenario for invasive species is if the Emerald Ash Borer would break through the quarantine in Pennsylvania and would invade the County's ash trees. With the high mortality rate associated with the Emerald Ash Borer, the forests would be devastated, causing logging establishments to shut down and a potential drop in forest-based tourism, which could, in turn, result in the loss of jobs and valuable income to the County.

### **4.3.6.3 Past Occurrence**

Invasive species have been entering Pennsylvania since the arrival of early European settlers. A 2010 Forest Health Report shows the presence of Emerald Ash Borer and Hemlock Woolly Adelgid in Bradford County. The 2011 survey visually confirmed the presence of Emerald Ash Borer in Bradford County. Bradford County is part of the 2010 Emerald Ash Borer quarantine zone, along with 43 other western counties. Additionally, Hemlock Woolly Adelgid has been present in Bradford County 1967. DCNR continues to monitor the westerly progression of the invasive species and has detected a general movement west in the 2010 survey.

### **4.3.6.4 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, some suspect climate change is contributing to the introduction of new invasive species. As maximum and minimum seasonal temperatures change, pests are able to establish themselves in previously inhospitable climates. This also gives introduced species an earlier start and increases the magnitude of their growth. 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 Bradford County.

### **4.3.6.5 Vulnerability Assessment**

Bradford 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. Bradford County is in the middle of 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.

The probability of invasive species affecting Bradford County is highly likely; with a risk factor of 2.4 identified.

### **4.3.7 Landslides**

#### **4.3.7.1 Location and Extent**

Landslides are a natural movement of earth down a slope. Deaths and injuries from landslides have not been a problem in the past in Bradford County; however, this does not mean that they will not occur. The worst damage by a landslide is usually done to utilities (pipelines, power lines/poles), roadways, and buildings.

Bradford County lies in a region known as the Endless Mountains, located in the northeastern portion of Pennsylvania. The landscape is predominately forested hills and mountains, agricultural valleys, and small towns and villages. Elevation ranges from 600 feet to 2,300 feet. In some areas of the county, the elevation change is drastic. Higher percentage of slope in terrain leads to vulnerable areas for landslides.

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

The threat of landslides is greatest along high-volume traffic areas. Therefore, municipalities along U.S. Route 220, US Route 6 and PA 549, PA 14, PA 414, PA 187, PA 706 and the numerous county and township roads face the greatest risk associated with a severe landslide. There are approximately 1,926.3 linear miles of local roadways within Bradford County. Landslides can cause traffic disruptions and accidents. These events can lead to interruptions in utilities or hazardous material spills.

#### **4.3.7.3 Past Occurrence**

Landslide history is not documented as well as other hazards. Primarily, this is because landslides are not always seen. Landslides have occurred all over Pennsylvania and have caused minor to major damage. The Pennsylvania Department of Transportation estimates it spends \$10 million annually on repair contracts for roadways damaged by landslides throughout the Commonwealth. Limited data exists on landslides in Bradford County, however research on their history will continue.

During the 1972 Tropical Storm Agnes, landslides blocked the East Athens-Sheshequin Road (State Road 1043) at the Tioga Narrows.

Standing Stone Township in the Waverly Hill Area has also experienced landslides. The Waverly Hill area was impacted by a landslide on June 11, 1968 that closed Route 17. The slide was caused by a clogged storm water pipe. The runoff from the clogged pipe contributed to the landslide.

### **4.3.7.4 Future Occurrence**

There is a possible probability that a landslide will affect Bradford County. Individual municipalities may have a higher or lower risk of future occurrence based on geographic location in the county. A risk factor of 1.6 has been assigned to this hazard utilizing the risk factor assessment tool provided by the Pennsylvania Emergency Management Agency.

### **4.3.7.5 Vulnerability Assessment**

The total number of landslides and their damage in Pennsylvania is unknown. Reporting varies widely from county to county. Most landslides are a result of heavy precipitation. Also contributing to this is the removal of vegetation, changing the slope of a hillside, and earthquakes. The most vulnerable and dangerous places for landslides are along transportation routes and pipeline pathways. Roadways are often blocked with soil and rocks from recent landslides. The most likely time an injury or death from a landslide will be reported is when it happens on a roadway. Pipelines are particularly in danger from landslides because of the materials in the pipeline. Pipeline breaks from landslides can contaminate soils, waterways, and other natural habitats with the material that is being transported through the pipeline. Some of the secondary effects of a landslide include utility failure, dam failure, hazardous materials release, and transportation accidents/roadway damage. Much like earthquakes, landslides will occur several times a year and may go unnoticed. A vulnerability map is located in Appendix H-2.



### **4.3.8 Pandemic and Infectious Diseases**

#### **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.

The Commonwealth of Pennsylvania is primarily concerned with West Nile Virus and influenza. West Nile Virus is spread through a mosquito bite and is aided by warm temperatures and wet climates conducive to mosquito breeding; with most cases occurring between April and October. West Nile Virus is a vector-borne disease. This means an animal, usually an insect or a tick, transmits parasitic microorganisms and therefore, the diseases they cause. The disease causes headaches, high fever, neck stiffness, disorientation, tremors, convulsions, muscle weakness, paralysis, and death in its most serious form. West Nile Virus has been detected in all 67 counties at least once in the past 10 years.

Influenza, also known as “the flu”, is a contagious disease. It is caused by the influenza virus and most commonly attacks the respiratory tract in humans. Pandemic influenza is more easily transmitted from person-to-person than West Nile Virus. The 2009 H1N1 flu virus resulted in 78 deaths in Pennsylvania by the time the pandemic ended.

#### **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.

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.

WHO (World Health Organization) has six phases of pandemic alert for incorporation of new recommendations and approaches for preparedness and response plans. These phases are listed below in table 4.3.8-1

Table 4.3.8-1 Pandemic Influenza Phases	
Phase	Characteristics
Phase 1	No viruses circulating among animals have been reported to cause infections in humans
Phase 2	An animal influenza virus circulating among domesticated or wild animals is known to have caused infection in humans and is therefore considered a potential pandemic threat.
Phase 3	An animal or human-animal influenza reassortant virus has caused sporadic cases or small clusters of disease in people, but has not resulted in human-to-human transmission sufficient to sustain community-level outbreaks.
Phase 4	Characterized by verified human-to-human transmission of an animal or human-animal influenza reassortant virus able to cause “community-level outbreaks”.
Phase 5	Characterized by human-to-human spread of the virus into at least two countries in one WHO region.
Phase 6	The pandemic phase is characterized by community level outbreaks in at least one other country in a different WHO region in addition to the criteria defined in Phase 5. Designation of this phase3 will indicate that a global pandemic is under way.

Source: WHO <http://www.who.int/en/>

Smallpox – This was an infectious disease unique to humans, caused by either of two virus variants, *Variola major* and *Variola minor*. The last naturally occurring case of smallpox (*Variola minor*) was diagnosed in October 1977 in Somolia. The last reported case in the United States was in 1949. *Variola major* is the more severe and has an overall mortality rate of 30 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 – This is found in temperate and tropical regions of the world and is a mosquito-borne zoonotic arbovirus. It was first identified in the West Nile sub-region in the East African nation of Uganda in 1937. It was considered a minor risk to humans until an outbreak in Algeria in 1994. At that time there were cases of West Nile Virus that caused encephalitis. The virus has spread globally. In 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.

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### 4.3.8.3 Past Occurrence

#### West Nile Virus:

West Nile Virus reached the United States in 1999 and a year later was detected in Pennsylvania when mosquito pools, dead birds, and/or horses in 19 counties tested positive for the virus. A comprehensive network has been developed in Pennsylvania that includes trapping mosquitoes, collecting dead birds and monitoring horses, people and, in past years, sentinel chickens. According to Pennsylvania's West Nile Virus Control Program there has been no virus found in Bradford County in 2013. Table 4.3.8-2 outlines the West Nile Virus within Bradford County over the past thirteen years.

Year	Total Positives	Human Cases	Avian Samples			Mosquito Samples			Veterinary Positives
			Collected	Tested	Positive	Collected	Tested	Positive	
2013	0	0	1	1	0	0	0	0	0
2012	0	0	0	0	0	7	5	0	0
2011	2	0	0	0	0	27	22	2	0
2010	0	0	0	0	0	32	17	0	0
2009	0	0	3	1	0	545	179	0	0
2008	0	0	1	1	0	551	192	0	0
2007	0	0	2	2	0	523	138	0	0
2006	0	0	1	1	0	451	177	0	0
2005	0	0	0	0	0	439	204	0	0
2004	0	0	0	0	0	353	150	0	0
2003	2	0	1	1	1	258	129	1	0
2002	4	0	12	11	3	27	13	0	1
2001	1	0	4	4	1	437	9	0	0

Source: <http://www.westnile.state.pa.us/surv.htm>

#### Influenza

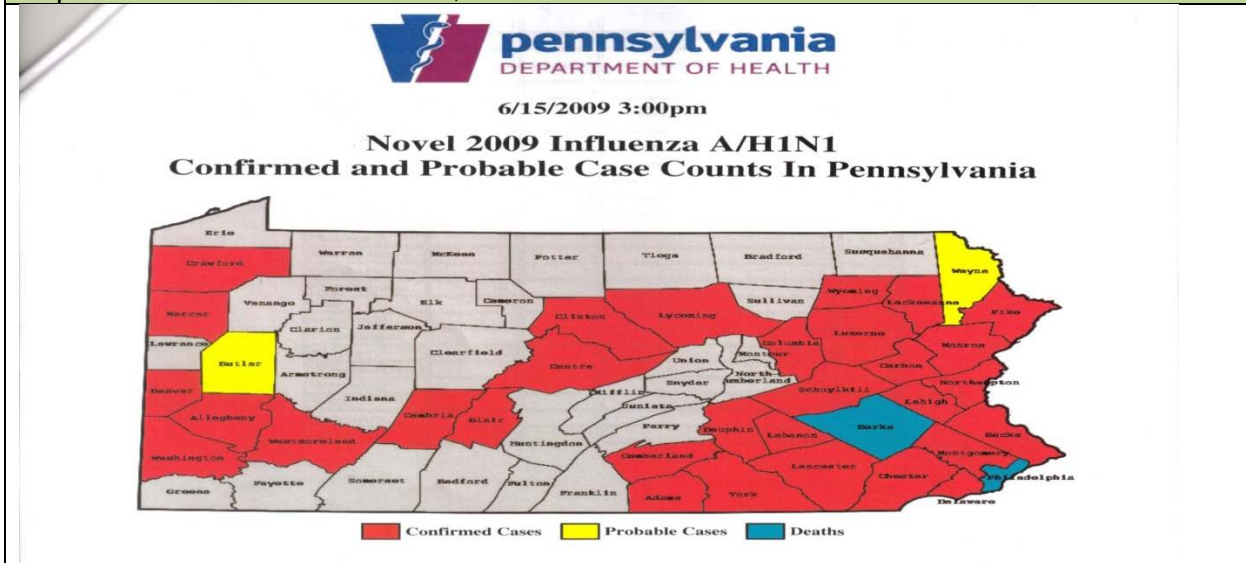
Bradford County was impacted with the H1N1 virus during 2009. The Pennsylvania Department of Health set up clinics throughout the county to administer vaccines.

On June 25, 2009 the Pennsylvania Department of Health listed Bradford County having confirmed cases of the Novel 2009 Influenza A/H1N1, and just ten days earlier on June 15, 2009 there were no reported cases. Figure 4.3.8-3 reflect these statistics.

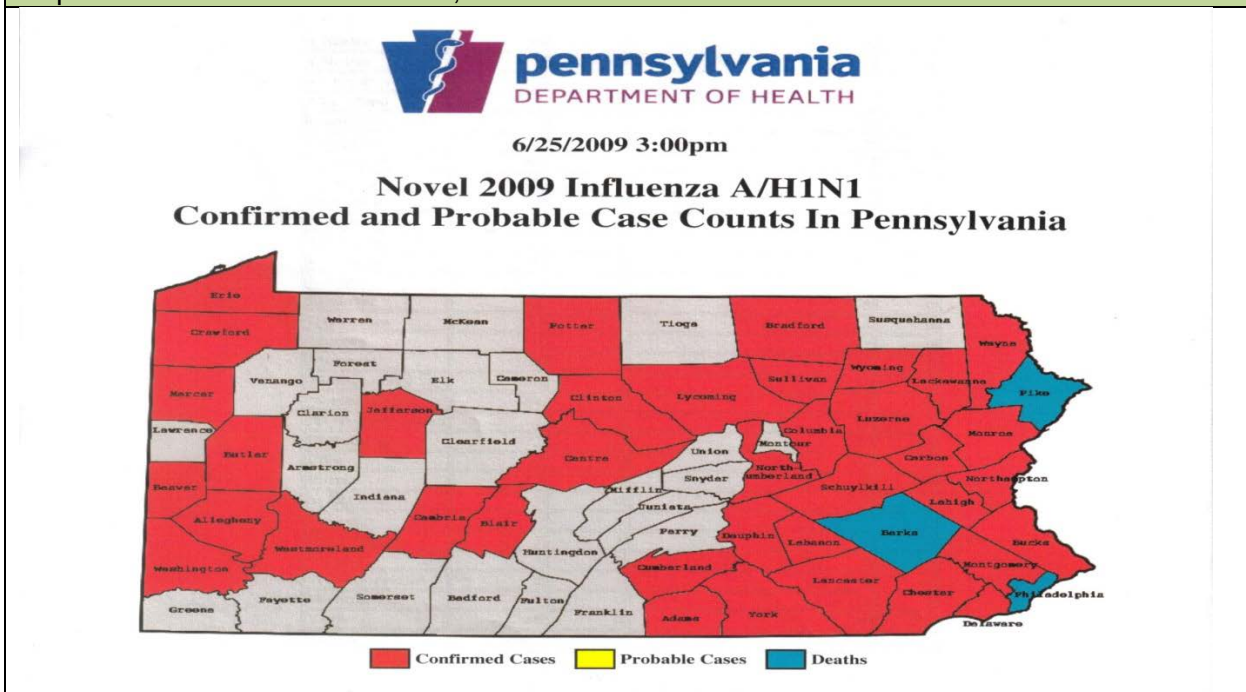
## Bradford County 2015 Hazard Mitigation Plan

Figure 4.3.8-3 Novel 2009 Influenza A/H1N1

Reported cases of H1N1 June 15, 2009



Reported cases of H1N1 June 25, 2009



Source: PA Department of Health

The 1918 Influenza (Spanish Flu) Pandemic is classified as the “Mother of all Pandemics”. An estimated one third of the world’s population were infected and had clinically apparent illnesses during the 1918-1919 influenza pandemic. Pennsylvania was one of the hardest hit states in the country because influenza tended to strike cities very hard. At that time frame Philadelphia was the state’s largest city and Pittsburgh was the second largest city. The impact of the 1918-1919 Influenza is not limited to that time frame. All Influenza-A pandemics since that time have

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been caused by 1918 virus descendants (including “drifted” H1N1 viruses and reasserted H2N2 and H3N2 viruses). Table 4.3.8-4 lists past Influenza-A events.

Year(s)	Common Name
1889	Russian Flu
1918-1919	Spanish Flu
1957	Asian influenza
1968	Hong Kong influenza
1976	Swine Flu
2009	Novel H1N1 “swine flu”

Source: World Health Organization (WHO) Fact sheet No. 211, Revised March 2003; CDC [www.cdc.gov/ncidod/eid/vol12no01/05-0979.htm](http://www.cdc.gov/ncidod/eid/vol12no01/05-0979.htm)

### **4.3.8.4 Future Occurrence**

The 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. Bradford 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.

Chinese health officials urged health care workers to prepare for the possible re-emergence of the deadly H7N9 bird flu in the fall of 2013. This virus killed one-third of the patients hospitalized. Researchers suggest that the H7N9 is deadlier than the 2009 H1N1 swine flu virus.

### **West Nile Virus**

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

### **4.3.8.5 Vulnerability Assessment**

The probability of a pandemic occurring in Bradford County is highly likely. A risk factor of 2.9 has been assigned to this hazard utilizing the risk factor assessment tool provided by the Pennsylvania Emergency Management Agency. 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 is estimated that 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 in the United States. Between 15 to 35 percent of the U.S. population could be affected by an influenza pandemic, and the economic impact could range between \$71.3- \$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 reduce as they will be at high risk of illness from exposure in the community and healthcare settings. Some may have to miss work to care for ill family members. Resources in many locations could be limited depending on the severity and spread of an influenza pandemic.

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.

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### 4.3.9 Radon Exposure

#### 4.3.9.1 Location and Extent

Radon is a naturally occurring, colorless, odorless, inert, radioactive gas. It forms as a product of the natural decay of uranium. Radon and its radioactive products are dangerous to health. Alpha particles are a probable cause of lung cancer. Studies done in Pennsylvania since 1984 show that indoor radon levels are controlled by the radon-emanation properties of the soil and rock homes are built on. The table below, Table 4.3.9-1, completed by the Pennsylvania Department of Environmental Protection, Bureau of Radon Protection, suggests guidelines to reduce radon exposure levels to .02 Working Levels (WL) or less.

<b>Table 4.3.9-1 Suggested Guidelines to Reduce Radon Exposure Levels</b>		
<b>If your home measures*</b>	<b>Suggested Action **</b>	<b>Time Frame for Plan</b>
More than 5.0 WL	Residents should either promptly relocate or undertake temporary remedial action to lower levels as far below 5.0 WL as possible. Smoking in high areas discouraged.	Within 2-3 days
1.0 to 5.0 WL	Residents should undertake temporary remedial action to lower levels as far below 1.0 WL as possible. Smoking in high areas discouraged	Within 1 week
0.5 to 1.0 WL	Residents should undertake temporary remedial action to lower levels as far below 0.5 WL as possible	Within 2 weeks
0.1 to .05 WL	Residents should undertake temporary remedial action to lower levels as far below 0.1 WL as possible. Higher exposure levels require action to be taken in a shorter period of time.	3 weeks to 3 months
0.02 to 0.1 WL	Residents should undertake temporary and/or permanent remedial action to lower levels below 0.02 WL. Higher exposure levels require action to be taken in a shorter period of time.	4 to 15 months
<p>* Assumes continuous 24-hour exposure in living area.            ** Home testing should be conducted at the end of the indicated time frame to determine if remedial action has reduce the radon daughter exposure levels below the indicated value. If remedial action has not been successful, residents should be aware of the risks associated with continuous exposure at the indicated levels.            Source: Pennsylvania Department of Environmental Protection</p>		

Radioactivity caused by airborne radon has been recognized for many years as an important component in the natural background radioactivity exposure of humans. 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, nonfission- 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.

## **Bradford County 2015 Hazard Mitigation Plan**

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As a result of this event, the Reading Prong section of Pennsylvania where Watras lived became the focus of the first large-scale radon threat 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.

Bradford County municipalities face a high level of radon gas emission. Only areas that have been tested and found safe are not susceptible to the effects of radon gas emission. The secondary effects of radon are difficult to identify. Often, radon goes undetected and unnoticed.

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.

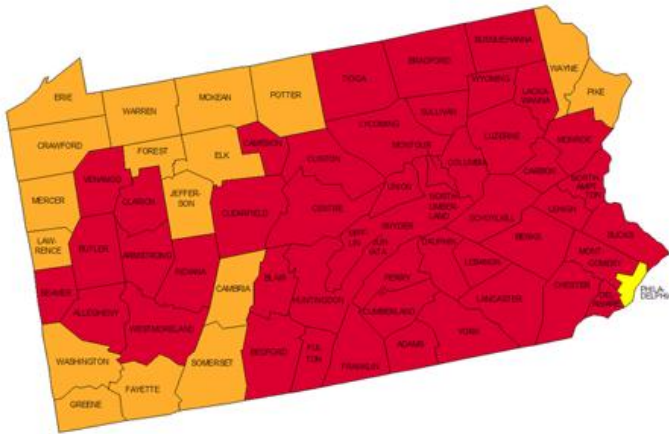
Bradford County is identified by Environmental Protection Agency as being in Radon Zone 1 – Highest Potential. Counties in this zone have a predicted average indoor radon screening level greater than 4 pCi/L (pico curies per liter).



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**Table 4.3.9-2: EPA 1993 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>



Source: PA DEP

Table 4.3.9-3 shows the characteristics of Radon and the short-lived decay products produced.

<b>Table 4.3.9-3 Characteristics of Radon-222 and its short-lived Decay Products</b>				
Nuclide	Half-Life	Alpha Energy (MeV)	Maximum Beta Energy (MeV)	Principal Gamma Energies (MeV)
Radon-222	3.8 days	5.49		
Polonium-218	3.0 minutes	6.0		
Lead-214	26.8 minutes		0.65, 0.71, 0.98	0.29, 0.35
Bismuth-214	19.7 minutes		1.0, 1.51, 3.26	0.609, 1.12, 1.764
Polonium-214	$1.64 \times 10^{-4}$ seconds	7.69		

Source: Health Physics Society- Background Information on "Update on Perspectives and Recommendations on Indoor Radon" Revised October 2009.

### **4.3.9.3 Past Occurrence**

The Pennsylvania Radon Bureau responded to the highest level of radon daughter levels (concentration of decay products of radon in the uranium chain) ever reported in the Commonwealth with a massive radon monitoring, educational, and remediation effort in 1984. As of November 1986, over 18,000 homes had been screened for radon and approximately 59 percent were found to have radon daughter levels in excess of the 0.020 Working Level guideline. Radon daughter levels ranged up to 13 Working Levels (WL) or 2600 pCi/L (pico Curies per liter) of radon gas. While individual instances of radon are not well documented, no individual location can be assumed safe unless proven so by testing.

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

#### **4.3.9.4 Future Occurrence**

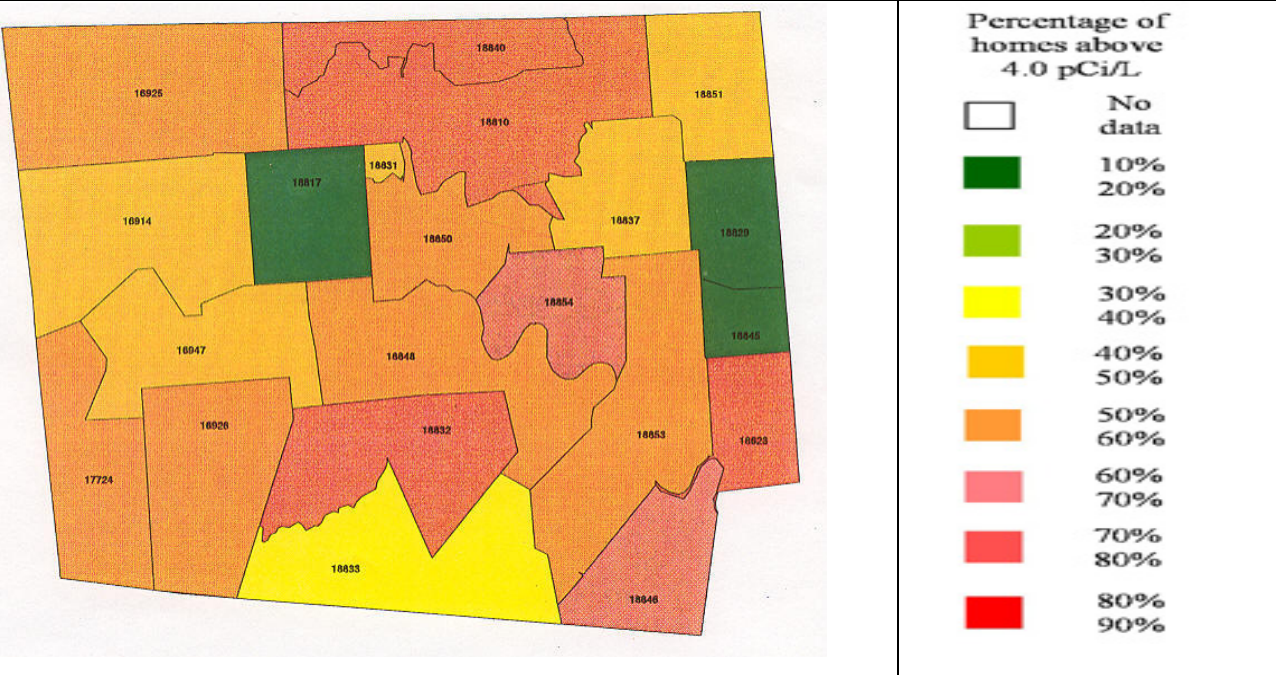
Radon gas is emitted from underground decaying uranium. The probability for radon emission in Bradford County is highly likely. No area should be assumed safe until tests have proven so. The EPA recommends that a homeowner take action to reduce his/her home indoor radon levels if his/her test is 4pCi/L (pico Curies per liter) or higher. A risk fraction of 3.1 has been assigned to this hazard utilizing the risk factor assessment tool provided by the Pennsylvania Emergency Management Agency.

#### **4.3.9.5 Vulnerability Assessment**

According to the Environmental Protection Agency (EPA), Bradford County is among the counties in Pennsylvania with the highest potential for dangerous radon emission. It is important to remember that no individual location can be assumed to be safe unless proven so by testing. The EPA recommends that a homeowner take action to reduce his/her home indoor radon levels if his/her radon test is 4 pCi/L (pico Curies per liter) or higher. Table 4.3.9-4 shows the percentage of homes that have been identified being above 4.0 pCi/L of radon per zip code.

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Table 4.3.9-4 Bradford County Percentage of Homes above 4.0 pCi/L of Radon



Source: wpb-radon.com

**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 approximately 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.

Tornadoes can have varying secondary effects. The most common secondary effect is power failure; the severe wind strength can dismantle power sources. Structural damage can also be significant. Hazardous material releases can occur if a tornado comes near a holding tank, or the spill stems from a traffic accident caused by high winds.

Tornadoes are measured by their wind speed and the damage that can occur. For years the Fujita Scale was used to measure the magnitude of a tornado. On February 1, 2007, the Fujita Scale was updated and amended. The new scale was named the Enhanced Fujita Scale. The new scale has the same basic design as the original scale but was redesigned to represent increasing degrees of damage and better data from damage assessment. Table 4.3.10-1 identifies the Enhanced Fujita Scale. The table also identifies the previous designation off the Fujita Scale for comparison.

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

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

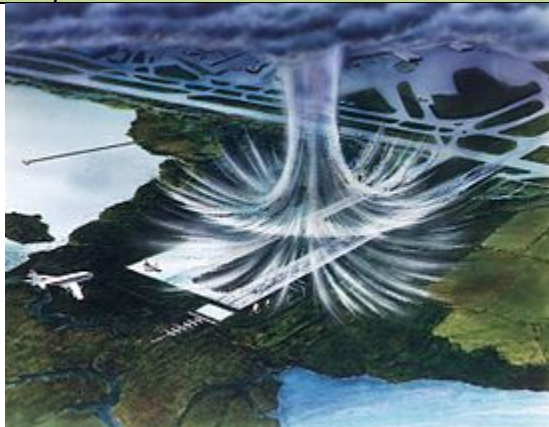
<u>EF-SCALE NUMBER</u>	<u>WIND SPEED (mph)</u>	<u>F-SCALE NUMBER</u>	<u>TYPE OF DAMAGE POSSIBLE</u>
<b>EF3</b>	136–165	F2-F3	<b>Severe damage:</b> Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars 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, straight line winds (derecho) or microbursts are more frequent with thunderstorms than with hurricanes or tornadoes in Pennsylvania. A microburst, which is a form of a windstorm, is a very-localized column of sinking air, capable of producing damaging, opposing and straight-line winds at the ground surface. Straight-line wind is wind that comes out of a thunderstorm. If these winds meet or exceed 58 miles per hours, then the National Weather Service (NWS) classifies the storm as severe. The downward momentum in the downdraft region of a thunderstorm produces these winds. An environment conducive to a storm containing straight-line wind is one in which the updrafts and thus downdrafts are strong, the air is dry in the middle troposphere and the storm has a fast forward motion.

**Illustration 4.3.10-2 Microburst**

The air moves in a downward motion until it hits the 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**

Tornadoes are measured by their wind speed and the damage that one can incur. For years the Fujita Scale was used to measure the magnitude of a tornado. On February 1, 2007, the Fujita Scale was updated and amended. The new scale was named the Enhanced Fujita Scale. The new scale has the same basic design as the original scale but was redesigned to represent increasing degrees of damage and better data from damage assessment. Table 4.3.10-1 identifies the Enhanced Fujita Scale. The table also identifies the previous designation off the Fujita Scale for comparison.

**4.3.10.3 Past Occurrence**

In just over 60 years, seventeen tornadoes have struck Bradford County; with two of these being recorded on the same day just 15 minutes apart. The strength of tornadoes has ranged between an F0/EF0 to F2. Table 4.3.10-3 identifies the date, time, town, magnitude, deaths and injuries that have occurred with these events.

**Table 4.3.10-3: Bradford County Tornado History**

Date	Town	Time	Magnitude	Deaths	Injuries
07/08/2014	Albany/Overton	6:00 P.M.	EF2	0	0
07/15/2012	Troy	3:50 P.M.	EF0	0	0
05/26/2011	Milan	6:00 P.M.	EF1	0	0
06/22/2010	Windham Center	7:30 P.M.	EF1	0	0
08/12/2005	Towanda	4:10 P.M.	F0	0	0
07/01/1999	Overton	6:55 P.M.	F0	0	0
06/02/1998	Terrytown	8:45 P.M.	F1	0	0
06/22/1996	Wyalusing	2:00 P.M.	F1	0	0
06/15/1993	Not Available	2:30 P.M.	F0	0	0
07/05/1992	Not Available	12:15 P.M.	F1	0	0
07/06/1977	Not Available	12:30 P.M.	F1	0	0
07/06/1977	Not Available	12:15 P.M.	F1	0	0
07/29/1976	Not Available	3:30 P.M.	F1	0	1
06/28/1973	Not Available	10:00 P.M.	F0	0	0
07/01/1964	Not Available	1:00 P.M.	F1	0	0
09/19/1954	Not Available	5:34 P.M.	F2	0	0
07/21/1951	Not Available	11:00 A.M.	F0	0	0

Source: [www.ncdc.noaa.gov/stormevents/listevents.jsp](http://www.ncdc.noaa.gov/stormevents/listevents.jsp)? And <http://www.tornadopproject.com/safety/safety.htm>

Wind related events have not been documented as well as tornadoes in the past. As technology develops, incidents can be better documented as they occur. Between January 1, 1996 and August 31, 2013, there were two wind storm events reported by the National Climatic Data Center for Bradford County. On December 23, 2004 strong winds were estimated at 45 knots or 51 miles per hour; and on November 29, 2005 there were estimated wind gusts of 50 knots or 57 miles per hour. Although this is all the information that is identified by the National Climatic Data Center, other known wind related events have occurred in the past years.

### **4.3.10.4 Future Occurrence**

The probability of a disastrous tornado hitting Bradford County is possible. There is historical evidence to support this as a hazard. Bradford County witnessed two tornadoes in one day during 1977 and has experienced numerous tornadoes in the past. A risk factor of 1.9 has been assigned to tornadoes using the risk factor assessment tool provided by the Pennsylvania Emergency Management Agency.

The probability of wind storms is highly likely, because winds can be generated with every type of storm. A risk factor of 2.7 has been assigned to windstorms using the risk factor assessment tool provided by the Pennsylvania Emergency Management Agency.

### **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 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 Bradford 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 social vulnerability in Bradford County. With a storm's ability to destroy structures, citizens' 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 releases, 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.

## ***Bradford County 2015 Hazard Mitigation Plan***

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Bradford County's environment is 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 releases can pollute ground water systems and vegetation. These incidents can require extensive clean-up and mitigation efforts. A previous occurrence and vulnerability map is located in **Appendix H-3**.



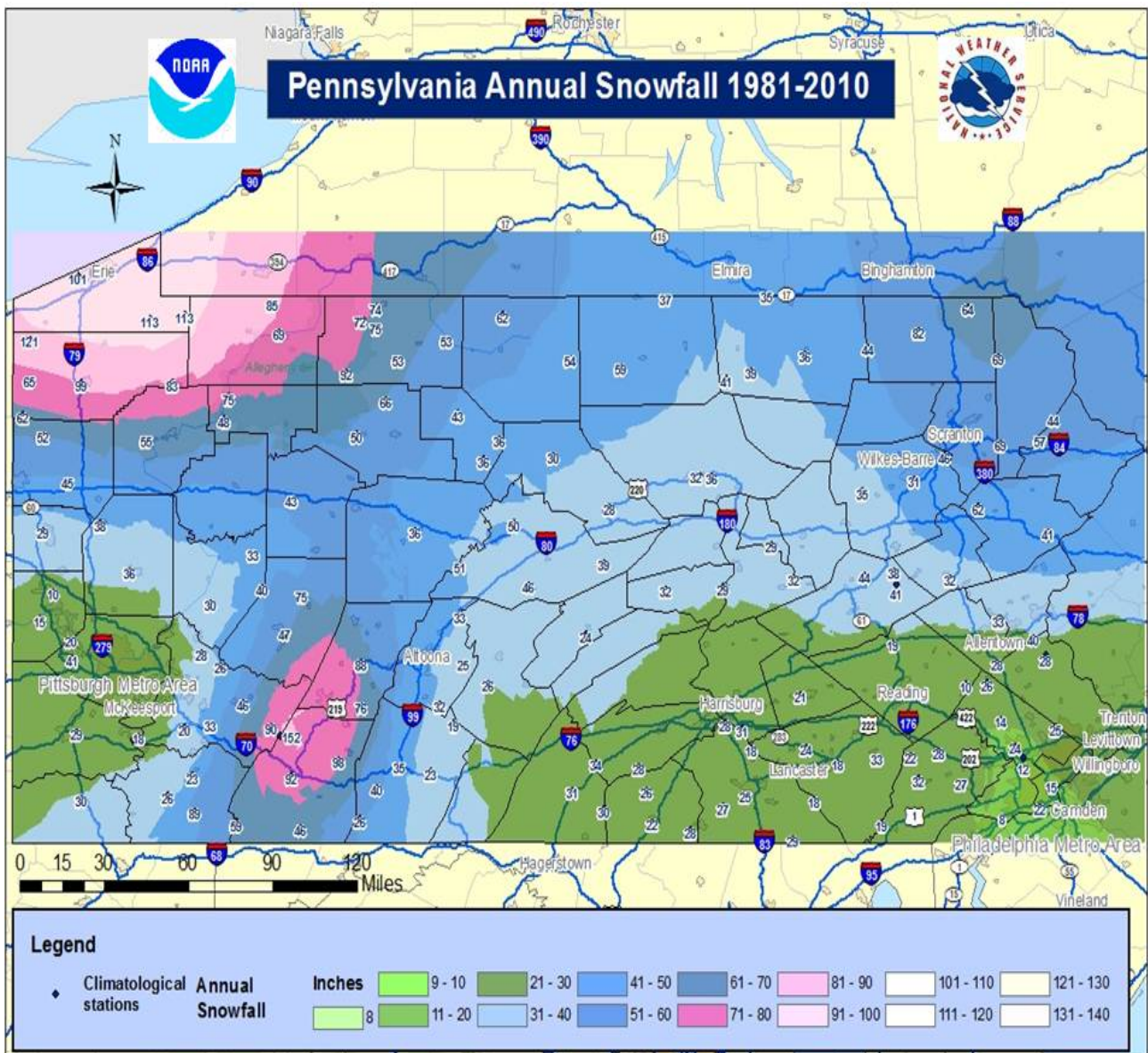
# Bradford County 2015 Hazard Mitigation Plan

## 4.3.11 Winter Storms

### 4.3.11.1 Location and Extent

Winter storms with excessive snow and ice and frigid temperatures can occur on average five times a year in Bradford 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 4.3.11-1 shows the annual snowfall amounts for locations in Pennsylvania.

Figure 4.3.11-1  
Pennsylvania Annual Snowfall 1981-2010



**4.3.11.2 Range of Magnitude**

Winter storms are usually a county-wide hazard. Winter storms consist of cold temperatures, heavy snow or ice 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.

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 4.3.11-2:

<b>Table 4.3.11-2: 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.

**4.3.11.3 Past Occurrence**

Bradford County is vulnerable to an array of winter weather. This weather has the ability to close businesses, and close schools, and block and damage roadways throughout the county. Bradford County has been subjected to other strong winter storms numerous times. The history of major winter storms in Bradford County is outlined in Table 4.3.11-3

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<b>Table 4.3.11-3 Winter Storm Events in Bradford County</b>	
<b>Date</b>	<b>Brief Description of the Episode</b>
01/08 to 01/09/1999	1 to 3 inches of snow then changed over to sleet and freezing rain
01/13 to 01/15/1999	5 to 9 inches of snow, sleet, and freezing rain
01/31/2002	2 inches or less of snow, and a quarter of an inch of ice
02/01/2002	2 inches or less of snow, and freezing rain, with a quarter of an inch of ice
02/13 to 02/14/2007	1 to 2 feet of snow. Snow fall rates of 1 to 3 inches per hour were reported.
04/15 to 04/16/2007	1 to 2 inches of slushy snow. Precipitation was moderate to heavy rain that changed over to a mix of snow and sleet
12/13/2007	6 to 8 inches of snow. The snow was mixed with sleet.
12/11 to 12/12/2008	9 inches of snow. Major icing occurred in eastern Bradford County damaging trees and power lines. Heavy snow fell in the western part of the county.
02/10/2010	4 to 9 inches of snow. Heavy snow and strong winds caused blowing and driving snow.
02/25 to 02/26/2010	10 to 16 inches of heavy snow. North winds increased to 20 to 25 mph with gusts to 35 mph, leading to near blizzard conditions and considerable blowing and drifting snow.
02/20 to 02/21/2011	7 to 9 inches of snow with 11 inches over the far western parts of the county.
02/25/2011	6 to 9 inches of snow.
03/23/2011	8 to 10 inches of snow with 12 inches in the higher terrain of the western part of the county.
12/26 to 12/27/2012	7 to 9 inches of snow, with freezing rain and sleet mixed in across northeast Pennsylvania.
Note: There were no injuries or deaths related to any of the above listed storm events.	
Source: <a href="http://www.ncdc.noaa.gov/stormevents/listevents.jsp?">http://www.ncdc.noaa.gov/stormevents/listevents.jsp?</a>	

These storms have resulted in the loss of electricity and telephone service. The main transportation routes, US 6, US 220, PA 549, PA 14, PA 414, PA 187 and PA 706 are normally opened immediately for emergency traffic; but secondary roads could remain impassable for days. Most residents and travelers in Bradford County are aware of the winter weather reputation in the county and avoid travel when under a winter storm watch.

### **4.3.11.4 Future Occurrence**

There is a highly likely probability of winter storms occurring in Bradford County. A risk factor of 3.0 is associated with this natural hazard as assessed with the risk factor assessment tool provided by the Pennsylvania Emergency Management Agency. Approximately thirty-five winter storm events occur across Pennsylvania every year, and about three to five events occur in Bradford County annually.

### **4.3.11.5 Vulnerability Assessment**

Bradford County is vulnerable to winter weather. The economic impacts from snow removal, road and infrastructure repair, instill 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.).

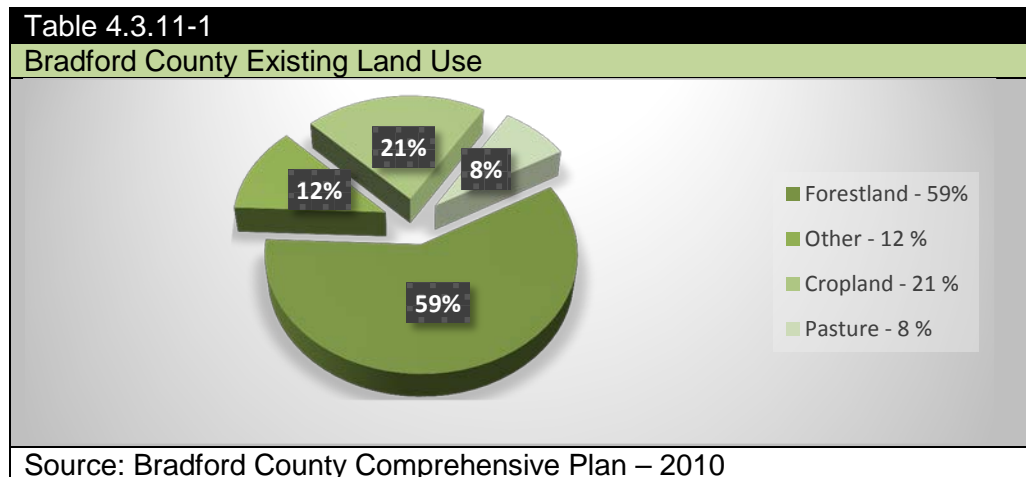
## 4.3.12 Wildfire

### 4.3.12.1 Location and Extent

The most frequent causes of devastating wildfires are droughts, arson, and human carelessness. 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).

### 4.3.12.2 Range of Magnitude

The rural areas of Bradford County are at the greatest risk for wildfires. Bradford 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 59 percent of Bradford 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 Bradford County. Power outages may be the most prevalent of these hazards. Environmental hazards could also result from a wildfire or urban fire. Due to the increase of natural gas well sites in Bradford County, these critical sites are extremely vulnerable.

### 4.3.12.3 Past Occurrence

The Pennsylvania Department of Conservation of Natural Resources (DCNR) Bureau of Forestry tracks forest fires by forest districts. Bradford County is located in the Loyalsock Forest District of Pennsylvania (D-20). According to DCNR, there were only 3 fires within the Loyalsock Forest District in 2011, approximately 0.1 percent of the state total. Of these fires, two were in the spring and one was during the fall of 2011.

## Bradford County 2015 Hazard Mitigation Plan

Table 4.3.12-2 shows the wildfire percentage occurrence during each month.

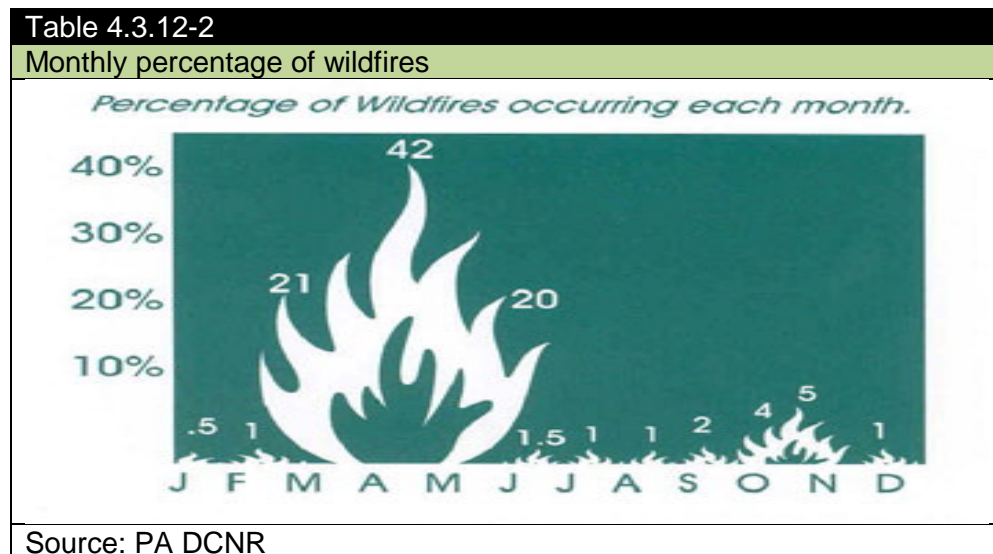


Table 4.3.12-3 reflects the Loyalsock District Report from 2003-2011.

**Table 4.3.12-3: Statewide Wildfires in the Loyalsock District, 2003-2011**

Year	Forest District	Fires	% of Statewide	Acres	% of Statewide
2003	Loyalsock (D-20)	21	5.1%	125.4	6.2%
	State Totals	408	-	2026.9	-
2004	Loyalsock (D-20)	13	6.3%	2378.2	85.6%
	State Totals	205	-	2779.6	-
2005	Loyalsock (D-20)	44	5.4%	552.7	12.9%
	State Totals	809	-	4268.2	-
2006	Loyalsock (D-20)	4	0.4%	12.6	0.2%
	State Totals	911	-	7919.8	-
2007	Loyalsock (D-20)	4	0.7%	0.5	0.0%
	State Totals	540	-	1140.3	-
2008	Loyalsock (D-20)	10	1.5%	17.4	0.2%
	State Totals	689	-	7670.4	-
2009	Loyalsock (D-20)	46	7.4%	192.8	3.2%
	State Totals	619	-	6064.9	-
2010	Loyalsock (D-20)	34	6.0%	197.4	5.8%
	State Totals	569	-	3398.3	-
2011	Loyalsock (D-20)	3	1.5%	0.5	0.1%
	State Totals	202	-	579.1	-

### **4.3.12.4 Future Occurrence**

Rural fires, or wildfires, have an unlikely probability and the frequency of these events is low. No significant wildfires have occurred in Bradford County's recent recorded history (between January 1996 and August 2013). Weather conditions play a major role in the occurrence of these wildfires. Dry conditions with decreased humidity are an ideal scenario for a wildfire. A risk factor of 1.4 has been assigned to this hazard utilizing the risk factor assessment tool provided by the Pennsylvania Emergency Management Agency.

### **4.3.12.5 Vulnerability Assessment**

Although no significant wildfires have been recorded by the NCDC (National Climatic Data Center) for Bradford County, rural 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.

The natural gas exploration and extraction is a huge industry in Bradford County. The unconventional well sites are predominately located in forested or open land/field areas. These sites and the infrastructure for extraction and transmission of the natural gas products are extremely vulnerable to fires and subsequent explosions. As of October 2013, there have been 2,348 permitted well sites in the county. A vulnerability map is located in **Appendix H-4**.

### 4.3.13 Civil Disturbance

#### 4.3.13.1 Location and Extent

Civil disturbance is a term that is used to describe a disturbance between groups of people and is considered a form of protest. Union protests, riots, uprisings are all considered as civil disturbance. 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. Bradford County has had incidents of civil disturbance in the past and could be affected in the future.

#### 4.3.13.2 Range of Magnitude

Civil disturbance hazards can range from a wide possibility of events that cause civil disorder, confusion, strife, and economic hardship. Some of these events are: famine; economic collapse or recession; misinformation; public unrest, mass hysteria or riot; labor disputes or strikes. Citizens not directly involved in a civil disturbance may have their lives disrupted. The civil disorder may jeopardize citizens not obtaining necessities. Civil disorder is a form of unrest caused by a group of people and is a symptom of or protest against major socio-political problems. Table 4.3.13-1 describes the different classifications of crowds.

Classification of a Crowd	Description
Casual Crowd	Loose collection of people who have little interaction
Conventional Crowd	Resulting from deliberate planning of an event and conforming to norms appropriate to the situation
Expressive Crowd	Forms around an event that has emotional appeal
Acting Crowd	Energetically doing something
Protest Crowd	Has some political goal, like anti-War protest crowds

Source: [http://wps.pearsoned.ca/ca\\_ph\\_macionis\\_sociology\\_6/73/18925/4844839.cw/content/index.html](http://wps.pearsoned.ca/ca_ph_macionis_sociology_6/73/18925/4844839.cw/content/index.html)

Bradford County's greatest threat to civil disorder could occur in Towanda Borough, the county seat. Citizens, property, and infrastructure could be affected if a large-scale disorder were to take place.

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**

In February 1974, there was a statewide truckers strike as outlined in the 2013 Pennsylvania Hazard Mitigation Plan. The 2009 Bradford County Hazard Mitigation Plan identified that the transport of raw milk depended on the trucking industry. A delay in transporting the milk could have incurred large daily monetary losses for farmers. Violent confrontation between truckers and farmers was narrowly avoided. State Police escorts and governmental negotiations were the mitigation efforts used to ensure the transport of the raw milk.

### **4.3.13.4 Future Occurrence**

The probability is possible for a large-scale civil disorder in Bradford County to occur. A risk factor of 1.7 is associated with this hazard.

### **4.3.13.5 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 be exacerbated by how authorities handle the crowd. The county prison is a vulnerable facility. This facility has a volatile environment on a daily basis. A riot could occur at any given time. Prison officials ensure that staff members receive appropriate training to deescalate a situation and mitigate the situation if necessary.

Vulnerability is difficult to determine because many variables are affiliated with this hazard. The major cities in the Commonwealth of Pennsylvania are the most vulnerable to civil disorder. The county seat and higher population areas would be considered more vulnerable than the rural areas of the county. Also, the natural gas exploration and extraction industry has provided an influx of many non-resident citizens. Increased crime rates and other emergent incidents have occurred in the past 5 years. The possibility for some type of civil disorder to occur because of this scenario is possible. A vulnerability map is located in **Appendix H-5**.



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### 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.

Major dams are categorized as being 50 feet tall with a storage capacity of at least 5,000 acre feet, or of any height with a storage capacity of 25,000 acre feet. There are no major dams identified in Bradford County.

Dams are classified in terms of hazard potential as: high, significant, or low, with high-hazard dams requiring Emergency Action Plans. Table 4.3.14-1 lists an inventory of Bradford County dams.

Dam Name	River	Owner	Hazard Level	EAP Completed
Lake Nephowen	Outlet Lake Nephowen	Crawford Holmes	Low	No
Allyn	Wappasening Creek	Howard Allyn	Low	No
Dicuollo	TR Laning Creek	Angelo Dicuollo	Moderate	No
Swimming	Coal Run	PA Game Commission	Moderate	No
Cooks Pond	TR Beaver Creek	Cooks Pond Association, Inc.	High	Yes
Pine Cradle Lake	TR Parks Creek	Pine Cradle Lake Campground	Low	No
Lake Bonin	TR Jerome Creek	Keith Bonin	Moderate	No
Mud Pond	Carbon Run	PA Game Commission	Moderate	No
Saxe Pond	North Branch Mehoopany Creek	Michael Saxe	High	Yes
PA-103	Sugar Run	PA Game Commission	Moderate	No
PA-102	Sugar Run	PA Game Commission	Moderate	No
Sugar Creek	South Branch Sugar Creek	Tennessee Gas Pipeline Company	High	Yes
Ridgebury Lake	TR Fall Creek	Ridgebury Lake Estates Association	High	Yes
Lake-O-Meadows	Outlet Lake of Meadows	Lake-O-Meadows Corporation	Low	No
Queen Esther Lake	TR Chemung River	Mary Sullivan	Moderate	No
Vanderpool	Durell Creek	Albert Vanderpool	Moderate	No
Rehfeldt	TR Towanda Creek	Eugene Rehfeldt	Moderate	No
Wanzo	Parks Creek	Jeffrey Wiseman	Low	No
Millers Pond	Miller Run	Ridgebury Township	High	Yes
Benchley Pond	Outlet Pond	Alberta Payne	Low	No
Billets Pond	TR Sugar Run	Pat Reithoffer	Low	No

**Table 4.3.14-1: Bradford County Dam Inventory**

Dam Name	River	Owner	Hazard Level	EAP Completed
Brague	Towanda Creek	Roger Graham, Jr.	Moderate	No
Haighs Pond	TR Johnson Creek	Eastern Bradford Rod and Gun Club	Low	No
Plank Road Reservoir	Satterlee Run	Borough of Towanda	Moderate	No
PA-113	Chaffee Run	PA Game Commission	Moderate	No
Ciccotti	Roaring Run	Eugene Ciccotti	Moderate	No
Stephen Foster	Mill Creek	DCNR	High	Yes
Black Pond	Mill Creek	Floyd Shores	Low	No
Totem Lake	Camps Creek	Eric Chaffee	High	Yes
Chamberlain	Wolcott Creek	Lake Macham Association, Inc.	High	Yes
Lake Wesauking	Wysox Creek	Lake Wesauking Association	Low	No
Lake Ondawa	TR Bentley Creek	Tim Leonard Rod and Gun Club	High	Yes
Mill Creek	Mill Creek	Camp Spring Hill, Inc.	High	Yes
Galvin Pond	West Branch Trout Creek	John Firely	High	Yes

*Source: National Inventory of Dams*

**4.3.12.2 Range of Magnitude**

The municipalities where these dams are located are at the greatest risk for a 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 are classified in terms of hazard potential as: high, significant, or low, with high-hazard dams requiring Emergency Action Plans. Dams assigned the high hazard potential are those dams that probability is high that loss of human life would occur if a failure occurred. 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.

**4.3.12.3 Past Occurrence**

The only recorded dam failure in Bradford County occurred in April 2001. The Saco Pond Dam, a low hazard dam, failed due to an over topping condition after heavy rainfall. Due to the location, no danger to structures or individuals occurred.

No high or significant hazard dams have failed in Bradford County.

### **4.3.12.4 Future Occurrence**

Minor dam failures occur quite frequently. However, they often go unnoticed and cause little or no damage or effects on the general population. Significant and high hazard dam failures occur much less frequently. The probability of a significant or high hazard dam failure in Bradford 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. A risk factor of 1.5 has been assigned to this hazard using the risk factor assessment tool provided by the Pennsylvania Emergency Management Agency.

### **4.3.12.5 Vulnerability Assessment**

There is always a possibility a dam could fail. 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. The most vulnerable area of any dam failure is the area immediately downstream from the dam. The volume of water that is released and the rate that the water is released have a direct impact on the severity of impact downstream. Dams that meet the high hazard threshold require emergency action plans that assist with downstream notifications to vulnerable residents and businesses.

Another vulnerable area that will require research in the future is in reference to the natural gas exploration and extraction in the county. During the drilling and hydro-fracturing process, a large volume of water is stored in water impoundment. At times these ponds exceed a million gallons of water. In the event that a breach was to occur at one of these ponds, the downstream residents and businesses would be in danger. The local planning team will investigate this further during the next 5 year cycle of the hazard mitigation plan. A vulnerability map is located in **Appendix H-6**.

### 4.3.15 Environmental Hazards

#### 4.3.15.1 Location and Extent

##### **Hazardous Materials:**

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 Bradford County, hazardous materials such as chemicals, fuels, and other hazardous materials such as manure 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)). There are additional resources at this site as listed below:

- Superfund National Priorities List sites,
- RCRAInfo (EPA and state treatment, storage, disposal) facilities,
- Toxic Release Inventory System (TRI) sites,

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- Integrated Compliance Information System and Permit Compliance System - National Pollutant Discharge Elimination System Majors,
- RCRAInfo - Large Quantity Generators,
- Air Facility System - Major discharges of air pollutants,
- RCRAInfo - Corrective Actions,
- Risk Management Plan,
- Section Seven Tracking System Sites (Pesticides)
- ACRES - Brownfields Properties.

Table 4.3.15-1 lists the SARA Title III facilities located in Bradford County, as well as whether or not the facility resides in the special flood hazard area. Bradford County has a total of 13 SARA facilities. None of the SARA facilities are located within the floodplain.

<b>Table 4.3.15-1: Bradford County SARA Title III Facilities</b>	
<b>Name</b>	<b>Located within the SFHA-Floodplain</b>
Arrow United	No
Canton Borough Water	No
Cargil Meats	No
Jeld-Wen Incorporated	No
Dupont	No
GE Railcar Repair	No
Global Tungsten and Powders	No
Leprino Foods	No
Masco Corporation	No
Sayre Area Schools	No
Towanda Borough Water	No
Troy Area Schools	No
Walmart	No
<b>Source: Bradford County Emergency Management Agency</b>	

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. Hazardous materials releases from rail transport are also of concern due to collisions and derailments that result in large spills. The road and railroad network along with drastic elevation changes pose significant threat of a transportation hazardous materials incident.

### **Marcellus Shale:**

Natural gas exploration and extraction has skyrocketed in the past 10 years in Bradford County. Unconventional Marcellus Shale gas exploration became prevalent in 2008. The Marcellus Shale formation, which exists at a depth of 5,000 to 8,000 feet and is expected to hold trillions of cubic feet of natural gas, is located underneath all of Bradford County. New technologies that allow for a less expensive avenue for drilling and extraction have been utilized. Bradford County has the highest population of natural gas drilling wells in the Commonwealth of Pennsylvania.

The influx of natural gas company employees, corporate staffing and subcontractors has had a significant impact on the county's infrastructure. The Pennsylvania Department of Environmental Protection (DEP) reported 47 permitted unconventional well sites in 2008. As of October 2013, DEP reports that 2,348 unconventional wells have been permitted. All of the activities associated with the Marcellus Shale gas drilling and extraction has caused great concerns for Bradford County and the municipalities. The public infrastructure is not capable of expanding to accommodate the rapid growth in certain areas of the county. Concerns of water contamination, fires and other pollutions from the industry are an issue as well.

#### **4.3.15.2 Range of Magnitude**

##### **Hazardous Materials:**

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.

There are many conditions that can affect the severity of a hazardous materials release. The type of chemical released and the amount of the release have a direct bearing on any situation or condition. Weather conditions are one of the most important conditions that can affect the spill. Various chemicals react different ways with all the conditions of weather. The topography of the land is another aspect that is considered.

Certain mitigation efforts may directly affect the outcome of a hazardous material release. The ability for first responders to respond to and contain or control the hazardous materials incident is an important aspect. The ability for first responders to have adequate training and appropriate response equipment is a great mitigation effort. The issuance of shelter in place notifications can protect people and property as well.

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The severity of any incident is impacted by the conditions and efforts stated above. A hazardous material spill in an urban or suburban area may have a greater impact with injuries and property damage than in a rural area of the county. Government officials and public safety professionals must be prepared for any scenario that may be presented.

### **Marcellus Shale:**

Conventional gas and oil wells have been operational in the Bradford County for years. Bradford County has approximately 35 active conventional oil and gas wells in the county as noted in the Pennsylvania Hazard Mitigation Plan. 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 Bradford County at a depth of 5,000 to 8,000 feet.

The extraction process is different from traditional natural gas extraction. Vertical and horizontal well drilling is usually necessary to access the Marcellus Shale and its copious amounts of natural gas. When horizontal drilling is necessary, hydraulic fracturing is often used. Hydraulic fracturing involves pumping millions of gallons of water into the well with other components and chemicals mixed in the solution. Usually some type of fracturing process is implemented so that once the fracture is in place, the fluid will assist with allowing the gas to excrete more easily. The fluid that is recovered is referred to as frac fluid. The frac fluid is extremely saline and contains numerous chemicals that may be harmful to the environment and health of people.

Other potential impacts of unconventional well drilling are the depletion of surface water, contamination of surface water and groundwater, explosions or fires and hazardous material contamination from the drilling process. There have been incidents throughout the county over the past years in reference to these types of issues. The transportation system is another concern. Many roads and highways were not designed for the heavy truck traffic and other related transportation activities that occur with a drilling operation. The Bradford County officials continue to work with municipalities on issues like these.

### **4.3.15.3 Past Occurrence**

#### **Hazardous Materials:**

The National Response Center lists 63 incidents occurring in Bradford County between January 2000 and January 2014. During 2011, the Pennsylvania Emergency Management Agency received reports identifying 2,026 hazardous material release incidents in Pennsylvania. Of those 2,026 incidents, 30 were located in Bradford County. The severity and other specific information on these incidents was not available.

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The Commonwealth as a whole experienced 914 spills in 2012. 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 all of Bradford 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.

### **Marcellus Shale:**

There is no comprehensive database of unconventional well incidents in Pennsylvania. However, the FracTracker Alliance, a non-profit organization dedicated to enhancing the public's understanding of the oil and gas industry, has made data available on incidents where the Pennsylvania Department of Environmental Protection has confirmed causality between an incident and an oil and gas well. From 2007 until 2012, there were 162 of these type incidents that were linked to the oil and gas extraction. Of those incidents, 36 were located in Bradford County. The following are some of those incidents with some details:

- December 2009, an incident occurred where 295 gallons of hydrochloric acid spilled from a tank at a natural gas well site in Asylum Township.
- January 28, 2010, a natural gas explosion occurred in Tuscarora Township caused by equipment failure during the extraction at the gas well site. There were 2 minor injuries and 1 serious injury.

Bradford County EMA does not have any other incident data specific to a Marcellus Shale incident but some incidents may be related.

#### **4.3.15.4 Future Occurrence**

The overall probability of Bradford County experiencing an environmental hazard at a fixed facility is likely. A risk factor of 2.0 has been assigned to this hazard utilizing the Risk Factor methodology probability criteria.

The probability of an environmental hazard via transportation in Bradford County is highly likely. A risk factor of 2.8 has been assigned to this hazard utilizing the risk factor assessment tool provided by the Pennsylvania Emergency Agency.

There is a likely probability of an environmental hazard with the natural gas industry within Bradford County. A risk factor of 2.4 has been assigned to this hazard utilizing the risk factor methodology.

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 Bradford 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.

It is difficult to predict a Marcellus Shale well incident. As more wells are drilled in the county, the additional possibility of an incident increases.

### **4.3.15.5 Vulnerability Assessment**

#### **Hazardous Materials:**

A hazardous materials release 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). Due to the agricultural industry and traffic on transportation routes, this makes Bradford County vulnerable to hazardous material spills including manure spills.

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.

#### **Marcellus Shale:**

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 are large amounts of employees, equipment, supplies and drilling rigs are much larger than standard well drilling rigs. These are sites of many hazards including confine spaces, high angle drill rigs, chemicals, radioactive materials,

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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 that the water contains contaminants such as brine, radioactive materials and other chemicals. Also, Bradford County has some underground coal mines that are not mapped. These can lead to issues in the well drilling process. A vulnerability map is located in **Appendix H-7**.

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### 4.3.16 Nuclear Incidents

#### 4.3.16.1 Location and Extent

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

- Beaver Valley Power Station, Beaver County;
- Limerick Generating Station, Montgomery County;
- Peach Bottom Atomic Power Station, York County;
- Susquehanna Steam Electric Station, Luzerne County; and,
- Three Mile Island Nuclear Generating Station, Dauphin County.

#### 4.3.16.2 Range of Magnitude

Susquehanna Steam Electric Station, Unit 1 and Unit 2 would affect Bradford County. These are boiling water reactors. The southern part of Bradford County would be in the Ingestion Exposure Pathway.

**Table 4.3.16-1: Emergency Planning Zones (EPZ)**

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

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

There are three categories of nuclear accidents:

- Criticality accidents: Involves loss of nuclear assemblies or power reactors.
- Loss of coolant accidents: Occurs when a reactor coolant system experiences a break or opening large enough so that the coolant inventory in the system cannot be maintained by the normally operating make-up system.
- Loss of containment accidents: Involves the release of radioactivity from materials such as tritium, fission products, plutonium, and natural, depleted, or enriched uranium.

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

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

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

### **4.3.16.3 Past Occurrence**

There have been no nuclear plant failures that have directly affected Bradford County. There have been emergencies at the Susquehanna Steam Electric Station. These are identified in Table 4.3.16-2

**Table 4.3.16-2: Susquehanna Steam Electric Station Incidents**

Year	Incident
1982	Electrical fire at a switch box controlling the supply of cooling water to emergency systems. No injuries were reported.
1985	Approximately 10,000 gallons of radioactive water spilled at the Station's Unit 1 turbine building after a filtering system gasket failed.

Source: [http://en.wikipedia.org/wiki/Susquehanna\\_Steam\\_Electric\\_Station](http://en.wikipedia.org/wiki/Susquehanna_Steam_Electric_Station)

The Susquehanna Steam Electric Station has been in operation since 1983.

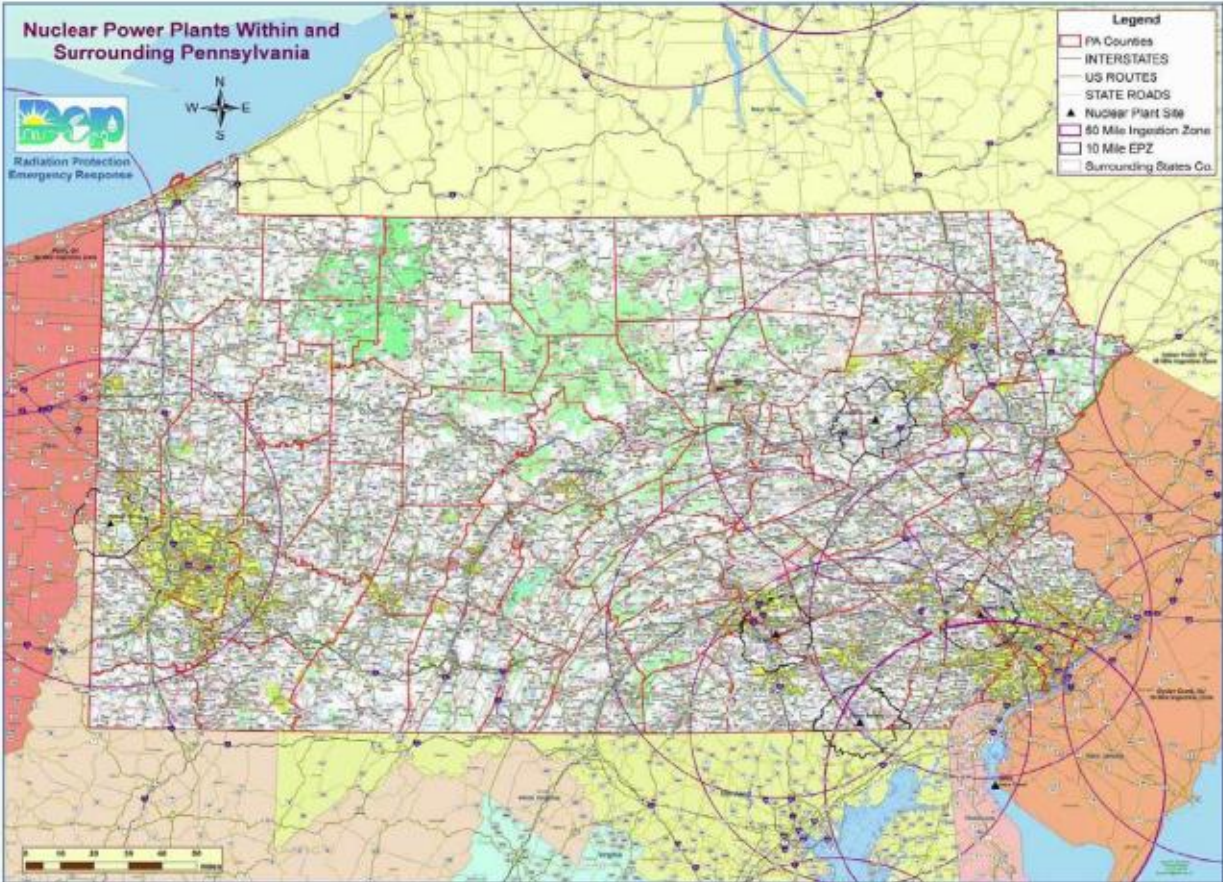
### **4.3.16.4 Future Occurrence**

According to the 2013 Pennsylvania Hazard Mitigation Plan; a number of *Unusual Event* and *Alert* classification level events occur each year at the over 100 nuclear facilities; and of these Alert emergencies occur less frequently. Also noted in the 2013 Pennsylvania Hazard Mitigation Plan; *Site Area Emergency* and *General Emergency* incidents are rare occurrences.

### **4.3.16.5 Vulnerability Assessment**

The probability of a nuclear incident in Bradford County is unlikely. A risk factor of 1.9 has been assigned to this hazard using the risk factor assessment tool provided by the Pennsylvania Emergency Management Agency. However, the county does lie within the 50 mile radius of the ingestion exposure pathway. The possibility of agricultural losses within Bradford County could result from a nuclear incident. Due to most of the food and agriculture-related critical facilities being privately owned, the replacement value is unknown. Figure 4.3.16-3 identifies the vulnerable areas of Bradford County.

**Figure 4.3.16-3: Nuclear Power Plants and Ingestions Zones of Pennsylvania**



### 4.3.17 Terrorism

#### **4.3.17.1 Location and Extent**

Terrorism is the unlawful use, or threat of the use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives (28 CFR 0.85). The major weapons and activities of terrorists include chemical and biological agents, radiological dispersion devices (RDD; commonly referred to as “dirty bombs), nuclear weapons, conventional explosives, improvised explosive devices (IED; includes incendiary devices), kidnappings, hijackings, arson, school bombs, and shootings. Terrorist targets are usually high-value, high-profile, and high-visibility targets. Such targets may include: international airports, large cities, major special events, critical infrastructure, resorts, important landmarks, political and/or business leaders. It is important to keep in mind that these are specific people, places, and targets and not regions.

A nuclear detonation is potentially the most destructive of any terrorist attack. The amount of destruction caused by a nuclear attack is determined by the size of the weapon. The effects of the fallout are determined by other factors such as wind speed and weather conditions. “Dirty bombs” are not included in the category of nuclear weapons and do not result in a nuclear explosion, but is one of the many forms of explosives used by terrorists. Anthrax, as an example of bioterrorism, is an infectious disease that can be spread by inhaling, ingesting, or touching the spore-forming bacteria. As seen in the past, terrorists (either international or domestic) can use the U.S. Postal Service to spread anthrax. With the massive size of the Postal Service, this form of terrorism is extremely difficult to stop.

Other types of terrorism include:

- Agriterrorism – Intentionally contaminating the food supplies or the introduction of pests and/or disease agents to crops and livestock.
- Cyberterrorism – Terrorism that involves computers and networks, and the information they contain.

#### **4.3.17.2 Range of Magnitude**

The largest impact resulting from a terrorist event can vary from nominal to catastrophic, depending on the type, location, and severity of the event. The greatest impact would be to the health and safety of the citizens, the continuation of government operations, facilities, critical infrastructure, and economic stability county-wide.

The rural areas of Bradford County are most susceptible to agriterrorism and school bomb threats. The impact of agriterrorism could be severe to the traditional family-operated farm, low-density residential areas, commercial agriculture operations, resource production facilities, and small-scale operations. In 2012 Bradford County had a high percentage of farmers that reported their principal occupation was farming.

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The areas along the major transportation routes, including US-6 and US-220 would be susceptible to some form of public transit terrorist attack. US-6 runs east and west while US-220 runs north and south. The more populated areas of the county could be susceptible to chemical, biological, radiological, nuclear, or explosive (CBRNE) events, due to the concentration and density of residential communities.

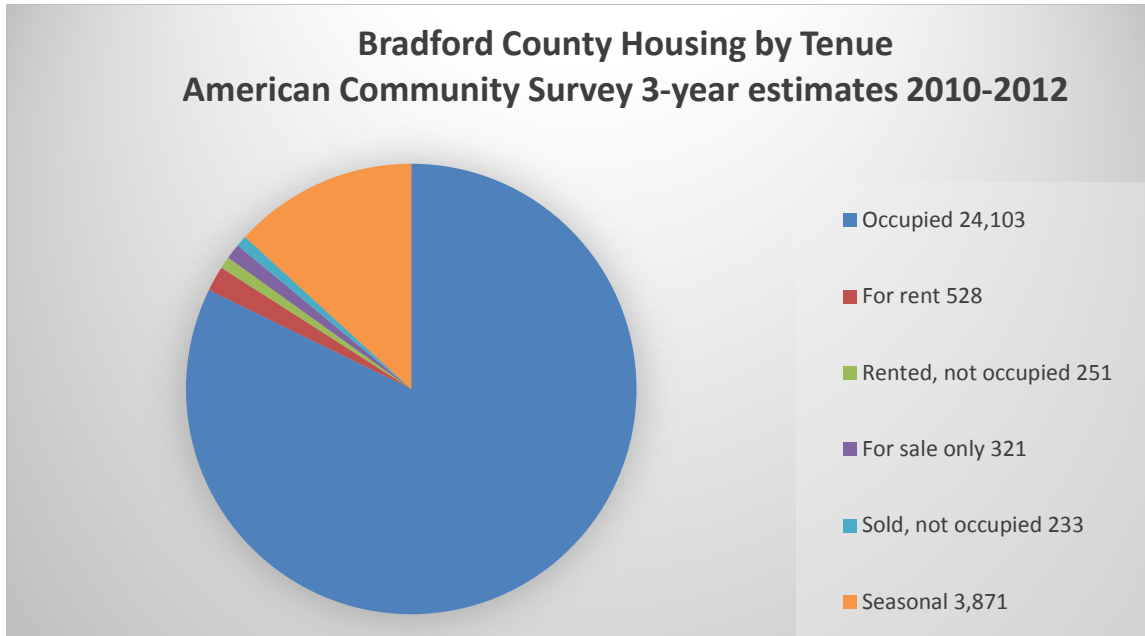
The impact of bomb threats disrupts the learning atmosphere in schools, disrupts worker productivity in businesses, can cause traffic to be re-routed, and ties up the tax payers' assets such as police and fire units. Bradford County has 7 school districts throughout the county and numerous non-public schools.

The resulting secondary effects from an act of terrorism are contingent on the type, location, and severity of an event. Nominal effects, similar to what Somerset County experienced in the wake of the Flight 93 tragedy on September 11, 2001, may be relatively minor compared to the impact on the populace, property, and surrounding environment. Emotional trauma, subsequent property damage, and the introduction of small amounts of hazardous materials into the environment are the more likely secondary effects of a similar incident occurring in Bradford County.

Secondary effects can also range to the catastrophic in impact and may be more damaging and have a greater lasting impact than the initial event. This may occur as the result of a CBRNE event that directly or indirectly affects the County. Critical protective actions may be required of first responders or the entire population. Resulting mass evacuations could lead to traffic congestion and a breakdown in civil order, further exacerbating the situation. Government operations may be disrupted, due to the need to displace or operate under reduced capacity. The environment may experience damaging long-term effects from radiation fallout, chemical introduction into the ground water, or biologic/germ introduction into the ecosystem. Critical infrastructure may be irreparably damaged and a loss in agriculture productivity could permanently affect the County's economy.

Another secondary effect of terrorism could be the migration from heavily populated areas to Bradford County. The seasonal housing in Bradford County accounts for just more than half of all the housing. Figure 4.3.17-1

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Source: [http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS\\_12\\_3YR\\_B25004&prodType=table](http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_12_3YR_B25004&prodType=table)

### 4.3.17.3 Past Occurrence

Table 4.3.17-2 lists past occurrences of bomb events (threats) within Bradford County between January 1, 2005 and December 31, 2013.

Table 4.3.17-2 Bomb Threats within Bradford County between 1/1/2005 and 12/31/2013		
Date	Location	Venue
12/15/2005	Bradford County Courthouse	County Government
03/08/2006	Northern Tier Counseling	Healthcare
03/29/2006	Litchfield School	Education
12/14/2006	Smoker's Choice	Business
08/04/2007	Walmart	Business
12/12/2007	Sayre High School	Education
05/03.2009	Gamelands	State Government
07/10/2009	S. Center Street	Residential
08/27/2010	Pennroy and Old Agway Alley	Unknown
03/10/2012	Troy Dandy	
12/06/2012	Bradford County Courthouse	County Government
02/26/2013	Cargill	Industry

Source: Bradford County



### **4.3.17.4 Future Occurrence**

Terrorist events are unpredictable by nature; leaving all communities vulnerable to terroristic incidents. While significant improvements have been made in their detection and prevention, terrorist events remain challenging to predict in size, scope, intent, and frequency.

The probability of a terrorist occurrence in Bradford County or the surrounding area is likely. A risk factor of 1.9 has been assigned to this hazard utilizing the risk factor methodology probability criteria provided by the Pennsylvania Emergency Management Agency.

### **4.3.17.5 Vulnerability Assessment**

The likelihood of an attack at any location in Bradford County is unlikely. Agriterrorism poses the greatest threat to Bradford County since agricultural cropland accounts for 21% land cover in the county; and pastures account for 8%. It is important to note that the use and exposure to biological agents can remain unknown for several days until the infected person(s), livestock, or crops begin to experience symptoms. Often these agents are contagious and the infected person must be quarantined, livestock culled, and/or crops destroyed.

It is not likely that Bradford County will experience a direct attack by a terrorist organization. The county is more likely to experience the secondary effects of a nearby area being attacked. However, the threat of a terrorist attack with chemical, biological, radiological, nuclear, or explosive (CBRNE) weapons is increasing. One method to assess the potential for a terrorist attack is by looking at the amount of critical infrastructure in the area. Facilities such as power plants and water facilities; if attacked could disrupt a much larger area more prone to terrorist attacks.

School bomb threats are the most likely terrorist activity to occur in the county. Bradford has 7 public school districts, 7 private schools and four institutions of higher education throughout the county. Bomb threats at these educational facilities are experienced annually. Bomb threats pose a risk to first responders, students and faculty when they occur.

A vulnerability map is located in **Appendix H-8**.

### **4.3.18 Transportation Accidents**

#### **4.3.18.1 Location and Extent**

##### **Highway:**

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. Bradford County is served by numerous U.S. routes, state routes and municipal roads. Bradford County ranks number 9 in Pennsylvania with 899 miles of Pennsylvania Department of Transportation (PennDOT) maintained roads. Hazardous materials travel through Bradford County daily.

##### **Aviation:**

Bradford County has one general aviation airport within its boundaries. The Bradford County Airport is located in Towanda. There are three regional airports within 86 miles of Towanda but not located within the county.

##### **Pipeline:**

Bradford County has a vast amount of pipelines in the county. Most of the pipelines are due to the natural gas exploration and extraction. A majority of the pipelines are located underground but there are locations that are located above ground and pose a risk for release. The lines vary in diameter of 2 inches to 36 inches and some lines are low pressure versus high pressure.

##### **Railroad:**

Bradford County has two active railroads in the county. Norfolk-Southern Railway Company and the Reading Blue Mountain and Northern Railroad conduct operations in the county. There are approximately 75-100 miles of rail line in the county. The line runs from Sayre south along the Susquehanna River.

#### **4.3.15.2 Range of Magnitude**

In terms of transportation, the maximum threat to Bradford 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 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.

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**4.3.15.3 Past Occurrence**

**Highway:**

Bradford County has witnessed fewer than the state average in automobile accidents from 2010-2012. Fatal accidents in Bradford County between the same time period also fall below the state average. In 2012, 82 percent of those involved in reported accidents in Bradford County were wearing a seatbelt. Table 4.3.15-1 outlines Bradford County vehicle crash data.

**Table 4.3.15-1 Bradford County Vehicle Crashes (2010-2012)**

	2010	2011	2012
<b>Total Crashes</b>	770	847	776
<b>State Average</b>	1,810	1,871	1,852
<b>Fatal Crashes</b>	20	10	15
<b>State Average</b>	20	19	20
<b>Seatbelt Usage</b>	85%	86%	82%
<b>State Average</b>	77%	78%	78%

Source: Pennsylvania Department of Transportation

**Aviation:**

Bradford County has experienced some aviation accidents. On July 27, 2009, a Cessna 177 made a hard landing at the Bradford County Airport. No injuries or fatalities were reported. Another incident occurred on June 5, 2001 in Sayre. This incident involved an Interplane Sky Boy which is a type of ultralight. The ultralight rolled over after takeoff and impacted the runway. One serious injury was reported.

**Railroad:**

The 2009 mitigation plan outlined that from 1977-2005, there were three rail incidents in Bradford County, which resulted in a total of eight cars carrying hazardous materials being derailed. These cars were leaking hazardous substances. No fatalities were reported in any of the accidents. No further details were available. No additional incidents were identified during this assessment.

**4.3.15.4 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, rail road accident or an aviation accident. Roadway accidents occur annually, often with limited impact. The exploration and extraction of natural gas in Bradford County has led to an increase of truck and heavy equipment traffic. A risk factor of 2.6 has been assigned to this hazard utilizing the risk factor methodology probability criteria.

### **4.3.15.5 Vulnerability Assessment**

#### **Highway:**

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. The natural gas industry has increased the vulnerability of traffic accidents. More heavy trucks are traveling on Bradford County roadways. Due to the fact that these trucks with heavy equipment must travel onto the municipal roads, the vulnerability increases even more due to narrow roads and decreased integrity of the road surface.

#### **Pipeline:**

Bradford 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 Bradford County, include hurricanes and tornadoes. Pipelines continue to be built and upgraded in Bradford County due to the natural gas industry. The pipelines that carry natural gas have grown significantly over the past 5 years. Since there are an increased numbers of pipelines there is an increased risk of a pipeline incident. (Some of the new pipelines have static pressures of over 1000 pounds per square inch.)

#### **Railroad:**

Railroad incidents pose a vulnerability to populations that live near rail lines. Major highways and critical infrastructure would also be impacted in the event of a railroad accident occurred in these areas. Most of the rail lines in Bradford County are located in rural areas but some large population areas like Towanda and Sayre have rail lines running through them. The Bradford County rail lines are located in close vicinity to the Susquehanna River and tributaries of this river. A rail incident that releases hazardous materials could be an environmental disaster.

#### **Aviation:**

Aviation transportation poses a vulnerability and threat in the immediate area of the Bradford County Airport. There are numerous addressable structures and critical facilities within a five mile radius of the airport. Damage to critical infrastructure resources could include power lines, telecommunication systems, roads, railroads, bridges and pipelines.

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

### **4.3.19 Urban Fire and Explosions**

#### **4.3.19.1 Location and Extent**

Urban fire and explosion hazards incorporate vehicle and building/structure fires as well as overpressure rupture, overheat, or other explosions that do not ignite. Statewide, this hazard occurs in the denser, more urbanized areas and occurs most often in residential structures (US Fire Administration, 2009). Urban fires can easily spread from building to building in these denser areas.

Although fires can start from numerous causes, major fires are often the result of other hazards such as storms, droughts, transportation accidents, hazardous material spills, and criminal activity (arson) or terrorism. Small structural fires occur often and will not have a large impact on an area, but the increase of insurance rates from these fires will.

#### **4.3.19.2 Range of Magnitude**

Urban fires can occur in any populated area. Fires affecting one structure happen quite often. The greatest risk urban fires present, is the rapid spread of the fire from one structure to another. Bradford County is listed as a rural county. There are fourteen boroughs within Bradford County.

Severe urban fires result in extensive damage to residential, commercial, and/or public property. Damages ranges from minor smoke and/or water damage to the destruction of buildings. People are often displaced for several months to years depending on the magnitude of the fire or explosion event. Urban fires and explosions can also cause injuries and death. Although most instances of fire do not reach disaster proportions, the sum of the impact of all small fires is often much greater than the impact of the few major fire and explosion hazards that occur.

There are additional economic consequences related to this hazard. Urban fires and explosions may result in lost wages due to temporarily or permanently closed businesses, destruction and damage involving business and personal assets, loss of tax base, recovery costs, and lost investments on destroyed property. The secondary effects of urban fire and explosion events relate to the ability of public, private, and non-profit entities to provide post-incident relief. Human service agencies (community support programs, health and medical services, public assistance programs and social services) can be affected by urban fire and explosion events as well. Effects may consist of physical damage to facilities and equipment, disruption of emergency communications, loss of health and medical facilities and supplies, and an overwhelming load of victims who are suffering from the effects of the urban fire, including loss of their home or place of business.

There are 27 fire departments within Bradford County providing services to the 51 municipalities. A breakdown of fire coverage provider(s) within each municipality is listed in Table 4.3.19-2.

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<b>Table 4.3.19-2 Fire Coverage Provider(s) per Municipality</b>	
<b>Municipality</b>	<b>Fire Coverage Provider(s)</b>
Alba Borough	Canton Fire Department
Albany Township	New Albany Volunteer Fire Department Dushore Volunteer Fire Department
Armenia Township	Troy Volunteer Fire Department
Asylum Township	Wysox Volunteer Fire Department
Athens Borough	Athens Borough Fire Department
Athens Township	Athens Township Volunteer Fire Department
Burlington Borough	Troy Fire Department
Burlington Township	Troy Fire Department East Smithfield Fire Department North Towanda Fire Department Franklindale Fire Department
West Burlington Twp.	Troy Fire Department East Smithfield Fire Department
Canton Borough	Canton Fire Department
Canton Township	Canton Volunteer Fire Company
Columbia Township	Troy Volunteer Fire Company
Franklin Township	Franklin Township Volunteer Fire Company
Granville Township	Troy Fire Department
Herrick Township	Herrickville Volunteer Fire Department
LeRaysville Borough	LeRaysville-Pike Volunteer Fire Company
LeRoy Township	Canton Volunteer Fire Department
Litchfield Township	Litchfield Volunteer Fire Department
Monroe Borough	Monroe Hose Company
Monroe Township	Monroe Hose Fire Company
New Albany Borough	New Albany Volunteer Fire Company
Orwell Township	Herrick Township Volunteer Fire Department LeRaysville-Pike Volunteer Fire Department Vigilante Volunteer Fire Department
Overton Township	New Albany Volunteer Fire Company
Pike Township	LeRaysville-Pike Volunteer Fire Department
Ridgebury Township	Ridgebury Volunteer Fire Company
Rome Borough	Vigilante Engine Company
Rome Township	Vigilante Engine Company
Sayre Borough	Sayre Borough Volunteer Fire Department
Sheshequin Township	Ulster Sheshequin Fire Company
Smithfield Township	Smithfield Township Volunteer Fire Department
South Creek Township	South Creek Volunteer Fire Company
South Waverly Borough	South Waverly Volunteer Fire Department
Springfield Township	Oscoluwa Engine Hose Smithfield Township Volunteer Fire Department Ridgebury Township Volunteer Fire Company
Standing Stone Township	Wysox Volunteer Fire Company
Stevens Township	LeRaysville-Pike Volunteer Fire Company
Sylvania Borough	Troy Volunteer Fire Department
Terry Township	Wyalusing Volunteer Fire Department New Albany volunteer Fire Department Wilmot Volunteer Fire Department
Towanda Borough	Towanda Fire Department
Towanda Township	Towanda Fire Department

<b>Table 4.3.19-2 Fire Coverage Provider(s) per Municipality</b>	
<b>Municipality</b>	<b>Fire Coverage Provider(s)</b>
North Towanda Township	North Towanda Fire and Rescue
Troy Borough	Troy Volunteer Fire Department
Troy Township	Troy Volunteer Fire Department
Tuscarora Township	Wyalusing Valley Volunteer Fire Company Laceyville Goodwill Company
Ulster Township	Ulster Sheshequin Fire Company
Warren Township	Warren Township Volunteer Fire Company
Wells Township	Millerton Fire Department Big Elm Fire Department
Wilmot Township	Wilmot Fire Company
Windham Township	Windham Township Volunteer Fire Company
Wyalusing Borough	Wyalusing Valley Volunteer Fire Department
Wyalusing Township	Wyalusing Valley Volunteer Fire Department
Wysox Township	Wysox Volunteer Fire Department
<b>Source: Bradford County Data Resource Book 2012</b>	

The Commonwealth of Pennsylvania has a statewide Uniform Construction Code, which is enforced by local governments individually or through multi-municipal agreements. In Bradford County, the Eastern and Western Council of Governments assist 43 municipal governments; and has entered into an agreement with the *Code Inspections, Inc.* to enforce the Uniform Construction Code.

**4.3.19.3 Past Occurrence**

From 1910 until 1990, the Commonwealth of Pennsylvania experienced 13 major fires in suburban and urban settings, 10 of them from 1980-1990. Between 1978 and 1982, the average number of deaths per fire was 2.7. Since October 1990, the average number of deaths per fire has decreased.

**4.3.19.4 Future Occurrence**

The probability of an urban fire or explosion in Bradford County is possible. However, most urban fires are contained and cause little damage. A risk factor of 2.0 has been assigned to this hazard utilizing the risk factor methodology probability criteria. Minor events will likely happen more frequently than major fires or explosions in the future.

**4.3.19.5 Vulnerability Assessment**

Fire and explosion vulnerability greatly depends on the vulnerability of other hazards. Most fires result from the secondary effect of another hazard. The probability of a fire or explosion occurring has been increasing with population and economic growth. This is due to human error and carelessness, which are other factors contributing to urban fires. The natural gas industry and exploration is an example of the increased growth in Bradford County. This risk also increases as the use of wood burning and kerosene space heaters increases. The elderly (65

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and older) tend to be more vulnerable to fires than any other age group. They will also experience the highest number of deaths per fire. The second most vulnerable age group is those who are 14 and younger. These groups are generally affected while they are at home, and in the case of children, they may often be home alone. Additionally, many homes destroyed by urban fires are often the older homes in the community. Fire can spread faster in areas with higher concentrations of housing, as opposed to rural areas. The potential secondary effects of an urban fire include utilities failure and transportation accidents.

As structures age there is always the increase probability of a fire. Table 4.3.19-3 shows the age of household construction within Bradford County. There are more households that are 70 years or older. Households that are between 30 and 40 years old make up the second highest total of structures. According to the Bradford County Data Resource Book 2012, there are a total of 8,043 structures distributed in urban settings. This is 28 percent of the total housing units within the County.

<b>Table 4.3.19-3 Bradford County Number of Households Built Timeframe</b>	
<b>Years Household Construction Built</b>	<b>Total Households Built</b>
1999 to March 2000	434
1995 to 1998	1,419
1990 to 1994	1,777
1980 to 1989	3,468
1970 to 1979	5,016
1960 to 1969	2,465
1950 to 1959	1,949
1940 to 1949	1,233
1939 or earlier	10,921
<b>Source: Bradford County Data Resource book 2012</b>	



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**4.3.20 Utility Interruptions**

**4.3.20.1 Location and Extent**

Utility interruptions in Bradford 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, tornadoes, winter storms or tropical storms. Severe thunderstorms, tornadoes, 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. Table 4.3.20-1 identifies the utility providers in Bradford County.

<b>Table 4.3.20-1: Bradford County Municipal Utility Provider Summary</b>	
<b>Electric</b>	Penelec Claverack Tri-County Rural Electric company
<b>Water</b>	Aqua PA Canton Water Authority LeRaysville Water Company Towanda Water & Sewer Troy Water & Sewer Authority Ulster Municipal Authority Wyalusing Municipal Authority
<b>Public Sanitary Sewer</b>	Athens Township Sewer Authority Valley Joint Sewage Authority Canton Borough Sewer Authority Herrick Township Sewage LeRaysville Sewer Company Bradford County Sanitation Towanda Borough Water & Sewer New Albany Sewer Smithfield Authority South Waverly Municipal Authority Troy Borough Water & Sewer Authority Wyalusing Municipal Authority Wysox Township Municipal Authority
<b>Gas</b>	UGI Central Penn Gas Valley Energy Inc.
<b>Telephone</b>	Frontier Communications Verizon North Penn MCI

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<b>Table 4.3.20-1: Bradford County Municipal Utility Provider Summary</b>	
<b>Internet</b>	COMCAST Beaver Valley Cable/Cable Racer CQ Services EMCS.Net Epix Internet Services Frontier PenTeleData Sarver's Output Services Time Warner Road Runner Tower Micro Wildblue Highspeed Internet
<b>Cable &amp; Satellite</b>	COMCAST Beaver Valley Cable Blue Ridge Communications Direct TV Dish Network Time Warner Cable
<b>*Pipelines</b>	Chesapeake Energy Sunoco Logistics Talisman Energy Tennessee Gas Pipeline Company, L.L.C. UGI
<b>Sources: Bradford County 2012 Resource Data Book *2012 Emergency Official Manual Pipeline Emergency</b>	

A breakdown of utility services per municipality in Bradford County is listed in Table 4.3.20-2

<b>Table 4.3.20-2 Bradford County Municipal Utility Service Providers</b>					
<b>Municipality</b>	<b>Electric</b>	<b>Water</b>	<b>Public Sanitary Sewer</b>	<b>Gas</b>	<b>Telephone</b>
Alba Borough	Penelec	N/A	N/A	UGI Central Penn Gas	Frontier Communications
Albany Township	Penelec & Claverack	N/A	N/A	N/A	Frontier Communications
Armenia Township	Tri-County Rural Electric Company	N/A	N/A	UGI Central Penn Gas	Frontier Communications
Asylum Township	Penelec & Claverack	N/A	N/A	N/A	Frontier Communications
Athens Borough	Penelec	Aqua PA	Valley Joint Sewer Authority	Valley Energy Inc.	Verizon
Athens Township	Penelec & Tri-County Rural Electric Company	Aqua PA	Athens Township Authority	Valley Energy Inc.	Verizon
Burlington Borough	Penelec	N/A	N/A	UGI Central Penn Gas	Frontier Communications
Burlington Township	Tri-County Rural Electric Company	N/A	N/A	N/A	Frontier Communications

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**Table 4.3.20-2 Bradford County Municipal Utility Service Providers**

Municipality	Electric	Water	Public Sanitary Sewer	Gas	Telephone
West Burlington Twp.	Penelec	N/A	N/A	UGI Central Penn Gas	Frontier Communications
Canton Borough	Penelec	Canton Borough Water Authority	Canton Borough Sewer Authority	UGI Central Penn Gas	Frontier Communications
Canton Township	Penelec & Claverack	N/A	N/A	UGI Central Penn Gas	Frontier Communications
Columbia Township	Penelec & Tri-County Rural Electric	N/A	N/A	UGI Central Penn Gas	Frontier Communications
Franklin Township	Penelec & Claverack	N/A	N/A	N/A	Frontier Communications
Granville Township	Penelec	N/A	N/A	UGI Central Penn Gas	Frontier Communications
Herrick Township	Claverack & GPU	N/A	Herrick Township Sewage	N/A	Frontier Communications
LeRaysville Borough	Penelec	LeRaysville Water Company	LeRaysville Sewer Company	N/A	Frontier Communications
LeRoy Township	Penelec & Claverack	N/A	N/A	N/A	Frontier Communications
Litchfield Township	Penelec & Claverack	N/A	Bradford County Sanitation	N/A	Verizon & Frontier Communications
Monroe Borough	Penelec	Towanda Water & Sewer	Towanda Water & Sewer	Valley Energy Inc.	Frontier Communications
Monroe Township	Penelec	Towanda Water & Sewer	Towanda Water & Sewer	Valley Energy Inc.	Frontier Communications
New Albany Borough	Penelec	Towanda Water & Sewer	Towanda Water & Sewer	N/A	Frontier Communications
Orwell Township	Penelec & Claverack	N/A	N/A	N/A	Frontier Communications
Overton Township	Penelec & Sullivan Rural Electric	N/A	N/A	N/A	Frontier Communications
Pike Township	Penelec & Claverack	N/A	N/A	N/A	Frontier Communications
Ridgebury Township	Penelec & Tri-County Rural Electric Company	N/A	N/A	UGI Central Penn Gas	North Penn & Frontier Communications
Rome Borough	Penelec	N/A	N/A	N/A	Frontier Communications
Rome Township	Penelec & Claverack	N/a	N/A	N/A	Frontier Communications
Sayre Borough	Penelec	Aqua PA	Valley Joint Sewer Authority	Valley Energy Inc.	Verizon & Time Warner

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**Table 4.3.20-2 Bradford County Municipal Utility Service Providers**

Municipality	Electric	Water	Public Sanitary Sewer	Gas	Telephone
Sheshequin Township	Penelec & Claverack	N/A	N/A	N/A	Frontier Communications
Smithfield Township	Penelec	N/A	Smithfield Authority	UGI Central Penn Gas	North Penn & MCI
South Creek Township	Penelec	N/A	N/A	UGI Central Penn Gas	North Penn & MCI
South Waverly Borough	Penelec	Aqua PA	South Waverly Municipal Authority	Valley Energy Inc.	Verizon
Springfield Township	Penelec & Tri-County Rural Electric Company	N/A	N/A	UGI Central Penn Gas	North Penn & Frontier Communications
Standing Stone Township	Claverack & Penelec	N/A	N/A	N/A	Frontier Communications
Stevens Township	Claverack & Penelec	N/A	N/A	N/A	Frontier Communications
Sylvania Borough	Penelec	N/A	N/A	UGI Central Penn Gas	Frontier Communications
Terry Township	Claverack	N/A	N/A	N/A	Frontier Communications
Towanda Borough	Penelec	Towanda Water & Sewer	Towanda Water & Sewer	Valley Energy Inc.	Frontier Communications
Towanda Township	Penelec	Towanda Water & Sewer	Towanda Water & Sewer	Valley Energy Inc.	Frontier Communications
North Towanda Township	Penelec	Towanda Water & Sewer	Towanda Water & Sewer	Valley Energy Inc.	Frontier Communications
Troy Borough	Penelec	Troy Borough Water & Sewer Authority	Troy Borough Water & Sewer Authority	UGI Central Penn Gas	Frontier Communications
Troy Township	Penelec & Tri-County	N/A	Troy Township Water & Sewer Authority	UGI Central Penn Gas	Frontier Communications
Tuscarora Township	Penelec & Claverack	N/A	N/A	N/A	Frontier Communications
Ulster Township	Penelec	Ulster Municipal Authority	N/A	N/A	North Penn & Frontier Communications
Warren Township	Penelec	N/A	N/A	N/A	Frontier Communications
Wells Township	Penelec & Tri-County Rural Electric company	N/A	N/A	UGI Central Penn Gas	North Penn
Wilmot Township	Claverack	N/A	N/A	N/A	Frontier Communications

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**Table 4.3.20-2 Bradford County Municipal Utility Service Providers**

Municipality	Electric	Water	Public Sanitary Sewer	Gas	Telephone
Windham Township	Penelec & Claverack	N/A	N/A	N/A	Frontier Communications
Wyalusing Borough	Penelec	Wyalusing Municipal Authority	Wyalusing Municipal Authority	N/A	Frontier Communications
Wyalusing Township	Penelec & Claverack	N/A	N/A	N/A	Frontier Communications
Wysox Township	Penelec	N/A	Wysox Township Municipal Authority	Valley Energy	Frontier communications

Source: Bradford County Data Resource Book 2012

Table 4.3.20-3 shows the community public water supply populations and the primary source of that supply for Bradford County. The remaining residents of Bradford County receive their water supplies under the purview of the PUC (Public Utility commission).

**Table 4.3.20-3 Community Public Water Supply Populations and Primary Source (DEP, 2013)**

Ground	Ground or Purchased Ground Under SWI	Purchased Ground	Purchased Surface	Surface	Grand total
27,073	600	2,099	0	0	29,772

Source: Pennsylvania 2013 Approved State Hazard Mitigation Plan

### 4.3.20.2 Range of Magnitude

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

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

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.

### **4.3.20.3 Past Occurrence**

It is commonly known that utility failures occur annually, at a minimum. Previous occurrence statistics were not available for this risk assessment. The continued documentation of these failures will provide opportunities for the county to mitigate such service failures.

### **4.3.20.4 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 3.1 has been assigned to this hazard utilizing the risk factor methodology probability criteria.

An aging infrastructure also poses a threat to potential utility interruptions. As the equipment and facilities age, constant wear and tear of the service deteriorates it. There is often a mix of new and old equipment along the line, as total replacement is not a feasible solution for utility companies.

### **4.3.20.5 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. Other causes of power outages include flooding, falling tree limbs, vehicle accidents involving utility poles, and 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 and heating or air conditioning loss which affects both residences and businesses.

Most critical infrastructure and special needs facilities have backup generators to alleviate the loss of electricity. Fuel supplies are sufficient to supply generators for numerous days in most cases. Fuel supplies for extended durations create another vulnerability for some facilities.

#### **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

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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 Bradford 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.

**Gas and liquid pipelines:**

Interruptions to natural gas distribution could be affected by several means: the deterioration of lines and facilities; puncturing the distribution lines by humans (either intentional or accidental); coastal and winter storms; extreme heat or cold events; or transportation accidents. Table 4.3.20-4 outlines the products that could be transported through Bradford County.

<b>Table 4.3.20-4 Pipeline products transported through Bradford County</b>	
<b>Pipeline Company</b>	<b>Products transported via pipelines, DOT Guidebook ID #</b>
Chesapeake Energy	Natural Gas, 1971 Natural Gas Condensate, 3295
Sunoco Logistics	Diesel Fuel, 1993 Fuel Oil, 1993 Fuel, Aviation, Turbine Engine (Jet Fuel or Jet A) 1863 Gasoline, 1203 Kerosene, 1223 Light Cycle Oil, 1993 Low Sulfur Diesel, 1993 Ultra Low Sulfur Diesel, 1993 Ultra Low Sulfur Kerosene, 1223
Talisman Energy	Natural Gas, 1971
Tennessee Gas Pipeline Co.	Natural Gas, 1971
UGI	Natural Gas, 1971
<b>Source: 2012 Emergency Official Manual Pipeline Emergency Response Planning Information for Pennsylvania</b>	

**Communications and Internet Providers:**

The Bradford County primary provider for most municipalities for land based telecommunications is Frontier Communications. Verizon, MCI, North Penn and Time Warner also provide service in some municipalities. Since Frontier provides a majority of the land based communications in the county, a failure in this system could be a county wide emergency. Small-scale failures occur annually. Since the cellular coverage is limited in the county, reliance on cellular communications as a backup is not a valid solution in portions of the county.

Cellular communications and coverage is sporadic in the county. Drastic elevation changes, topography issues and a lack of cellular towers in the county lead to a decreased ability to use cellular communications. The topography of Bradford County varies from 2,300 feet to 640 feet above Sea Level. Cellular communications infrastructure has grown over the past 5 years but is still limited.

Internet service providers (ISP) vary across the county. Some municipalities may be served by more than one ISP. Others may only have one provider. There are many variables that affect the vulnerability of this service. Electric backup to infrastructure design all play a vital role in the viability of this service. Many businesses and residents are switching from traditional land based telephone service to voice over internet protocol (VoIP). In the event that a resident or business loses internet as a VoIP telephone user, they will lose telephone communications as well. Internet is also a vital link for many businesses to continue daily operations.

### **4.3.21 Levee Failure**

#### **4.3.21.1 Location and Extent**

In 2009 FEMA completed an inventory of all known levees across Pennsylvania, with an update in 2014, known as the Mid-Term Levee Inventory (MLI). Levee data gathered in the MLI is first and foremost for structures designed to protect from the 1%-annual-chance flood event. Areas behind a maintained and certified levee that is designed to protect from a 1%-annual-chance flood is called a Levee Protected Area. The MLI does not include every levee, especially small levees and agricultural levees.

Flood waters will ultimately inundate the protected area landward of the levee in the event of a failure. The extent of inundation is dependent on the intensity of flooding. Buildings located nearest the levee overtopping or breach location will suffer the most damage from the initial embankment failure flood wave. Landward buildings will be damaged by inundation.

Levees require maintenance to continue to provide the level of protection they were designed and built to protect. Maintenance responsibility belongs to a variety of entities including, local, state and federal government and private land owners. Levee owners need to both maintain levees and pay for an independent inspection in order to have the levee certified as providing flood protection. The impacts of an un-certified levee include levee failure and insurance rate increases because FEMA identifies that the structures are not designed to protect to the 1%-annual-chance flood height on Flood Insurance Rate Maps. Levees designed and constructed by PA DEP (Department of Environmental Protection) are then sponsored by the municipality in which it has been constructed. Sponsorship indicates the party that is responsible for the levee's operations and maintenance.



Table 4.3.21.1-1 lists the identified levees in Bradford County.

<b>Table 4.3.21.1-1: Bradford County levees per the Mid-Term Levee Inventory</b>		
<b>Levee Identification</b>	<b>Primary Community</b>	<b>Operated by:</b>
Athens-Chemung River Levee System (Upstream)	Athens Borough	Athens Borough
Athens-Chemung River Levee System (Downstream)	Athens Borough	Athens Borough
Sayre Levee System	Sayre Borough	Sayre Borough
Source: <a href="http://r3levees.org/wiki/images/0/02/WIKI_Region3_1072014_PAL_Tracking_Spreadsheet.pdf">http://r3levees.org/wiki/images/0/02/WIKI_Region3_1072014_PAL_Tracking_Spreadsheet.pdf</a>		

**4.3.21.2 Range of Magnitude**

A levee failure causes flooding in landward areas adjacent to the levee system. Properties located in the area of reduced-risk landward of a levee system area not subject to the mandatory flood insurance purchase requirement of the National Flood Insurance Program. Therefore, regardless of whether a levee is accredited, there is concern that properties in these areas lack flood insurance. In the event of a failure, it is likely that flooded properties will not be insured.

The following is a list and description of the potential environmental impacts from a levee failure:

- Flooding could pose an air, water and/or soil contamination if hazardous materials are compromised in the flooding.
- Flood waters will back up sanitary sewer systems
- Water will inundate waste water treatments plans, causing raw sewage to contaminate residential and commercial buildings and the flooding waterway.
- Water supplies and waste water treatment could be off-line for a long period of time.
- Contaminated sediment must be removed from buildings and properties.

**4.3.21.3 Past Occurrence**

There is no comprehensive list of levee failures in Pennsylvania, and historically few, if any, have been reported. While there is not a comprehensive list, there are news reports of some levee-related flood damage from the Chemung Levee in Athens, Bradford County. In July 2013, the Chemung levee repairs were under construction with an 80/20 federal/state match fund.

### **4.3.21.4 Future Occurrence**

Given certain circumstances, a levee failure can occur at any time. However, the probability of future occurrence can be reduced through proper design, construction and maintenance measures. Without proper maintenance, the age of a levee can increase the potential for failures.

The overall probability of Bradford County experiencing a levee failure is unlikely. A risk factor of 1.8 has been assigned to this hazard utilizing the Risk Factor methodology probability criteria.

### **4.3.21.5 Vulnerability Assessment**

The vulnerability for levee failures is directly related to the population in landward areas adjacent to the levee system. The more populated an area the more vulnerable it is to a levee failure. Areas that are in the reduced-risk landward that do not have flood insurance are more vulnerable to property loss in an inundation event.

Bradford County will complete additional research and determination of loss to the areas landward from levees in the county.

## **4.4 Hazard Vulnerability Summary**

### **4.4.1 Methodology**

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

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

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

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.

## Bradford County 2015 Hazard Mitigation Plan

**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>	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	

# Bradford County 2015 Hazard Mitigation Plan

## 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 twenty (20) potential hazards identified in the 2015 HMP. It should be noted that the tornado hazard and windstorm hazard were ranked individually instead of together and flooding was ranked according to flash flooding, river flooding and ice jam flooding. Hazards identified as *high* risk have risk factors greater than 2.5. Risk Factors ranging from 2.0 to 2.4 were deemed *moderate* risk hazards. Hazards with Risk Factors 1.9 and less are considered *low* risk.

**Table 4.4-2: Bradford County Hazard Ranking Based on RF Methodology.**

HAZARD RISK	HAZARD NATURAL(N) OR MAN-MADE(M)	RISK ASSESSMENT CATEGORY					RISK FACTOR (RF)
		PROBABILITY	ECONOMIC IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	
HIGH	Radon Exposure (N)	4	2	4	1	4	3.1
	Utility Interruptions (M)	4	2	3	4	3	3.1
	Winter storms (N)	4	2	4	1	3	3.0
	Pandemic (N)	4	2	3	1	4	2.9
	Environmental Hazards	4	2	2	4	2	2.8
	Transportation (M)	4	2	2	4	1	2.7
	Windstorms (N)	4	2	2	4	1	2.7
	Flooding –River (N)	2	3	3	1	4	2.6
	Transportation Accidents (M)	4	2	1	4	2	2.6
Flooding- Flash (N)	3	2	2	4	2	2.5	
MODERATE	Extreme Temperatures (N)	2	2	4	1	3	2.4
	Hurricane/Tropical Storm (N)	2	2	4	1	3	2.4
	Invasive species (N)	4	1	2	1	4	2.4
	Environmental hazard – gas industry (M)	3	2	1	4	3	2.4
	Drought (N)	2	1	4	1	4	2.2
	Earthquake (N)	1	2	4	4	1	2.2
	Flooding- Ice Jams (N)	2	1	2	4	3	2.0
	Environmental hazards – fixed facility (M)	3	1	1	4	2	2.0
	Urban Fire and Explosion (M)	2	2	1	4	2	2.0
LOW	Tornadoes (N)	2	2	1	4	1	1.9
	Nuclear incidents (M)	1	1	4	1	4	1.9
	Terrorism (M)	3	1	1	4	1	1.9
	Levee Failure (M)	1	2	2	1	4	1.8
	Civil Disturbance (M)	2	1	1	4	2	1.7
	Landslides (N)	2	1	1	1	4	1.6
	Dam Failure (M)	1	1	2	1	4	1.5
Wildfire (N)	1	1	1	4	2	1.4	

## Bradford County 2015 Hazard Mitigation Plan

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Based on these results, there are nine (9) *high* risk hazards, nine (9) *moderate* risk hazards and eight (8) *low* risk hazards in Bradford County. Mitigation actions were developed for all high, moderate, and low risk hazards (see Section 6.4). The threat posed to life and property for moderate and high risk hazards is considered significant enough to warrant the need for establishing hazard-specific mitigation actions. Mitigation actions related to future public outreach and emergency service activities are identified to address low risk hazard events.

A risk assessment result for the entire county does not mean that each municipality is at the same amount of risk to each hazard. Table 4.4-3 shows the different municipalities in Bradford County and their assessment of risk to hazards. A municipality hazard identification and risk evaluation worksheet was provided to all municipalities for completion. In part 1 of the worksheet, all hazards that were profiled in the current hazard mitigation plan were listed. The municipalities then identified if the frequency of occurrence, magnitude of impact and geographic extent had increased, decreased or had no change. The results are identified in Table 4.4-3 below. I = Increase, D = Decrease, NC = No Change.

In part 2 of the worksheet, a list of all natural and human-made hazards were listed. The municipalities were instructed to select hazards that have the potential to affect the municipality. The results of part 2 are identified in Table 4.4-4 below.

Hailstorms, Sinkhole/Subsidence, Lightning Strike, Building/Structure Collapse, Disorientation, Urban Fire and Explosion, Drowning and War/Criminal Activity hazards were identified by some municipalities. The Bradford County Project Team and the consulting firm completed research on these hazards. After review of past events and other data for each of these hazards, profiling of these hazards during the 2015 hazard mitigation plan update was not recommended by the local planning team. Additional research on these hazards will be conducted during the next mitigation planning period. Historical data and related activity will be analyzed and documented for the next mitigation plan update. Information and data will be gathered from the municipalities that identified these hazards as new threats. Updated to the 2015 hazard mitigation plan will be completed as needed.

## Bradford County 2015 Hazard Mitigation Plan

**Table 4.4-3: Bradford County Municipality Hazard Identification and Risk Evaluation Worksheet Overview  
Hazards Profiled in the 2009 Bradford County Hazard Mitigation Plan**

Municipality	Earthquake	Hurricane Tropical Storm	Landslide	Pandemic	Flooding	Drought	Wildfire	Winter Storm	Dam Failure	Terrorism	Hazardous Materials	Civil Disturbance	Nuclear Incidents	Transportation Accidents	Energy Emergencies	Fires
Alba Borough	D	I	D	D	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Albany Township	NC	I	NC	NC	I	NC	NC	NC	NC	I	I	I	NC	I	NC	I
Armenia Township	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	I	NC	NC
Asylum Township	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Athens Borough	NC	I	NC	NC	I	NC	NC	NC	NC	NC	I	I	NC	NC	NC	NC
Athens Township	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	I	I	NC	I	NC	I
Burlington Borough	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Burlington Township	NC	NC	NC	NC	I	NC	NC	NC	NC	NC	NC	NC	NC	I	NC	NC
Canton Borough	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Canton Township	D	I	D	D	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Columbia Township	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Franklin Township	NC	I	NC	NC	I	NC	NC	NC	NC	NC	NC	NC	NC	NC	I	NC
Granville Township	NC	I	NC	NC	I	I	NC	D	NC	NC	I	NC	NC	I	I	I
Herrick Township	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	I	NC	NC	I	NC	NC
LeRaysville	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC

## Bradford County 2015 Hazard Mitigation Plan

**Table 4.4-3: Bradford County Municipality Hazard Identification and Risk Evaluation Worksheet Overview  
Hazards Profiled in the 2009 Bradford County Hazard Mitigation Plan**

Municipality	Earthquake	Hurricane Tropical Storm	Landslide	Pandemic	Flooding	Drought	Wildfire	Winter Storm	Dam Failure	Terrorism	Hazardous Materials	Civil Disturbance	Nuclear Incidents	Transportation Accidents	Energy Emergencies	Fires
Borough																
LeRoy Township	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Litchfield Township	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	I	NC	NC	I	NC	NC
Monroe Borough	NC	I	NC	NC	I	NC	NC	I	NC	NC	NC	NC	NC	NC	I	NC
Monroe Township	NC	NC	NC	NC	I	NC	NC	NC	NC	NC	I	NC	NC	I	NC	NC
New Albany Borough	NC	I	NC	NC	I	NC	NC	I	NC	NC	NC	I	NC	I	NC	NC
North Towanda Township	I	NC	NC	NC	NC	NC	NC	NC	NC	NC	I	NC	NC	NC	I	NC
Orwell Township	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Overton Township	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	I	NC	NC	I	NC	NC
Pike Township	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Ridgebury Township	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Rome Borough	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Rome Township	NC	NC	NC	NC	I	NC	D	NC	NC	NC	I	NC	NC	NC	NC	I
Sayre Borough	I	NC	NC	I	I	NC	NC	I	NC	NC	I	NC	NC	I	NC	NC
Sheshequin	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	I	NC	NC	NC	I	NC



## Bradford County 2015 Hazard Mitigation Plan

<b>Table 4.4-3: Bradford County Municipality Hazard Identification and Risk Evaluation Worksheet Overview Hazards Profiled in the 2009 Bradford County Hazard Mitigation Plan</b>																
<b>Municipality</b>	<b>Earthquake</b>	<b>Hurricane Tropical Storm</b>	<b>Landslide</b>	<b>Pandemic</b>	<b>Flooding</b>	<b>Drought</b>	<b>Wildfire</b>	<b>Winter Storm</b>	<b>Dam Failure</b>	<b>Terrorism</b>	<b>Hazardous Materials</b>	<b>Civil Disturbance</b>	<b>Nuclear Incidents</b>	<b>Transportation Accidents</b>	<b>Energy Emergencies</b>	<b>Fires</b>
Township																
Smithfield Township	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
South Creek Township	NC	I	NC	NC	I	NC	NC	NC	NC	NC	I	NC	NC	I	I	NC
South Waverly Borough	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Springfield Township	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Standing Stone Township	NC	NC	NC	NC	I	NC	NC	I	NC	NC	NC	NC	NC	I	I	NC
Stevens Township	NC	NC	NC	NC	I	NC	NC	NC	NC	NC	I	NC	NC	I	NC	NC
Sylvania Borough	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Terry Township	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Towanda Borough	I	NC	NC	NC	NC	NC	NC	NC	NC	NC	I	NC	NC	NC	I	NC
Towanda Township	<b>DID NOT COMPLETE WORKSHEET</b>															
Troy Borough	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Troy Township	NC	I	NC	NC	I	NC	NC	NC	NC	NC	I	I	NC	I	NC	NC
Tuscarora Township	<b>DID NOT COMPLETE WORKSHEET</b>															

## Bradford County 2015 Hazard Mitigation Plan

<b>Table 4.4-3: Bradford County Municipality Hazard Identification and Risk Evaluation Worksheet Overview Hazards Profiled in the 2009 Bradford County Hazard Mitigation Plan</b>																
<b>Municipality</b>	<b>Earthquake</b>	<b>Hurricane Tropical Storm</b>	<b>Landslide</b>	<b>Pandemic</b>	<b>Flooding</b>	<b>Drought</b>	<b>Wildfire</b>	<b>Winter Storm</b>	<b>Dam Failure</b>	<b>Terrorism</b>	<b>Hazardous Materials</b>	<b>Civil Disturbance</b>	<b>Nuclear Incidents</b>	<b>Transportation Accidents</b>	<b>Energy Emergencies</b>	<b>Fires</b>
Ulster Township	NC	I	NC	NC	I	NC	NC	I	NC	I	I	I	NC	I	I	NC
Warren Township	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Wells Township	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
West Burlington Township	<b>DID NOT COMPLETE WORKSHEET</b>															
Wilmot Township	NC	I	NC	NC	I	NC	NC	NC	NC	NC	NC	NC	NC	I	NC	NC
Windham Township	NC	I	NC	NC	I	NC	NC	I	NC	NC	I	NC	NC	I	NC	NC
Wyalusing Borough	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Wyalusing Township	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Wysox Township	NC	NC	NC	NC	NC	NC	NC	I	NC	NC	I	NC	NC	NC	NC	NC

**Bradford County 2015 Hazard Mitigation Plan**

**Table 4.4-4: Bradford County Municipality Hazard Identification and Risk Evaluation Worksheet Overview**

Municipality	Extreme Temperature	Tornado & Windstorm	Subsidence and Sinkhole	Expansive Soils	Hailstorm	Invasive Species	Lightning Strike	Radon Exposure	Building & Structure Collapse	Disorientation	Urban Fire & Explosion	Drowning	War & Criminal Activity
Alba Borough		X			X		X		X		X		
Albany Township		X			X		X						
Armenia Township		X											
Asylum Township													
Athens Borough					X	X			X			X	
Athens Township	X	X			X								
Burlington Borough													
Burlington Township	X				X	X	X	X	X		X		X
Canton Borough		X			X		X						
Canton Township		X			X		X		X		X		
Columbia Township													
Franklin Township								X					
Granville Township											X		
Herrick Township													
LeRaysville Borough													
LeRoy Township													
Litchfield Township													
Monroe Borough	X												
Monroe Township													
New Albany Borough													
North Towanda Township		X						X	X		X		

## Bradford County 2015 Hazard Mitigation Plan

**Table 4.4-4: Bradford County Municipality Hazard Identification and Risk Evaluation Worksheet Overview**

Municipality	Extreme Temperature	Tornado & Windstorm	Subsidence and Sinkhole	Expansive Soils	Hailstorm	Invasive Species	Lightning Strike	Radon Exposure	Building & Structure Collapse	Disorientation	Urban Fire & Explosion	Drowning	War & Criminal Activity
Orwell Township													
Overton Township													
Pike Township													
Ridgebury Township													
Rome Borough													
Rome Township													
Sayre Borough			X			X	X	X	X				
Sheshequin Township		X						X					
Smithfield Township	X	X					X		X				
South Creek Township						X							
South Waverly Borough		X			X	X	X				X		
Springfield Township		X											
Standing Stone Township	X	X			X		X	X	X	X		X	X
Stevens Township								X					
Sylvania Borough													
Terry Township													
Towanda Borough		X							X		X		
Towanda Township	<b>DID NOT COMPLETE WORKSHEET</b>												
Troy Borough													
Troy Township													X
Tuscarora Township	<b>DID NOT COMPLETE WORKSHEET</b>												

**Bradford County 2015 Hazard Mitigation Plan**

**Table 4.4-4: Bradford County Municipality Hazard Identification and Risk Evaluation Worksheet Overview**

Municipality	Extreme Temperature	Tornado & Windstorm	Subsidence and Sinkhole	Expansive Soils	Hailstorm	Invasive Species	Lightning Strike	Radon Exposure	Building & Structure Collapse	Disorientation	Urban Fire & Explosion	Drowning	War & Criminal Activity
Ulster Township													
Warren Township													
Wells Township													
West Burlington Township	<b>DID NOT COMPLETE WORKSHEET</b>												
Wilmot Township						X							
Windham Township	X	X			X	X	X	X	X	X	X	X	X
Wyalusing Borough					X	X	X	X	X		X	X	X
Wyalusing Township													
Wysox Township	X				X		X		X			X	

### **4.4.3 Potential Loss Estimates**

Flooding and tornadoes/windstorms are significant natural hazards in Bradford County. The estimation of potential loss in this assessment focuses on the monetary damage that could result from these hazards. 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 and the Bradford County Tax Assessment Database.

The Bradford County Assessment Office houses a dataset with the total assessed value and market 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 special flood hazard area (SFHA). Once the impacted parcels and structures were identified, then primary residence structures and commercial structures were identified. Bradford County has seasonal structures that are located in the SFHA. 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 SFHA was determined. The building assessed value provides a total assessed value for that property. The total assessed value and market value for each structure in a municipality was tallied to derive the total assessed value and total market value per municipality for every primary residential and commercial structure that was located in the SFHA. Bradford County will conduct analysis of seasonal structures located in the SFHA and will estimate the loss per municipality during the 2015-2020 mitigation plan period.

Table 4.4-5 outlines the potential flooding losses and the number of primary residential structures and commercial structures located in the SFHA for each municipality in Bradford County. The assessed value and market value per municipality does not include the commercial values as they were not available for the assessment. 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 structure intersected by the SFHA. As a result of these limitations, the estimates are likely overstated, but to what degree the potential losses are overstated cannot be determined.

## Bradford County 2015 Hazard Mitigation Plan

**Table 4.4-5 Bradford County Potential Flooding Loss Estimates per Municipality**

Municipality	Residential	Commercial	Assessment Value	Market Value
Alba Borough	9	1	\$182,900	\$365,800
Albany Township	8	1	\$156,850	\$313,700
Armenia Township	0	0	\$0	\$0
Asylum Township	17	2	\$612,600	\$1,225,200
Athens Borough	120	17	\$3,476,800	\$6,953,600
Athens Township	47	5	\$1,863,800	\$3,727,600
Burlington Borough	8	1	\$191,950	\$383,900
Burlington Township	5	1	\$169,150	\$338,300
Canton Borough	21	5	\$495,500	\$991,000
Canton Township	26	6	\$776,250	\$1,552,500
Columbia Township	16	0	\$583,200	\$1,166,400
Franklin Township	13	1	\$354,350	\$708,700
Granville Township	6	1	\$139,000	\$278,000
Herrick Township	0	0	\$0	\$0
LeRaysville Borough	0	0	\$0	\$0
LeRoy Township	1	0	\$84,500	\$169,000
Litchfield Township	1	0	\$53,800	\$107,600
Monroe Borough	140	10	\$4,569,550	\$9,139,100
Monroe Township	56	3	\$1,348,150	\$2,696,300
New Albany Borough	2	0	\$48,800	\$97,600
North Towanda Township	5	0	\$281,450	\$562,900
Orwell Township	20	2	\$665,200	\$1,330,400
Overton Township	0	0	\$0	\$0

## Bradford County 2015 Hazard Mitigation Plan

**Table 4.4-5 Bradford County Potential Flooding Loss Estimates per Municipality**

Municipality	Residential	Commercial	Assessment Value	Market Value
Pike Township	2	0	\$54,650	\$109,300
Ridgebury Township	101	20	\$2,304,375	\$4,608,750
Rome Borough	31	4	\$963,600	\$1,927,200
Rome Township	15	3	\$459,250	\$918,500
Sayre Borough	36	2	\$591,050	\$1,182,100
Sheshequin Township	18	1	\$878,250	\$1,756,500
Smithfield Township	8	0	\$297,600	\$595,200
South Creek Township	43	7	\$1,104,500	\$2,209,000
South Waverly Borough	9	2	\$323,150	\$646,300
Springfield Township	2	1	\$84,250	\$168,500
Standing Stone Township	18	2	\$348,700	\$697,400
Stevens Township	8	1	\$213,750	\$427,500
Sylvania Borough	10	1	\$341,800	\$683,600
Terry Township	12	0	\$272,900	\$545,800
Towanda Borough	54	15	\$1,343,725	\$2,687,450
Towanda Township	1	1	\$25,400	\$50,800
Troy Borough	5	7	\$120,300	\$240,600
Troy Township	23	8	\$813,050	\$1,626,100
Tuscarora Township	9	0	\$257,700	\$515,400
Ulster Township	11	3	\$285,400	\$570,800
Warren Township	33	2	\$945,300	\$1,890,600
Wells Township	16	1	\$477,000	\$954,000
West Burlington Township	4	1	\$112,600	\$225,200



## Bradford County 2015 Hazard Mitigation Plan

**Table 4.4-5 Bradford County Potential Flooding Loss Estimates per Municipality**

Municipality	Residential	Commercial	Assessment Value	Market Value
Wilmot Township	39	1	\$1,097,400	\$2,194,800
Windham Township	23	2	\$668,650	\$1,337,300
Wyalusing Borough	0	0	\$0	\$0
Wyalusing Township	28	9	\$1,250,250	\$2,500,500
Wysox Township	12	2	\$383,750	\$767,500
<b>Total</b>	<b>1,092</b>	<b>152</b>	<b>\$32,072,150</b>	<b>\$64,144,300</b>

Table 4.4-6 outlines the potential tornado and windstorm losses for each municipality in Bradford County. Mobile homes are the most susceptible to wind related damage during wind events. Mobile home GIS data was utilized to determine the loss estimates. All non-primary residence mobile homes or camps were removed from the list once compiled. In Bradford County there are a large number of mobile homes that are used as camps. Once all primary residence mobile homes were identified and quantified per municipality, the data was then intersected with the county assessment data to determine the assessed value loss per municipality. Losses shown here can only be viewed as estimates and as potential, based on the random occurrence of high wind conditions and limited data.

**Table 4.4-6 Bradford County Potential Wind and Tornado Loss Estimates per Municipality**

Municipality	Quantity Residences	Assessment Value
Alba Borough	18	\$589,300
Albany Township	140	\$4,051,626
Armenia Township	88	\$1,412,236
Asylum Township	201	\$7,887,581
Athens Borough	19	\$843,900
Athens Township	747	\$21,886,551
Burlington Borough	12	\$298,200
Burlington Township	121	\$4,131,011
Canton Borough	42	\$982,700
Canton Township	297	\$8,362,261
Columbia Township	151	\$3,876,800
Franklin Township	116	\$3,200,251
Granville Township	106	\$3,573,738

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**Table 4.4-6 Bradford County Potential Wind and Tornado Loss Estimates per Municipality**

Municipality	Quantity Residences	Assessment Value
Herrick Township	86	\$2,853,972
LeRaysville Borough	9	\$261,700
LeRoy Township	89	\$3,016,110
Litchfield Township	199	\$6,819,798
Monroe Borough	8	\$158,100
Monroe Township	188	\$5,992,140
New Albany Borough	11	\$413,807
North Towanda Township	63	\$2,940,500
Orwell Township	128	\$4,762,085
Overton Township	82	\$1,598,150
Pike Township	74	\$2,212,937
Ridgebury Township	330	\$7,483,672
Rome Borough	84	\$1,440,971
Rome Township	239	\$6,175,703
Sayre Borough	48	\$2,324,700
Sheshequin Township	212	\$6,593,906
Smithfield Township	167	\$5,694,099
South Creek Township	162	\$4,158,200
South Waverly Borough	14	\$900,250
Springfield Township	140	\$4,026,064
Standing Stone Township	96	\$3,333,006
Stevens Township	82	\$1,913,284
Sylvania Borough	7	\$288,500
Terry Township	219	\$7,686,214
Towanda Borough	30	\$2,027,150
Towanda Township	128	\$4,092,480
Troy Borough	14	\$776,281
Troy Township	239	\$7,298,200
Tuscarora Township	164	\$5,929,802
Ulster Township	150	\$6,090,150
Warren Township	132	\$3,796,247
Wells Township	192	\$4,681,938
West Burlington Township	62	\$2,042,545
Wilmot Township	220	\$7,337,668
Windham Township	160	\$4,290,153
Wyalusing Borough	21	\$958,100
Wyalusing Township	129	\$6,057,078
Wysox Township	236	\$8,339,202
<b>Total</b>	<b>6,672</b>	<b>\$207,861,017</b>

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

No population projections can accurately predict all the factors that may affect the county's future growth rate. However, population projections that are made depend primarily on the economic growth factors in the county and region. Population projections were developed for the Bradford County Comprehensive Plan. The comprehensive plan is due to be updated and will be updated and accurate population projections will be developed during the next mitigation planning period.

The housing trends for Bradford County vary throughout the county. The Marcellus Shale industry has placed a demand for housing in the county. Some municipalities have increased recreational vehicle location rentals on personal and commercial properties. No specific projections for future housing are identified in the current version of the county comprehensive plan. The Bradford County Planning Department has stated that public infrastructure build out (sewage and water) in Athens Borough, Athens Township, Towanda Township, Troy Borough, Sayre Borough and South Waverly Township could impact housing growth and commercial growth.

The updated digital flood insurance rate maps for all Bradford County municipalities will be adopted on October 16, 2014. The implementation of new flood plain ordinances and regulations will impact future residential and commercial development in the municipalities. Building new residences or businesses in the special flood hazard area will be decreased and regulated. With the decrease of new development occurring in this hazard area, impacts of flooding will be decreased.

# 5. Capability Assessment

## 5.1 Update Process Summary

The capability assessment is an evaluation of Bradford 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' missions, 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 at meetings of Bradford 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 fifty one (51) 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 Bradford County and its municipalities have the capacity to do and provides an understanding of what must be changed to mitigate loss.

Bradford 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 Bradford 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 that hazard events have on their community.

The Emergency Management Services Code (PA Title 35) requires that all municipalities in the Commonwealth have a Local Emergency Operations Plan (EOP) which is updated every two years. All of the municipalities in the county have adopted by resolution the Bradford 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 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.

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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.

Fifty (50) of fifty one (51) municipalities participate in the NFIP. None of the municipalities participate in the NFIP-CRS program. Table 5.2-1 identifies each municipality for floodplain

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compliance and NFIP participation. New floodplain ordinances will be adopted in the fall of 2014 by municipalities that are affected by the updated special flood hazard area.

**Table 5.2-1: Summary of planning tools adopted by each municipality in Bradford County (HMP Capability Assessment Surveys, 2014; Bradford County Planning Department 2014)**

COMMUNITY	COMPREHENSIVE PLAN	PLAN YEAR ADOPTED	BUILDING CODE	NFIP PARTICIPANT	FLOODPLAIN ORDINANCE	SUBDIVISION & LAND DEVELOPMENT ORDINANCE	SALDO YEAR ADOPTED	ZONING ORDINANCE	ZONING YEAR ADOPTED
Alba Borough	NO	N/A	YES	YES	Under Revision	COUNTY	N/A	NO	N/A
Albany Township	NO	N/A	YES	YES	Under Revision	COUNTY	N/A	NO	N/A
Armenia Township	NO	N/A	YES	YES	Under Revision	COUNTY	N/A	NO	N/A
Asylum Township	YES	2003	YES	YES	Under Revision	YES	2008	NO	N/A
Athens Borough	YES	2014	YES	YES	Yes	COUNTY	N/A	YES	1990
Athens Township	YES	2005	YES	YES	Yes	YES	2000	YES	2012
Burlington Borough	NO	N/A	YES	YES	Under Revision	COUNTY	N/A	NO	N/A
Burlington Township	NO	N/A	YES	YES	Under Revision	COUNTY	N/A	NO	N/A
Canton Borough	JOINT	2005	YES	YES	Under Revision	COUNTY	N/A	YES	1976
Canton Township	JOINT	2005	YES	YES	Under Revision	COUNTY	N/A	NO	N/A
Columbia Township	NO	N/A	YES	YES	Under Revision	COUNTY	N/A	NO	N/A
Franklin Township	NO	N/A	YES	YES	Under Revision	COUNTY	N/A	NO	N/A
Granville Township	JOINT	2005	YES	YES	Under Revision	COUNTY	N/A	NO	N/A
Herrick Township	NO	N/A	YES	NO	Under Revision	COUNTY	N/A	NO	N/A

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COMMUNITY	COMPREHENSIVE PLAN	PLAN YEAR ADOPTED	BUILDING CODE	NFIP PARTICIPANT	FLOODPLAIN ORDINANCE	SUBDIVISION & LAND DEVELOPMENT ORDINANCE	SALDO YEAR ADOPTED	ZONING ORDINANCE	ZONING YEAR ADOPTED
LeRaysville Borough	NO	N/A	YES	YES	Under Revision	COUNTY	N/A	NO	N/A
LeRoy Township	NO	N/A	YES	YES	Yes	COUNTY	N/A	NO	N/A
Litchfield Township	YES	2003	YES	YES	Under Revision	YES	2005	NO	N/A
Monroe Borough	NO	N/A	YES	YES	Under Revision	COUNTY	N/A	YES	2001
Monroe Township	NO	N/A	YES	YES	Under Revision	COUNTY	N/A	NO	N/A
New Albany Borough	NO	N/A	YES	YES	Under Revision	COUNTY	N/A	NO	N/A
North Towanda Township	JOINT	2008	YES	YES	Yes	COUNTY	N/A	YES	2013
Orwell Township	NO	N/A	YES	YES	Under Revision	COUNTY	N/A	NO	N/A
Overton Township	NO	N/A	YES	YES	Under Revision	COUNTY	N/A	NO	N/A
Pike Township	NO	N/A	YES	YES	Under Revision	COUNTY	N/A	NO	N/A
Ridgebury Township	NO	2005	YES	YES	Under Revision	COUNTY	N/A	NO	N/A
Rome Borough	NO	N/A	YES	YES	Under Revision	COUNTY	N/A	YES	1983
Rome Township	NO	N/A	YES	YES	Under Revision	COUNTY	N/A	NO	N/A
Sayre Borough	YES	2008	YES	YES	Yes	COUNTY	N/A	YES	1976
Sheshequin Township	YES	2007	YES	YES	Under Revision	COUNTY	N/A	NO	N/A



## Bradford County 2015 Hazard Mitigation Plan

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COMMUNITY	COMPREHENSIVE PLAN	PLAN YEAR ADOPTED	BUILDING CODE	NFIP PARTICIPANT	FLOODPLAIN ORDINANCE	SUBDIVISION & LAND DEVELOPMENT ORDINANCE	SALDO YEAR ADOPTED	ZONING ORDINANCE	ZONING YEAR ADOPTED
Smithfield Township	NO	N/A	YES	YES	Under Revision	COUNTY	N/A	NO	N/A
South Creek Township	NO	N/A	YES	YES	Yes	COUNTY	N/A	NO	N/A
South Waverly Borough	YES	2003	YES	YES	Under Revision	COUNTY	N/A	YES	1978
Springfield Township	NO	N/A	YES	YES	Under Revision	COUNTY	N/A	NO	N/A
Standing Stone Township	YES	2004	YES	YES	Under Revision	COUNTY	N/A	NO	N/A
Stevens Township	NO	N/A	YES	YES	Yes	COUNTY	N/A	NO	N/A
Sylvania Borough	NO	N/A	YES	YES	Yes	COUNTY	N/A	NO	N/A
Terry Township	NO	N/A	YES	YES	Under Revision	COUNTY	N/A	NO	N/A
Towanda Borough	JOINT	2008	YES	YES	Yes 3/2/1981	COUNTY	N/A	YES	1971
Towanda Township	JOINT	2008	YES	YES	Under Revision	COUNTY	N/A	NO	N/A
Troy Borough	JOINT	2004	YES	YES	Under Revision	YES	1978	YES	1957
Troy Township	JOINT	2004	YES	YES	Yes	YES	2011	NO	N/A
Tuscarora Township	NO	N/A	YES	YES	Under Revision	COUNTY	N/A	NO	N/A
Ulster Township	YES	2004	YES	YES	Under Revision	COUNTY	N/A	YES	2013
Warren Township	YES	2005	YES	YES	Under Revision	COUNTY	N/A	NO	N/A
Wells Township	YES	2004	YES	YES	Under Revision	COUNTY	N/A	NO	N/A

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**Table 5.2-1: Summary of planning tools adopted by each municipality in Bradford County (HMP Capability Assessment Surveys, 2014; Bradford County Planning Department 2014)**

COMMUNITY	COMPREHENSIVE PLAN	PLAN YEAR ADOPTED	BUILDING CODE	NFIP PARTICIPANT	FLOODPLAIN ORDINANCE	SUBDIVISION & LAND DEVELOPMENT ORDINANCE	SALDO YEAR ADOPTED	ZONING ORDINANCE	ZONING YEAR ADOPTED
West Burlington Township	NO	N/A	YES	YES	Yes	COUNTY	N/A	NO	N/A
Wilmot Township	NO	N/A	YES	YES	Under Revision	COUNTY	N/A	NO	N/A
Windham Township	NO	N/A	YES	YES	Under Revision	COUNTY	N/A	NO	N/A
Wyalusing Borough	YES	1992	YES	YES	Yes	YES	N/A	YES	1997
Wyalusing Township	YES	2009	YES	YES	Under Revision	YES	1997	YES	2012
Wysox Township	YES	1982	YES	YES	Under Revision	COUNTY	N/A	YES	2012

### **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 Bradford 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 regions 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.

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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 Bradford County adhere to the standards of the Pennsylvania Uniform Construction Code (Act 45). All of Bradford County’s municipalities have “opted in”. See Table 5.2-1 above.

### **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. Every municipality is responsible for their own zoning ordinance. See Table 5.2-1.

### **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. Bradford County has developed a subdivision ordinance that 44 of the 51 municipalities have adopted as the municipal ordinance. The remaining 7 municipalities have adopted a municipal ordinance. See Table 5.2-1.

### **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.

Each municipality in Bradford County is responsible for a stormwater management plan.

### **Comprehensive Plan**

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

Bradford County has a county comprehensive plan that is dated May 11, 2004. Article III of the Municipality Planning Code (MPC) enables municipalities to prepare a comprehensive plan; however, development of a comprehensive plan is voluntary. Twenty two (22) municipalities within Bradford County have a municipal comprehensive plan or has adopted 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 some

municipalities within Bradford County that have an identified capital improvements plan. Bradford County has an annual capital improvement 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.

Bradford 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 Bradford County. The EOP, or portions thereof, would be implemented when emergency circumstances warranted. Bradford County's EOP was adopted in February 2012 by the county and then adopted by resolution by each borough and township.

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

There are fifty one (51) municipalities within Bradford 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. Bradford County has a planning department.

#### **Municipal Engineer**

A municipal engineer performs duties as directed in the areas of construction, reconstruction, maintenance and repair of streets, roads, pavements, sanitary sewers, bridges, culverts, and other engineering work. The municipal engineer prepares plans, specifications and estimates of

the work undertaken by the township. All municipalities in Bradford County have contracted or have access to engineers.

### **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. Bradford County has a planning department that is skilled in GIS. There are no personnel in the county that are skilled in HAZUS. Most municipalities utilize the GIS capabilities that the county offers.

### **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 Bradford 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.

### **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 forty six (46) 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.” All municipalities had a varying degree of capabilities for planning and regulatory capability, administrative and technical capability, fiscal capability and political capability.

### **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 2009 hazard mitigation plan. The 2015 Bradford County Hazard Mitigation Plan Update has six (6) goals and twenty one (21) 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. Copies of these meetings and all documentation associated with the meetings are located in **Appendix C**.

Actions provide more detailed descriptions of specific work tasks to help the county and its municipalities achieve prescribed goals and objectives. There were ten (10) actions identified in the 2009 mitigation strategy; none of these actions have been entirely completed or discontinued while another ten (10) are continual actions that reduce risk, vulnerability, and losses. A list of these actions as well as a review and summary of their progress based on comments from the Bradford County Local Planning Team is included in Table 6.1-2. Actions were evaluated by the Local Planning Team with the intent of carrying over any actions that were not started or continuous for the next five years.

## Bradford County 2015 Hazard Mitigation Plan

Table 6.1-1: Bradford County Mitigation Goals and Objectives Review Worksheet		Comments
<b>GOAL 1</b>	<i>Increase county and municipal governments' knowledge of the impacts of flooding and other natural disasters on both their public and private properties, such as structures, critical facilities, infrastructure and businesses.</i>	Local Planning Team Review: The local planning team (LPT) requests that the goal be changed to the following, "Keep current the knowledge of the impacts of flooding and other natural and man-made disasters to structures, critical facilities, infrastructure and businesses." New objectives were developed.
New Objective 1.1	Conduct hazard specific seminars, summits and conferences to educate officials	
New Objective 1.2	Increase advance warning capabilities	
New Objective 1.3	Conduct vulnerability assessments based on identified hazards	
<b>GOAL 2</b>	<i>Improve planning and emergency response among state, county and local emergency management personnel and all emergency disciplines to protect public health and safety within the county.</i>	Local Planning Team Review: The LPT recommends that this goal remain with slight enhancements. The new goal should read as follows: "Improve emergency response capabilities among state, county and local emergency management personnel and all emergency disciplines to protect public health and safety within the county". No objectives were identified previously. New objectives were developed.
New Objective 2.1	Conduct a training, exercise and equipment needs assessment with municipalities and first responders	
New Objective 2.2	Complete training programs to enhance response capabilities for first responders	
New Objective 2.3	Enhance damage assessment capabilities at the county and municipal level	
New Objective 2.4	Conduct exercises in accordance with the Homeland Security Exercise and Evaluation Program	
<b>GOAL 3</b>	<i>Advance the level of intergovernmental cooperation within the county in order to prevent or reduce the impact natural hazards have on the county as a whole.</i>	Local Planning Team Review: The LPT changed this goal to the following, "Encourage intergovernmental cooperation and planning within the county in order to prevent or reduce the impact of natural and man-made hazards". New objectives were developed.
New Objective 3.1	Update the county comprehensive plan.	
New Objective 3.2	Develop and implement regulations and ordinances.	
New Objective 3.3	Review and update mitigation, response and recovery plans.	
New Objective 3.4	Encourage local officials to incorporate the hazard mitigation goals, objectives and actions into local planning efforts.	

## Bradford County 2015 Hazard Mitigation Plan

Table 6.1-1: Bradford County Mitigation Goals and Objectives Review Worksheet		Comments
<b>GOAL 4</b>	<i>Continue to build and strengthen Bradford County's spatial information resources in order to enhance both public and private hazard mitigation planning and decision-support capabilities.</i>	Local Planning Team Review: Recommended that this goal be changed to the following, "Expand spatial information resources to support hazard mitigation processes." There were no objectives identified in the current mitigation plan. New objectives were developed.
New Objective 4.1	Develop GIS data on the location of occurrences for high and moderate hazards.	
New Objective 4.2	Update existing GIS layers.	
New Objective 4.3	Develop flooding specific GIS data that can be used during the mitigation, response and recovery phases of emergency management.	
<b>GOAL 5</b>	<i>Raise the level of public awareness of potential risks of natural hazards and reduce these risks by advising them of activities that will reduce them.</i>	Local Planning Team Review: This goal repeats Goal #1 Change to: "Expand and support the technical or material acquisitions to support hazard mitigation." There were no objectives identified in the current mitigation plan. New objectives were developed.
New Objective 5.1	Acquire, demolish or elevate flood prone properties, repetitive loss properties and severe repetitive loss properties.	
New Objective 5.2	Research and acquire grant funding to complete flooding mitigation project opportunities.	
New Objective 5.3	Protect infrastructure and critical facilities from identified hazards.	
<b>NEW GOAL 6</b>	Expand and enhance public information activities to support hazard mitigation strategies.	The Local Planning Team added new goal #6 and all objectives.
New Objective 6.1	Publicize and advertise the Bradford County Hazard Mitigation Plan	
New Objective 6.2	Develop a public awareness action plan	
New Objective 6.3	Educate the public on how to prepare and respond to hazards and disasters	
New Objective 6.4	Utilize multi-media resources to disseminate hazard mitigation information	

## Bradford County 2015 Hazard Mitigation Plan

Table 6.1-2: 2009 Bradford County Mitigation Actions Review

Existing Mitigation Actions	Status					Review Comments
	No Progress / Unknown	In Progress / Not Yet Complete	Continuous	Completed	Discontinued	
1.1.1 - Continue involvement and support of annual municipal flood summits sponsored by the Endless Mountains Resource Conservation and Development Council (RC&D) for municipal officials			X			Reworded this action to the following: "Conduct annual municipal flood summits to educate municipal officials on hazard mitigation opportunities for the flooding hazard."
1.1.2 - Continue individual municipal officials training through the Department of Community and Economic Development (DCED) Floodplain Outreach Program that provides technical assistance for Community Assisted Visits (CAVs) contracted through the Conservation District – conduct at least 5 to 10 visits to different municipalities annually.			X			The local planning team recommends to keep this action but reword this action to the following: "research individual municipal officials training through the Department of Community and Economic Development (DCED) Floodplain Outreach Program that provides technical assistance for Community Assisted Visits (CAVs) contracted through the Conservation District".
1.1.3 – Provide detailed local municipal flood hazard mapping.			X			Updated this action by adding additional detail. Added "upon the issuance of updated digital flood insurance rate map data".
2.1.1 – Seek funding to enhance existing stream flow monitoring system installed by the Conservation District and Watershed Groups to provide a Countywide Flood Warning System.	X					This action has not been completed. The Bradford County Conservation District advised that some gauges were set up but no monitoring system is associated with the gauges and the county is not completely covered. This action should remain valid. The action has been changed to action 5.2.1.
2.1.2 – Training and exercises for all emergency disciplines to better protect public health and safety within the county.			X			Removed the word training and add the word conduct to this action. Moved to action 2.4.1

## Bradford County 2015 Hazard Mitigation Plan

Table 6.1-2: 2009 Bradford County Mitigation Actions Review						
Existing Mitigation Actions	Status					Review Comments
	No Progress / Unknown	In Progress / Not Yet Complete	Continuous	Completed	Discontinued	
3.1.1 – Hold an annual coordination meeting of the Bradford County Hazard Mitigation Committee, local elected officials, State and Federal Emergency Management Agencies, and other appropriate agencies; organizations and individuals for the purpose of reviewing the County Plan progress and recommending any modifications.			X			This action remains valid. Limited review has been completed in the past of the current plan but the current county planning team will endeavor to complete this annually. The new action number is 3.4.1
4.1.1 – Conduct an inventory, in cooperation with local municipalities, of all non-mapped flood prone hazard areas for the purpose of developing a flood prone hazard map.	X					This action remains valid. The new action number is 4.3.2
4.1.2 – Centralize stream erosion hazard information in relationship to homes, businesses, and infrastructure that has been collected through watershed groups and the Conservation District.	X					This action remains valid and is now action number 1.3.6
5.1.1 – Develop a public awareness action plan that would include development of informational brochures to provide to new home builders/buyers, educational materials and programs for use in schools, regular news releases and public workshops/forums.	X					These should be broken up into individual actions and made specific to hazards or groups of hazards. Moved to action 6.2.1

## Bradford County 2015 Hazard Mitigation Plan

Table 6.1-2: 2009 Bradford County Mitigation Actions Review						
Existing Mitigation Actions	Status					Review Comments
	No Progress / Unknown	In Progress / Not Yet Complete	Continuous	Completed	Discontinued	
5.1.2 – Seek funding resources to install signage throughout the county for the indication of flood elevations and flood zones.	X					The local planning team stated that this action was not started. The action is moved forward to the 2015 mitigation plan update. This action has been moved to action 1.2.3



**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 six (6) goals and twenty one (21) corresponding objectives was developed. Table 6.2-1 details the mitigation goals and objectives established for the 2015 Bradford County Hazard Mitigation Plan Update.

**Bradford County 2015 Hazard Mitigation Plan**

<b>Table 6.2-1: Bradford County 2015 Goals and Objectives</b>	
<b>GOAL 1</b>	Keep current the knowledge of the impacts of flooding and other natural and man-made disasters to structures, critical facilities, infrastructure and businesses
Objective 1.1	Conduct hazard specific seminars, summits and conferences to educate officials
Objective 1.2	Increase advance warning capabilities
Objective 1.3	Conduct vulnerability assessments based on identified hazards
<b>GOAL 2</b>	Improve emergency response capabilities among state, county and local emergency management personnel and all emergency disciplines to protect public health and safety within the county
Objective 2.1	Conduct a training, exercise and equipment needs assessment with municipalities and first responders
Objective 2.2	Complete training programs to enhance response capabilities for first responders
Objective 2.3	Enhance damage assessment capabilities at the county and municipal level
Objective 2.4	Conduct exercises in accordance with the Homeland Security Exercise and Evaluation Program
<b>GOAL 3</b>	Encourage intergovernmental cooperation and planning within the county in order to prevent or reduce the impact of natural and man-made hazards.
Objective 3.1	Update the county comprehensive plan.
Objective 3.2	Develop and implement regulations and ordinances.
Objective 3.3	Review and update mitigation, response and recovery plans.
Objective 3.4	Encourage local officials to incorporate the hazard mitigation goals, objectives and actions into local planning efforts.
<b>GOAL 4</b>	Expand spatial information resources to support hazard mitigation processes
Objective 4.1	Develop GIS data on the location of occurrences for high and moderate hazards.
Objective 4.2	Update existing GIS layers.
Objective 4.3	Develop flooding specific GIS data that can be used during the mitigation, response and recovery phases of emergency management.
<b>GOAL 5</b>	Expand and support the technical or material acquisitions to support hazard mitigation
Objective 5.1	Acquire, demolish or elevate flood prone properties, repetitive loss properties and severe repetitive loss properties.
Objective 5.2	Research and acquire grant funding to complete flooding mitigation project opportunities.
Objective 5.3	Protect infrastructure and critical facilities from identified hazards.
<b>GOAL 6</b>	Expand and enhance public information activities to support hazard mitigation strategies
Objective 6.1	Publicize and advertise the Bradford County Hazard Mitigation Plan
Objective 6.2	Develop a public awareness action plan
Objective 6.3	Educate the public on how to prepare and respond to hazards and disasters
Objective 6.4	Utilize multi-media resources to disseminate hazard mitigation information

### 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. Bradford County used this guide to identify mitigation techniques and develop mitigation actions. There are six categories of mitigation actions which Bradford County considered in developing the 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 six categories of mitigation actions are:

- **Prevention:** Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built and public activities to reduce hazard losses. Examples include planning, zoning, building codes, subdivision regulations, hazard-specific regulations (such as floodplain regulations), capital improvement programs, open-space preservation, and stormwater regulations.

The prevention technique will protect and reduce the impact of specific hazards on new and existing buildings by improving building code standards and regulating new and renovation construction. The improved building codes will decrease the impact of risk hazards. Subdivision and land development enhancements will also augment this process.

- **Property Protection:** Actions that involve modifying or removing existing buildings or infrastructure to protect them from a hazard. Examples include structure acquisition, elevation, relocation; retrofitting; flood-proofing; and shatter-resistant glass use. While this category predominantly includes techniques that constitute a “sticks and bricks” approach to property protection, it also includes insurance.

The property protection technique will protect and reduce the impact of specific hazards on new and existing buildings through the alteration of existing structures with construction enhancements that will decrease or eliminate the effect of identified risk hazards. The implementation of increased hazard mitigation construction standards will decrease or eliminate the effects of identified hazards to new construction. Ensuring that municipalities participate in the National Flood Insurance Program and encourage participation in the Community Rating System will decrease the impact as well.

- **Public Education and Awareness:** Actions to educate citizens, elected officials, and property owners about potential risks from hazards and potential ways to mitigate them. Examples include performing hazard mapping, implementing outreach projects, disseminating library materials, providing real estate disclosures, establishing hazard information centers, and developing educational programs for school-age children or for adults.

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The public education and awareness technique will protect and reduce the impact of specific hazards on new and existing buildings through education of citizens and property owners on the impacts that specific hazards could have on new or renovated structures. This information will allow the owner to make appropriate changes or enhancements that will lessen or eliminate the impact of hazards.

- **Natural Resource Protection:** Actions that, in addition to minimizing hazard losses, preserve or restore the functions of natural systems. Examples include sediment and erosion control, stream corridor restoration, forest and vegetation management, wetlands restoration or preservation, slope stabilization, and historic property and archeological site preservation.
- **Structural Project Implementation:** Mitigation projects intended to lessen the impact of a hazard by using structures to modify the environment. Structures include stormwater controls (culverts); dams, dikes and levees; and safe rooms.

Structural project implementation is a technique that removes or diverts the hazard from structures. The new or renovated structures are therefore protected or have a reduced impact of hazards.

- **Emergency Services:** Actions that typically are not considered mitigation techniques but reduce the impacts of a hazard event on people and property. These actions are often taken prior to, during, or in response to an emergency or disaster. Examples include warning systems, evacuation planning and management, emergency response training and exercises, and emergency flood protection procedures.

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 Bradford County Mitigation Strategy Technique Matrix</b>						
<b>HAZARD</b>	<b>MITIGATION TECHNIQUE</b>					
	<b>Prevention</b>	<b>Property Protection</b>	<b>Public Education / Awareness</b>	<b>Natural Resource Protection</b>	<b>Structural Projects</b>	<b>Emergency Services</b>
<b>Radon Exposure</b>	X	X	X			
<b>Utility Interruption</b>	X	X	X			X
<b>Winter Storm</b>	X	X	X			X
<b>Pandemic</b>	X		X			

## Bradford County 2015 Hazard Mitigation Plan

<b>Table 6.3-1 Bradford County Mitigation Strategy Technique Matrix</b>						
<b>HAZARD</b>	<b>MITIGATION TECHNIQUE</b>					
	<b>Prevention</b>	<b>Property Protection</b>	<b>Public Education / Awareness</b>	<b>Natural Resource Protection</b>	<b>Structural Projects</b>	<b>Emergency Services</b>
<b>Environmental Hazards</b>	X		X	X		X
<b>Tornadoes and Wind Storms</b>	X		X			X
<b>Flood, Flash Flood and Ice Jams</b>	X	X	X	X	X	X
<b>Transportation Accident</b>			X	X		X
<b>Extreme Temperature</b>	X		X			X
<b>Hurricane and Tropical Storm</b>	X	X	X			
<b>Invasive Species</b>	X		X	X		
<b>Drought</b>	X		X			X
<b>Earthquake</b>	X		X			
<b>Urban Fire and Explosion</b>	X		X			X

### **6.4 Mitigation Action Plan**

The Bradford County Hazard Mitigation Local Planning Team (LPT) immediately began work on the mitigation strategy section of the 2015 hazard mitigation plan (HMP) update after the risk assessment section was completed. The LPT started this section by reviewing the 2009 HMP mitigation strategy section. A review of the previous goals, objectives, actions and project opportunities documented in the 2009 HMP was conducted. The next step the LPT completed was the brainstorming of possible new actions based on new identified risks. The LPT compiled all this information for presentations to the municipalities.

The LPT identified the following accomplishments since the development of the 2009 Bradford County Hazard Mitigation Plan. Those accomplishments are identified in the following bullet items:

- Bradford County municipalities have adopted the updated 2012 Bradford County Emergency Operations Plan as the municipal emergency operations plan.
- The Bradford County continuity of operations plan was updated in 2012.
- Numerous repetitive loss and severe repetitive loss properties have been purchased with disaster recovery funding.
- Municipalities were able to complete some mitigation opportunities as a result of the disaster recovery funding from declared disasters since the last hazard mitigation plan update.

The Bradford County Emergency Management Agency has had numerous organizational changes in the last 5 years. Administrative staff has changed and there have been challenges with the completion of actions or projects. The Bradford County Emergency Management Agency is committed to making progress during the 2015-2020 planning period. During this period, annual reviews will be completed and reports of all actions and projects will be developed to determine the status.

MCM Consulting Group, Inc. completed municipality meetings March 26, 2014 through March 28, 2014 at various time periods each day at the Bradford County Department of Public Safety. During all these meetings, an overview of mitigation strategy was presented and the municipalities were informed that they needed to have at least one hazard-related mitigation action for their municipality. The municipalities were notified of draft mitigation actions and encouraged to provide new mitigation actions that could be incorporated into the plan. Municipalities were provided copies of their previously submitted mitigation opportunity forms and asked to determine if the projects were still valid. Municipalities were solicited for new project opportunities as well. All agendas, sign in sheets and other support information from these meetings is included in **Appendix C**.

Mitigation measures for the 2015 Bradford County HMP are listed in the mitigation action plan. Table 6.4-1 is the 2015 Bradford County Mitigation Action Plan. This plan outlines

***Bradford County 2015 Hazard Mitigation Plan***

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mitigation actions and projects that comprise a strategy for Bradford County. The action plan includes actions, a benefit and cost prioritization, a schedule for implementation, any funding sources to complete the action, a responsible agency or department and an estimated cost. All benefit and cost analysis was completed using the Pennsylvania Emergency Management Agency recommended PA STEEL analysis tool. The completed PA STEEL analysis is located in Table 6.4-3. Table 6.4-2 is a matrix that identifies the county and/or municipalities responsible for mitigation actions in the new mitigation action plan.

## Bradford County 2015 Hazard Mitigation Plan

**Table 6.4-1: Bradford County 2015 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	Prevention	Conduct annual municipal flood summits to educate municipal officials on hazard mitigation opportunities for the flooding hazard.	Flooding	X			2014-2018	Local	County EMA County Planning	\$5,000
1.1.2	Prevention	Research individual municipal officials training through the Department of Community and Economic Development (DCEd) Floodplain Outreach Program that provides technical assistance for Community Assisted Visits (CAVs) contracted through the Conservation District.	Flooding	X			2014-2018	Local	County EMA and Conservation District	Unknown
1.1.3	Prevention	Provide detailed local municipal flood hazard mapping upon the issuance of updated digital flood insurance rate map data.	Flooding	X			2014-2015	Local	County EMA and Planning Department	\$1000
1.1.4	Prevention	Contact the Department of Environmental Protection and determine specific tactics to educate municipal officials on radon in Bradford County.	Radon		X		2015	Local	County and Local EMA	Unknown
1.1.5	Prevention	Contact the local Department of Health office and develop a strategy to educate local officials on pandemic and infectious disease issues.	Pandemic	X			2014-2015	Local	County and Local EMA	Unknown
1.2.1	Prevention	Encourage NOAA alert radio use by homeowners, critical facilities and special needs facilities.	All Hazards	X			2014-2018	Local	County EMA	\$500
1.2.2	Prevention	Research upgrades for the county emergency notification system that would enhance early warning capabilities.	All Hazards		X		2014-2018	Local	County EMA and 9-1-1	\$500
1.2.3	Prevention	Seek funding resources to install signage throughout the county for the indication of flood elevations and flood zones.	Flooding		X		2014-2018	FMA	County Planning and Local Governments	Unknown



## Bradford County 2015 Hazard Mitigation Plan

**Table 6.4-1: Bradford County 2015 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	
1.3.1	Prevention	Conduct a commodity flow study to determine hazardous materials that are transported through Bradford County	Environmental and Transportation Accidents	X			2014	HMEP	County EMA Contractor	\$15,000
1.3.2	Prevention	Conduct an inventory of dams or impoundments of water that are not identified in the dam failure hazard.	Dam Failure and Environmental Hazard		X		2014-2018	Local and HMGP	County and Local EMA and County Planning	Unknown
1.3.3	Property Protection	Conduct assessments to determine vulnerability of critical facilities to high and moderate risk hazards.	All Hazards		X		2014-2018	Local	County and Local EMA and Facility Owners	Unknown
1.3.4	Prevention	Determine the emergency generator capabilities of critical facilities and special needs facilities in all municipalities of Bradford County.	Utility Interruptions		X		2014-2018	Local	County and Local EMA	Unknown
1.3.5	Prevention	Develop and maintain a database to track wind damage by municipality during the next 5 year period to assist with determining wind and tornado vulnerability	Windstorms and Tornado	X			2014-2018	Local	County and Local EMA	\$1,000
1.3.6	Property Protection	Centralize stream erosion hazard information in relationship to homes, businesses, and infrastructure that has been collected through watershed groups and the Conservation District.	Flooding			X	2014-2018	Local and FMA	Conservation District	Unknown
2.1.1	Emergency Services	Conduct a training and exercise needs assessment with municipalities and first responders to determine specific training that would enhance mitigation capabilities to profiled hazards.	All Hazards		X		2014-2018	Local	County EMA, First Responders North Central Task Force	\$500
2.2.1	Emergency Services	Conduct hazardous material training to enhance response capabilities to transportation and fixed facility hazardous material incidents.	Environmental Hazards and Transportation Accidents		X		2014-2018	HMEP, HMRF	County EMA, LEPC	\$10,000 - \$25,000

## Bradford County 2015 Hazard Mitigation Plan

**Table 6.4-1: Bradford County 2015 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	Prevention	Enhance the county damage assessment team capabilities and encourage the development of municipal damage assessment teams to augment the county team.	All Hazards		X		2014-2018	Local	County and Local EMA	\$500
2.3.2	Prevention	Conduct annual damage assessment training for damage assessment teams and local officials.	All Hazards		X		2014-2018	Local	County EMA	\$1,000
2.4.1	Prevention	Conduct exercises for all emergency disciplines to better protect public health and safety within the county.	All Hazards		X		2014-2018	Local, HSGP	County and Local EMA, Municipalities	Varies
2.4.2	Prevention	Conduct exercises to test the capabilities of municipalities to respond to large scale, long duration utility outages.	Utility Interruptions		X		2015	Local, HSGP	County and Local EMA	\$5,000 - \$10,000
3.1.1	Prevention	Seek funding to complete an update of the Bradford County Comprehensive Plan.	All Hazards	X			2014-2015	Local	County Planning Department	\$50,000
3.1.2	Prevention	Incorporate risk assessment and hazard mitigation principles into the Bradford County Comprehensive Plan Update.	All Hazards	X			2014-2015	Local	County Planning Department and County EMA	Unknown
3.2.1	Prevention	Enforce the Uniform Construction Codes and incorporate higher standards for hazard resistance at the municipal level.	All Hazards		X		2014-2018	Local	Municipal Governments	Unknown
3.2.2	Prevention	Regulate new development in known hazard areas, especially the special flood hazard area.	Flooding		X		2014-2018	Local	Municipal Governments	Varies

## Bradford County 2015 Hazard Mitigation Plan

**Table 6.4-1: Bradford County 2015 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	
3.2.3	Natural Resource Protection	Maintain and enhance the county storm water management plan and encourage municipal participation.	Flooding and Hurricane/Tropical	X			2014-2018	PDM, FMA, HMGP	County Planning Department and DEP	Unknown
3.2.4	Prevention	Ensure the zoning ordinance encourages higher densities outside of known hazard areas.	All Hazards		X		2014-2018	Local	Municipal Governments	Unknown
3.2.5	Prevention	Encourage municipalities to participate in the National Flood Insurance Program, Community Rating System.	Flooding		X		2014-2018	Local	County EMA	Under \$500
3.3.1	Prevention	Review high risk dam emergency plans annually and participate in exercises as required.	Dam Failure		X		2014-2018	Local	County/Local EMA and Dam Owners	Under \$500
3.3.2	Prevention	Encourage the municipalities to adopt the county emergency operations plan as the municipal emergency operations plan.	All Hazards	X			2014-2015	Local	County and Local EMA and Elected Officials	Unknown
3.4.1	Prevention	Hold an annual coordination meeting of the Bradford County Hazard Mitigation Committee, local elected officials, State and Federal Agencies, and other appropriate agencies; organizations and individuals for the purpose of reviewing the County Plan progress and recommending any modifications.	All Hazards	X			2014-2018	Local	County and Local Officials and County Planning	Unknown
3.4.2	Prevention	Incorporate hazard mitigation objectives into applicable plans that support the hazard mitigation planning process	All Hazards	X			2014-2018	PDM	County EMA and County Planning Department	\$10,000
4.1.1	Prevention	Develop GIS layers identifying the damage from profiled hazards during the next planning cycle.	All Hazards		X		2014-2018	Local	County EMA and County Planning Department	Unknown

## Bradford County 2015 Hazard Mitigation Plan

**Table 6.4-1: Bradford County 2015 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	
4.1.2	Prevention	Develop a GIS layer for large impoundments of water that support gas exploration	Environmental Hazard	X			2014-2018	Local	County EMA and County Planning Department	Unknown
4.2.1	Prevention	Update and maintain the critical infrastructure and special needs GIS layers on a regular basis	All Hazards			X	2014-2018	Local	County EMA and County Planning Department	Unknown
4.2.2	Prevention	Maintain the special flood hazard area GIS layer and disseminate to the municipalities	Flooding	X			2014-2018	Local	County EMA and County Planning Department	Unknown
4.2.3	Prevention	Update all GIS layers used for hazard mitigation planning purposes annually	All Hazards	X			2014-2018	Local	County EMA and County Planning Department	Varies
4.3.1	Prevention	Develop a GIS layer that identifies locations of flash flooding throughout the county with input from municipalities.	Flash Flooding		X		2015	Local	County EMA and County Planning Department	Unknown
4.3.2	Prevention	Conduct an inventory, in cooperation with local municipalities, of all non-mapped flood prone hazard areas for the purpose of developing a flood prone hazard map.	Flooding			X	2014-2018	FMA, HMGP	County and Municipalities	Unknown
5.1.1	Prevention	Purchase repetitive loss and severe repetitive loss properties through mitigation grant opportunities.	Flooding			X	2014-2018	FMA, HMGP	Municipal Governments	Varies
5.2.1	Prevention	Seek funding to enhance existing stream flow monitoring system installed by the Conservation District and Watershed Groups to provide a Countywide Flood Warning System.	Flooding		X		2014-2015	FMA, HMGP	County and Municipalities	Unknown

## Bradford County 2015 Hazard Mitigation Plan

**Table 6.4-1: Bradford County 2015 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	
5.2.2	Prevention	Disseminate information on grant funding through the flood mitigation assistance program and assist with the application process.	Flooding		X		2014-2018	Local	County EMA	\$500
5.2.3	Prevention	Research hazard mitigation annual granting programs and compare against the mitigation strategy for Bradford County to determine funding capabilities.	All Hazards	X			2014-2018	Local	County and Local EMA	\$500
5.3.1	Structural Project	Install emergency generators at critical facilities and special needs facilities	Utility Interruptions	X			2014-2018	FMA, HMGP	County and Local	Varies
5.3.2	Prevention	Conduct a maintenance program for all levees or dikes in Bradford County.	Flooding			X	2014-2018	Local, FMA	Municipalities	Unknown
6.1.1	Public Awareness	Place the County hazard mitigation plan on the County website and provide outreach identifying how to access the plan	All Hazards	X			2014-2018	Local	County EMA and County Planning Department	\$500-\$1,000
6.1.2	Public Awareness	Conduct public announcements with risk and mitigation strategy information to increase the public knowledge of hazard mitigation efforts.	All Hazards	X			2014-2018	Local	County and Local Governments	\$500
6.2.1	Public Awareness	Develop a public awareness action plan that would include development of informational brochures to provide to new home builders/buyers, educational materials and programs for use in schools, regular news releases and public workshops/forums.	All Hazards	X			2015	Local	County and Local Governments	\$500 - \$1,000
6.3.1	Public Awareness	Conduct National Flood Insurance Program community workshops to provide information and incentives for property owners to acquire flood insurance.	Flooding	X			2014-2018	PDM, HMGP	County EMA and County Planning Department	\$5000

## Bradford County 2015 Hazard Mitigation Plan

**Table 6.4-1: Bradford County 2015 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	
6.3.2	Public Awareness	Develop a brochure to educate the public about the dangers of radon, the impacts of radon and mitigation efforts to remove radon.	Radon	X			2014-2018	PDM or HMGP	County EMA	\$500-\$1,000
6.4.1	Public Awareness	Develop public service announcements to utilize prior to storms during the winter season	Winter Storms	X			2014-2018	Local	County EMA	Under \$500
6.4.2	Public Awareness	Develop a strategy to utilize social media for hazard mitigation information dissemination.	All Hazards	X			2014-2018	Local	County EMA	Under \$500

## Bradford County 2015 Hazard Mitigation Plan

**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	1.2.3	1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	2.1.1	2.2.1	2.3.1	2.3.2	2.4.1	2.4.2
Bradford County	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Alba Borough	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Albany Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Armenia Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Asylum Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Athens Borough	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Athens Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Burlington Borough	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Burlington Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Canton Borough	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Canton Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Columbia Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Franklin Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Granville Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Herrick Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
LeRaysville Borough	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
LeRoy Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Litchfield Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Monroe Borough	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Monroe Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
New Albany Borough	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
North Towanda Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Orwell Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Overton Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Pike Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X

## Bradford County 2015 Hazard Mitigation Plan

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	1.2.3	1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	2.1.1	2.2.1	2.3.1	2.3.2	2.4.1	2.4.2
Ridgebury Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Rome Borough	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Rome Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Sayre Borough	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Sheshequin Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Smithfield Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
South Creek Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
South Waverly Borough	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Springfield Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Standing Stone Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Stevens Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Sylvania Borough	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Terry Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Towanda Borough	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Towanda Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Troy Borough	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Troy Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Tuscarora Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Ulster Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Warren Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Wells Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
West Burlington Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Wilmot Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Windham Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Wyalusing Borough	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X



## Bradford County 2015 Hazard Mitigation Plan

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	1.2.3	1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	2.1.1	2.2.1	2.3.1	2.3.2	2.4.1	2.4.2
Wyalusing Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X
Wysox Township	X	X		X	X	X		X		X	X	X	X	X	X	X	X	X	X	X

Table 6.4-2: Hazard Mitigation Actions – Municipal Checklist																				
Municipality	Mitigation Actions																			
	3.1.1	3.1.2	3.2.1	3.2.2	3.2.3	3.2.4	3.2.5	3.3.1	3.3.2	3.4.1	3.4.2	4.1.1	4.1.2	4.2.1	4.2.2	4.2.3	4.3.1	4.3.2	5.1.1	5.2.1
Bradford County	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Alba Borough			X	X	X	X	X		X	X	X	X	X				X	X		X
Albany Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Armenia Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Asylum Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Athens Borough			X	X	X	X	X		X	X	X	X	X				X	X		X
Athens Township			X	X	X	X	X		X	X	X	X	X				X	X	X	X
Burlington Borough			X	X	X	X	X		X	X	X	X	X				X	X		X
Burlington Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Canton Borough			X	X	X	X	X		X	X	X	X	X				X	X		X
Canton Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Columbia Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Franklin Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Granville Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Herrick Township			X	X	X	X	X		X	X	X	X	X				X	X		X

## Bradford County 2015 Hazard Mitigation Plan

Table 6.4-2: Hazard Mitigation Actions – Municipal Checklist																				
Municipality	Mitigation Actions																			
	3.1.1	3.1.2	3.2.1	3.2.2	3.2.3	3.2.4	3.2.5	3.3.1	3.3.2	3.4.1	3.4.2	4.1.1	4.1.2	4.2.1	4.2.2	4.2.3	4.3.1	4.3.2	5.1.1	5.2.1
LeRaysville Borough			X	X	X	X	X		X	X	X	X	X				X	X		X
LeRoy Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Litchfield Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Monroe Borough			X	X	X	X	X		X	X	X	X	X				X	X		X
Monroe Township			X	X	X	X	X		X	X	X	X	X				X	X		X
New Albany Borough			X	X	X	X	X		X	X	X	X	X				X	X		X
North Towanda Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Orwell Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Overton Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Pike Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Ridgebury Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Rome Borough			X	X	X	X	X		X	X	X	X	X				X	X		X
Rome Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Sayre Borough			X	X	X	X	X		X	X	X	X	X				X	X		X
Sheshequin Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Smithfield Township			X	X	X	X	X		X	X	X	X	X				X	X		X
South Creek Township			X	X	X	X	X		X	X	X	X	X				X	X		X
South Waverly Borough			X	X	X	X	X		X	X	X	X	X				X	X		X
Springfield Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Standing Stone Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Stevens Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Sylvania Borough			X	X	X	X	X		X	X	X	X	X				X	X		X
Terry Township			X	X	X	X	X		X	X	X	X	X				X	X	X	X
Towanda Borough			X	X	X	X	X		X	X	X	X	X				X	X		X
Towanda Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Troy Borough			X	X	X	X	X		X	X	X	X	X				X	X		X

## Bradford County 2015 Hazard Mitigation Plan

Table 6.4-2: Hazard Mitigation Actions – Municipal Checklist																				
Municipality	Mitigation Actions																			
	3.1.1	3.1.2	3.2.1	3.2.2	3.2.3	3.2.4	3.2.5	3.3.1	3.3.2	3.4.1	3.4.2	4.1.1	4.1.2	4.2.1	4.2.2	4.2.3	4.3.1	4.3.2	5.1.1	5.2.1
Troy Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Tuscarora Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Ulster Township			X	X	X	X	X		X	X	X	X	X				X	X	X	X
Warren Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Wells Township			X	X	X	X	X		X	X	X	X	X				X	X		X
West Burlington Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Wilmot Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Windham Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Wyalusing Borough			X	X	X	X	X		X	X	X	X	X				X	X		X
Wyalusing Township			X	X	X	X	X		X	X	X	X	X				X	X		X
Wysox Township			X	X	X	X	X		X	X	X	X	X				X	X	X	X

Table 6.4-2: Hazard Mitigation Actions – Municipal Checklist																				
Municipality	Mitigation Actions																			
	5.2.2	5.2.3	5.3.1	5.3.2	6.1.1	6.1.2	6.2.1	6.3.1	6.3.2	6.4.1	6.4.2									
Bradford County	X	X	X	X	X	X	X	X	X	X	X									
Alba Borough			X			X	X	X	X	X	X									
Albany Township			X			X	X	X	X	X	X									
Armenia Township			X			X	X	X	X	X	X									
Asylum Township			X			X	X	X	X	X	X									
Athens Borough			X			X	X	X	X	X	X									

## Bradford County 2015 Hazard Mitigation Plan

Table 6.4-2: Hazard Mitigation Actions – Municipal Checklist																			
Municipality	Mitigation Actions																		
	5.2.2	5.2.3	5.3.1	5.3.2	6.1.1	6.1.2	6.2.1	6.3.1	6.3.2	6.4.1	6.4.2								
Athens Township			X			X	X	X	X	X	X								
Burlington Borough			X			X	X	X	X	X	X								
Burlington Township			X			X	X	X	X	X	X								
Canton Borough			X			X	X	X	X	X	X								
Canton Township			X			X	X	X	X	X	X								
Columbia Township			X			X	X	X	X	X	X								
Franklin Township			X			X	X	X	X	X	X								
Granville Township			X			X	X	X	X	X	X								
Herrick Township			X			X	X	X	X	X	X								
LeRaysville Borough			X			X	X	X	X	X	X								
LeRoy Township			X			X	X	X	X	X	X								
Litchfield Township			X			X	X	X	X	X	X								
Monroe Borough			X			X	X	X	X	X	X								
Monroe Township			X			X	X	X	X	X	X								
New Albany Borough			X			X	X	X	X	X	X								
North Towanda Township			X			X	X	X	X	X	X								
Orwell Township			X			X	X	X	X	X	X								
Overton Township			X			X	X	X	X	X	X								
Pike Township			X			X	X	X	X	X	X								
Ridgebury Township			X			X	X	X	X	X	X								
Rome Borough			X			X	X	X	X	X	X								
Rome Township			X			X	X	X	X	X	X								
Sayre Borough			X			X	X	X	X	X	X								
Sheshequin Township			X			X	X	X	X	X	X								
Smithfield Township			X			X	X	X	X	X	X								
South Creek Township			X			X	X	X	X	X	X								

## Bradford County 2015 Hazard Mitigation Plan

Table 6.4-2: Hazard Mitigation Actions – Municipal Checklist																			
Municipality	Mitigation Actions																		
	5.2.2	5.2.3	5.3.1	5.3.2	6.1.1	6.1.2	6.2.1	6.3.1	6.3.2	6.4.1	6.4.2								
South Waverly Borough			X			X	X	X	X	X	X								
Springfield Township			X			X	X	X	X	X	X								
Standing Stone Township			X			X	X	X	X	X	X								
Stevens Township			X			X	X	X	X	X	X								
Sylvania Borough			X			X	X	X	X	X	X								
Terry Township			X			X	X	X	X	X	X								
Towanda Borough			X			X	X	X	X	X	X								
Towanda Township			X			X	X	X	X	X	X								
Troy Borough			X			X	X	X	X	X	X								
Troy Township			X			X	X	X	X	X	X								
Tuscarora Township			X			X	X	X	X	X	X								
Ulster Township			X			X	X	X	X	X	X								
Warren Township			X			X	X	X	X	X	X								
Wells Township			X			X	X	X	X	X	X								
West Burlington Township			X			X	X	X	X	X	X								
Wilmot Township			X			X	X	X	X	X	X								
Windham Township			X			X	X	X	X	X	X								
Wyalusing Borough			X			X	X	X	X	X	X								
Wyalusing Township			X			X	X	X	X	X	X								
Wysox Township			X			X	X	X	X	X	X								

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

The Federal Emergency Management Agency (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 1.1.2; 1.1.3; 3.2.5 and 6.3.1 comply for Bradford County and all its municipalities. These actions are highlighted in yellow in Table 6.4-1 above.

### Evaluate and Prioritize Mitigation Actions

Mitigation actions were evaluated using the seven criteria which frame the *PASTEEL* method. These feasibility criteria include:

- **Political:** Does the action have public and political support?
- **Administrative:** Is there adequate staffing and funding available to implement the action in a timely manner?
- **Social:** Will the action be acceptable by the community or will it cause any one segment of the population to be treated unfairly?
- **Technical:** How effective will the action be in avoiding or reducing future losses?
- **Economic:** What are the costs and benefits of the action and does it contribute to community economic goals?
- **Environmental:** Will the action provide environmental benefits and will it comply with local, state and federal environmental regulations?
- **Legal:** Does the community have the authority to implement the proposed measure?

The *PASTEEL* method uses political, administrative, social, technical, economic, environmental and legal considerations as a basis means of evaluating which of the identified actions should be considered most critical. Economic considerations are particularly important in weighing the costs versus benefits of implementing one action prior to another.

FEMA mitigation planning requirements indicate that any prioritization system used shall include a special emphasis on the extent to which benefits are maximized according to a cost-benefit review of the proposed projects. To do this in an efficient manner that is consistent with FEMA's guidance on using cost-benefit review in mitigation planning, the *PASTEEL* method was adapted to include a higher weighting for two elements of the *economic* feasibility factor – Benefits of Action and Costs of Action. This method incorporates concepts similar to those described in Method C of FEMA 386-5: Using Benefit Cost Review in Mitigation Planning (FEMA, 2007).

Those participating in the 2015 HMP update process provided comments which allowed for the prioritization of the mitigation actions listed in Table 6.4-1 using the seven *PASTEEL* criteria. In order to evaluate and prioritize the mitigation actions, *favorable* and *less favorable* factors were identified for each action. Table 6.4-3 summarizes the evaluation methodology and provides

***Bradford County 2015 Hazard Mitigation Plan***

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the results of this evaluation for all mitigation actions. The first results column includes a summary of the feasibility factors, placing equal weight on all factors. The second results column reflects feasibility scores with benefits and costs weighted more heavily; and therefore, given greater priority. A weighting factor of three was used for each benefit and cost element. Therefore, a “+” benefit factor rating equals three pluses and a “-“ benefit factor rating equals three minuses in the total prioritization score.

# Bradford County 2015 Hazard Mitigation Plan

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NO.	Name	P Political			A Administrative			S Social		T Technical			E Economic				E Environmental				L Legal			SUMMARY (EQUAL WEIGHTING)	SUMMARY (BENEFITS & COSTS PRIORITIZED)
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1.1.1	Conduct annual municipal flood summits to educate municipal officials on hazard mitigation opportunities for the flooding hazard.	+	+	+	+	+	+	+	+	+	+	+	+	+	-	N	N	N	+	+	+	+	N	18(+) 1(-) 4(N)	22(+) 1(-) 4(N)
1.1.2	Research municipal officials training through the Department of Community and Economic Development (DCED) Floodplain Outreach Program that provides technical assistance for Community Assisted Visits (CAVs) contracted by the Conservation District.	+	+	+	+	+	+	+	+	+	+	+	+	+	-	N	N	N	+	+	+	+	N	18(+) 1(-) 4(N)	22(+) 1(-) 4(N)



## Bradford County 2015 Hazard Mitigation Plan

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1.1.3	Provide detailed local municipal flood hazard mapping upon the issuance of updated digital flood insurance rate map data.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	N	N	+	+	N	+	+	-	19(+) 1(-) 3(N)	23(+) 1(-) 3(N)
1.1.4	Contact the Department of Environmental Protection and determine specific tactics to educate municipal officials on radon in Bradford County.	+	+	+	+	-	+	+	+	+	+	+	+	+	-	N	N	N	N	N	+	+	-	15(+) 3(-) 5(N)	19(+) 3(-) 5(N)

# Bradford County 2015 Hazard Mitigation Plan

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1.1.5	Contact the local Department of Health office and develop a strategy to educate local officials on pandemic and infectious disease issues.	+	+	+	+	+	+	+	+	+	+	+	+	+	-	N	N	N	N	+	+	+	-	17(+) 2(-) N	21(+) 2(-) N
1.2.1	Encourage NOAA alert radio use by homeowners, critical facilities and special needs facilities.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	N	N	N	N	N	N	+	17(+) 0(-) 6(N)	21(+) 0(-) 6(N)
1.2.2	Research upgrades for the county emergency notification system that would enhance early warning capabilities.	+	+	+	+	-	-	+	+	+	+	+	+	+	-	N	N	N	N	N	N	+	+	14(+) 3(-) 6(N)	18(+) 3(-) 6(N)

# Bradford County 2015 Hazard Mitigation Plan

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1.2.3	Seek funding resources to install signage throughout the county for the indication of flood elevations and flood zones.	+	+	+	+	-	-	+	+	+	+	+	+	+	-	N	N	N	N	N	N	+	-	13(+) 4(-) 6(N)	17(+) 4(-) 6(N)
1.3.1	Conduct a commodity flow study to determine hazardous materials that are transported through Bradford County	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	21(+) 3(-) 0(N)	25(+) 3(-) 0(N)

## Bradford County 2015 Hazard Mitigation Plan

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1.3.2	Conduct an inventory of dams or impoundments of water that are not identified in the dam failure hazard.	+	+	+	-	-	-	+	+	+	+	+	+	+	-	N	N	N	N	N	N	+	-	12(+) 5(-) 6(N)	16(+) 5(-) 6(N)
1.3.3	Conduct assessments to determine vulnerability of critical facilities to high and moderate risk hazards.	+	+	+	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	19(+) 5(-) 0(N)	23(+) 5(-) 0(N)

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1.3.4	Determine the emergency generator capabilities of critical facilities and special needs facilities in all municipalities of Bradford County.	+	+	+	-	-	-	+	+	+	+	+	+	+	+	+	+	N	N	N	N	N	+	+	-	14(+) 4(-) 5(N)	18(+) 4(-) 5(N)
1.3.5	Develop and maintain a database to track wind damage by municipality during the next 5 year period to assist with determining wind and tornado vulnerability	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	N	N	N	N	N	+	+	+	16(+) 1(-) 6(N)	20(+) 1(-) 6(N)

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1.3.6	Centralize stream erosion hazard information in relationship to homes, businesses, and infrastructure that has been collected through watershed groups and the Conservation District.	+	-	-	-	-	-	+	+	+	-	+	-	+	-	+	-	+	N	N	N	N	N	N	+	-	9(+) 9(-) 5(N)	11(+) 11(-) 5(N)
2.1.1	Conduct a training and exercise needs assessment with municipalities and first responders to determine specific training that would enhance mitigation capabilities to profiled hazards.	+	+	+	+	-	+	+	+	N	N	N	+	+	+	+	N	N	N	N	N	N	N	+	+	13(+) 1(-) 9(N)	17(+) 1(-) 9(N)	

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2.2.1	Conduct hazardous material training to enhance response capabilities to transportation and fixed facility hazardous material incidents.	+	+	+	+	-	+	+	+	+	+	+	+	N	+	+	+	+	+	+	+	+	+	-	20(+) 2(-) 1(N)	24(+) 2(-) 1(N)
2.3.1	Enhance the county damage assessment team capabilities and encourage the development of municipal damage assessment teams to augment the county team.	+	+	+	+	-	+	+	+	N	N	N	+	+	N	+	N	N	N	N	+	+	-	12(+) 2(-) 9(N)	16(+) 2(-) 9(N)	

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2.3.2	Conduct annual damage assessment training for damage assessment teams and local officials.	+	+	+	+	-	+	+	+	N	N	N	+	+	+	+	N	N	N	N	N	N	+	-	12(+) 2(-) 9(N)	16(+) 2(-) 9(N)
2.4.1	Conduct exercises for all emergency disciplines to better protect public health and safety within the county.	+	+	+	+	-	+	+	+	N	N	N	+	+	+	+	N	N	N	N	N	+	+	+	14(+) 1(-) 8(N)	18(+) 1(-) 8(N)
2.4.2	Conduct exercises to test the capabilities of municipalities to respond to large scale, long duration utility outages.	+	+	+	+	-	+	+	+	N	N	N	+	+	+	+	N	N	N	N	N	+	+	-	13(+) 2(-) 8(N)	17(+) 2(-) 8(N)



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<b>NO.</b>	<b>Name</b>	<b>P</b> Political			<b>A</b> Administrative			<b>S</b> Social		<b>T</b> Technical			<b>E</b> Economic				<b>E</b> Environmental				<b>L</b> Legal			<b>SUMMARY (EQUAL WEIGHTING)</b>	<b>SUMMARY (BENEFITS &amp; COSTS PRIORITIZED)</b>
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3.1.1	Seek funding to complete an update of the Bradford County Comprehensive Plan.	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	20(+) 3(-) 2(N)	24(+) 3(-) 2(N)
3.1.2	Incorporate risk assessment and hazard mitigation principles into the Bradford County Comprehensive Plan Update.	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	20(+) 3(-) 2(N)	24(+) 3(-) 2(N)
3.2.1	Enforce the Uniform Construction Codes and incorporate higher standards for hazard resistance at the municipal level.	-	+	-	-	-	+	-	+	+	+	+	+	+	+	N	N	N	N	+	+	+	-	13(+) 6(-) 4(N)	17(+) 6(-) 4(N)

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3.2.2	Regulate new development in known hazard areas, especially the special flood hazard area.	-	+	-	-	-	+	+	+	+	+	+	+	+	+	+	N	N	+	N	+	+	+	-	15(+) 5(-) 3(N)	19(+) 5(-) 3(N)
3.2.3	Maintain and enhance the county storm water management plan and encourage municipal participation.	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	20(+) 3(-) (N)	24(+) 3(-) (N)
3.2.4	Ensure the zoning ordinance encourages higher densities outside of known hazard areas.	-	+	-	+	-	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	18(+) 5(-) 0(N)	22(+) 5(-) 0(N)

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3.2.5	Encourage municipalities to participate in the National Flood Insurance Program, Community Rating System.	+	+	+	+	+	+	+	+	-	+	+	+	+	+	N	N	N	N	N	+	+	+	+	17(+) 1(-) 5(N)	21(+) 1(-) 5(N)
3.3.1	Review high risk dam emergency plans annually and participate in exercises as required.	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	N	N	N	+	+	+	-	18(+) 2(-) 3(N)	22(+) 2(-) 3(N)	

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3.3.2	Encourage the municipalities to adopt the county emergency operations plan as the municipal emergency operations plan.	+	+	+	+	+	+	+	+	N	+	+	+	+	+	N	+	+	+	+	+	+	+	21(+) 0(-) 2(N)	25(+) 0(-) 2(N)

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3.4.1	Hold an annual coordination meeting of the Bradford County Hazard Mitigation Committee, local elected officials, State and Federal Agencies, and other appropriate agencies; organizations and individuals for the purpose of reviewing the County Plan progress and recommending any modifications.	+	+	+	+	+	+	+	+	N	+	+	+	+	+	N	+	+	+	+	+	+	+	21(+) 0(-) 2(N)	25(+) 0(-) 2(N)
3.4.2	Incorporate hazard mitigation objectives into applicable plans that support the hazard mitigation planning process	+	+	+	+	+	+	+	+	+	+	+	+	+	N	N	N	N	N	+	+	+	+	18(+) 0(-) 5(N)	22(+) 0(-) 5(N)

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4.1.1	Develop GIS layers identifying the damage from profiled hazards during the next planning cycle.	-	+	+	-	+	-	+	+	+	+	+	+	+	+	+	N	N	N	N	N	N	+	N	13(+) 3(-) 7(N)	17(+) 3(-) 7(N)
4.1.2	Develop a GIS layer for large impoundments of water that support gas exploration	-	+	+	-	-	+	+	+	+	+	+	+	+	+	+	+	N	+	N	+	+	+	+	18(+) 3(-) 2(N)	22(+) 3(-) 2(N)
4.2.1	Update and maintain the critical infrastructure and special needs GIS layers on a regular basis	-	+	+	-	-	-	+	+	+	+	-	+	-	+	+	N	N	N	N	N	N	+	+	11(+) 6(-) 6(N)	13(+) 8(-) 6(N)

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4.2.2	Maintain the special flood hazard area GIS layer and disseminate to the municipalities	+	+	+	+	-	+	+	N	+	+	+	+	+	+	+	+	+	+	+	+	+	+	21(+) 1(-) 1(N)	25(+) 1(-) 1(N)
4.2.3	Update all GIS layers used for hazard mitigation planning purposes annually	+	+	+	-	-	+	+	N	+	+	+	+	+	+	+	+	+	+	+	+	+	+	20(+) 1(-) 2(N)	24(+) 1(-) 2(N)
4.3.1	Develop a GIS layer that identifies locations of flash flooding throughout the county with input from municipalities.	-	+	+	-	-	-	+	+	+	+	+	+	+	+	N	N	+	+	N	+	+	+	16(+) 4(-) 3(N)	20(+) 4(-) 3(N)

# Bradford County 2015 Hazard Mitigation Plan

**Table 6.4-3: Bradford County Mitigation Strategy PA STEEL Review Sheet**

Mitigation Actions		PA STEEL CRITERIA CONSIDERATIONS																				Results					
		(+) Favorable    (-) Less favorable    (N) Not Applicable																									
NO.	Name	P Political			A Administrative			S Social		T Technical			E Economic				E Environmental				L Legal			SUMMARY (EQUAL WEIGHTING)	SUMMARY (BENEFITS & COSTS PRIORITIZED)		
		Political Supports	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws	State Authority	Existing Local Authority			Potential Legal Challenge	
4.3.2	Conduct an inventory, in cooperation with local municipalities, of all non-mapped flood prone hazard areas for the purpose of developing a flood prone hazard map.	-	+	-	-	-	+	-	N	+	+	+	+	-	+	+	+	+	N	+	+	N	+	+	-	13(+) 7(-) 2(N)	15(+) 9(-) 2(N)
5.1.1	Purchase repetitive loss and severe repetitive loss properties through mitigation grant opportunities.	-	+	-	+	-	-	-	+	+	+	+	+	-	+	+	N	N	N	+	+	+	+	+	-	13(+) 7(-) 3(N)	15(+) 9(-) 3(N)



# Bradford County 2015 Hazard Mitigation Plan

<b>Table 6.4-3: Bradford County Mitigation Strategy PA STEEL Review Sheet</b>																											
<b>Mitigation Actions</b>		<b>PA STEEL CRITERIA CONSIDERATIONS</b>																				<b>Results</b>					
		(+) Favorable    (-) Less favorable    (N) Not Applicable																									
<b>NO.</b>	<b>Name</b>	<b>P</b> Political			<b>A</b> Administrative			<b>S</b> Social		<b>T</b> Technical			<b>E</b> Economic				<b>E</b> Environmental				<b>L</b> Legal			<b>SUMMARY (EQUAL WEIGHTING)</b>	<b>SUMMARY (BENEFITS &amp; COSTS PRIORITIZED)</b>		
		Political Supports	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws	State Authority	Existing Local Authority			Potential Legal Challenge	
5.2.1	Seek funding to enhance existing stream flow monitoring system installed by the Conservation District and Watershed Groups to provide a Countywide Flood Warning System.	+	+	+	+	+	N	+	+	N	N	N	+	+	+	N	+	N	+	+	N	N	+	N	14(+) 0(-) 9(N)	18(+) 0(-) 9(N)	
5.2.2	Disseminate information on grant funding through the flood mitigation assistance program and assist with the application process.	+	+	+	+	+	N	+	N	N	N	N	+	+	+	N	N	N	N	+	+	+	N	+	N	12(+) 0(-) 11(N)	16(+) 0(-) 11(N)

# Bradford County 2015 Hazard Mitigation Plan

**Table 6.4-3: Bradford County Mitigation Strategy PA STEEL Review Sheet**

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NO.	Name	P Political			A Administrative			S Social		T Technical			E Economic				E Environmental				L Legal			SUMMARY (EQUAL WEIGHTING)	SUMMARY (BENEFITS & COSTS PRIORITIZED)	
		Political Supports	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws	State Authority	Existing Local Authority			Potential Legal Challenge
5.2.3	Research hazard mitigation annual granting programs and compare against the mitigation strategy for Bradford County to determine funding capabilities.	+	+	+	+	+	N	+	+	+	+	+	+	+	+	N	N	N	N	N	N	+	+	+	16(+) 0(-) 7(N)	20(+) 0(-) 7(N)
5.3.1	Install emergency generators at critical facilities and special needs facilities	+	+	+	-	-	+	+	+	+	+	+	+	+	+	N	N	+	N	N	+	+	+	17(+) 2(-) 4(N)	21(+) 2(-) 4(N)	
5.3.2	Conduct a maintenance program for all levees or dikes in Bradford County.	-	-	+	-	-	-	+	+	+	+	+	-	+	+	+	+	N	+	+	+	+	+	16(+) 6(-) 1(N)	18(+) 8(-) 1(N)	

# Bradford County 2015 Hazard Mitigation Plan

**Table 6.4-3: Bradford County Mitigation Strategy PA STEEL Review Sheet**

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6.1.1	Place the County hazard mitigation plan on the County website and provide outreach identifying how to access the plan	+	+	+	+	+	+	+	+	+	+	+	+	+	N	N	N	+	+	N	N	+	+	18(+) 0(-) 5(N)	22(+) 0(-) 5(N)
6.1.2	Conduct public announcements with risk and mitigation strategy information to increase the public knowledge of hazard mitigation efforts.	+	+	+	+	+	+	+	+	+	+	+	+	+	N	N	N	N	N	N	N	+	+	17(+) 0(-) 6(N)	21(+) 0(-) 6(N)

# Bradford County 2015 Hazard Mitigation Plan

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6.2.1	Develop a public awareness action plan that would include development of informational brochures to provide to new home builders/buyers, educational materials and programs for use in schools, regular news releases and public workshops forums.	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	N	N	N	N	N	N	+	+	16(+) 1(-) 6(N)	20(+) 1(-) 6(N)
6.3.1	Conduct National Flood Insurance Program community workshops to provide information and incentives for property owners to get insurance.	+	+	-	+	+	+	-	+	+	+	+	+	+	+	+	+	N	N	N	N	+	+	+	+	17(+) 2(-) 4(N)	21(+) 2(-) 4(N)

# Bradford County 2015 Hazard Mitigation Plan

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6.3.2	Develop a brochure to educate the public about the dangers of radon, the impacts of radon and mitigation efforts to remove radon.	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	N	N	N	N	N	+	+	-	16(+) 2(-) 5(N)	20(+) 2(-) 5(N)
6.4.1	Develop public service announcements to utilize prior to storms during the winter season	+	+	+	+	+	+	+	+	+	+	+	+	+	N	N	N	N	N	N	N	+	+	16(+) 0(-) 7(N)	20(+) 0(-) 7(N)	
6.4.2	Develop a strategy to utilize social media for hazard mitigation information dissemination.	+	+	+	+	+	+	+	+	+	+	+	+	+	N	N	N	N	N	N	N	+	+	16(+) 0(-) 7(N)	20(+) 0(-) 7(N)	

## **7. Plan Maintenance**

### **7.1 Update Process Summary**

Monitoring, evaluating and updating this plan, is critical to maintaining its value and success in Bradford 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 Bradford County HMP Local Planning Team decided to alter the current maintenance procedures. The 2015 HMP update establishes a review of the plan within 30-90 days of a disaster event in addition to continuing with an annual plan evaluation. This HMP update also defines the municipalities' role in updating and evaluating the plan. Finally, the 2015 HMP Update encourages continued public involvement and how this plan may be integrated into other planning mechanisms in the county.

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

Hazard mitigation planning in Bradford County is a responsibility of all levels of government (i.e., county and local), as well as the citizens of the county. The Bradford County Local Planning Team will be responsible for maintaining this 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 Bradford 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 Bradford County Emergency Management Agency will maintain a copy of these records and place them in **Appendix I** of this plan.

Bradford 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**

#### **Bradford County Comprehensive Plan**

The Bradford County Planning Department is responsible for maintaining and updating the Bradford 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 Bradford 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 Bradford County Comprehensive Plan is due to be updated based on the municipalities planning code's 10-year review cycle. 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 Bradford County Comprehensive Plan and the Bradford 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 Bradford County Hazard Mitigation Plan will provide valuable information for the update of the next comprehensive plan. Consideration and incorporation of data from this plan will ensure the inclusion of hazard mitigation practices in the county comprehensive plan.

#### **Bradford 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). Bradford 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 Bradford 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.

## **Bradford County 2015 Hazard Mitigation Plan**

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EMA should consider the Bradford 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, Bradford 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. Bradford 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.

### **7.4 Continued Public Involvement**

Numerous options will be utilized to ensure continued public involvement. Once approved by the county and municipalities, digital and hard copy versions of the approved hazard mitigation plan will be disseminated throughout the county so that the public has access to the plan. Various mitigation actions will also be implemented as part of the mitigation action plan to ensure the continued public involvement as well. The Bradford County Emergency Management Agency will ensure that the 2015 Bradford County Hazard Mitigation Plan is posted and maintained on the Bradford County website and will continue to encourage public review and comment on the plan. The Bradford County website that the plan will be located at is as follows: [www.bradfordcountypa.org](http://www.bradfordcountypa.org)

The citizens of Bradford County are encouraged to submit their comments to elected officials and/or members of the Bradford County HMP Local Planning Team. To promote public participation, the Bradford 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 Bradford 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 2015 Bradford County Hazard Mitigation Plan. Copies of the adopting resolutions are included in this plan in **Appendix J**. FEMA Region III in Philadelphia is the final approval authority for the Hazard Mitigation Plan. PEMA also reviews the plan before submission to FEMA.

## **9. Appendices**

Appendix A:	Bibliography
Appendix B:	Local Mitigation Plan Review Crosswalk
Appendix C:	Meeting and Other Participation Documentation
Appendix D:	Municipality Flood Vulnerability Maps
Appendix E:	Critical Facilities and Maps
Appendix F:	2009 and 2012 Mitigation Project Opportunity Forms
Appendix G:	2015 Mitigation Project Opportunity Forms
Appendix H:	Risk Assessment Hazard Maps
Appendix I:	Annual Review Information
Appendix J:	County and Municipal Adoption Resolutions