



Union County 2014 Hazard Vulnerability Assessment & Mitigation Plan Update

Prepared for:

Union County Commissioners
155 North 15th Street
Lewisburg, PA 17837
with support from PEMA

Prepared by:

Michael Baker Jr., Inc.
1818 Market Street, Suite 3110
Philadelphia, PA 19103

October 31, 2014



Michael Baker
INTERNATIONAL

Union County Hazard Vulnerability Assessment and Mitigation Plan Update

Certification of Annual Review Meetings

The Union County Hazard Mitigation Steering Committee has reviewed this Hazard Vulnerability Assessment and Mitigation Plan. See Section 8 for further details regarding this form. The director of the Hazard Mitigation Steering Committee hereby certifies the review.

YEAR	DATE OF MEETING	PUBLIC OUTREACH ADDRESSED?*	SIGNATURE
2010	N/A	N/A	To the best knowledge of the Union County HMSC, no HMP progress reports were submitted from municipalities for the period from 2010-2014 although some mitigation actions were accomplished in this period. Progress on actions is discussed in detail in Section 6.1 of this plan.
2011	N/A	N/A	
2012	N/A	N/A	
2013	N/A	N/A	
2014	N/A	N/A	
2015			
2016			
2017			
2018			

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

Union County Hazard Vulnerability Assessment and Mitigation Plan Update

Record of Changes

DATE	DESCRIPTION OF CHANGE MADE, MITIGATION ACTION COMPLETED, OR PUBLIC OUTREACH PERFORMED	CHANGE MADE BY (PRINT NAME)	CHANGE MADE BY (SIGNATURE)
2010-2014	To the best knowledge of the Union County HMSC, no HMP progress reports were submitted from municipalities for the period from 2010-2014 although some mitigation actions were accomplished in this period. Progress on actions is discussed in detail in Section 6.1 of this plan.	N/A	N/A

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

Table of Contents

<i>Certification of Annual Review Meetings</i>	<i>ii</i>
<i>Record of Changes</i>	<i>iii</i>
1. Introduction	1
1.1. <i>Background</i>	1
1.2. <i>Purpose</i>	1
1.3. <i>Scope</i>	2
1.4. <i>Authority and References</i>	2
2. Community Profile	4
2.1. <i>Geography and Environment</i>	4
2.2. <i>Community Facts</i>	7
2.3. <i>Population and Demographics</i>	7
2.4. <i>Land Use and Development</i>	9
2.5. <i>Data Sources and Limitations</i>	14
3. Planning Process	17
3.1. <i>Update Process and Participation Summary</i>	17
3.2. <i>The Planning Team</i>	21
3.3. <i>Meetings and Documentation</i>	23
3.4. <i>Public & Stakeholder Participation</i>	23
3.5. <i>Multi-Jurisdictional Planning</i>	25
4. Risk Assessment	26
4.1. <i>Update Process Summary</i>	26
4.2. <i>Hazard Identification</i>	27
4.2.1. <i>Table of Presidential Disaster Declarations</i>	27
4.2.2. <i>Summary of Hazards</i>	28
4.3. <i>Hazard Profiles and Vulnerability Analysis</i>	31
NATURAL HAZARDS	31
4.3.1. <i>Drought</i>	31
4.3.1.1. <i>Location and Extent</i>	31
4.3.1.2. <i>Range of Magnitude</i>	31
4.3.1.3. <i>Past Occurrence</i>	34
4.3.1.4. <i>Future Occurrence</i>	35

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

4.3.1.5.	<i>Vulnerability Assessment</i>	38
4.3.2.	Earthquake	39
4.3.2.1.	<i>Location and Extent</i>	39
4.3.2.2.	<i>Range of Magnitude</i>	41
4.3.2.3.	<i>Past Occurrence</i>	42
4.3.2.4.	<i>Future Occurrence</i>	44
4.3.2.5.	<i>Vulnerability Assessment</i>	44
4.3.3.	Flood, Flash Flood, Ice Jam	44
4.3.3.1.	<i>Location and Extent</i>	44
4.3.3.2.	<i>Range of Magnitude</i>	49
4.3.3.3.	<i>Past Occurrence</i>	49
4.3.3.4.	<i>Future Occurrence</i>	57
4.3.3.5.	<i>Vulnerability Assessment</i>	58
4.3.4.	Hurricane, Tropical Storm, Nor'easter	63
4.3.4.1.	<i>Location and Extent</i>	63
4.3.4.2.	<i>Range of Magnitude</i>	65
4.3.4.3.	<i>Past Occurrence</i>	66
4.3.4.4.	<i>Future Occurrence</i>	69
4.3.4.5.	<i>Vulnerability Assessment</i>	71
4.3.5.	Landslide	71
4.3.5.1.	<i>Location and Extent</i>	71
4.3.5.2.	<i>Range of Magnitude</i>	75
4.3.5.3.	<i>Past Occurrence</i>	75
4.3.5.4.	<i>Future Occurrence</i>	75
4.3.5.5.	<i>Vulnerability Assessment</i>	75
4.3.6.	Subsidence and Sinkhole	78
4.3.6.1.	<i>Location and Extent</i>	78
4.3.6.2.	<i>Range of Magnitude</i>	80
4.3.6.3.	<i>Past Occurrence</i>	80
4.3.6.4.	<i>Future Occurrence</i>	80
4.3.6.5.	<i>Vulnerability Assessment</i>	80
4.3.7.	Tornado and Windstorm	84
4.3.7.1.	<i>Location and Extent</i>	84
4.3.7.2.	<i>Range of Magnitude</i>	85
4.3.7.3.	<i>Past Occurrence</i>	86
4.3.7.4.	<i>Future Occurrence</i>	91
4.3.7.5.	<i>Vulnerability Assessment</i>	91
4.3.8.	Wildfire	92
4.3.8.1.	<i>Location and Extent</i>	92
4.3.8.2.	<i>Range of Magnitude</i>	92
4.3.8.3.	<i>Past Occurrence</i>	93
4.3.8.4.	<i>Future Occurrence</i>	95
4.3.8.5.	<i>Vulnerability Assessment</i>	95
4.3.9.	Winter Storm	99
4.3.9.1.	<i>Location and Extent</i>	99

*Union County 2014 Hazard Vulnerability Assessment and
Mitigation Plan Update*

4.3.9.2.	<i>Range of Magnitude</i>	101
4.3.9.3.	<i>Past Occurrence</i>	102
4.3.9.4.	<i>Future Occurrence</i>	103
4.3.9.5.	<i>Vulnerability Assessment</i>	103
4.4.	<i>Hazard Vulnerability Summary</i>	105
4.4.1.	<i>Methodology</i>	105
4.4.2.	<i>Ranking Results</i>	107
4.4.3.	<i>Potential Loss Estimates</i>	108
4.4.4.	<i>Future Development and Vulnerability</i>	112
5.	Capability Assessment	115
5.1.	<i>Update Process Summary</i>	115
5.2.	<i>Capability Assessment Findings</i>	116
5.2.1.	<i>Planning and Regulatory Capability</i>	116
5.2.1.1.	<i>Plans and Regulations</i>	116
5.2.1.2.	<i>Participation in the National Flood Insurance Program</i>	119
5.2.2.	<i>Administrative and Technical Capability</i>	121
5.2.3.	<i>Financial Capability</i>	123
5.2.4.	<i>Education and Outreach</i>	124
5.2.5.	<i>Plan Integration</i>	125
6.	Mitigation Strategy	127
6.1.	<i>Update Process Summary</i>	127
6.2.	<i>Mitigation Goals and Objectives</i>	139
6.3.	<i>Identification and Analysis of Mitigation Techniques</i>	141
6.4.	<i>Mitigation Action Plan</i>	143
7.	Plan Maintenance	170
7.1.	<i>Update Process Summary</i>	170
7.2.	<i>Monitoring, Evaluating and Updating the Plan</i>	170
7.3.	<i>Continued Public Involvement</i>	172
8.	Plan Adoption	173
9.	Appendices	176

Table of Figures

Figure 2.1-1 Base map of Union County. 4

Figure 2.4-2 Map of current land uses in Union County (Union County GIS, 2014) 9

Figure 2.4-3 Major Watersheds of Union County (USGS NHD, 2013; SRBC; 2006). 10

Figure 2.4-4 Map of current new development in Union County between 2010 and 2014 (Union County GIS, 2014)12

Figure 4.3.1-1 August 2014 Drought Locations (USGS, 2014).30

Figure 4.3.1-2 Percent of time areas of the United States have PSDI values <= -3 (NIDIS, 2010).35

Figure 4.3.2-1 Pennsylvania relative earthquake hazard zones (USGS, 2014).38

Figure 4.3.2-2 USGS Seismic Hazard Map – Pennsylvania39

Figure 4.3.2-3 Union County and Pennsylvania earthquake history (DCNR, 2004). 42

Figure 4.3.3-1 Diagram identifying Special Flood Hazard Area, 1% annual chance (100-Year) floodplain, floodway and flood fringe.45

Figure 4.3.3-2 Map showing the location of watercourses and flood zones throughout Union County.46

Figure 4.3.3-3 Photo of acquisition and demolition project of several repetitive loss structures in Lewisburg Borough.....50

Figure 4.3.4-1 Design wind speeds for community shelters across the United States (FEMA 2009).61

Figure 4.3.4-2 Historical coastal storm events tracking in or near Union County.64

Figure 4.3.4-3 Seasonal probability of a hurricane of tropical storm affecting Union County (NOAA Hurricane Research Division, 2009)66

Figure 4.3.5-1 Map of general landslide hazard areas and municipalities in Union County (USGS, 2014)68

Figure 4.3.5-2 Steep slope locations in Union County.70

Figure 4.3.6-1 Locations with subsidence potential in Union County (USGS, 2014; DCNR 2013)74

Figure 4.3.7-1 Tornadoes that have touched down in Union County between 1950 and 2013 (NOAA, 2013)83

Figure 4.3.8-1 Wildfire origins in Union County between 2008 and 2013. (DCNR, 2013)87

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Figure 4.3.8-2 Wildfire hazard potential per municipality in Union County (DCNR, 2010).89

Figure 4.3.9-1 Mean Annual Snowfall for Pennsylvania and Union County (NOAA-NWSFO, 2013).92

Figure 4.4.3-1 Distribution by census block of the potential total economic loss expected from a 1%-annual-chance flood in Union County (HAZUS-MH v2.1)..... 102

Figure 4.4.4-1 Projected Percent Population Change in Union County (PA DEP, 2012). 105

Figure 6.1-1 Photo of roadway flood mitigation project completed in Limestone Township (Photo courtesy of Limestone Township, 2014). 128

Table of Tables

Table 2.3-1	List of municipalities in Union County with associated populations (US Census, 2014).	7
Table 2.4-1	Distribution of Land Use (Union County GIS, 2014)	8
Table 2.5-1	Critical Facilities by Type in Union County (Union County GIS Department, 2014).	15
Table 3.1-1	Summary of participation from local municipalities during the 2014 Union County Hazard Vulnerability Assessment and Mitigation Plan Update.	18
Table 3.1-2	Summary of changes to the format of the 2010 and 2014 versions of the Union County Hazard Vulnerability Assessment and Mitigation Plan.	19
Table 3.2-1	Stakeholders who participated in the planning process.	21
Table 4.2.1-1	Presidential Disaster and Emergency Declarations affecting Union County.	25
Table 4.2.1-2	Gubernatorial Disaster Declarations or Proclamations affecting Union County.	26
Table 4.2.1-3	Small Business Administration Disaster Declarations affecting Union County.	27
Table 4.2.2-1	Natural hazards identified in the Union County 2010 Hazard Vulnerability Assessment and Mitigation Plan Update.	27
Table 4.2.2-2	List and description of natural hazards profiled in the 2014 Hazard Vulnerability Assessment and Mitigation Plan Update.	28
Table 4.3.1-1	Palmer Drought Severity Index (NDMC, 2009).	31
Table 4.3.1-2	Union County Declared Drought Status from 1980 to 2010 (PADEP, 2014).	33
Table 4.3.1-3	Middle Susquehanna Region Drought History (Cornell University, 2014).	34
Table 4.3.1-4	Number of reported domestic wells in Union County (PaGWIS, 2014).	36
Table 4.3.2-1	Richter scale magnitudes and associated earthquake size effects.	40
Table 4.3.2-2	Modified Mercalli Intensity Scale with associated impacts.	40
Table 4.3.3-1	Rivers and Streams in Union County	44

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 4.3.3-2	Flood and flash flood events impacting Union County from 1993-2014 (NCDC, 2014). Note that property damage values are estimates based on best available information. “Countywide” indicates several locations in the County were affected.	48
Table 4.3.3-3	Summary of the number and type of Repetitive Loss properties by municipality (PA Emergency Management Agency. October 2013. PA Standard State All-Hazard Mitigation Plan).	51
Table 4.3.3-4	Summary of the number and type of Severe Repetitive Loss properties by municipality (PA Emergency Management Agency. October 2013. PA Standard State All-Hazard Mitigation Plan).	52
Table 4.3.3-5	Union County Municipal Participation in the National Flood Insurance Program.	54
Table 4.3.3-6	Recurrence intervals and associated probabilities of occurrence (FEMA, 2007).	55
Table 4.3.3-7	Community Flood Vulnerability for Union County.	57
Table 4.3.3-8	Structures in the SFHA by Generalized Land Use Type (Union County GIS Department, 2014)*	58
Table 4.3.3-9	Public Facilities in Special Flood Hazard Areas.	59
Table 4.3.4-1	Saffir-Simpson Scale categories with associated wind speeds and damages (NHC, 2009).	62
Table 4.3.4-2	Previous tropical storm events with centers of circulation within 30 nautical miles of Union County.	63
Table 4.3.5-1	Percent of Area with Steep Slopes (Union County GIS Department, 2014).	69
Table 4.3.5-2	Landslide Vulnerability for Union County.	72
Table 4.3.6-1	Percent of Area with Potential for Land Subsidence or Sinkholes.	75
Table 4.3.6-2	Subsidence Vulnerability for Union County.	76
Table 4.3.6-3	Critical Facilities in Areas with Potential for Subsidence or Sinkholes.	77
Table 4.3.7-1	Enhanced Fujita Scale (EF-Scale) categories with associated wind speeds and description of damages.	79
Table 4.3.7-2	Expected Tornado Damages.	79
Table 4.3.7-3	Previous tornado events between 1950 and 2014 in Union County (NCDC, 2014).	80
Table 4.3.7-4	Previous windstorm events greater than 50 knots in Union County between 1950 and 2014 (NCDC, 2014).	80

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 4.3.7-5	Manufactured housing units per municipality in Union County (Union County GIS Department, 2014).....	85
Table 4.3.8-1	List of wildfire events reported in Union County from 2008-2013 (DCNR, 2013).	86
Table 4.3.8-2	List of jurisdictions with each wildfire “hazard” rating.....	88
Table 4.3.8-3	Wildfire Vulnerability for Union County.....	90
Table 4.3.9-1	Previous winter storm events impacting Union County since 1950 (NCDC, 2014).	94
Table 4.3.9-2	Probability of Measurable Snowfall in Union County by Snow Station Location (NCDC, 2013).	95
Table 4.3.9-3	Age of housing units in Union County (U.S. Census, ACS 2008-2012)	96
Table 4.4.1-1	Summary of Risk Factor approach used to rank hazard risk.	97
Table 4.4.2-1	Ranking of hazard types based on Risk Factor methodology.....	98
Table 4.4.2-2	Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk	99
Table 4.4.3-1	Crop losses in Union County resulting from drought (USDA, 2014). .	103
Table 5.2.1-1	Regulatory Capabilities	108
Table 6.1-1	List and review summary of 2010 mitigation strategy goals and objectives.	116
Table 6.1-2	List and review summary of 2010 mitigation actions.	120
Table 6.2-1	List of 2014 mitigation strategy goals and objectives.	129
Table 6.3-1	Mitigation techniques used for the hazards in Union County.....	131

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

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

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table of Acronyms			
ACRONYM	FULL NAME	ACRONYM	FULL NAME
HMSC	Hazard Mitigation Steering Committee	SFIP	State Flood Insurance Program
HVA	Hazards Vulnerability Analysis	SOG	Standard Operating Guide
ICC	International Code Council	UCC	Universal Construction Code
IBC	International Building Code	US DOT	United States Department of Transportation
NCDC	National Climatic Data Center	USACE	United States Army Corps of Engineers
NDIS	National Drought Information System	USDA	United States Department of Agriculture
NDMC	National Drought Mitigation Center	USGS	United States Geological Survey
NFIP	National Flood Insurance Program	WYO	Write Your Own

1. Introduction

1.1. Background

This plan is an update of the *Union County Hazard Vulnerability Assessment and Mitigation Plan Update* that was last updated and adopted for implementation by Union County, Pennsylvania and the 14 jurisdictions within the County in 2010.

Union County is at risk of damage from a variety of natural hazards: flooding, winter storms, tornado or windstorms, wildfire, earthquake, land subsidence, landslide, hurricanes, and drought. This plan explains a rigorous analysis of the potential effects of these natural hazards on the structures and infrastructure within Union County and proposes hazard mitigation measures to reduce the risk of a natural hazard leading to a disaster with property loss, business disruption, or even loss of life.

The emergency management community, citizens, elected officials and others in Union County recognize the potential impacts of natural hazards on their community and have developed this plan to mitigate potential damages and reduce future losses. Hazard mitigation actions reduce the potential for loss of life and destruction of property. Mitigation actions are taken in advance of the occurrence of a potential hazard and are essential for breaking the disaster cycle of damage, reconstruction, and repeated damage.

Accordingly, the Union County Hazard Mitigation Planning Team (HMPT), composed of government leaders from Union County, in cooperation with elected officials of the County and its municipalities have prepared this Hazard Vulnerability Assessment and Mitigation Plan Update. The plan is the result of work by citizens of the County to develop a pre-disaster multi-hazard mitigation plan that will not only guide the County towards greater disaster resistance, but will also respect the character and needs of the community.

1.2. Purpose

This plan was developed for the purpose of:

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

Adoption of this plan ensures that Union County and participating jurisdictions continue to be eligible to apply for and receive certain Federal grant funds that are administered by the Commonwealth of Pennsylvania for the Federal Emergency Management Agency (FEMA). This

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

plan complies with the requirements of the Disaster Mitigation Act of 2000 and its implementing regulations published in Title 44 of the Code of Federal Regulations (CFR) Section 201.6.

1.3. Scope

The Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update has been prepared to meet requirements set forth by the FEMA and PEMA in order for the County to be eligible for funding and technical assistance from State and Federal hazard mitigation programs. It will be updated and maintained to continually address hazards determined to be of significant risk to the County and/or its local municipalities. Updates will take place following significant disasters or at a minimum, every five years.

1.4. Authority and References

Authority for this plan originates from the following federal sources:

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

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

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

The following 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.



Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

- FEMA Hazard Mitigation Assistance Unified Guidance. September 11, 2013.
- FEMA. Integrating Hazard Mitigation Into Local Planning: Case Studies and Tools for Community Officials. March 1, 2013
- FEMA. Mitigation Ideas. A Resource for Reducing Risk to Natural Hazards. January 2013.

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

- PEMA: *Hazard Mitigation Planning Made Easy!*
- PEMA Mitigation Ideas: *Potential Mitigation Measures by Hazard Type; A Mitigation Planning Tool for Communities.* March 6, 2009.
- PEMA: *Standard Operating Guide.* October 19, 2013.

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

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

2. Community Profile

2.1. *Geography and Environment*

Union County is a rural community in the heart of Pennsylvania. The County consists of four boroughs and 10 townships. Lewisburg, a showcase of Federal and Victorian architecture, is the Union County government seat.

Union County is in the Appalachian Region of north central Pennsylvania. The County stretches from the Bald Eagle Mountains in the north to the junction of the East and West Branches of the Susquehanna River in the south. The County encompasses two general topographical areas: the Appalachian Mountains in the west and north and the Susquehanna lowlands in the east and south.

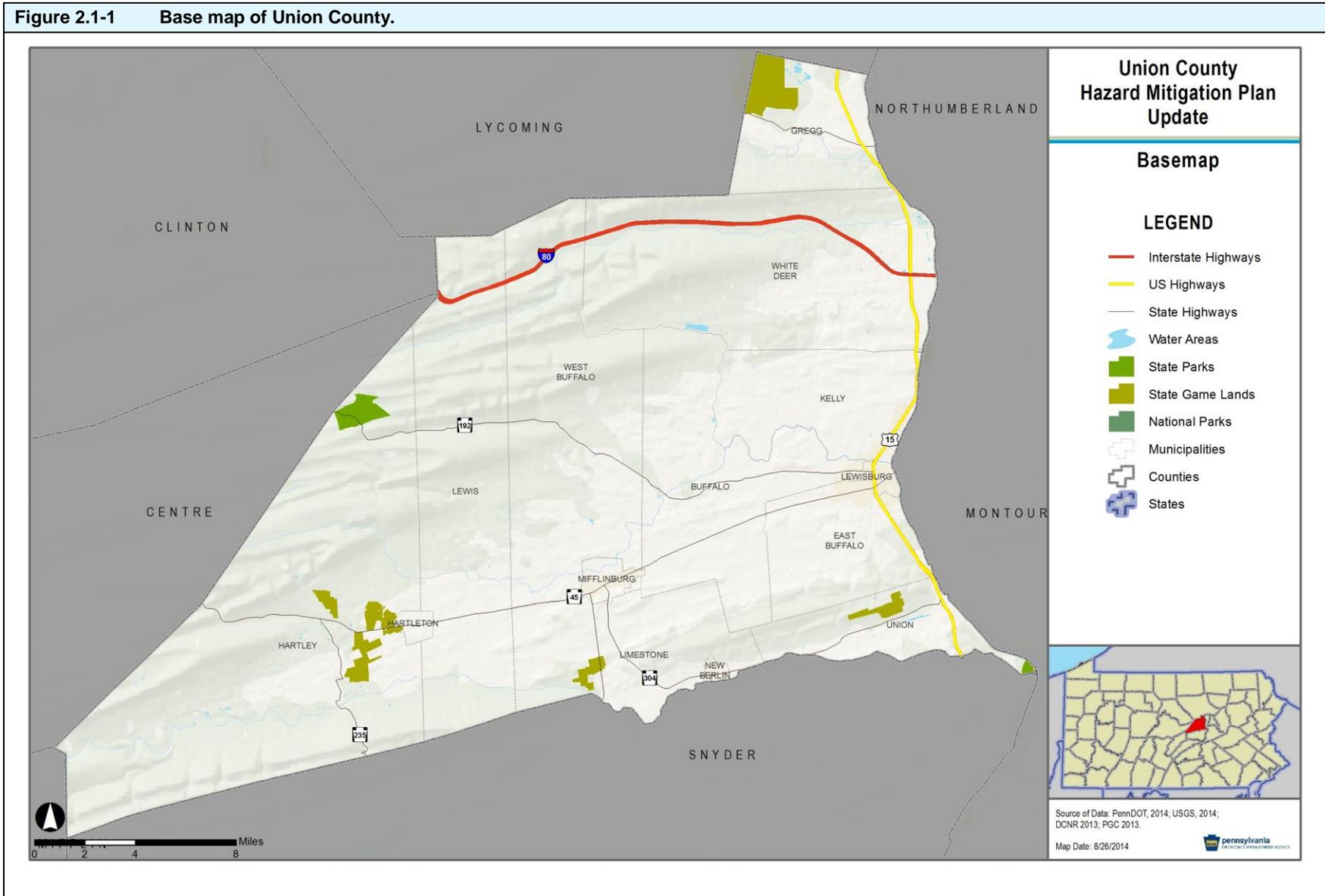
The County covers about 318 square miles or 203,420 acres and consists mostly of wooded mountains and agricultural land. There are three state parks in the County: R.B. Winter State Park, Sand Bridge State Park, and Shikellamy State Park.

Interstate 80 extends east to west through the northern part of the County providing access to Scranton, Wilkes-Barre, and State College. U.S. Highway 15 passes north to south along the eastern edge of the County and provides access to Harrisburg. State Route 45 traverses the center of the County from east to west connecting the Boroughs of Lewisburg, Mifflinburg, and Hartleton. The locations of highways, boroughs, and townships are provided in Figure 2.1-1.

Adjacent counties include Lycoming County to the north, Clinton County to the northwest, Northumberland County to the east, Snyder and Mifflin Counties to the south, and Centre County to the west.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Figure 2.1-1 Base map of Union County.



Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

The four boroughs and 10 townships that participated in the development of the Union County Hazard Vulnerability Assessment and Mitigation Plan Update are:

- **Hartleton Borough** is located between Lewis and Hartley Townships in the western area of the County and covers approximately one square mile. State Route 45 traverses the Borough.
- **Lewisburg Borough** is located along the bank of the West Branch of the Susquehanna River and covers approximately one square mile. The Borough is the seat of government for Union County and is home to Bucknell University.
- **Mifflinburg Borough** is located in Buffalo Valley in the south central area of Union County and covers about two square miles. Buffalo Creek passes east-west through the Borough and has been the source of previous flooding.
- **New Berlin Borough** is located on Penns Creek, which divides Union and Snyder Counties. The Borough measures less than ½ square mile. The Borough is the site of the original seat of government for Union County.
- **Buffalo Township** is centrally located in the County and is rural in character with a land area of about 30 square miles. The “Great Valley” at the center of the Township is framed by Buffalo Mountain to the north and Shamokin Mountain to the south. Buffalo Creek is the cause of flooding at the eastern tip of the township where it meets the floodplains of the Susquehanna River. The Township includes the villages of Vicksburg, Cowan, Buffalo Crossroads, and Mazeppa.
- **East Buffalo Township** is located along the west bank of the Susquehanna River and has a land area of about 15 square miles. Valleys encompass a major portion of the Township with Shamokin Mountain along the southern boundary.
- **Gregg Township** is the most northern township in the County and is geographically separated from the rest of the County by the White Deer Ridge. The Township has a land area of about 15 square miles. The West Branch of the Susquehanna River forms the Township’s eastern boundary. The Great Streams Common Industrial Park is located in the Township along with the Allenwood Federal Correction Complex.
- **Hartley Township** is the most western and rural and of the townships in Union County covering almost 80 square miles. Mountainous terrain accounts for 73 percent of the land area, and the Bald Eagle State Forest covers 60 percent of the Township. Penns Creek and Laurel Run flow eastward through the Township to the Susquehanna River. The Township includes the villages of Laurelton, Gen Iron, and Weikert.
- **Kelly Township** is located along the west bank of the Susquehanna River and has a land area of about 17 square miles. A majority of land in the Township is in agricultural

use or woodland. Several areas of the Township are subject to flooding from the Susquehanna, Buffalo Creek, and Spruce Run. Lewisburg Federal penitentiary is located along the southern edge of the Township. The Township includes the communities of West Milton and Kelly Crossroads.

- **Lewis Township** is located in the western area of the County and is the third largest Township with a land area of about 39 square miles. Mountainous terrain and forest cover a large portion of the Township. Hartleton Borough is located at the western boundary of the Township. The Township includes the communities of Pleasant Grove, Swengal, and Millmont.
- **Limestone Township** is located south of Mifflinburg and has a land area of about 21 square miles. Shamokin Mountain is located along the southern portion of the Township. The Township includes the village of White Springs.
- **Union Township** is the smallest Township in the County with a land area of about 11 square miles. The Township is bordered by the West Branch of the Susquehanna River to the east. Shamokin Mountain forms the Township's northern boundary.
- **West Buffalo Township** is located in the central area of Union County covering about 38 square miles. Mountainous terrain and the Bald Eagle State Forest cover the entire northern portion of the Township and account for nearly 50 percent of the land area. Valleys along the southern portion of the County include agricultural lands, woodlands, and wetlands. The Township includes the community of Forest Hill.
- **White Deer Township** is located in the eastern area of the County along the west bank of the Susquehanna River and is the second largest township with a land area of about 46 square miles. Mountainous terrain and state forest cover extend across the western and northern areas of the Township. The Township includes the villages of West Milton, White Deer, and Columbia.

2.2. Community Facts

Union County was created on March 22, 1813, from part of Northumberland County. The County was named in reference to the federal Union. It has a total area of 318 square miles, of which 316 square miles is land. The County consists of 10 townships and four boroughs which are listed in Section 2.1 above. There are four public school districts throughout the County (Lewisburg Area School District, Mifflinburg Area School District, Milton Area School District, and Warrior Run School District). There is one university, Bucknell University, located in Lewisburg, and one vocational school, the SUN Area Technical Institute, in New Berlin.

2.3. Population and Demographics

According to the 2010 Census, the population of Union County is 44,947. The US Census estimates that in 2013, Union County's population declined to 44,867. Table 2.3-1 provides a

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

distribution of County population per municipality obtained from the U.S. Census Bureau, Population Estimates Program. Note that 2013 populations are estimated projections based on 2010 Census results.

Table 2.3-1 List of municipalities in Union County with associated populations (US Census, 2014).			
MUNICIPALITY	2010 POPULATION	2013 ESTIMATED POPULATION	PERCENT CHANGE (%)
Buffalo Township	3,538	3,535	-0.08%
East Buffalo Township	6,414	6,383	-0.48%
Gregg Township	4,984	4,954	-0.60%
Hartleton Borough	283	284	0.35%
Hartley Township	1,820	1,808	-0.66%
Kelly Township	5,491	5,465	-0.47%
Lewis Township	1,480	1,470	-0.68%
Lewisburg Borough	5,792	5,733	-1.02%
Limestone Township	1,723	1,742	1.10%
Mifflinburg Borough	3,540	3,503	-1.05%
New Berlin Borough	873	865	-0.92%
Union Township	1,589	1,592	0.19%
West Buffalo Township	2,983	2,981	-0.07%
White Deer Township	4,437	4,552	2.59%
TOTAL	44,947	44,867	-0.18%

The population of Union County is concentrated in Lewisburg Borough and the surrounding townships in the eastern portion of the County. The 2013 population estimate for Union County provided by the U.S. Census Bureau is 44,867. Population in the County grew from 36,176 in 1990 to 41,624 in 2000 to 44,947 in 2010 (U.S. Census, 2014). Between 1990 and 2000, a portion of this increase was due to the opening of Allenwood Federal Correctional Complex in Gregg Township. Excluding the inmate population, Union County has historically experienced a steady increase of between 2,000 to 3,000 persons per decade since 1920. The Union County Planning Department projects that the population will continue to increase at the historical rate in upcoming decades.

The median income of households in Union County is \$46,737. This is approximately \$6,000 more than the national median household income (U.S. Census, 2014). However, 12.6% of the Union County population lives in poverty; 17.9% of related children under 18 are below the poverty line, compared with 6.8% of people 65 years or older. The median age of the County population is 38.4 years with 18.2% of the population under 18 years of age and 15.0% of the population aged 65 years or older. Approximately 76% of housing units in the County are

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

single-unit structures, 16.2% are multi-unit structures and 7.9% are mobile homes. The median monthly housing costs for mortgaged home-owners is \$1,270 and non-mortgaged owners is \$444. Renters pay an average of \$697 per month. Eighty-eight point eight percent of the County population is White, 8.0% is Black or African-American, 5.7% is Hispanic, and 1.3% is Asian (U.S. Census, 2014).

2.4. Land Use and Development

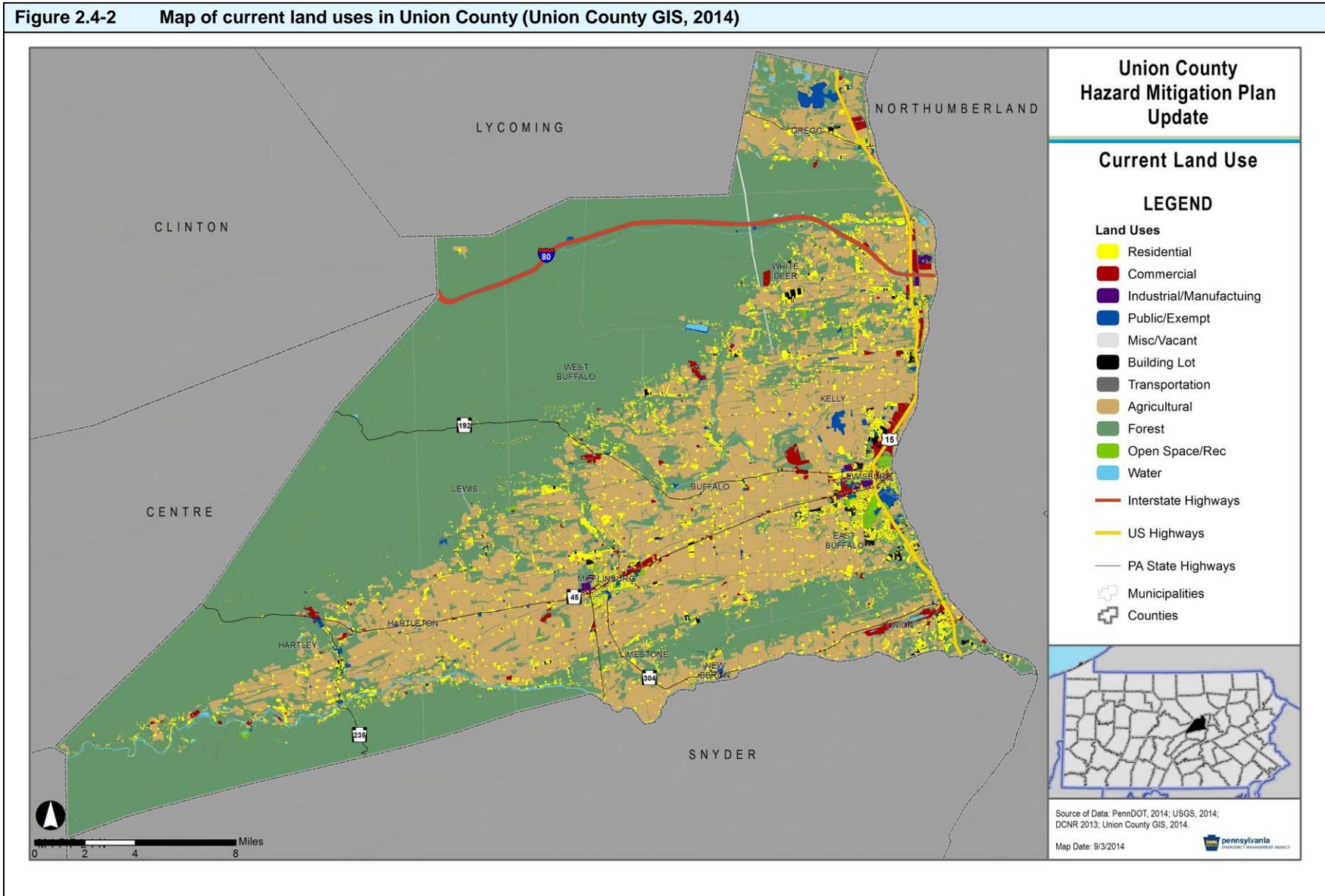
Land use in the County is classified as agricultural, commercial, forested, industrial, open space/recreation area, public space, residential, transportation, water, or vacant land. More than 60 percent of the County is forested, including approximately 100 square miles of state forest. Almost 30 percent of Union County's land use is agricultural. Table 2.4-1 summarizes land use by acres and percentage of the area of the County. Figure 2.4-1 illustrates the existing general land use in the County. Union County's major watersheds are depicted in Figure 2.4-2. There are six major watersheds in Union County.

LAND USE CATEGORY	ACREAGE	PORTION OF UNION COUNTY
Agricultural	58,596.77	28.74%
Building Lot*	720.42	0.35%
Commercial	2,183.16	1.07%
Forest	123,199.71	60.43%
Industrial/Manufacturing	243.14	0.12%
Miscellaneous/Vacant	170.84	0.08%
Open Space/Rec	512.12	0.25%
Public/Exempt	1,367.99	0.67%
Residential	11,314.36	5.55%
Transportation	4,191.74	2.06%
Water	1,379.79	0.68%
TOTAL	203,880.02	100.00%

* This land use category consists of areas of vacant land that have primarily been subdivided for housing developments that have yet to be built upon.

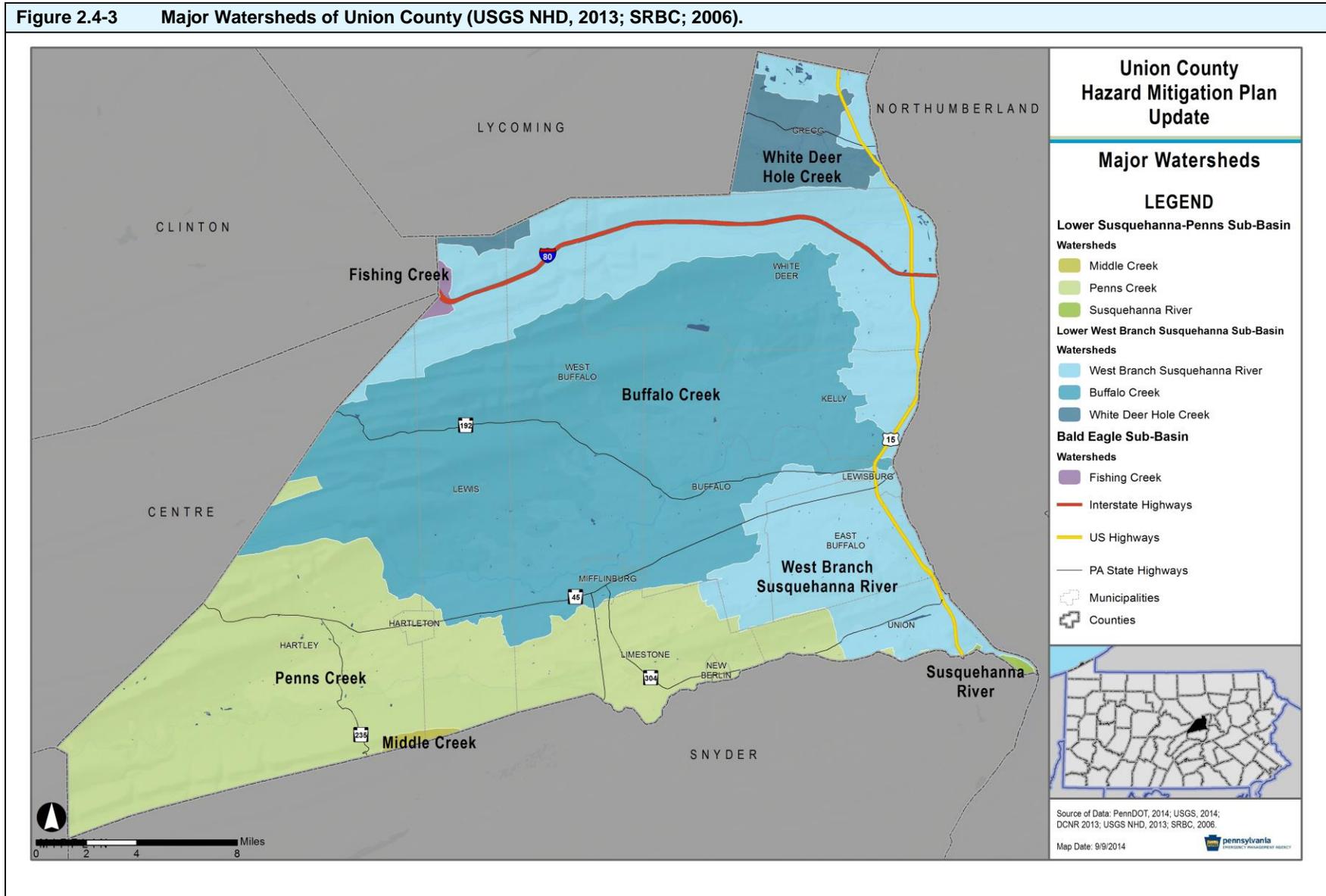
Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Figure 2.4-2 Map of current land uses in Union County (Union County GIS, 2014)



Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Figure 2.4-3 Major Watersheds of Union County (USGS NHD, 2013; SRBC; 2006).





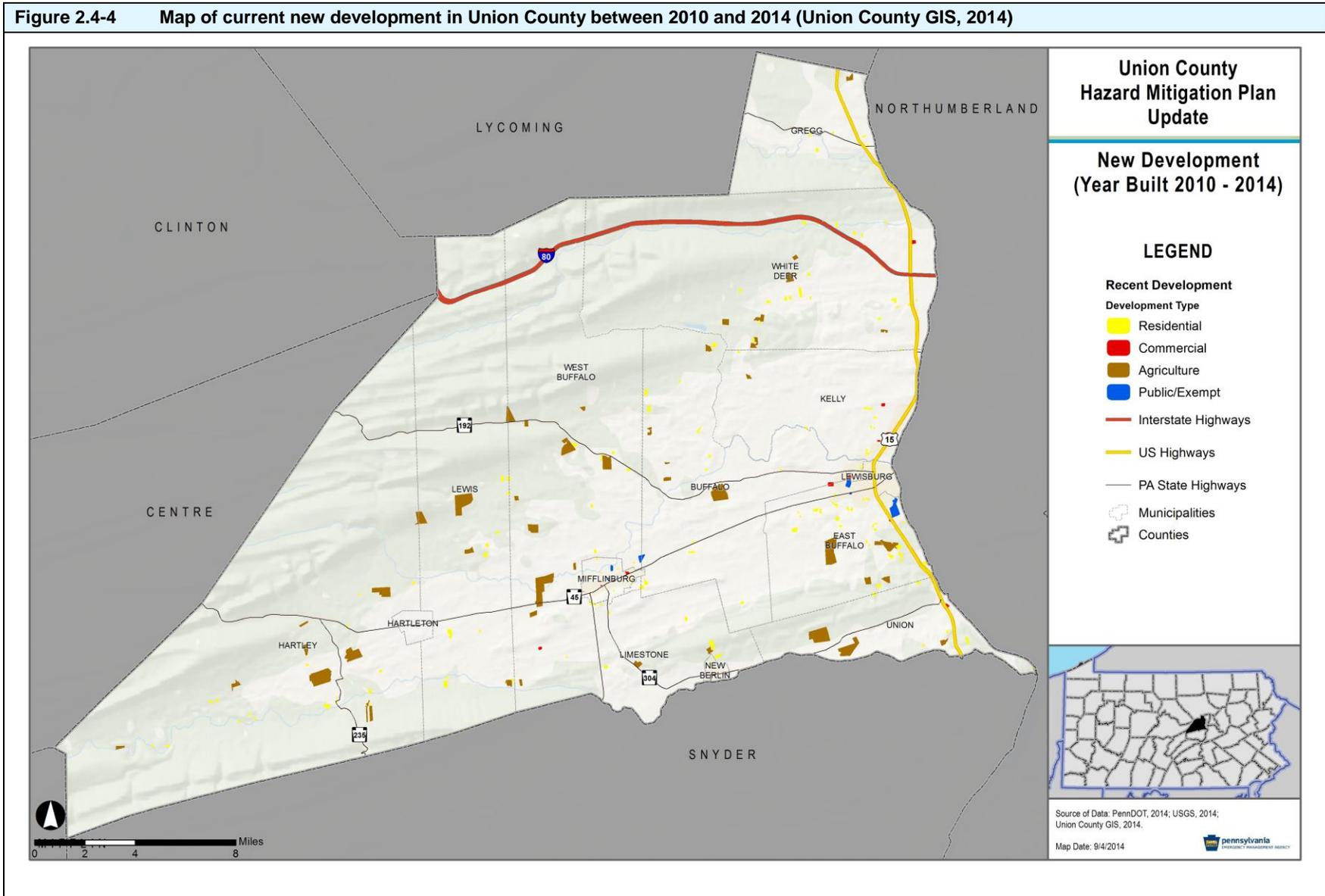
Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

With continued growth, according to U.S. Census data, the number of housing units in the County by 2050 will be 24,612, which would be a 69 percent increase over the 16,995 housing units identified in the County in the 2010 Census. According to the 2009 Comprehensive Plan for Union County, growth is anticipated to occur primarily in Hartleton Borough with some growth near U.S. Highway 15 in East Buffalo and Kelly Townships on land currently in agricultural or forestry use.

Between 2010 and 2014, new development occurred in a scattered manner throughout the County. New development has been primarily residential and agricultural. Most residential development occurred in the eastern part of the County and agricultural development occurred mostly in the southern half of the County. Commercial development occurred near the U.S. Highway 15 and State Route 45 corridors. Figure 2.4-3 shows the location of recent development within the County. An additional discussion of future land development and how it interacts with hazards is provided in Section 4.4.4.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Figure 2.4-4 Map of current new development in Union County between 2010 and 2014 (Union County GIS, 2014)



2.5. Data Sources and Limitations

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

- Critical facilities (including Bucknell University, community facilities, county buildings, fire companies, EMS, hotels/motels, hospitals, libraries, medical facilities, military facilities, municipal buildings, PennDOT facilities, police, prisons, public schools, Red Cross, retail facilities, retirement homes, sewer facilities, utilities, and water suppliers)
- Structures
- Streams and water bodies
- Current land use
- Steep slopes
- Parcels
- Municipal boundaries
- Transportation routes and railways

Union County's DFIRM (effective date September 28, 2007) was downloaded in July 2014 and extracted from the National Flood Hazard Layer. This data provides flood frequency and elevation information used in the flood hazard risk assessment. Additional base map data was provided by PA Game Commission, PA DCNR, and PennDOT. Also, population data from the 2010 Census and 2013 estimated populations were obtained from the U.S. Census Bureau (2014).

Additional information used to complete the risk assessment for this plan was taken from various government agency and non-government agency sources. Those sources are cited where appropriate throughout the plan and on each map with full references listed in **Appendix A – Bibliography**. It should be noted that numerous GIS datasets were obtained from the Pennsylvania Spatial Data Access (PASDA) website (<http://www.pasda.psu.edu/>). PASDA is the official public access geospatial information clearinghouse for the Commonwealth of Pennsylvania. PASDA was developed by the Pennsylvania State University as a service to the citizens, governments, and businesses of the Commonwealth. PASDA is a cooperative project of the Governor's Office of Administration, Office for Information Technology, Geospatial Technologies Office and the Penn State Institutes of Energy and the Environment of the Pennsylvania State University.

In order to assess the vulnerability of different jurisdictions to the hazards, data on past occurrences of damaging hazard events was gathered. The Union County 2010 Hazard Vulnerability Assessment and Mitigation Plan used hazard data from SHELDUS. SHELDUS is

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

a county-level hazard loss data set for the United States for 18 different natural hazard events types. However, because the SHELUS database was down for maintenance during the period of plan writing for this 2014 plan update, hazard data from the National Climatic Data Center (NCDC) database was utilized instead. NCDC is a division of the US Department of Commerce's National Oceanic and Atmospheric Administration (NOAA). Information on hazard events is compiled by NCDC from data gathered by the National Weather Service (NWS), another division of NOAA. NCDC then presents it on its website in various formats. The data used for this plan came from the US Storm Events database, which "documents the occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce" (NOAA, 2014). The database currently contains hazard event data from January 1950 to May 2014. Other federal datasets came from USGS, the National Hurricane Center, and NOAA's Storm Prediction Center.

HAZUS-MH is a powerful risk assessment methodology for analyzing potential losses from floods, hurricane winds, and earthquakes. In HAZUS-MH, current scientific and engineering knowledge is coupled with the latest GIS technology to produce estimates of hazard-related damage before or after a disaster occurs. Version 2.1 of this software was used to estimate losses for floods in Union County. For more information about the methodology employed to prepare the HAZUS model and estimate losses, see **Appendix F**.

This 2014 Hazard Vulnerability Assessment and Mitigation Plan Update evaluates the vulnerability of the County's critical facilities. For the purposes of this plan, critical facilities are those entities that are essential to the health and welfare of the community. The list of critical facilities was developed in conjunction with the Union County Department of Emergency Management, Union County Planning Department, and Union County GIS Department. Critical facilities have been identified in Union County to include fire stations, police stations, and municipal and county office buildings as well as facilities where a number of people might require special attention or evacuation should an identified natural hazard occur. Table 2.5-1 summarizes the critical facilities in Union County by type and by municipality. For a complete listing of critical facilities, please see **Appendix E**.

Throughout the risk and vulnerability assessment included in Section 4, descriptions of limited data indicate some areas in which the County and municipalities can improve their ability to identify vulnerable structures and improve loss estimates. As the County and municipal governments work to increase their overall technical capacity and implement comprehensive planning goals, they will also attempt to improve the ability to identify areas of increased vulnerability.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

FACILITY	Buffalo Township	East Buffalo Township	Gregg Township	Hartleton Borough	Hartley Township	Kelly Township	Lewis Township	Lewis-burg Borough	Limestone Township	Mifflin-burg Borough	New Berlin Borough	Union Township	West Buffalo Township	White Deer Township	TOTAL
Bucknell	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Community	1	2	0	0	0	1	0	1	0	0	1	0	0	1	7
County	0	1	0	0	0	0	0	1	0	1	0	0	0	0	3
EMS	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Fire Company	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Fire Company /EMS	0	0	1	0	1	0	0	1	0	0	1	1	0	1	6
Hospital	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Hotel/Motel	0	3	1	0	0	3	0	0	0	0	0	0	0	2	9
Library	0	1	0	0	1	0	0	0	0	1	0	0	0	0	3
Medical Facility	1	2	0	0	0	8	0	0	0	1	0	0	0	0	12
Military	0	1	0	0	0	1	0	0	0	0	0	0	0	0	2
Municipal	1	1	1	0	1	1	1	1	1	2	0	1	1	1	13
PennDOT	0	1	0	0	0	0	0	0	0	1	1	0	1	0	4
Police	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Prison	0	0	5	0	0	1	0	0	0	0	0	0	0	0	6
Public School	1	2	0	0	1	1	0	1	0	4	2	0	0	1	13
Red Cross	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Retail	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Retirement Facility	0	1	0	0	1	1	0	3	0	0	0	0	0	0	6
Sewer	1	1	1	1	1	1	1	0	0	1	1	0	0	1	10
Utility	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Water	0	0	0	0	1	0	0	0	0	0	0	0	1	1	3
Total Critical Facilities in Municipality	5	20	9	1	7	20	2	8	1	13	6	2	3	8	105

3. Planning Process

3.1. Update Process and Participation Summary

This 2014 plan is an update of the Union County Hazard Vulnerability Assessment and Mitigation Plan that was originally developed in 2003-2005 and adopted in 2005-2006 and then updated and adopted for implementation in 2010.

The 2005 plan, 2010 plan, and this updated 2014 Union County Hazard Vulnerability Assessment and Mitigation Plan represent the work of citizens, elected and appointed government officials, business leaders, and volunteers of non-profit organizations in developing a blueprint for protecting community assets, preserving the economic viability of the community, and saving lives.

An update to the 2010 plan was initiated in June 2014. Union County engaged in the plan update initiative in 2014 (a year early in the five-year plan update cycle) as funding support was available from the Pennsylvania Emergency Management Agency and the Federal Emergency Management Agency. Michael Baker Jr., Inc., a full-service engineering firm that provides hazard mitigation planning guidance and technical support, assisted the County through the update process. The 2014 Hazard Vulnerability Assessment and Mitigation Plan Update was completed in October 2014.

The 2014 plan update was led by a Hazard Mitigation Steering Committee and a Hazard Mitigation Planning Team. Each member of the 2010 HMPT as well as other community leaders were invited by the County Mitigation Officer to actively participate in updating the plan; those who accepted the invitation comprise the current Planning Team members, listed further in this section.

The 2014 planning process began with a kickoff meeting with representatives from municipalities, county agencies, non-profit groups, and other stakeholders. All potential participants were mailed an invitation to attend the meeting. In addition, officials of Northumberland, Clinton, Mifflin, Centre, Snyder, and Lycoming Counties were notified via mail and invited to participate in the planning process. While none of these neighboring counties participated in plan development, each is aware of the planning effort as Union County has existing mutual aid agreements with each of these adjacent Counties and works with representatives regularly on updating Emergency Operations Plans.

Contact information was obtained from all meeting attendees and used to create a HMPT mailing list. Section 3.2 provides a discussion of the HMPT as well as a table of members with their corresponding organization(s).

Municipal officials and the other stakeholders continued to receive notification regarding all meetings via telephone, letters, email, or some combination. A brief description of each meeting that was held is available in Section 3.3. In addition, meeting minutes that describe in detail events of each meeting are available in **Appendix C – Meeting and Other Participation Documentation**.



Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

In order to obtain information from municipalities and other stakeholders, forms and surveys were distributed and collected throughout the planning process. Some of the forms were completed during planning meetings while others were sent via email or were posted to the plan website, www.pennsylvaniiahmp.com/union-hmp. These forms were completed and returned in between scheduled meetings. All municipalities were required to have a representative attend at least one meeting and provide pertinent information for the plan update. Table 3.1-1 lists each municipality along with their specific participation and contributions to the planning process. Sign-in sheets for each meeting with individual names are available in **Appendix C – Meeting and Other Participation Documentation** along with all completed forms and surveys. **Fourteen out of 14** municipalities participated in the plan update.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 3.1-1 Summary of participation from local municipalities during the 2014 Union County Hazard Vulnerability Assessment and Mitigation Plan Update.								
MUNICIPALITY	MEETING				WORKSHEETS/SURVEYS/FORMS			
	HAZARD MITIGATION PLANNING WORKSHOP July 16, 2014	HAZARD MITIGATION PLANNING TELE-CONFERENCE #1 July 29, 2014	HAZARD MITIGATION PLANNING TELE-CONFERENCE #2 August 15, 2014	PUBLIC MEETING September 17, 2014	RISK ASSESSMENT SURVEY	CAPABILITY ASSESSMENT	NFIP WORK-SHEET	5-YEAR PLAN REVIEW WORK-SHEET
Buffalo Township		✓			✓	✓	✓	✓
East Buffalo Township		✓		✓	✓	✓	✓	✓
Gregg Township		✓			✓	✓		✓
Hartleton Borough	✓				✓			
Hartley Township		✓		✓	✓			
Kelly Township	✓				✓			
Lewis Township		✓			✓	✓	✓	✓
Lewisburg Borough	✓				✓	✓	✓	✓
Limestone Township			✓		✓	✓	✓	✓
Mifflinburg Borough	✓				✓	✓	✓	✓
New Berlin Borough		✓			✓	✓	✓	✓
Union Township	✓				✓	✓	✓	✓
West Buffalo Township		✓			✓	✓	✓	✓
White Deer Township	✓			✓	✓			

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

The 2014 plan follows an outline developed by the Pennsylvania Emergency Management Agency in 2009 which provides a standardized format for all local hazard mitigation plans in the Commonwealth of Pennsylvania. As a result, the format of the 2014 Union County Hazard Vulnerability Assessment and Mitigation Plan Update contrasts significantly from the 2010 Union County Hazard Vulnerability Assessment and Mitigation Plan Update. These changes are summarized in Table 3.1-2. A summary of the update process used for each section of this plan is included in Sections 4.1, 5.1, 6.1, and 7.1.

Table 3.1-2 Summary of changes to the format of the 2010 and 2014 versions of the Union County Hazard Vulnerability Assessment and Mitigation Plan.	
2010 SECTION	2014 SECTION
Introduction	Section 1
Purpose of the Plan	Section 1.2
Organization of the Plan	Section 1.3
Jurisdictions Represented in the Plan	Sections 2
Adoption Resolutions	Section 8
Planning Process	Section 3
Planning Process Update	Section 3.1
2005 Planning Process	Section 3.1
2010 Planning Process	Section 3.1
Community Profile	Section 2
Land Use and Development Trends	Section 2.4
Capability Assessment	Section 5
Hazard Identification	Section 4.2
Hazard Identification Update	Section 4.1
Description of Hazards	Section 4.2
Flooding Risk Assessment	Section 4.3.3
Flooding Update	Section 4.3.3
Hazard Profile - Flooding	Section 4.3.3
Vulnerability Assessment - Flooding	Section 4.3.3
Heavy Snow or Ice Risk Assessment	Section 4.3.9
Heavy Snow or Ice Update	Section 4.3.9
Hazard Profile - Heavy Snow or Ice	Section 4.3.9
Vulnerability Assessment - Heavy Snow or Ice	Section 4.3.9
Tornado or High Wind Risk Assessment	Section 4.3.7
Tornado or High Wind Update	Section 4.3.7
Hazard Profile - Tornado or High Wind	Section 4.3.7
Vulnerability Assessment - Tornado or High Wind	Section 4.3.7
Wildfire Risk Assessment	Section 4.3.8
Wildfire Update	Section 4.3.8
Hazard Profile - Wildfire	Section 4.3.8
Vulnerability Assessment - Wildfire	Section 4.3.8
Earthquake Risk Assessment	Section 4.3.2
Earthquake Update	Section 4.3.2
Hazard Profile - Earthquake	Section 4.3.2
Vulnerability Assessment - Earthquake	Section 4.3.2
Land Subsidence Risk Assessment	Section 4.3.6

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 3.1-2 Summary of changes to the format of the 2010 and 2014 versions of the Union County Hazard Vulnerability Assessment and Mitigation Plan.	
2010 SECTION	2014 SECTION
Land Subsidence Update	Section 4.3.6
Hazard Profile - Land Subsidence	Section 4.3.6
Vulnerability Assessment - Land Subsidence	Section 4.3.6
Landslide Risk Assessment	Section 4.3.5
Landslide Update	Section 4.3.5
Hazard Profile - Landslide	Section 4.3.5
Vulnerability Assessment - Landslide	Section 4.3.5.
Drought Risk Assessment	Section 4.3.1
Drought Update	Section 4.3.1
Hazard Profile - Drought	Section 4.3.1
Vulnerability Assessment - Drought	Section 4.3.1
Summary of Risk Assessment Findings	Section 4.4
Mitigation Goals	Section 6.2
Mitigation Goals Update	Section 6.1
Mitigation Planning Principles	Section 6.2
Goals	Section 6.2
Mitigation Objectives	Section 6.2
Mitigation Objectives Update	Section 6.2
Objectives	Section 6.2
Alternative Mitigation Actions	Section 6.1
Mitigation Alternatives Update	Section 6.1
Review of Previously Proposed Mitigation Actions	Section 6.1
Comprehensive Range of Actions for Each Hazard	Section 6.3
Prioritization Methodology	Section 6.4
Proposed Mitigation Actions	Section 6.4
Mitigation Actions Update	Section 6.1
Selected Actions	Section 6.4
Plan Maintenance	Section 7
Plan Maintenance Update	Section 7.1
Monitoring Mitigation Actions	Section 7.2
Evaluating the Plan	Section 7.2
Updating the Plan	Section 7.2
List of Sources	Appendix A

3.2. The Planning Team

The Hazard Mitigation Steering Committee (HMSC) for the 2014 Plan Update included:

- David Wagner, Mitigation Officer, Union County Department of Emergency Management
- John DeVecchio, Community Planner, Union County Planning Department
- Keith Ayers, GIS Specialist, Union County GIS Office
- Robert Crebs, Operation and Training Officer, Union County Department of Emergency Management
- Alexis Williams, Planner, Michael Baker Jr., Inc.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

The HMSC developed a list of potential HMPT members which included municipal officials, state and Union County government representatives, adjacent county representatives, other non-profit organizations, and other stakeholders. All invited stakeholders are listed in **Appendix C**. These individuals were invited to participate in the plan update process. The HMSC worked throughout the process to plan and hold meetings, collect information, and conduct public outreach.

The stakeholders listed in Table 3.2-1 served on the 2014 countywide HMPT and actively participated in the planning process through attendance at meetings, completion of assessment surveys, or submission of comments.

Table 3.2-1 Stakeholders who participated in the planning process.	
MUNICIPALITY/ORGANIZATION	PARTICIPANT(S)
Buffalo Township	Robert Beck, William Zimmerman, George Young
East Buffalo Township	Stacy Kifolo, Lawson Fetterman
Gregg Township	Jodi Willow
Hartleton Borough	Tom Perrin
Hartley Township	Timothy Leitzel, Earl Bingaman
Kelly Township	David Hanssenplug
Lewis Township	Wayne Klingman
Lewisburg Borough	Steven Beattie
Limestone Township	Judy Christ
Mifflinburg Borough	Jim Emery
New Berlin Borough	Rebecca Witmer
Union Township	Wendy Yoder, R. Nelson Poe, Dave Anderson
West Buffalo Township	Robert Valentine, Mark Trutt
White Deer Township	Larry Maynard
Bucknell University	Gregg Rokavec
Citizens Electric	Eric Winslow, John Kelchner
Evangelical Hospital	Stan Hudson
Mifflin Area School District	David Oberlin
Union County Conservation District	Bill Dietrick

3.3. Meetings and Documentation

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

July 16, 2014 – Hazard Mitigation Planning Workshop held at the Union County Government Center to discuss project scope, schedule, goals, and available resources. Hazards from the 2010 plan were evaluated with the HMSC prior to this meeting and reviewed with the HMPT at the planning workshop. Municipal attendees completed an “Evaluation of Hazards and Risk Form” to identify their jurisdictional risk to each hazard. Capability Assessment Surveys and NFIP worksheets were also completed by municipal attendees. Projects from the 2010 plan were reviewed by municipalities who had included projects in the 2010 plan, and new projects and actions were developed to be included in the 2014 plan update.

July 29, 2014 – Hazard Mitigation Planning Teleconference #1 held via conference call with municipalities that were unable to attend the July 16 kickoff meeting and an opportunity to participate in the planning process. The July 16, 2014 PowerPoint slides were discussed with meeting attendees, and the participation forms were explained.

August 15, 2014 – Hazard Mitigation Planning Teleconference #2 held via conference call to give Limestone Township the opportunity to participate in the planning process. The July 16, 2014 PowerPoint slides were discussed with the meeting attendees, and the participation forms were explained.

September 17, 2014 – Public Meeting held at the Union County Government Center to update the public about the plan update process and findings. The meeting was advertised in two local newspapers on September 10, 2014: *The Standard* and *The Daily Item*. Municipalities were mailed a meeting reminder and encouraged to inform their residents about the meeting. Attendees were asked to review the entire plan on the County’s hazard mitigation plan website www.pennsylvaniiahmp.com/union-hmp and provide written comments.

3.4. Public & Stakeholder Participation

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

- **Capability Assessment Survey:** Collects information on local planning, regulatory, administrative, technical, fiscal, political and resiliency capabilities that can be included in the plan’s Capability Assessment section.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

- **Evaluation of Hazards and Risk Form:** Collects information from the HMPT regarding whether there have been changes to the frequency of occurrence, magnitude of impact, or geographic extent of hazards identified in the 2010 plan. In addition, the form asks members of the HMPT to select any additional hazards that they believe should be considered for inclusion in the 2014 plan.
- **NFIP Worksheet:** Collects information on a community's participation in and continued compliance with the NFIP.
- **Five-year Plan Review Worksheet:** Because many municipalities had actions/projects in the 2010 plan, they were asked to evaluate the status of projects submitted in the previous planning process, indicating if there had been progress, if a project had been discontinued or completed, and whether each project should be carried over into the 2014 plan.
- **Comment Form:** Provided to representatives and the public at the public meeting and used to provide comments on the hazards, risk assessment, mitigation strategy, and any other topics of the participants' choice.

Community participation and comment was encouraged throughout the planning process, particularly through the project website, www.pennsylvaniiahmp.com/union-hmp. This site acted as a repository for the entire planning process, including presentations, agendas, minutes, and worksheets from each meeting as well as promulgating meeting dates, times, and important announcements. The public was also encouraged to provide images and stories on the effects of the identified hazards in their communities on the website. From when the Union County HMP website went live on July 11, 2014 through October 10, 2014, 63 people visited the website, including 17 visits to the draft plan library.

To advertise the public meeting, a newspaper notice was published in two local newspapers on September 10, 2014 (*The Standard* and *The Daily Item*) to notify the citizens of Union County of the date and time of the public meeting. Copies of the newspaper notice are included in **Appendix C: Meeting and Other Participation Documentation**.

Union County posted the 2014 Draft Hazard Vulnerability Assessment and Mitigation Plan Update on the plan update website (www.pennsylvaniiahmp.com/union-hmp) beginning on September 15, 2014 and accepted comments through October 14, 2014. In addition, an invitation to the public to review and comment on the draft plan was posted on the home page of the Union County website. Comments were to be submitted in writing to David Wagner of the Union County Department of Emergency Management, to Alexis Williams of Michael Baker Jr., Inc., by mail or email, or online on the plan update website. No public comments were received at the final public meeting or through the comment form on the website. However, the HMSC reviewed the draft plan and had two comments which were incorporated into the plan. The first was that the HMSC wanted the Hurricane, Tropical Storm, and Nor'easter hazard profile (Section 4.3.4.2) to highlight Hurricane Agnes as the worst case scenario hurricane instead of

Hurricane Dennis. Additionally, the HMSC requested that an additional mitigation action be added to the plan's Mitigation Strategy (Section 6) for a mitigation project in East Buffalo Township to replace a culvert. Both of these edits were made to the draft plan.

3.5. Multi-Jurisdictional Planning

This Hazard Vulnerability Assessment and Mitigation Plan Update was developed using a multi-jurisdictional approach. With funding support from PEMA, the County departments had resources such as technical expertise and data which local jurisdictions lacked. However, involvement from local municipalities was critical to the collection of local knowledge related to hazard events and mitigation activities. Local municipalities also have the legal authority to enforce compliance with land use planning and development issues. The County undertook an intensive effort to involve all 14 municipalities in the planning process. Tables 3.1-1 and 3.2-1 list jurisdictional participation in the 2014 plan.

Table 3.1-1 documents jurisdictional presence at the meetings described in Section 3.3 and other involvement from each jurisdiction throughout the planning process. Each municipality was mailed invitations to all meetings and received telephone call reminders prior to each meeting. Surveys and forms were provided at the meetings or mailed to jurisdictions requesting that local information be provided. Jurisdictions were also directed to the plan update website where all forms were posted. In the end, all 14 municipalities in the County participated in the plan, thus achieving 100% participation. This is an increase in representation that was achieved in 2010 when 13 of the 14 municipalities participated and adopted the 2010 plan.

4. Risk Assessment

4.1. Update Process Summary

To reduce the potential for damage due to hazards, it is necessary to identify hazards that may affect the County. This risk assessment provides a factual basis for activities proposed by the County in its mitigation strategy. Hazards that may affect Union County are identified and defined in terms of location and geographic extent, magnitude of impact, previous events and likelihood of future occurrence. This hazard profile structure differs from what was used in the 2010 Union County Hazard Vulnerability Assessment and Mitigation Plan Update; however all information from the previous plan has been included or updated in the 2014 Hazard Vulnerability Assessment and Mitigation Plan Update, unless otherwise indicated.

The Union County Hazard Mitigation Steering Committee reviewed the hazards profiled in the 2010 Union County Hazard Vulnerability Assessment and Mitigation Plan Update prior to the July 16, 2014 planning workshop with the HMPT. The HMSC determined that all of the existing hazards should be continued into the plan update and decided that one additional natural hazard should be profiled in the 2014 plan update: Hurricanes, Tropical Storms, and Nor'easters. While the HMSC discussed some human-made hazards, it was decided that the focus of the mitigation plan and mitigation resources should be on natural hazards as other planning mechanisms have been developed by Union County and participating boroughs and townships that thoroughly address human-made hazards. The hazards selected by the HMSC were then reviewed with the HMPT at the July 16, 2014 planning workshop. The municipalities completed an Evaluation of Hazards and Risk Form to indicate their jurisdictional risk to each hazard that would be profiled in the 2014 plan. All fourteen municipalities in Union County completed this form.

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

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

4.2. Hazard Identification

4.2.1. Table of Presidential Disaster Declarations

In the past, natural hazards have led to costly disasters in Union County resulting in a Presidential Declaration of Major Disaster or a Gubernatorial Proclamation of Extreme Emergency. Presidential Disaster and Emergency Declarations are issued when it has been determined that State and local governments need assistance in responding to a disaster event. Table 4.2.1-1 identifies Presidential Disaster and Emergency Declarations issued between 1955 through 2014 that have affected Union County. Additional declarations beyond 2014 can be found on the FEMA website at: <https://www.fema.gov/disasters/grid/state-tribal-government/44>.

DECLARATION NUMBER	DATE	EVENT
3356	October, 2012	Proclamation of Emergency – Hurricane Sandy
4030	September, 2011	Tropical Storm Lee
3340	September, 2011	Proclamation of Emergency – Remnants of Tropical Storm Lee
3235	September, 2005	Proclamation of Emergency – Hurricane Katrina
1557	September, 2004	Tropical Depression Ivan
3180	March, 2003	Proclamation of Emergency – Snowstorm
1298	September, 1999	Flooding
1093	January, 1996	Flooding
1085	January, 1996	Blizzard
1015	March, 1994	Winter Storm, Severe Storm
3105	March, 1993	Proclamation of Emergency – Blizzard
737	June, 1985	Severe Storms, High Winds, Tornadoes
485	September, 1975	Severe Storms, Heavy Rains, Flooding

In addition to these Presidentially-declared events, 20 events warranted Gubernatorial Disaster Declarations or Proclamations. Table 4.2.1-2 lists Gubernatorial Disaster Declarations or Proclamations that have been issued for Union County between 1954 and 2013.

DATE	EVENT
June, 2013	Proclamation of Emergency - High Winds, Thunderstorms, Heavy Rain, Tornado, Flooding
October, 2012	Proclamation of Emergency - Hurricane Sandy
April, 2012	Proclamation of Emergency - Spring Winter Storms
August, 2012 (amended September 2011)	Proclamation of Emergency - Severe Storms and Flooding (Lee/Irene)
January, 2011	Proclamation of Emergency - Severe Winter Storm

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 4.2.1-2 Gubernatorial Disaster Declarations or Proclamations affecting Union County.	
DATE	EVENT
February 2010	Proclamation of Emergency - Severe Winter Storm
April, 2007	Severe Storm
February, 2007	Proclamation of Emergency – Severe Winter Storm
February, 2007	Proclamation of Emergency – Regulations
April, 2007	Proclamation of Emergency – Severe Winter Storm
September, 2006	Proclamation of Emergency – Tropical Depression Ernesto
September, 2005	Proclamation of Emergency – Hurricane Katrina
July, 1999	Drought
September, 1995	Drought
November, 1980	Drought Emergency
January, 1978	Heavy Snow
February, 1978	Blizzard
February, 1972	Heavy Snow
January 1966	Heavy Snow
September, 1955	Drought

Union County has also received Small Business Administration Disaster Assistance during one disaster event that occurred in 1991. A Small Business Administration Disaster Declaration qualifies communities for access to affordable, timely, and accessible financial assistance. Table 4.2.1-3 illustrates the Small Business Administration Disaster Declaration issued for Union County between 1954 and 2011.

Table 4.2.1-3 Small Business Administration Disaster Declarations affecting Union County.	
DATE	EVENT
July, 1991	Drought

4.2.2. Summary of Hazards

Table 4.2.2-1 summarizes hazards identified in the 2010 Union County Hazard Vulnerability Assessment and Mitigation Plan Update.

Table 4.2.2-1 Natural hazards identified in the Union County 2010 Hazard Vulnerability Assessment and Mitigation Plan Update.	
HAZARD	
Drought	
Earthquake	
Flooding	
Heavy Snow or Ice	

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 4.2.2-1 Natural hazards identified in the Union County 2010 Hazard Vulnerability Assessment and Mitigation Plan Update.	
HAZARD	
Land Subsidence	
Landslide	
Tornado or High Wind	
Wildfire	

All hazards identified in 2010 plan were included in the 2014 plan update. The hazards were reviewed by the HMSC and then discussed with the members of the HMPT at the July 16, 2014 planning workshop. Each municipal attendee was provided with an *Evaluation of Hazards and Risk Form* and the PEMA Standard List of Hazards which is a comprehensive list of all hazards to be considered for evaluation in the 2014 plan. This list was obtained primarily from the 2007 Edition of the National Fire Protection Association's *NFPA 1600: Standard on Disaster/Emergency Management and Business Continuity Programs* (NFPA, 2007).

Following review of this hazards list and completion of the *Evaluation of Hazards and Risk Form*, the HMPT discussed the hazards selected by the HMSC for the 2014 plan, including the addition of the hazard hurricane, tropical storm, and nor'easter, and concurred on the list of hazards for the 2014 plan. Table 4.2.2-2 contains a complete list of all potential hazards in Union County identified through the risk assessments and planning meetings. Hazard profiles are included in Section 4.3 for each of these hazards.

Table 4.2.2-2 List and description of natural hazards profiled in the 2014 Hazard Vulnerability Assessment and Mitigation Plan Update.	
HAZARD	HAZARD DESCRIPTION
Drought	Drought is a natural climatic condition which occurs in virtually all climates, the consequence of a natural reduction in the amount of precipitation experienced over a long period of time, usually a season or more in length. High temperatures, prolonged winds, and low relative humidity can exacerbate the severity of drought. This hazard is of particular concern in Pennsylvania due to the presence of farms as well as water-dependent industries and recreation areas across the Commonwealth. A prolonged drought could severely impact these sectors of the local economy, as well as residents who depend on wells for drinking water and other personal uses (National Drought Mitigation Center, 2006).
Earthquake	An earthquake is the motion or trembling of the ground produced by sudden displacement of rock usually within the upper 10-20 miles of the Earth's crust. Earthquakes result from crustal strain, volcanism, landslides, or the collapse of underground caverns. Earthquakes can affect hundreds of thousands of square miles, cause damage to property measured in the tens of billions of dollars, result in loss of life and injury to hundreds of thousands of persons, and disrupt the social and economic functioning of the affected area. Most property damage and earthquake-related deaths are caused by the failure and collapse of structures due to ground shaking which is dependent upon amplitude and duration of the earthquake (FEMA, 1997).
Flood, Flash Flood, &	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

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 4.2.2-2 List and description of natural hazards profiled in the 2014 Hazard Vulnerability Assessment and Mitigation Plan Update.	
HAZARD	HAZARD DESCRIPTION
Ice Jam	experienced when precipitation occurs over a given river basin for an extended period of time. Flash flooding is usually a result of heavy localized precipitation falling in a short time period over a given location, often along mountain streams and in urban areas where much of the ground is covered by impervious surfaces. The severity of a flood event is dependent upon a combination of stream and river basin topography and physiography, hydrology, precipitation and weather patterns, present soil moisture conditions, the degree of vegetative clearing as well as the presence of impervious surfaces in and around flood-prone areas. Winter flooding can include ice jams which occur when warm temperatures and heavy rain cause snow to melt rapidly. Snow melt combined with heavy rains can cause frozen rivers to swell, which breaks the ice layer on top of a river. The ice layer often breaks into large chunks, which float downstream, piling up in narrow passages and near other obstructions such as bridges and dams. All forms of flooding can damage infrastructure (USACE, 2007).
Hurricane, Tropical Storm, & Nor'easter	Hurricanes, tropical storms, and nor'easters are classified as cyclones and are any closed circulation storm 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, tornadoes, or heavy snow and ice as is the case with nor'easters. The majority of hurricanes and tropical storms form in the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico during the official Atlantic hurricane season which extends from June through November (FEMA, 1997). Nor'easters typically develop in the winter months from low-pressure centers between Georgia and New Jersey within 100 miles of the coastline and generally move north or northeastward (NOAA, 2013).
Landslide	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, rockfalls, 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.
Subsidence and Sinkholes	Subsidence is a natural geologic process that commonly occurs in areas with underlying limestone bedrock and other rock types that are soluble in water. Water passing through naturally occurring fractures dissolves these materials leaving underground voids. Eventually, overburden on top of the voids causes a collapse which can damage structures with low strain tolerances. This collapse can take place slowly over time or quickly in a single event. Karst topography describes a landscape that contains characteristic structures such as sinkholes, linear depressions, and caves. In addition to natural processes, human activity such as water, natural gas, and oil extraction can cause subsidence and sinkhole formations. (FEMA, 1997).
Tornado & Windstorm	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 light to severe 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

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 4.2.2-2 List and description of natural hazards profiled in the 2014 Hazard Vulnerability Assessment and Mitigation Plan Update.	
HAZARD	HAZARD DESCRIPTION
	and are relatively uncommon in Pennsylvania. An average of over 800 tornadoes is reported annually nationwide, resulting in an average of 80 deaths and 1,500 injuries (NOAA, 1995). 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 miles across Pennsylvania (FEMA, 2009).
Wildfire	A wildfire is a raging, uncontrolled fire that spreads rapidly through vegetative fuels, exposing and possibly consuming structures. Wildfires often begin unnoticed and can spread quickly, creating dense smoke that can be seen for miles. Wildfires can occur at any time of the year, but mostly occur during long, dry hot spells. Any small fire in a wooded area, if not quickly detected and suppressed, can get out of control. Most wildfires are caused by human carelessness, negligence, and ignorance. However, some are precipitated by lightning strikes and in rare instances, spontaneous combustion. Wildfires in Pennsylvania can occur in fields, grass, brush and forests. Ninety-eight percent of wildfires in Pennsylvania are a direct result of people, often caused by debris burns (Department of Conservation and Natural Resources, 2009).
Winter Storm	Winter storms may include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. A winter storm can range from a moderate snowfall or ice event over a period of a few hours to blizzard conditions with wind-driven snow that lasts for several days. Many winter storms are accompanied by low temperatures and heavy and/or blowing snow, which can severely impair visibility and disrupt transportation. The Commonwealth of Pennsylvania has a long history of severe winter weather.

4.3. Hazard Profiles and Vulnerability Analysis

NATURAL HAZARDS

4.3.1. Drought

4.3.1.1. Location and Extent

Drought is defined as the consequence of a natural reduction in the amount of precipitation expected over an extended period of time, usually a season or more in length. Droughts are regional climatic events, so they typically impact all communities in a relatively uniform fashion with only minor localized variations in rainfall events. Droughts often occur across county boundaries, affecting large areas of Pennsylvania at the same time. Therefore a drought would affect all of Union County, with the largest impact being on areas of the County with extensive agriculture uses. As shown in Table 2.4-1 and Figure 2.4-2 in Section 2.4 of this plan, almost 30% of all land in Union County is agricultural.

Locations of drought nationwide are monitored continuously by the USGS and the Pennsylvania Department of Environmental Protection monitors conditions throughout the state. Maps showing locations currently experiencing drought conditions are posted on various web sites including <http://waterwatch.usgs.gov/?m=dryw> showing locations where stream flow is below normal and where drought conditions exist or are emerging. As this plan was being developed in August 2014, no locations in Pennsylvania were experiencing drought.

4.3.1.2. Range of Magnitude

The Pennsylvania Department of Environmental Protection determines drought conditions by monitoring precipitation, stream flows, ground water levels, and the Palmer Drought Severity Index to monitor drought conditions.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

The Palmer Drought Severity Index is used to describe abnormally wet to abnormally dry conditions. Zero represents normal rainfall and temperature conditions; drought condition indices are described in Table 4.3.1-1.

INDEX	DESCRIPTION OF CONDITIONS
4.0 or more	Extremely wet
3.0 to 3.99	Very wet
2.0 to 2.99	Moderately wet
1.0 to 1.99	Slightly wet
0.5 to 0.99	Incipient wet spell
0.49 to -0.49	Near normal
-0.5 to -0.99	Incipient dry spell
-1.0 to -1.99	Mild drought
-2.0 to -2.99	Moderate drought
-3.0 to -3.99	Severe drought
-4.0 or less	Extreme drought

Data provided by Cornell University show that drought conditions in the Middle Susquehanna River region of Pennsylvania have resulted in Palmer Drought Severity Index level as low as -7.51. This was during a drought that lasted for almost three years. The longest period of drought in this region was 38 months from 1921 until 1924. In the Union County area, the average Palmer Drought Severity Index level for droughts is -4.4 and the average duration of a drought is 8.3 months.

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

- **Drought Watch**: A period to alert government agencies, public water suppliers, water users, and the public regarding the potential for future drought-related problems. The focus is on increased monitoring, awareness, and preparation for response if conditions worsen. A request for voluntary water conservation is made. The objective of voluntary water conservation measures during a drought watch is to reduce water uses by five percent in the affected areas. Due to varying conditions, individual water suppliers or municipalities may be asking for more stringent conservation actions.
- **Drought Warning**: This phase involves a coordinated response to imminent drought conditions and potential water supply shortages through concerted voluntary conservation measures to avoid or reduce shortages, relieve stressed sources, develop new sources, and if possible forestall the need to impose mandatory water use restrictions. The objective of voluntary water conservation measures during a drought warning is to reduce overall water uses by 10-15 percent in the affected areas. Due to

varying conditions, individual water suppliers or municipalities may be asking for more stringent conservation actions.

- **Drought Emergency**: This stage is a phase of concerted management operations to marshal all available resources to respond to actual emergency conditions, to avoid depletion of water sources, to assure at least minimum water supplies to protect public health and safety, to support essential and high priority water uses, and to avoid unnecessary economic dislocations. It is possible during this phase to impose mandatory restrictions on non-essential water uses that are provided in the Pennsylvania Code (Chapter 119), if deemed necessary and if ordered by the Governor of Pennsylvania. The objective of water use restrictions (mandatory or voluntary) and other conservation measures during this phase is to reduce consumptive water use in the affected area by fifteen percent, and to reduce total use to the extent necessary to preserve public water system supplies, to avoid or mitigate local or area shortages, and to assure equitable sharing of limited supplies.
- **Local Water Rationing**: Although not a drought phase, local municipalities may, with the approval of the PA Emergency Management Council, implement local water rationing to share a rapidly dwindling or severely depleted water supply in designated water supply service areas. These individual water rationing plans, authorized through provisions of the Pennsylvania Code (Chapter 120), will require specific limits on individual water consumption to achieve significant reductions in use. Under both mandatory restrictions imposed by the Commonwealth and local water rationing, procedures are provided for granting of variances to consider individual hardships and economic dislocations.

Environmental impacts of drought include:

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

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

4.3.1.3. Past Occurrence

On July 20, 1999, the Governor of Pennsylvania declared a drought emergency in almost all of Pennsylvania including, Union County, following extended dry weather through much of the summer. Precipitation deficits for the months of May through July averaged between five and seven inches. Precipitation departures for the 365-day period ending in mid-July were more than one foot below normal in many places. This is about one-third of total annual normal precipitation in most areas. Streams were empty, wells dried up, and the Susquehanna River hit record low flows. Table 4.3.1-2 lists periods of drought in the Union County area showing a total of 25 droughts between 1980 and 2014.

DATE	DROUGHT STATUS
November 18, 1980 – April 20, 1982	Emergency
April 26, 1985 – December 19, 1985	Watch
July 7, 1988 – August 24, 1988	Watch
August 24, 1988 – December 12, 1988	Warning
March 3, 1989 – May 15, 1989	Watch
June 28, 1991 – July 24, 1991	Warning
July 24, 1991 – April 20, 1992	Emergency
April 20, 1992 – June 23, 1992	Warning
September 1, 1995 – September 20, 1995	Warning
September 20, 1995 – November 8, 1995	Emergency
November 8, 1995 – December 18, 1995	Warning
July 19, 1997 – January 16, 1998	Watch
December 3, 1998 – December 8, 1998	Watch
December 8, 1998 – March 15, 1999	Warning
March 15, 1999 – June 10, 1999	Watch
June 10, 1999 – July 20, 1999	Warning
July 20, 1999 – September 30, 1999	Emergency
September 30, 1999 – May 5, 2000	Watch
August 8, 2001 – December 5, 2001	Watch
December 5, 2001 – June 14, 2002	Warning
September 5, 2002 – November 7, 2002	Watch
April 11, 2006 – June 30, 2006	Watch
April 11, 2006 – June 30, 2006	Watch
August 6, 2007 – February 15, 2008	Watch
September 16, 2010 – November 10, 2010	Watch

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

In addition, Cornell University has record of historic droughts that affected the Middle Susquehanna region of Pennsylvania prior to 1980. These are presented in Table 4.3.1-3.

DROUGHT PERIOD	DURATION OF DROUGHT CONDITIONS	LOWEST PALMER DROUGHT SEVERITY INDEX
9/1895–2/1896	6 months	-5.35
4/1896–6/1897	15 months	-4.86
10/1897–11/1897	2 months	-3.46
5/1900–4/1901	12 months	-5.79
6/1901–7/1901	2 months	-3.65
11/1908–3/1909	5 months	-4.73
5/1909–7/1911	27 months	-6.45
9/1914–1/1915	5 months	-4.79
4/1915–7/1915	4 months	-3.46
11/1916–5/1917	7 months	-4.02
11/1918–4/1919	6 months	-3.42
3/1921–4/1924	38 months	-6.65
3/1925–1/1926	11 months	-4.42
3/1926–9/1926	7 months	-4.58
12/1928–3/1929	4 months	-3.77
7/1929–9/1929	3 months	-4.13
1/1930–9/1932	33 months	-7.51
7/1934–8/1934	2 months	-3.28
11/1939–1/1940	3 months	-4.06
11/1953–1/1954	3 months	-3.14
10/1964–2/1965	5 months	-3.84
5/1965–9/1965	5 months	-4.39
7/1966–8/1966	2 months	-3.82

4.3.1.4. Future Occurrence

It is difficult to forecast the severity and frequency of future drought events. Based on data from 1895 to 1995, Pennsylvania can be divided into ten PDSI areas (see Figure 4.3.1-1). Each of these areas have been assigned a percent of time PDSI values are less than or equal to three – a value equivalent to a drought warning or drought emergency in Pennsylvania. Historically, Union County is under a drought warning or emergency between 10 and 15 percent of the time. This is equivalent to a PDSI value less than or equal to -3. The future occurrence of drought in

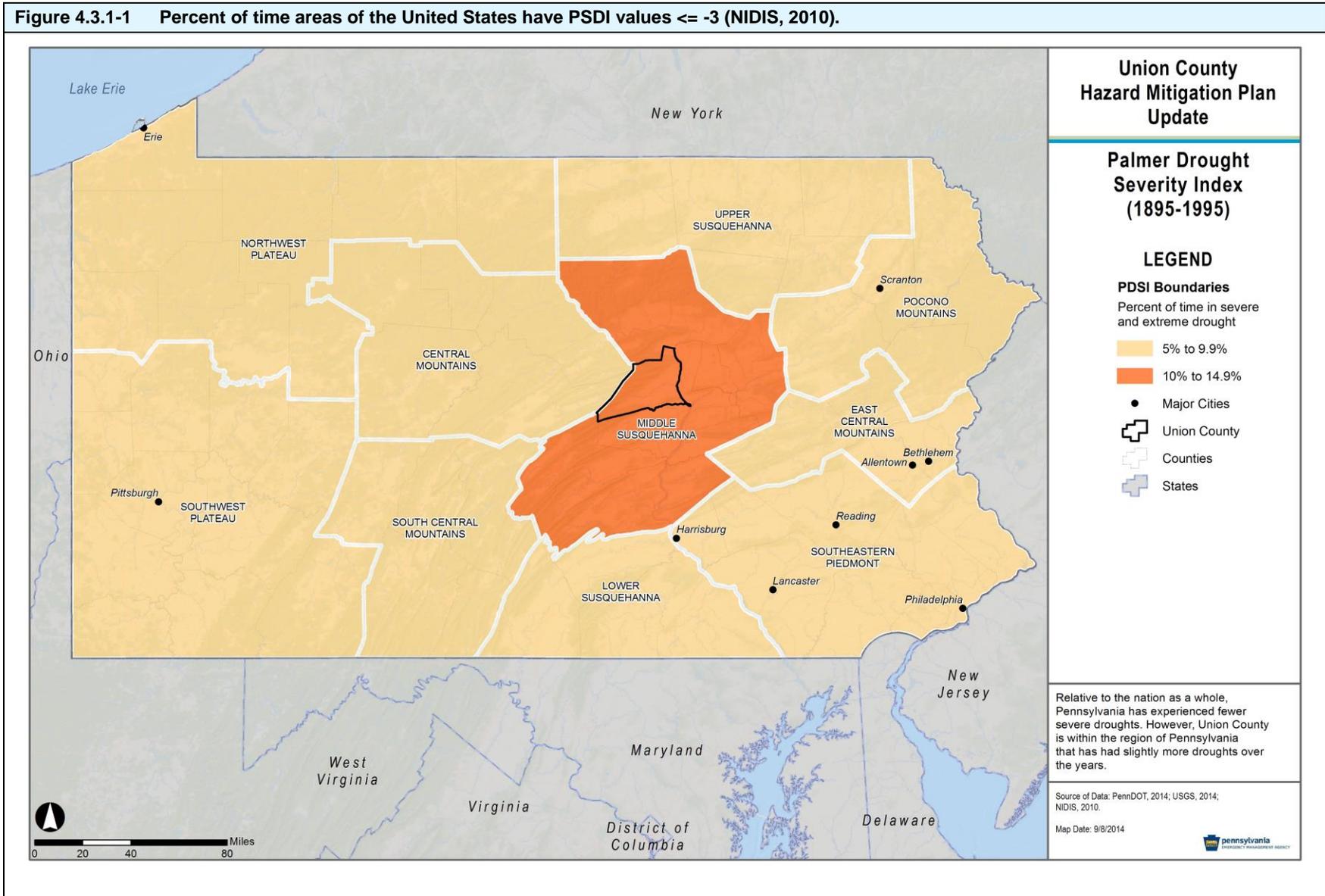


Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Union County can be considered *possible* as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Figure 4.3.1-1 Percent of time areas of the United States have PSDI values ≤ -3 (NIDIS, 2010).



4.3.1.5. Vulnerability Assessment

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

Negative impacts of drought would be experienced by agricultural interests, and the community would need to reduce its usage of water. Prolonged drought would affect the 613 farms located in Union County, which sold approximately \$136,000,000 in agricultural products in 2012 (USDA, 2012). The major crops in Union County are corn, hay, and soybeans with totals of 20,000, 13,500, and 11,600 respectively (USDA, 2012). According to the USDA 2012 Census of Agriculture, the majority of sales to date came from livestock sales, totaling \$110,021,000 (81%). Crop sales made up the remaining 19%.

Union County residents that use private domestic wells are also vulnerable to droughts because their wells can dry up. There are 1,678 of these domestic wells in Union County, with at least one in every municipality except New Berlin Borough. Table 4.3.1-4 shows the number of domestic wells per municipality as collected by the Pennsylvania Groundwater Information System (PaGWIS). According to this dataset, residents in White Deer Township are the most vulnerable to the water supply issues related to droughts because of the high amount of wells that are reported there. It is important to note, however, that the well data collected by PaGWIS relies on voluntary submissions of well record data by well drillers; therefore, it is not a complete database of all domestic wells in the County.

Table 4.3.1-4 Number of reported domestic wells in Union County (PaGWIS, 2014).

MUNICIPALITY	NUMBER OF REPORTED DOMESTIC WELLS
Buffalo Township	247
East Buffalo Township	120
Gregg Township	44
Hartleton Borough	11
Hartley Township	234
Kelly Township	113
Lewis Township	97
Lewisburg Borough	1
Limestone Township	119

Table 4.3.1-4 Number of reported domestic wells in Union County (PaGWIS, 2014).

MUNICIPALITY	NUMBER OF REPORTED DOMESTIC WELLS
Mifflinburg Borough	6
New Berlin Borough	0
Union Township	135
West Buffalo Township	205
White Deer Township	346
Total	1,678

4.3.2. Earthquake

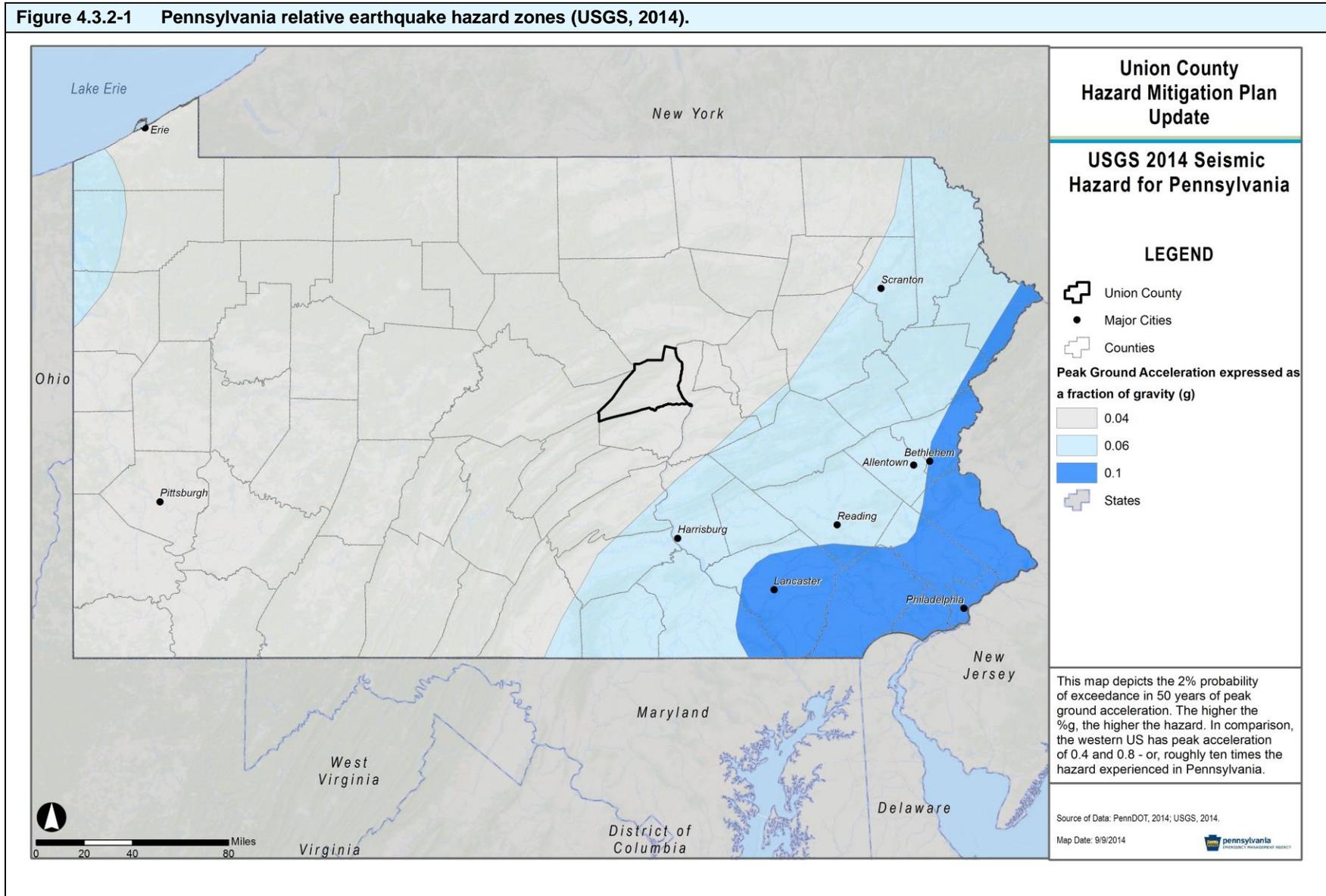
4.3.2.1. Location and Extent

An earthquake would affect all of Union County. The closest plate that might contribute to an earthquake in Union County is the Mid-Atlantic Ridge, which is approximately 2,000 miles to the east of Pennsylvania.

Earthquake events in Pennsylvania typically do not impact areas greater than 100 km from the epicenter, and earthquake epicenters in Union County are rare. The area is generally not known for seismicity, and USGS downgraded the probabilistic seismic hazard for much of Pennsylvania in 2014. Figure 4.3.2-1 shows the 2014 earthquake hazard in Pennsylvania and Union County, expressed as the two-percent probability of exceedance in 50 years of peak ground acceleration (g). This map was digitized from the 2014 National Seismic Hazard report. Union County lies in the 0.04 zone, indicating that the hazard is slight. However, earthquakes originating outside Pennsylvania can affect Union County, though they are not expected to cause significant damage.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Figure 4.3.2-1 Pennsylvania relative earthquake hazard zones (USGS, 2014).



4.3.2.2. Range of Magnitude

There are several different ways of describing the magnitude of an earthquake. One way measures peak ground acceleration. Peak ground acceleration is the maximum horizontal ground acceleration measured in centimeters per second per second (cm/sec²). Peak ground acceleration can range from zero for an earthquake that is noticed by very few people to 350, which would be a catastrophic event. A peak ground acceleration of 10 cm/sec² means that the shaking is equivalent to about one percent of the acceleration due to gravity. Generally, ground acceleration must exceed 15 cm/sec² for significant damage to occur.

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

Table 4.3.2-1 Richter scale magnitudes and associated earthquake size effects.	
RICHTER MAGNITUDES	EARTHQUAKE EFFECTS
Less than 3.5	Generally not felt, but recorded.
3.5-5.4	Often felt, but rarely causes damage.
Under 6.0	At most, slight damage to well-designed buildings; can cause major damage to poorly constructed buildings over small regions.
6.1-6.9	Can be destructive in areas where people live up to about 100 kilometers across.
7.0-7.9	Major earthquake; can cause serious damage over large areas.
8.0 or greater	Great earthquake; can cause serious damage in areas several hundred kilometers across.

The Richter Scale does not give any indication of the impact or damage of an earthquake, although it can be inferred that higher magnitude events cause more damage. Therefore, another way of measuring the intensity of an earthquake is the Modified Mercalli Intensity Scale. Measures on this scale range from I, an earthquake that is not generally noticeable, to XII, an earthquake that causes complete destruction. Table 4.3.2-2 summarizes Modified Mercalli Intensity Scale impacts of earthquake events, measured in terms of earthquake intensity.

Table 4.3.2-2 Modified Mercalli Intensity Scale with associated impacts.			
SCALE	INTENSITY	DESCRIPTION OF EFFECTS	CORRESPONDING RICHTER SCALE MAGNITUDE
I	Instrumental	Detected only on seismographs	<4.2
II	Feeble	Some people feel it	<4.2
III	Slight	Felt by people resting; like a truck rumbling by	<4.2
IV	Moderate	Felt by people walking	<4.2

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

V	Slightly Strong	Sleepers awake; church bells ring	<4.8
VI	Strong	Trees sway; suspended objects swing; objects fall off shelves	<5.4
VII	Very Strong	Mild alarm, walls crack, plaster falls	<6.1
VIII	Destructive	Moving cars uncontrollable, masonry fractures, poorly constructed buildings damaged	<6.9
IX	Ruinous	Some houses collapse, ground cracks, pipes break open	<6.9
X	Disastrous	Ground cracks profusely, many buildings destroyed, liquefaction and landslides widespread	<7.3
XI	Very Disastrous	Most buildings and bridges collapse, roads, railways, pipes and cables destroyed, general triggering of other hazards	<8.1
XII	Catastrophic	Total destruction, trees fall, ground rises and falls in waves	>8.1

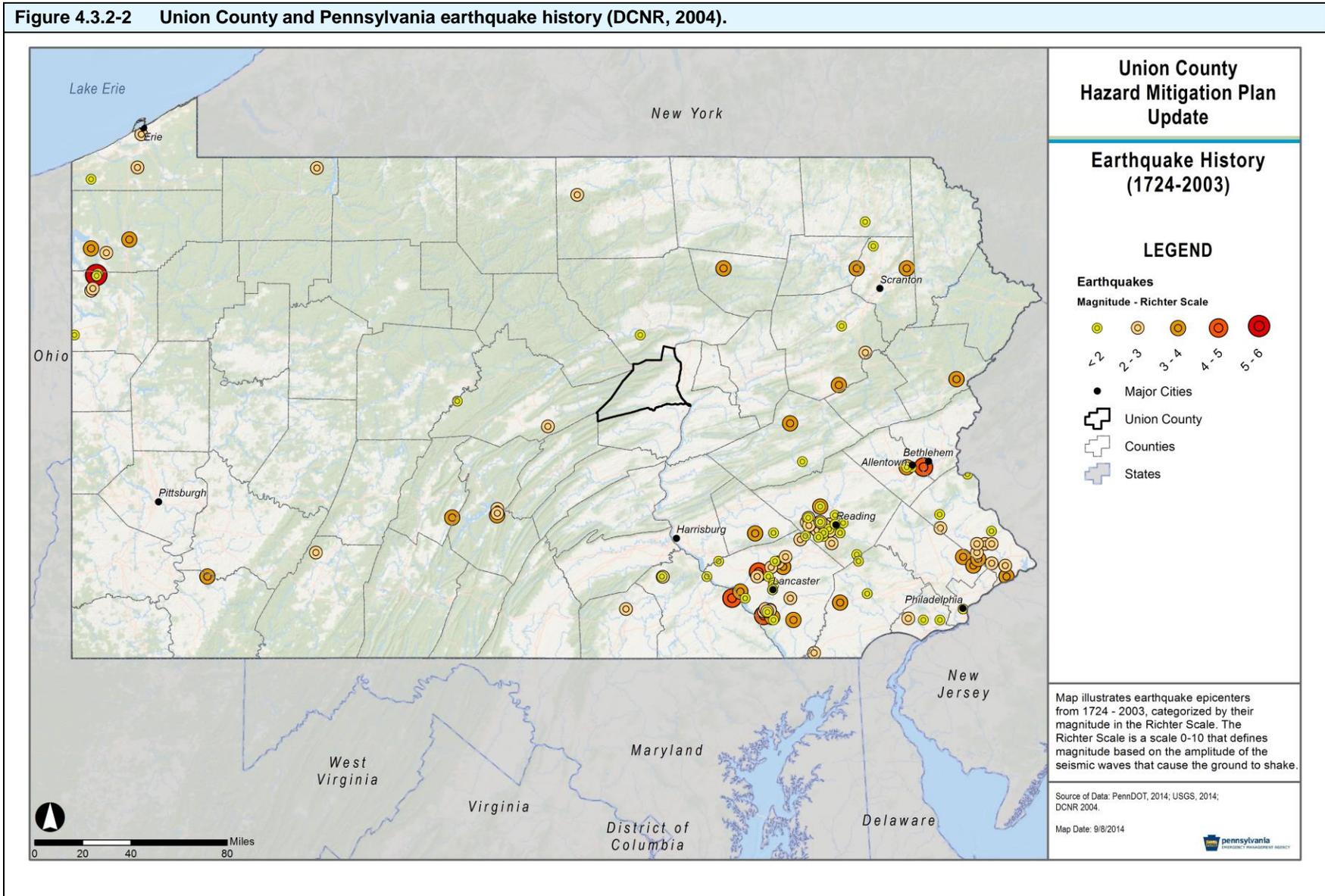
Recent earthquakes in Pennsylvania have been measured from IV to VI on the Modified Mercalli Intensity Scale. However, since the worst earthquake recorded in Pennsylvania was a magnitude 5.2, a worst-case scenario for this hazard would be if an earthquake of similar magnitude occurred in Union County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

4.3.2.3. Past Occurrence

According to records maintained by the Pennsylvania Department of Conservation and Natural Resources (DCNR), there have been no earthquakes recorded with epicenters in Union County (Figure 4.3.2-3). However parts of the county probably experienced some of the shock waves of some minor earthquakes that have occurred around the region shown on Figure 4.3.2-2. It is important to note that some of these events may not have been true earthquakes but instead may have been the result of mine or quarry blasts. On the whole, though, these events have largely been minor events with Richter Scale magnitudes of less than 5.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Figure 4.3.2-2 Union County and Pennsylvania earthquake history (DCNR, 2004).



4.3.2.4. Future Occurrence

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

4.3.2.5. Vulnerability Assessment

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

Based on the history of earthquakes in Pennsylvania, no structural damages are anticipated in Union County. However, for earthquakes, the available history covers a period of less than 300 years, which is a relatively short period of time for an examination of earthquakes. Large earthquakes may only affect a location every several centuries or millennia.

A very large earthquake affecting Union County might cause structural damage in dilapidated structures or structures that do not meet current building codes. Roads and bridges might be damaged and trees and power lines might fall. Thus the impact of an earthquake might range from negligible to catastrophic. Based on 300 years of experience in Union County, there will most likely be no damage or very slight damage.

Structures identified as potentially at risk of damage due to an earthquake are older structures. All existing buildings have the potential to experience an earthquake. Given no history of damage in Union County due to earthquake, damages are estimated to be limited to the more dilapidated structures and structures with unreinforced masonry. The number of structures that are at least 50 years old is 10,986.

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

4.3.3. Flood, Flash Flood, Ice Jam

4.3.3.1. Location and Extent

A flood is a natural event for rivers and streams. Flooding occurs when excess water from snowmelt or rainfall fills a stream, causing it to overflow onto the stream banks and adjacent floodplains. Floodplains are lowlands adjacent to rivers, streams, and creeks that are subject to recurring floods. Flash flood conditions can result from a large amount of rainfall over a short time span. Similarly, a small amount of rain can also result in floods in locations where the soil is frozen or saturated from a previous wet period or if the rain is concentrated in an area of impervious surfaces such as large parking lots, paved roadways, or other densely developed

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

areas. In addition, ice jams can occur when broken river ice caught in a narrow channel of a river or stream results in flooding.

All of Union County lies within the drainage basin of the Susquehanna River, which is the largest basin on the Atlantic Seaboard of the United States. The Susquehanna River drains directly into the Chesapeake Bay. The County seat, the Borough of Lewisburg, is located along the West Branch of the Susquehanna River at the eastern boundary of Union County.

The various tributary streams and creeks generally flow west to east, from the foothills of the Appalachian Mountains towards the Susquehanna River. Penns Creek and Buffalo Creek are the largest tributaries in the County.

Of the 14 municipalities within Union County, the Borough of Lewisburg has suffered the most severe damage from flooding due to extensive development within the floodplain and its proximity to the Susquehanna River and tributaries.

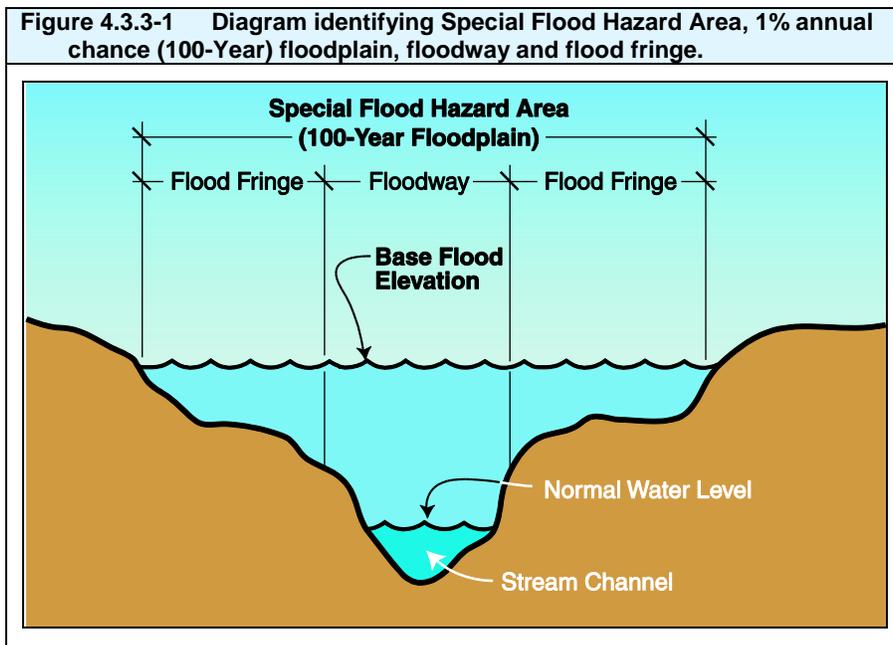
Table 4.3.3-1 shows which tributaries have the potential to lead to flooding in particular jurisdictions; there is the potential for flooding due to rivers and streams in each jurisdiction in the County except Hartleton Borough.

Table 4.3.3-1 Rivers and Streams in Union County						
MUNICIPALITY	RIVERS AND STREAMS					
	WEST BRANCH, SUSQUEHANNA RIVER	LIMESTONE RUN – BULL RUN	BUFFALO CREEK	PENNS CREEK	WHITE DEER CREEK	WHITE DEER HOLE CREEK
Buffalo Township			✓			
East Buffalo Township	✓	✓				
Gregg Township	✓					✓
Hartleton Borough						
Hartley Township				✓		
Kelly Township	✓		✓			
Lewis Township			✓	✓		
Lewisburg Borough	✓	✓	✓			
Limestone Township				✓		
Mifflinburg Borough			✓			
New Berlin Borough				✓		

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 4.3.3-1 Rivers and Streams in Union County						
MUNICIPALITY	RIVERS AND STREAMS					
	WEST BRANCH, SUSQUEHANNA RIVER	LIMESTONE RUN – BULL RUN	BUFFALO CREEK	PENNS CREEK	WHITE DEER CREEK	WHITE DEER HOLE CREEK
Union Township	✓			✓		
West Buffalo Township			✓			
White Deer Township	✓				✓	

The size of the floodplain is described by the recurrence interval of a given flood. Flood recurrence intervals are explained in more detail in Section 4.3.3.4. However, in assessing the potential spatial extent of flooding it is important to know that a floodplain associated with a flood that has a 10 percent chance of occurring in a given year is smaller than the floodplain associated with a flood that has a 0.2% annual chance of occurring. The National Flood Insurance Program (NFIP), for which Flood Insurance Rate Maps (FIRM) are published, identifies the 1% annual chance flood. This 1% annual chance flood event is used to delineate the *Special Flood Hazard Area* (SFHA) and identify *Base Flood Elevations*. Figure 4.3.3-1 illustrates these terms. The SFHA serves as the primary regulatory boundary used by FEMA and Union County governments.



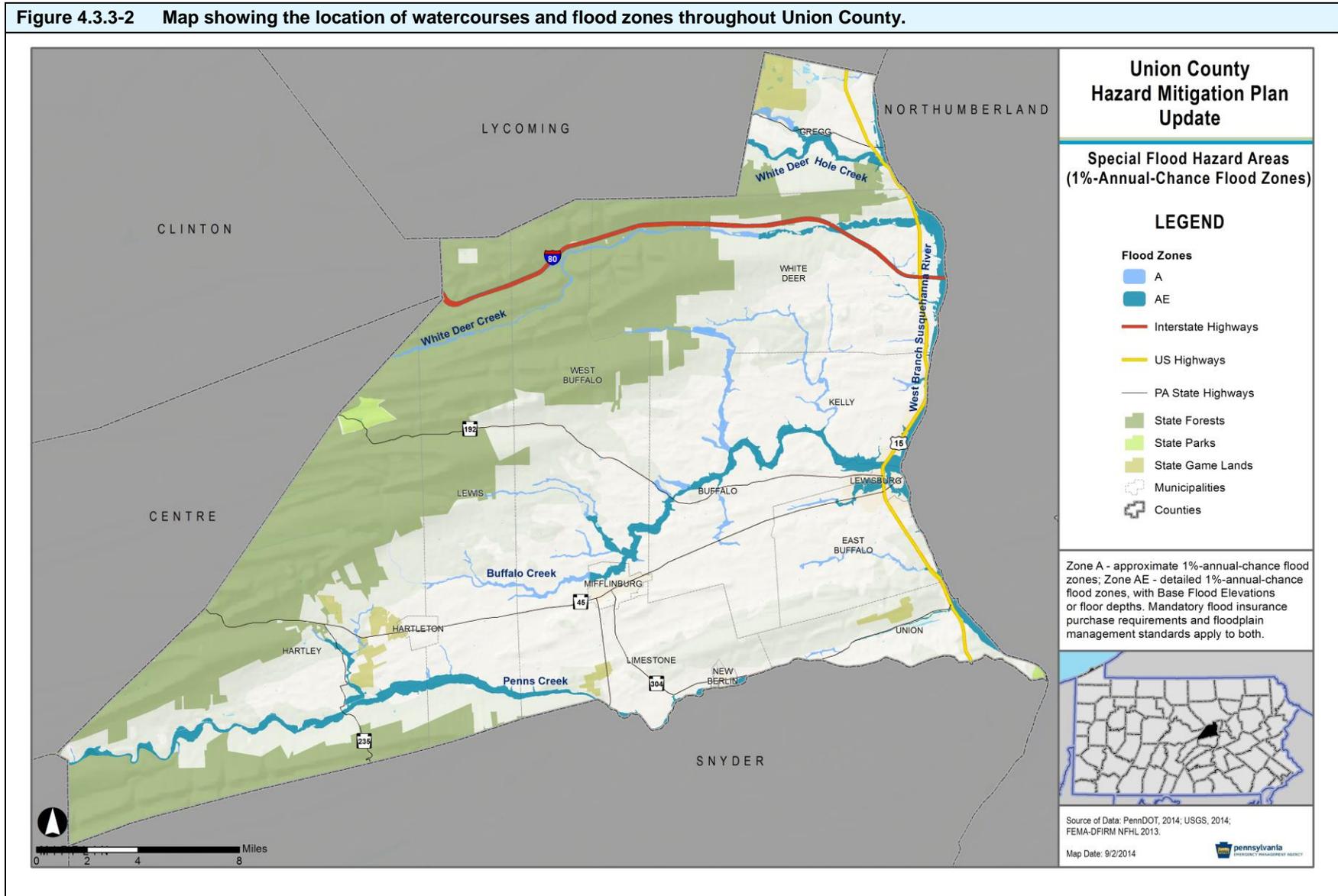
Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Countywide DFIRMs were published for Union County on September 28, 2007 and map panels in some communities were updated on October 16, 2009. FIRMs for the entire county can be obtained from the FEMA Map Service Center (<http://www.msc.fema.gov>). These maps can be used to identify the expected spatial extent and elevation of flooding from a 1% and 0.2% annual chance event. Thirteen municipalities in the County were determined to have special flood hazard areas. Hartleton Borough does not have any SFHAs. Figure 4.3.3-2 shows the location of watercourses and flood zones in Union County. The location of approximate and detailed (which include Base Flood Elevations) Special Flood Hazard Areas (1% annual chance zones) are shown. There is not record of flood events caused by ice jams in Union County. However, ice jams would be limited to the Susquehanna River.

It should also be noted that flooding can also be a result of dam failure. As described in Section 5.2.1, Union County has five high hazard dams located within the county. In addition, Union County is part of the inundation area for six dams located outside of the county boundaries. If any one of these dams were to fail, there could be loss of life and property damage resulting from flooding within the dam inundation areas. Emergency Action Plans are on file at the Union County Public Safety Office for these dams which address procedures and actions to be taken both to prevent dam failure and in the event of a failure.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

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



4.3.3.2. Range of Magnitude

Flooding in Union County has been caused by heavy rainfall bringing more than three to as many as eight inches of rain to the area within a day. Penns Creek was measured at eight feet above flood stage in 2003. Flooding in the County can be exacerbated when heavy rains occur in late winter and accelerate the melting of snow. Flooding can also be exacerbated locally by the presence of impermeable surfaces due to buildings and pavement or lack of appropriately sized flood water detention basins.

Flooding in Union County can be exacerbated if the flow of water is obstructed in some way such as by an undersized culvert. This is a potential problem upstream of an abandoned railroad bridge on the Susquehanna River between Union and Northumberland Counties; it has the potential to trap debris and create a dam, which would increase flooding in Lewisburg and Kelly Township. As this railroad bridge is no longer maintained, there is also the possibility of the bridge becoming dislodged during a major flood and contributing to flooding immediately downstream at the Pennsylvania Route 45 Bridge where it might create a blockage. Several parties are currently working to identify a solution to this problem and a mitigation action is included in Section 6 of the plan for Union County and Lewisburg Borough to remain involved in the process for developing a solution.

Hurricanes can also contribute to flooding in the County. A worst case scenario for flooding occurred in June 1972, where Hurricane Agnes resulted in over 18 inches of rain in Shamokin Dam, a borough located just to the south and downstream of Union County. It led to flooding in 80 percent of Lewisburg and three deaths in the County.

Although floods can cause damage to property and loss of life, floods are naturally occurring events that benefit riparian systems which have not been disrupted by human actions. Such benefits include groundwater recharge and the introduction of nutrient rich sediment improving soil fertility. However, the destruction of riparian buffers, changes to land use and land cover throughout a watershed, and the introduction of chemical or biological contaminants which often accompany human presence cause environmental harm when floods occur. Hazardous material facilities are potential sources of contamination during flood events. Other negative environmental impacts of flooding include: water-borne diseases, heavy siltation, damage or loss of crops, and drowning of both humans and animals.

4.3.3.3. Past Occurrence

Union County has a long history of flooding problems. Bordered to the east by the West Branch of the Susquehanna River and traversed by several tributary streams, creeks and runs, Union County has suffered damage from numerous major floods and localized flash flooding. Table 4.3.3-2 lists flooding events in Union County since 1993. Estimated property damages include every loss to any type of facility (residential, commercial, agricultural, or industrial) and include structure, content, and crop damages.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 4.3.3-2 Flood and flash flood events impacting Union County from 1993-2014 (NCDC, 2014). Note that property damage values are estimates based on best available information. "Countywide" indicates several locations in the County were affected.

DATE	LOCATION & DESCRIPTION	ESTIMATED TOTAL DAMAGE (\$)
1/19/1996	Countywide; no additional details available.	<i>not provided</i>
9/13/1996	Mifflinburg; Roads were flooded due to heavy rains across portions of Union County.	<i>not provided</i>
12/1/1996	Countywide; no additional details available.	<i>not provided</i>
12/13/1996	Countywide; no additional details available.	<i>not provided</i>
1/8/1998	Countywide; Heavy rains produced flooding across a large area of central PA over a 3-day period from Jan. 7 through the 10 th . Large amounts of moisture moved northeast across the Ohio Valley into the area. The Susquehanna River exceeded flood stage at Bloomsburg and Lewisburg on the 9 th and Danville and Harrisburg on the 10 th .	<i>not provided</i>
2/18/1998	Countywide; Rain of up to 2.5 inches fell across the area overnight, causing flooding of small streams and roads.	<i>not provided</i>
4/19/1998	Countywide; A steady soaking rain fell across the region with 24 hour amounts in excess of 2 inches. Storm drains clogged, some roads were closed, small streams topped their banks, and a number of basements were flooded.	<i>not provided</i>
1/24/1999	Countywide; no additional details available.	\$5,000
8/20/1999	Lewisburg; Six to eight inches of rain fell in 3 hours and caused serious flooding across eastern parts of the country.	\$100,000
9/7/1999	Eastern Portion of County; The city of Lewisburg was especially hard hit by the remnants of Hurricane Dennis as up to 8 inches of rain fell in 24 hours, most of it during the early morning hours. Waters rose rapidly in the early morning hours. At least 160 people were displaced from their homes, many of them Bucknell University students. A total of 414 homes were affected by the flooding along with 30 county businesses. Vehicles were floated down the city side streets and 162 were damaged. The campus of Bucknell University also had damage. Other parts of the county from Mifflinburg east to the Susquehanna River had problems. Route 15 was closed due to flooding.	\$10,000,000
9/16/1999	Countywide; no additional details available.	\$20,000
9/30/1999	Countywide; 2.5 to 3 inches caused poor drainage flooding.	<i>not provided</i>
9/24/2001	Lewisburg; Heavy rain caused Bull Run Creek to run out of its banks.	<i>not provided</i>
9/23/2003	Countywide; Heavy rainfall caused Penns Creek to exceed its flood stage. The creek exceeded flood stage at 3:15 on Sep. 23 then fell back below flood stage at 8:30 on the 23 rd .	<i>not provided</i>
12/11/2003	Countywide; Heavy rainfall caused Penns Creek to exceed flood stage. It rose above flood stage around noon on Dec. 11 and fell back below flood stage around 10:00 that night.	<i>not provided</i>
8/20/2004	Mifflinburg; Heavy rain brought nearly three inches of rain to Union County during the evening of Aug. 20. Streams and creeks first started to overflow their banks in the Mifflinburg area, flooding roads and making them impassable. County Emergency Management officials reported that many streams throughout the county were out of their banks by midnight, with many roads in the county closed.	<i>not provided</i>
8/21/2004	Countywide; Heavy rain brought nearly three inches of rain to Union County during the evening of Aug. 20. While flash flooding ended shortly after midnight on the 21 st , high water continued along with flooding into the morning.	<i>not provided</i>
9/17/2004	Countywide; no additional details available.	<i>not provided</i>

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 4.3.3-2 Flood and flash flood events impacting Union County from 1993-2014 (NCDC, 2014). Note that property damage values are estimates based on best available information. "Countywide" indicates several locations in the County were affected.		
DATE	LOCATION & DESCRIPTION	ESTIMATED TOTAL DAMAGE (\$)
9/18/2004	Countywide; Heavy rain caused the West Branch of the Susquehanna River at Lewisburg to exceed its flood stage. The river rose above flood stage on the 18 th and fell back below flood stage on the 20 th .	<i>not provided</i>
3/29/2005	Countywide; Heavy rain caused Penns Creek to flood. The creek exceeded flood stage on the 29 th and fell back below flood stage later that day.	<i>not provided</i>
4/2/2005	Countywide; no additional details available.	<i>not provided</i>
4/3/2005	Countywide; Heavy rain caused the West Branch of the Susquehanna River at Lewisburg to flood. The river exceeded flood stage on the 3 rd and fell back below flood stage on the 4 th .	<i>not provided</i>
4/3/2005	Countywide; Heavy rain caused the West Branch of the Susquehanna River at Milton to flood. The river exceeded flood stage on the 3 rd and fell back below flood stage that same day.	<i>not provided</i>
11/29/2005	Countywide; Heavy rain cause Penns Creek to flood. The creek exceeded flood stage on the 29 th and fell back below flood stage on the 30 th .	<i>not provided</i>
6/27/2006	Countywide; Heavy rain associated with a weak tropical storm system caused flash flooding across central PA on June 27 th and 28 th . Numerous roads were closed due to flood waters, especially in Mifflinburg.	<i>not provided</i>
3/5/2008	Lewisburg; Heavy rain caused flooding of Bull Run, and the closure of several roads near Lewisburg. Buffalo Creek also overflowed its banks, causing flooded streets and road closures in Mifflinburg.	<i>not provided</i>
7/31/2009	Linntown; Heavy rain caused a mudslide along Route 15.	\$5,000
1/25/2010	Linntown; Heavy rain caused rapid rises and flash flooding along many small streams and creeks which eventually spilled over their banks. The flash flooding closed several roads in the towns of Winfield and Lewisburg.	<i>not provided</i>
12/1/2010	West Milton; Rainfall amounts between 2 and 4 inches caused widespread flooding. The West Branch Susquehanna River at Milton crested over moderate flood stage at just under 23 ft.	\$5,000
3/6/2011	Rutherton; Flooding caused the closure of several roads in Union County, especially in Mifflinburg Borough, Lewis Township, Hartley Township, and Kelly Township.	<i>not provided</i>
3/10/2011	Lewisburg; Flooding closed several roads across Union County. Media reports also indicated some residential flooding in the Lewisburg area near Buffalo Creek, including closed roads, flooded fields, and flooded residential back yards.	<i>not provided</i>
9/7/2011	Lewisburg; The West Branch Susquehanna River at Lewisburg and Watsonstown crested in moderate flood stage. It crested in major flood stage at Milton. Several roads in Union County were closed due to flooding from creeks and streams, resulting from heavy rainfall from the remnants of Tropical Storm Lee. Flooding severely damaged at least three homes at Bucknell University and some areas were evacuated. A preliminary total of 174 buildings across Union County suffered major damage from this event, with 56 suffering minor damage and a total of 230 structures impacted.	\$800,000
9/28/2011	Kelly Point; Heavy rain caused flash flooding county-wide, with many roads closed.	<i>not provided</i>
5/8/2013	Linntown; Locally heavy rain caused flash flooding around Lewisburg. Bull Run and Turtle Creek came out of their banks and flooded adjacent roads. The Lewisburg COOP observer recorded 3.25 inches of rain.	<i>not provided</i>

In addition to the aforementioned past flood events, the NFIP identifies properties that frequently experience flooding and have received more than one payment through the National Flood

Insurance Program (NFIP) for flood damages A **Repetitive Loss** property is a structure covered by a contract for flood insurance made available under the NFIP that:

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

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

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

Table 4.3.3-3 displays repetitive loss properties by jurisdiction and type in Union County. The County has 138 repetitive loss properties and 43 repetitive loss properties that have been mitigated. Lewisburg Borough has the most repetitive loss properties (52) and also the most mitigated repetitive loss properties (35). Of these 138 repetitive loss structures properties in the County, the most are single family homes (98). Table 4.3.3-4 displays severe repetitive loss properties in Union County. There are seven SRL properties in Union County: four in Lewisburg Borough, two in White Deer Township, and one in Union Township.

Lewisburg Borough recognized the problems posed by flooding in the Borough and the impact on repetitive loss structures. The Lewisburg Neighborhood Corporation, a nonprofit organization, developed The Elm Street Program. The Elm Street Program, in cooperation with Lewisburg Borough, received a nearly \$3 million FEMA grant in 2012 for a project to acquire and demolish nine structures that have flooded repeatedly in central Lewisburg on 6th Street along Bull Run. Figure 4.3.3-2 is a picture of the acquisition and demolition project that is currently underway.

Figure 4.3.3-3 Photo of acquisition and demolition project of several repetitive loss structures in Lewisburg Borough.



Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 4.3.3-3 Summary of the number and type of Repetitive Loss properties by municipality (PA Emergency Management Agency, October 2013. PA Standard State All-Hazard Mitigation Plan).

MUNICIPALITY	NON-RESIDENTIAL		2-4 FAMILY		SINGLE FAMILY		CONDO		OTHER RESIDENT		TOTAL RL PROP-ERTIES	TOTAL MITIGATED RL PROP-ERTIES
	Number of Prop-erties	Number of Mitigated Prop-erties	Number of Prop-erties	Number of Mitigated Prop-erties	Number of Properties	Number of Mitigated Properties	Number of Properties	Number of Mitigated Properties	Number of Properties	Number of Mitigated Properties		
Buffalo Township	0	0	0	0	1	0	0	0	0	0	1	0
East Buffalo Township	0	0	0	0	6	0	0	0	0	0	6	0
Gregg Township	0	0	0	0	4	1	0	0	0	0	4	1
Hartleton Borough	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hartley Township	1	0	0	0	16	3	0	0	0	0	17	3
Kelly Township	0	0	0	0	3	0	0	0	0	0	3	0
Lewis Township	0	0	0	0	4	0	0	0	0	0	4	0
Lewisburg Borough	5	2	16	10	29	21	0	0	2	2	52	35
Limestone Township	0	0	0	0	10	2	1	1	0	0	11	3
Mifflinburg Borough	0	0	0	0	2	0	0	0	0	0	2	0
New Berlin Borough	0	0	0	0	2	0	0	0	0	0	2	0
Union Township	9	1	0	0	18	0	1	0	0	0	28	1
West Buffalo Township	0	0	0	0	0	0	0	0	0	0	0	0
White Deer Township	1	0	3	0	3	0	0	0	1	0	8	0
TOTAL	16	3	19	10	98	27	2	1	3	2	138	43

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 4.3.3-4 Summary of the number and type of Severe Repetitive Loss properties by municipality (PA Emergency Management Agency, October 2013. PA Standard State All-Hazard Mitigation Plan).

MUNICIPALITY	NON-RESIDENTIAL		2-4 FAMILY		SINGLE FAMILY		CONDO		OTHER RESIDENT		TOTAL RL PROP-ERTIES	TOTAL MITIGATED RL PROP-ERTIES
	Number of Prop-erties	Number of Mitigated Prop-erties	Number of Prop-erties	Number of Mitigated Prop-erties	Number of Properties	Number of Mitigated Properties	Number of Properties	Number of Mitigated Properties	Number of Properties	Number of Mitigated Properties		
Buffalo Township	0	0	0	0	0	0	0	0	0	0	0	0
East Buffalo Township	0	0	0	0	0	0	0	0	0	0	0	0
Gregg Township	0	0	0	0	0	0	0	0	0	0	0	0
Hartleton Borough	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hartley Township	0	0	0	0	0	0	0	0	0	0	0	0
Kelly Township	0	0	0	0	0	0	0	0	0	0	0	0
Lewis Township	0	0	0	0	0	0	0	0	0	0	0	0
Lewisburg Borough	0	0	2	2	2	0	0	0	0	0	4	2
Limestone Township	0	0	0	0	0	0	0	0	0	0	0	0
Mifflinburg Borough	0	0	0	0	0	0	0	0	0	0	0	0
New Berlin Borough	0	0	0	0	0	0	0	0	0	0	0	0
Union Township	0	0	0	0	1	0	0	0	0	0	1	0
West Buffalo Township	0	0	0	0	0	0	0	0	0	0	0	0
White Deer Township	0	0	2	0	0	0	0	0	0	0	2	0
TOTAL	0	0	4	2	3	0	0	0	0	0	7	2

Floods are the most common and costly natural catastrophe in the United States. In terms of economic disruption, property damage, and loss of life, floods are “nature’s number-one disaster.” For that reason, flood insurance is almost never available under industry-standard homeowner’s and renter’s policies. The best way for citizens to protect their property against flood losses is to purchase flood insurance through the NFIP.

Congress established the NFIP in 1968 to help control the growing cost of federal disaster relief. The NFIP is administered by the FEMA, part of the U.S. Department of Homeland Security. The NFIP offers federally-backed flood insurance in communities that adopt and enforce effective floodplain management ordinances to reduce future flood losses.

Since 1983, the chief means of providing flood insurance coverage has been a cooperative venture of FEMA and the private insurance industry known as the Write Your Own (WYO) Program. This partnership allows qualified property and casualty insurance companies to “write” (that is, issue) and service the NFIP’s Standard Flood Insurance Policy (SFIP) under their own names.

The NFIP provides flood insurance to individuals in communities that are members of the program. Membership in the program is contingent on the community adopting and enforcing floodplain management and development regulations.

The NFIP is based on the voluntary participation of communities of all sizes. In the context of this program, a “community” is a political entity – whether an incorporated city, town, township, borough, or village, or an unincorporated area of a county or parish – that has legal authority to adopt and enforce floodplain management ordinances for the area under its jurisdiction.

National Flood Insurance is available only in communities that apply for participation in the NFIP and agree to implement prescribed flood mitigation measures. Newly participating communities are admitted to the NFIP’s Emergency Program. Most of these communities quickly earn “promotion” to the Regular Program.

The Emergency Program is the initial phase of a community’s participation in the NFIP. In return for the local government’s agreeing to adopt basic floodplain management standards, the NFIP allows local property owners to buy modest amounts of flood insurance coverage.

In return for agreeing to adopt more comprehensive floodplain management measures, an Emergency Program community can be “promoted” to the Regular Program. Local policyholders immediately become eligible to buy greater amounts of flood insurance coverage. All participating municipalities in Union County are in the Regular Program. Table 4.3.3-5 lists the Union County municipalities participating in the NFIP.

The minimum floodplain management requirements to be part of the Regular Program include:

- Review and permit all development in the Special Flood Hazard Area (SFHA);
- Elevate new and substantially improved residential structures above the Base Flood Elevation;

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

- Elevate or dry floodproof new and substantially improved non-residential structures;
- Limit development in floodways;
- Locate or construct all public utilities and facilities so as to minimize or eliminate flood damage; and
- Anchor foundation or structure to resist floatation, collapse, or lateral movement.

In addition, Regular Program communities are eligible to participate in the NFIP’s Community Rating System (CRS). Under the CRS, policyholders can receive premium discounts of five to 45 percent as their cities and towns adopt more comprehensive flood mitigation measures. Currently, only Lewisburg Borough participates in CRS in Union County.

COMMUNITY	PARTICIPATION STATUS	CID	INITIAL FIRM IDENTIFIED	CURRENT EFFECTIVE MAP DATE
Buffalo Township	PARTICIPATING	421237	04/01/1977	10/16/2009
East Buffalo Township	PARTICIPATING	421011	02/02/1977	10/16/2009
Gregg Township	PARTICIPATING	420830	09/28/1979	10/16/2009
Hartleton Borough	NOT PARTICIPATING (NO SFHAs)	422528	09/28/2007	09/28/2007
Hartley Township	PARTICIPATING	422102	03/04/1988	09/28/2007
Kelly Township	PARTICIPATING	422103	03/01/1977	10/16/2009
Lewis Township	PARTICIPATING	422104	09/30/1987	09/28/2007
Lewisburg Borough	PARTICIPATING	420831	02/02/1977	10/16/2009
Limestone Township	PARTICIPATING	422105	03/04/1988	09/28/2007
Mifflinburg Borough	PARTICIPATING	420832	03/04/1988	09/28/2007
New Berlin Borough	PARTICIPATING	420833	03/04/1988	09/28/2007
Union Township	PARTICIPATING	420834	08/01/1979	09/28/2007
West Buffalo Township	PARTICIPATING	422106	09/30/1987	09/28/2007
White Deer Township	PARTICIPATING	421034	09/28/1979	09/28/2007

4.3.3.4. Future Occurrence

Approximately 6.3 percent of the County has been determined by flood studies conducted by FEMA for the development of Digital Flood Insurance Rate Maps (DFIRMs) to be within a flood-prone area; 5.3 percent is in an area with at least a 1-percent chance of flooding in any given year and another 1 percent of the County is in an area with a 0.2-percent chance of flooding in any given year. In this plan, the term special flood hazard area is used rather than floodplain to clarify that the area under consideration is identified on the Flood Insurance Rate Maps as having at least a 1-percent chance of flooding in any given year. Historically, the area with a 1-percent chance of flooding in any given year has been called the “100-year floodplain” and the area with a 0.2-percent chance of flooding in any given year has been called the “500-year

floodplain.” As these terms can be misleading by suggesting that there will be a flood only every 100 or 500 years respectively, they are not used in this plan.

Table 4.3.3-6 shows a range of flood recurrence intervals and associated probabilities of occurrence.

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

The NFIP recognizes the 1 percent-annual-chance flood, also known as the *base flood*, as the standard for identifying properties subject to federal flood insurance purchase requirements. The DFIRMs identify areas subject to the 1- and 0.2 percent-annual-chance flooding. Areas subject to 2% and 10% annual chance events are not shown on DFIRMs; however, water surface elevations associated with these events are included in the flood source profiles contained in the Flood Insurance Study Report. The most recent Flood Insurance Study for each county in Pennsylvania is available from the FEMA Map Service Center (<http://www.msc.fema.gov>)

In Union County, flooding occurs commonly and can occur during any season of the year. Within the flood-susceptible areas of Union County, it is expected that the character of flooding will remain essentially unchanged from what has been experienced for many years. However, some increase in the severity and frequency of flooding may result due to planned or recent development within the floodplains of the various county streams. Therefore, the future occurrence of floods in Union County can be characterized as *highly likely* as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

4.3.3.5. Vulnerability Assessment

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

Flood vulnerability is described in terms of what community assets, structures, and infrastructure lay in locations where flooding is anticipated. For purposes of assessing vulnerability, this plan focuses on those that are located in the SFHA. Please note that while other floods are possible, information about the extent and depths for this floodplain is available for all municipalities countywide, thus providing a consistent basis for analysis. Flood vulnerability maps for each applicable local municipality, showing the SFHA, addressable structures, critical facilities and transportation routes within it, are included in **Appendix D**.

These maps were created using FEMA Countywide digital data from the current effective FIRMS.

Table 4.3.3-7 displays the 2010 population per municipality that lives within the SFHA. Lewisburg Borough has the most people living in the SFHA (1,672) and the largest percentage of people living in the SFHA (28.9%).

Some structures and infrastructure in each participating jurisdiction, except Hartleton Borough, are at risk of flood damage. Table 4.3.3-7 also displays the total number of structures and critical facilities located within the SFHA. Approximately 10% of all addressable structures (2,635 structures) in Union County are located in the SFHA and are most vulnerable to flood losses. Lewisburg Borough also has the most structures located in the SFHA (766) and is therefore most vulnerable to the 1%-annual-chance flood event. Three municipalities in Union County have 2% or less of their structures located in the SFHA: Hartleton Borough, Mifflinburg Borough, and New Berlin Borough.

Table 4.3.3-8 shows the number of structures in each municipality located in the SFHA by land use type. The land use type displaying the greatest vulnerability to flood, flash flood, and ice jam hazards is residential. Of the 2,635 structures in Union County located in the SFHA, nearly half are residential properties. Manufactured housing units (e.g. trailers and mobile homes) that are located in the SFHA are at a greater risk, and in Union County, there are 235 of these structures. White Deer Township has the most manufactured housing units in the SFHA.

There are 798 structures in Union County insured under the NFIP. A total of 896 NFIP claims for flood damages have been made since 1978 for these structures, and 94 were for substantial damage. Cumulative NFIP payments for flood damages have exceeded \$12.5 million.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 4.3.3-7 Community Flood Vulnerability for Union County.									
Municipality	Total Structures in Municipality	Structures in SFHA	Percent of Structures in SFHA	Total Critical Facilities in Municipality	Total Critical Facilities in SFHA	Percent Critical Facilities in SFHA	Total 2010 Population	2010 Population in SFHA*	Percent Population in SFHA
Buffalo Township	2,743	274	10.0%	5	0	0.0%	3,538	569	16.1%
East Buffalo Township	3,400	157	4.6%	20	6	30.0%	6,414	97	1.5%
Gregg Township	799	104	13.0%	9	1	11.1%	4,984	101	2.0%
Hartleton Borough	206	0	0.0%	1	0	0.0%	283	0	0.0%
Hartley Township	2,030	235	11.6%	7	2	28.6%	1,820	169	9.3%
Kelly Township	2,443	121	5.0%	20	1	5.0%	5,491	155	2.8%
Lewis Township	1,321	59	4.5%	2	0	0.0%	1,480	57	3.9%
Lewisburg Borough	2,346	766	32.7%	8	3	0.0%	5,792	1,672	28.9%
Limestone Township	1,398	75	5.4%	1	0	0.0%	1,723	47	2.7%
Mifflinburg Borough	2,493	57	2.3%	13	0	0.0%	3,540	177	5.0%
New Berlin Borough	536	5	0.9%	6	0	0.0%	873	6	0.7%
Union Township	1,091	100	9.2%	2	0	0.0%	1,589	90	5.7%
West Buffalo Township	2,352	119	5.1%	3	0	0.0%	2,983	246	8.2%
White Deer Township	3,420	563	16.5%	8	0	0.0%	4,437	666	15.0%
TOTAL	26,578	2,635	9.9%	105	13	12.4%	44,947	4,052	9.0%
*Calculated by selecting the 2010 census block centroids that intersect the SFHAs in order to provide an approximation of populations living near the SFHA.									

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

	Buffalo Twp	East Buffalo Twp	Gregg Twp	Hartleton Boro	Hartley Twp	Kelly Twp	Lewis Twp	Lewisburg Boro	Limestone Twp	Mifflinburg Boro	New Berlin Boro	Union Twp	West Buffalo Twp	White Deer Twp	TOTAL
Auxiliary Structure	83	67	38	0	61	51	17	215	14	28	2	24	41	208	849
Barn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Church Structure	1	0	0	0	1	0	0	0	0	0	0	1	0	0	3
Institutional Structure	0	4	2	0	4	4	0	12	2	1	0	1	0	4	23
Commercial Structure	14	34	3	0	3	5	0	44	0	2	1	4	7	6	123
Future Structure Site	0	0	0	0	0	2	0	0	0	0	0	0	1	0	3
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mixed-Use Structure	2	0	0	0	0	3	0	32	0	0	0	0	1	4	42
Residential Structure	161	49	45	0	149	56	38	443	54	20	2	53	42	206	1,318
School Structure	0	0	0	0	0	0	0	18	0	0	0	0	1	0	19
Tower	0	1	0	0	0	0	0	0	0	0	0	1	0	0	2
Trailer	12	1	16	0	16	0	3	1	5	6	0	16	26	133	235
Unknown	0	0	0	0	1	0	1	0	0	0	0	0	0	2	2
Utility Structures	1	1	0	0	0	0	0	1	0	0	0	0	0	2	5
TOTAL	274	157	104	0	235	121	59	766	75	57	5	100	119	563	2,635

**Generalized land use type derived from detailed structure categories in County GIS data. Aggregated by generalized category for ease of discussion in report.*

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

A number of critical facilities are also located in flood-prone areas. These include fire stations, police stations, and municipal buildings. Other facilities including hotels/motels and retirement facilities that may also require special attention during times of flooding for evacuation purposes are also located in flood-prone areas. Table 4.3.3-7 also shows the number of critical facilities located in the SFHA. Only 13 of 105 critical facilities are located in the 1%-annual-chance floodplain. East Buffalo Township has the most critical facilities located in the 1%-annual-chance floodplain with six. Table 4.3.3-9 highlights some of the critical facilities located in the SFHA.

Table 4.3.3-9 Public Facilities in Special Flood Hazard Areas.	
FACILITY	MUNICIPALITY
Union County Community Services Building	East Buffalo Township
Union County Government Center	East Buffalo Township
Warrior Run Area Fire Company	Gregg Township
William Cameron Engine Company	Lewisburg Borough
White Deer Township Fire Department	White Deer Township
East Buffalo Township Municipal Offices	East Buffalo Township
Hartley Township Municipal Building	Hartley Township
Lewisburg Borough Offices/Reading RR Station	Lewisburg Borough
Lewisburg Borough Equipment Center	Lewisburg Borough
East Buffalo Township Police Station	East Buffalo Township
Lewisburg Borough Police Station/Reading RR Station	Lewisburg Borough
Lewisburg Area High School	Lewisburg Borough

While Evangelical Community Hospital is not located in a Special Flood Hazard Area, flooding may cause difficulty in reaching the hospital as Buffalo Creek may lead to flooding on access routes, U.S. Highway 15 and Hospital Drive.

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

4.3.4. Hurricane, Tropical Storm, Nor'easter

4.3.4.1. Location and Extent

Hurricanes, tropical storms, and nor'easters are classified as cyclones and are any closed circulation developing around a low-pressure center in which the winds rotate counter-clockwise. Tropical storms impacting Union County develop in tropical or sub-tropical waters found in the Atlantic Ocean, Gulf of Mexico, or Caribbean Sea. Cyclones with maximum sustained winds of less than 39 miles per hour are called tropical depressions. A tropical storm is a cyclone with maximum sustained winds between 39-74 mph. These storms sometimes develop into hurricanes with wind speeds in excess of 74 mph. Although Union County is located over 100 miles inland from the Atlantic Coast, tropical storms and hurricanes could track inland causing heavy rainfall and strong winds.

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

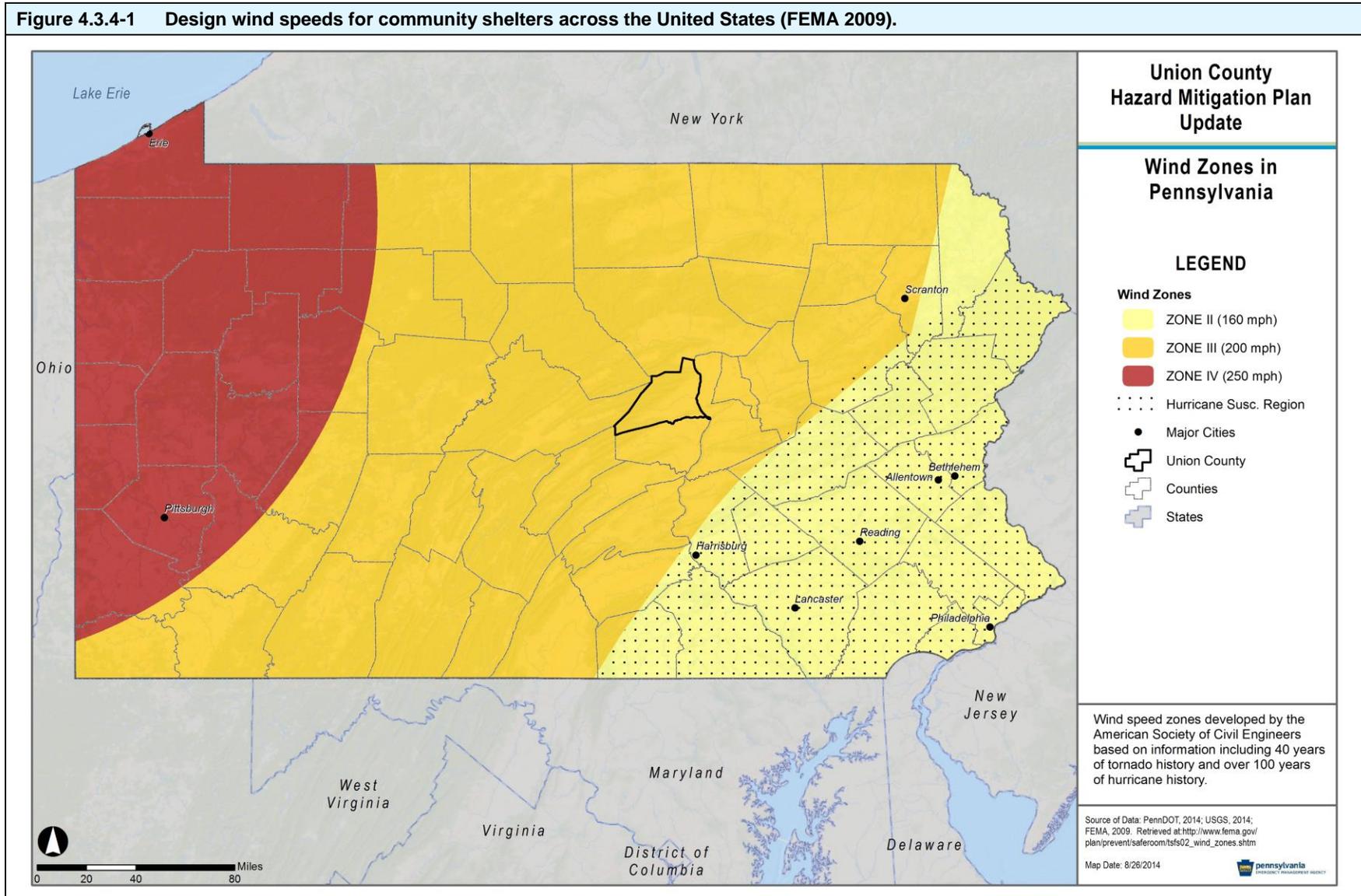
Hurricanes, tropical storms, and nor'easters are regional events that can impact very large areas hundreds to thousands of miles across over the life the storm. Therefore, all communities within Union County are equally subject to the impacts of hurricanes, tropical storms, and nor'easters that track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

Figure 4.3.4-1 shows wind speed zones developed by the American Society of Civil Engineers based on information including 40 years of tornado history and over 100 years of hurricane history. It identifies wind speeds that could occur across the United States to be used as the basis for design and evaluation of the structural integrity of shelters and critical facilities.

Union County falls within Zone III, meaning design wind speeds for shelters and critical facilities should be able to withstand a three second gust of up to 200 mph, regardless of whether the gust is the result of a tornado, hurricane, tropical storm, or windstorm event.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Figure 4.3.4-1 Design wind speeds for community shelters across the United States (FEMA 2009).



4.3.4.2. Range of Magnitude

The impacts associated with hurricanes and tropical storms are primarily wind damage and flooding. It is not uncommon for tornadoes to develop during these events. Historical tropical storm and hurricane events have brought intense rainfall, sometimes leading to damaging floods, northeast winds, which, combined with waterlogged soils, caused trees and utility poles to fall. Nor'easters can also bring damaging rain and wind but because they often occur during the winter months, they bring the additional threat of snow and ice associated with winter storms. Heavy snow can cause roof collapse in older homes and ice presents a threat of slipping and tree branch collapse. More information on the range of magnitude of winter storms can be found in Section 4.3.9.2.

The impact tropical storm or hurricane events have on an area is typically measured in terms of wind speed. Expected damage from hurricane force winds is measured using the Saffir-Simpson Scale. The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds, barometric pressure, and storm surge potential (characteristic of tropical storms and hurricanes), which are combined to estimate potential damage. Table 4.3.4-1 lists Saffir-Simpson Scale categories with associated wind speeds and expected damages. Categories 3, 4, and 5 are classified as "major" hurricanes. While major hurricanes comprise only 20 of all tropical cyclones making landfall, they account for over 70 percent of the damage in the United States. The intensity of a storm is also impacted by its orientation, location of landfall, and speed. The likelihood of these damages occurring in Union County is assessed in Section 4.3.4.4, Future Occurrence.

STORM CATEGORY	WIND SPEED (mph)	DESCRIPTION OF DAMAGES
1	74-95	Very dangerous winds will produce some damage: Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110	Extremely dangerous winds will cause extensive damage: Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3	111-130	Devastating damage will occur: Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4	131-155	Catastrophic damage will occur: Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5	>155	Catastrophic damage will occur: A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

STORM CATEGORY	WIND SPEED (mph)	DESCRIPTION OF DAMAGES
		of the area will be uninhabitable for weeks or months.

It is important to recognize the potential for flooding events during hurricanes, tropical storms, and nor'easters; the risk assessment and associated impact for these events is included Section 4.3.4. Wind impacts in Union County generally include downed trees and utility poles, which can spark widespread utility interruptions. Wind impacts are particularly an issue for mobile homes and other manufactured housing; these structures are often not well-anchored and are highly susceptible to wind damage in a hurricane, tropical storm, or nor'easter.

The worst case scenario for a hurricane, tropical storm, or nor'easter event in Union County was Hurricane Agnes, which struck the Susquehanna Valley in June 1972 and causing over 16 inches in rain. The Susquehanna River reached 34.23 feet. The Borough of Lewisburg was particularly impacted by the hurricane. Water covered sections of Routes 15 and 45 and three people died during evacuations.

4.3.4.3. Past Occurrence

The National Oceanic and Atmospheric Administration's Coastal Services Center maintains records of all coastal storms occurring in the United States since the 1850s. Table 4.3.4-2 lists all coastal storms having centers of circulation to pass through or within 30 nautical miles of Union County. Typically when these storms reach Union County, they have lost their hurricane speed winds, so structural damage is usually not as bad as coastal communities may experience.

YEAR	EVENT	STRENGTH IN/NEAR UNION COUNTY
2006	Ernesto	Hurricane
1999	Dennis	Hurricane
1994	Beryl	Tropical Storm
1992	Danielle	Tropical Storm
1979	David	Hurricane
1979	Frederic	Hurricane
1959	Gracie	Hurricane
1955	Connie	Hurricane
1954	Hazel	Hurricane

Figure 4.3.4-2 shows the tracking of some of these storm events in or near Union County. It is important to note that a number of hurricane and tropical storm events have impacted the County without tracking through or near it; these storm events include Tropical Storm Lee

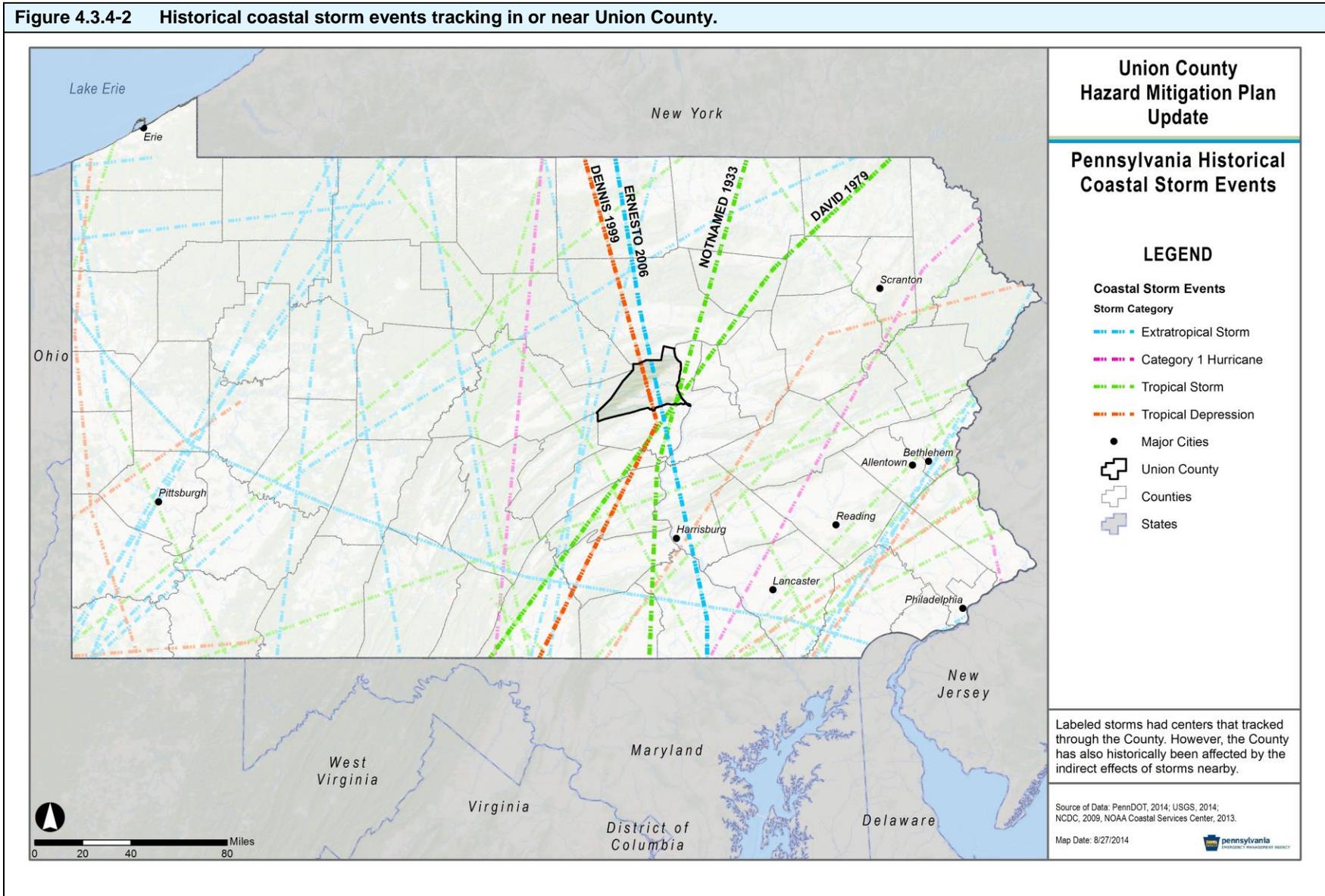
Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

(2011), Hurricane Sandy (2012), Hurricane Katrina (2005), and Tropical Depression Ivan (2004). Each of these storm events resulted in a Presidential Disaster Declaration. In addition, Hurricane Agnes (1972) did not track in or near Union County but resulted in significant flooding in the Borough of Lewisburg as described in Section 4.3.4.2 above.

The NOAA NCDC database does not track nor'easters as a separate weather event; they are tracked as high wind, heavy snow, and/or coastal flooding events, so a complete listing is not available. However, other sources provide record that some of the winter storms listed in Section 4.3.9.3 were nor'easters. For instance, a nor'easter affected much of Pennsylvania and several other states between Washington, D.C. and Boston, Massachusetts from January 6-8, 1996, resulting in Presidential Disaster Declaration 1085. Blizzard conditions included heavy snow, strong winds, and very cold temperatures (NWS, 1996). About a week later, unseasonably high temperatures and rainfall melted the thick snowpack left by the Nor'easter and resulted in Presidential Disaster Declaration 1093 for flooding (NCDC, 2014). More recently, there was a nor'easter that took place on October 29, 2011 and brought 3-9" of snow accumulation with 10-12" of accumulation in the higher elevations. The heavy, wet snow brought tree and utility damage and half a million power outages state-wide (NCDC, 2014).

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Figure 4.3.4-2 Historical coastal storm events tracking in or near Union County.

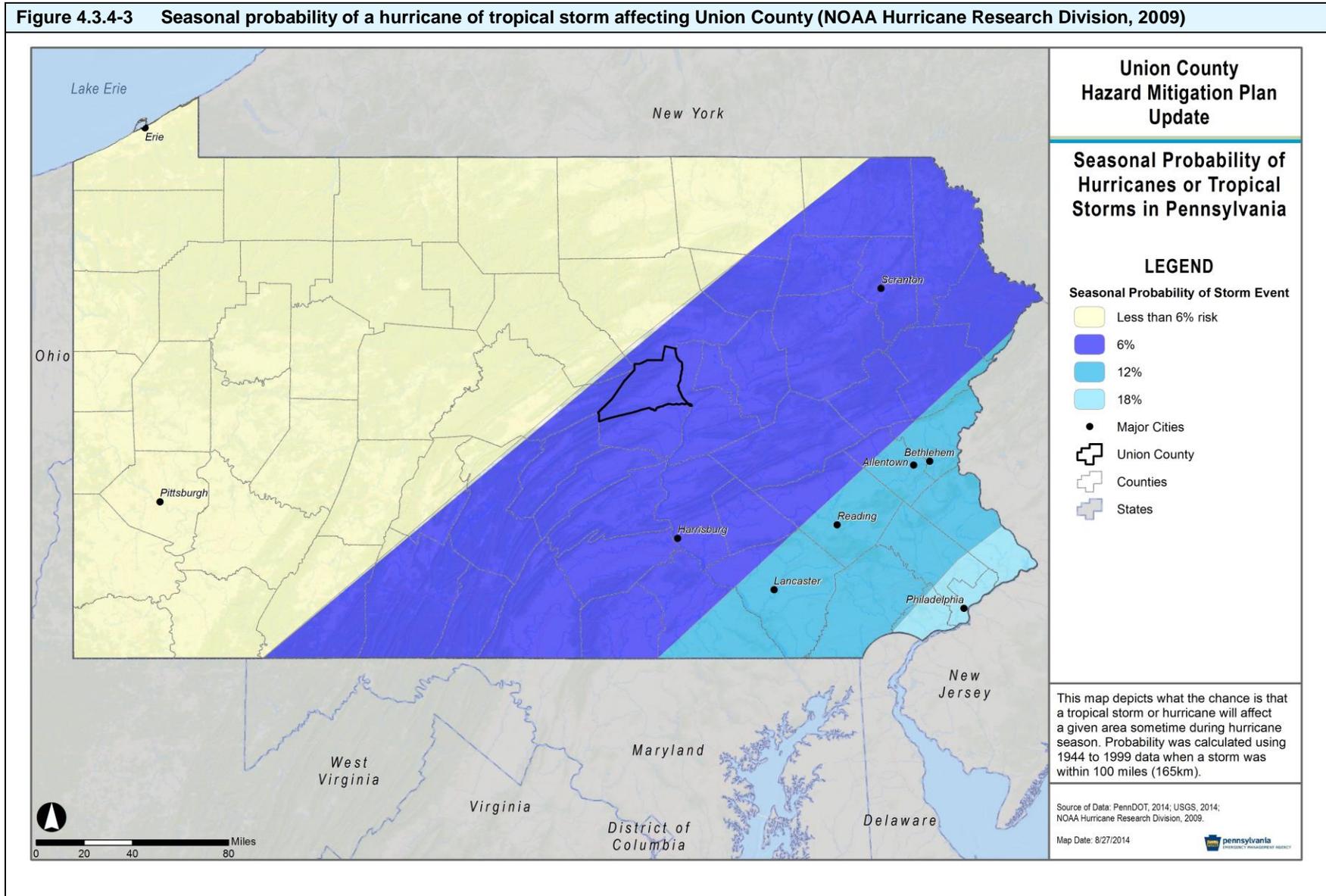


4.3.4.4. Future Occurrence

Although hurricanes, tropical storms, and nor'easters can cause flood events consistent with 1 percent- and 0.2 percent- level frequency, their probability of occurrence is measured relative to wind speed. The National Oceanic and Atmospheric Administration Hurricane Research Division published the map included as Figure 4.3.4-2 showing the chance that a tropical storm or hurricane will affect a given area during the entire Atlantic hurricane season spanning from June to November. Note that this figure does not provide information on the probability of various storm intensities. However, based on historical data between 1944 and 1999, this map reveals there is approximately a six percent chance of experiencing a tropical storm or hurricane event between June and November of any given year in the County. This translates to a future occurrence of *possible*, as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1). It is difficult to assign a probability to the future occurrence of nor'easters in Union County; however, the storms are possible in the county. Although Union County is not likely to experience the severe high winds faced in more coastal communities during a nor'easter, the county is subject to heavy snow, ice, and blizzard conditions.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Figure 4.3.4-3 Seasonal probability of a hurricane or tropical storm affecting Union County (NOAA Hurricane Research Division, 2009)



4.3.4.5. Vulnerability Assessment

A vulnerability assessment for hurricanes, tropical storms, and nor'easters focuses on the impacts of flooding and severe wind. Therefore, the assessment for flood-related vulnerability is addressed in Section 4.3.3.5. In addition, mobile/manufactured homes are vulnerable to hurricanes, tropical storms, and nor'easters. Section 4.3.7.5 discusses vulnerability to wind damage and includes Table 4.3.7-4 which shows the number of mobile homes per community. The County is also vulnerable to severe winter weather impacts caused by nor'easters which are evaluated in 4.3.9.5.

4.3.5. Landslide

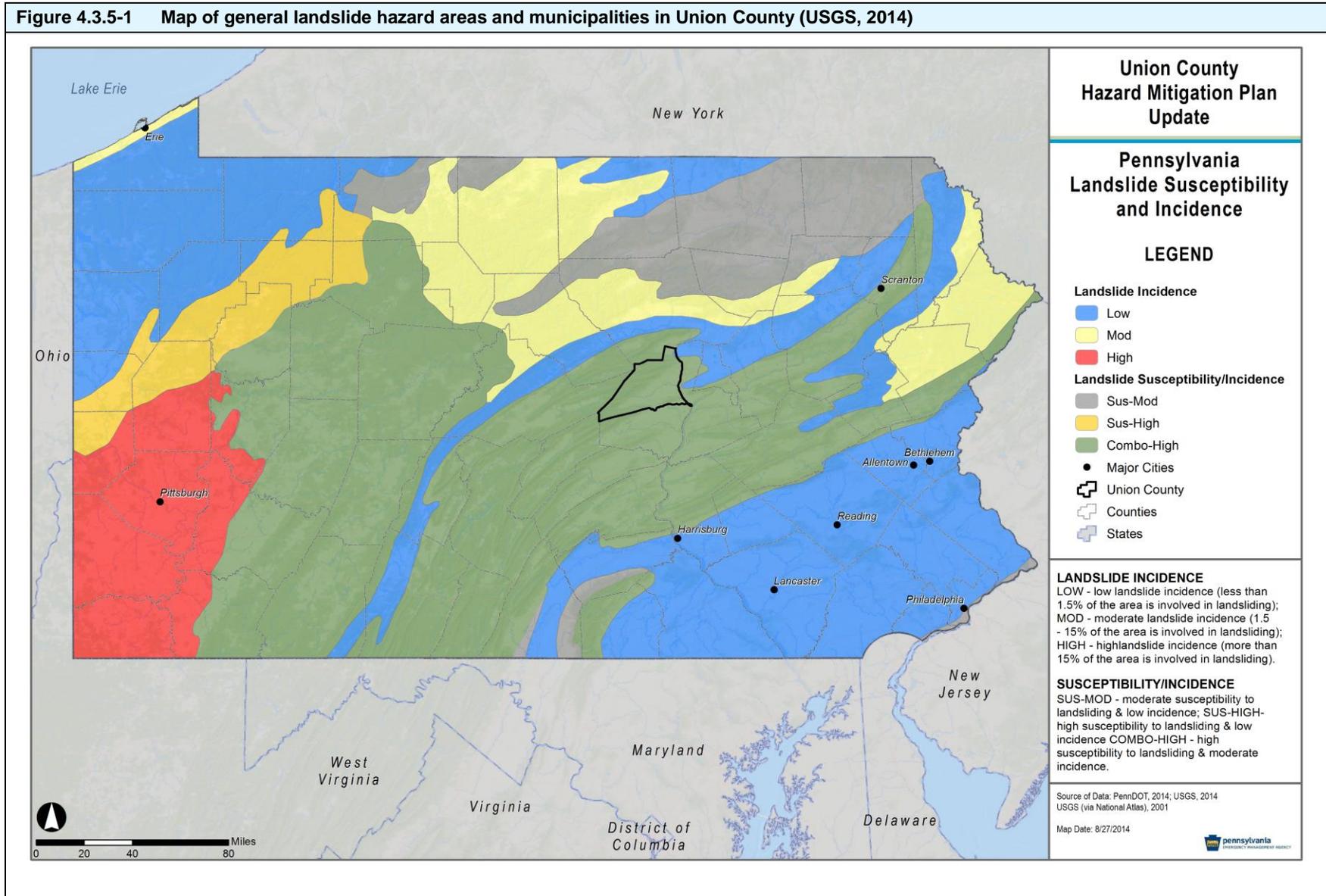
4.3.5.1. Location and Extent

A landslide is a natural geologic process that has played a large part in shaping the landscape of Pennsylvania. Landslide is a general term for mass movement of soil, rock, or a combination of materials down a slope.

The USGS identifies Union County as falling into a *Combo-High* zone of landslide susceptibility and incidence (Figure 4.3.5-1). This means that these areas have a high susceptibility to landslides with a moderate incidence of occurrence.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Figure 4.3.5-1 Map of general landslide hazard areas and municipalities in Union County (USGS, 2014)



Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

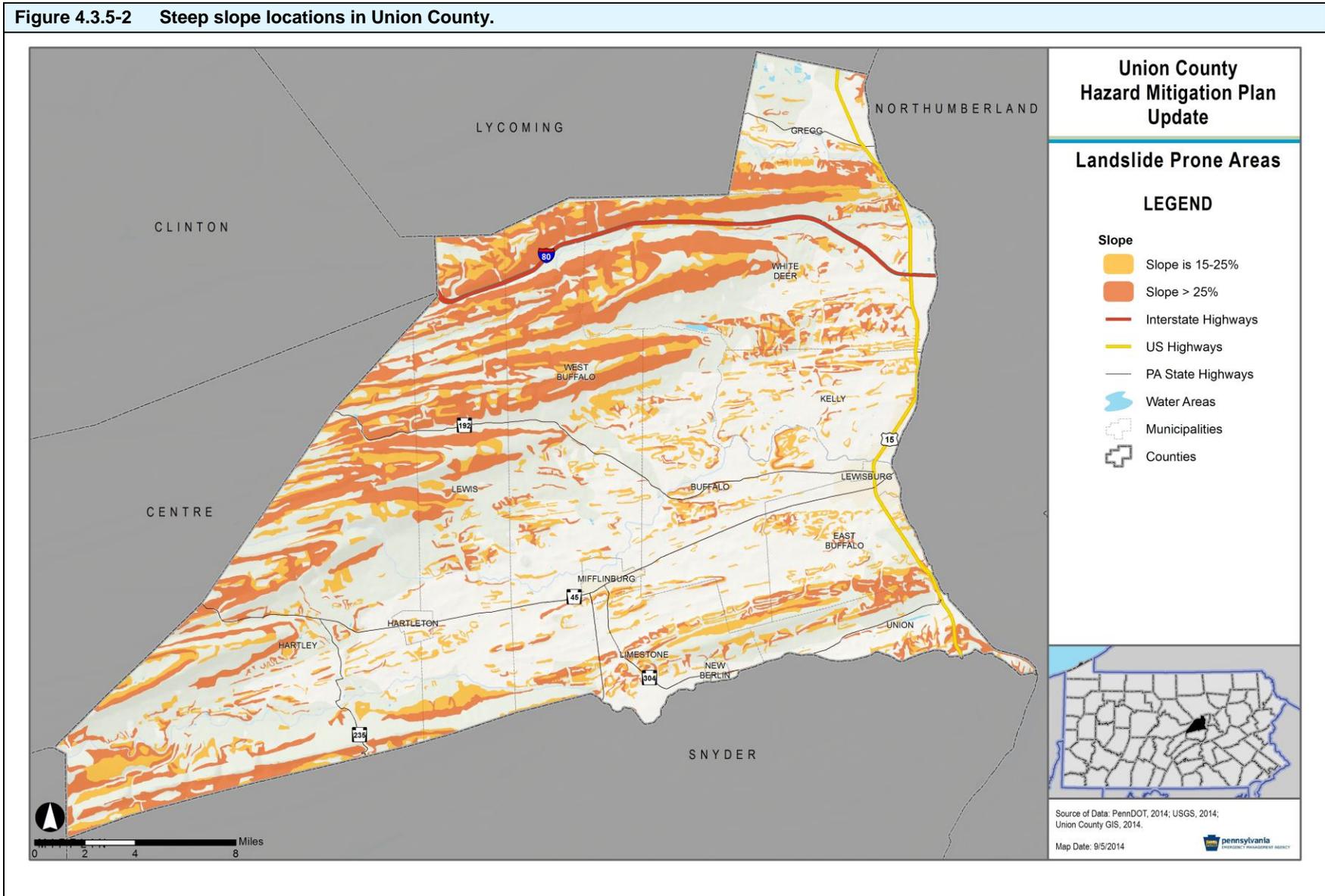
A slope greater than 7% (approximately around 15 degrees) needs special considerations for building roads according to common engineering practice, and a slope of 15% (approximately around 25 degrees) is generally unstable and highly sensitive to surface changes. Slopes greater than 25% are very unstable. Steep slopes are particularly prevalent in Hartley and Lewis Townships as shown in Table 4.3.5-1. Figure 4.3.5-2 shows the locations of areas with slopes between 15 and 25 percent and greater than or equal to 25 percent.

Table 4.3.5-1 Percent of Area with Steep Slopes (Union County GIS Department, 2014).

MUNICIPALITY	AREA WITH SLOPES OF 25% OR GREATER	AREAS WITH SLOPES BETWEEN 15% AND 25%
Buffalo Township	0.2%	0.2%
East Buffalo Township	0.5%	0.6%
Gregg Township	1.1%	0.4%
Hartleton Borough	0.8%	7.3%
Hartley Township	0.2%	0.0%
Kelly Township	0.1%	0.3%
Lewis Township	0.4%	0.0%
Lewisburg Borough	0.0%	0.0%
Limestone Township	0.2%	0.0%
Mifflinburg Borough	0.9%	31.2%
New Berlin Borough	0.6%	15.1%
Union Township	1.2%	0.0%
West Buffalo Township	0.5%	0.0%
White Deer Township	0.4%	0.1%

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Figure 4.3.5-2 Steep slope locations in Union County.



4.3.5.2. Range of Magnitude

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

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

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

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

4.3.5.3. Past Occurrence

A comprehensive inventory of landslides events in Pennsylvania does not exist. The NCDC database captures landslides as they occur in conjunction with severe storms; the NCDC database does not report any landslides in Union County. However, representatives of the Union County Department of Emergency Management identified two incidents of falling rock that have occurred within the past 25 years. One incident occurred along U.S. Highway 15 and the other along State Route 45, although it was unclear the year in which these events happened.

4.3.5.4. Future Occurrence

Given that no damage due to landslide has been recorded in Union County, the future occurrence of landslides can be considered *unlikely* as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1). However, there is the possibility of some rock falling from a steep slope, given that this occurred twice in the past 25 years. These events are not expected to be small, and cause little to no damage.

4.3.5.5. Vulnerability Assessment

A landslide might cause a structure to collapse or might cause minor damages such as broken windows. A landslide might cause a roadway to be temporarily blocked. Less than 10 percent of structures in Union County are located on steep slopes that pose a risk of damage due to landslide. There are two critical facilities located in steep slope areas.

Table 4.3.5-2 summarizes the number of existing buildings and critical facilities in the County that are located in areas with steep slopes and may, therefore, experience damages should a landslide occur.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 4.3.5-2 Landslide Vulnerability for Union County						
Municipality	Total Structures in Municipality	Structures in Steep Slope Areas	Percent of Structures in Steep Slope Areas	Total Critical Facilities in Municipality	Total Critical Facilities in Steep Slope Areas	Percent Critical Facilities in Steep Slope Areas
Buffalo Township	2,743	276	10.1%	5	0	0.0%
East Buffalo Township	3,400	265	7.8%	20	0	0.0%
Gregg Township	799	66	8.3%	9	0	0.0%
Hartleton Borough	206	9	4.4%	1	0	0.0%
Hartley Township	2,030	237	11.7%	7	1	14.3%
Kelly Township	2,443	250	10.2%	20	0	0.0%
Lewis Township	1,321	153	11.6%	2	0	0.0%
Lewisburg Borough	2,346	7	0.3%	8	0	0.0%
Limestone Township	1,398	206	14.7%	1	0	0.0%
Mifflinburg Borough	2,493	174	7.0%	13	0	0.0%
New Berlin Borough	536	7	1.3%	6	0	0.0%
Union Township	1,091	163	14.9%	2	0	0.0%
West Buffalo Township	2,352	228	9.7%	3	0	0.0%
White Deer Township	3,420	458	13.4%	8	1	12.5%
TOTAL	26,578	2,499	9.4%	105	2	1.9%

Table 4.3.5-3 shows the number of structures in each municipality located in areas susceptible to landslide by land use type. The land use type displaying the greatest vulnerability to landslide hazards is residential.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

	Buffalo Twp	East Buffalo Twp	Gregg Twp	Hartleton Boro	Hartley Twp	Kelly Twp	Lewis Twp	Lewisburg Boro	Limestone Twp	Mifflinburg Boro	New Berlin Boro	Union Twp	West Buffalo Twp	White Deer Twp	TOTAL
Auxiliary Structure	111	43	24	6	57	102	72	2	90	50	1	43	85	171	857
Barn	0	1	0	0	0	1	0	0	1	0	0	0	0	1	4
Church Structure	1	0	0	0	0	1	1	0	0	2	0	0	0	1	6
Institutional Structure	0	3	1	0	8	1	1	0	1	3	0	0	0	7	25
Commercial Structure	4	3	0	1	3	7	2	0	0	0	0	2	2	3	27
Future Structure Site	0	40	0	0	0	10	3	0	4	1	0	2	4	16	80
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mixed-Use Structure	1	0	0	0	0	1	1	0	0	1	0	1	0	0	5
Residential Structure	130	174	25	2	153	115	64	0	106	116	6	109	124	228	1,352
School Structure	0	0	0	0	0	0	0	5	0	0	0	0	1	0	6
Tower	0	0	0	0	0	2	0	0	0	1	0	0	0	0	3
Trailer	29	0	16	0	15	10	9	0	4	0	0	6	8	29	126
Unknown	0	1	0	0	1	0	0	0	0	0	0	0	4	2	8
Utility Structures	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	2,743	3,400	799	206	2,030	2,443	1,321	2,346	1,398	2,493	536	1,091	2,352	3,420	26,578

**Generalized land use type derived from detailed structure categories in County GIS data. Aggregated by generalized category for ease of discussion in report.*

Existing infrastructure at risk of damage or closure due to landslide or rock fall are four segments of busy roadways. These are:

- State Route 45 in Hartley Township, which experiences an average of 1,600 trips per day
- U.S. Highway 15 in Kelly Township, which experiences an average of 25,000 trips per day
- U.S. Highway 15 in White Deer Township, which experiences an average of 14,500 trips per day
- U.S. Highway 15 in Union Township, which experiences an average of 18,400 trips per day

4.3.6. Subsidence and Sinkhole

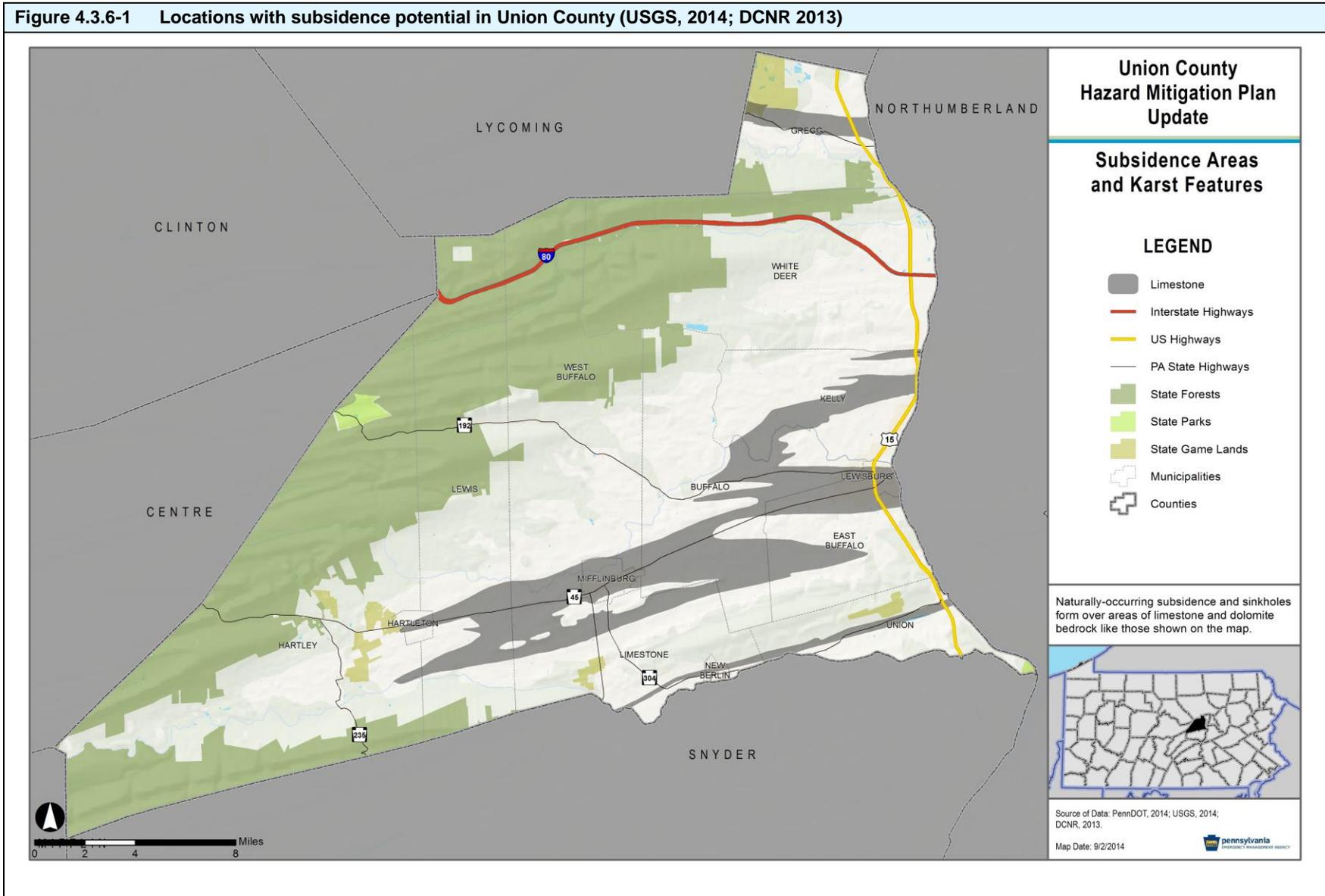
4.3.6.1. Location and Extent

In Pennsylvania, research has shown that subsidence may occur, but will not necessarily occur, in areas underlain by carbonate bedrock. Figure 4.3.6-1 shows that the eastern portion of Union County is underlain by carbonate bedrock (i.e., limestone). However, according to the Steering Committee, no locations in Union County are known to have a history of subsidence despite the possibility of subsidence due to the carbonate bedrock.

Subsidence and the appearance of sinkholes in Pennsylvania are also often due to subsurface mining. The Pennsylvania Department of Environmental Protection has a Mine Subsidence program and provides information about the risk of subsidence by zip code. As part of this planning process, all Union County zip codes were identified and examined for occurrences of mine subsidence. No occurrences of mine subsidence were identified in Union County zip codes.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Figure 4.3.6-1 Locations with subsidence potential in Union County (USGS, 2014; DCNR 2013)



4.3.6.2. Range of Magnitude

The magnitude of land subsidence and sinkholes in Union County is minimal as there are no known occurrences of land subsidence. However, experience in Pennsylvania shows that subsidence may cause from a fraction of an inch to several feet of sagging of the surface of the earth and may occur within minutes or over several years.

Land subsidence and sinkholes can affect the movement of surface water as well as of groundwater and can lead to contamination of water. Land subsidence and sinkholes may lead to damage of roads or utility lines.

According to the Pennsylvania Department of Environmental Protection, structural damages due to subsidence range from slight damage requiring cosmetic repairs to severe damage requiring foundation replacement or other high cost repairs.

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

4.3.6.3. Past Occurrence

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

4.3.6.4. Future Occurrence

Because there are no known occurrences of subsidence or sinkholes in the County, the probability of land subsidence occurring in Union County is estimated to be less than one percent per year. It can be considered *unlikely* as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

4.3.6.5. Vulnerability Assessment

Almost 12 percent of Union County is part of the Keyser-Tonoloway Geologic Formation, which means that it is underlain with limestone and may be prone to subsidence. Table 4.3.6-1 shows the percentage of land, though not necessarily developed land, in each participating jurisdiction that has the potential for land subsidence based upon geologic characteristics.

MUNICIPALITY	PERCENT WITH POTENTIAL FOR SUBSIDENCE OR SINKHOLES
Buffalo Township	34.9%
East Buffalo Township	32.8%
Gregg Township	7.6%
Hartleton Borough	30.4%

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 4.3.6-1 Percent of Area with Potential for Land Subsidence or Sinkholes.

MUNICIPALITY	PERCENT WITH POTENTIAL FOR SUBSIDENCE OR SINKHOLES
Hartley Township	0.3%
Kelly Township	25.9%
Lewis Township	10.3%
Lewisburg Borough	87.2%
Limestone Township	12.5%
Mifflinburg Borough	91.2%
New Berlin Borough	25.9%
Union Township	12.6%
West Buffalo Township	5.6%
White Deer Township	0.0%
TOTAL	10.8%

Because there is no history of land subsidence in Union County, no impacts to structures or infrastructure are anticipated. However, existing structures potentially at risk of damage due to land subsidence are in the eastern part of the County. There are 9,617 structures on land underlain with limestone. These are a large portion of the structures located in Hartleton, Lewisburg, and Mifflinburg Boroughs as shown in Table 4.3.6-2.

Table 4.3.6-2 Subsidence Vulnerability for Union County.

Municipality	Total Structures in Municipality	Structures Underlain by Limestone	Percent of Structures Underlain by Limestone	Total Critical Facilities in Municipality	Total Critical Facilities Structures Underlain by Limestone	Percent Critical Facilities Structures Underlain by Limestone
Buffalo Township	2,743	1,049	38.2%	5	3	60.0%
East Buffalo Township	3,400	1,846	54.3%	20	16	80.0%
Gregg Township	799	156	19.5%	9	0	0.0%
Hartleton Borough	206	151	73.3%	1	0	0.0%
Hartley Township	2,030	18	0.9%	7	0	0.0%
Kelly Township	2,443	485	19.9%	20	0	0.0%
Lewis Township	1,321	436	33.0%	2	2	100.0%
Lewisburg Borough	2,346	2,245	95.7%	8	8	100.0%

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 4.3.6-2 Subsidence Vulnerability for Union County.						
Municipality	Total Structures in Municipality	Structures Underlain by Limestone	Percent of Structures Underlain by Limestone	Total Critical Facilities in Municipality	Total Critical Facilities Structures Underlain by Limestone	Percent Critical Facilities Structures Underlain by Limestone
Limestone Township	1,398	309	22.1%	1	0	0.0%
Mifflinburg Borough	2,493	2,377	95.3%	13	13	100.0%
New Berlin Borough	536	73	13.6%	6	4	66.7%
Union Township	1,091	134	12.3%	2	0	0.0%
West Buffalo Township	2,352	338	14.4%	3	1	33.3%
White Deer Township	3,420	0	0.0%	8	0	0.0%
TOTAL	26,578	9,617	36.2%	105	47	44.8%

Table 4.3.6-3 shows the number of structures in each municipality located in areas susceptible to subsidence and sinkhole by land use type. The land use type displaying the greatest vulnerability to subsidence and sinkhole hazards is residential.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

	Buffalo Twp	East Buffalo Twp	Gregg Twp	Hartleton Boro	Hartley Twp	Kelly Twp	Lewis Twp	Lewisburg Boro	Limestone Twp	Mifflinburg Boro	New Berlin Boro	Union Twp	West Buffalo Twp	White Deer Twp	TOTAL
Auxiliary Structure	428	454	49	68	10	208	212	657	144	822	22	55	87	0	3,216
Barn	1	1	0	0	0	0	1	0	3	0	0	0	0	0	6
Church Structure	11	3	1	1	0	3	5	7	4	8	1	1	2	0	47
Institutional Structure	3	9	1	3	0	4	6	19	0	26	4	0	2	0	77
Commercial Structure	66	109	2	9	0	13	12	97	21	124	4	14	21	0	492
Future Structure Site	45	47	22	0	0	8	1	0	1	2	0	0	4	0	130
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mixed-Use Structure	14	32	0	0	0	7	2	174	0	20	0	1	1	0	251
Residential Structure	463	1,127	77	69	8	237	175	1,239	123	1,229	39	60	219	0	5,065
School Structure	2	48	0	0	0	1	2	49	4	5	2	0	1	0	114
Tower	0	1	0	1	0	1	0	1	0	0	0	0	0	0	4
Trailer	14	14	4	0	0	3	18	1	9	140	1	0	0	0	204
Unknown	1	0	0	0	0	0	2	0	0	0	0	3	1	0	7
Utility Structures	1	1	0	0	0	0	0	1	0	1	0	0	0	0	4
TOTAL	1,049	1,846	156	151	18	485	436	2,245	309	2,377	73	134	338	0	9,617

**Generalized land use type derived from detailed structure categories in County GIS data. Aggregated by generalized category for ease of discussion in report.*

Forty-seven critical facilities have been identified in areas with the potential for land subsidence. Some of these are identified in Table 4.3.6-4 below.

Table 4.3.6-4 Critical Facilities in Areas with Potential for Subsidence or Sinkholes.
MUNICIPALITY
Lewisburg Borough Equipment Center
Lewisburg Borough Offices/Reading RR Station
Lewisburg Borough Police Station/Reading RR Station
(Lewisburg) William Cameron Engine Company
Mifflinburg Area Water Treatment Plant
Mifflinburg Borough Building
Mifflinburg Borough Garage
Mifflinburg Borough Offices
Mifflinburg Borough Police Station
Mifflinburg Hose Company
Mifflinburg Wastewater Treatment Plant
Buffalo Township Municipal Building
East Buffalo Township Municipal Offices
(East Buffalo Township) Pennsylvania Department of Transportation
East Buffalo Township Police Station
Lewis Township Municipal Authority
Lewis Township Municipal Building
Union County Community Services Building
Union County Courthouse
Union County Government Center
Union Township Fire Company

4.3.7. Tornado and Windstorm

4.3.7.1. Location and Extent

Tornadoes and potentially damaging high winds occur throughout Pennsylvania. A tornado or high winds may be experienced at any location in Union County.

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

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

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

Straight-line winds often accompany tornadoes and are caused by the movement of air from areas of higher pressure to areas of lower pressure – the greater the difference in pressure, the stronger the winds. Wind storms are generally defined as sustained wind speeds of 40 mph or greater lasting for one hour or longer, or winds of 58 mph or greater for any duration.

The enhanced Fujita Tornado Scale (or the -EF-Scale) classifies U.S. tornadoes into six intensity categories, named EF0 to EF5, based upon the estimated maximum winds occurring within the funnel. The EF-Scale has subsequently become the definitive metric for estimating wind speeds within tornadoes based upon the damage done to buildings and structures.

4.3.7.2. Range of Magnitude

Since 2007 an Enhanced Fujita Scale (EF Scale) has been used in the United States to describe the magnitude of tornadoes. Prior to 2007, the Fujita Scale was commonly used to describe magnitude. This scale is based on new information about the relationship between wind speed given in miles per hour (mph) and corresponding damages. The EF Scale categorized tornadoes from EF0 to EF5 with EF0 being the most commonly occurring type of tornado. The most damaging and deadliest tornado recorded in Union County was a category 3 or EF3 tornado. Table 4.3.7-1 shows the relationship between the Fujita and the Enhanced Fujita Scales.

Table 4.3.7-1 Enhanced Fujita Scale (EF-Scale) categories with associated wind speeds and description of damages.			
FUJITA SCALE		ENHANCED FUJITA SCALE	
F Number	3-Second Gust (mph)	EF Number	3-Second Gust (mph)
0	45–78	0	65–85
1	79–117	1	86–110
2	118–161	2	111–135
3	162–209	3	136–165

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 4.3.7-1 Enhanced Fujita Scale (EF-Scale) categories with associated wind speeds and description of damages.			
FUJITA SCALE		ENHANCED FUJITA SCALE	
4	210–261	4	166–200
5	262–317	5	Over 200

Table 4.3.7-2 provides a description of the types of damages that can be expected with each category of tornado.

Table 4.3.7-2 Expected Tornado Damages.	
F OR EF SCALE	EXAMPLES OF POSSIBLE DAMAGE
0	Light damage. Some damage to chimneys; broken tree branches; shallow-rooted trees pushed over; damage to sign boards.
1	Moderate damage. Surface peeled off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off roads.
2	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.
3	Severe damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; cars lifted off ground and thrown.
4	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
5	Catastrophic damage. Well built houses swept completely away, leaving only the slab foundations.

While tornado winds rotate, high winds that move in a straight line can also be damaging. High winds are defined as sustained wind speeds of 40 mph or greater lasting for one hour or more, or winds of 58 mph or greater for any duration.

Figure 4.3.4-1 in the Hurricane, Tropical Storm, and Nor'easter shows wind speed zones developed by the American Society of Civil Engineers based on information including 40 years of tornado history and over 100 years of hurricane history. It identifies wind speeds that could occur across the United States to be used as the basis for design and evaluation of the structural integrity of shelters and critical facilities. Union County falls within Zone III, meaning design wind speeds for shelters and critical facilities should be able to withstand a three-second gust of up to 200 mph, regardless of whether the gust is the result of a tornado, hurricane, tropical storm, or windstorm event. Therefore, these structures should be able to withstand speeds experienced in an EF4 or EF5 tornado.

4.3.7.3. Past Occurrence

The deadliest tornado recorded in Union County was an F3 in May 1985 when two people were killed and were 20 injured. Many houses and farm buildings were demolished. At one farm that was destroyed, nearly three dozen cows were killed. This was a worst-case scenario for

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

tornadoes in Union County. Two F0 tornadoes occurred on the same day in 1997. Tornadoes with an F1 magnitude occurred in 1998 and in 2001. In July 2009, an F0 tornado touched down on the north side of interstate 80 and moved southeast for approximately one mile. The tornado crossed interstate 80 before lifting near White Deer Township. Damage was minimal with about 10 trees and branches blown down or uprooted. There was also an EF0 tornado that occurred in 2009 and an EF1 tornado in 2011. Table 4.3.7-3 summarizes previous tornado events in Union County.

Table 4.3.7-3 Previous tornado events between 1950 and 2014 in Union County (NCDC, 2014).					
LOCATION	DATE	ESTIMATED LENGTH	ESTIMATED WIDTH	MAGNITUDE	ESTIMATED PROPERTY DAMAGE (\$)
Countywide	05/31/85	4.00 miles	910 yards	F3	25,000,000
Lewisburg	07/18/97	1.00 miles	440 yards	F0	<i>not given</i>
Lewisburg	07/18/97	2.30 miles	100 yards	F0	<i>not given</i>
New Columbia	09/27/98	2.50 miles	400 yards	F1	<i>not given</i>
Lewisburg	09/04/01	2.00 miles	300 yards	F1	60,000
White Deer	07/11/09	1.00 miles	50 yards	EF0	5,000
Winfield	05/23/11	0.29 miles	100 yards	EF1	25,000

High winds moving in a straight line are the movement of air from areas of higher pressure to areas of lower pressure. As the difference in pressure increases, the strength and speed of the winds increase. Wind storms are generally defined as having sustained straight-line wind speeds of 40 mph or greater that last for one hour or longer, or winds of 58 mph (i.e. 50 knots) or greater for any duration. Table 4.3.7-4 summarizes previous high wind events in the County.

Table 4.3.7-4 Previous windstorm events greater than 50 knots in Union County between 1950 and 2014 (NCDC, 2014).			
LOCATION	DATE	ESTIMATED WIND SPEED (knots)	ESTIMATED PROPERTY DAMAGE (\$)
Mifflinburg	11/11/1995	52	<i>not given</i>
New Columbia	11/08/1996	50	<i>not given</i>
Mifflinburg	05/19/1997	51	<i>not given</i>
New Columbia	08/16/1997	51	<i>not given</i>
Lewisburg	05/29/1998	51	<i>not given</i>
Lewisburg	06/02/1998	51	<i>not given</i>
Lewisburg	06/30/1998	51	<i>not given</i>
Mifflinburg	09/07/1998	51	<i>not given</i>
Countywide	09/16/1999	60	<i>not given</i>
Countywide	09/29/1999	60	<i>not given</i>
Allenwood	06/20/2001	50	<i>not given</i>
Mifflinburg	07/17/2001	50	<i>not given</i>
Lewisburg	08/19/2001	50	<i>not given</i>

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

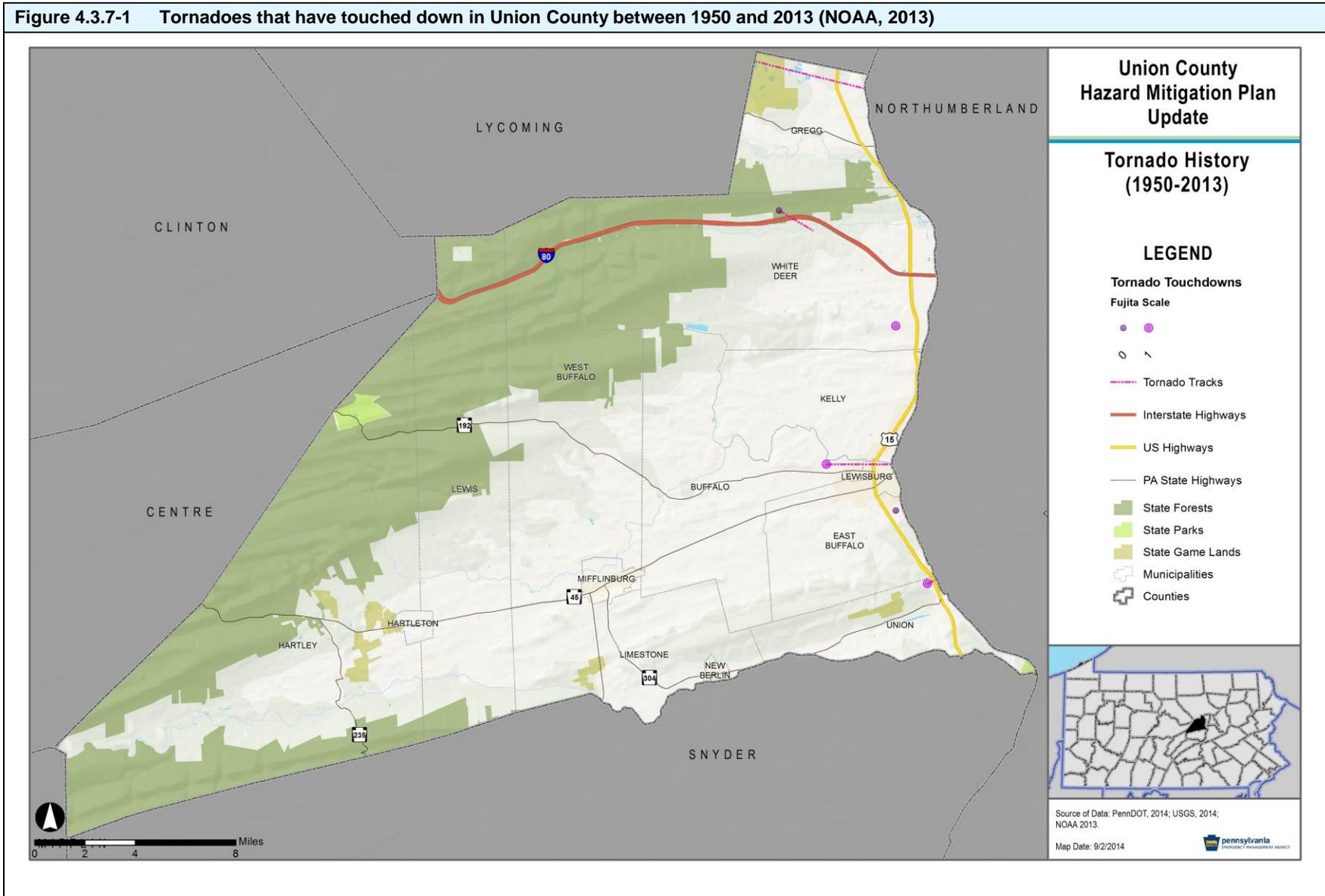
Table 4.3.7-4 Previous windstorm events greater than 50 knots in Union County between 1950 and 2014 (NCDC, 2014).

LOCATION	DATE	ESTIMATED WIND SPEED (knots)	ESTIMATED PROPERTY DAMAGE (\$)
Countywide	03/09/2002	50	<i>not given</i>
Mifflinburg	04/28/2002	50	<i>not given</i>
Mifflinburg	06/27/2002	50	<i>not given</i>
Lewisburg	07/23/2002	50	<i>not given</i>
West Milton	07/18/2003	50	<i>not given</i>
Mifflinburg	07/21/2003	50	<i>not given</i>
New Columbia	07/21/2003	50	5,000
Lewisburg	07/21/2003	60	25,000
Lewisburg	07/27/2003	50	<i>not given</i>
Lewisburg	08/16/2003	50	<i>not given</i>
Countywide	11/13/2003	60	<i>not given</i>
Mifflinburg	05/26/2004	50	<i>not given</i>
Forest Hill	06/06/2005	50	<i>not given</i>
Winfield	06/06/2005	50	<i>not given</i>
New Columbia	06/06/2005	70	<i>not given</i>
Mifflinburg	06/22/2006	50	<i>not given</i>
Lewisburg	11/06/2005	50	<i>not given</i>
Mifflinburg	06/22/2006	50	<i>not given</i>
Hartleton	06/22/2006	50	<i>not given</i>
Countywide	12/01/2006	45	<i>not given</i>
Glen Iron	06/08/2007	50	<i>not given</i>
Mifflinburg	06/19/2007	50	<i>not given</i>
Linntown	06/27/2007	50	<i>not given</i>
Laurelton State Village	08/07/2007	50	<i>not given</i>
New Columbia	06/16/2008	50	<i>not given</i>
Mifflinburg	06/16/2008	50	<i>not given</i>
New Columbia	07/12/2010	50	5,000
Mifflinburg	04/26/2011	50	5,000
Mifflinburg	04/28/2011	65	20,000
Mifflinburg	08/19/2011	50	5,000
Linntown	06/22/2012	50	5,000
Mifflinburg	07/07/2012	50	5,000
White Deer	07/26/2012	50	5,000
Countywide	10/29/2012	50	<i>not given</i>
Mifflinburg	04/19/2013	50	5,000
Mifflinburg	07/07/2013	50	5,000
Lewisburg	07/07/2013	50	5,000

Figure 4.3.7-2 depicts that tornado activity has occurred throughout the entire county.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Figure 4.3.7-1 Tornadoes that have touched down in Union County between 1950 and 2013 (NOAA, 2013)



4.3.7.4. Future Occurrence

Seven tornadoes were reported for Union County for the entire 1950–2014 period in NCDC. Therefore, the annual probability of being in the path of a tornado in Union County is relatively minor. While the chance of being hit by a tornado is small, the damage that results when the tornado arrives is devastating. According to NCDC, there have been over 80 wind events in Union County between 1950 and 2009. The probability of tornadoes and windstorms in Union County can be considered *possible* as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

4.3.7.5. Vulnerability Assessment

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

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

In Union County, high winds occur annually. The most common detrimental effects are interruptions in power supply and communications services due to downed wires and blocked roadways due to downed trees.

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

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

Table 4.3.7-5 displays the number of manufactured housing units per municipality in Union County. Gregg Township, Hartley Township, Kelly Township, Lewis Township, West Buffalo Township and White Deer Township are all more vulnerable to tornadoes and windstorms as each municipality has over 50 mobile homes.

Table 4.3.7-5 Manufactured housing units per municipality in Union County (Union County GIS Department, 2014).

MUNICIPALITY	NUMBER OF MANUFACTURED HOMES
Buffalo Township	107
East Buffalo Township	19
Gregg Township	124
Hartleton Borough	0
Hartley Township	135
Kelly Township	75
Lewis Township	66
Lewisburg Borough	1
Limestone Township	30
Mifflinburg Borough	140
New Berlin Borough	3
Union Township	42
West Buffalo Township	322
White Deer Township	300
TOTAL	1,364

4.3.8. Wildfire

4.3.8.1. Location and Extent

Any small fire in a wooded area, if not quickly detected and suppressed, can spread and become a wildfire that is out of control. Most wildfires are caused by human carelessness, negligence, and ignorance and some are precipitated by lightning strikes.

Wildfires in the Commonwealth of Pennsylvania can occur in fields, grass, and brush as well as in the forest itself. In Union County, much of the western half of the County is forest surrounded by cropland and pastures. This represents over 100,000 acres.

4.3.8.2. Range of Magnitude

A wildfire destroys personal and real property, valuable timber, forage and inestimable scenic and recreational values. Potential aftermath of wildfires include severe erosion, silting of stream beds and reservoirs, and flooding due to a loss of ground cover. However, like most natural hazards, there are potential benefits of a wildfire for the natural environment; wildfire can benefit wilderness areas as some plant species thrive in the aftermath of a wildfire.

The severity of a wildfire can be described as the amount of resources it takes to fight the fire as well as the amount of land the fire consumes. Wildfire events can range from small fires that can be managed by local firefighters to large fires impacting many acres of land. Large events may require evacuation from one or more communities and necessitate regional or national firefighting support.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Whereas the extent of wildfire in some parts of the County can be described by how quickly it will spread, this is not relevant in Union County. In Union County, forest or brush fires are brought under control quickly and do not become wildfires. The worst case scenario for a wildfire in Union County would be similar to the fire that occurred in the 1990s in which approximately 30 acres of forest burned.

4.3.8.3. Past Occurrence

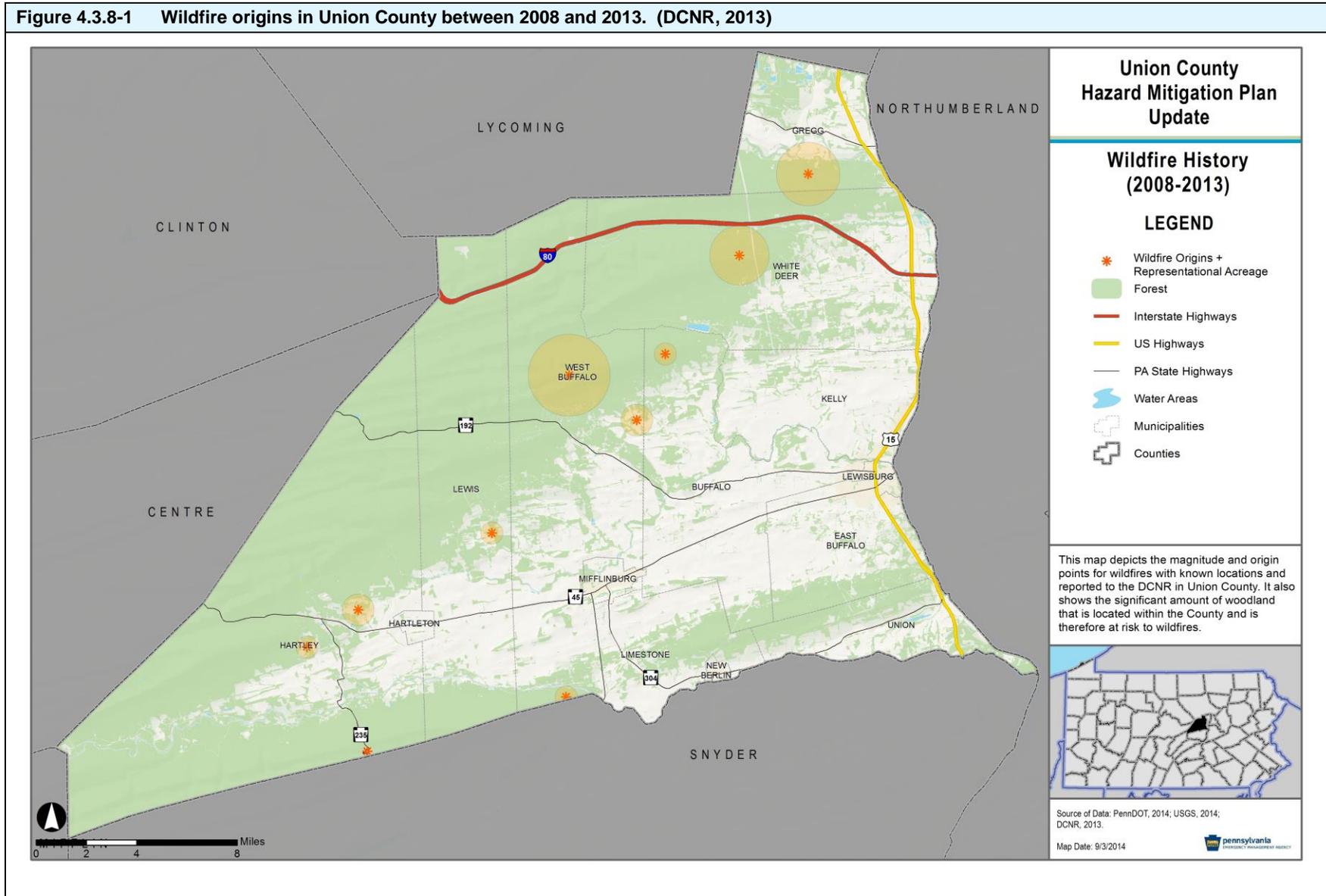
There have been 10 wildfire events in Union County reported to the Pennsylvania Department of Conservation and Natural Resources Bureau of Forestry from 2008-2013. This number does not include wildfires that were not reported to DCNR or that were controlled solely by the volunteer fire departments in the County, but it is the most comprehensive list of wildfire occurrences available for Union County. Table 4.3.8-1 shows the list of wildfire events reported to the DCNR.

Table 4.3.8-1 List of wildfire events reported in Union County from 2008-2013 (DCNR, 2013).		
YEAR	MUNICIPALITY	AREA (acres)
2008	Limestone Township	0.5
2008	West Buffalo Township	6.6
2008	White Deer Township	3.5
2009	Hartley Township	0.01
2009	Hartley Township	0.5
2009	Lewis Township	0.5
2009	West Buffalo Township	1.0
2010	Hartley Township	1.0
2012	Buffalo Township	0.5
2012	Gregg Township	4.0
TOTAL		18.11

Figure 4.3.8-1 maps the origins of the wildfire events which were reported to the DCNR listed in Table 4.3.8-1 above. It is important to note that this is not an inclusive map of all wildfires, just those with known locations. The map shows that previous occurrences of wildfires have occurred throughout the entire County but in only a few jurisdictions.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Figure 4.3.8-1 Wildfire origins in Union County between 2008 and 2013. (DCNR, 2013)



4.3.8.4. Future Occurrence

Ten wildfires were reported in Union County over a five-year period but in total, less than 20 acres of land were burned. Therefore the probability of a wildfire is estimated to be less than one percent in any given year and can be considered *possible* in any given year as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1). However, the likelihood of one of those fires attaining significant size and intensity is unpredictable and highly dependent on environmental conditions and firefighting response.

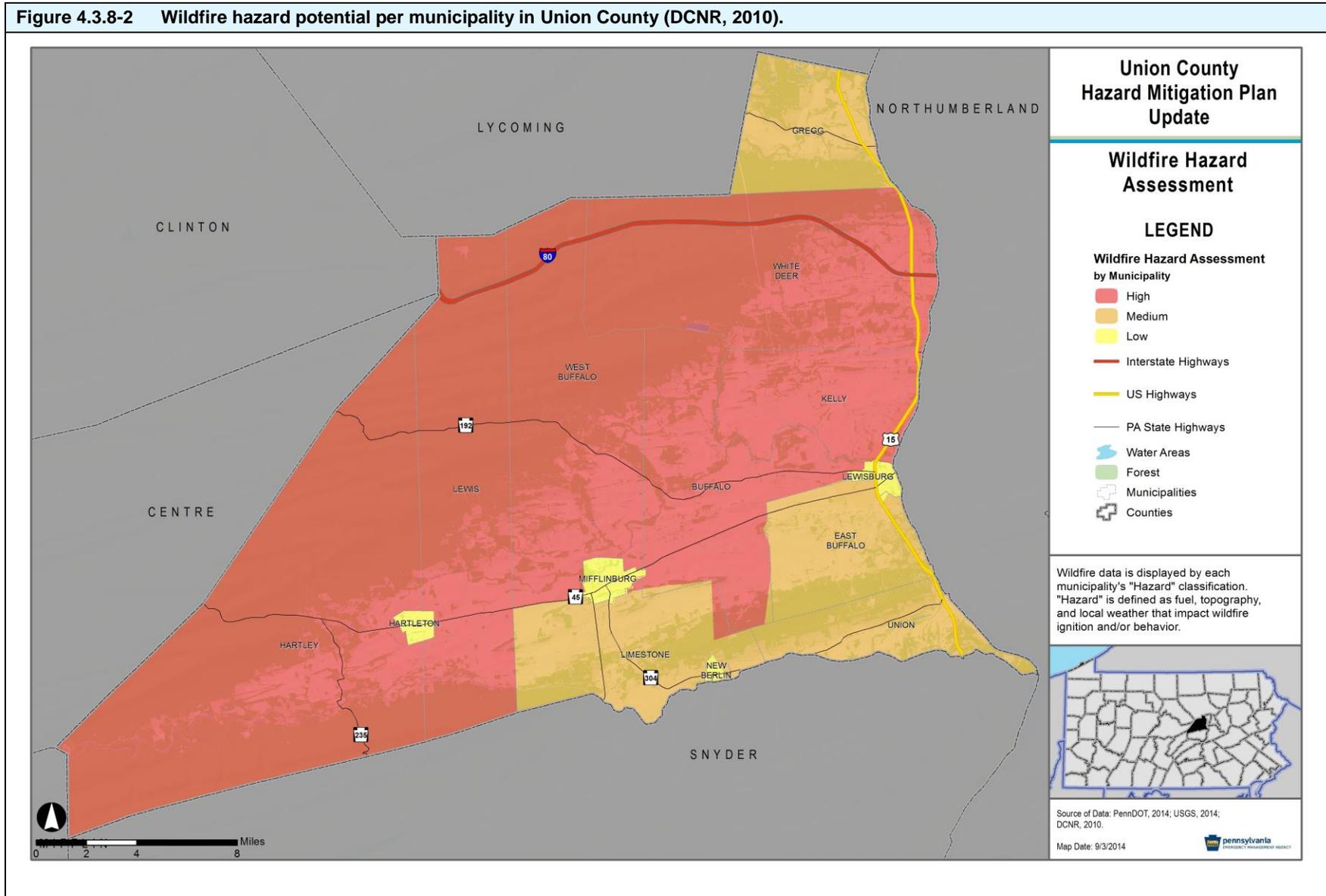
4.3.8.5. Vulnerability Assessment

The Pennsylvania Bureau of Forestry has conducted an independent wildfire hazard risk assessment for the various municipalities across Union County. Results of that assessment are shown in Figure 4.3.8-2. *Wildfire hazard* is defined based on conditions that affect wildfire ignition and/or behavior such as fuel, topography and local weather. Based on this assessment, six jurisdictions, mostly located in central and western Union County where there are still large tracts of undeveloped land in close proximity to suburban housing developments, have a *high* wildfire rating. Four municipalities within Union County have a *medium* wildfire hazard potential, three of which are in the southern portion of the County, while one is located at the northernmost portion of the county. Four jurisdictions, generally spatially concentrated in the southern part of the County, are considered to have *low* wildfire hazard potential. Table 4.3.8-2 lists the jurisdictions having each wildfire *hazard* rating.

Table 4.3.8-2 List of jurisdictions with each wildfire “hazard” rating.		
HIGH HAZARD JURISDICTIONS	MEDIUM HAZARD JURISDICTIONS	LOW HAZARD JURISDICTIONS
Buffalo Township	East Buffalo Township	Hartleton Borough
Hartley Township	Gregg Township	Lewisburg Borough
Kelly Township	Limestone Township	Mifflinburg Borough
Lewis Township	Union Township	New Berlin Borough
West Buffalo Township		
White Deer Township		

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Figure 4.3.8-2 Wildfire hazard potential per municipality in Union County (DCNR, 2010).



Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Using this DCNR assessment, the parcels and critical facilities most vulnerable to wildfire hazards are those located within the six high-rated jurisdictions. Table 4.3.8-3 shows the total structures and critical facilities in the high wildfire hazard areas. Please note that the individual vulnerability of communities will differ based on the design of the urban/wildland interface, the number of ingress and egress points into a community, and the availability of water to fight fires. All structures in Buffalo, Hartley, Kelly, Lewis, West Buffalo and White Deer Townships are located in high wildfire hazard areas. Table 4.3.8-3 also shows that there are 45 critical facilities vulnerable to wildfire in the County, with the most in Kelly Township. Some of these critical facilities include the Spruce Run Reservoir, the Stony Run Reservoir, the Mifflinburg Reservoir, and the Limestone Township Municipal Building.

Table 4.3.8-3 Wildfire Vulnerability for Union County.						
Municipality	Total Structures in Municipality	Structures in High Wildfire Hazard Areas	Percent of Structures	Total Critical Facilities in Municipality	Total Critical Facilities in High Wildfire Hazard Areas	Percent Critical Facilities
Buffalo Township	2,743	2,743	100.0%	5	5	100.0%
East Buffalo Township	3,400	0	0.0%	20	0	0.0%
Gregg Township	799	0	0.0%	9	0	0.0%
Hartleton Borough	206	0	0.0%	1	0	0.0%
Hartley Township	2,030	2,030	100.0%	7	7	100.0%
Kelly Township	2,443	2,443	100.0%	20	20	100.0%
Lewis Township	1,321	1,321	100.0%	2	2	100.0%
Lewisburg Borough	2,346	0	0.0%	8	0	0.0%
Limestone Township	1,398	0	0.0%	1	0	0.0%
Mifflinburg Borough	2,493	0	0.0%	13	0	0.0%
New Berlin Borough	536	0	0.0%	6	0	0.0%
Union Township	1,091	0	0.0%	2	0	0.0%
West Buffalo Township	2,352	2,352	100.0%	3	3	100.0%
White Deer Township	3,420	3,420	100.0%	8	8	100.0%
TOTAL	26,578	14,309	53.8%	105	45	42.9%

Table 4.3.8-4 shows the number of structures in each municipality located in areas susceptible to wildfires by land use type. The land use type displaying the greatest vulnerability to wildfire hazards is residential.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

	Buffalo Twp	East Buffalo Twp	Gregg Twp	Hartleton Boro	Hartley Twp	Kelly Twp	Lewis Twp	Lewisburg Boro	Limestone Twp	Mifflinburg Boro	New Berlin Boro	Union Twp	West Buffalo Twp	White Deer Twp	TOTAL
Auxiliary Structure	1,190	0	0	0	697	725	578	0	0	0	0	0	852	1,339	5,381
Barn	1	0	0	0	1	2	2	0	0	0	0	0	3	4	13
Church Structure	18	0	0	0	6	8	7	0	0	0	0	0	7	9	55
Institutional Structure	9	0	0	0	58	26	13	0	0	0	0	0	8	21	135
Commercial Structure	111	0	0	0	24	137	24	0	0	0	0	0	53	60	409
Future Structure Site	47	0	0	0	4	68	5	0	0	0	0	0	22	44	190
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mixed-Use Structure	18	0	0	0	4	8	6	0	0	0	0	0	10	13	59
Residential Structure	1,233	0	0	0	1,084	1,375	609	0	0	0	0	0	1,056	1,617	6,974
School Structure	3	0	0	0	3	4	3	0	0	0	0	0	5	1	19
Tower	2	0	0	0	1	4	3	0	0	0	0	0	1	2	13
Trailer	107	0	0	0	135	75	66	0	0	0	0	0	322	300	1,005
Unknown	2	0	0	0	12	9	5	0	0	0	0	0	12	6	46
Utility Structures	2	0	0	0	1	2	0	0	0	0	0	0	1	4	10
TOTAL	2,743	0	0	0	2,030	2,443	1,321	0	0	0	0	0	2,352	3,420	14,309

**Generalized land use type derived from detailed structure categories in County GIS data. Aggregated by generalized category for ease of discussion in report.*

Windshield surveys conducted as part of the process of developing the original Hazard Vulnerability Assessment and Mitigation Plan that was adopted in 2005 revealed that most structures in the Bald Eagle State Forest are used as sporting clubs and not year-round residences. Structures in other forested areas are predominantly single-family residences and vacation homes.

Future structures may be located in forested areas that have the potential to experience wildfire. However, current building codes require the use of roofing materials that have a low potential for burning, and this will reduce the risk of damage due to wildfire for future buildings.

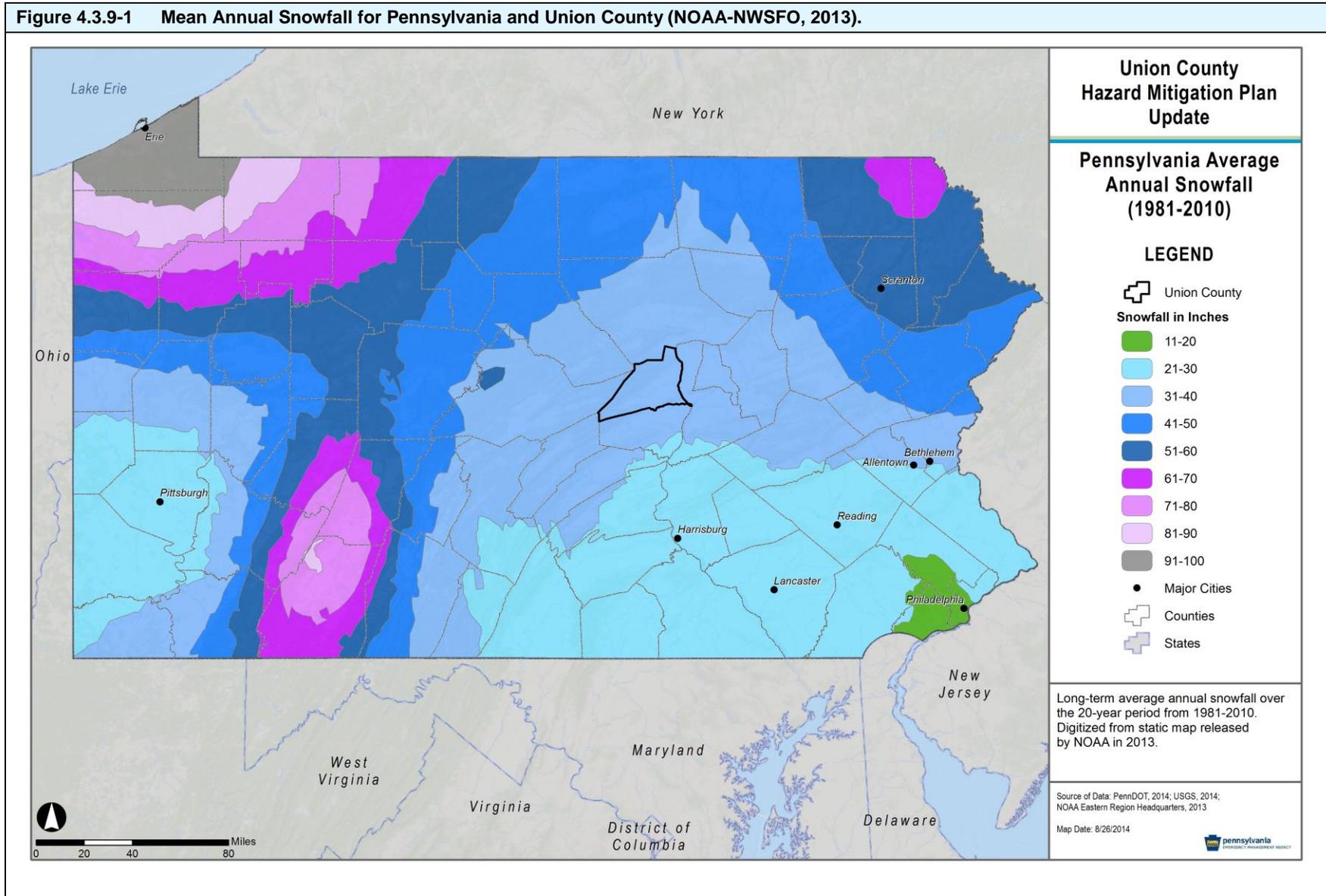
4.3.9. Winter Storm

4.3.9.1. Location and Extent

Heavy snow or ice occurs throughout the Commonwealth of Pennsylvania. Every county in the Commonwealth is affected by these storms with the northern and western counties and mountainous regions experiencing these storms more frequently and to a greater extent. Union County experiences all levels of winter storms from ice storms and freezing rain to heavy snow and blizzards. Generally, the average annual snowfall in the County is consistent throughout the County with the County receiving between 31 and 40 inches of snow annually (see Figure 4.3.9-1).

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Figure 4.3.9-1 Mean Annual Snowfall for Pennsylvania and Union County (NOAA-NWSFO, 2013).



4.3.9.2. Range of Magnitude

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

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

- **Heavy Snowstorm:** Accumulations of four inches or more in a six-hour period, or six inches or more in a 12-hour period.
- **Sleet Storm:** Sleet is formed when snow falling to the earth partially melts as it passes through a layer of warm air. The precipitation then passes through a cold layer of air and refreezes into solid pellets. Sleet causes surfaces to become slippery, posing hazards to pedestrians and motorists.
- **Ice Storm:** An ice storm occurs when rain freezes upon impact with the ground or other objects such as trees and power lines. Heavy accumulations of ice can bring down trees and topple utility poles, disrupting power and communication for days while crews make the necessary repairs. The icy conditions are also dangerous for pedestrians and vehicular traffic.
- **Blizzard:** According to the National Weather Service, a blizzard is a severe snowstorm that occurs when winds reach 35mph or more. The blowing snow reduces visibility to less the one-quarter of a mile for at least three hours. Storms that meet these criteria are not frequent in Union County; however, storms that produce blizzard-like conditions are a common occurrence.
- **Severe Blizzard:** Wind velocity of 45 mph, temperatures of 10 degrees Fahrenheit or lower, a high density of blowing snow with visibility frequently measured in feet prevailing over an extended period time.

Figure 4.3.9-1 above shows mean annual snowfall in Union County is between 30 and 40 inches. Anecdotal evidence indicates that ice storms in Union County can cause as much as one-half of an inch of ice to build up on trees and utility wires.

A worst case scenario for winter storms occurred in 1934 when a snowstorm deposited over 33 inches in Central Pennsylvania; sequential storms in 1996 deposited 27 inches and then 24 inches in Union County. A significant ice storm occurred in January 2009 when freezing rain

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

resulted in the accumulation of one-quarter to one-half of an inch of ice on power lines and tree limbs.

4.3.9.3. Past Occurrence

The Commonwealth of Pennsylvania has a long history of winter storms. Winter storms generally occur more than once each year in the County. The NCDC data on past occurrences for winter storm lists events since 1995. These winter storm events are listed in Table 4.3.9-1.

Table 4.3.9-1 Previous winter storm events impacting Union County since 1950 (NCDC, 2014).			
LOCATION	DATE	TYPE	ESTIMATED PROPERTY DAMAGE (\$)
Countywide	01/02/1996	Heavy Snow	N/A
Countywide	01/07/1996	Blizzard	N/A
Countywide	01/12/1996	Heavy Snow	N/A
Countywide	03/07/1996	Heavy Snow	N/A
Countywide	02/13/1997	Winter Storm	N/A
Countywide	03/14/1997	Ice Storm	N/A
Countywide	12/29/1997	Heavy Snow	N/A
Countywide	01/15/1998	Ice Storm	N/A
Countywide	01/22/1998	Ice Storm	N/A
Countywide	02/23/1998	Heavy Snow	N/A
Countywide	01/02/1999	Winter Storm	N/A
Countywide	01/08/1999	Winter Storm	N/A
Countywide	01/14/1999	Winter Storm	N/A
Countywide	03/14/1999	Heavy Snow	N/A
Countywide	01/25/2000	Heavy Snow	N/A
Countywide	01/30/2000	Heavy Snow	N/A
Countywide	02/13/2000	Ice Storm	N/A
Countywide	02/18/2000	Winter Storm	N/A
Countywide	12/13/2000	Winter Storm	N/A
Countywide	12/19/2000	Heavy Snow	N/A
Countywide	03/04/2001	Heavy Snow	\$4,000,000
Countywide	01/06/2002	Heavy Snow	N/A
Countywide	12/05/2002	Heavy Snow	N/A
Countywide	12/10/2002	Ice Storm	N/A
Countywide	12/25/2002	Heavy Snow	N/A
Countywide	01/02/2003	Heavy Snow	N/A
Countywide	02/16/2003	Heavy Snow	N/A
Countywide	02/03/2004	Heavy Snow	N/A
Countywide	02/06/2004	Ice Storm	N/A
Countywide	03/16/2004	Heavy Snow	N/A
Countywide	03/19/2004	Heavy Snow	N/A
Countywide	01/05/2005	Winter Storm	N/A
Countywide	02/24/2005	Heavy Snow	N/A
Countywide	03/01/2005	Heavy Snow	N/A
Countywide	12/09/2005	Heavy Snow	N/A
Countywide	12/16/2005	Winter Storm	N/A
Countywide	02/13/2007	Winter Storm	N/A
Countywide	03/16/2007	Heavy Snow	N/A
Countywide	02/01/2008	Winter Storm	N/A
Countywide	02/12/2008	Ice Storm	N/A
Countywide	12/19/2008	Winter Storm	N/A
Countywide	01/06/2009	Ice Storm	\$2,000,000

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 4.3.9-1 Previous winter storm events impacting Union County since 1950 (NCDC, 2014).

LOCATION	DATE	TYPE	ESTIMATED PROPERTY DAMAGE (\$)
Countywide	02/05/2010	Winter Storm	N/A
Countywide	02/09/2010	Winter Storm	N/A
Countywide	02/01/2011	Winter Storm	N/A
Countywide	03/06/2011	Heavy Snow	N/A
Countywide	10/29/2011	Heavy Snow	N/A
Countywide	12/14/2013	Winter Snow	N/A
Countywide	02/04/2014	Winter Storm	N/A
Countywide	02/13/2014	Heavy Snow	N/A

4.3.9.4. Future Occurrence

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

Table 4.3.9-3 shows the probability of receiving measureable snowfall by month in Union County. These are based on data collected at the weather stations in Lewisburg and Laurelton, PA.

Table 4.3.9-2 Probability of Measurable Snowfall in Union County by Snow Station Location (NCDC, 2013).

MONTH	PROBABILITY (%)	
	LEWISBURG	LAURELTON
January	100.00%	85.71%
February	100.00%	64.28%
March	64.70%	64.28%
April	18.75%	15.38%
May	0.00%	0.00%
June	0.00%	0.00%
July	0.00%	0.00%
August	0.00%	0.00%
September	0.00%	0.00%
October	12.50%	0.00%
November	35.29%	33.3%
December	58.82%	61.53%

4.3.9.5. Vulnerability Assessment

Vulnerability to the effects of winter storms on buildings is considered to be somewhat dependent on the age of a building because as building codes become more stringent, buildings are capable of supporting heavier loads and as building age, various factors may deteriorate their structural integrity. Vulnerability also depends upon the type of construction and the degree to which a structure has been maintained.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

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

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

All structures and infrastructure in Union County are exposed to heavy snow and ice. For this analysis, structures built prior to 1940 are identified as being potentially at risk of being somewhat weakened and more susceptible to damage due to heavy snow or ice. Table 4.3.9-4 shows the number of housing units in Union County built prior to 1940 according to the US Census Bureau's estimates. Hartley Township, Lewisburg Borough, and Mifflinburg Borough have the most structures of any municipality in the county built prior to 1940 (over 400 each). However, Hartleton Borough has the largest proportion of housing units built prior to 1940 (60%). While the US Census provides estimates for residential structures, the age of non-residential structures is not available.

MUNICIPALITY	NUMBER OF HOUSING UNITS BUILT PRIOR TO 1940	PERCENT OF TOTAL HOUSING UNITS
Buffalo Township	272	20.3%
East Buffalo Township	269	12.7%
Gregg Township	169	27.8%
Hartleton Borough	60	60.0%
Hartley Township	427	33.3%
Kelly Township	261	13.8%
Lewis Township	236	32.5%
Lewisburg Borough	898	43.4%
Limestone Township	182	24.5%
Mifflinburg Borough	558	34.0%
New Berlin Borough	152	40.4%
Union Township	177	24.1%
West Buffalo Township	161	12.9%
White Deer Township	375	18.2%
Total	4,196	24.8%

All structures and infrastructure in Union County will be exposed to heavy snow and ice. Yet, because all of Union County has adopted and enforced the 2009 International Building Code (IBC) and IRC, building yet to be constructed will be able to withstand the weight of heavy snow or ice.

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 be used to assist local community officials in ranking and prioritizing those hazards that pose the most significant threat to their area based on a variety of factors deemed important by the planning team and other stakeholders involved in the hazard mitigation planning process. The RF system relies mainly on historical data, local knowledge, general consensus opinions 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 eight hazards profiled in the 2010 Hazard Vulnerability Assessment and Mitigation Plan Update and the new hazard being profiled in the 2014 plan, Hurricane, Tropical Storm, or Nor'easter. Those categories include: *probability*, *impact*, *spatial extent*, *warning time*, and *duration*. Each degree of risk was assigned a value ranging from 1 to 4. The weighting factor is shown in Table 4.4.1-1. To calculate the RF value for a given hazard, the assigned risk value for each category was multiplied by the weighting factor. The sum of all five categories equals the final RF value, as demonstrated in the example equation:

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

Table 4.4.1-1 summarizes each of the five categories used for calculating a RF for each hazard. According to the weighting scheme applied, the highest possible RF value is 4.0.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 4.4.1-1 Summary of Risk Factor approach used to rank hazard risk.				
Risk Assessment Category	Degree of Risk			Weight Value
	Level	Criteria	Index	
PROBABILITY <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	
IMPACT <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	
SPATIAL EXTENT <i>How large of an area could be impacted by a hazard event? Are impacts localized or regional?</i>	NEGLIGIBLE	LESS THAN 1% OF AREA AFFECTED	1	20%
	SMALL	BETWEEN 1 & 10.9% OF AREA AFFECTED	2	
	MODERATE	BETWEEN 11 & 25% OF AREA AFFECTED	3	
	LARGE	GREATER THAN 25% OF AREA AFFECTED	4	
WARNING TIME <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	
DURATION <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	

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

4.4.2. Ranking Results

Using the methodology described in Section 4.4.1, Table 4.4.2-1 lists the Risk Factor calculated for each of the nine potential hazards identified in the 2014 Union County Hazard Vulnerability Assessment and Mitigation Plan Update. 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 4.4.2-1 Ranking of hazard types based on Risk Factor methodology.							
HAZARD RISK	NATURAL HAZARD	RISK ASSESSMENT CATEGORY					RISK FACTOR
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	
HIGH	Flood, Flash Flood, Ice Jam	4	3	3	2	3	3.2
	Winter Storm	4	2	3	4	3	3.1
MODERATE	Hurricane, Tropical Storm, Nor'easter	2	2	3	1	4	2.3
	Drought	2	1	4	1	4	2.2
	Wildfire	2	2	2	2	3	2.1
	Tornado, Windstorm	2	2	2	4	1	2.1
LOW	Earthquake	1	1	2	4	1	1.5
	Landslide	1	1	1	4	1	1.3
	Subsidence and Sinkhole	1	1	1	4	1	1.3

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

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

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 4.4.2-2 Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk

JURISDICTION	IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR								
	Flood, Flash Flood, Ice Jam	Winter Storm	Hurricane, Tropical Storm, Nor'easter	Drought	Wildfire	Tornado and Windstorm	Earthquake	Landslide	Subsidence and Sinkhole
	3.2	3.1	2.3	2.2	2.1	2.1	1.5	1.3	1.3
Buffalo Township	=	=	=	=	>	=	=	=	>
East Buffalo Township	=	=	=	=	=	=	=	>	>
Gregg Township	<	=	=	=	=	=	=	>	>
Hartleton Borough	<	>	>	<	<	=	=	=	>
Hartley Township	>	=	=	=	>	=	=	=	=
Kelly Township	=	<	>	=	>	=	=	=	>
Lewis Township	=	=	=	=	>	=	=	>	=
Lewisburg Borough	>	>	=	<	<	=	=	=	=
Limestone Township	=	=	=	=	=	=	=	=	=
Mifflinburg Borough	<	=	=	<	<	=	=	=	=
New Berlin Borough	<	>	=	<	<	=	=	=	>
Union Township	>	<	=	=	=	=	=	=	>
West Buffalo Township	<	<	=	<	>	=	=	>	=
White Deer Township	<	<	=	=	>	=	=	>	=

4.4.3. Potential Loss Estimates

Based on various kinds of available data, potential loss estimates were established for flood, flash flood, and ice jam, tornado and windstorms, wildfires, and winter storms. Estimates provided in this section are based on HAZUS-MH, version 2.1, geospatial analysis, and previous events. Estimates are considered *potential* in that they generally represent losses that

could occur in a countywide hazard scenario. In events that are localized, losses may be lower, while regional events could yield higher losses.

Potential loss estimates have four basic components, including:

- Replacement Value: Current cost of returning an asset to its pre-damaged condition, using present-day cost of labor and materials.
- Content Loss: Value of building's contents, typically measured as a percentage of the building replacement value.
- Functional Loss: The value of a building's use or function that would be lost if it were damaged or closed.
- Displacement Cost: The dollar amount required for relocation of the function (business or service) to another structure following a hazard event.

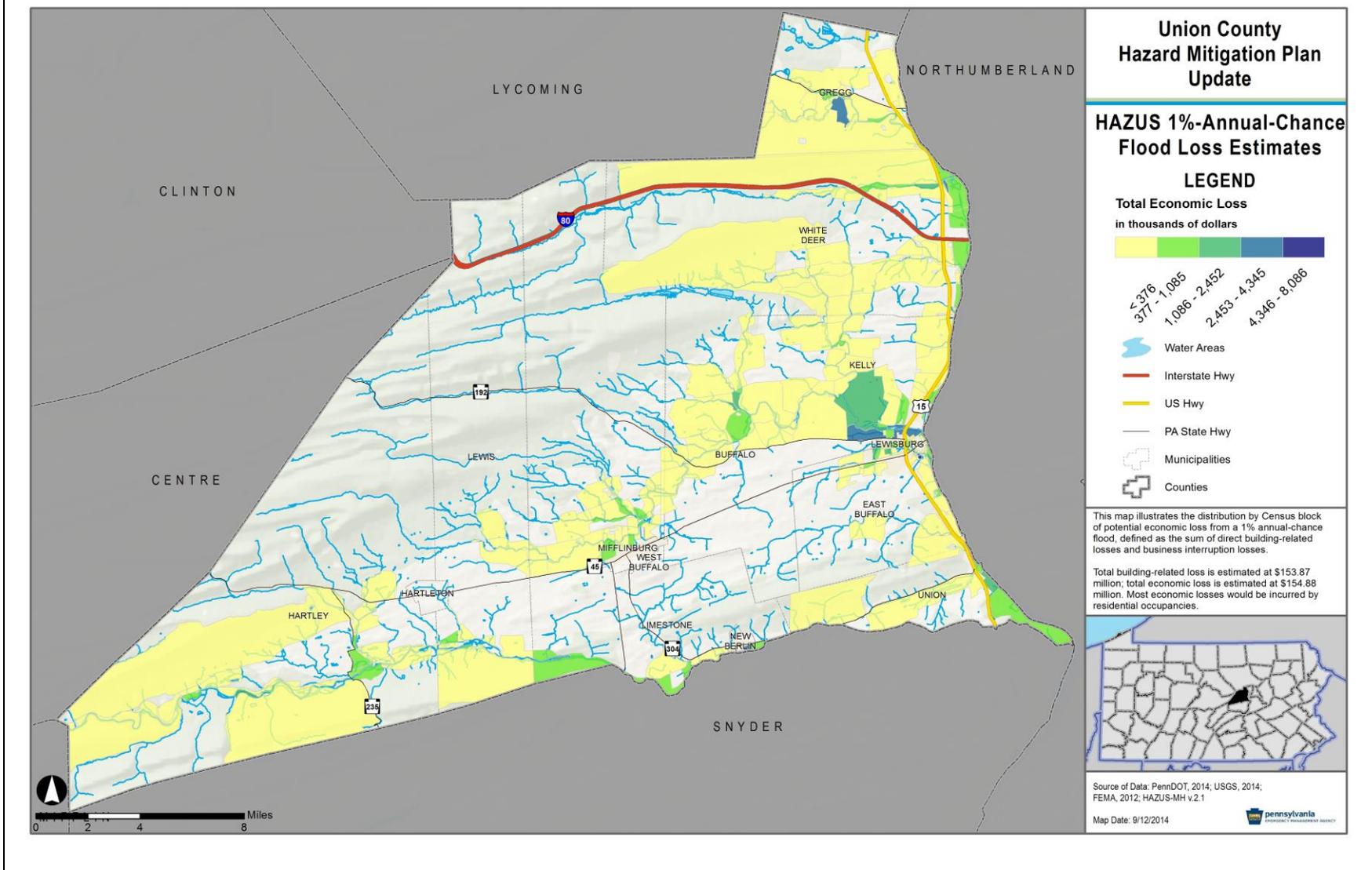
This plan employed an enhanced HAZUS analysis for floods. As opposed to basic analysis using only default data, enhanced analysis incorporates some kind of more recent, up-to-date, or specific data for inclusion in the hazard models. The enhanced data incorporated into this plan update include:

- Updated demographic data from the 2010 Census;
- Updated essential facilities data from the County and other sources; and
- A user-delineated 100-year depth grid derived for Union County from the effective DFIRM data and the 3.2 ft. statewide LiDAR dataset from DCNR.

Using these datasets in HAZUS-MH Version 2.1, total building-related losses from a 1%-annual-chance flood in Union County are estimated to equal \$153.87 million. Residential occupancies make up 55% of the total estimated building-related losses. Figure 4.4.3-1 shows a distribution of building-related losses by census block across Union County. Damages would be most significant in and near Lewisburg. Total economic loss, including replacement value, content loss, functional loss and displacement cost, from a countywide 1%-annual-chance flood are estimated to equal \$154.88 million. In this scenario, an expected 140 buildings would be moderately damaged. In addition, and estimated 3,704 households would be displaced, and 2,108 people would require shelter. Essential facilities would largely remain undamaged in this scenario, but one school is estimated to have at least moderate damage and would experience some loss of use. For more details on the HAZUS methodology used and additional results reports, see **Appendix F**.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Figure 4.4.3-1 Distribution by census block of the potential total economic loss expected from a 1%-annual-chance flood in Union County (HAZUS-MH v2.1).



Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

For the remaining hazards where loss estimates could be determined, loss estimates are generalized based on the historical impact of the hazard. For droughts, the losses are largely agricultural; as a result, losses are expected to be some portion of Union County's \$136 million in agricultural production, depending on the magnitude of the event. The USDA Risk Management Agency has a database of historical crop losses (of insured crops). Table 4.4.3-1 shows insured crop losses that were reported as a result of drought.

YEAR	CROP	ESTIMATED LOSSES
1993	All Other Crops	\$78
1995	All Other Crops	\$2,444
1995	All Other Crops	\$770
1998	All Other Crops	\$303
1999	Fresh Market Sweet Corn	\$1,771
2001	All Other Crops	\$872
2001	All Other Crops	\$713
2002	Fresh Market Sweet Corn	\$1,816
2002	All Other Crops	\$23,456
2002	All Other Crops	\$8,315
2002	All Other Crops	\$3,249
2002	All Other Crops	\$57,877
2005	All Other Crops	\$2,836
2005	All Other Crops	\$1,044
2006	All Other Crops	\$536
2007	All Other Crops	\$38,491
2007	All Other Crops	\$2,224
2007	All Other Crops	\$7,503
2008	All Other Crops	\$51,306
2008	All Other Crops	\$3,125
2009	All Other Crops	\$35,150
2010	Corn	\$13,086
2010	Corn	\$12,458
2010	Corn	\$24,615
2010	Soybeans	\$4,583
2010	All Other Crops	\$28,630
2011	Corn	\$28,423
2011	Corn	\$338
2011	Soybeans	\$9,857
2012	Corn	\$2,138
2013	Wheat	\$4,258
2013	Corn	\$16,326
2013	Corn	\$68
2013	Soybeans	\$2,942

Losses associated with particular natural hazard events are sometimes reported to the NCCD with the event. The reporting time frame is 1950-2014. While these historic losses give a

glimpse of potential losses in hazard events, they are not reported for all events and should be considered a broad estimate. Several deaths and millions of dollars' worth of property damage have been caused by floods, flash floods, or ice jams in Union County. Previous flood events listed in Table 4.3.3-2 have caused an estimated \$11 million worth of property damage throughout the County. Approximately ninety percent (\$10,000,000) of these losses were caused by remnants of Hurricane Dennis in 1999. It is important to note that loss estimates are not available for many of the previous flood events which have occurred in the County. Historical loss estimates are available for only seven of the 34 events listed in Table 4.3.3-2. Therefore, it is likely that \$11 million is a minimum estimate of historical flood losses.

Additionally, as discussed in Section 4.3.3.5 there are 798 structures in Union County insured under the NFIP. A total of 896 NFIP claims for flood damages have been made since 1978 for these structures and 94 were for substantial damage. Cumulative NFIP payments for flood damages have exceeded \$12.5 million.

The NCDC database did not list any losses for tornado events in Union County; however losses are reported for a number of windstorm events totaling \$95,000. For winter storm events, there were two events with reported losses ranging from \$2 million to \$4 million per event. A high percentage of losses from winter storms are usually in the form of repairs to damaged utility poles, wires, and other infrastructure.

4.4.4. Future Development and Vulnerability

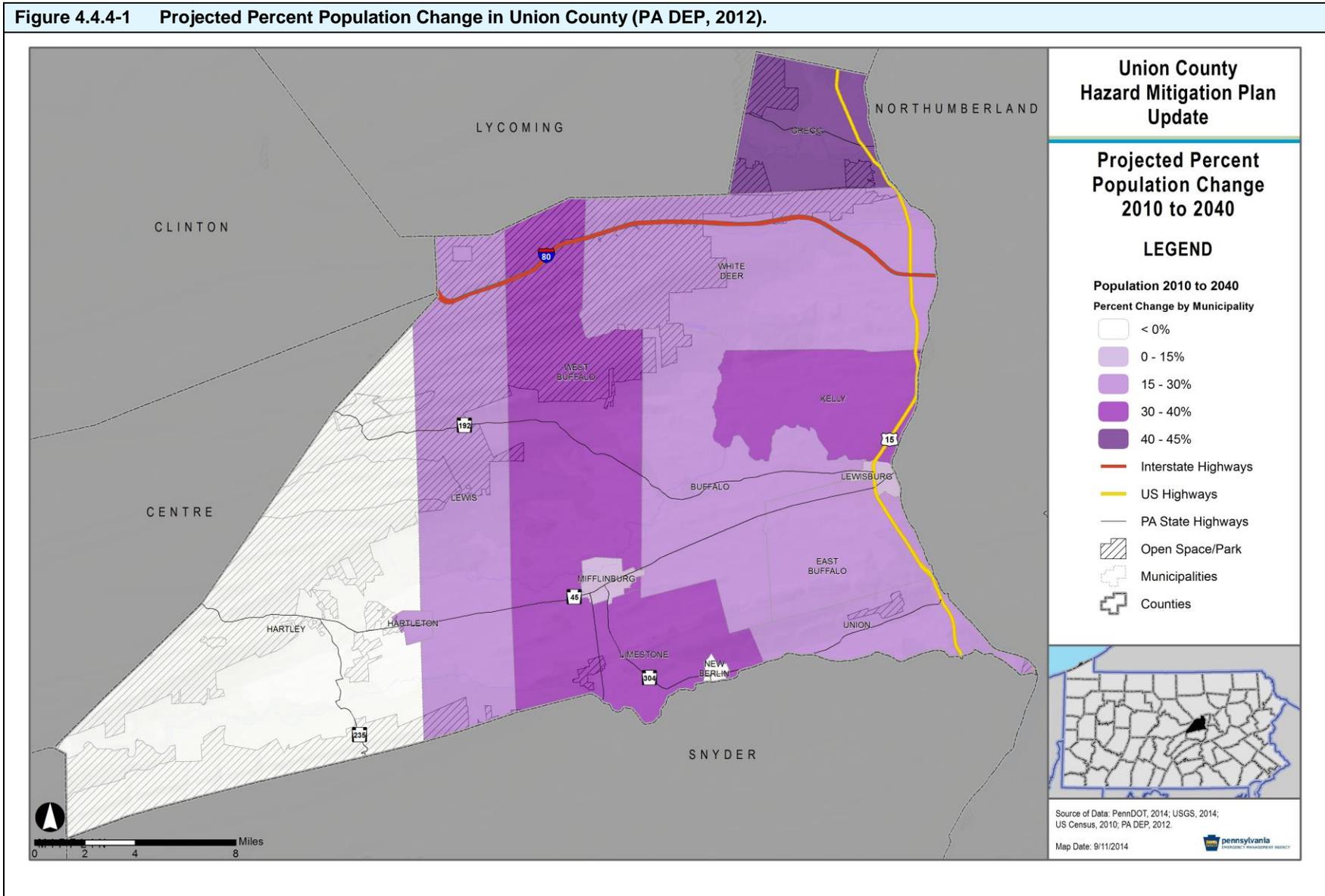
Risk and vulnerability to natural hazard events are not static. Risk will increase or decrease as counties and municipalities see changes in land use and development as well as changes in population. Union County is expected to experience a variety of factors that will, in some areas, increase vulnerability to hazards while in other areas, vulnerability may stay static or even be reduced.

Population change and the age of the housing stock are main indicators of vulnerability change in Union County. As discussed in Section 2.3, the total population of Union County has decreased by 0.01 percent from 2000 to 2013, indicating the overall population of the County generally stayed the same. However, six municipalities increased in population while eight decreased in population during this time period (see Table 2.3-1). Figure 2.4-4 also shows locations of new development built between 2010 and 2014. Areas of higher density, in the larger municipalities and growing municipalities, face increased vulnerability and increased exposed structures with most hazard events. Increases in population results in increased vulnerability to hazards such as wildfires, floods, and winter storms as more people will be impacted.

If the population of Union County is projected out to 2040, it shows population growth in the eastern half of the County while the western half remains largely the same. Figure 4.4.4-1 shows projected population change in Union County between 2010 and 2040 based on PA DEP population projections.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Figure 4.4.4-1 Projected Percent Population Change in Union County (PA DEP, 2012).



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

In addition, remote and sparsely populated municipalities also face higher vulnerability to hazards because they do not have as easy access to care facilities or response personnel. For instance, the less populated municipalities such as Lewis Township (1,437 residents) face increased vulnerability to winter storms due to isolation, access issues, and longer emergency response times.

Over 15 percent of Union County's population is over the age of 65. Older residents pose unique challenges when it comes to evacuation and/or mobility during the rescue and recovery processes that typically occur in the case of a hazard event. Officials may consider partnering with human services organizations to specifically plan for this vulnerable population.

The aging housing stock in Union County is another source of current and future vulnerability in many hazard events. As discussed in Section 4.3.9.5, many homes in the County were built before 1940. Union County can experience gusts of wind up to 200 miles per hour during windstorms, tornadoes, hurricane, tropical storms, or nor'easters. The structure of these older houses may be more at risk of destruction under these strong wind conditions. These structures may also be at risk during flooding and winter storm events if the materials are either not strong enough to withstand the pressure or weight of the precipitation or are liable to leak, causing further risk of destruction to the house. Sixty percent of the housing units in Hartleton Borough were built before 1940, making it most vulnerable to the risks from these hazards. New Berlin Borough and Lewisburg Borough also have a large percent of housing units built before 1940 (>40%).

On December 31, 2009 Union County adopted a Comprehensive Plan titled *Cultivating Community: A Plan for Union County's Future*. The Vision Statements in the plan include: "Protecting precious natural resources and agriculture;" "Supporting sustainable economic growth and viable towns;" and "Promoting its unique town and country lifestyle." The Comprehensive Plan also has a Sustainability Principle to "Focus new development in and around established communities." Concentrating growth may help to reduce isolation-based vulnerability of communities with few access routes, no municipal water supply, and low cell phone reception. On the other hand, higher densities mean that more people are likely to be impacted in a hazard event should it strike those more populated areas.

5. Capability Assessment

5.1. Update Process Summary

The purpose of the Capability Assessment is to identify strengths and weaknesses that will affect the ability of the County and participating jurisdictions to implement mitigation actions. Capabilities include a variety of regulations, existing planning mechanisms, and administrative capabilities provided through established agencies or authorities.

Based on the above-identified vulnerability analysis, Union County can assess its current resources and begin to address the legal, regulatory, administrative, financial and other capabilities which it currently has at its disposal to address the potential hazards which make the County and its local municipalities vulnerable.

Union 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, financial capabilities, and participation in local, regional, state, and federal programs. The presence of these resources enables community resiliency through actions taken before, during, and after a hazard event. The most important resources which provide the basis for addressing hazard potential and mitigation are the emergency services manpower, equipment, fiscal, and other resources available within Union County communities. At the County level, the Union County Department of Emergency Management provides the leadership and resources to address hazard incidents.

The 2010 Union County Hazard Vulnerability Assessment and Mitigation Plan Update identified the suite of resources available in the County to support hazard mitigation, including regulatory, planning, and administrative resources. It also indicated the presence of local plans, ordinances, and codes in applicable municipalities. Finally, the 2010 Capability Assessment specified local, state, and federal resources available for mitigation efforts.

For the 2014 plan, the HMSC updated the 2010 Capability Assessment by distributing a *Capability Assessment Survey* to all 14 municipalities and summarizing responses. In addition, the HMPT provided additional input into the 2014 Capability Assessment through feedback at meetings. The HMPT also provided input on a *National Flood Insurance Program (NFIP) Worksheet* where the municipalities provided comments on how they implemented the NFIP in their communities.

The 2014 Capability Assessment provides an updated inventory of the most critical local planning and regulatory tools available within each municipality, a summary of the fiscal and technical capabilities available through programs and organizations outside of the County, and provides an opportunity to discuss any plan integration opportunities with the hazard mitigation plan. It also identifies emergency management capabilities and the processes used for implementation of the National Flood Insurance Program.

While the capability assessment serves as a good instrument for identifying local capabilities, it also provides a means for recognizing gaps and weaknesses that can be resolved through

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

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. Planning and Regulatory Capability

Table 5.2.1-1 summarizes the regulatory tools used in Union County and participating jurisdictions. These regulations support the goals of this hazard mitigation plan and provide opportunities for further mitigating the potentially negative effects of natural hazards through regulation.

JURISDICTION	COMPREHENSIVE PLAN	ZONING ORDINANCES	SUBDIVISION REGULATIONS	FLOODPLAIN MANAGEMENT REGULATIONS	STORMWATER MANAGEMENT REGULATIONS	BUILDING CODES	HISTORIC PRESERVATION ORDINANCE
Union County	✓	N/A	✓	✓	✓	N/A	
Buffalo Township	✓	✓	✓	✓	✓	✓	
East Buffalo Township	✓	✓	✓	✓	✓	✓	
Gregg Township	✓	✓	✓	✓	✓	✓	
Hartleton Borough			✓		✓	✓	
Hartley Township	✓	✓	✓	✓	✓	✓	
Kelly Township	✓	✓	✓	✓	✓	✓	
Lewis Township		✓	✓	✓	✓	✓	
Lewisburg Borough	✓	✓	✓	✓	✓	✓	✓
Limestone Township	✓		✓	✓	✓	✓	
Mifflinburg Borough	✓	✓	✓	✓	✓	✓	
New Berlin Borough	✓	✓	✓	✓	✓	✓	
Union Township	✓		✓	✓	✓	✓	
West Buffalo Township	✓	✓	✓	✓	✓	✓	
White Deer Township	✓	✓	✓	✓	✓	✓	

5.2.1.1. Plans and Regulations

The **Union County Comprehensive Plan** was completed and adopted on December 31, 2009. A comprehensive plan is a policy document identifying community goals and objectives for future growth and development. All municipalities and Union County have adopted a municipal comprehensive plan except for Lewis Township and Hartleton Borough. Gregg Township adopted the Lycoming U.S. 15 South Comprehensive Plan.

A **zoning ordinance** specifies the types of development that can occur in particular locations. All municipalities other than Hartleton Borough, Limestone Township, and Union Township have adopted zoning ordinances.

Subdivision regulations further specify how development can occur. Union County and all 14 municipalities have adopted Subdivision Regulations. Hartleton Borough, New Berlin Borough, Hartley Township, Lewis Township, Limestone Township, and West Buffalo Township have adopted the Union County Subdivision and Land Development Ordinance. Other jurisdictions have adopted their own subdivision ordinances.

Stormwater management regulations provide for the conveyance of stormwater to decrease flooding. Union County adopted Act 167 stormwater management plans for Buffalo Creek (1999), Bull Run (adopted 1994 and updated 2004), Fishing Creek / Cedar Run (1996), White Deer Creek (2004) and the West Branch of the Susquehanna River (2004). All municipalities in Union County have adopted regulations for stormwater management.

Adoption and enforcement of **building codes** ensure that both residential and commercial structures are safe. Every municipality in Union County has adopted the 2009 International Code Council (ICC) Family of Model Codes including the 2009 International Residential Code (IRC).

A local **historic district ordinance** enables a community to regulate development in a specific, designated area of historic significance. Lewisburg Borough has adopted a historic district ordinance and has a Historic District Architectural Review Board.

A variety of planning mechanisms are used in Union County and participating jurisdictions. Other plans can support the goals of this hazard mitigation plan and provide opportunities for integrating actions that will mitigate the potentially negative effects of natural hazards with actions designed to achieve other goals.

Other plans address specific human-made or biological hazards. Because the following plans have been developed and adopted in Union County, the technological, human-made or biological hazards that they cover are not addressed in this plan to avoid duplication of effort:

- **Integrated Contingency Plan**, March 2007, addresses terrorism and civil unrest and examines a range of scenarios that may occur at the Federal Penitentiary in Union County. The plan identifies necessary supplies, personnel, and equipment for managing disturbances.
- **Emergency Procedures Plans** have been developed for each School District in Union County to address a variety of scenarios caused by accidents or willful acts.
- **Union County Hazardous Material Response Plan**, is updated annually based on information provided by facilities that handle hazardous materials.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

- **Union County Nuclear / Radiological Incident Plan**, 2008, addresses the potential for nuclear facility accidents.
- **Emergency Action Plans** have been prepared for high hazard dams located in Union County as well as those for which the inundation area includes part of Union County. Each Emergency Action Plan addresses ways to safeguard lives and reduce property damage within the inundation area; procedures for effective dam surveillance; procedures for prompt notification of emergency management officials; warning and evacuation procedures; and emergency response actions that will be taken in the event of potential or imminent failure of the dam. Plans have been prepared, reviewed by Union County officials, and are on file at the Union County Public Safety Office for:
 - Dams located in Union County:
 - Halfway Dam
 - Poe Valley Dam
 - Spruce Run Dam
 - Stoney Run Dam
 - White Deer Reservoir Dam
 - Dams for which part of the inundation area is in Union County:
 - Albin-Bush Dam
 - Curwan Dam
 - Curwensville Lake Dam
 - Foster Sayers Dam
 - George B Stevenson Dam – note that the Emergency Action Plan for this dam is currently undergoing a review and update by PEMA officials, state police, health officials, and other emergency management personnel as of September 2014.
 - Lake Chillisque Dam
- **Union County Pandemic Plan**, August 2009, addresses the threat of widespread influenza.
- **Union County Environmental Plans and Policies** identifies steep slopes as slopes greater than 15 percent and requires engineering review for roads on slopes greater than seven percent, as steep slopes can be unstable.

The Pennsylvania Emergency Management Services Code, Title 35, requires all political jurisdictions in the Commonwealth to have an Emergency Operations Plan (EOP), an Emergency Management Coordinator (EMC), and an Emergency Operations Center (EOC). The County **Emergency Operations Plan** is reviewed annually. Each borough and township in

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Union County also has an Emergency Operations Plan that is reviewed bi-annually. Emergency Operations Plans identify the actions necessary to protect lives and safety in the immediate aftermath of a damaging natural or human-made hazard. Emergency Operations Plans address the response capabilities of fire, police, and emergency medical services personnel and include information about search and rescue operations, emergency power generation and communications, provision of emergency shelters, and locations of special needs populations.

The County has developed a **Disaster Response Plan** to identify actions that will be necessary in the aftermath of a disaster to guide the physical, social, environmental, and economic recovery and reconstruction process after a disaster. The plan addresses provision of temporary shelter, debris disposal, and assessment of damage, restoration of utility services, reconstruction priorities, and opportunities for financial assistance.

Union County and participating jurisdictions do not develop long-term capital improvement plans for addressing the future needs for improvements to the public infrastructure.

5.2.1.2. Participation in the National Flood Insurance Program

The Pennsylvania Floodplain Management Act (Act 166 of 1978) requires every municipality identified by the Federal Emergency Management Agency (FEMA) to participate in the NFIP and permits all municipalities to adopt floodplain management regulations. It is in the interest of all property owners in the floodplain to keep development and land usage within the scope of the floodplain regulations for their community. This helps keep insurance rates low and makes sure that the risk of flood damage is not increased by property development.

Of the municipalities in Union County, 13 of 14 participate in the NFIP. Table 5.2.1-2 shows whether the municipality is participating in NFIP, the number of policies they have, whether the municipality is in good standing, and when they entered the NFIP. Hartleton Borough has never participated in the NFIP and flood studies have never identified a flood hazard area in Hartleton Borough (FEMA, 2014a).

MUNICIPALITY	DATE ENTERED THE NFIP	# POLICIES	IS THE COMMUNITY IN GOOD STANDING?
Buffalo Township	4/1/1977	58	Yes
East Buffalo Township	2/2/1977	54	Yes
Gregg Township	9/28/1979	25	Yes
Hartleton Borough	NP	-	NP
Hartley Township	3/4/1988	64	Yes
Kelly Township	3/1/1977	31	Yes
Lewis Township	9/30/1987	13	Yes
Lewisburg Borough	2/2/1977	312	Yes
Limestone Township	3/4/1988	41	Yes
Mifflinburg Borough	3/4/1988	19	Yes
New Berlin Borough	4/30/1986	2	Yes

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

MUNICIPALITY	DATE ENTERED THE NFIP	# POLICIES	IS THE COMMUNITY IN GOOD STANDING?
Union Township	8/1/1979	44	Yes
West Buffalo Township	09/60/1987	22	Yes
White Deer Township	9/28/1979	113	Yes

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

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

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

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

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

activities that are organized under four categories: Public Information, Mapping and Regulations, Flood Damage Reduction, and Flood Preparedness.

Lewisburg Borough (CRS Class 8) is the only municipality participating in this program. Lewisburg Borough has received CRS points for the following: elevation certificates, map information, outreach projects, hazard disclosure, and open space preservation.

The Steering Committee used FEMA's NFIP Worksheet to understand local implementation of the NFIP. Results of this survey showed that municipalities engage in the NFIP in several ways. East Buffalo Township administers NFIP permit review via a third party inspection; their ordinance exceeds FEMA and State minimum requirements by requiring elevation certifications, freeboard of 1.5' over base flood elevation, prohibits hazardous materials, prohibits development in flood way unless offset, regulates flood mitigation, requires flood proofed structures, and requires buildings/structures to be anchored. All development requires a zoning permit that is reviewed by the zoning office and/or the township engineer and other state and federal agencies, as needed. In Gregg Township, the SFHA is identified as an environmentally sensitive area where no units may be built, and the ordinance requires 18 inches of freeboard for both residential and non-residential structures. It also requires anchoring of mobile homes. Lewisburg Borough mainly implements the NFIP through its zoning ordinance. Development applications are reviewed with respect to the NFIP through zoning review, engineering review, and CRS requirements. SFHA concerns are noted in the application review process. Lewisburg Borough's ordinance exceeds FEMA and State minimums by regulating additional structures and exceeding review requirements. Limestone Township implements the NFIP through its building code administered by a third party entity. Mifflinburg Borough administers the NFIP through permit review, inspections, and collection of elevation certificates; its ordinance meets FEMA and the State's minimum requirements. New Berlin Borough indicates that floodplain management is an auxiliary function, and NFIP administration is limited to letters being sent to home owners. Its floodplain management ordinance meets FEMA and State minimum requirements, as do Union Township and West Buffalo Township's. Buffalo Township and Lewis Township provided limited information on their NFIP implementation.

5.2.2. Administrative and Technical Capability

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

- In addition to meeting NFIP regulatory requirements, Lewisburg Borough participates in the **Community Rating System**, as discussed above. This program is managed by FEMA and can result in reduced flood insurance premiums for residents and business owners due to the additional efforts made by administrators in a participating jurisdiction to reduce flood damages. The goals of CRS are reduction of flood losses, accurate insurance ratings, and increased awareness of the benefits of flood insurance. NFIP insurance premiums in Lewisburg are slightly reduced as it has completed many of the activities designated by CRS for realizing these goals.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

- Lewisburg Borough is also developing a **Flood Insurance Task Force**. The purpose of the committee will be to educate homeowners on the NFIP, work to increase the municipality's CRS rating, and develop a local grant program.
- **Agricultural Land Preservation Program** assists landowners in placing an Agricultural Conservation Easement on property so that it will remain in agricultural or open space use in perpetuity.
- **Main Street Programs** in Lewisburg and Mifflinburg Boroughs have developed comprehensive strategies to promote the revitalization of traditional business districts with the support of the National Trust for Historic Preservation. The authorities are the Lewisburg Downtown Partnership and the Mifflinburg Heritage and Revitalization Association.
- **Union County Economic Development** provides economic development planning in the County.
- **Union County Conservation District** in cooperation with the Pennsylvania Department of Environmental Protection reviews permit applications pertaining to agricultural activities, minor road crossings, intake and outfall structures, stream bank rehabilitation, and gravel bar removal and can issue permits under the Pennsylvania Dam Safety and Waterway Management Code. The District investigates complaints pertaining to illegal stream encroachments. The District is also responsible for administering the Erosion and Sedimentation Pollution Control Program, to conduct site inspections, sponsor educational programs, and investigate complaints related to commercial or agricultural activities.
- **Susquehanna River Basin Commission** is authorized by the Congress of the United States to guide the conservation, development, and administration of water resources in the Susquehanna River Basin.
- **Buffalo Creek Watershed Alliance** focuses on improvement of water quality and restoration of riparian buffers and wildlife habitat and enhanced protection against flood damages in the Buffalo Creek Watershed.
- **Central Keystone Council of Governments** provides building permit review for all 14 jurisdictions in Union County as well as enforcement of zoning and of sanitary wastewater management.
- **Susquehanna Economic Development Association and Council of Governments (SEDA-COG)** is a regional authority that augments local capabilities for economic development and transportation planning.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

- SEDA-COG regularly updates the Comprehensive Economic Development Strategy, the Transportation Improvement Program, and the Long Range Transportation Plan for Union and surrounding counties.
- SEDA-COG has established two Keystone Opportunity Zones, land with special tax incentives to induce development in Union County; these are the Mifflinburg Industrial Park and the 170-acre Great Streams Commons, which is a mixed-use business park with housing and commercial development.
- SEDA-COG has adopted *Valley Vision 2020: a Plan for Pennsylvania's Heartland*, which established environmental conservation and recreation goals.

Additionally, Union County, Lewisburg and New Berlin Boroughs, and East Buffalo, Kelly, Lewis, Limestone, and White Deer Townships have planners on staff to assist with the implementation of mitigation actions. Union County administers a comprehensive GIS database for the entire County, and the Union County GIS Department provides mapping and development data retrieval capabilities.

5.2.3. Financial Capability

A critical key to the implementation of any plan is the financial resources to accomplish the priority projects identified. The implementation of mitigation actions requires time and fiscal resources. While some mitigation actions are less costly than others, it is important that money is available locally to implement policies and projects. Financial resources are particularly important if communities are trying to take advantage of state or federal mitigation grant funding opportunities that require local-match contributions. Based on the *Capability Assessment Survey* results received, most municipalities within the County perceive fiscal capability to be limited; however, four communities listed their capability to be moderate to high.

Support for mitigation planning actions is provided by the Commonwealth of Pennsylvania and the Federal Government. Programs that complement Union County mitigation planning initiatives are:

- Pennsylvania administered programs including:
 - **Local Government Capital Projects Loan Program**, which provides low-interest loans for purchasing equipment.
 - **Shared Municipal Services**, which provides grant funds to promote cooperation among municipalities.
 - **Land Use Planning and Technical Assistance Program**, which provides grant funds for the preparation of community comprehensive plans and ordinances to implement them.
 - **Floodplain Land Use Assistance Program**, which provides grants and technical assistance to improve management of floodplain lands.
 - **Community Revitalization Program**, which provides grant funds to support local initiatives that promote social and economic diversity to ensure a productive tax base and good quality of life.

- Federal Government programs including the:
 - **Hazard Mitigation Assistance Programs**, which provide grants for cost-effective mitigation projects either in the absence of a disaster or after a disaster declaration has occurred:
 - Pre-Disaster Mitigation Assistance Program (PDM)
 - Flood Mitigation Assistance Program (FMA)
 - Hazard Mitigation Grant Program (HMGP)
 - **Community Development Block Grants**, which provides funds to address a wide range of community development needs.
 - **Small Communities Program Fund**, which supports water quality infrastructure projects.
 - **Weatherization Assistance Program**, which enables low-income households to make their homes more energy-efficient.
 - **Firewise Communities** Program, which involves homeowners and community leaders in protecting structures from fire damage.

5.2.4. Education and Outreach

Education and outreach programs and methods are used to implement mitigation activities and communicate hazard-related information. Examples include fire safety programs that fire departments deliver to students at local schools; participation in community programs, such as Firewise Communities Certification or StormReady Certification; and activities conducted as part of hazard awareness campaigns, such as Hurricane Preparedness Week. Some communities have their own public information or communications office to handle outreach initiatives. Only one municipality (Lewisburg Borough) reports on its *Capability Assessment Survey* that is had moderate education and outreach capability. All other municipalities who completed the survey reported limited capabilities.

Reported education and outreach activities in Union County are summarized as follows:

- Union County, Lewisburg Borough, and West Buffalo maintain StormReady Certification.
- Lewisburg Borough also conducts annual flood outreach efforts as part of the CRS program including notices, postings, the internet, walk-ins, and public meetings.
- Buffalo Township, Lewis Township, Lewisburg Borough, and New Berlin Borough have local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, or access and functional needs populations. One example is the Lewisburg Borough Flood Insurance Task Force described in Section 5.2.2 above. Another example is the Lower Penns Creek Watershed Association which does projects in New Berlin Borough such as install rain gardens.
- Union County Department of Emergency Management staff also conducts public outreach throughout the year to share hazard preparedness and safety information. Staff attends various PEMA and FEMA trainings and events. Staff also works with

residents one-on-one on an as-needed basis to answer questions about mitigation projects and grants.

5.2.5. Plan Integration

Plan integration ensures that hazard mitigation planning is woven into each municipality's planning and regulatory documents. These include the plans, policies, codes, and programs that guide land use and development. Effective integration of hazard mitigation occurs when the planning framework fosters development that does not increase risks from known hazards or leads to redevelopment that reduces risk from known hazards (FEMA, 2013).

As mentioned above, Union County adopted its Comprehensive Plan in December 2009. The plan includes a sustainability principle to focus new development in and around established communities. The plan also includes a sustainability principle to limit the impacts of new development on community services including police, fire, and EMS. The plan recognizes that flooding is a hazard in the County as well as in the entire Susquehanna River Basin and identifies floodplains on its Growth Management Strategy Map. It discusses the importance of protecting natural features such as wetlands which have an important role in absorbing floodwater. In addition, the plan excludes floodplains and steep slopes over 15% in its calculation of growth areas for the County. The Union County Planning Department recognizes the importance of plan integration and will develop more ways to integrate this Hazard Vulnerability Assessment and Mitigation Plan Update into the next update of the Union County Comprehensive Plan.

The Union County Planning Department is also in the process of developing a County Greenway and Open Space Plan. This plan is anticipated to be completed within the next two years and will target hazard areas such as floodplains, forested land, and steep slopes as areas for acquisition as greenways or open space.

Based on the capability assessment results and information from the Union County Department of Emergency Management, all of Union County's jurisdictions have some forms of local land use controls. As will be discussed in Section 6.1, upon review of the 2010 mitigation actions, it was determined that several municipalities completed mitigation actions that achieve plan integration by furthering hazard mitigation goals through land development regulations. For example, East Buffalo Township added new language in its subdivision and land development ordinance to require new power and communications lines to be buried. East Buffalo Township, along with Lewisburg Borough, increased their 1.5-foot freeboard requirement in local flood damage prevention ordinances to better protect new structures from the effects of floods and flash floods. Finally, Gregg Township developed new language in its zoning regulations to allow higher density cluster development to limit the location of future development in Special Flood Hazard Areas.

Some other land use tools in municipalities have not been updated recently. As municipalities work to update comprehensive plans and land use ordinances, local governments can go further to use land use regulations to direct development away from hazard-prone areas.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

A barrier to plan integration is often the lack of resources to accomplish activities that plan integration requires. Several municipalities noted on the *Capability Assessment Surveys* that lack of financial resources precludes development of some planning tools. The Self-Assessment portion of the survey provided each municipality an opportunity conduct its own self-assessment of its capability to effectively implement hazard mitigation activities. As part of this process, County and municipal officials were encouraged to consider the barriers to implementing proposed mitigation strategies in addition to the mechanisms that could enhance or further such strategies. In response to the survey questionnaire, local officials classified each of the capabilities as either “limited,” “moderate,” or “high.” Table 5.2.5-1 summarizes the results of the self-assessment survey as a percentage of responses received. With available resources being limited and stretched into the foreseeable future, plan integration is extremely relevant and will help leverage existing resources to the maximum extent possible.

CAPABILITY CATEGORY	LIMITED	MODERATE	HIGH
Planning & Regulatory	25%	37.5%	37.5%
Administrative & Technical	25%	25%	50%
Financial	50%	25%	25%
Education & Outreach	87.5%	12.5%	0%

6. Mitigation Strategy

6.1. Update Process Summary

Goals are long-term aspirations about the resiliency of the community given the potential effects of hazards. Objectives are measurable strategies that the Union County community has determined will be necessary to move closer to attaining each goal. Actions are the tasks that are proposed for realizing each objective.

There were 10 goals and 21 objectives identified in the 2010 Union County Hazard Vulnerability Assessment and Mitigation Plan Update. Goals and objectives were presented to the HMPT during the July 16, 2014 planning team meeting. Following this meeting, the HMSC reviewed the goals and objectives via conference call and a review summary is included in Table 6.1-1. Some goals and objectives were modified slightly based on the results of the updated risk assessment.

Table 6.1-1 List and review summary of 2010 mitigation strategy goals and objectives.	
Goal 1: Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to flooding.	
Objective 1.1: Protect existing structures in the Special Flood Hazard Area.	<p>Review: The Hazard Mitigation Steering Committee agreed that this goal should be continued. However, the name of the hazard was changed from “Flooding” to “Flood, Flash Flood, and Ice Jam” so as to be consistent with PEMA’s Standard Operating Guide.</p> <p>Objectives 1.1 through 1.3 have been continued into the 2014 plan.</p> <p>The HMSC determined that Objective 1.4 should be reworded. The bridge is owned by the Buffalo Valley Recreation Authority which has plans to make it into a river destination. As neither Union County nor Lewisburg Borough own the bridge and would be responsible for developing the solution to the abandoned bridge, the Objective is being reworded to: “Continue to monitor progress on the development of an approach for reducing the possibility of damage due to dislodgement of the abandoned railroad bridge in Lewisburg Borough.”</p>
Objective 1.2: Promote the continuing purchase of flood insurance by property owners in flood hazard areas.	
Objective 1.3: Develop a comprehensive approach for reducing the possibility of damage and loss of function to critical facilities located in the Special Flood Hazard Area.	
Objective 1.4: Develop a comprehensive approach for reducing the possibility of damage due to the potential dislodgement of the abandoned railroad bridge in Lewisburg Borough.	
Goal 2: Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to heavy snow or ice.	

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.1-1 List and review summary of 2010 mitigation strategy goals and objectives.	
<p>Objective 2.1: Develop a comprehensive approach to reducing the possibility of damage and loss of function to identified vulnerable buildings and critical facilities, due to the effects of severe weather hazards.</p>	<p>Review: The Hazard Mitigation Steering Committee agreed that this goal should be continued. However, the name of the hazard was changed from “Heavy Snow or Ice” to “Winter Storm” so as to be consistent with PEMA’s Standard Operating Guide.</p> <p>Objectives 2.1 and 2.2 have been continued into the 2014 plan; however Objective 2.1 has been slightly reworded to specify the hazard, winter storm.</p>
<p>Objective 2.2: Protect future development from damage due to snow or ice through continued enforcement of building codes.</p>	
<p>Goal 3: Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to tornado or high wind.</p>	
<p>Objective 3.1: Protect future development from damage from severe weather hazards through continued enforcement of building codes.</p>	<p>Review: The Hazard Mitigation Steering Committee agreed that this goal should be continued. However, the name of the hazard was changed from “Tornado or High Wind” to “Tornado or Windstorm” so as to be consistent with PEMA’s Standard Operating Guide.</p> <p>Objective 3.1 has been continued into the 2014 plan; however the wording has been slightly modified to specify the hazard, tornado and wind storm.</p>
<p>Goal 4: Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to wildfire.</p>	
<p>Objective 4.1: Develop a comprehensive approach for reducing the possibility of injury and loss of life due to the exposure of structures to wildfires in forested areas.</p>	<p>Review: The HMSC agreed this goal should continue into the 2014 plan.</p> <p>The three objectives will be continued into the 2014 plan; however Objective 4.2 will be reworded to specify the hazard wildfire and to include all municipalities.</p>
<p>Objective 4.2: Develop a comprehensive approach to reducing the possibility of damage and loss of function to critical facilities in Hartley, White Deer, and Gregg Townships.</p>	
<p>Objective 4.3: Develop a comprehensive approach to reducing the possibility of damage and loss due to the exposure of vacation and year-round residential structures in all municipalities that have structures in forested areas, with special attention to those with the highest number of structures (Hartley, White Deer, and West Buffalo).</p>	

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.1-1 List and review summary of 2010 mitigation strategy goals and objectives.	
Goal 5: Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to earthquake.	
Objective 5.1: Develop a comprehensive approach to reducing the possibility of damage and loss of function to identified older buildings to the effects of earthquakes.	Review: The HMSC agreed this goal and objective should continue into the 2014 plan.
Goal 6: Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to land subsidence.	
Objective 6.1: Work with the Pennsylvania Department of Environmental Protection to be aware of any locations within the County that may be identified as having the potential for land subsidence.	Review: The Hazard Mitigation Steering Committee agreed that this goal should be continued. However, the name of the hazard was changed from “Land Subsidence” to “Subsidence and Sinkhole” so as to be consistent with PEMA’s Standard Operating Guide. Objective 6.1 will be continued into the 2014 plan, but the Pennsylvania Department of Conservation and Natural Resources will also be added to the objective.
Goal 7: Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to landslide.	
Objective 7.1: Develop a comprehensive approach to reducing the possibility of damage and loss due to future rock falls and related land failures along identified high hazard areas along Routes 15 and 45 in Hartley, Kelly, White Deer, and Union Townships.	Review: The HMSC agreed this goal and objective should continue into the 2014 plan.
Goal 8: Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to drought.	
Objective 8.1: Promote water conservation measures and awareness.	Review: The HMSC agreed this goal and objective should continue into the 2014 plan.
Goal 9: Promote disaster-resistant features in future residential, commercial, institutional, and industrial development.	
Objective 9.1: Encourage and facilitate the adoption of the newest building codes that will provide protection for new construction and substantial renovations from the effects of identified hazards.	Review: The HMSC agreed this goal and three objectives should continue into the 2014 plan.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.1-1 List and review summary of 2010 mitigation strategy goals and objectives.	
Objective 9.2: Encourage and facilitate the development or revision of comprehensive plans and zoning ordinances to limit development in high hazard areas.	
Objective 9.3: Continue to provide consistent enforcement of ordinances and codes.	
Goal 10: Promote hazard mitigation as a public value in recognition of its importance to the health, safety, and welfare of the population.	
Objective 10.1: Promote disaster resistance within the business community.	Review: The HMSC agreed this goal and four objectives should continue into the 2014 plan.
Objective 10.2: Develop an effective public awareness program about potential natural hazards.	
Objective 10.3: Promote partnerships between the municipalities and the County to continue to develop a County-wide approach to identifying and implementing mitigation actions.	
Objective 10.4: Provide public education to increase awareness of hazards and opportunities for mitigation.	

Through the original planning process in 2005, the Steering Committee and citizens of Union County also adopted principles for guiding the development of the mitigation plan that were used during the initial planning process and again during the plan update in 2010. These mitigation planning principles are being continued into the 2014 Union County Hazard Vulnerability Assessment and Mitigation Plan Update. These mitigation planning principles are:

- Mitigation actions must support the rich historic, recreational, and agricultural assets of the community.
- Mitigation actions must protect the natural environment.
- Mitigation actions must promote economic development through measures that are consistent with floodplain management development regulations and building codes.
- Mitigation actions must protect people and property, the functioning of local government, and the local economy from the negative effects of hazards.
- The County will cooperate with state agencies to identify critical facilities and infrastructure that are potentially at risk of damage due to natural hazards and will undertake feasible and cost effective measures to minimize future losses.
- The County will support scientific study of natural hazards and the improvement of data about hazards.
- The County supports enhancing public safety during hazard events, identifying natural hazards, increasing awareness of natural hazards, and taking actions to avoid or minimize damages.
- The County recognizes that the benefits of hazard mitigation planning and actions are the enhanced health, safety, and welfare of the general population.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Actions provide more detailed descriptions of specific work tasks to help the County and its municipalities achieve the goals and objectives. There were 33 actions identified in the 2010 Union County Hazard Vulnerability Assessment and Mitigation Plan. Each municipality and the County were provided with a *5-Year Hazard Mitigation Plan Review Worksheet* which included a list of its actions include in the 2010 plan. Communities were asked to use the worksheet to indicate whether each action was “completed,” “canceled,” “deferred,” or is “ongoing.” The communities were also asked to include notes and comments on the actions indicating what was accomplished during the reporting period, if any obstacles were encountered, and for actions that were not completed whether they are still relevant.

The majority of existing mitigation actions have been carried over into the 2014 Hazard Vulnerability Assessment and Mitigation Plan as they are continuous actions or actions that were not completed in the last five years, but the County or municipalities would like to continue them into the 2014 Hazard Vulnerability Assessment and Mitigation Plan so that they can work to complete them over the next five years (i.e. “deferred actions”). A list of these actions as well as a review and summary of their progress based on comments received from stakeholders involved in the plan update process is included in Table 6.1-2. Actions were evaluated by the HMSC and municipal officials with the intent of producing a usable mitigation action plan in 2014 with actions and projects that could be completed over the next five years. **Appendix C** contains a summary of responses provided by municipalities to the *5-Year Hazard Mitigation Plan Review Worksheet*.

Table 6.1-2 List and review summary of 2010 mitigation actions.		
ACTION	RESPONSIBLE AGENCY(IES)	REVIEW
Continue efforts to acquire repetitive flood claim and severe repetitive loss properties in Union County.	Union County	The County indicated that this project is ongoing. In the previous reporting period, nine properties were acquired and are in the process of being razed. Therefore this action is being continued into the 2014 plan. See action #1 in Table 6.4-1.
Invite State NFIP Coordinator to schedule a Community Assistance Visit to ensure continued compliance with NFIP regulations.	Union County	The County indicated that this project is being deferred. Therefore it is being continued into the 2014 plan. See action #2 in Table 6.4-1.
Sponsor a workshop about costs and benefits of purchasing and maintaining flood insurance for any interested community residents and business owners.	Union County	The County indicated that this project is being deferred. Therefore it is being continued into the 2014 plan. See action #3 in Table 6.4-1.
Initiate meeting with providers of electric power to examine the cost and potential sources of funding for burying power lines.	Union County	The County indicated that this project is being deferred. Therefore it is being continued into the 2014 plan. See action #4 in Table 6.4-1.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.1-2 List and review summary of 2010 mitigation actions.		
ACTION	RESPONSIBLE AGENCY(IES)	REVIEW
Initiate a meeting of land developers and contractors to determine the cost of burying power and communications lines in new subdivisions.	Union County	The County indicated that this project is ongoing and the Planning Department is responsible for this action. Therefore it is being continued into the 2014 plan. See action #5 in Table 6.4-1.
Provide information to schools, prisons, and nursing homes about the Great California Shake-Out and encourage participation in this educational program about surviving the immediate effects of an earthquake.	Union County	The County indicated that this project is being deferred. Therefore it is being continued into the 2014 plan. See action #6 in Table 6.4-1.
Provide education for residents about water-saving landscaping techniques.	Union County	The County indicated that this project is ongoing. Therefore it is being continued into the 2014 plan. See action #7 in Table 6.4-1.
Turn one or more rooms in each school and public building into safe rooms providing safe, temporary shelter during a tornado.	Union County	The County indicated that this project is ongoing. Therefore it is being continued into the 2014 plan. See action #8 in Table 6.4-1. The action is also being reworded to include windstorms, hurricanes, tropical storms, and nor'easters.
Provide workshops for farmers regarding livestock management and crop survival during times of drought.	Union County	The County indicated that this project is ongoing. Therefore it is being continued into the 2014 plan. See action #9 in Table 6.4-1.
Proceed with a project to improve storm water drainage in West Milton area of Kelly Township near U.S. Highway 15 and railroad tracks.	Kelly Township	The HMSC reviewed the mitigation action on behalf of the community and determined that the action should be continued into the 2014 plan. See action #10 in Table 6.4-1.
Provide information to residents and business owners to examine the interior of structures to identify objects that may fall in the event of an earthquake (e.g., tall file cabinets, water heaters). Include information about anchoring.	Union County, Buffalo Township, East Buffalo, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The County, municipalities, and HMSC reviewed this action. It was determined to be either deferred or ongoing for all 14 municipalities and Union County. The project will be included in the 2014 plan. See action #12 in Table 6.4-1.
Provide training for each County and municipal building inspector so that building code enforcement is consistent throughout the County.	Union County, Buffalo Township, East Buffalo, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The County, municipalities, and HMSC reviewed this action and determined it was ongoing for all 14 municipalities and Union County. The County indicated that the Code Enforcement Department handles continuing education efforts and the municipalities indicated that code enforcement is provided by the Central Keystone Council of Governments (CK-COG). The project will be included in the 2014 plan. See action #13 in Table 6.4-1.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.1-2 List and review summary of 2010 mitigation actions.

ACTION	RESPONSIBLE AGENCY(IES)	REVIEW
Develop a program to do non-structural retrofit for earthquake safety in each public building (e.g., anchor file cabinets, secure clocks on walls).	Union County, Buffalo Township, East Buffalo, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The County, municipalities, and HMSC reviewed this action and determined it was either deferred or ongoing for all 14 municipalities and Union County. Therefore it is being continued into the 2014 plan. See action #14 in Table 6.4-1.
Maintain regular contact with Pennsylvania Department of Environmental Protection to ensure that County information about potential mine subsidence is current.	Union County, Buffalo Township, East Buffalo, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The HMSC determined that this action was not applicable for Union County as mine subsidence was not a hazard in the County. Therefore the action is not being continued into the 2014 plan.
Examine feasibility of jurisdictions besides Hartleton Borough, Lewisburg Borough and Limestone Township to participate in the Community Rating System.	Union County, Buffalo Township, East Buffalo, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The County, municipalities, and HMSC reviewed this action and determined it was either deferred or ongoing for 12 municipalities and Union County. Therefore it is being continued into the 2014 plan. Additionally, the action will be reworded since Hartleton Borough does not have any SFHA and Limestone Township and Lewisburg Borough do not currently participate in the CRS Program. See action #15 in Table 6.4-1.
Study options for dismantling the railroad bridge in Lewisburg by completing a structural integrity survey, assessing salvage potential, and identifying opportunities for adaptive reuse.	Union County, Lewisburg Borough	The County and municipality indicated that this project is ongoing, and efforts to acquire and raze the railroad bridge are continuous. Therefore it is being continued into the 2014 plan, but the HMSC determined that the action should be reworded to reflect continued participation in efforts in to find a solution regarding the railroad bridge. Buffalo Valley Recreation Authority owns the bridge and has plans to make it into a river destination. See action #11 in Table 6.4-1.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.1-2 List and review summary of 2010 mitigation actions.		
ACTION	RESPONSIBLE AGENCY(IES)	REVIEW
Institute a program to inspect public buildings including storage facilities and lift station housing to identify structural defects that may lead to collapse due to heavy snow or ice.	Union County, Buffalo Township, East Buffalo, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The County, municipalities, and HMSC reviewed this action and determined it was either deferred or ongoing for all 14 municipalities and Union County. The project will be included in the 2014 plan. See action #16 in Table 6.4-1.
Include publicity about the benefits of mitigation actions in a public relations program.	Union County, Buffalo Township, East Buffalo, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The County, municipalities, and HMSC reviewed this action and determined it was either deferred or ongoing for all 14 municipalities and Union County. Lewisburg Borough indicated that public notices are sent out annually to lending, insurance, and real estate offices as well as owners. The project will be included in the 2014 plan. See action #16 in Table 6.4-1.
Attend NFIP training workshops offered in Pennsylvania for local officials and encourage local officials to become Certified Floodplain Managers.	Union County, Buffalo Township, East Buffalo, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The County, municipalities, and HMSC reviewed this action and determined it was either deferred or ongoing for 13 municipalities and Union County. It was determined that Hartleton Borough should not be listed under this action in the 2014 plan since the Borough does not have any SFHA. Additionally, East Buffalo Township indicated that its Planning Director attended a training on August 21, 2014, and Lewisburg Borough indicated that its EMC is continuing education by working with council members on NIMS certification. The action is being continued into the 2014 plan. See action #18 in Table 6.4-1.
Develop language for potential inclusion in subdivision regulations requiring new power and communications (telephone, cable television) lines to be buried.	Union County, Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	<p>The County, municipalities, and HMSC reviewed this action and determined that it was either deferred or ongoing for 11 municipalities and Union County. Lewisburg Borough indicated that this project remains a line item within the Subdivision and Land Development Ordinance. The action is being continued into the 2014 plan. See action #19 in Table 6.4-1.</p> <p>Two municipalities, Mifflinburg Borough and Union Township, indicated that this project was not applicable. East Buffalo Township indicated that this project has been completed since the last update.</p>

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.1-2 List and review summary of 2010 mitigation actions.

ACTION	RESPONSIBLE AGENCY(IES)	REVIEW
Examine the benefit of increasing the current 1.5-foot freeboard requirement in local flood damage prevention ordinances so that structures are protected to a level greater than the established base flood elevation.	Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, New Berlin Borough, West Buffalo Township, White Deer Township	<p>The municipalities and HMSC reviewed this action and determined it was either deferred or ongoing for 11 municipalities. Therefore it is being continued into the 2014 plan. See action #20 in Table 6.4-1.</p> <p>East Buffalo Township and Lewisburg Borough indicated that this project is completed. It was determined that Hartleton Borough should not be listed under this action in the 2014 plan since the Borough does not have any SFHA.</p>
Examine the possibility of amending/developing local zoning ordinances to direct new development away from areas underlain with carbonate bedrock.	Buffalo Township, East Buffalo, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	<p>The municipalities and HMSC reviewed this action and determined it was either deferred or ongoing for 13 municipalities and Union County. The action will be included in the 2014 plan. See action #21 in Table 6.4-1.</p> <p>Lewisburg Borough indicated that this project does not apply to their borough, and the municipality will not be included in the 2014 plan.</p>
Continue efforts to elevate structures in the Special Flood Hazard Area.	Union County, Buffalo Township, East Buffalo, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	<p>The County, municipalities, and HMSC reviewed this action and determined it was either deferred or ongoing for 13 municipalities and Union County. The County indicated that several grant applications have been submitted regarding this action. Lewisburg Borough also indicated that they have an active HMGP Grant application to elevate a structure on South Front Street. The project will be included in the 2014 plan but reworded to also include acquisition, demolition, and floodproofing. See action #22 in Table 6.4-1.</p> <p>It was determined that Hartleton Borough should not be listed under this action in the 2014 plan since the Borough does not have any SFHA.</p>

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.1-2 List and review summary of 2010 mitigation actions.

ACTION	RESPONSIBLE AGENCY(IES)	REVIEW
Work with Township and Borough officials to increase awareness among residents and business owners about NFIP insurance.	Union County, Buffalo Township, East Buffalo, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	<p>The County, municipalities, and HMSC reviewed this action and determined it was either deferred or ongoing for 13 municipalities and Union County. Lewisburg Borough indicated that they continue CRS education through notices, postings, the internet, walk-ins, and public meetings. The project will be included in the 2014 plan. See action #23 in Table 6.4-1.</p> <p>It was determined that Hartleton Borough should not be listed under this action in the 2014 plan since the Borough does not have any SFHA.</p>
Develop language for potential inclusion in zoning regulations allowing higher density cluster development to limit the location of future development in Special Flood Hazard Areas.	Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	<p>The municipalities and HMSC reviewed this action and determined it was either deferred or ongoing for 13 municipalities. East Buffalo Township indicated that zoning amendments are completed while regulation bulk and density for development are ongoing. Lewisburg Borough indicated that the Union County Planning Department addresses this issue in the multi-municipal comprehensive plan. The project will be included in the 2014 plan. See action #24 in Table 6.4-1.</p> <p>Gregg Township indicated that this project has been completed since the last update.</p>
Develop language for potential inclusion in flood damage prevention ordinances extending elevation and flood-proofing requirements to structures in the area just beyond the Special Flood Hazard Area that has been shown by FEMA to have a 0.2-percent chance of flooding in any given year.	Union County, Buffalo Township, East Buffalo, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	<p>The municipalities and HMSC reviewed this action and determined it was either deferred or ongoing for 13 municipalities. The project will be included in the 2014 plan. See action #25 in Table 6.4-1.</p> <p>It was determined that Hartleton Borough should not be listed under this action in the 2014 plan since the Borough does not have any SFHA.</p>

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.1-2 List and review summary of 2010 mitigation actions.		
ACTION	RESPONSIBLE AGENCY(IES)	REVIEW
Conduct systematic examination of structures in Special Flood Hazard Area to identify potential violations such as unvented enclosures below base flood elevation.	Union County, Buffalo Township, East Buffalo, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	<p>The municipalities and HMSC reviewed this action and determined it was either deferred or ongoing for 13 municipalities. The project will be included in the 2014 plan. See action #26 in Table 6.4-1.</p> <p>It was determined that Hartleton Borough should not be listed under this action in the 2014 plan since the Borough does not have any SFHA.</p>
Obtain first floor elevations for all structures in identified Special Flood Hazard Areas (including "pre-FIRM" structure built before flood insurance rates maps were developed for the County).	Union County, Buffalo Township, East Buffalo, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	<p>The municipalities and HMSC reviewed this action and determined it was either deferred or ongoing for 13 municipalities. Lewisburg Borough indicated that due to the Biggert-Waters Act, homeowners are distributing elevation certificates to the Borough office. The project will be included in the 2014 plan. See action #27 in Table 6.4-1.</p> <p>It was determined that Hartleton Borough should not be listed under this action in the 2014 plan since the Borough does not have any SFHA.</p>
Review paper/electronic files relating to development in Special Flood Hazard Areas to ensure that elevation certificates have been saved.	Union County, Buffalo Township, East Buffalo, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	<p>The municipalities and HMSC reviewed this action and determined it was either deferred or ongoing for 13 municipalities. Therefore, the project will be included in the 2014 plan. See action #28 in Table 6.4-1.</p> <p>It was determined that Hartleton Borough should not be listed under this action in the 2014 plan since the Borough does not have any SFHA.</p>
Continue to discuss flood mitigation options with property owners.	Union County, Buffalo Township, East Buffalo, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	<p>The municipalities and HMSC reviewed this action and determined it was either deferred or ongoing for 13 municipalities. Therefore, the project will be included in the 2014 plan. See action #29 in Table 6.4-1.</p> <p>It was determined that Hartleton Borough should not be listed under this action in the 2014 plan since the Borough does not have any SFHA.</p>

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.1-2 List and review summary of 2010 mitigation actions.		
ACTION	RESPONSIBLE AGENCY(IES)	REVIEW
Maintain regular contact with Pennsylvania Department of Conservation and Natural Resources to ensure that County information about the potential for landslides is current.	Buffalo Township, East Buffalo, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The municipalities and HMSC reviewed this action and determined it was either deferred or ongoing for all 14 municipalities. The project will be included in the 2014 plan. See action #30 in Table 6.4-1.
Develop language for potential inclusion in subdivision regulations requiring grading permits to minimize the potential for landslides.	Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	The municipalities and HMSC reviewed this action and determined it was either deferred or ongoing for all 14 municipalities. The project will be included in the 2014 plan. See action #31 in Table 6.4-1. East Buffalo Township indicated that permits issued by the County Conservation District are required for earth moving activities and the project is ongoing.
Educate citizens and business owners about removing flammable vegetation or combustible materials from the immediate vicinity of buildings in wooded areas.	Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	The municipalities and HMSC reviewed this action and determined it was either deferred or ongoing for all 14 municipalities. Lewisburg Borough indicated that the Code Enforcement or Fire Department notifies owners with notice of potential hazards. The project will be included in the 2014 plan. See action #32 in Table 6.4-1.

Table 6.1-2 above indicated that progress has been made on a number of mitigation actions since the 2010 plan as well as some mitigation actions which were not identified in the 2010 plan. Since 2010, Lewisburg Borough has increased its CRS level and is now a Class 8 community, which was a mitigation action identified in the old plan. This accomplishment will allow residents in the Borough to receive a higher discount on flood insurance premiums. To preventively address the effects of floods and flash floods, Lewisburg Borough has also demolished nine properties along the east side of South 6th Street since 2010. These properties were among the most vulnerable in the Borough due to their location in the SFHA and were repetitive loss properties. In addition to structural improvements, Lewisburg has revised its monthly maintenance log for NFIP to include obstructions on each major waterway that passes through the Borough. A Flood Insurance Task Force was formed to review the Biggert-Waters Act and any new legislation that affects flood insurance. While these activities were not identified as mitigation actions in the 2010 plan, they did address various mitigation goals and objectives.

Limestone Township has also pursued infrastructure improvements to alleviate the effects of flooding. The Township continues to complete road projects aimed at protecting highways from erosion. Figure 6.1-1 shows an example of this infrastructure protection.



Other municipalities completed mitigation activities from the 2010 plan that aimed to further hazard mitigation goals through land development regulations, as discussed in Section 5.2.5. For example, East Buffalo Township added new language in its subdivision and land development ordinance to require that new power and communications lines be buried. East Buffalo Township, along with Lewisburg Borough, increased their 1.5-foot freeboard requirement in local flood damage prevention ordinances to better protect new structures from the effects of floods and flash floods. Finally, Gregg Township developed new language in its zoning regulations to allow higher density cluster development to limit the location of future development in Special Flood Hazard Areas.

6.2. Mitigation Goals and Objectives

Based on results of the review of the mitigation goals and objectives established in 2010, a new set of goals and objectives was adopted in 2014. Tables 6.1-1 above explains how several of the existing goals and objectives were revised. One new goal and objective was added to the 2014 plan to address the hazard of Hurricane, Tropical Storm, or Nor'easter. Table 6.2-1 shows

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

the mitigation goals and objectives established for the 2014 plan. There are 11 goals and twenty-two objectives identified.

Table 6.2-1 List of 2014 mitigation strategy goals and objectives.	
GOAL 1	Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to floods, flash floods, and ice jams.
Objective 1.1	Protect existing structures in the Special Flood Hazard Area.
Objective 1.2	Promote the continuing purchase of flood insurance by property owners in flood hazard areas.
Objective 1.3	Develop a comprehensive approach for reducing the possibility of damage and loss of function to critical facilities located in the Special Flood Hazard Area.
Objective 1.4	Continue to monitor progress on the development of an approach for reducing the possibility of damage due to dislodgement of the abandoned railroad bridge in Lewisburg Borough.
GOAL 2	Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to winter storms.
Objective 2.1	Develop a comprehensive approach to reducing the possibility of damage and loss of function to identified vulnerable buildings and critical facilities, due to the effects of winter storms.
Objective 2.2	Protect future development from damage due to snow or ice through continued enforcement of building codes.
GOAL 3	Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to tornado or windstorms.
Objective 3.1	Protect future development from damage from tornados or windstorms through continued enforcement of building codes.
GOAL 4	Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to wildfire.
Objective 4.1	Develop a comprehensive approach for reducing the possibility of injury and loss of life due to the exposure of structures to wildfires in forested areas.
Objective 4.2	Develop a comprehensive approach to reducing the possibility of damage and loss of function to critical facilities in municipalities vulnerable to wildfires.
Objective 4.3	Develop a comprehensive approach to reducing the possibility of damage and loss due to the exposure of vacation and year-round residential structures in all municipalities that have structures in forested areas, with special attention to those with the highest number of structures.
GOAL 5	Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to earthquake.
Objective 5.1	Develop a comprehensive approach to reducing the possibility of damage and loss of function to identified older buildings to the effects of earthquakes.
GOAL 6	Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to subsidence or sinkholes.
Objective 6.1	Work with the Pennsylvania Department of Environmental Protection and the Department of Conservation and Natural Resources to be aware of any locations within the County that may be identified as having the potential for land subsidence.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.2-1 List of 2014 mitigation strategy goals and objectives.	
GOAL 7	Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to landslide.
Objective 7.1	Develop a comprehensive approach to reducing the possibility of damage and loss due to future rock falls and related land failures along identified high hazard areas along Routes 15 and 45 in Hartley, Kelly, White Deer, and Union Townships.
GOAL 8	Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to drought.
Objective 8.1	Promote water conservation measures and awareness.
GOAL 9	Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to hurricanes, tropical storms, or nor'easters.
Objective 9.1	Protect future development from damage from hurricanes, tropical storms, or nor'easters through continued enforcement of building codes.
GOAL 10	Promote disaster-resistant features in future residential, commercial, institutional, and industrial development.
Objective 10.1	Encourage and facilitate the adoption of the newest building codes that will provide protection for new construction and substantial renovations from the effects of identified hazards.
Objective 10.2	Encourage and facilitate the development or revision of comprehensive plans and zoning ordinances to limit development in high hazard areas.
Objective 10.3	Continue to provide consistent enforcement of ordinances and codes.
GOAL 11	Promote hazard mitigation as a public value in recognition of its importance to the health, safety, and welfare of the population.
Objective 11.1	Promote disaster resistance within the business community.
Objective 11.2	Develop an effective public awareness program about potential natural hazards.
Objective 11.3	Promote partnerships between the municipalities and the County to continue to develop a County-wide approach to identifying and implementing mitigation actions.
Objective 11.4	Provide public education to increase awareness of hazards and opportunities for mitigation

6.3. Identification and Analysis of Mitigation Techniques

The mitigation strategy in the updated Hazard Vulnerability Assessment and Mitigation Plan Update should include analysis of a comprehensive range of specific techniques or actions. FEMA, through the March 2013 Local Mitigation Handbook, and PEMA, through the October 2013 Standard Operating Guide (SOG), identify four categories of hazard mitigation techniques.

- **Local plans and regulations:** Government authorities, policies, or codes that influence the way land and buildings are developed and built. Examples include, but are not limited to: comprehensive plans, subdivision regulations, building codes and enforcement, and NFIP and CRS.
- **Structure and infrastructure:** Modifying existing structures and infrastructure or constructing new structures to reduce hazard vulnerability. Examples include, but are not limited to: acquisition and elevation of structures in flood prone areas, utility

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

undergrounding, structural retrofits, floodwalls and retaining walls, detention and retention structures, and culverts.

- **Natural systems protection:** Actions that minimize damage and losses and also preserve or restore the functions of natural systems. Examples include, but are not limited to: sediment and erosion control, stream corridor restoration, forest management, conservation easements, and wetland restoration and preservation.
- **Education and awareness:** Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate the hazards, and may also include participation in national programs. Examples include, but are not limited to: radio or television spots, websites with maps and information, provide information and training, NFIP outreach, StormReady, and Firewise Communities.

The planning team reviewed the four types of mitigation techniques and examples of actions at the HMP Workshop. Table 6.3-1 provides a matrix identifying the mitigation techniques used for each hazard in the County. The specific actions associated with these techniques are included in Table 6.4-1.

HAZARD	MITIGATION TECHNIQUE			
	LOCAL PLANS AND REGULATIONS	EDUCATION AND AWARENESS PROGRAMS	NATURAL SYSTEMS PROTECTION	STRUCTURAL AND INFRASTRUCTURE PROJECTS
Drought		✓		
Earthquake		✓		
Flood, Flash Flood, Ice Jam	✓	✓	✓	✓
Hurricane, Tropical Storm, Nor'easter	✓	✓	✓	✓
Landslide	✓	✓		
Subsidence and Sinkhole	✓	✓		
Tornado and Windstorm	✓	✓		✓
Wildfire		✓		
Winter Storm	✓	✓		✓

6.4. Mitigation Action Plan

A Hazard Mitigation Workshop was held on July 16, 2014 to develop a framework for the 2014 plan. The goals and objectives were presented during the workshop and Mitigation Techniques were discussed using PEMA’s *Mitigation Ideas* document. During the workshop, municipalities were provided with their *Five-Year Plan Review Worksheet* which listed their projects from the 2010 plan. As described in Section 6.1 above, the municipalities were asked to review whether each project was completed, discontinued/canceled, deferred, or is continuous/ongoing. “Completed” or “discontinued/canceled,” actions were not carried over to the 2014 Action Plan. In addition, many of the actions proposed by the previous version of the mitigation plan are again proposed for implementation.

Copies of the *Five-Year Plan Review Worksheet* for each municipality can be found in **Appendix C**. In addition, participants were provided with space at the bottom of the *Five-Year Plan Review Worksheet* to list new actions or projects to be included in the plan update. Meeting participants who were not affiliated with a municipality were provided with *New Mitigation Action Forms* to include new mitigation actions in the 2014 plan if they so wished.

The HMSC reviewed the 2010 actions submitted by municipalities that did not turn in one of the above action/project forms and determined that the projects were still viable and should be continued into the 2014 Hazard Vulnerability Assessment and Mitigation Plan Update. Additionally, several new actions were developed by the HMSC based on the 2014 risk assessment and assigned to municipalities based on relevance.

The final list of 40 mitigation actions is contained in Table 6.4-1. This table provides an overview of the strategy that will be utilized in order to implement each of the 40 proposed mitigation actions. For each action listed in Table 6.4-1, the associated strategy identifies the agency or job title that will be responsible for initiating the work and potential sources of funding for the work. Each strategy also indicates when the action will happen.

At least one mitigation action was established for each hazard in Union County. More than one action is identified for several hazards. Every participating jurisdiction has at least one mitigation action. Each mitigation action is intended to address one or more of the goals and objectives identified in Section 6.2. Actions 2, 3, 15, 18, 20, 23, 25, 26, 34, and 37 address continued compliance and improved participation in the NFIP. The priority level and feasibility of each action follows in separate tables.

Table 6.4-1 List of 2014 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
COMMUNITY: Union County	ACTION: Continue efforts to acquire repetitive flood claim and severe repetitive loss properties in Union County.
ACTION NO: 1	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.4-1 List of 2014 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
Lead Agency/Department:	Union County Mitigation Officer (Union County Department of Emergency Management)
Implementation Schedule:	Annually
Funding Source:	HMGP, PDM, FMA
COMMUNITY: Union County	ACTION: Invite State NFIP Coordinator to schedule a Community Assistance Visit to ensure continued compliance with NFIP regulations.
ACTION NO: 2	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Union County Mitigation Officer (Union County Department of Emergency Management)
Implementation Schedule:	3 – 5 years
Funding Source:	County Annual Budget
COMMUNITY: Union County	ACTION: Sponsor a workshop about costs and benefits of purchasing and maintaining flood insurance for any interested community residents and business owners.
ACTION NO: 3	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Union County Mitigation Officer (Union County Department of Emergency Management)
Implementation Schedule:	3 – 5 years
Funding Source:	County Annual Budget
COMMUNITY: Union County	ACTION: Initiate meeting with providers of electric power to examine the cost and potential sources of funding for burying power lines.
ACTION NO: 4	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Tornado and Windstorm; Hurricane, Tropical Storm, and Nor'easter; Winter Storm
Lead Agency/Department:	Union County Mitigation Officer (Union County Department of Emergency Management)
Implementation Schedule:	1 – 2 years
Funding Source:	County Annual Budget
COMMUNITY: Union County	ACTION: Initiate a meeting of land developers and contractors to determine the cost of burying power and communications lines in new subdivisions.
ACTION NO: 5	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Tornado and Windstorm; Hurricane, Tropical Storm, and Nor'easter; Winter Storm

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.4-1 List of 2014 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
Lead Agency/Department:	Union County Mitigation Officer (Union County Department of Emergency Management)
Implementation Schedule:	1 – 2 years
Funding Source:	County Annual Budget
COMMUNITY: Union County	ACTION: Provide information to schools, prisons, and nursing homes about the Great California Shake-Out and encourage participation in this educational program about surviving the immediate effects of an earthquake.
ACTION NO: 6	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	Earthquake
Lead Agency/Department:	Union County Mitigation Officer (Union County Department of Emergency Management)
Implementation Schedule:	Annually
Funding Source:	County Annual Budget
COMMUNITY: Union County	ACTION: Provide education for residents about water-saving landscaping techniques.
ACTION NO: 7	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	Drought
Lead Agency/Department:	Union County Mitigation Officer (Union County Department of Emergency Management)
Implementation Schedule:	Annually
Funding Source:	County Annual Budget
COMMUNITY: Union County	ACTION: Turn one or more rooms in each school and public building into safe rooms providing safe, temporary shelter during a tornado, windstorm, hurricane, tropical storm, or nor'easter
ACTION NO: 8	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Tornado and Windstorm; Hurricane, Tropical Storm, or Nor'easter
Lead Agency/Department:	Union County Mitigation Officer in cooperation with Superintendents of Lewisburg Area, Mifflinburg Area, Warrior Run, and Milton Area School Districts
Implementation Schedule:	1–2 years to begin; 3–5 years to complete
Funding Source:	PDM
COMMUNITY: Union County	ACTION: Provide workshops for farmers regarding livestock management and crop survival during times of drought.
ACTION NO: 9	
Category:	Education and Awareness Programs

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.4-1 List of 2014 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
Hazard(s) Addressed:	Drought
Lead Agency/Department:	Union County Mitigation Officer (Union County Department of Emergency Management)
Implementation Schedule:	Annually
Funding Source:	County Annual Budget
COMMUNITY: Kelly Township	ACTION: Proceed with a project to improve storm water drainage in West Milton area of Kelly Township near U.S. Highway 15 and railroad tracks.
ACTION NO: 10	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Kelly Township and SEDA Council of Governments
Implementation Schedule:	2010 – 2013
Funding Source:	HMGP, PDM, FMA
COMMUNITY: Union County, Lewisburg Borough	ACTION: Continue to participate in meetings and discussion regarding development of a solution to the abandoned railroad bridge in Lewisburg.
ACTION NO: 11	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Union County and Lewisburg Borough (Lewisburg Area Recreation Authority) in cooperation with Northumberland County and Buffalo Valley Recreation Authority (current owners of the Bridge)
Implementation Schedule:	Within 5 years
Funding Source:	HMGP, PDM, FMA
COMMUNITY: Union County, Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	ACTION: Provide information to residents and business owners to examine the interior of structures to identify objects that may fall in the event of an earthquake (e.g., tall file cabinets, water heaters). Include information about anchoring.
ACTION NO: 12	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	Earthquake
Lead Agency/Department:	Union County Mitigation Officer in conjunction Chiefs of municipal

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.4-1 List of 2014 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
	fire departments
Implementation Schedule:	1 – 2 years
Funding Source:	County Annual Budget
COMMUNITY: Union County, Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	ACTION: Provide training for each County and municipal building inspector so that building code enforcement is consistent throughout the County.
ACTION NO: 13	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	Flood, Flash Flood and Ice Jam; Earthquake; Hurricane, Tropical Storm, and Nor'easter; Tornado and Windstorm; Wildfire; Winter Storm
Lead Agency/Department:	Union County Mitigation Officer in conjunction with each Township or Borough Building Inspector
Implementation Schedule:	Every 2 years
Funding Source:	County Annual Budget
COMMUNITY: Union County, Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	ACTION: Develop a program to do non-structural retrofit for earthquake safety in each public building (e.g., anchor file cabinets, secure clocks on walls).
ACTION NO: 14	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	Earthquake
Lead Agency/Department:	Union County Mitigation Officer in conjunction with each Township or Borough Building Inspector
Implementation Schedule:	1 – 2 years
Funding Source:	County Annual Budget

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.4-1 List of 2014 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
COMMUNITY: Union County, Buffalo Township, East Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	ACTION: Examine feasibility of jurisdictions besides Lewisburg Borough to participate in the Community Rating System.
ACTION NO: 15	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Union County Mitigation Officer in cooperation with Emergency Manager/Director of each participating jurisdiction
Implementation Schedule:	1 – 5 years
Funding Source:	County, Township, and Borough Annual Budgets
COMMUNITY: Union County, Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	ACTION: Institute a program to inspect public buildings including storage facilities and lift station housing to identify structural defects that may lead to collapse due to heavy snow or ice.
ACTION NO: 16	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Winter Storm
Lead Agency/Department:	Union County Mitigation Officer in cooperation with Emergency Manager/Director of each participating jurisdiction
Implementation Schedule:	1 – 2 years
Funding Source:	County, Township, and Borough Annual Budgets

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.4-1 List of 2014 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<p>COMMUNITY: Union County, Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township</p>	<p>ACTION: Include publicity about the benefits of mitigation actions in a public relations program.</p>
ACTION NO: 17	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	All hazards
Lead Agency/Department:	Union County Mitigation Officer in cooperation with officials of each Borough and Township
Implementation Schedule:	Annually
Funding Source:	Annual County Budget
<p>COMMUNITY: Union County, Buffalo Township, East Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township</p>	<p>ACTION: Attend NFIP training workshops offered in Pennsylvania for local officials and encourage local officials to become Certified Floodplain Managers.</p>
ACTION NO: 18	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Each Township or Borough Zoning Official
Implementation Schedule:	Every year
Funding Source:	County, Township, and Borough Annual Budgets
<p>COMMUNITY: Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, New Berlin Borough, West Buffalo Township, and White Deer Township</p>	<p>ACTION: Develop language for potential inclusion in subdivision regulations requiring new power and communications (telephone, cable television) lines to be buried.</p>
ACTION NO: 19	

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.4-1 List of 2014 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Tornado and Windstorm; Hurricane, Tropical Storm, and Nor'easter; Winter Storm
Lead Agency/Department:	Each Township or Borough Zoning Official
Implementation Schedule:	3–5 years depending on outcome of meetings with developers and electric companies
Funding Source:	Township and Borough Annual Budgets
COMMUNITY: Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	ACTION: Examine the benefit of increasing the current 1.5-foot freeboard requirement in local flood damage prevention ordinances so that structures are protected to a level greater than the established base flood elevation.
ACTION NO: 20	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Each Township or Borough Zoning Official
Implementation Schedule:	1 – 2 years
Funding Source:	Township and Borough Annual Budgets; PA Floodplain Land Use Assistance Program
COMMUNITY: Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	ACTION: Examine the possibility of amending/developing local zoning ordinances to direct new development away from areas underlain with carbonate bedrock.
ACTION NO: 21	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Subsidence and Sinkhole
Lead Agency/Department:	Zoning Official of each Township or Borough
Implementation Schedule:	3 – 5 years
Funding Source:	Township and Borough Annual Budgets
COMMUNITY: Buffalo Township, East Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township,	ACTION: Continue efforts to acquire, demolish, elevate, and floodproof structures in the Special Flood Hazard Area.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.4-1 List of 2014 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
Lewisburg Borough, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	
ACTION NO: 22	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Union County Mitigation Officer in cooperation with Emergency Manager/Director of each participating jurisdiction
Implementation Schedule:	Annually
Funding Source:	HMGP, PDM, FMA
COMMUNITY: Buffalo Township, East Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	ACTION: Work with township and borough officials to increase awareness among residents and business owners about NFIP insurance.
ACTION NO: 23	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Union County Mitigation Officer in cooperation with Emergency Manager/Director of each participating jurisdiction except Hartleton Borough
Implementation Schedule:	Annually
Funding Source:	County Annual Budget
COMMUNITY: Buffalo Township, East Buffalo Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	ACTION: Develop language for potential inclusion in zoning regulations allowing higher density cluster development to limit the location of future development in Special Flood Hazard Areas.
ACTION NO: 24	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.4-1 List of 2014 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
Lead Agency/Department:	Each Township or Borough Zoning Official with the exception of Hartleton Borough
Implementation Schedule:	3 – 5 years
Funding Source:	Township and Borough Annual Budgets; PA Floodplain Land Use Assistance Program
COMMUNITY: Buffalo Township, East Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	ACTION: Develop language for potential inclusion in flood damage prevention ordinances extending elevation and flood-proofing requirements to structures in the area just beyond the Special Flood Hazard Area that has been shown by FEMA to have a 0.2-percent chance of flooding in any given year.
ACTION NO: 25	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Each Township or Borough Zoning Official with the exception of Hartleton Borough
Implementation Schedule:	3 – 5 years
Funding Source:	Township and Borough Annual Budgets; PA Floodplain Land Use Assistance Program
COMMUNITY: Buffalo Township, East Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	ACTION: Conduct systematic examination of structures in Special Flood Hazard Area to identify potential violations such as unvented enclosures below base flood elevation.
ACTION NO: 26	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Each Township or Borough Zoning Official with the exception of Hartleton Borough
Implementation Schedule:	1 – 2 years
Funding Source:	County, Township, and Borough Annual Budgets
COMMUNITY: Buffalo Township, East Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Mifflinburg	ACTION: Obtain first floor elevations for all structures in identified Special Flood Hazard Areas (including “pre-FIRM” structure built before flood insurance rates maps were developed for the County).

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.4-1 List of 2014 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	
ACTION NO: 27	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Each Township or Borough Zoning Official with the exception of Hartleton Borough
Implementation Schedule:	1 – 5 years
Funding Source:	County, Township, and Borough Annual Budgets
COMMUNITY: Buffalo Township, East Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	ACTION: Review paper/electronic files relating to development in Special Flood Hazard Areas to ensure that elevation certificates have been saved.
ACTION NO: 28	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Each Township or Borough Zoning Official with the exception of Hartleton Borough
Implementation Schedule:	1 – 2 years
Funding Source:	County, Township, and Borough Annual Budgets
COMMUNITY: Buffalo Township, East Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	ACTION: Continue to discuss flood mitigation options with property owners.
ACTION NO: 29	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Emergency Manager/Director of each participating jurisdiction

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.4-1 List of 2014 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
	except Hartleton Borough
Implementation Schedule:	Annually
Funding Source:	Township and Borough Annual Budgets
COMMUNITY: Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	ACTION: Maintain regular contact with Pennsylvania Department of Conservation and Natural Resources to ensure that County information about the potential for landslides is current.
ACTION NO: 30	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Landslide
Lead Agency/Department:	Union County Mitigation Officer and Building Inspector for each Township or Borough except for Lewisburg Borough
Implementation Schedule:	Annually
Funding Source:	County Annual Budget
COMMUNITY: Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	ACTION: Develop language for potential inclusion in subdivision regulations requiring grading permits to minimize the potential for landslides.
ACTION NO: 31	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Landslide
Lead Agency/Department:	Zoning Official for each Township or Borough except Lewisburg Borough
Implementation Schedule:	3 – 5 years
Funding Source:	Township and Borough Annual Budgets

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.4-1 List of 2014 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
COMMUNITY: Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township ACTION NO: 32	ACTION: Educate citizens and business owners about removing flammable vegetation or combustible materials from the immediate vicinity of buildings in wooded areas.
Category:	Education and Awareness Program
Hazard(s) Addressed:	Wildfire
Lead Agency/Department:	Union County Mitigation Officer in conjunction with Chiefs of each municipal fire department
Implementation Schedule:	1 – 2 years
Funding Source:	DHS Fire Prevention and Safety Grant Program
COMMUNITY: Gregg Township ACTION NO: 33	ACTION: Clear debris and trees from streams.
Category:	Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam; Hurricane, Tropical Storm, and Nor'easter
Lead Agency/Department:	Gregg Township Public Works Department
Implementation Schedule:	Annually
Funding Source:	Township Annual Budgets
COMMUNITY: Lewisburg Borough ACTION NO: 34	ACTION: Increase CRS level.
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Lewisburg Borough Emergency Management Coordinator
Implementation Schedule:	Within 5 years
Funding Source:	Borough Annual Budgets
COMMUNITY: Lewisburg Borough ACTION NO: 35	ACTION: Acquire and demolish one additional home along 56 th Street.
Category:	Flood, Flash Flood, and Ice Jam

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.4-1 List of 2014 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
Hazard(s) Addressed:	Structure and Infrastructure Projects
Lead Agency/Department:	Union County Mitigation Officer (Union County Department of Emergency Management) in cooperation with Borough Emergency Management Coordinator
Implementation Schedule:	Within 5 years
Funding Source:	HMGP, PDM, FMA
COMMUNITY: Lewisburg Borough	ACTION: Increase the number of rain gardens in the Borough to accommodate storm water filtration.
ACTION NO: 36	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Lewisburg Borough in cooperation with property owners
Implementation Schedule:	2-3 years
Funding Source:	Borough Annual Budgets; HMGP, PDM, FMA
COMMUNITY: Lewisburg Borough	ACTION: Improve NFIP reporting to residents and businesses.
ACTION NO: 37	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Lewisburg Borough Emergency Management Coordinator
Implementation Schedule:	1-2 years
Funding Source:	Borough Annual Budgets
COMMUNITY: Lewisburg Borough	ACTION: Update the Emergency Operations Plan for Lewisburg Borough.
ACTION NO: 38	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	All hazards
Lead Agency/Department:	Lewisburg Borough Emergency Management Coordinator
Implementation Schedule:	1-2 years
Funding Source:	Borough Annual Budgets
COMMUNITY: Union County, New Berlin Borough	ACTION: Install rip rap culvert improvements to mitigate flooding along Tan Run.
ACTION NO: 39	

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.4-1 List of 2014 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	New Berlin Borough Emergency Management Coordinator; Borough Public Works Department; and Union County Mitigation Officer
Implementation Schedule:	2-3 years
Funding Source:	Borough Annual Budgets; HMGP, PDM, FMA
COMMUNITY: Union County, East Buffalo Township	ACTION: Replace culvert under River Road to mitigate flooding.
ACTION NO: 40	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	East Buffalo Township Emergency Management Coordinator; Township Public Works Department; and Union County Mitigation Officer
Implementation Schedule:	2-3 years
Funding Source:	Township Annual Budgets; HMGP, PDM, FMA

Table 6.4-1 lists 40 mitigation actions, many of which will require substantial time commitments from staff at the County and local municipalities. Those that participated in the development of the 2014 plan believe that each of these actions is attainable and can pragmatically be implemented over the next five-year cycle.

While all of these activities will be pursued over the next five years, the reality of limited time and resources requires the identification of the feasibility and priority level of mitigation actions. Prioritization allows the individuals and organizations involved to focus their energies and ensure progress on mitigation activities.

Evaluating mitigation actions involves judging each action against certain criteria to determine whether or not it can be executed. The feasibility of each mitigation action was evaluated using the ten evaluation criteria set forth in the Mitigation Action Evaluation methodology in PEMA's October 2013 Standard Operating Guide. The methodology solicits input on whether each action is highly effective or feasible and ineffective or not feasible for the criteria. These criteria are listed below and aid in determining the feasibility of implementing one action over another.

- **Life Safety:** Will the action be effective in promoting public safety?
- **Property Protection:** Will the action be effective in protecting public or private property?
- **Technical:** How effective will the action be in avoiding or reducing future losses?
- **Political:** Does the action have public and political support?

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

- **Legal:** Does the community have the authority to implement the proposed measure?
- **Environmental:** Will the action provide environmental benefits and will it comply with local, state and federal environmental regulations?
- **Social:** Will the action be acceptable by the community, or will it cause any one segment of the population to be treated unfairly?
- **Administrative:** Is there adequate staffing and funding available to implement the action in a timely manner?
- **Local Champion:** Is there local support for the action to help ensure its completion?
- **Other Community Objectives:** Does the action address any current or future community objectives either through municipal planning or community goals?

To evaluate the mitigation actions, each action as was identified as highly effective or feasible and ineffective and *favorable* and *less favorable* factors were identified for each action. For each criterion, the prioritization methodology assigned a “+” if the action was highly effective or feasible, a “-“ if the action was ineffective or not feasible, and a “N” if no cost or benefit could be associated with the suggested action or the action was not applicable to the criteria. Results are included in Table 6.4-2 below. All actions received scores where their positive factors outweighed their negative factors.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.4-2 Mitigation Action Feasibility Evaluation.												
MITIGATION ACTIONS		PA STEEL CRITERIA CONSIDERATIONS										
		(+) <i>Highly Effective or Feasible</i>					(-) <i>Ineffective or Not Feasible</i>			(N) <i>Neutral or Not Applicable</i>		
NO.	NAME	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	Total Score
1	Continue efforts to acquire repetitive flood claim and severe repetitive loss properties in Union County.	+	+	+	+	+	+	+	+	+	+	10 (+) 0 (-) 0 (N)
2	Invite State NFIP Coordinator to schedule a Community Assistance Visit to ensure continued compliance with NFIP regulations.	+	+	+	+	+	N	N	+	N	+	7 (+) 0 (-) 3 (N)
3	Sponsor a workshop about costs and benefits of purchasing and maintaining flood insurance for any interested community residents and business owners.	+	+	+	+	+	+	+	+	N	+	9 (+) 0 (-) 1 (N)
4	Initiate meeting with providers of electric power to examine the cost and potential sources of funding for burying power lines.	+	+	+	+	+	N	N	+	N	+	7 (+) 0 (-) 3 (N)
5	Initiate a meeting of land developers and contractors to determine the cost of burying power and communications lines in new subdivisions.	+	+	+	+	+	N	N	+	N	+	7 (+) 0 (-) 3 (N)
6	Provide information to schools, prisons, and nursing homes about the Great California Shake-Out and encourage participation in this educational program about surviving the immediate effects of an earthquake.	+	+	+	+	+	N	+	+	N	+	8 (+) 0 (-) 2 (N)
7	Provide education for residents about water-saving landscaping techniques.	+	+	+	+	+	+	+	+	N	+	9 (+) 0 (-) 1 (N)

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.4-2 Mitigation Action Feasibility Evaluation.												
MITIGATION ACTIONS		PA STEEL CRITERIA CONSIDERATIONS										
		(+) <i>Highly Effective or Feasible</i>					(-) <i>Ineffective or Not Feasible</i>			(N) <i>Neutral or Not Applicable</i>		
NO.	NAME	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	Total Score
8	Turn one or more rooms in each school and public building into safe rooms providing safe, temporary shelter during a tornado, windstorm, hurricane, tropical storm, or nor'easter.	+	+	+	+	+	N	+	N	N	+	7 (+) 0 (-) 3 (N)
9	Provide workshops for farmers regarding livestock management and crop survival during times of drought.	+	+	+	+	+	N	N	+	N	+	7 (+) 0 (-) 3 (N)
10	Proceed with a project to improve storm water drainage in West Milton area of Kelly Township near U.S. Highway 15 and railroad tracks.	+	+	+	+	+	+	+	+	N	+	9 (+) 0 (-) 1 (N)
11	Continue to participate in meetings and discussion regarding development of a solution to the abandoned railroad bridge in Lewisburg.	+	+	+	+	+	N	N	+	N	+	7 (+) 0 (-) 3 (N)
12	Provide information to residents and business owners to examine the interior of structures to identify objects that may fall in the event of an earthquake (e.g., tall file cabinets, water heaters). Include information about anchoring.	+	+	+	+	+	N	N	+	N	+	7 (+) 0 (-) 3 (N)
13	Provide training for each County and municipal building inspector so that building code enforcement is consistent throughout the County.	+	+	+	+	+	N	N	+	N	+	7 (+) 0 (-) 3 (N)

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.4-2 Mitigation Action Feasibility Evaluation.												
MITIGATION ACTIONS		PA STEEL CRITERIA CONSIDERATIONS										
		(+) <i>Highly Effective or Feasible</i>					(-) <i>Ineffective or Not Feasible</i>			(N) <i>Neutral or Not Applicable</i>		
NO.	NAME	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	Total Score
14	Develop a program to do non-structural retrofit for earthquake safety in each public building (e.g., anchor file cabinets, secure clocks on walls).	+	+	+	+	+	N	N	+	N	+	7 (+) 0 (-) 3 (N)
15	Examine feasibility of jurisdictions besides Lewisburg Borough to participate in the Community Rating System.	+	+	+	+	+	N	N	+	N	+	7 (+) 0 (-) 3 (N)
16	Institute a program to inspect public buildings including storage facilities and lift station housing to identify structural defects that may lead to collapse due to heavy snow or ice.	+	+	+	+	+	N	N	+	N	+	7 (+) 0 (-) 3 (N)
17	Include publicity about the benefits of mitigation actions in a public relations program.	+	+	+	+	+	N	+	+	N	+	8 (+) 0 (-) 2 (N)
18	Attend NFIP training workshops offered in Pennsylvania for local officials and encourage local officials to become Certified Floodplain Managers.	+	+	+	+	+	N	+	+	N	+	8 (+) 0 (-) 2 (N)
19	Develop language for potential inclusion in subdivision regulations requiring new power and communications (telephone, cable television) lines to be buried.	+	+	+	+	+	N	+	+	N	+	8 (+) 0 (-) 2 (N)
20	Examine the benefit of increasing the current 1.5-foot freeboard requirement in local flood damage prevention ordinances so that structures are protected to a level greater than the established base flood elevation.	+	+	+	+	+	N	+	+	N	+	8 (+) 0 (-) 2 (N)

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.4-2 Mitigation Action Feasibility Evaluation.												
MITIGATION ACTIONS		PA STEEL CRITERIA CONSIDERATIONS										
		(+) <i>Highly Effective or Feasible</i>					(-) <i>Ineffective or Not Feasible</i>			(N) <i>Neutral or Not Applicable</i>		
NO.	NAME	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	Total Score
21	Examine the possibility of amending/developing local zoning ordinances to direct new development away from areas underlain with carbonate bedrock.	+	+	+	+	+	N	+	+	N	+	8 (+) 0 (-) 2 (N)
22	Continue efforts to acquire, demolish, elevate, and floodproof structures in the Special Flood Hazard Area.	+	+	+	+	+	N	+	+	N	+	8 (+) 0 (-) 2 (N)
23	Work with township and borough officials to increase awareness among residents and business owners about NFIP insurance.	+	+	+	+	+	N	+	+	N	+	8 (+) 0 (-) 2 (N)
24	Develop language for potential inclusion in zoning regulations allowing higher density cluster development to limit the location of future development in Special Flood Hazard Areas.	+	+	+	+	+	N	+	+	N	+	8 (+) 0 (-) 2 (N)
25	Develop language for potential inclusion in flood damage prevention ordinances extending elevation and flood-proofing requirements to structures in the area just beyond the Special Flood Hazard Area that has been shown by FEMA to have a 0.2-percent chance of flooding in any given year.	+	+	+	+	+	N	+	+	N	+	8 (+) 0 (-) 2 (N)
26	Conduct systematic examination of structures in Special Flood Hazard Area to identify potential violations such as unvented enclosures below base flood elevation.	+	+	+	+	+	N	+	+	N	+	8 (+) 0 (-) 2 (N)

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.4-2 Mitigation Action Feasibility Evaluation.												
MITIGATION ACTIONS		PA STEEL CRITERIA CONSIDERATIONS										
		(+) <i>Highly Effective or Feasible</i>					(-) <i>Ineffective or Not Feasible</i>			(N) <i>Neutral or Not Applicable</i>		
NO.	NAME	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	Total Score
27	Obtain first floor elevations for all structures in identified Special Flood Hazard Areas (including "pre-FIRM" structure built before flood insurance rates maps were developed for the County).	+	+	+	+	+	N	N	+	N	+	7 (+) 0 (-) 3 (N)
28	Review paper/electronic files relating to development in Special Flood Hazard Areas to ensure that elevation certificates have been saved.	+	+	+	+	+	N	N	+	N	+	7 (+) 0 (-) 3 (N)
29	Continue to discuss flood mitigation options with property owners.	+	+	+	+	+	N	+	+	N	+	8 (+) 0 (-) 2 (N)
30	Maintain regular contact with Pennsylvania Department of Conservation and Natural Resources to ensure that County information about the potential for landslides is current.	+	+	+	+	+	N	N	+	N	+	7 (+) 0 (-) 3 (N)
31	Develop language for potential inclusion in subdivision regulations requiring grading permits to minimize the potential for landslides.	+	+	+	+	+	N	+	+	N	+	8 (+) 0 (-) 2 (N)
32	Educate citizens and business owners about removing flammable vegetation or combustible materials from the immediate vicinity of buildings in wooded areas.	+	+	+	+	+	N	+	+	N	+	8 (+) 0 (-) 2 (N)
33	Clear debris and trees from streams.	+	+	+	+	+	+	+	-	N	+	8 (+) 1 (-) 1 (N)
34	Increase CRS level.	+	+	+	+	+	+	+	+	N	+	9 (+) 0 (-) 1 (N)
35	Acquire and demolish one additional home along 56 th Street.	+	+	+	-	-	+	N	N	+	+	6 (+) 2 (-) 2 (N)

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.4-2 Mitigation Action Feasibility Evaluation.												
MITIGATION ACTIONS		PA STEEL CRITERIA CONSIDERATIONS										
		(+) <i>Highly Effective or Feasible</i>					(-) <i>Ineffective or Not Feasible</i>			(N) <i>Neutral or Not Applicable</i>		
NO.	NAME	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	
36	Increase rain gardens to accommodate storm water filtration.	+	+	+	+	+	+	+	N	+	+	9 (+) 0 (-) 1 (N)
37	Improve NFIP reporting to residents and businesses.	+	+	+	+	+	N	N	+	+	+	8 (+) 0 (-) 2 (N)
38	Update emergency operation plan for Lewisburg Borough.	+	+	+	+	+	N	N	+	+	+	8 (+) 0 (-) 2 (N)
39	Install rip rap culvert improvements to mitigate flooding along Tan Run.	+	+	+	+	+	+	+	+	+	+	10 (+) 0 (-) 0 (N)
40	Replace culvert under River Road to mitigate flooding.	+	+	+	+	+	+	+	+	+	+	10 (+) 0 (-) 0 (N)

Actions were then compared with one another to determine a ranking or priority by applying the Multi-Objective Mitigation Action Prioritization criteria. Scores were assigned to each criterion using the following weighted, multi-objective mitigation action prioritization criteria.

- **Effectiveness** (weight: 20% of score): The extent to which an action reduces the vulnerability of people and property.
- **Efficiency** (weight: 30% of score): The extent to which time, effort, and cost is well used as a means of reducing vulnerability.
- **Multi-Hazard Mitigation** (weight: 20% of score): The action reduces vulnerability for more than one hazard.
- **Addresses High Risk Hazard** (weight: 15% of score): The action reduces vulnerability for people and property from a hazard(s) identified as high risk.
- **Addresses Critical Communications/Critical Infrastructure** (weight: 15% of score): The action pertains to the maintenance of critical functions and structures such as transportation, supply chain management, data circuits, etc.

Scores of 1, 2, or 3 were assigned for each multi-objective mitigation action prioritization criterion where 1 is a low score and 3 is a high score. Actions were prioritized using the cumulative score assigned to each. Each mitigation action was given a priority ranking (Low, Medium, and High) based on the following:

- Low Priority: 1.0 – 1.8
- Medium Priority: 1.9 – 2.4
- High Priority: 2.5 – 3.0

Table 6.4-3 presents the cumulative results of the prioritization of mitigation actions. All but three actions were ranked High Priority or Medium Priority. Actions 6, 7, and 30 were ranked Low Priority.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.4-3 Mitigation Action Prioritization.							
MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					
		Low = 0-1.8		Medium = 1.9-2.4		High = 2.5-3	
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	Total Score
1	Continue efforts to acquire repetitive flood claim and severe repetitive loss properties in Union County.	3	2	1.5	3	2	2.25
2	Invite State NFIP Coordinator to schedule a Community Assistance Visit to ensure continued compliance with NFIP regulations.	2	2.5	1.5	3	1.5	2.125
3	Sponsor a workshop about costs and benefits of purchasing and maintaining flood insurance for any interested community residents and business owners.	1.8	2.5	1.5	3	1.5	2.085
4	Initiate meeting with providers of electric power to examine the cost and potential sources of funding for burying power lines.	2.2	2.2	3	2	3	2.45
5	Initiate a meeting of land developers and contractors to determine the cost of burying power and communications lines in new subdivisions.	2.2	2.2	3	2	3	2.45
6	Provide information to schools, prisons, and nursing homes about the Great California Shake-Out and encourage participation in this educational program about surviving the immediate effects of an earthquake.	1.2	2	1.5	1	2.5	1.665
7	Provide education for residents about water-saving landscaping techniques.	1.2	2	1.5	1	2.5	1.665
8	Turn one or more rooms in each school and public building into safe rooms providing safe, temporary shelter during a tornado, windstorm, hurricane, tropical storm, or nor'easter.	2.1	1.8	3	2	2	2.16
9	Provide workshops for farmers regarding livestock management and crop survival during times of drought.	1.8	2.5	1.5	1	3	2.01
10	Proceed with a project to improve storm water drainage in West Milton area of Kelly Township near U.S. Highway 15 and railroad tracks.	2	2.2	1.5	3	3	2.26

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.4-3 Mitigation Action Prioritization.							
MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					
		Low = 0-1.8		Medium = 1.9-2.4		High = 2.5-3	
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	Total Score
11	Continue to participate in meetings and discussion regarding development of a solution to the abandoned railroad bridge in Lewisburg.	1.5	2	2.5	3	2	2.15
12	Provide information to residents and business owners to examine the interior of structures to identify objects that may fall in the event of an earthquake (e.g., tall file cabinets, water heaters). Include information about anchoring.	1.2	2.2	2.5	1	2	1.85
13	Provide training for each County and municipal building inspector so that building code enforcement is consistent throughout the County.	2	2.5	3	3	2	2.5
14	Develop a program to do non-structural retrofit for earthquake safety in each public building (e.g., anchor file cabinets, secure clocks on walls).	2.3	1.8	2.5	1	2	1.95
15	Examine feasibility of jurisdictions besides Lewisburg Borough to participate in the Community Rating System.	2.4	2.7	1.5	3	1.5	2.265
16	Institute a program to inspect public buildings including storage facilities and lift station housing to identify structural defects that may lead to collapse due to heavy snow or ice.	2.5	2.5	3	3	2.5	2.675
17	Include publicity about the benefits of mitigation actions in a public relations program.	1.9	2.8	3	3	1.5	2.495
18	Attend NFIP training workshops offered in Pennsylvania for local officials and encourage local officials to become Certified Floodplain Managers.	2	2.8	1.5	3	1.5	2.215
19	Develop language for potential inclusion in subdivision regulations requiring new power and communications (telephone, cable television) lines to be buried.	2.2	2.8	3	3	3	2.78
20	Examine the benefit of increasing the current 1.5-foot freeboard requirement in local flood damage prevention ordinances so that structures are protected to a level greater than the established base flood elevation.	3	2.8	1.5	3	2	2.49

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.4-3 Mitigation Action Prioritization.							
MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					
		Low = 0-1.8			Medium = 1.9-2.4		High = 2.5-3
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	Total Score
21	Examine the possibility of amending/developing local zoning ordinances to direct new development away from areas underlain with carbonate bedrock.	2.4	2.8	2.5	1	2	2.27
22	Continue efforts to acquire, demolish, elevate, and floodproof structures in the Special Flood Hazard Area.	2.5	1.8	1.5	3	2	2.09
23	Work with township and borough officials to increase awareness among residents and business owners about NFIP insurance.	1.8	2.5	1.5	3	1.5	2.085
24	Develop language for potential inclusion in zoning regulations allowing higher density cluster development to limit the location of future development in Special Flood Hazard Areas.	2.7	2.8	2.5	3	2	2.63
25	Develop language for potential inclusion in flood damage prevention ordinances extending elevation and flood-proofing requirements to structures in the area just beyond the Special Flood Hazard Area that has been shown by FEMA to have a 0.2-percent chance of flooding in any given year.	2.8	2.8	1.5	3	2	2.45
26	Conduct systematic examination of structures in Special Flood Hazard Area to identify potential violations such as unvented enclosures below base flood elevation.	2.4	2.5	1.5	3	2	2.28
27	Obtain first floor elevations for all structures in identified Special Flood Hazard Areas (including "pre-FIRM" structure built before flood insurance rates maps were developed for the County).	2	2	1.5	3	2	2.05
28	Review paper/electronic files relating to development in Special Flood Hazard Areas to ensure that elevation certificates have been saved.	2	2	1.5	3	2	2.05
29	Continue to discuss flood mitigation options with property owners.	2.4	2.8	1.5	3	2	2.37

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Table 6.4-3 Mitigation Action Prioritization.							
MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA					
		Low = 0-1.8			Medium = 1.9-2.4		High = 2.5-3
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	Total Score
30	Maintain regular contact with Pennsylvania Department of Conservation and Natural Resources to ensure that County information about the potential for landslides is current.	1.5	2.2	1.5	1	2.5	1.785
31	Develop language for potential inclusion in subdivision regulations requiring grading permits to minimize the potential for landslides.	2.3	2.6	2.5	1	2.5	2.265
32	Educate citizens and business owners about removing flammable vegetation or combustible materials from the immediate vicinity of buildings in wooded areas.	2.7	2.7	2.5	1	2.8	2.42
33	Clear debris and trees from streams.	2	2.8	2.5	3	2.8	2.61
34	Increase CRS level.	2.5	2.8	1.5	3	2	2.39
35	Acquire and demolish one additional home along 56 th Street.	2.5	1.2	1.5	3	2	1.91
36	Increase rain gardens to accommodate storm water filtration.	2	1.8	2.5	3	1.5	2.115
37	Improve NFIP reporting to residents and businesses.	2	2.6	1.5	3	1.5	2.155
38	Update emergency operation plan for Lewisburg Borough.	3	2	3	3	2.5	2.625
39	Install rip rap culvert improvements to mitigate flooding along Tan Run.	2.5	2	2.5	3	2	2.35
40	Replace culvert under River Road to mitigate flooding.	2.5	2	2.5	3	2	2.35

7. Plan Maintenance

7.1. Update Process Summary

Monitoring, evaluating, and updating this plan are critical to maintaining its value and success in Union 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 Union County Department of Emergency Management engaged in plan maintenance since 2010, particularly with regard to monitoring mitigation actions of the municipalities in the County. Most recently, beginning in December of 2013, the Union County Mitigation Officer met with the manager of East Buffalo Township and reached out to a resident regarding applying for a grant for a flood elevation project. In addition, the Union County Mitigation Officer also worked with the municipal supervisors to inform two residents in White Deer Township about opportunities for and the benefits of flood elevation. The Union County Mitigation Officer also carries out continued efforts with all municipalities in the County to be aware of the progress on mitigation actions in the plan and opportunities for new mitigation actions. Outreach is conducted semi-annually via phone or email.

The HMSC reviewed the 2010 plan maintenance section and a few minor updates were made. The majority of this section is consistent with the plan maintenance section in the 2010 plan.

7.2. Monitoring, Evaluating and Updating the Plan

The Union County Mitigation Officer will monitor the progress made on the implementation of the identified action items annually at about the anniversary date of plan adoption. Monitoring will be accomplished by calling or emailing each County or municipal agency that, through adoption of the plan, has assumed the responsibility of implementing one or more mitigation actions.

By monitoring mitigation actions, when the plan is next updated, information about the status of proposed mitigation actions will be readily available. The updated plan will include a section explaining if previously proposed mitigation actions have been implemented, completed, or deferred. The updated plan will identify actions that are no longer appropriate for the community and should be deleted. The updated plan will identify obstacles to implementation that caused proposed actions to be deferred and will recommend strategies for overcoming those obstacles.

The HMSC will not only monitor the implementation of mitigation actions proposed in this plan, but will also monitor actions of participating jurisdictions and surrounding communities that may affect the ability of Union County to withstand the effects of natural hazards or to recover from a disaster in the future. The method for gathering information about actions beyond those proposed in this plan will be informal; as active members of the Union County community, Steering Committee members will bring their own knowledge of the area to monitoring meetings

to provide information about actions of participating jurisdictions as well as of nearby communities.

One month after conducting the annual monitoring of mitigation actions, the Union County Mitigation Officer will schedule an annual meeting of the Steering Committee to evaluate the mitigation planning process, implementation of the plan, and conditions in Union County that suggest the need to modify either planning data or planning actions. Participating boroughs and townships will be invited to attend the evaluation meetings. The evaluation meeting will include a presentation of the results of the monitoring of mitigation actions and will answer the following questions:

- Do mitigation goals and objectives reflect current community concerns as well as the finding of the risk assessment?
- Have conditions in the County changed so that findings of the risk assessment should be updated?
- What hazards have caused damage in the County since the plan was written? Were these anticipated and evaluated in the plan, or should these hazards be added to the plan?
- Have conditions in the County changed so that the magnitude of risk as expressed in this plan has changed?
- Are new sources of data available that will improve the risk assessment?
- Are current resources sufficient for implementing mitigation actions?
- For each mitigation action that has not been completed, what are the obstacles to implementation? What are potential solutions for overcoming these obstacles?
- Is each completed mitigation action effective in reducing risk? What action is required to further reduce the risk addressed by the completed action?
- What mitigation actions should be added to the plan and proposed for implementation?
- Should any proposed mitigation actions be deleted from the plan? What is the rationale for deleting previously proposed actions from the plan?
- Based upon the evaluation, should the plan be updated as soon as possible or should the plan be updated as scheduled five years after it was adopted?

The County Mitigation Officer will document the results of the annual evaluation meeting and submit the findings to each borough and township in the County for review within two weeks. Documentation of the annual evaluation meeting will be attached to the Union County paper and electronic copies of this plan within one month. If the HMSC determines that the plan should be updated as soon as possible, the County Mitigation Officer will take action to initiate the plan update.

This plan must be updated within five years and again adopted by the County and participating jurisdictions in order to maintain compliance with the regulations stated in 44 CFR Part 201.6 and ensure eligibility for applying for and receiving certain Federal mitigation grant funds.

Monitoring and evaluation will identify necessary modifications to the plan including changes in mitigation strategies and actions that should be incorporated in the next update. The update will also have more current information about previous occurrences of hazards.

The Union County Mitigation Officer will initiate the process of updating the plan no more than three years after the plan was adopted or immediately upon a determination by the HMSC that the plan should be updated sooner. This will allow approximately one year for securing funding and/or staff for updating the plan and one year for conducting research and writing the updated plan.

7.3. Continued Public Involvement

The Union County Mitigation Office will provide printed copies of the plan to key Union County offices including the Department of Public Safety as well as to the largest public library in the County so that the public has access to printed copies of the plan. A copy of the adopted plan will be posted on the County Web site for five years so that the public has electronic access to the plan. The website will include an easy-to-access feedback option so that residents, business owners, and others who read the plan will be able to provide a comment about the plan or about the mitigation strategies. The Union County Mitigation Officer will maintain these comments and will provide them to the HMSC for consideration at the annual plan evaluation meetings.

The Union County Mitigation Officer will post notices of annual mitigation plan evaluation meetings using the usual methods for posting meeting announcements in the County to invite the public to participate. In addition to posting announcements on the County website, at least one newspaper press release will be published at the onset of the process of updating the plan inviting public participation.

The County Mitigation Officer will document the number of people who participate in the annual meetings and the results of the meeting for inclusion in the plan when it is next updated. In this way, the public will have an opportunity to become involved in the planning process and to influence mitigation planning decisions.

In order to better involve the public in this plan update, the County Mitigation Officer extended an invitation to all school districts and to Bucknell University. This practice will be carried out in future plan updates.

The Union County Mitigation Officer will provide a written report and/or make a presentation to the Union County Commissioners to advise them of the status of the plan and of proposed mitigation actions. In this way, the public will have another opportunity to become aware of local mitigation efforts.

8. Plan Adoption

The Plan was submitted to the Pennsylvania State Hazard Mitigation Officer and forwarded to FEMA for final review and approval-pending-adoption on October 31, 2014. FEMA granted approval-pending-adoption on February 4, 2015. Full approval from FEMA was received on *<Month Day, Year>*.

This section of the plan includes copies of the local adoption resolutions passed by Union County and its municipal governments as well as a completed Local Mitigation Plan Review Crosswalk. Adoption resolution templates are provided to assist the County and municipal governments with recommended language for future adoption of the plan.

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update
County Adoption Resolution

Resolution No. _____
Union County, Pennsylvania

WHEREAS, the municipalities of Union County, Pennsylvania are most vulnerable to natural hazards which may result in loss of life and property, economic hardship, and threats to public health and safety, and

WHEREAS, Section 322 of the Disaster Mitigation Act of 2000 (DMA 2000) requires State and local governments to develop and submit for approval to the President a mitigation plan that outlines processes for identifying their respective natural hazards, risks, and vulnerabilities, and

WHEREAS, Union County acknowledges the requirements of Section 322 of DMA 2000 to have an approved Hazard Mitigation Plan as a prerequisite to receiving post-disaster Hazard Mitigation Grant Program funds, and

WHEREAS, the Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan has been developed by the Union County Department of Emergency Management in cooperation with other county departments, local municipal officials, and the citizens of Union County, and

WHEREAS, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Union County 2014 Hazard Mitigation Plan, and

WHEREAS, the Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan recommends mitigation activities that will reduce losses to life and property affected by natural hazards that face the County and its municipal governments,

NOW THEREFORE BE IT RESOLVED by the governing body for the County of Union that:

- The Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan is hereby adopted as the official Hazard Mitigation Plan of the County, and
- The respective officials and agencies identified in the implementation strategy of the Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

ADOPTED, this _____ day of _____, 2014

ATTEST:

UNION COUNTY COMMISSIONERS

By _____

By _____

By _____

Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update

Municipal Adoption Resolution

Resolution No. _____

<Borough/Township of Municipality Name>, Union County, Pennsylvania

WHEREAS, the <Borough/Township of Municipality Name>, Union County, Pennsylvania is most vulnerable to natural hazards which may result in loss of life and property, economic hardship, and threats to public health and safety, and

WHEREAS, Section 322 of the Disaster Mitigation Act of 2000 (DMA 2000) requires State and local governments to develop and submit for approval to the President a mitigation plan that outlines processes for identifying their respective natural hazards, risks, and vulnerabilities, and

WHEREAS, the <Borough/Township of Municipality Name> acknowledges the requirements of Section 322 of DMA 2000 to have an approved Hazard Mitigation Plan as a prerequisite to receiving post-disaster Hazard Mitigation Grant Program funds, and

WHEREAS, the Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan has been developed by the Union County Department of Emergency Management in cooperation with other county departments, and officials and citizens of <Borough/Township of Municipality Name>, and

WHEREAS, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Union County 2014 Hazard Mitigation Plan, and

WHEREAS, the Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan recommends mitigation activities that will reduce losses to life and property affected by natural hazards that face the County and its municipal governments,

NOW THEREFORE BE IT RESOLVED by the governing body for the <Borough/Township of Municipality Name>:

- The Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan is hereby adopted as the official Hazard Mitigation Plan of the <Borough/Township>, and
- The respective officials and agencies identified in the implementation strategy of the Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

ADOPTED, this _____ day of _____, 2014

ATTEST:

<BOROUGH/TOWNSHIP OF MUNICIPALITY NAME>

By _____

By _____

By _____

9. Appendices

- Appendix A – Bibliography*
- Appendix B – Local Mitigation Plan Review Crosswalk*
- Appendix C – Meeting and Other Participation Documentation*
- Appendix D – Local Municipality Flood Vulnerability Maps*
- Appendix E – Critical Facilities*
- Appendix F – HAZUS Reports*