

# LEHIGH VALLEY HAZARD MITIGATION PLAN



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[www.lvpc.org/hazard-mitigation.html](http://www.lvpc.org/hazard-mitigation.html)



# EXECUTIVE SUMMARY

In the five years since the Lehigh Valley updated its Hazard Mitigation Plan, there hasn't been the kind of devastating floods that forced hundreds of people from their homes and businesses in 2004, 2005 and 2006. Or the kind of 80 mile per hour winds that left nearly 200,000 structures without power for days after Hurricane Sandy hit in 2012.

However, the lessons learned during those events and countless others in the history of this region now help us take steps to prepare before the next disaster hits.

The Lehigh Valley drafted hazard mitigation plans in 2006 and 2013, and federal regulation requires that plans be updated every five years, but perhaps more importantly, the effects of climate and cultural changes and emerging hazards require that we evolve in our methods of preparing for disaster.

The *Lehigh Valley Hazard Mitigation Plan* reflects that evolution.

**Both counties  
and all 62  
Lehigh Valley  
municipalities  
agreed to  
participate in  
the Plan.**

**Together,  
they've  
proposed  
1,161 actions  
designed  
to lessen  
the impact  
of future  
hazards.**

The Plan still addresses the 22 natural and non-natural hazards that were covered in the previous plan. Hurricanes, sinkholes, winter storms and drought remain serious risks, and flooding is still the number one threat to communities across the region, but three new hazards have been added to combat changes in a region that is growing in population by more than 5,000 residents per year. Like much of the nation, the Lehigh Valley is dealing with a drug overdose crisis that claimed the lives of 193 Lehigh Valley residents in 2016. Therefore, the new Drug Overdose Crisis hazard includes actions designed to save lives and prevent addiction.

Invasive Species was added as a hazard to help people deal with the growing damage caused by the arrival of the Spotted Lanternfly, Emerald Ash Borer, Hemlock Woolly Adelgid, Gypsy Moth and Asian Tiger Mosquito. Pandemic and Infectious Disease was also added as a hazard for the first time, and thousands of people who fled to the Lehigh Valley from hurricane-ravaged Puerto Rico last fall prompted us to consider population evacuation strategies in other hazards where it applies.

The goals of this Plan reach to the core of the life and death struggles that accompany most disasters. They include minimizing the risk to life and property, enhancing the resiliency benefits of our natural resources, improving planning and emergency response to protect public health and safety, raising public awareness, and promoting hazard avoidance, particularly in floodplains.

## MITIGATION GOALS

1. **To minimize the risk to human life associated with natural and non-natural hazards.**
2. **To promote hazard avoidance, especially in floodplains.**
3. **To reduce the damages and functional loss from natural and non-natural hazards to existing and future public and private assets, including structures, critical facilities and infrastructure.**
4. **To preserve and enhance the effectiveness of natural resources, including woodlands, streams, rivers, wetlands, floodplains and riparian buffers to provide resiliency benefits.**
5. **To develop, prioritize and implement cost-effective, long-term actions that will reduce the impacts of natural and non-natural hazards.**
6. **To improve local regulations to reduce the impacts of natural and non-natural hazards.**
7. **To enhance planning and emergency response efforts among federal, state, county and local emergency management personnel to protect public health and safety.**
8. **To promote public awareness on both the potential impacts of natural and non-natural hazards and actions to reduce those impacts.**

Hazard mitigation priorities for the region moving forward include:

- Integrating hazard mitigation into municipal and county plans, especially related to infrastructure and capital improvement programs.
- Identifying hazard mitigation project funding opportunities and giving communities the tools to compete for it.
- Improving outreach to the public and business community.
- Helping municipalities implement the Community Rating System designed to lower their flood insurance costs.
- Committing to annual monitoring and updating of the Plan to ensure its effectiveness.

Keeping that focus is important, not only for the obvious reasons of helping to insulate residents from the pain that comes from natural and non-natural hazards, but because, for local communities to have access to federal hazard mitigation funding, they have to both participate in and adopt the Plan.

The months since the kick-off meeting have revealed the kind of teamwork needed to cover a 726-square-mile region with a diverse topography that includes mountains and waterways that wrap around a robust transportation

network and a population of 659,312 people. All 62 municipalities agreed to participate, all 62 municipalities offered data used to build the plan, and together they've devised more than 1,000 actions designed to protect the community. Every city, borough and township has designed strategies to prepare for rising waters in a region that includes 71 miles of rivers and 1,000 miles of streams.

In the coming years, this Plan will allow municipalities to apply for federal aid to relocate or remove homes and businesses that have been repeatedly flooded. They'll be eligible to apply for grants to buy back-up generators to keep essential services running during emergencies, and virtually all communities are proposing actions to enhance education and community outreach.

In the coming months, every municipality in the region will be asked to adopt this Plan, and every year they'll be expected to make progress on the many actions they've proposed to help protect their residents. Fighting the impacts of hurricanes, floods and drug overdose isn't something we can do by thinking about it every five years. This Plan's purpose is to make hazard mitigation planning part of every community's everyday routine.

In the end, it is everyone's shared responsibility—from municipal leaders to emergency management professionals to private developers and citizens—to implement the Plan to save lives, property and the environment.





# INTRODUCTION

Be prepared: It is a motto adopted by the Boy Scouts more than a century ago, and one that is now the primary purpose of hazard mitigation planning nationwide.

Preparing before disaster strikes can save lives, lessen property damage and enable communities to recover more quickly from a disaster or emergency.

That focus is at the heart of the federal Disaster Mitigation Act of 2000 and is the basis for the *Lehigh Valley Hazard Mitigation Plan*, which covers Lehigh and Northampton counties and the 62 municipalities that make up the Lehigh Valley.

**Hazard mitigation is any sustained action taken to reduce or eliminate the long-term risk to life and property from 25 hazards such as floods, winter storms and drug overdose.**

Across the United States, natural and non-natural disasters have led to increasing levels of deaths, injuries, property damage and interruption of business and government services. The time, money and effort needed to recover from these disasters exhausts resources, diverting attention from important public programs and private agendas. Since 1955, there have been 59 presidential disaster declarations and emergency declarations in Pennsylvania, 23 of which have affected the Lehigh Valley. The emergency management professionals, citizens, elected officials and other stakeholders in the region recognize the impact of disasters on their community and support proactive efforts needed to reduce the impact of natural and non-natural hazards.

Beyond those benefits, hazard mitigation helps planning and municipal leaders better manage land use, environmental resources and population to help avoid disaster altogether.

The Federal Emergency Management Agency (FEMA) and the Pennsylvania Emergency Management Agency (PEMA) have issued guidelines for how hazard mitigation plans should be developed, and those guides provided the foundation for how this Plan was built. Specifically, federal regulations require that local governments update the Plan every five years, while monitoring and evaluating the data, events and actions that make up the Plan.

For this multi-jurisdictional *Lehigh Valley Hazard Mitigation Plan*, the Lehigh County Emergency Management Agency

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**\$16**

**The amount the Federal Emergency Management Agency estimates is saved for every dollar spent on damage prevention through avoided post-disaster damage repair.**

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## Purpose

The purpose of the *Lehigh Valley Hazard Mitigation Plan* is to reduce the loss of life, property and resources caused by natural and non-natural hazards.

This Plan is designed to achieve:

- An increased understanding of hazards faced in the Lehigh Valley by local governments, stakeholders and the general public.
- A more sustainable, disaster-resistant and resilient community.
- Financial savings through partnerships that support planning and mitigation efforts.
- Focused use of limited resources on hazards that have the biggest impact on the community.
- A blueprint for reducing property and infrastructure damage and saving lives from the effects of future disasters.
- Making the county and local municipalities eligible for pre-disaster and post-disaster grant funding.
- A commitment for monitoring and updating the Plan.

and Northampton County Emergency Management Services worked in partnership with the Lehigh Valley Planning Commission to craft a plan that protects residents in every municipality in both counties. All 62 municipalities joined that partnership along with dozens of community stakeholders that included the Nurture Nature Center in Easton, Lehigh University in Bethlehem and Partnership for

Disability Friendly Community. The *Hazard Mitigation Plan* is the third for the region, updating plans adopted in 2006 and 2013.

## SCOPE

The *Lehigh Valley Hazard Mitigation Plan* serves as a tool to help save lives and protect the economic vitality of every community in Lehigh and Northampton counties. Designed to be continuously monitored, evaluated and updated as circumstances change and communities work to become more resilient, the Plan is built on community outreach and input. Public outreach to governments and stakeholders during the planning process included the clear message that participation is required to be eligible for federal or state mitigation funding. Federal regulation requires that the Plan be updated every five years. This Plan will also be subject to a maintenance update annually and after significant hazard events that may cause changes to the Plan, and the public will have an opportunity to participate in any update.

## AUTHORITY AND REFERENCES

Authority for this document originates from the following federal sources:

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

Authority for this document originates from the following 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.
- Pennsylvania Stormwater Management Act of October 4, 1978. P.L. 864, No 167.

The following PEMA and FEMA guides and reference documents were used to prepare this Plan:

- PEMA All-Hazard Mitigation Planning Standard Operating Guide, October 2013.
- PEMA Do It Yourself Hazard Mitigation Plan Update, 2017.
- PEMA Hazard Mitigation Planning Made Easy, 2007.
- PEMA Mitigation Ideas: Potential Mitigation Measures by Hazard Type; a Mitigation Planning Tool for Communities, March 2009.
- FEMA Hazard Mitigation Assistance Guidance, February 2015.
- FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards, January 2013.
- FEMA Local Mitigation Plan Review Guide, October 2011.
- FEMA Plan Integration: Linking Local Planning Efforts, July 2015.
- FEMA Local Mitigation Planning Handbook, March 2013.



# THE REGION

## GEOGRAPHY AND ENVIRONMENT

### Geographical Location

The Lehigh Valley region is comprised of two counties, Lehigh and Northampton, which together measure about 726 square miles. The region is located in the central eastern portion of the Commonwealth about 50 miles north of Philadelphia, 80 miles west of New York City and within 300 miles of 46 other metropolitan areas of the Northeastern and Mid-Atlantic United States.

The Lehigh Valley contains 62 incorporated municipalities. In addition to the cities of Allentown, Bethlehem and Easton, there are 27 boroughs and 32 townships. The two counties form the core of a metropolitan area defined by the Bureau of the Census as the Allentown–Bethlehem–Easton Metropolitan Statistical Area, which is the 3rd largest metropolitan area in Pennsylvania.

A Growing  
Region  
Population is  
expected to grow  
by more than  
5,000 per year

647,232  
in 2010

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690,374  
in 2020

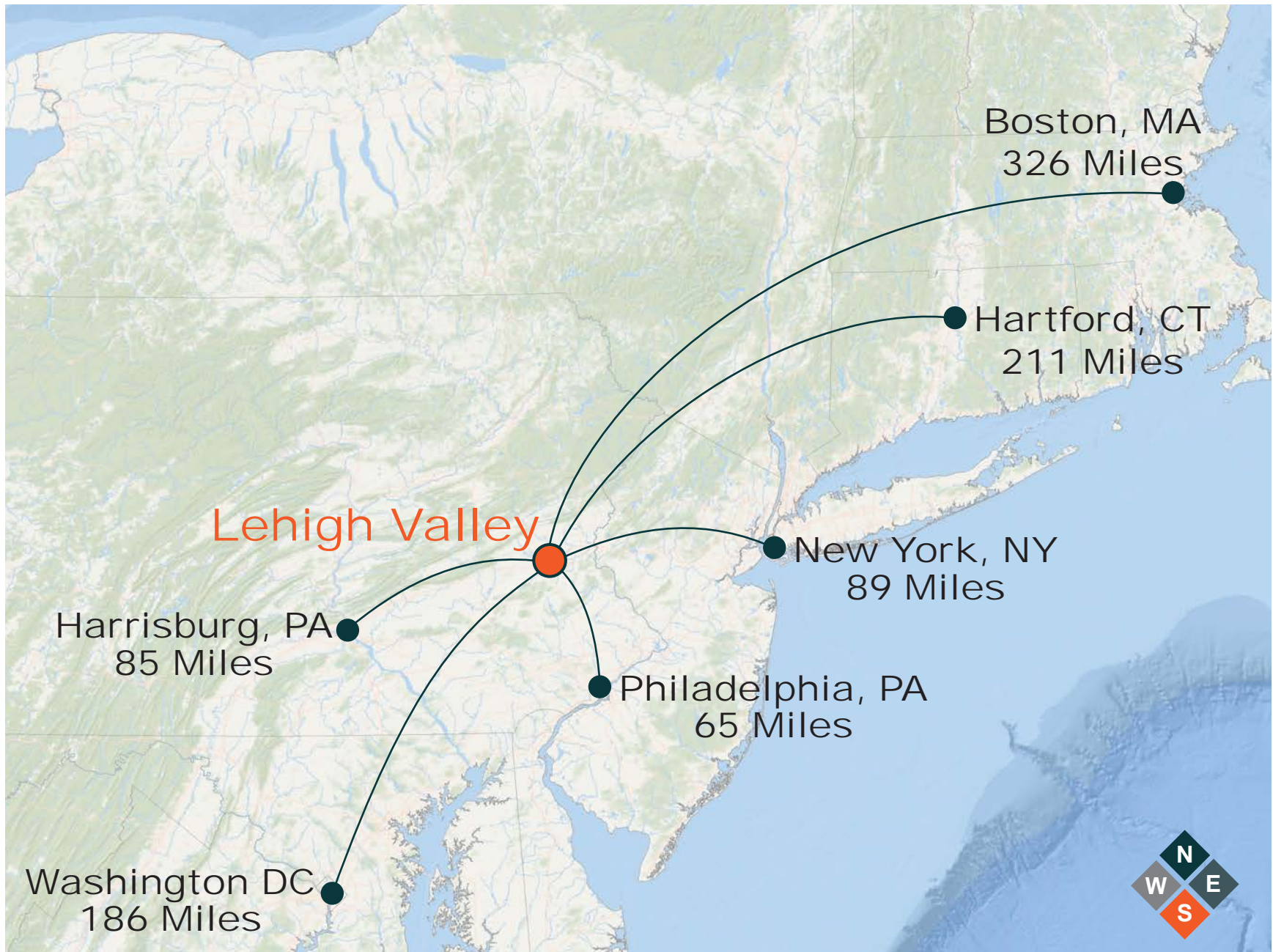
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760,326  
in 2030

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813,187  
in 2040



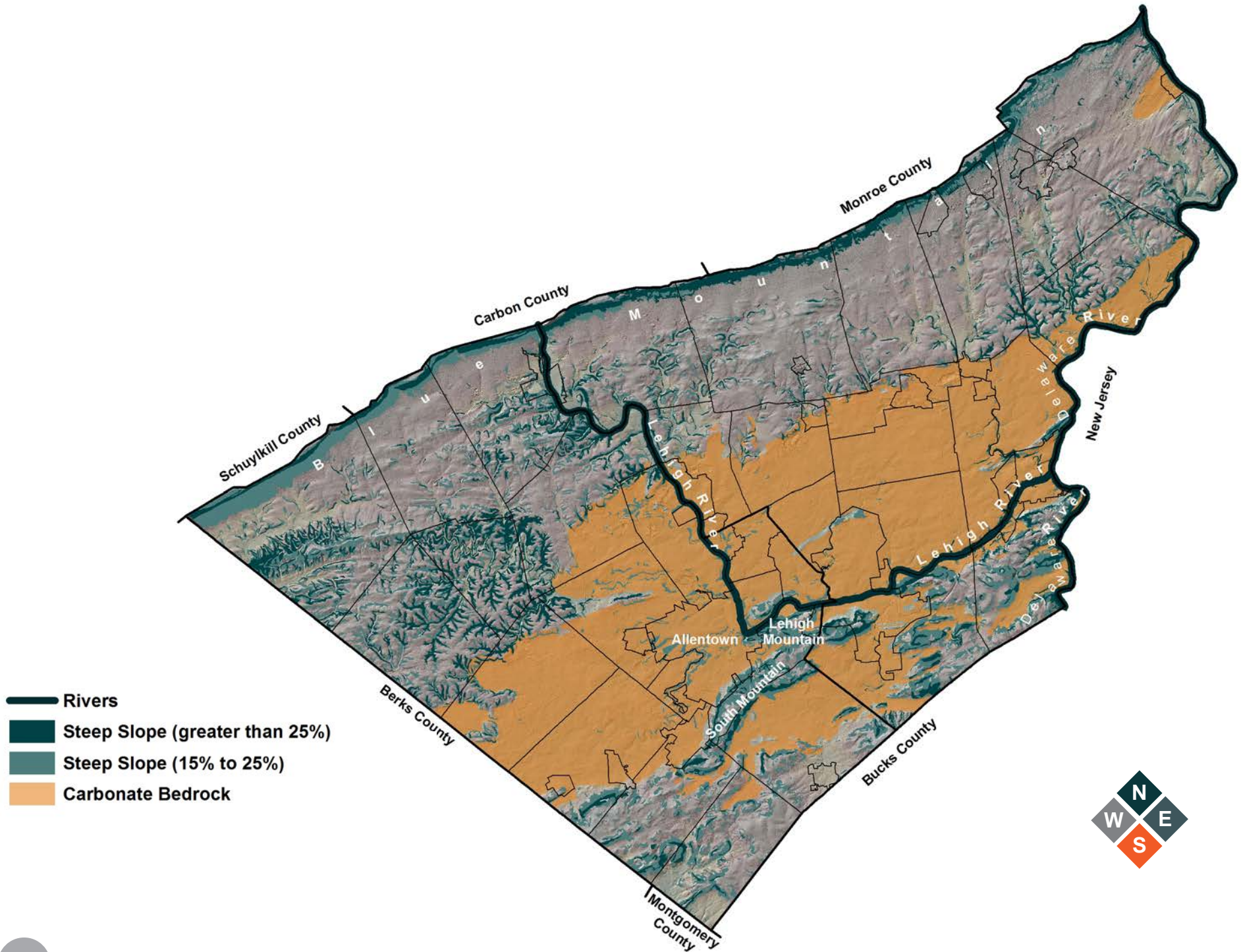






## Topography

The Blue Mountain forms the northern boundary of the Lehigh Valley and extends southwest to the Maryland border. To the south, Lehigh Mountain and South Mountain are two landmark ridges located on the southern border of Allentown. The Delaware River serves as the Lehigh Valley's eastern boundary, while to the west, the valley plain breaks into low, rolling hills, which rise to form a divide between lands drained by the Lehigh and Schuylkill rivers. Between Blue Mountain and South Mountain is a seven-mile wide

limestone valley where most people in the Lehigh Valley live and work. Elevations vary from 200 feet above mean sea level along some parts of the Lehigh and Delaware rivers to greater than 1,695 feet above mean sea level on Blue Mountain and 1,042 feet on South Mountain. There are large areas of steep slope in townships along the northern and southern borders of Lehigh and Northampton counties, with the steepest slopes and the greatest concentration of steep slopes found on Blue Mountain and South Mountain.





-  Rivers
-  Steep Slope (greater than 25%)
-  Steep Slope (15% to 25%)
-  Carbonate Bedrock





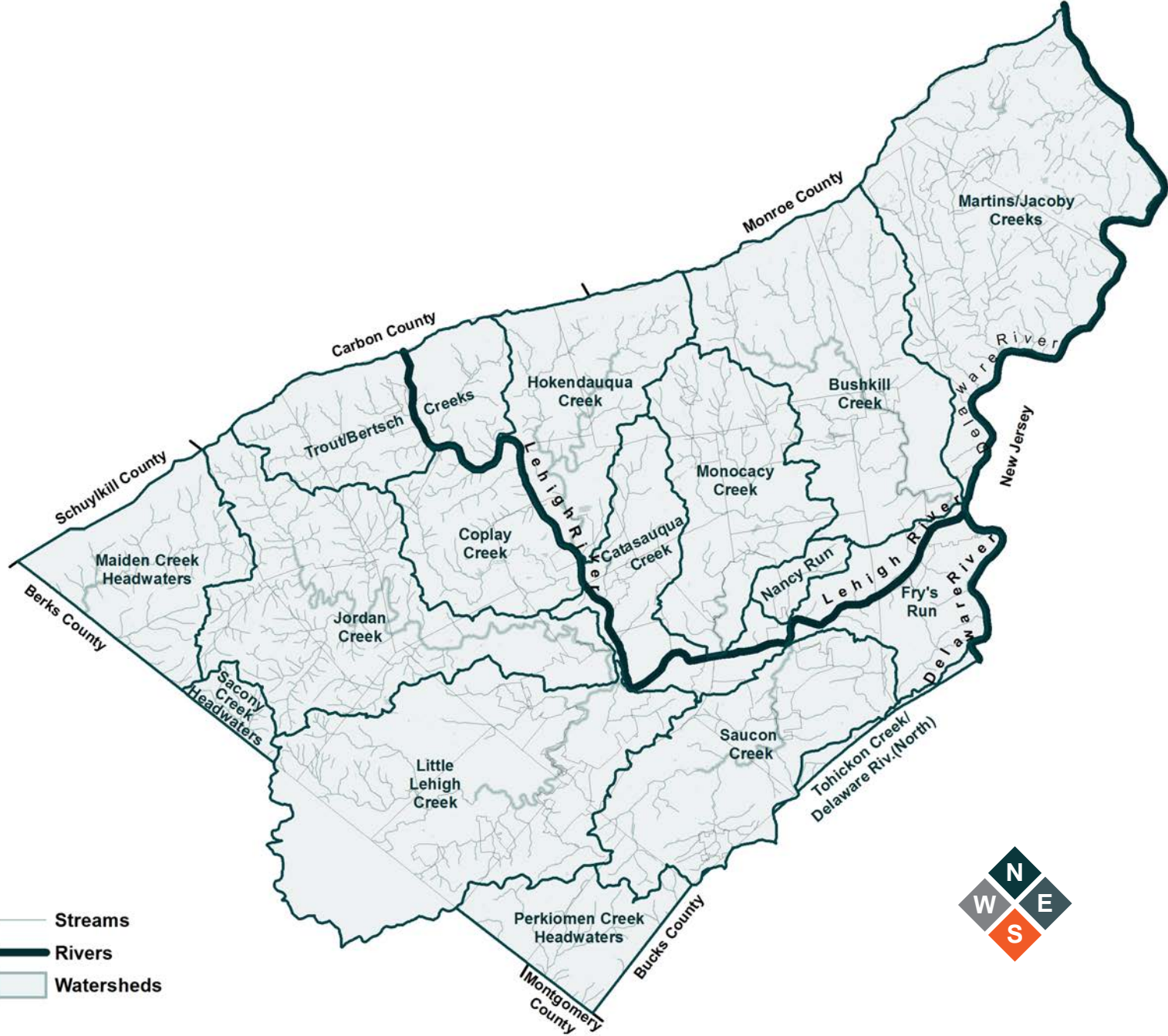
## Hydrography and Hydrology

Two major rivers, the Lehigh and Delaware, and 1,000 miles of streams flow through the region. Major tributary streams flowing into the Lehigh River are Jordan Creek, Little Lehigh Creek, Hokendauqua Creek, Monocacy Creek and Saucon Creek. Bushkill Creek and Martins Creek flow directly into the Delaware. The entire Lehigh Valley lies within the Delaware River Basin, which drains an area of 13,539 square miles in the states of Pennsylvania, New York, New Jersey and Delaware. Within the Lehigh Valley, there are 16 watersheds:

- Three tributaries to the Schuylkill River in western parts of Lehigh County: Maiden Creek Headwaters, Perkiomen Creek Headwaters and Sacony Creek Headwaters

- Nine tributaries to the Lehigh River: Trout/Bertsch Creeks, Coplay Creek, Jordan Creek, Little Lehigh Creek, Saucon Creek, Hokendauqua Creek, Catasauqua Creek, Nancy Run and Monocacy Creek
- Four tributaries to the Delaware River: Martins/Jacoby Creeks, Bushkill Creek, Fry's Run and Tohickon Creek

In addition, there are areas that drain directly to the Lehigh River and Delaware River that do not enter a named stream. These areas are not broken out on the map.



-  Streams
-  Rivers
-  Watersheds



## Geology

From the perspective of hazard mitigation planning, the most significant geologic feature in the Lehigh Valley is the carbonate bedrock (limestone and dolomite) that underlies nearly all of the urban development areas. In Lehigh and Northampton counties, 47 of the 62 municipalities are underlain entirely or in part by carbonate rock. These carbonate formations provide the primary raw material for the local cement industry, and they lie under the most fertile soils. Carbonate rock has the potential for sinkhole formation, which is fairly common in the Lehigh Valley.

## Climate

The area enjoys a moderate climate, with an annual average temperature of about 51 degrees Fahrenheit. Temperatures are rarely above 100 degrees or below 0 degrees Fahrenheit. Precipitation is generally ample and dependable. The growing season is 170 to 185 days.

## HISTORY

Before the arrival of European settlers, the Lehigh Valley was inhabited by the Delaware/Lenape tribes who hunted the bear, fish and other wildlife thriving in the natural environment. In the 1730s, Scotch-Irish and German settlers began the agricultural development of the Lehigh Valley. Early industry in Lehigh County consisted primarily of agriculture and small-scale, water-powered grist mills, served by a network of roads and covered bridges.

Local entrepreneurs constructed the Lehigh Canal in 1818-1820 to capitalize on the Lehigh Valley's strategic location between the Pennsylvania Coal Region to the north and the major commercial ports of New York and Philadelphia. By 1855, the canal was supplemented and quickly supplanted by the Lehigh Valley Railroad.

In the late 19<sup>th</sup> century, the mining of iron ore fueled the rise of iron and steel production along the banks of the Lehigh River at Catasauqua, Allentown and, most notably, Bethlehem. The discovery of significant limestone deposits also launched the Lehigh Valley's cement industry, while the northern Lehigh Valley developed into a major center for slate production. The silk-weaving industry thrived into the early 20<sup>th</sup> century. As the weaving industry began to sunset locally, the region's heavy manufacturing grew, and in 1905, Mack Trucks relocated its truck-building operation from Brooklyn to the City of Allentown.

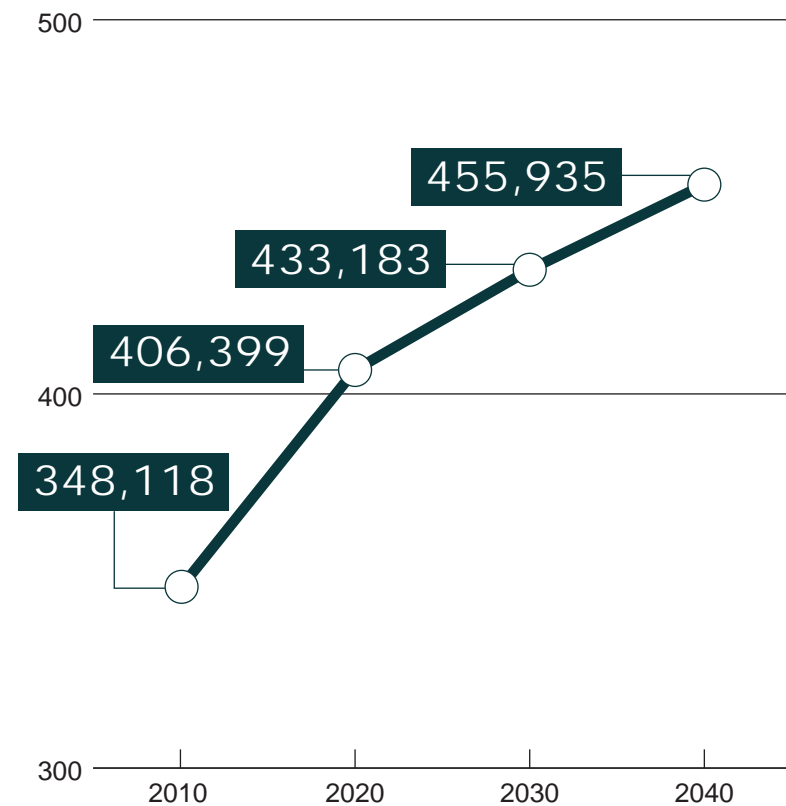
In the decades after World War II, the Lehigh Valley experienced growth trends that were similar to those in other metropolitan areas throughout the country. Construction of Routes 22 and 378, as well as a new terminal building for the Lehigh Valley International Airport, spurred the region's post-war suburban expansion, particularly in the townships surrounding the region's three cities.

## Economy

Total employment in the Lehigh Valley for 2016 was 386,669, and the LVPC forecasts a 31% increase in jobs in the Lehigh Valley between 2010 and 2040. In 2016, the average unemployment rate in the Lehigh Valley was 5.4%, compared to a statewide average of 5.4% and a national average of 4.9%. The region's median income of roughly \$58,500 is higher than the state and national medians. The average median household income for 2012-2016 was \$57,685 in Lehigh County and \$62,753 in Northampton County.

As the labor market has become more service-oriented than goods-producing, sectors like finance, insurance, real estate and business management have become increasingly important to regional employment and economy. Nearly 60,000 people work in the region's healthcare industry, making it the Lehigh Valley's largest employment sector. Manufacturing, which is the largest contributor to the Lehigh Valley's \$27 billion gross domestic product, employs more than 30,000 people. Products manufactured in the region include food and beverages, metal fittings and industrial components, medical supplies, apparel and trucks.

Sources: PA Department of Labor & Industry Center for Workforce Information & Analysis; US Census Bureau, 2012-2016 American Community Survey 5-Year Estimates; Bureau of Economic Analysis; REMI, LVPC.



### Employment Projections

In Thousands

Source: REMI 2014 and LVPC 2017

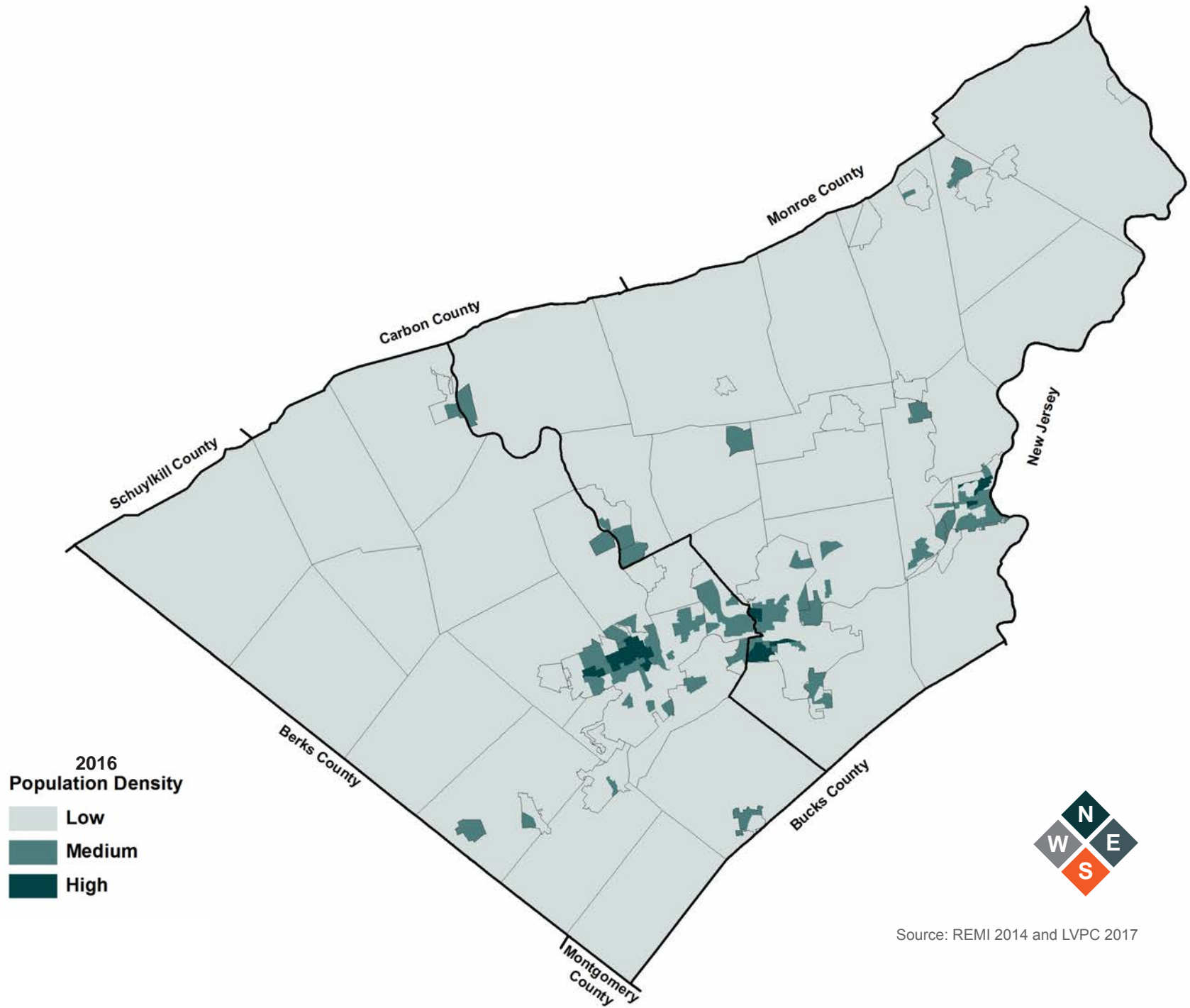
## POPULATION PROFILE

### Population and Density

The total population of the Lehigh Valley in 2016 was 659,312. The City of Allentown's estimated 119,624 residents easily make it the Lehigh Valley's most populous municipality and the third largest city in Pennsylvania. Chapman Borough is the region's least populated municipality with 178 people.

The Lehigh Valley has 909 people per square mile, with the region's cities and boroughs generally having the highest population density. The City of Allentown is the densest municipality at 6,637 people per square mile. The region's rural townships have the lowest population densities, with Lynn Township being the least dense at 103 people per square mile.

Source: US Census Bureau, 2012-2016 American Community Survey 5-Year Estimates.



Source: REMI 2014 and LVPC 2017



Lehigh County	2010 Population	2016 Population	Population Change, 2010-2016	2016 Population Density (Pop/Sq. Mile)
Alburtis Borough	2,361	2,454	3.9%	3,444
Allentown, City of	118,032	119,624	1.3%	6,637
Bethlehem, City of	19,343	19,642	1.5%	3,874
Catasauqua Borough	6,436	6,509	1.1%	4,884
Coopersburg Borough	2,386	2,402	0.7%	2,566
Coplay Borough	3,192	3,232	1.3%	5,158
Emmaus Borough	11,211	11,363	1.4%	3,920
Fountain Hill Borough	4,597	4,634	0.8%	6,102
Hanover Township	1,571	1,716	9.2%	402
Heidelberg Township	3,416	3,480	1.9%	141
Lower Macungie Township	30,633	31,662	3.4%	1,410
Lower Milford Township	3,775	3,864	2.4%	196
Lowhill Township	2,173	2,112	-2.8%	150
Lynn Township	4,229	4,314	2.0%	103
Macungie Borough	3,074	3,115	1.3%	3,154
North Whitehall Township	15,703	16,088	2.5%	564
Salisbury Township	13,505	13,697	1.4%	1,217
Slatington Borough	4,232	4,278	1.1%	3,087
South Whitehall Township	19,180	19,624	2.3%	1,138
Upper Macungie Township	20,063	22,515	12.2%	858
Upper Milford Township	7,292	7,516	3.1%	417
Upper Saucon Township	14,808	15,904	7.4%	645
Washington Township	6,624	6,733	1.6%	284
Weisenberg Township	4,923	5,075	3.1%	189
Whitehall Township	26,738	27,239	1.9%	2,122
<b>Lehigh County</b>	<b>349,497</b>	<b>358,792</b>	<b>2.7%</b>	<b>1,030</b>

### Population and Density Statistics: Lehigh County

Source: US Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

Northampton County	2010 Population	2016 Population	Population Change, 2010-2016	2016 Population Density (Pop/Sq. Mile)
Allen Township	4,269	4,630	8.5%	411
Bangor Borough	5,273	5,198	-1.4%	3,433
Bath Borough	2,693	2,691	-0.1%	2,990
Bethlehem Township	23,730	23,880	0.6%	1,623
Bethlehem, City of	55,639	55,468	-0.3%	3,874
Bushkill Township	8,178	8,359	2.2%	325
Chapman Borough	199	178	-10.6%	497
East Allen Township	4,903	4,855	-1.0%	333
East Bangor Borough	1,172	1,099	-6.2%	1,288
Easton, City of	26,800	27,014	0.8%	6,199
Forks Township	14,721	15,229	3.5%	1,238
Freemansburg Borough	2,636	2,633	-0.1%	3,482
Glendon Borough	440	513	16.6%	651
Hanover Township	10,866	11,352	4.5%	1,708
Hellertown Borough	5,898	5,837	-1.0%	4,369
Lehigh Township	10,526	10,431	-0.9%	350
Lower Mt. Bethel Township	3,101	3,088	-0.4%	125
Lower Nazareth Township	5,674	5,905	4.1%	435
Lower Saucon Township	10,772	10,796	0.2%	441
Moore Township	9,198	9,239	0.4%	245
Nazareth Borough	5,746	5,703	-0.7%	3,367
North Catasauqua Borough	2,849	2,841	-0.3%	3,788
Northampton Borough	9,926	9,887	-0.4%	3,769
Palmer Township	20,691	21,114	2.0%	2,024
Pen Argyl Borough	3,595	3,567	-0.8%	2,554
Plainfield Township	6,138	6,138	0.0%	250
Portland Borough	519	482	-7.1%	831
Roseto Borough	1,567	1,619	3.3%	2,540
Stockertown Borough	927	1170	26.2%	1,176
Tatamy Borough	1,203	1,027	-14.6%	1,811
Upper Mt. Bethel Township	6,706	6,843	2.0%	155
Upper Nazareth Township	6,231	6,576	5.5%	880
Walnutport Borough	2,070	2,112	2.0%	2,693
Washington Township	5,122	5,186	1.2%	289
West Easton Borough	1,257	1,347	7.2%	4,066
Williams Township	5,884	5,985	1.7%	321
Wilson Borough	7,896	7,819	-1.0%	6,334
Wind Gap Borough	2,720	2,709	-0.4%	1,972
<b>Northampton County</b>	<b>297,735</b>	<b>300,520</b>	<b>0.9%</b>	<b>797</b>

## Population and Density Statistics: Northampton County

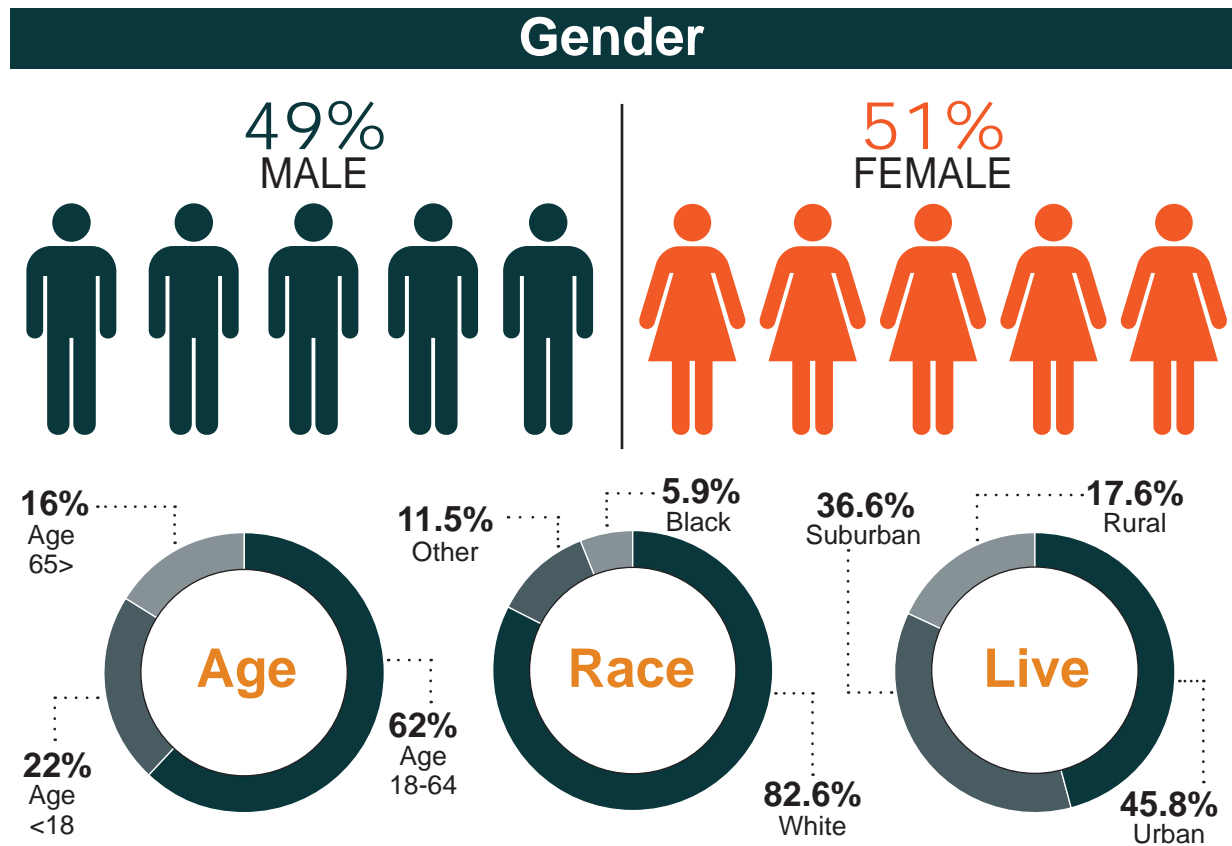
Source: US Census Bureau, 2012-2016 American Community Survey 5-Year Estimates



## Population Characteristics

The region's population is almost evenly split between women and men. Just more than 60% are between the ages of 18 and 64. The population is 82.6% White and 5.9% African-American, with 17.4% identifying as Hispanic or Latin-American.

Just less than half of Lehigh Valley residents live in urban areas and more than a third live in suburban areas, with the remaining 17.6% living in rural areas.

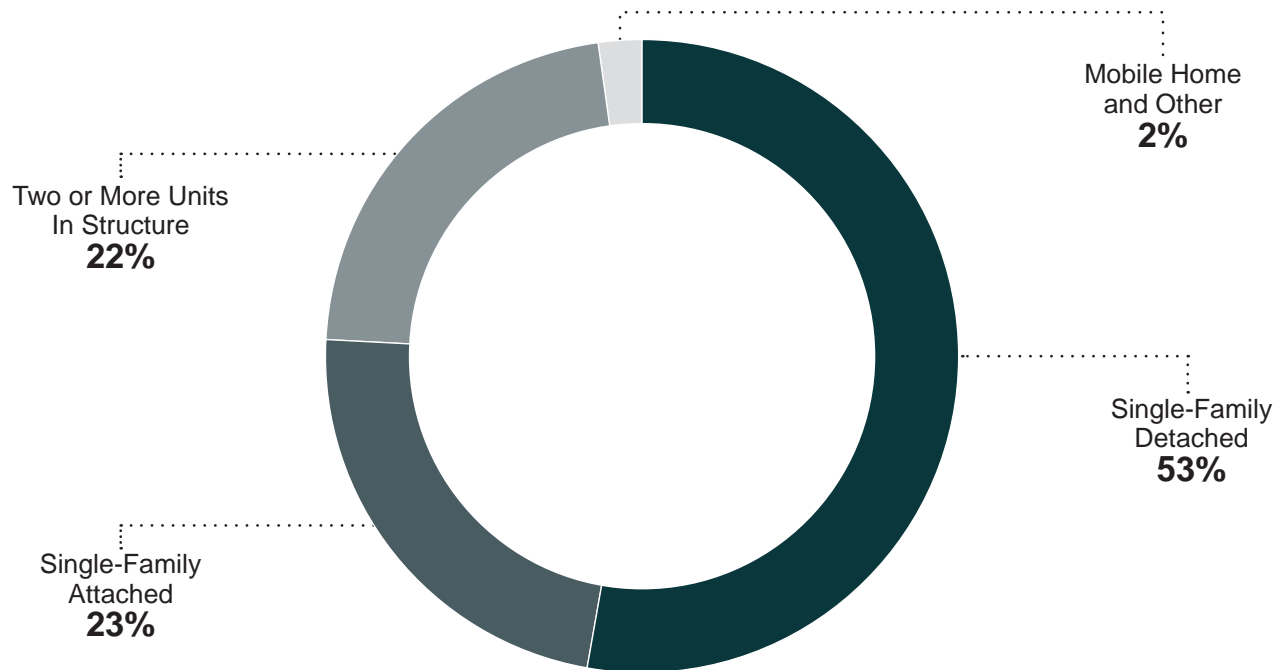


Source: U.S. Census 2016 American Community Survey

## Housing

The Lehigh Valley has an estimated 264,745 housing units, with 143,538 in Lehigh County and 121,207 in Northampton County. Further, the Lehigh Valley has 248,182 households, with 135,363 in Lehigh County and 112,819 in Northampton County. More than half of the region's housing units are single-family detached homes. About 46% of residences were built since 1970, and one in four residences was built before 1940.

The majority of Lehigh Valley houses are occupied by homeowners, while just under a third of residents are renters. Rural townships are dominated by owner-occupied households, while the region's cities and boroughs have higher shares of renter-occupied households. Vacancy rates are highest in the cities of Allentown and Easton and in northern Northampton County. However, the region's cities and exurban townships are experiencing an apartment boom. Approved apartments in 2016 more than doubled regionwide from 2015.



**Percentage of Lehigh Valley Households by Units in Structure**

Source: US Census 2016 American Community Survey 5-Year Estimates

## LAND USE AND DEVELOPMENT

### Population Growth

The Lehigh Valley population is projected to increase from 647,232 in 2010 to 813,187 in 2040, or by 25.6% over three decades. This increase is slightly slower than the growth rate over the previous 30 years (1980-2010), when population increased by 30%.

In Lehigh County, where the population is projected to increase by 90,897 people, or an average of 8.7% per decade, the top five municipalities projected to experience the largest population growth are the City of Allentown and the townships of Upper Macungie, Upper Saucon, North Whitehall and Whitehall.

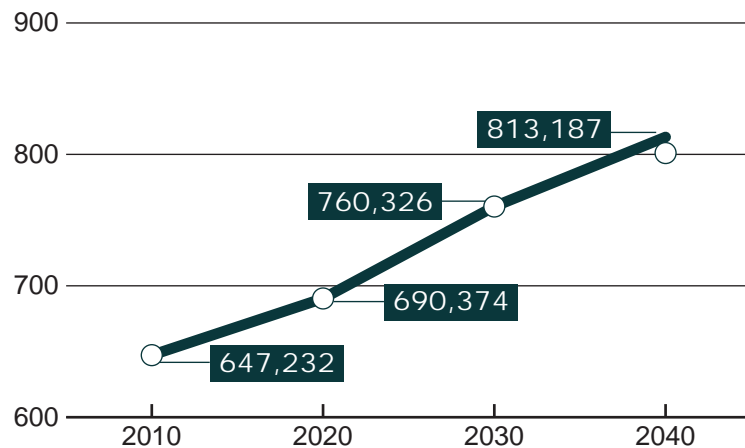
Northampton County's population is projected to increase by 75,058 people, or an average of 8.4% per decade. In Northampton County, the five municipalities projected to

grow the most are the City of Bethlehem, Bethlehem Township, Forks Township, the City of Easton and Palmer Township.

### Extent of Developed Area

Most urban development in the region encompasses the area around Route 22 and I-78 from Route 100 east to the Delaware River. Interchange locations in this corridor have been popular sites for business and industrial locations since the late 1950s. The corridor is also bounded by rapidly developing suburbs such as Hanover and Bethlehem townships in Northampton County and Upper and Lower Macungie townships in western Lehigh County. Development in western Lehigh County grew quickly after the building of a long sewer interceptor from western Allentown to the industrial area around the I-78/Route 100 interchange in the late 1960s. Since its final completion in 2002, Route 33 has also spurred significant commercial and industrial growth in Northampton County.

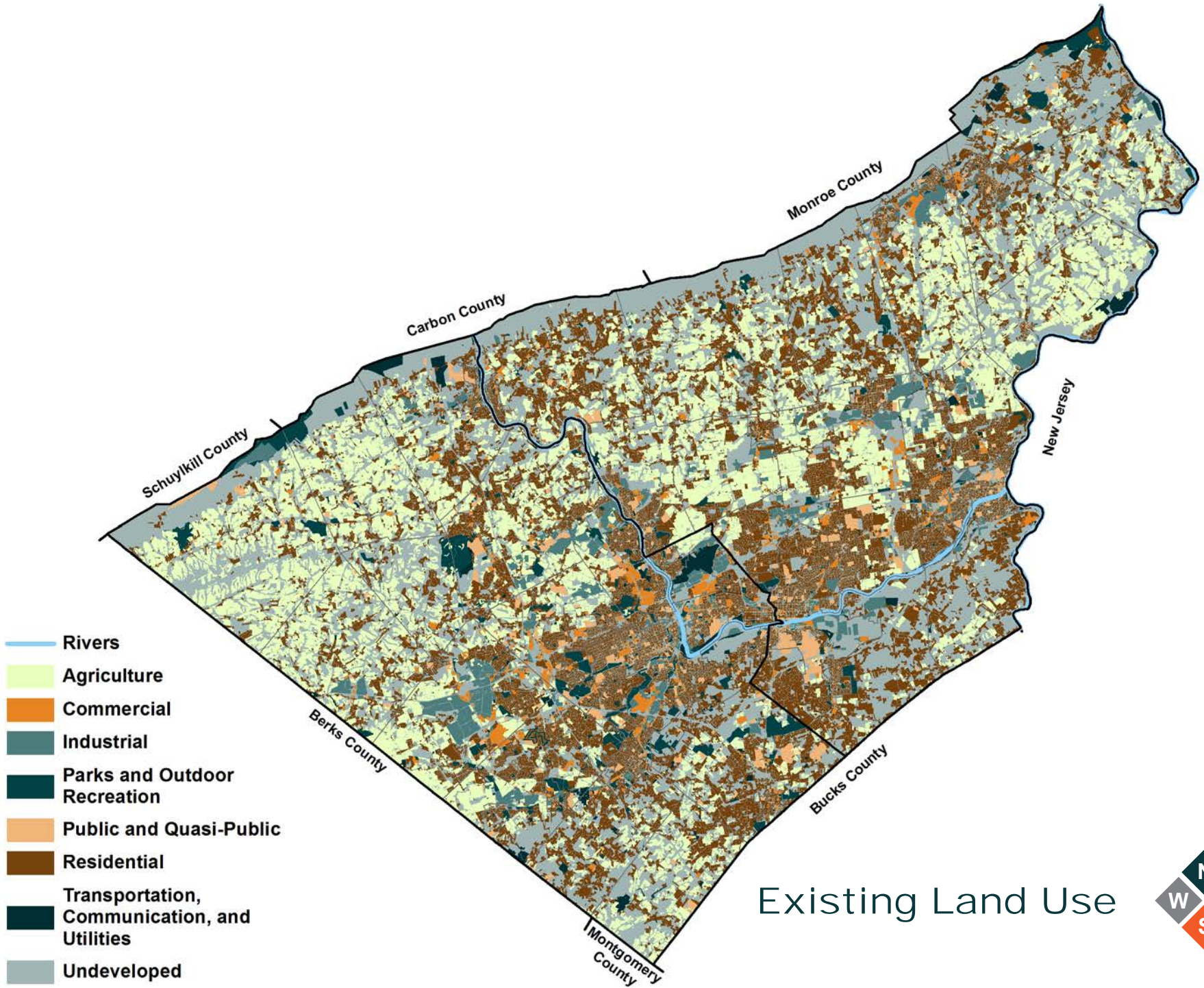
Expanses of farmland and other open space still exist in northwestern Lehigh County, southwestern Lehigh County, northeastern Northampton County and southeastern Northampton County. There is also an area of prime farmland south of Bath and Nazareth boroughs. However, industrial and residential development has greatly reduced farmland. Rural single-family subdivisions on large lots served by on-lot sewer and water are scattered throughout the region. In the less developed areas, individual lots or small groups of lots are found along existing roads and at rural road intersections.



### Lehigh Valley Population Projections

In thousands

Source: REMI 2014 and LVPC 2017



Existing Land Use





## Development Trends

The Lehigh Valley's three cities and 27 boroughs have very different land use and development characteristics than the region's suburban and rural townships. About 89% of the total area of all cities and boroughs is developed, and some of the remaining 11% may not be suitable or available for development. Therefore, new development usually comes from the redevelopment of previously developed land. Allentown's Neighborhood Improvement Zone (NIZ) has spurred significant office and residential development in the city's central business district and along the Lehigh River Waterfront. In Bethlehem, the ongoing adaptive reuse of the former Bethlehem Steel complex is bringing new industrial, warehouse, office and commercial development to the city's South Side. Easton has experienced infill redevelopment downtown and the redevelopment of its former silk mill site in the west. However, while the cities of Allentown and Bethlehem were among the top four municipalities in approving residential units from 2007 to 2016, residential development in the region's boroughs has been limited during that same period.

The fastest growing municipalities in the Lehigh Valley are suburban townships adjacent to the cities of Allentown, Bethlehem and Easton and served by public sewer and water. The townships of Upper Macungie, Upper Saucon, Hanover (Northampton County), South Whitehall and Forks were among the top seven municipalities in

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**The fastest growing municipalities in the Lehigh Valley are suburban townships adjacent to the cities of Allentown, Bethlehem and Easton served by public sewer and water.**

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approving residential units from 2007 to 2016. While residential development in suburban townships was previously characterized mainly by low density, single-family residential subdivisions, these municipalities have seen significant increases in higher density apartment and assisted-living development.

From 2007 to 2016, suburban townships have also had the highest total acreage in approved non-residential development. With the current expansion in warehouse and logistics development, rural townships like Weisenberg, Allen and Upper Mt. Bethel have also seen a significant amount of acreage go towards non-residential development. However, this increase in non-residential development in rural townships has been accompanied by a drop in residential subdivision development since 2007. Without continuing action to preserve farmland, coordinate municipal zoning and effectively manage growth, rural municipalities will become more suburban by 2040.

Sources: BuildLV, LVPC 2017, Comprehensive Plan The Lehigh Valley ... 2030

## TRANSPORTATION SYSTEMS

### Highways, Roadways and Associated Systems

The roadway network is by far the dominant system of travel infrastructure in the Lehigh Valley. It serves passenger vehicles, trucks and public bus transportation needs in the region. In 2016, there were 14,164,373 daily vehicle miles of travel on the entire regional road network. By 2030, this figure is anticipated to grow to 19,600,000.

The Lehigh Valley is served by six expressways, two of which are interstate highways. The interstate roads are I-78 and I-476. Other expressways are Route 22, a portion of Route 33, a portion of Route 309 and a portion of Route 378 through the City of Bethlehem.

The Lehigh Valley's 912 bridges are owned by several entities that include the Commonwealth of Pennsylvania, Lehigh County, Northampton County, municipalities, Pennsylvania Turnpike Commission, Delaware River Joint

Road Type	Miles
Interstate Highways	60
Freeways/Expressways	38
Arterials	411
Collectors	525
Local Roads	3,107
<b>TOTAL</b>	<b>4,141</b>

Toll Bridge Commission, railroad companies and private entities. Bridges with high traffic volumes in the area include the Route 22 Lehigh River Bridge, Route 33 Lehigh River Bridge, Route 329 Cementon Bridge, Route 145 Treichlers Bridge, Hamilton Street and Tilghman Street bridges in the City of Allentown, Hill-to-Hill, Fahy, and Minsi Trail bridges in the City of Bethlehem, 25th Street Bridge in Palmer Township, and the 3rd Street Bridge in the City of Easton. The average age of a bridge in the Lehigh Valley is 50 years old.

Sources: PennDOT; LVPC

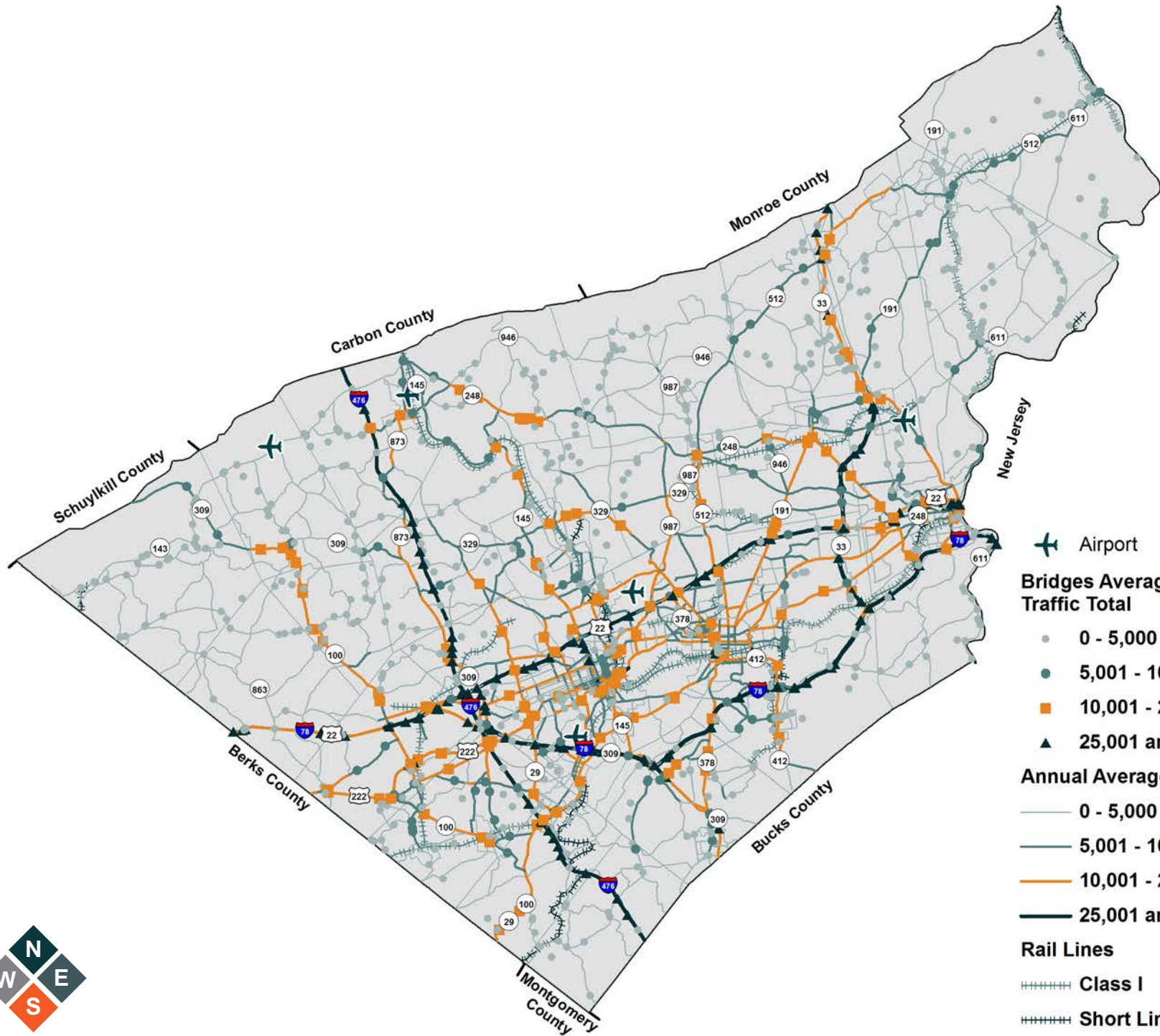
## Railways

The dominant class 1 rail freight carrier in the Lehigh Valley is the Norfolk Southern Railroad. The railroad's Newark, New Jersey to Harrisburg main line passes through the two counties. This line is part of the Central Corridor, the largest of the six priority freight corridors in the state. A secondary line extends north from Allentown to the Scranton area.

Numerous branch lines provide Norfolk Southern service to area shippers. Among them are the Cement Secondary, which serves the Forks Industrial area, and the C&F Secondary, which serves the Fogelsville area. A second class 1 carrier, Canadian Pacific, also uses trackage rights to serve the Lehigh Valley. Canadian Pacific Rail has assumed the operations once provided by the Delaware and Hudson Railway.

The area is also served by six short line railroads: RJ Corman-Allentown, the East Penn Railroad, the Northampton Development Corp. Railroad, the Belvidere & Delaware River Railroad, the Delaware Lackawanna Railroad and the Lehigh Valley Rail Management Railroad.

These railroads operate several significant rail facilities within the Lehigh Valley. The Allentown Classification Yard is one of the major yards in the Norfolk Southern System. The Lehigh Valley Rail Management operates an intermodal terminal and container terminal, both located in the City of Bethlehem.



- ✈ Airport
- Bridges Average Daily Traffic Total**
  - 0 - 5,000
  - 5,001 - 10,000
  - 10,001 - 25,000
  - ▲ 25,001 and Greater
- Annual Average Daily Traffic**
  - 0 - 5,000
  - 5,001 - 10,000
  - 10,001 - 25,000
  - 25,001 and Greater
- Rail Lines**
  - Class I
  - Short Line



## Airports and Heliports

Lehigh and Northampton counties are served by air passenger carrier, air cargo and general aviation services. The Lehigh Valley International Airport (LVIA), located on a 789-acre site in Hanover Township, Lehigh County, provides passenger, general aviation and air cargo services. LVIA is operated by the Lehigh-Northampton Airport Authority. In addition, the Queen City Airport in Allentown, Braden Airpark in Forks Township, the Slatington Airport, and the Flying “M” Aerodrome in Heidelberg Township also serve general aviation aircraft needs.

## Public Transportation

The Lehigh and Northampton Transportation Authority (LANTA) operates the LANtaBus and LANtaVan operations. The LANtaBus division provides fixed-route services along 30 routes and operates about 4.9 million trips annually. It serves the Lehigh Valley metropolitan area, including the cities of Allentown, Bethlehem and Easton and their surrounding municipalities. The LANtaVan division provides nearly 400,000 door-to-door trips a year for the region’s elderly and those with disabilities.

In the 1980s, an intermodal center was developed in the City of Bethlehem to serve as a transportation hub. In the summer of 2007, a transportation hub was developed in Center City Allentown. A similar facility opened in 2015 on S. 3<sup>rd</sup> Street in Easton and is used by Trans-Bridge Lines Inc., Greyhound, New Jersey Transit, LANTA and Fullington Trailways.

Inter-city bus service exists to popular destinations such as New York City and Philadelphia. This service is provided by private bus operators Carl R. Beiber, Trans-Bridge Lines, Inc. and Fullington Trailways.

## Non-Motorized Travel

The Lehigh Valley contains a significant trail and sidewalk network to aid in both commutation and recreation. The LVPC *WalkLV* report (2016) identifies the existing sidewalk network and provides an assessment of sidewalk connectivity. Among the many beneficial applications to this study is one main goal: to promote an interconnected network of pedestrian-accessible transportation corridors. An active transportation plan will be developed that furthers the efforts of *WalkLV*. While commuter biking in the Lehigh Valley is modest, recreational biking is growing in popularity. Numerous municipalities have and continue to develop bicycling and pedestrian trails. The LVPC *Lehigh Valley Trails Inventory-2013* provides an inventory of existing Lehigh and Northampton County trails and information on safe road crossings, as well as identifies priority trail gaps. Bicycling and pedestrian facilities have long been supported in the region by various funding mechanisms such as the PennDOT Transportation Alternatives Set-Aside, Transportation Alternatives Program, Transportation Enhancements Program, Safe Routes to School, and Multimodal Transportation Fund Programs through both PennDOT and the Department of Community and Economic Development.







# PLANNING PROCESS

Creating the *Lehigh Valley Hazard Mitigation Plan* was a 12-month process that involved monthly meetings with municipalities and stakeholders, more than two dozen presentations before community groups and the Lehigh Valley Planning Commission, five scheduled public meetings, regular media stories, a dedicated webpage, television appearances, public service radio announcements and an advertising campaign that included ads—in English and Spanish—on every mass transit bus in the region.

The goal of this process was to prepare a plan that not only meets the requirements of the Disaster Mitigation Act of 2000, using the guidelines provided by the Federal Emergency Management Agency (FEMA) and Pennsylvania Emergency Management Agency (PEMA), but one built from community input that would best assist the region in minimizing the impacts of future disasters.

## PUBLIC ENGAGEMENT

26

Community Meeting Presentations

5

Public Meetings

83

Transit Buses with Hazard Mitigation Ads

32

Public Service Announcements on La Mega 99.5 Spanish Radio

3

RCN TV4 Hazard Mitigation Program Air Dates

## THE PLANNING TEAM

The 2018 Plan process began with the establishment of the Administrative Planning Team, including Lehigh and Northampton County Emergency Management officials and Lehigh Valley Planning Commission (LVPC) representatives who served as the steering committee for the 2006 and 2013 Plans. With a FEMA planning grant secured by Lehigh County on behalf of the region, the counties arranged for the LVPC, the official planning agency for Lehigh and Northampton counties, to prepare the 2018 *Lehigh Valley Hazard Mitigation Plan*. Tetra Tech Inc. was contracted as a consultant by the LVPC to assist in preparing Hazard Profiles and Vulnerability Assessments for the Plan.

With the Administrative Planning Team in place, the Planning Team was established through personal invitations to all municipalities and a wide variety of stakeholders, resulting in 100% participation of all 62 municipalities in addition to dozens of experts in the public. The Administrative Planning Team, which included FEMA and PEMA representatives, guided overall direction of the planning effort, made day-to-day decisions and developed and outreach program. The Planning Team participated throughout the process by attending scheduled meetings and providing information and input.

Name	Title	Organization
Scott Lindenmuth	Director	Lehigh County Emergency Management Agency
Tanya Hook	Community Outreach Coordinator	Lehigh County Emergency Management Agency
Jon Al-Khal	Training and Operations	Lehigh County Emergency Management Agency
Todd Weaver, ENP	Director	Northampton County Emergency Management Services
Thomas Guth, Jr.	Manager, Hazard Mitigation Services and Disaster Recovery	Northampton County Emergency Management Services
Jeff Steiert	Deputy Director	Northampton County Emergency Management Services
Michael Rinker	Emergency Management Planning Manager	Northampton County Emergency Management Services
William Hillanbrand, MA	Manager, Emergency Management Planning (retired)	Northampton County Emergency Management Services
Nick Tylenda	Deputy Director (retired)	Northampton County Emergency Management Services
Wade Haubert, Jr.	Deputy Emergency Management Coordinator	City of Bethlehem
Becky Bradley, AICP	Executive Director	Lehigh Valley Planning Commission
Geoffrey Reese, PE	Director of Environmental Planning	Lehigh Valley Planning Commission
Matt Assad	Managing Editor	Lehigh Valley Planning Commission
Susan Rockwell	Senior Environmental Planner	Lehigh Valley Planning Commission
Mari Radford, CFM	Mitigation Planner	Federal Emergency Management Agency
Ernie Szabo	Hazard Mitigation Planner	Pennsylvania Emergency Management Agency

### Administrative Planning Team

One of the first actions of the Administrative Planning Team was to invite all 62 municipalities to participate on a separate Planning Team that would meet monthly and provide information and input throughout the planning process. Municipalities were sent an invitation letter to the Planning Team Kick-off Meeting in October 2017. The letter included a Statement of Intent to participate in the planning effort and a list of general municipal responsibilities:

- Complete the Statement of Intent to participate in the planning process and identify municipal representatives responsible for attending Planning Team meetings and assuring municipal expectations are met.
- Identify municipal stakeholders and community stakeholders that should be informed and/or involved in the planning process.
- Provide data and information about the community as requested.
- Support/provide public outreach efforts in the community.
- Provide comments and input regarding the draft plan.
- Provide the status of mitigation actions that have occurred over the past five years.
- Evaluate and identify additional mitigation actions to address hazards of concern in the community.
- Formally adopt the 2018 Plan by resolution of the governing body after FEMA conditional approval.

The result was participation by all 62 municipalities in Lehigh and Northampton counties.

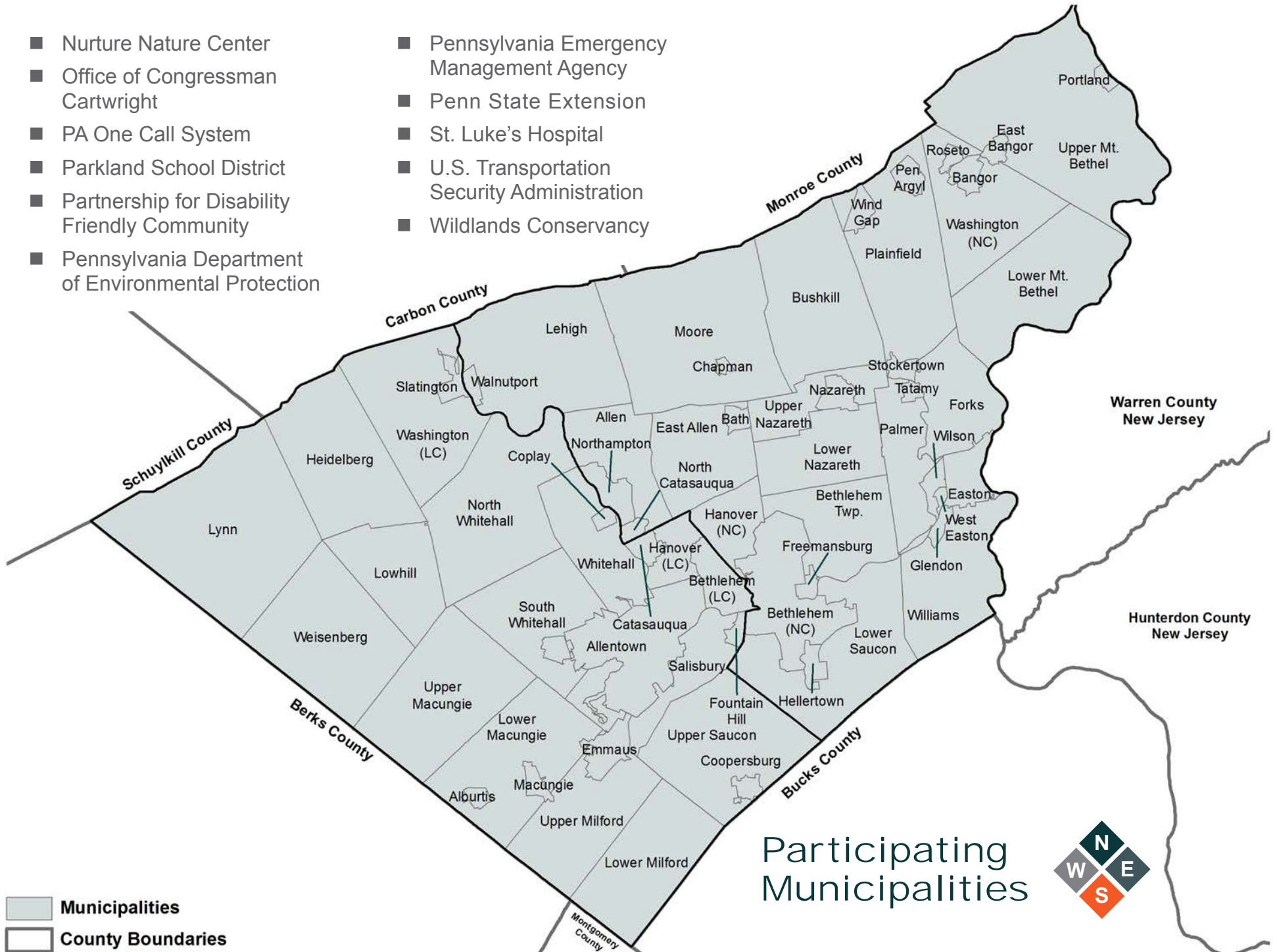
With the perspective that the best plan is one that has

the most community buy-in and input, diligent efforts were made to assure broad regional, county and local participation during the planning process. To that end, the Administrative Planning Team developed a comprehensive list of stakeholders, and personal invitations were sent to more than 60 stakeholders across the region and in neighboring counties to join the Planning Team and provide input throughout the process. Among those invited were officials from hospitals, churches, transportation organizations, public utilities, economic development organizations, businesses, non-profit organizations and environmental groups, as well as officials from local, county, state and federal agencies. The list of stakeholders invited to join the Planning team is available in the Appendix.

Representatives from the following stakeholder organizations participated in the planning process by attending Planning Team or public meetings and providing input:

- American Red Cross of the Greater Lehigh Valley
- Allentown Health Bureau
- Bethlehem Health Bureau
- Borton-Lawson engineering firm
- Citizen's Climate Lobby
- Community Action Committee of the Lehigh Valley
- Jewish Federation of the Lehigh Valley
- J.G. Petrucci Co.
- Lehigh County Authority
- Lehigh University
- Hanover Engineering
- Northampton County Council

- Nurture Nature Center
- Office of Congressman Cartwright
- PA One Call System
- Parkland School District
- Partnership for Disability Friendly Community
- Pennsylvania Department of Environmental Protection
- Pennsylvania Emergency Management Agency
- Penn State Extension
- St. Luke's Hospital
- U.S. Transportation Security Administration
- Wildlands Conservancy



Participating Municipalities



## PUBLIC AND STAKEHOLDER PARTICIPATION

All 62 municipalities and the stakeholders on the Planning Team were given multiple opportunities to participate in the 2018 planning process. Municipalities and stakeholders were invited to attend monthly Planning Team meetings; provide information and input through completion of a series of worksheets and surveys; provide input on hazards and risks, goals, objectives and mitigation actions; and comment on the draft 2018 Plan.

As part of the planning process, a series of 11 worksheets and surveys were provided to municipalities either at Planning Team meetings or emailed to municipal points of contact to help them determine their risks and capabilities, potentially resulting in new mitigation actions. Worksheets and surveys provided to the municipalities included the following:

1. Statement of Intent: Indicates whether the municipality intended to participate in the 2018 planning process and identifies municipal responsibilities.

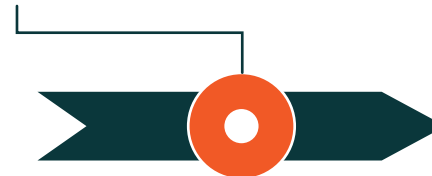
2. Municipal Participation Survey (New for 2018): Identifies municipal/community stakeholders to be involved in the process and describes how the community will be engaged in the current process and how they were engaged over the past five years.
3. Compliance with the National Flood Insurance Program (New for 2018): Identifies participation and compliance with the NFIP, including a description of the permitting process and flood mapping assistance provided to residents.
4. Community Assets Survey (New for 2018): Identifies community assets at risk to hazards, including vulnerable populations, economic, built environment and natural environment.
5. Capability Assessment Survey: Collects information on municipal planning and regulatory, administrative and technical, financial, and education and outreach capabilities. Includes a self-assessment of capability survey.

## MEETINGS AND DOCUMENTATION TIMELINE

The Planning Team met on the third Thursday of each month during the planning process from October 2017 through July 2018 (ten meetings) at various centrally located community locations in the Lehigh Valley, including the UGI Auditorium, Best Western Hotel and Lehigh Valley Hospital-Muhlenberg. The Administrative Planning Team also met monthly and followed the Planning Team meeting at the same location. The Administrative Planning Team decided to hold monthly meetings of both groups in an effort to provide municipalities and stakeholders sufficient opportunities to participate and provide input.

### October 19, 2017, Planning Team Kick-Off

**Meeting:** Attendees were provided an overview of hazard mitigation planning, the plan update process, municipal participation and responsibilities, stakeholder involvement, previous plan goals and hazards profiled, and the plan update timeline. The first of the worksheets to be completed by municipalities (Worksheets 1-9) were reviewed and distributed at the meeting.





6. **Known or Anticipated Future Development:** Identifies development over the next 5-10 years and known hazard areas.
7. **Mitigation Action Plan Review:** Provides the status/progress on actions from the 2013 Plan, including whether the action should be included in the 2018 Plan or not.
8. **Natural Hazard Event History:** Provides the natural hazard event specific to the municipality since the 2013 Plan.
9. **Hazard Identification and Risk Evaluation:** Identifies changes in hazard risk since the 2013 Plan and additional hazards of concern to the municipality.
10. **Goal Evaluation:** Requests input on whether the 2013 Plan goals should be kept, revised or removed. Stakeholders were provided the opportunity to complete this worksheet as well.
11. **Mitigation Strategy Action Plan:** Identifies proposed new mitigation actions for municipalities.

One of the key roles of the municipalities in this effort was to assist with and provide public outreach in their community by engaging municipal and community stakeholders they identified in Worksheet #2. In addition to providing outreach throughout the planning process, municipalities were asked to inform those municipal and community stakeholders about the public meetings, post public meeting notices at their municipal buildings or on websites or through social media methods, including Facebook or Twitter. Several municipalities placed notices on their websites. Screenshots of the sites are included in the Appendix.

Public participation and comment was encouraged throughout the planning process. A wide-ranging public outreach plan was developed that included radio, television, online, print media and social media strategies. The first three public meetings, including the March 8, 2018 Planning and Pizza session, were promoted on the LVPC Hazard Mitigation Plan webpage, Facebook, Twitter and LinkedIn. The July 10 public meeting and Planning and Pizza meeting will be similarly promoted.

**November 16, 2017:** Planning Team Meeting where municipal participation was discussed during the meeting. Questions on filling out the worksheets were discussed. Potential new hazards to profile in the 2018 Plan were identified, including several from the 2013 Pennsylvania Hazard Mitigation Plan.



**December 18, 2017:** LVPC.ORG/Hazard-Mitigation.html goes live, with description of update, key dates, copies of previous plans, progress on new plan and place for the public to comment. Webpage gets 752 page views from 427 unique users in its first two weeks of operation.



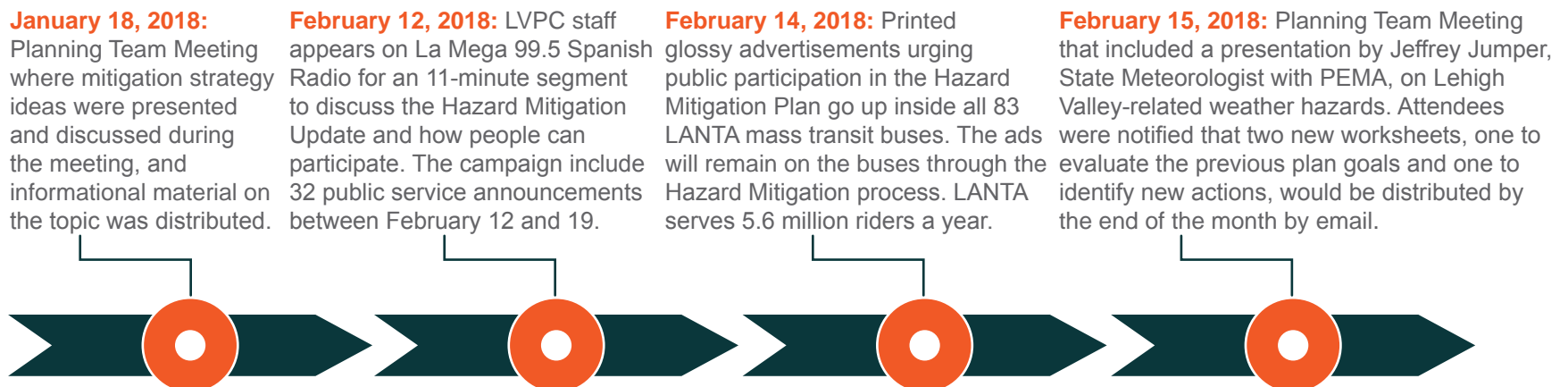
**December 21, 2017:** Planning Team Meeting where an overview of the National Flood Insurance Program's Community Rating System was provided and FEMA material on the program distributed to attendees. During the meeting, the Planning Team concurred with updating the profiles of the 22 hazards from the 2013 Lehigh Valley Plan and adding three new hazards: invasive species, pandemic and infectious disease, and drug overdose crisis.



The public outreach campaign began with a September 14, 2017 LVPC Newsletter article, delivered by email to more than 2,000 community stakeholders and posted on LVPC.ORG, announcing that the Hazard Mitigation Plan update had begun, and continued with an appearance on RCN TV4 for an hour-long program called *Community Spotlight* that aired October 8, 10 and 12, 2017. In December 2017, a webpage was created at LVPC.ORG/Hazard-Mitigation.html and was designed to educate and inform people about all aspects of the project. The site includes an explanation of Hazard Mitigation, the update effort being done, why the plan is important to the community and why community participation is vital. The site also includes past and current Hazard Mitigation plans, key dates, public meetings or events, any media coverage of the update, worksheets and a place where people can comment. Through May 25, 2018, the website received over 1,500 page views. In an effort to reach out to the business community, articles about the Hazard Mitigation Plan were included in the Lehigh Valley Business Journal on October 16, 2017 and April 23, 2018.

Much of the public outreach campaign was geared to direct people to the website, where they could obtain the most information about the Plan and planning process. A social media campaign announcing all public events on Facebook, Twitter and LinkedIn was launched in January 2018, and an advertising campaign that included Public Service Announcements and an on-air interview on Pennsylvania’s highest-rated Spanish radio station, La Mega 99.5 FM, began in February 2018. The 30-second public service advertisements ran 32 times over an eight-day period from February 12 through February 19, in advance of the first public meeting. La Mega reaches more than 27,000 Spanish-speaking Lehigh Valley residents each week.

Signs printed in English and Spanish were also placed in all 83 Lehigh and Northampton Transportation Authority (LANTA) buses on February 14, 2018 and remained through the duration of the planning process. LANTA serves 5.6 million riders per year. The signs were also provided to the municipalities and counties to place in a public location. Documentation on public outreach efforts are included in the Appendix.



**FLOODS.  
EXTREME STORMS.  
ACCIDENTS.**

**You can help**

[www.lvpc.org/hazard-mitigation.html](http://www.lvpc.org/hazard-mitigation.html)



Financial support by FEMA and PEMA does not constitute an endorsement or reflect the views of FEMA and PEMA



Advertising posters placed inside 83 LANTA mass transit buses.

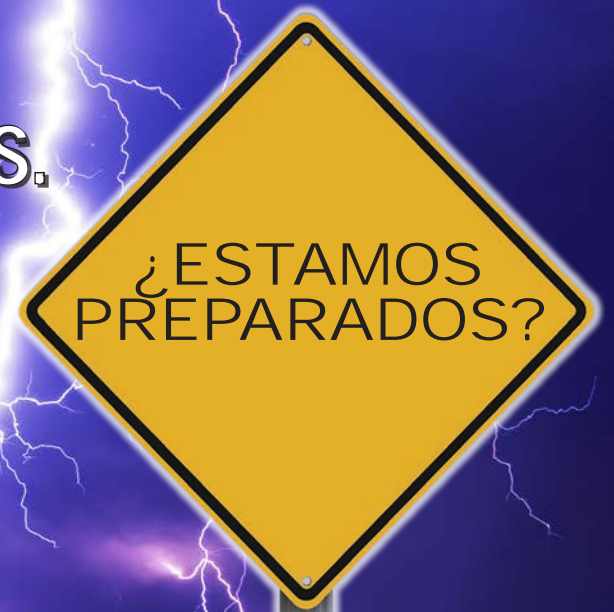
**INUNDACIONES.  
TORMENTAS EXTREMAS.  
ACCIDENTES.**

**Usted puede ayudar**

[www.lvpc.org/hazard-mitigation.html](http://www.lvpc.org/hazard-mitigation.html)



La prestación de apoyo financiero por parte de la Agencia Federal para el Manejo de Emergencias (Federal Emergency Management Agency, FEMA) y de la Agencia para el Manejo de Emergencias del Estado de Pensilvania (Pennsylvania Emergency Management Agency, PEMA) no constituye una aprobación ni refleja las opiniones de la FEMA y la PEMA.



In addition, the project was presented at 13 LVPC meetings and 13 regularly scheduled stakeholder group meetings throughout the Lehigh Valley, including:

- Northampton County Association of Township Officials – October 5, 2017 at Green Pond Country Club, Bethlehem Township
- Seventh Lehigh Valley Watershed Conference – October 17, 2017 at Lehigh University, Bethlehem
- Lehigh County Congress of Governments – October 31, 2017 at the America On Wheels Museum, Allentown
- Lehigh Valley Regional Partnership – December 7, 2017 at the PPL Training Center, South Whitehall Township. The partnership posts monthly meeting agendas and PowerPoint presentations on its website.
- Lehigh Valley General Assembly – January 30, 2018 at Penn State Lehigh Valley, Center Valley
- Lehigh County Emergency Management Coordinators Meeting – February 15, 2018 at the Joint Operations Center, South Whitehall Township
- Lehigh Valley Regional Partnership – February 22, 2018 at the PPL Training Center, South Whitehall Township
- Lehigh County Congress of Governments – April 3, 2018 at the America On Wheels Museum, Allentown
- Northampton County Emergency Management Coordinators Meetings – April 11, 2018, at 9 a.m. and 7 p.m., Upper Nazareth Township (2 meetings)
- Northampton County Council of Governments – April 25, 2018 at Northampton County Human Services, Bethlehem
- Municipal Leaders’ Conference – April 28, 2018 at Northampton Community College, Monroe Campus, Tannersville
- Lehigh Valley Master Watershed Steward Program – May 2, 2018 at Illick’s Mill, Bethlehem

**February 20, 2018:** Public Meeting at Pinebrook Family Answers, Allentown. Topics included an introduction to hazard mitigation planning, hazards impacting the Lehigh Valley, types of mitigation actions and plan update timeline. Attendees had the opportunity to discuss past experiences with hazard events and provide input. A Spanish language interpreter was provided at the meeting.



**March 8, 2018:** Public Meeting Planning + Pizza at the LVPC Office. Topics discussed were similar to the February 20 meeting to provide information on the importance of hazard mitigation planning. This meeting was held to reach out to additional community members.



**March 15, 2018:** Planning Team meeting included a presentation by Jennifer Massaro, Client Relationship Manager, Penn State Extension, to discuss invasive species—one of the three new hazards to be profiled in the 2018 Plan—and potential mitigation action ideas. The meeting also included a discussion on overall plan goals, objectives and actions.



## MULTI-JURISDICTIONAL PLANNING

Updating the Lehigh Valley Hazard Mitigation Plan involved a multi-jurisdictional approach that included contacting municipalities multiple times each month and enlisting the help of county officials to encourage each municipality to participate in the 2018 Plan. Every effort was made to involve all 62 municipalities throughout the planning process, resulting in a high level of meeting attendance and completion of worksheets and surveys. Municipalities were informed throughout the planning process that only municipalities that participate in the process and adopt the Plan would be eligible for hazard mitigation planning funds.

All 62 municipalities signed a Statement of Intent to participate in the 2018 Plan. All municipalities also participated in the 2006 and 2013 plans, with all adopting

the 2006 Plan, but only 37 adopting the 2013 Plan. The goal for the 2018 Plan is adoption by all 62 municipalities.

Throughout the planning process, each municipality was emailed a reminder prior to every Planning Team meeting, with 57 municipalities attending at least one meeting. Documentation on municipal meeting attendance is provided in the Appendix.

In addition to attending meetings, municipalities were provided a series of worksheets and surveys to complete, which were distributed at Planning Team meetings or emailed to municipal points of contact. All municipalities participated in completion of some or all of the worksheets as documented in the Appendix. A multi-jurisdictional summary sheet, documenting whether the required participation elements for each municipality were either met or not met, is also provided in the Appendix.

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**April 19, 2018:** The Planning Team meeting included presentations from two guest speakers on two of the new hazards to be profiled in the 2018 Plan: 1) Kristen Wenrich, Bethlehem Health Bureau Director and Chair of the Northampton County Opioid and Heroin Overdose Task Force, to discuss the drug overdose crisis in the Lehigh Valley and potential municipal mitigation actions, and 2) Vicky Kistler, Allentown Health Bureau Director, to discuss pandemic and infectious diseases and potential municipal mitigation actions. The Administrative Planning Team developed sample actions for the three new hazards, which were later emailed to all municipalities for consideration.



**April 25, 2018:** Public Meeting at Nurture Nature Center, Easton. Topics included the hazards of concern for the region, risk assessment, capability assessment, plan goals and mitigation actions.



## WHAT'S NEW FOR 2018

- The overall format of the 2018 Plan was structured according to the Pennsylvania All-Hazard Mitigation Planning Standard Operating Guide, October 2013.
- Public outreach was expanded for the 2018 Plan, including outreach into the region's growing Hispanic community.
- A social media element was also added to reflect evolving methods of communication.
- The discussion on plan integration has been moved from this section to the Capability Assessment section.
- Data Sources and Limitations are included in the Appendix.
- A description of changes since the 2013 Plan is provided in each of the Risk Assessment, Capability Assessment, Mitigation Strategy and Plan Maintenance sections.

**May 17, 2018:** Planning Team meeting where the overall plan status was discussed. Draft goals and objectives were distributed for Planning Team review. A summary of actions completed from the previous plan and summary of proposed 2018 actions was distributed to the group.

**June 21, 2018:** Planning Team meeting where a draft of the plan was discussed.

**July 10, 2018:** Planning + Pizza at the LVPC Office. To present the draft 2018 Plan. Meeting not yet held.

Public meeting at the Iron Works Municipal Building, Catasauqua. To present the draft 2018 Plan. Meeting not yet held

**Note:** Invitation letters, meeting agendas, PowerPoint presentations, informational materials and meeting minutes for all Planning Team and public meetings are located in the Appendix.

**July 19, 2018:** Planning Team meeting not held yet.







# RISK ASSESSMENT

The purpose of a risk assessment is to determine the potential impacts of hazards to the people, economy and built and natural environments of a community. The risk assessment provides the foundation for the rest of the mitigation planning process, which is focused on identifying and prioritizing actions to reduce the risk from hazards. Risk, for the purposes of the hazard mitigation plan, is the potential for damage or loss created by the interaction of hazards with community assets and varies for each community. A risk assessment includes identification and profiling of hazards of concern to the community, an inventory of community assets, an analysis of hazard risks and a summary of the community's vulnerability to the identified hazards.

## Natural hazards that pose the highest risk to Lehigh Valley

- Extreme Temperature
- Flood
- Winter Storm
- Windstorm/  
Tornado
- Invasive Species
- Drought

The Planning Team considered the 22 hazards profiled in the 2013 Plan and determined they remained relevant to the region. The risk assessment for the 2018 Plan includes an updated description for each of the natural and non-natural hazards profiled in the 2013 Plan as well as descriptions for three new hazards—invasive species, pandemic and infectious disease and drug overdose crisis—that the Planning Team agreed were of concern to the region. An inventory of community assets was obtained from each municipality. A risk analysis for the 2018 Plan was completed that evaluates vulnerable assets, describes potential impacts and estimates losses (where possible) for each hazard.

In an effort to make this Plan more accessible, the risk assessment is summarized in this section, with complete descriptions, profiles and vulnerability assessments for each hazard, including loss estimates and methodology, provided in the Appendix.

## HAZARD IDENTIFICATION

The Robert T. Stafford Disaster Relief and Emergency Assistance Act provides for two types of Presidential disaster declarations: emergency declarations and major disaster declarations. Both types of declarations are issued when the President has determined that state and local governments require supplemental federal assistance in responding to a disaster event. However, the events, scope and amount of assistance differ between the two types of declarations. Emergency declarations supplement state or local government efforts in providing emergency services, including protection of lives, public health and safety, for any occasion or instance when the President determines there is a need. Major disaster declarations provide a wide range of federal assistance programs for individuals and

Date	Event	Counties Affected
March 2016	Severe Winter Storm and Snowstorm	Lehigh and Northampton
January 2013	Hurricane Sandy	Northampton
October 2012*	Hurricane Sandy	Lehigh and Northampton
September 2011*	Remnants of Tropical Storm Lee	Lehigh and Northampton
September 2011	Remnants of Tropical Storm Lee	Northampton
September 2011	Hurricane Irene	Lehigh and Northampton
August 2011*	Hurricane Irene	Lehigh and Northampton
June 2006	Flooding	Lehigh and Northampton
September 2005*	Hurricane Katrina	Lehigh and Northampton
April 2005	Severe Storms, Flooding and Mudslides	Northampton
September 2004	Tropical Depression Ivan	Northampton
September 2003	Hurricane Isabel/Henri	Lehigh and Northampton
February 2003*	Severe Winter Storm	Lehigh and Northampton
September 1999	Hurricane Floyd	Lehigh and Northampton
January 1996	Severe Winter Storms	Lehigh and Northampton
January 1996	Flooding	Lehigh and Northampton
January 1994	Severe Winter Storms	Lehigh and Northampton
March 1993*	Blizzard	Lehigh and Northampton
September 1975	Flood (Eloise)	Northampton
July 1973	Flood	Northampton
June 1972	Flood (Agnes)	Northampton
August 1965	Drought	Lehigh and Northampton
August 1955	Flood (Diane)	Lehigh and Northampton

### PRESIDENTIAL DISASTER AND EMERGENCY DECLARATIONS (1955-2017)

\* Emergency Declaration  
Source: PEMA (2013), FEMA (2017)

public infrastructure for any natural event that the President determines has caused damage severe enough that it is beyond combined state and local government capabilities to respond.

Since 1955, 23 Presidential Declarations have been issued for the Lehigh Valley primarily for flooding, winter storm and hurricane or tropical storm/depression events.

## SUMMARY OF HAZARDS

As part of the 2018 planning process, the Lehigh Valley Hazard Mitigation Planning Team reviewed the hazards of concern profiled in the 2013 Lehigh Valley Plan as well as those identified in the Pennsylvania 2013 Standard State All-Hazard Mitigation Plan. The Planning Team also considered the history of hazard events that have occurred in the Lehigh Valley, including those that occurred since completion of the 2013 Plan. Further, all participating municipalities were provided a “Hazard Identification/Risk Evaluation” worksheet (Worksheet #9) to help identify any additional hazards of concern—natural or non-natural—to that community not profiled in the previous Lehigh Valley Hazard Mitigation Plans.

The 2018 Plan profiles 25 hazards, which includes the 22 hazards from the 2013 Lehigh Valley Plan and three new hazards: invasive species, pandemic and infectious disease and drug overdose crisis.

Types	Hazard	Year Profiled		
		2006	2013	2018
Natural Hazards	Drought	Yes	Yes	Yes
	Earthquake	No	Yes	Yes
	Extreme Temperature	No	Yes	Yes
	Flood, Flash Flood, Ice Jam	Yes	Yes	Yes
	Hailstorm	No	Yes	Yes
	Invasive Species	No	No	Yes
	Landslide	No	Yes	Yes
	Lightning Strike	No	Yes	Yes
	Pandemic and Infectious Disease	No	No	Yes
	Radon Exposure	No	Yes	Yes
	Subsidence/Sinkhole	Yes	Yes	Yes
	Wildfire	Yes	Yes	Yes
	Windstorm/Tornado	Yes	Yes	Yes
Winter Storm	Yes	Yes	Yes	
Non-Natural Hazards	Civil Disturbance/Mass Gathering	No	Yes	Yes
	Dam Failure	No	Yes	Yes
	Drug Overdose Crisis	No	No	Yes
	Environmental Hazards/Explosion	No	Yes	Yes
	Fire (Urban/Structural)	No	Yes	Yes
	Levee Failure	No	Yes	Yes
	Nuclear Incident	No	Yes	Yes
	Structural Collapse	No	Yes	Yes
	Terrorism	No	Yes	Yes
	Transportation Crash	No	Yes	Yes
	Utility Interruption	No	Yes	Yes

## HAZARDS PROFILED

The 2013 Pennsylvania Hazard Mitigation Plan identifies and profiles 26 hazards; the 2018 Lehigh Valley Plan profiles 23 of those hazards, plus two additional hazards not listed in the State Plan (Structural Collapse and Drug Overdose Crisis).

Based on Planning Team input, the 2018 Lehigh Valley Plan does not include the following hazards from the State Plan:

- Coastal Erosion: According to the PEMA Standard Operating Guide, “With the exception of portions of Erie County, coastal erosion is not a hazard for communities in Pennsylvania.”
- Hurricane, Tropical Storm, Nor’easter: Impacts from hurricanes, tropical storms and Nor’easters are covered in the Flood, Windstorm/Tornado and Winter Storm profiles and mitigation actions and have not been duplicated under this hazard category.
- Mass Food/Animal Feed Contamination: According to the 2013 State Plan, “[w]ith the aggressive testing and food safety outreach the Department of Agriculture conducts, the overall probability of a mass food or animal feed contamination event is unlikely, according to the Risk Factor Methodology. Pennsylvania has not been the origin or cause of a mass food or animal feed contamination.”

As the 2018 Plan is monitored and evaluated over the five-year maintenance period, the Planning Team will review the list of hazards to ensure it remains appropriate and relevant to the region and update the Plan as appropriate.

## NATURAL HAZARD DESCRIPTIONS

**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.

**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.

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

**Flood, Flash Flood, Ice Jam:** Flooding is the temporary condition of partial or complete inundation on normally dry land and it is the most frequent and costly of all natural hazards in Pennsylvania. Flooding events are generally the result of excessive precipitation. General flooding is typically experienced when precipitation occurs over a given river basin for an extended period of time. Flash flooding is usually a result of heavy localized precipitation falling in a short time period over a given location, often along mountain streams and in urban areas where much

of the ground is covered by impervious surfaces. Winter flooding can include ice jams which occur when heavy rains cause frozen rivers to swell, breaks the ice layer on top and ice chunks float downstream and pile up near obstructions such as bridges. All forms of flooding can damage infrastructure.

**Hailstorm:** In addition to flooding and severe winds, hail is another potential damaging product of severe thunderstorms. Hailstorms occur when ice crystals form within a low pressure front due to the rapid rise of warm air into the upper atmosphere and the subsequent cooling of the air mass. Frozen droplets gradually accumulate on the ice crystals until, having developed sufficient weight, they fall as precipitation in the form of balls or irregularly shaped masses of ice greater than 0.75 inches in diameter. Damage to crops and vehicles are typically the most significant impacts of hailstorms.

**Invasive Species:** An invasive species is a species that is not indigenous or native to the ecosystem and whose introduction causes or is likely to cause economic or environmental harm or harm to human health. Infestations may not necessarily impact human health, but can create a nuisance or agricultural hardships by destroying crops, defoliating populations of native plant and tree species, or interfering with ecological systems.

**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.

**Lightning Strike:** Lightning is a discharge of electrical energy resulting from the build-up of positive and negative charges within a thunderstorm. The flash or “bolt” of light usually occurs within clouds or between clouds and the ground. A bolt of lightning can reach temperatures approaching 50,000°F. On average, 89 people are killed each year by lightning strikes in the United States. Within Pennsylvania, the annual average number of thunder and lightning events a given area can expect ranges between 40-70 events per year.

**Pandemic and Infectious Disease:** A pandemic occurs when infection from of a new strain of a certain disease, to which most humans have no immunity, substantially exceeds the number of expected cases over a given period of time. Such a disease may or may not be transferable between humans and animals.

**Radon Exposure:** Radon is a cancer-causing natural radioactive gas that you can't see, smell or taste. It is a large component of the natural radiation that humans are exposed to and can pose a serious threat to public health when it accumulates in poorly ventilated residential and occupation settings. According to the United States Environmental Protection Agency (USEPA), radon is estimated to cause about 21,000 lung cancer deaths per year, second only to smoking as the leading cause of lung cancer. An estimated 40% of the homes in Pennsylvania are believed to have elevated radon levels.

**Subsidence/Sinkhole:** 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 formation.

**Wildfire:** A wildfire is a raging, uncontrolled fire that spreads rapidly through vegetative fuels, exposing and possibly consuming structures. Wildfires can occur at any time of the year, but mostly occur during long, dry hot spells. 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.

**Windstorm/Tornado:** A wind storm can occur during severe thunderstorms, winter storms, coastal storms or tornadoes. Straight-line winds such as a downburst have the potential to cause wind gusts that exceed 100 miles per hour. A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud extending to the ground, most often generated by thunderstorms 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 windblown debris. Tornado wind speeds can range between 30 to more than 300 miles per hour. They are more likely to occur during 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. Structures made of light materials such as mobile homes are most susceptible to damage. Based on National Oceanic and Atmospheric Administration (NOAA) Storm Prediction Center Statistics, the number of recorded F3, F4, & F5 tornadoes between 1950 and 1998 ranges from less than 1 to 15 per 3,700 square mile area across Pennsylvania.

**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.

## NON-NATURAL HAZARD DESCRIPTIONS

**Civil Disturbance/Mass Gathering:** Civil disturbance hazards encompass a set of hazards emanating from a wide range of possible events that cause civil disorder, confusion, strife and economic hardship. Cases include famine, economic collapse, recession, misinformation, public unrest, mass hysteria, riot, strike, and labor dispute. Note: all mass gatherings, including civil disturbance, are included in the Civil Disturbance/Mass Gathering profile in the Appendix.

**Dam Failure:** A dam is a barrier across flowing water that obstructs, directs or slows down water flow. Dams provide benefits such as flood protection, power generation, drinking water, irrigation and recreation. Failure of these structures results in an uncontrolled release of impounded water. Failures are relatively rare, but immense damage and loss of life is possible in downstream communities when such events occur.

**Drug Overdose Crisis:** Based on the methodology of the U.S. Drug Enforcement Administration (DEA), this hazard encompasses only drug-related overdose deaths ruled accidental or undetermined (if provided and toxicology was present) and excludes drug-related suicides. Drawing upon information from Pennsylvania's coroners and medical examiners as well as law enforcement intelligence, the DEA has prepared a list of drugs of interest under the following six drug categories: benzodiazepines, cocaine, fentanyl/fentanyl-related substances/non-prescription synthetic opioids, heroin, prescription opioids, and other illicit drugs.

**Environmental Hazards:** Environmental hazards are hazards that pose threats to the natural environment, the built environment, and public safety through the diffusion of harmful substances, materials or products. Environmental hazards include hazardous material releases at fixed facilities or in transit; including toxic chemicals, infectious substances, biohazardous waste, and any materials that are explosive, corrosive, flammable or radioactive.

**Fire (Urban/Structural) and Explosion:** An urban fire involves a structure or property within an urban or developed area. Major urban fires involving large buildings and/or multiple properties are of primary concern. The effects of a major urban fire include minor to significant property damage, loss of life, and residential or business displacement. Explosions are extremely rapid releases of energy that usually generate high temperatures and often lead to fires. The risk of severe explosions can be reduced through careful management of flammable and explosive hazardous materials.

**Levee Failure:** A levee is a human-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control or divert the flow of water so as to provide protection from temporary flooding. Levee failures or breaches occur when a levee fails to contain the floodwaters for which it is designed to control or floodwaters exceed the height of the constructed levee.

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

**Structural Collapse:** Collapse of a building or structure refers to the loss of the load-carrying capacity of a component of the structure or the entire structure itself. The loss of a structure's load carrying capacity occurs when the loads applied to the structure exceed capacity. This can be a result of improper design, lack of maintenance, events from a structure's history that have gradually reduced its load-carrying capacity, or sudden and severe hazard events such as severe weather or terrorism.

**Terrorism:** Terrorism is use of force or violence against persons or property with the intent to intimidate or coerce. Acts of terrorism include threats of terrorism; assassinations; kidnappings; hijackings; bomb scares and bombings; cyber-attacks (computer-based); and the use of chemical, biological, nuclear and radiological weapons.

**Transportation Crash:** Transportation crashes can result from any form of air, rail, water or road travel. It is unlikely that small accidents would significantly impact the larger community. However, certain accidents could have secondary regional impacts such as a hazardous materials release or disruption in critical supply/access routes, especially if vital transportation corridors or junctions are present.

**Utility Interruption:** Utility interruption hazards impair the functioning of important utilities in the energy, telecommunications, public works and information network sectors. Utility interruption hazards include disruptions of communication, navigation and satellite systems; fuel or resource shortages, resulting from supply chain breaks or secondary to other hazard events; damaging current surges in electrical and electronic systems; information technology failure, due to software bugs, viruses or improper use; ancillary support equipment (electrical generating, transmission, system-control and distribution-system) failure; public works failures including damage to or failure of highways, flood control systems, public buildings, bridges and dams; telecommunications system failure resulting in damage to data transfer, communications and processing equipment; and transmission facility or linear utility accident, including liquefied natural gas leakages, explosions and facility problems.

## HAZARD LOCATION

When planning for a given hazard, it is important to identify the geographic areas that are affected by the hazard. Some events, such as winter storms, tend to be region-wide occurrences; others, such as dam failures, are highly localized and associated with specific geographic features.

### Entire Lehigh Valley

**Drought:** Droughts are regional in scope and may affect the entirety of the Lehigh Valley rather than individual municipalities within Lehigh and Northampton counties. Droughts may also concurrently affect counties near the Lehigh Valley, or even the entire Commonwealth. Generally, areas along waterways will experience drought conditions later than areas away from waterways.

**Earthquake:** The location of an earthquake is commonly described by its focal depth and the geographic position of its epicenter. The focal depth of an earthquake is the depth from the Earth's surface to the region where an earthquake's energy originates (the focus or hypocenter). The epicenter of an earthquake is the point on the Earth's surface directly above the hypocenter. Earthquakes usually occur without warning, and their effects can impact areas at great distance from the epicenter. The Lehigh Valley falls in a moderate risk zone, along with other municipalities and counties located within 17.5 miles from a historical epicenter. In this zone, minor earthquake damage is expected.

**Extreme Temperature:** The Lehigh Valley can experience many different temperature extremes in the summer and winter seasons. Records from across the Piedmont

Plateau are generally representative of conditions in the Lehigh Valley, and show daily temperatures reaching 90°F or above on the average of 25 days during the summer season; however, readings of 100°F or above are comparatively rare. In general, the winters are comparatively mild, with an average of less than 100 days with minimum temperatures below the freezing point.

**Hailstorm:** Hailstorms can impact the entire Lehigh Valley; they are not limited to any particular geographic area of the region. Neither the duration of the storm nor the extent of area affected by such an occurrence can be predicted.

**Invasive Species:** Multiple invasive species threats are present throughout the Lehigh Valley. Though the presence of these pests often spans the entirety of the region, the threats can be localized to specific natural and agricultural communities. At specific risk are ash trees (emerald ash borer), hemlocks (hemlock woolly adelgid), various hardwoods (gypsy moth), and grapes and hops (spotted lanternfly). In urban areas, species such as the Asian tiger mosquito (for which the Lehigh Valley is under surveillance) pose a greater concern, acting as a vector for Dengue fever and Zika virus. Regulations prohibiting the movement of firewood and certain agricultural products have been implemented to slow the expansion of some of these species into new areas, with limited success.

**Lightning Strike:** Lightning can occur with all thunderstorms, making all of the Lehigh Valley susceptible. Different geographic areas experience varying event frequencies, but in all cases lightning strikes and associated fatalities, injuries and damages occur primarily during the summer months. While the impact of lightning events is

highly localized, strong storms can result in numerous widespread events. In addition, the impacts of an event can be serious or widespread if lightning strikes a particularly significant location such as a power station or large public venue. According to the Pennsylvania 2013 Standard State All-Hazard Mitigation Plan, Northampton County has one of the highest lightning risks of all counties in Pennsylvania. Both Lehigh and Northampton counties are considered vulnerable to lightning events.

**Pandemic and Infectious Disease:** Pandemic and infectious disease events can cover a wide geographical area. The exact size and extent of an infected population is dependent upon how easily the illness is spread, the mode of transmission and the amount of contact between infected and uninfected individuals. The transmission rates of pandemic illnesses are often higher in more densely populated areas. Pandemic events can also occur after other natural disasters, particularly floods, when there is the potential for bacteria to grow and contaminate water.

**Radon Exposure:** The distribution of radon is correlated with the distribution of radium (i.e.  $^{226}\text{Ra}$ ), its immediate radioactive parent, and with uranium, its original ancestor. The highest proportion of elevated values includes a zone extending from central Pennsylvania to southeast Pennsylvania that includes the entire Lehigh Valley.

**Windstorm/Tornado:** Tornadoes and windstorms can occur throughout the Lehigh Valley, though events are usually localized. The Lehigh Valley is located in Wind Zone II, which FEMA defines as having wind speeds up to 160 miles per hour. The Lehigh Valley is also located within the FEMA-defined Hurricane Susceptibility Region,

which extends along the northeastern coastline of the United States. While the extent of tornado damage is usually localized, extreme winds of this type can be among the most destructive on Earth when they move through populated, developed areas.

**Winter Storm:** Winter storms can consist of cold temperatures and heavy snow or ice. Major winter storms occur in Pennsylvania several times annually and are regional events. Every county in the Commonwealth, including Lehigh and Northampton counties, is subject to severe winter storms. Based on annual snowfall averages according to the 2013 Pennsylvania Hazard Mitigation Plan, the Lehigh Valley can expect to receive an average of 21-50 inches of snowfall accumulation during the winter season.

**Civil Disturbance/Mass Gathering:** Within the Lehigh Valley, pre-planned events such as sports gatherings, college ceremonies, and public festivals draw large numbers of individuals that are considered mass gathering events. Additionally, the location of government facilities, landmarks, prisons, colleges and universities within the region may draw the attention of protest organizations looking to voice their message and/or disrupt local operations. These facilities are generally located within the larger, more urban environments found within the cities of Allentown, Bethlehem and Easton.

**Drug Overdose Crisis:** No portion of the Lehigh Valley is immune to the current drug epidemic and the resultant deaths that have been left in its wake. Though a variety of drugs, including cocaine, ethanol, and alprazolam, have been implicated in fatal overdoses, the opioids, heroin and

fentanyl represent the overwhelming majority. The death rate has increased steadily over the last two decades. In addition to fatalities, thousands of additional individuals across the Lehigh Valley have been affected by addiction, either personally, or through family, friends and co-workers.

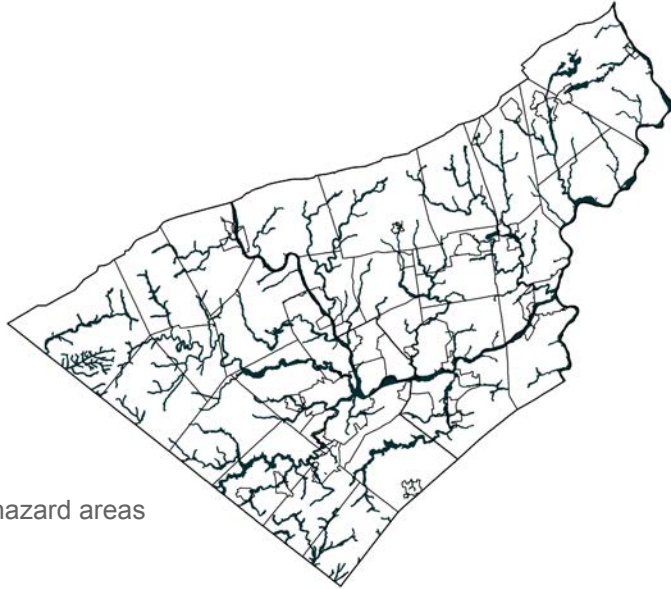
**Environmental Hazards/Explosion:** Hazardous material releases pose threats to the natural environment, the built environment and public safety through the diffusion of harmful substances, materials, or products. There are over 300 facilities identified under the Superfund Amendments and Reauthorization Act (SARA) in the Lehigh Valley, with varying degrees of exposure. Transportation of hazardous materials on highways is responsible for the greatest number of hazardous material release incidents. The Lehigh Valley contains 4,141 miles of roadways, many of which cross rivers and streams and have the potential to pollute water. Potential also exists for hazardous material releases occurring along rail lines, as collisions and derailments of train cars can result in large spills. Pipelines can also transport hazardous liquids and flammable substances such as natural gas. Incidents can occur when pipes corrode, when they are damaged during excavation, incorrectly operated or damaged by other forces. In addition, hazardous materials can be transported by aircraft or by watercraft.

**Structural Collapse:** Based upon building age, construction type, maintenance and modification, structural collapses could happen anywhere in the Lehigh Valley. In addition, incidents of structural collapse may be reported as a cascading event following another incident. For example, a water main break under a residence may cause the failure of any of the load bearing elements within a structure.

**Terrorism:** Terrorism could occur at any location at any time of day in the Lehigh Valley, depending on the terrorist's or terrorist group's agenda. Any facility is vulnerable, as terrorists have historically sent chemical or biological agents through the mail. High-risk targets include local, county, state or federal government facilities; major venues and gathering places; sites with historic, cultural or other significance; key infrastructure; etc. Damage to or disruption of operations at government facilities could have a profound impact on the Lehigh Valley's population, even if the terrorism event is relatively small-scale.

**Utility Interruption:** Utility interruptions occur throughout the Lehigh Valley, but are usually of small scale and short duration. These interruptions are often cascade events, being initiated by a variety of other hazards (winter storm, wind storm, flood, transportation crash, etc.). Interruptions are possible anywhere there is utility service. Some utility facilities are especially vulnerable, such as potable water facilities, wastewater treatment plants and substations located within the 1% annual chance floodplain (100-year). A flood of this magnitude may seriously impact any of these services.

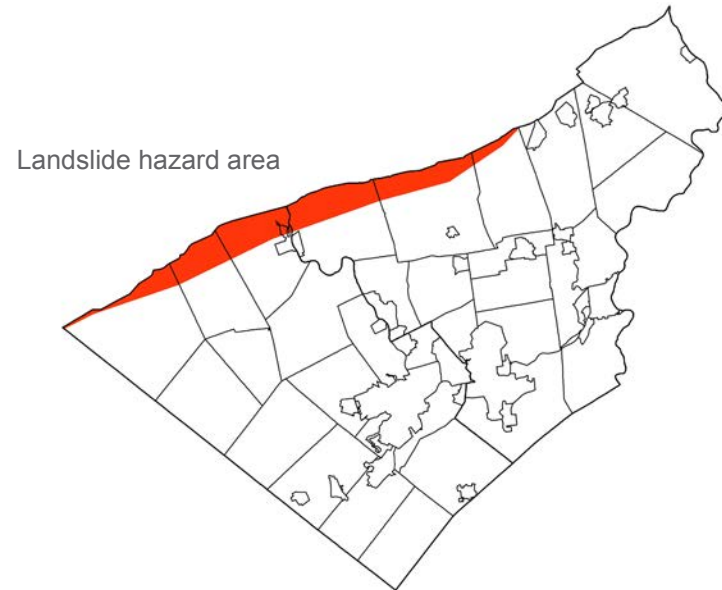




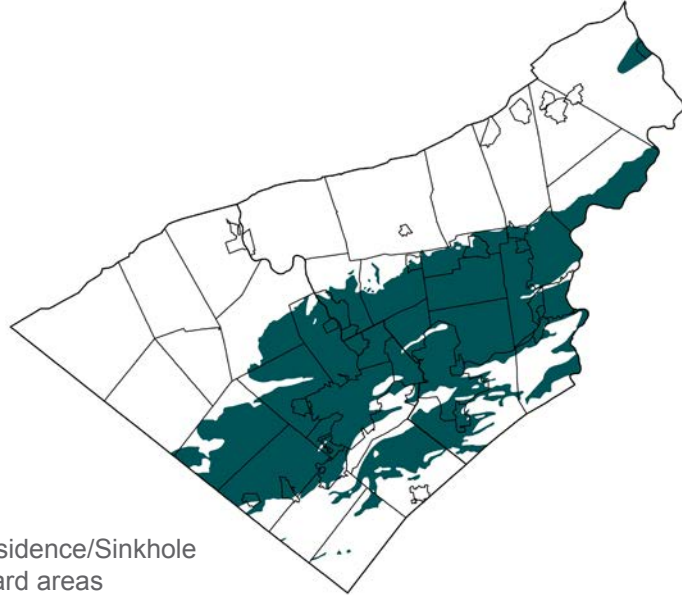
Flood hazard areas

**Flood:** Flooding in Pennsylvania is typically associated with abnormally high and intense rainfall amounts. It can also be caused by sudden snowmelt, landslides or dam failures. In Pennsylvania, flooding usually occurs in the summer; however, flooding has occurred during the winter months as well. Floodplains are found in lowland areas adjacent to rivers, streams, creeks, lakes or other bodies of water that become inundated during a flood. Several types of flooding (riverine, flash and ice jam) occur in the areas of rivers, streams and creeks found throughout the Lehigh Valley. Stormwater/urban flooding occurs in areas of ditches, storm sewers, retention ponds and other facilities constructed to store runoff. Two major rivers, the Lehigh and Delaware, are located within the Lehigh Valley, along with the tributaries of these two rivers. In Lehigh and Northampton counties, all municipalities have areas prone to flooding along streams and rivers.

**Landslide:** The entire U.S. experiences landslides, with 36 states having moderate to highly severe landslide hazards. Expansion of urban and recreational developments into hillside areas exposes more people to the threat of landslides each year. According to the United States Geological Survey, Lehigh and Northampton counties have low to high landslide potential. Rockfalls and other slope failures can occur in areas of the Lehigh Valley with moderate to steep slopes. Areas experiencing erosion, decline in vegetative cover and earthquakes are also susceptible to landslides.



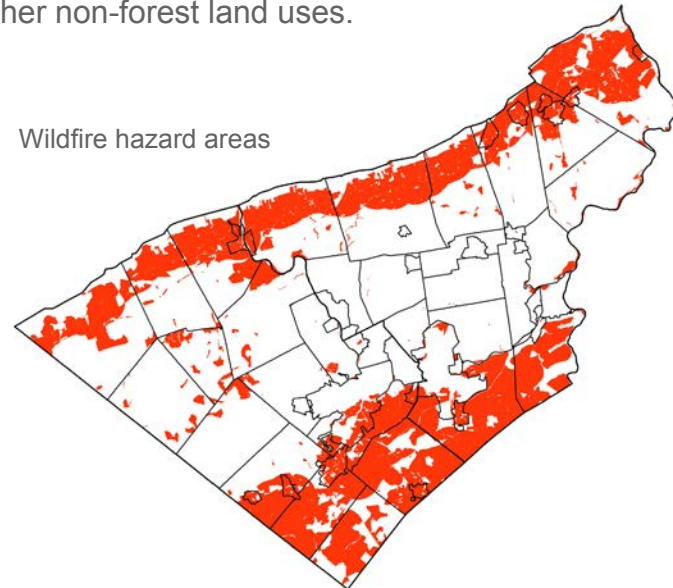
Landslide hazard area



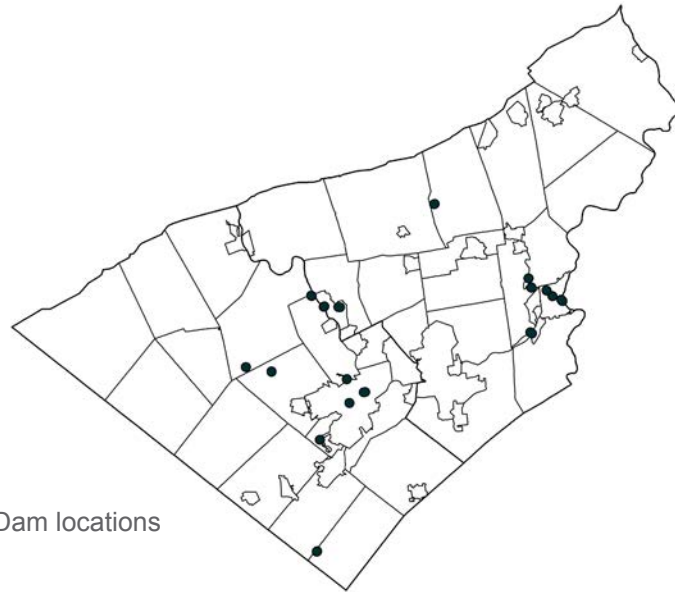
Subsidence/Sinkhole hazard areas

**Subsidence/Sinkhole:** Of the Lehigh Valley’s 62 municipalities 47 (roughly 76%) are underlain entirely or in part by carbonate bedrock. These limestone and dolomite rock formations have developed karst landforms, resulting in significant land subsidence. They underlie the heart of the Lehigh Valley’s urban core, and soils produced from their weathering also provide the area’s most fertile farmland. The Saucon Valley of Lehigh County is one of the most common sinkhole locations throughout Pennsylvania. For purposes of this Plan, the higher the percentage of carbonate bedrock in a municipality, the higher the risk for sinkhole formation.

**Wildfire:** Open fields, grass, dense brush and forest-covered areas are typical sites for wildfire events. Under dry conditions or droughts, wildfires have the potential to burn forests as well as croplands. The greatest potential for wildfires is in the spring months of March, April and May, and, to a lesser extent, the autumn months of October and November. In the spring, bare trees allow sunlight to reach the forest floor, drying fallen leaves and other ground debris. In the fall, dried leaves are also fuel for fires. The two primary areas of wildfire susceptibility in the Lehigh Valley comprise the region’s northern tier, along the Blue Mountain (bordering Schuylkill, Carbon and Monroe counties) and its southern tier, in the area of South Mountain (bordering Berks, Bucks and Montgomery counties). The lower priority areas, located in the central portion of the Lehigh Valley, have unfavorable fuels, a lack of wildland fire occurrence, a significant amount of agriculture and/or other non-forest land uses.



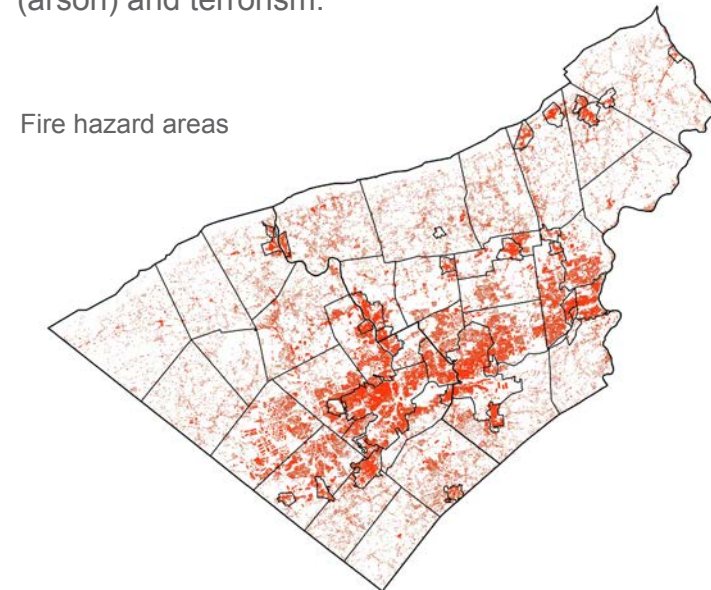
Wildfire hazard areas



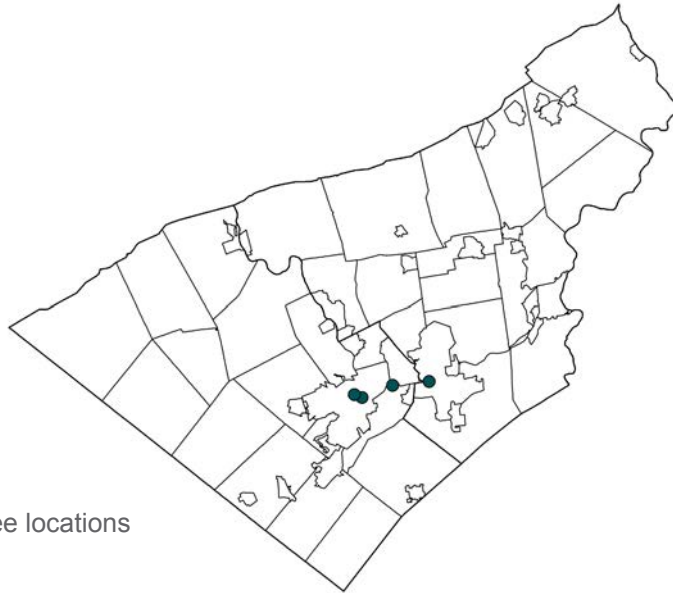
Dam locations

**Dam Failure:** Dam failures can cause serious downstream flooding either because of partial or complete dam collapse. Failures are usually associated with intense rainfall and prolonged flood conditions; however, dam breaks may occur during dry periods as a result of progressive erosion of an embankment. The greatest threat from a dam break is to areas immediately downstream. According to the Pennsylvania Department of Environmental Protection, there are 101 dams in the Lehigh Valley, eight of which are classified as high hazard dams (category 1 and 2). There are no reported dam failure events for the Lehigh Valley.

**Fire (Urban/Structural):** Urban fires occur in denser, more urbanized areas and most often occur in residential structures (US Fire Administration, 2009). Urban fires can more easily spread from building to building in these denser areas. Furthermore, urban fires are a more significant threat in the many areas with a significant proportion of buildings over 50 years of age. Roughly 45% of residential buildings in the Lehigh Valley are over 50 years old. Urban fires often begin as a result of other hazards, particularly storms, lightning strikes, drought, transportation accidents, hazardous materials releases, criminal activity (arson) and terrorism.



Fire hazard areas

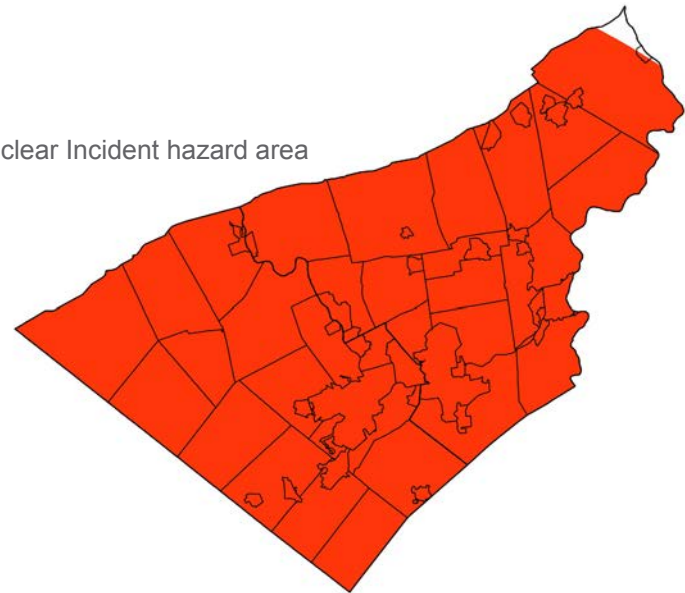


Levee locations

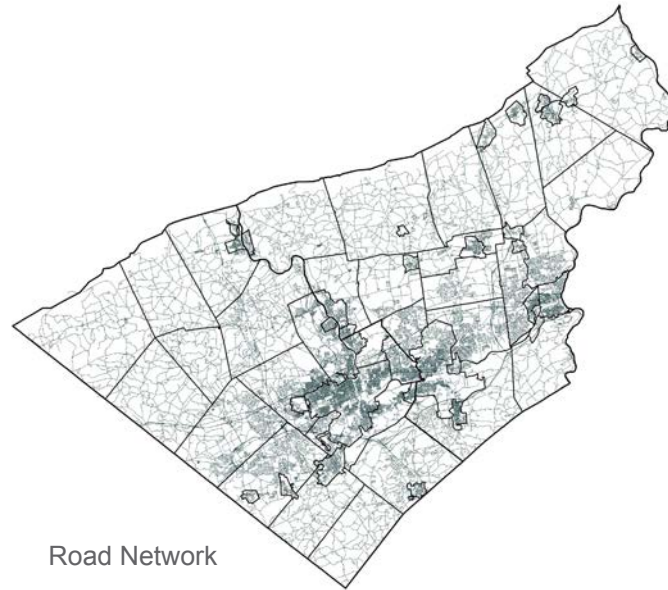
**Levee Failure:** There are four U.S. Army Corps of Engineers levees/floodwalls in the Lehigh Valley: the Allentown (Sewer Treatment Plant) Levee, the Salisbury Levee, the Allentown-Jordan Creek Floodwall, and the Bethlehem Levee System. A complete levee failure, like a dam failure, is rather infrequent overall, with no historical occurrences in the Lehigh Valley, and typically coincides with events such as heavy rainfall, storm surge, or hurricanes. In the event of a levee failure, floodwaters may ultimately inundate the protected area landward of the levee.

**Nuclear Incident:** The Limerick Generation Station (LGS) and the Susquehanna Steam Electric Station (SSES) are both located outside the Lehigh Valley, but maintain a 50-mile ingestion exposure pathway that includes the majority of the region. LGS is located in central Montgomery County, to the south of the Lehigh Valley, and SSES is located in Luzerne County to the northwest of the Lehigh Valley region. Both Lehigh and Northampton counties maintain the classification of Support County for both the LGS and SSES facilities. This classification brings along a variety of responsibilities including planning, training, exercise and facility support.

Nuclear Incident hazard area







Road Network

**Transportation Crash:** The Lehigh Valley is home to 4,141 miles of roadways, including 60 miles of interstate highway, 38 miles of freeways, 188 miles of principal arterials, 223 miles of minor arterials, and 435 miles of major collectors. Vehicular travel in the region comprises millions of passenger miles, any of which could be associated with a crash. While higher speed and higher volume routes present risks of greater consequences, any roadway in the Lehigh Valley is susceptible to this hazard.

## PAST OCCURRENCES

Historical analysis uses information on impacts and losses from previous hazard events to predict potential impacts and losses during a similar future event. This can be especially useful for weather-related hazards, such as flooding and windstorms. Because of the frequency of these events, communities are more likely to have data on impacts and losses. For recent events, consideration should be given to not only what was damaged, but what might have been damaged if the event had been of a greater magnitude or severity. For hazard events that have not occurred recently, it is useful to consider new development and infrastructure that could be vulnerable in a similar event.

A wide variety of datasets was compiled to develop a comprehensive history of hazard events in the Lehigh Valley. These included federal, state, county and local government sources, as well data compiled by universities and non-governmental organizations. Notable among these were data developed by the National Oceanic and Atmospheric Administration, the U.S. and Pennsylvania Geological Surveys, the Pennsylvania Department of Transportation, and the U.S. Department of Agriculture. In addition to the total number of occurrences, events were examined for impacts such as significant recovery costs, casualties, loss of function and substantial infrastructure damage.

For the 25 different hazards profiled in this Plan, the data documenting past occurrences is highly varied in length of record, number of events, severity of events and even the type of event recorded. For example, the Zika virus under the pandemic and infectious disease hazard has only a

three-year history as a known virus, while the earthquake hazard has the longest official record at 146 years, followed by drought at 122 years. The number of events by type of hazard also varies widely. Influenza or seasonal flu not surprisingly has by far the largest number of “events” at 34,562 over a 15-year record. These events, however, are individual cases of the flu as opposed to flu events, which might be thought of more as one long event per year to be consistent with other hazard events like hailstorm or winter storm. Hazards with no recorded events are dam failure, levee failure and nuclear incident, and pandemic and infectious diseases like Dengue Fever and Ebola virus. These hazards with no occurrence history for the Lehigh Valley are still hazards of concern due to the severity of impacts to people and property that could occur from just a single event.

For certain hazards, there are multiple types of events that are distinguished in the past occurrence data. Examples include flood and windstorms/tornadoes. For floods, flash floods and ice jams are broken out from major, widespread or riverine floods. Flash floods are associated with short, very intense rainfall events that may cause severe impacts but typically over fairly small geographic areas. About two-thirds of all flood events in the record are flash floods. Ice jam floods are winter/early spring events where the frozen surface of a river breaks apart from heavy rains and/or snowmelt, and the chunks of ice accumulate behind flow obstructions like bridges. These events occur fairly rarely and account for only about 5% of all recorded floods. Major widespread floods require longer duration rainfall over larger geographic areas and, for the Lehigh and Delaware rivers, sometimes involve multiple events like back-to-back hurricanes or their remnants.



For windstorms/tornadoes, the vast majority of events are windstorms. In both Lehigh and Northampton counties, windstorms account for about 95% of all events, with about ten tornadoes each out of over 200 events. Of course, the severity and damage potential of tornadoes makes them of particular concern.

Examples of some of the more significant hazard events that have occurred in the Lehigh Valley include:

- In 2010, a catastrophic failure of a large gas main under a row of residential structures occurred in the 500 Block of North 13th Street in the City of Allentown. The explosion took the lives of five individuals and destroyed six residential structures. The incident forced the evacuation of hundreds of residential and commercial properties, including a senior living complex on the adjoining block.
- A sinkhole caused structural damage to the northbound Route 33 Bridge over the Bushkill Creek in 2004. The Pennsylvania Department of Transportation closed the bridge and determined the bridge needed to be demolished and replaced. The southbound bridge was also replaced for a total project cost of about \$6 million. This event resulted in a disaster declaration by the Governor.

- In 2016, Pennsylvania coroners and medical examiners reported 4,642 drug-related overdose deaths. The rate of drug-related overdose deaths in Pennsylvania increased from 26.7 per 100,000 people in 2015 to 36.5 per 100,000 in 2016, far exceeding the national average (16.3 per 100,000).
- The combination of snowmelt, unseasonably warm temperatures and an additional two inches of rain, caused flash flooding of almost every small stream and significant roadway flooding in the area in January 1996. Major flooding also occurred along the larger streams and rivers in Pennsylvania. The Lehigh River at Walnutport crested 4.3 feet above flood stage. Northampton County experienced both small stream and large river flooding. Most of the significant flooding occurred along the Lehigh and Delaware rivers. The Lehigh Valley had approximately \$42.3 million in property damages.

Municipalities were provided with a Natural Hazard Event History worksheet (Worksheet #8), which identifies events that occurred in the community since the 2013 Plan. Responses are located in the municipal annexes. A complete description of the past occurrence data for all 25 hazards as prepared by Tetra Tech is included in the hazard profiles located in the Appendix.

## REPETITIVE LOSS PROPERTIES

The National Flood Insurance Program (NFIP) defines a repetitive loss property as an NFIP-insured structure that has incurred flood-related losses on two occasions exceeding \$1,000 each in any ten-year period since 1978. Repetitive loss properties can also be categorized as severe repetitive loss properties if specific criteria are met. Severe repetitive loss properties are single or multifamily residential properties that have received at least four separate claim payments (including building and contents) over \$5,000 each, and the cumulative amount of such claim payments exceeds \$20,000; or at least two separate claim payments (building payments only) have been made on the property, with the cumulative amount of the such claims exceeding the market value of the building. In both instances, at least two of the claims must be within ten years of each other, and claims made within ten days of each other will be counted as one claim.

Overall, the Lehigh Valley has 378 repetitive loss properties and 23 severe repetitive loss properties. More than two-thirds of the repetitive loss properties are in Northampton County, and all but two of the severe repetitive loss properties are also in the county. The City of Allentown has

nearly 40% of all Lehigh County repetitive loss properties followed by Lower Macungie Township at nearly 20%. Lower Mt. Bethel Township (61), City of Easton (49), Forks Township (39), Upper Mt. Bethel Township (35) and Williams Township (35) have the most repetitive loss properties in Northampton County out of a total of 266 in the county. Forks (6) and Lower Mt. Bethel (5) townships have the most severe repetitive loss properties in the county out of a total of 21.

Over \$53 million in insurance claims for flooding occurred from 1978 to 2017 for the Lehigh Valley, with over 80% for Northampton County properties. Across the region, overall losses over this period were greatest for the City of Easton followed by Lower Mt. Bethel, Forks, Williams and Upper Mt. Bethel townships, the cities of Allentown and Bethlehem and Portland Borough. Notably, property insurance claims have been submitted within all six Northampton County municipalities that border the Delaware River, and all six have repetitive loss properties.

The number of policies, claims, payments and repetitive loss properties by municipality are located in the Flood section of the Appendix. A map of repetitive loss properties is located in the Appendix.

## FUTURE OCCURRENCE

As much as planning for hazards relies on knowing their geographic location, it is equally important to assess their probability of occurrence so that communities can make informed decisions about the sustainability of future development. Probability is the likelihood of the hazard occurring in the future and can be described in a variety of ways. Probability may be defined using historical frequencies or statistical probabilities. Statistical probabilities often refer to events of a specific size or strength. For example, the likelihood of a flood event of a given size is defined by the percent chance of occurrence in a single year, such as the 1% annual chance flood. Hazard likelihood can also be compared using general descriptions or rankings. The likelihood of each hazard occurring in a given year was updated for the 2018 Plan based on the operational experience of the Lehigh and Northampton County Emergency Management Agencies.

HAZARD	LIKELIHOOD OF OCCURRENCE*
<b>Natural Hazards</b>	
Drought	Possible
Earthquake	Unlikely
Extreme Temperature	Likely
Flood	Highly Likely
Hailstorm	Possible
Invasive Species	Highly Likely
Landslide	Unlikely
Lightning Strike	Highly Likely
Pandemic and Infectious Disease	Likely
Radon Exposure	Highly Likely
Subsidence/Sinkhole	Likely
Wildfire	Possible
Windstorm/Tornado	Possible
Winter Storm	Likely
<b>Non-Natural Hazards</b>	
Civil Disturbance/Mass Gathering	Highly Likely
Dam Failure	Unlikely
Drug Overdose Crisis	Highly Likely
Environmental Hazards/Explosion	Highly Likely
Fire (Urban/Structural)	Likely
Levee Failure	Unlikely
Nuclear Incident	Unlikely
Structural Collapse	Possible
Terrorism	Unlikely
Transportation Crash	Highly Likely
Utility Interruption	Likely

\*Unlikely = less than 1% annual probability; Possible = between 1%-49.9% probability; Likely = Between 50% and 90% annual probability; Highly Likely: = Greater than 90% annual probability

# ENVIRONMENTAL IMPACTS

Beyond the built environment, it is important to assess the impacts of hazard events to the natural environment. Environmental assets and natural resources are important to community identity and quality of life. They support the economy through agriculture, tourism and recreation, and a variety of other ecosystem services, such as clean air and water. The natural environment also provides protective functions that

reduce hazard impacts and increase resiliency. For instance, wetlands and riparian areas help absorb flood waters, soils and landscaping contribute to stormwater management, and vegetation provides erosion control while reducing runoff. Conservation of environmental assets may present opportunities to meet mitigation and other community objectives, such as protecting sensitive habitat, developing parks and trails, or contributing to the economy.

	Groundwater		Surface Water		Air	Soil	Erosion	Agricultural Production	Flora & Fauna	Biodiversity & Habitat
	Volume	Quality	Volume	Quality	Quality	Quality				
<b>Natural Hazard</b>										
Drought	Yes	Potential	Yes	Potential	Potential	Potential	Yes	Yes	Yes	Potential
Earthquake	No	Potential	Potential	Potential	No	No	Potential	No	No	No
Extreme Temperature	No	No	No	No	No	No	No	Yes	Potential	No
Flood	Yes	Yes	Yes	Yes	No	Yes	Yes	Potential	Potential	Potential
Hailstorm	No	No	No	No	No	No	Potential	Yes	Potential	No
Invasive Species	No	No	No	Potential	Potential	Potential	Potential	Yes	Yes	Potential
Landslide	No	No	Potential	Potential	No	Potential	Yes	No	Potential	Potential
Lightning Strike	No	No	No	No	No	No	No	No	Potential	Potential
Pandemic & Infectious Disease	No	No	No	No	No	No	No	No	No	No
Radon Exposure	No	No	No	No	No	No	No	No	No	No
Subsidence/Sinkhole	Potential	Potential	No	No	No	No	No	Potential	Potential	No
Wildfire	No	No	Yes	Yes	No	Potential	Yes	No	Yes	Yes
Windstorm/Tornado	No	No	No	No	No	No	No	No	Potential	Potential
Winter Storm	No	No	Potential	Potential	No	No	No	No	Potential	No
<b>Non-Natural Hazard</b>										
Civil Disturbance/Mass Gathering	No	No	No	No	No	No	No	No	No	No
Dam Failure	No	No	Yes	Yes	No	Potential	Yes	No	Potential	Potential
Drug Overdose Crisis	No	No	No	No	No	No	No	No	No	No
Environmental Hazard/Explosion	No	Potential	No	Potential	Potential	Potential	No	No	Potential	Potential
Fire (Urban/Structural)	No	No	No	No	No	No	No	No	No	No
Levee Failure	No	No	Yes	Yes	No	Potential	Yes	Potential	No	No
Nuclear Incident	No	Potential	No	Yes	No	Yes	No	Yes	No	No
Structural Collapse	No	No	Potential	No	No	No	No	No	No	No
Terrorism	No	Potential	No	Potential	Potential	Potential	No	Potential	Potential	Potential
Transportation Crash	No	Potential	No	Potential	Potential	No	No	No	No	No
Utility Interruption	No	No	Potential	Potential	Potential	No	No	No	Potential	Potential

## Environmental Impacts

# COMMUNITY ASSETS

Assets can be defined as anything important to the character and function of a community and generally fall under four categories:



## People

- Concentrations of vulnerable populations (e.g., elderly, physically or mentally disabled, non-english speakers, medically or chemically dependent).
- Types of visiting populations where large numbers of people are concentrated (e.g., visitors for special events, students).



## Economy

- Major employers, primary economic sectors (e.g., agriculture) and commercial centers where losses would have a severe impact on the community.



## Built Environment

- Existing structures (e.g., concentrations of buildings that may be more vulnerable to hazards based on location, age, construction type, condition or use).
- Infrastructure systems (e.g., water and wastewater, power utilities, transportation systems, communication systems, energy pipelines and storage).
- High potential loss facilities (e.g., dams, locations housing hazardous materials, military and civil defense installations).
- Critical facilities (e.g., hospitals, medical facilities, police and fire stations, emergency operations centers, shelters, schools, airports/heliports).



## Natural Environment

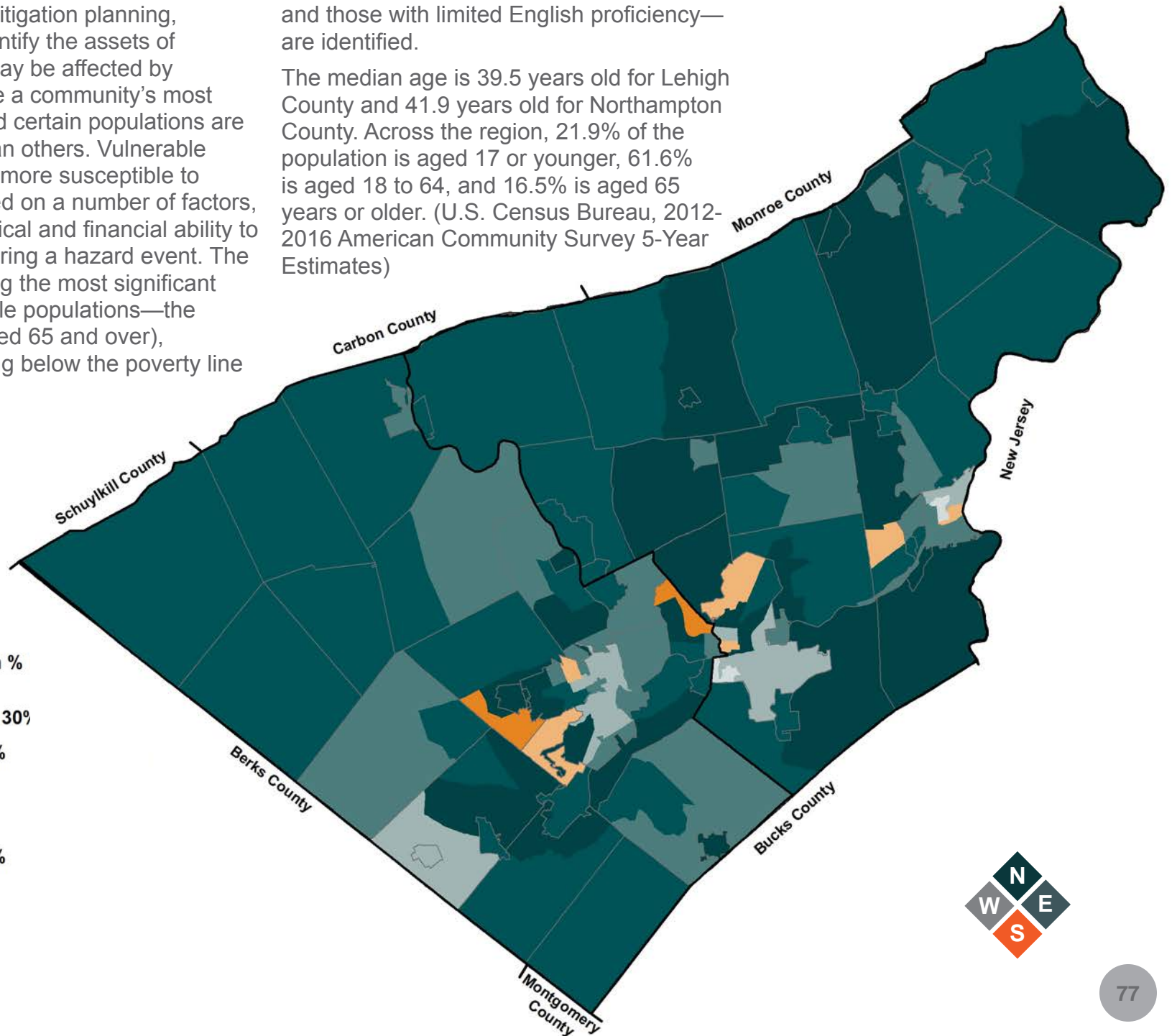
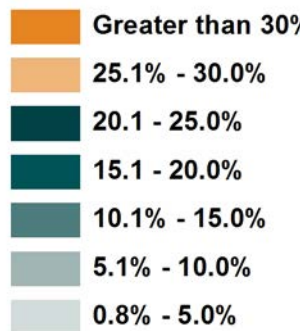
- Areas/features that can provide protective functions that reduce the magnitude of hazard events (e.g., wetlands, riparian areas).

As part of hazard mitigation planning, it is important to identify the assets of a community that may be affected by hazards. People are a community's most important asset, and certain populations are more vulnerable than others. Vulnerable populations can be more susceptible to hazard events based on a number of factors, including their physical and financial ability to react or respond during a hazard event. The municipalities having the most significant number of vulnerable populations—the elderly (persons aged 65 and over), disabled, those living below the poverty line

and those with limited English proficiency—are identified.

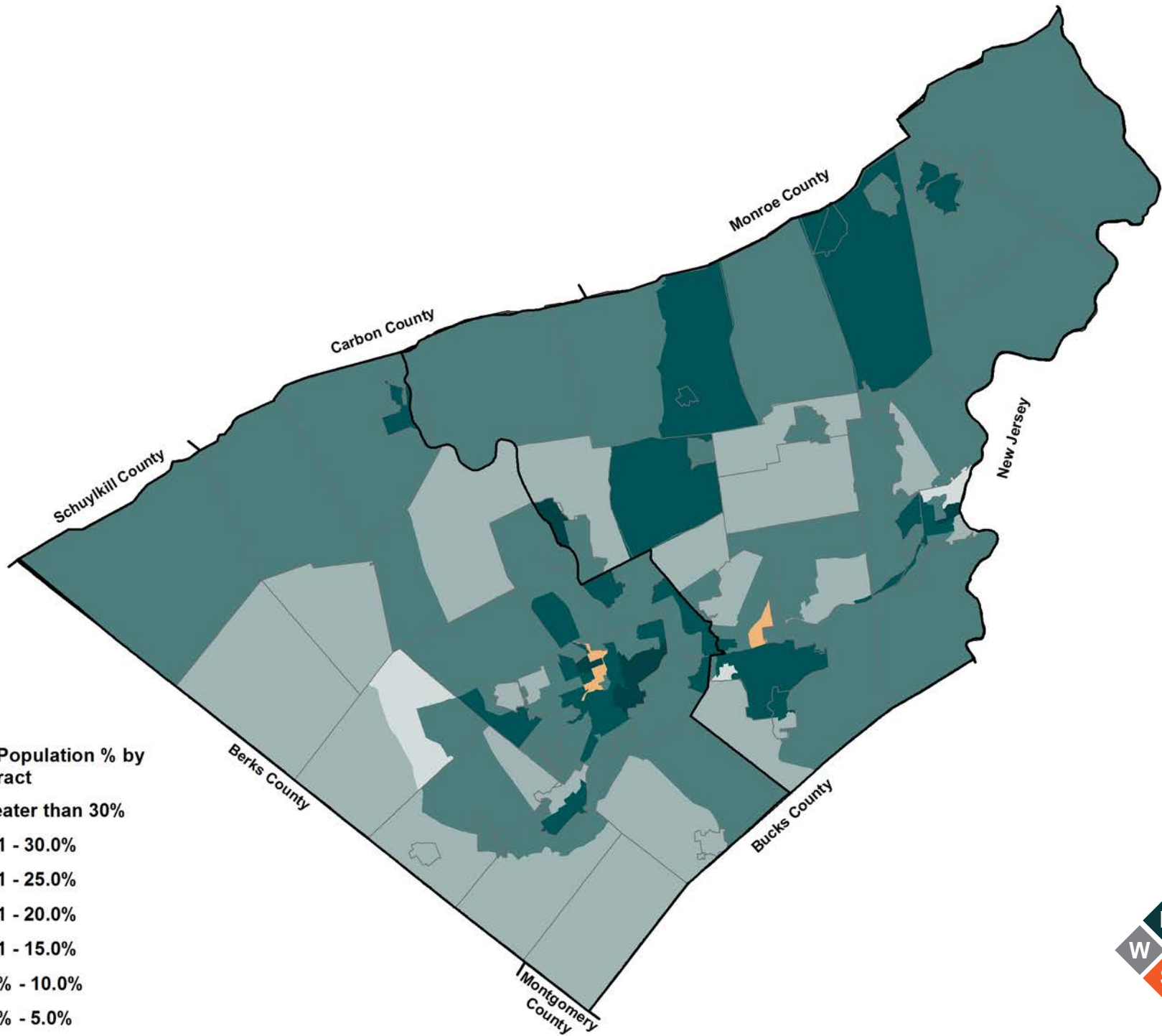
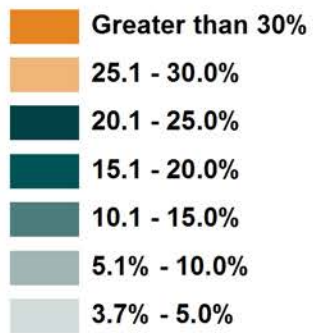
The median age is 39.5 years old for Lehigh County and 41.9 years old for Northampton County. Across the region, 21.9% of the population is aged 17 or younger, 61.6% is aged 18 to 64, and 16.5% is aged 65 years or older. (U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates)

**Age 65+ Population %  
Census Tract**

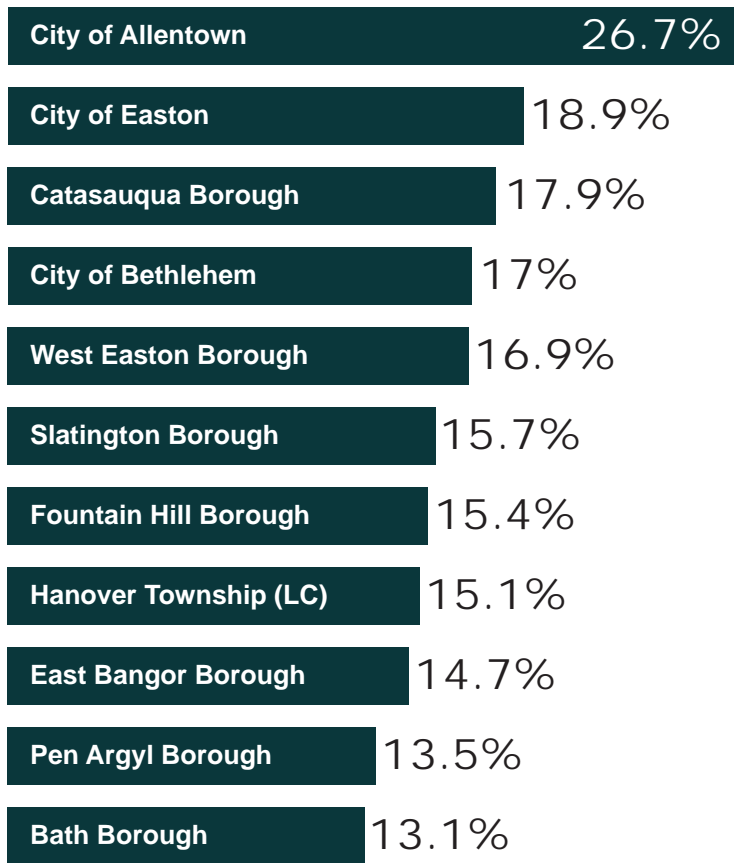




**Disabled Population % by  
Census Tract**

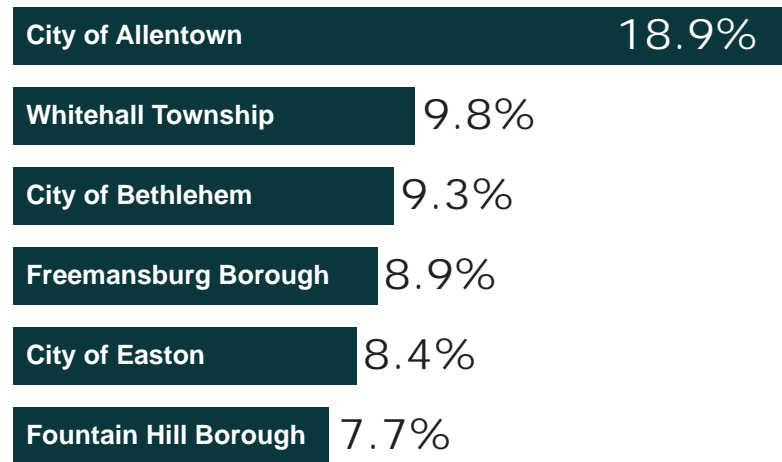


The region's three cities and many of its boroughs have poverty rates well above the countywide rates of 13.0% for Lehigh County and 9.1% for Northampton County.



**Municipalities with Highest Percentages of Residents Below Poverty Level**

Source: US Census Bureau, 2012-2016 American Community Survey 5-Year Estimates



**Municipalities with Highest Percentages of Residents Who Speak English Less Than "Very Well"**

Source: US Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

Critical facilities are those structures and institutions that must remain operational during and following a disaster event to reduce the severity of impacts and hasten recovery. As identified by the Federal Emergency Management Agency and for the purposes of this Plan, critical facilities include the following:

- Airports
- Bridges
- Communication Facilities
- Dams
- Electric Power Generation Facilities
- Emergency Medical and Rescue Services
- Emergency Operations Centers
- Fire Stations
- Government Facilities
- Medical Centers and Hospitals
- National Guard Facilities
- Natural Gas Facilities
- Police Stations
- Potable Water Facilities
- Schools
- Senior Facilities
- Shelters
- Storage Tanks
- Substations
- Transit Centers
- Wastewater Treatment Plants

A variety of locally defined critical facilities/community assets have been identified and include:

- Agricultural Processing Facilities
- Boat Launches/Water Access Points
- Cemeteries
- Commercial Facilities
- Community Organizations
- Daycare Centers
- Funeral Homes
- Golf Courses
- Industrial Facilities
- Libraries
- Lodging
- Museums
- Post Offices
- Media Organizations
- Prisons
- Public Health
- Religious Facilities
- Archives
- Stream Gages
- Veterinary Medical Facilities

The list of critical facilities from the 2013 Plan were updated for this 2018 Plan. The locations of all critical facilities have been identified in relation to hazard-prone areas, indicating those that may be compromised during a hazard event.

Lehigh County	All Critical Facilities		Flood		Landslide		Subsidence/Sinkhole		Wildfire		Nuclear Incident		All Other Hazards*	
	FEMA-Defined	Locally Defined	FEMA-Defined	Locally Defined	FEMA-Defined	Locally Defined	FEMA-Defined	Locally Defined	FEMA-Defined	Locally Defined	FEMA-Defined	Locally Defined	FEMA-Defined	Locally Defined
Alburtis Borough	10	6	10%	0%	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%
City of Allentown	212	410	20%	19%	0%	0%	94%	98%	9%	10%	100%	100%	100%	100%
City of Bethlehem	38	54	11%	11%	0%	0%	95%	100%	0%	0%	100%	100%	100%	100%
Catasauqua Borough	17	26	24%	38%	0%	0%	100%	100%	47%	31%	100%	100%	100%	100%
Coopersburg Borough	8	12	13%	0%	0%	0%	0%	0%	0%	0%	100%	100%	100%	100%
Coplay Borough	7	14	14%	7%	0%	0%	100%	100%	0%	0%	100%	100%	100%	100%
Emmaus Borough	23	41	17%	0%	0%	0%	70%	90%	70%	76%	100%	100%	100%	100%
Fountain Hill Borough	9	15	0%	0%	0%	0%	89%	93%	67%	100%	100%	100%	100%	100%
Hanover Township	15	62	0%	0%	0%	0%	100%	100%	0%	0%	100%	100%	100%	100%
Heidelberg Township	27	64	22%	9%	48%	23%	0%	0%	7%	45%	100%	100%	100%	100%
Lower Macungie Township	54	77	26%	3%	0%	0%	98%	99%	26%	18%	100%	100%	100%	100%
Lower Milford Township	16	12	0%	0%	0%	0%	13%	0%	44%	58%	100%	100%	100%	100%
Lowhill Township	13	17	77%	0%	0%	0%	0%	0%	23%	6%	100%	100%	100%	100%
Lynn Township	24	49	25%	10%	38%	6%	0%	0%	29%	55%	100%	100%	100%	100%
Macungie Borough	7	19	0%	5%	0%	0%	100%	95%	71%	95%	100%	100%	100%	100%
North Whitehall Township	35	78	23%	17%	0%	0%	23%	40%	11%	6%	100%	100%	100%	100%
Salisbury Township	53	37	4%	11%	0%	0%	49%	49%	72%	62%	100%	100%	100%	100%
Slatington Borough	19	34	16%	15%	21%	0%	0%	0%	84%	85%	100%	100%	100%	100%
South Whitehall Township	58	67	10%	3%	0%	0%	95%	84%	2%	0%	100%	100%	100%	100%
Upper Macungie Township	57	92	30%	4%	0%	0%	91%	96%	4%	0%	100%	100%	100%	100%
Upper Milford Township	21	35	14%	3%	0%	0%	19%	26%	67%	66%	100%	100%	100%	100%
Upper Saucon Township	54	69	9%	9%	0%	0%	67%	68%	67%	59%	100%	100%	100%	100%
Washington Township	46	84	22%	11%	48%	32%	0%	0%	54%	71%	100%	100%	100%	100%
Weisenberg Township	19	48	0%	2%	0%	0%	0%	0%	0%	10%	100%	100%	100%	100%
Whitehall Township	54	132	26%	13%	0%	0%	94%	96%	0%	0%	100%	100%	100%	100%
<b>Lehigh County Total</b>	<b>896</b>	<b>1,554</b>	<b>17%</b>	<b>11%</b>	<b>5%</b>	<b>3%</b>	<b>67%</b>	<b>70%</b>	<b>26%</b>	<b>25%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

\*Note: Dam failure, fire (urban/structural), levee failure and transportation crash are not included in the table because hazard locations are not defined across the entire region.

### Critical Facilities Within Hazard Areas: Lehigh County

Northampton County	All Critical Facilities		Flood		Landslide		Subsidence/Sinkhole		Wildfire		Nuclear Incident		All Other Hazards*	
	FEMA-Defined	Locally Defined	FEMA-Defined	Locally Defined	FEMA-Defined	Locally Defined	FEMA-Defined	Locally Defined	FEMA-Defined	Locally Defined	FEMA-Defined	Locally Defined	FEMA-Defined	Locally Defined
Allen Township	17	57	29%	4%	0%	0%	47%	68%	0%	0%	100%	100%	100%	100%
Bangor Borough	11	115	27%	65%	0%	0%	0%	0%	82%	76%	100%	100%	100%	100%
Bath Borough	22	54	18%	2%	0%	0%	77%	93%	0%	0%	100%	100%	100%	100%
Bethlehem Township	240	802	12%	4%	0%	0%	0%	0%	0%	0%	100%	100%	100%	100%
City of Bethlehem	81	201	7%	6%	0%	0%	0%	0%	19%	7%	100%	100%	100%	100%
Bushkill Township	37	72	24%	4%	0%	4%	0%	0%	5%	47%	100%	100%	100%	100%
Chapman Borough	1	8	0%	0%	0%	0%	0%	0%	0%	0%	100%	100%	100%	100%
East Allen Township	35	51	3%	8%	0%	0%	51%	84%	3%	2%	100%	100%	100%	100%
East Bangor Borough	6	27	33%	0%	0%	0%	0%	0%	67%	59%	50%	85%	100%	100%
City of Easton	135	524	24%	19%	0%	0%	95%	99%	0%	1%	100%	100%	100%	100%
Forks Township	39	79	10%	4%	0%	0%	90%	94%	3%	4%	100%	100%	100%	100%
Freemansburg Borough	9	31	11%	26%	0%	0%	100%	100%	0%	3%	100%	100%	100%	100%
Glendon Borough	5	10	0%	10%	0%	0%	100%	100%	0%	20%	100%	100%	100%	100%
Hanover Township	40	98	10%	2%	0%	0%	100%	99%	0%	0%	100%	100%	100%	100%
Hellertown Borough	14	118	36%	17%	0%	0%	100%	97%	93%	71%	100%	100%	100%	100%
Lehigh Township	42	270	14%	3%	29%	52%	0%	0%	33%	71%	100%	100%	100%	100%
Lower Mt. Bethel Township	31	80	55%	40%	0%	0%	65%	74%	10%	8%	100%	100%	100%	100%
Lower Nazareth Township	22	111	18%	1%	0%	0%	100%	100%	0%	0%	100%	100%	100%	100%
Lower Saucon Township	45	70	7%	7%	0%	0%	62%	74%	82%	83%	100%	100%	100%	100%
Moore Township	34	121	18%	2%	0%	12%	0%	0%	6%	31%	100%	100%	100%	100%
Nazareth Borough	28	128	4%	0%	0%	0%	75%	93%	0%	0%	100%	100%	100%	100%

\*Note: Dam failure, fire (urban/structural), levee failure and transportation crash are not included in the table because hazard locations are not defined across the entire region.

### Critical Facilities Within Hazard Areas: Northampton County

Northampton County	All Critical Facilities		Flood		Landslide		Subsidence/Sinkhole		Wildfire		Nuclear Incident		All Other Hazards*	
	FEMA-Defined	Locally Defined	FEMA-Defined	Locally Defined	FEMA-Defined	Locally Defined	FEMA-Defined	Locally Defined	FEMA-Defined	Locally Defined	FEMA-Defined	Locally Defined	FEMA-Defined	Locally Defined
North Catasauqua Borough	4	21	0%	5%	0%	0%	100%	100%	0%	0%	100%	100%	100%	100%
Northampton Borough	45	140	24%	11%	0%	0%	93%	96%	2%	0%	100%	99%	100%	100%
Palmer Township	49	171	10%	6%	0%	0%	96%	99%	0%	2%	100%	100%	100%	100%
Pen Argyl Borough	15	61	0%	2%	0%	0%	0%	0%	80%	98%	100%	100%	100%	100%
Plainfield Township	30	132	30%	4%	0%	0%	0%	2%	40%	36%	100%	100%	100%	100%
Portland Borough	7	25	29%	68%	0%	0%	100%	100%	43%	80%	0%	0%	100%	100%
Roseto Borough	10	38	0%	0%	0%	0%	0%	0%	90%	89%	100%	100%	100%	100%
Stockertown Borough	7	29	14%	7%	0%	0%	100%	93%	0%	3%	100%	100%	100%	100%
Tatamy Borough	3	19	0%	32%	0%	0%	100%	100%	0%	0%	100%	100%	100%	100%
Upper Mt. Bethel Township	135	176	22%	16%	0%	0%	7%	10%	30%	70%	4%	3%	100%	100%
Upper Nazareth Township	28	58	14%	3%	0%	0%	86%	100%	0%	0%	100%	100%	100%	100%
Walnutport Borough	10	65	0%	9%	10%	0%	0%	0%	90%	89%	100%	100%	100%	100%
Washington Township	23	71	17%	7%	0%	0%	0%	0%	52%	75%	100%	100%	100%	100%
West Easton Borough	6	23	33%	26%	0%	0%	100%	100%	0%	0%	100%	100%	100%	100%
Williams Township	36	78	14%	4%	0%	0%	56%	60%	44%	32%	100%	100%	100%	100%
Wilson Borough	34	101	0%	2%	0%	0%	97%	100%	3%	0%	100%	100%	100%	100%
Wind Gap Borough	11	76	9%	3%	0%	0%	0%	0%	91%	104%	100%	100%	100%	100%
<b>Northampton County Total</b>	<b>1,347</b>	<b>4,311</b>	<b>15%</b>	<b>10%</b>	<b>1%</b>	<b>4%</b>	<b>64%</b>	<b>68%</b>	<b>19%</b>	<b>25%</b>	<b>90%</b>	<b>95%</b>	<b>100%</b>	<b>100%</b>
<b>Lehigh Valley</b>	<b>2,243</b>	<b>5,865</b>	<b>16%</b>	<b>10%</b>	<b>3%</b>	<b>3%</b>	<b>65%</b>	<b>68%</b>	<b>22%</b>	<b>25%</b>	<b>94%</b>	<b>97%</b>	<b>100%</b>	<b>100%</b>

\*Note: Dam failure, fire (urban/structural), levee failure and transportation crash are not included in the table because hazard locations are not defined across the entire region.

### Critical Facilities Within Hazard Areas: Northampton County

For the 2018 Plan, municipalities were requested to provide an updated inventory of their assets (Community Assets Survey—

Worksheet #4). Responses to the survey are included in the municipal annexes.



## FUTURE DEVELOPMENT AND VULNERABILITY

Changes in population, growth and development may affect the future hazard vulnerability of a community. As discussed in The Region section, the Lehigh Valley's population is projected to increase 25.6% from 2010-2040, which is almost on par with the growth rate for the area from 1980-2010 (30%). With the exception of Chapman Borough, all municipalities are projected to see an increase in population through 2040. With the increases in population, these municipalities face increased vulnerability to hazards.

Since the Lehigh Valley's rebound from the 2008 recession, the region has seen a resurgence in development, including housing dominated by new apartment buildings and warehousing due to the rapid expansion of e-commerce. The three cities have been experiencing growth through redevelopment as revitalization efforts occur. Suburban townships adjacent to the cities have also experienced a significant amount of development as have rural townships. These trends are expected to continue.

The LVPC maintains a regional comprehensive plan, which at the time of this Plan is in the process of being updated. The comprehensive plan recommends the preservation of farmland, natural resources, parks and open space in the Lehigh Valley, and provides recommendations related to land use, transportation, community utilities, stormwater management and housing, in an effort to improve community resiliency and sustainability. With farmland and prime land areas rapidly disappearing due to growth, more development may occur in less suitable areas that may

result in increased vulnerability to hazards. The LVPC will be working with a number of municipalities in the region to develop multi-municipal comprehensive plans that can incorporate specific recommendations related to hazard mitigation planning to reduce future vulnerability.

The vulnerability of future growth and development to each hazard is provided in the hazard profiles in the Appendix.

Known or anticipated future development was identified at the local level (Worksheet #6) and includes the identification of known hazard risks and risk zones. Responses to the worksheet are located in the municipal annexes.

Other conditions, such as climate change, may affect the future vulnerability of the region. Climate change in and of itself may not be a hazard, but it may change the characteristics of hazards of concern in the region. In May 2015, the Commonwealth prepared the Pennsylvania Climate Impacts Assessment Update, which reports on the potential impacts of climate change in the state. The report provides:

- scientific predictions regarding changes in temperature and precipitation in Pennsylvania;
- potential impact of climate change on human health, the economy and other sectors; and
- economic opportunities created by potential need for alternative sources of energy and climate related technologies.

Potential impacts due to climate change are identified in the hazard profiles included in the Appendix.

## POTENTIAL LOSS ESTIMATES

Exposure analysis quantifies the number, type and value of structures located in identified hazard areas, as well as assets exposed to multiple hazards. It can also be used to quantify the number of future structures and infrastructure possible in hazard prone areas. As a general rule, the exposure of structures is related to the location and size of the given hazard area. Exposure is not the same as actual losses. Only a fraction of exposed structures will receive damage from various events. By contrast, estimated damages represent the expected losses for an event affecting the entire extent of the geographic area (municipality, county or region).

Potential future losses associated with the flood, wind and earthquake hazards are generated using the FEMA HAZUS-MH 4.0 software. For the 1% annual chance flood, the potential damage to structures in Lehigh County is estimated to be \$401 million and \$440 million in Northampton County. The 1% annual chance wind event would create about 1% of the losses experienced in Lehigh County from the 1% annual chance flood, but about 5% of the losses in Northampton County. Losses for earthquake are estimated for the 0.2% and 0.04% annual chance events (500-year and 2,500-year return periods, respectively), with the latter resulting in nearly \$2.5 billion in potential losses across the Lehigh Valley. Obviously, these events have only a slight chance of occurrence in any given year. The City of Allentown has by far the largest potential loss estimate for the 1% annual chance flood event at \$190 million, or nearly half of all Lehigh County losses. In Northampton County, the City of Easton has the largest potential loss estimate for the 1% annual chance flood event at \$92 million, which is about one-fifth of the total county losses.

## Displaced Persons and Sheltering Needs

During a hazard event, it is likely that a number of persons will become displaced. It is expected that a portion of the displaced population, unable to relocate on their own, will require shelter. While any hazard has the potential to displace persons, earthquakes and floods have a pronounced potential to force significant portions of the population to seek refuge. For these two hazards, HAZUS-MH (a software suite developed by Federal Emergency Management Agency) generates displacement and sheltering estimates based on data such as demographics, building stock and topography. If an earthquake were to affect the entire region, a 500-year event would be expected to displace 162 individuals, of which 103 would require shelter. This climbs to 1,932 displaced persons and 1,242 persons requiring shelter in the event of a 2,500-year earthquake. Regionwide inundation of the FEMA-designated Special Flood Hazard Areas (1% annual chance flood) would result in higher numbers. Such an event would result in an estimated displacement of 32,121 people of which 6,799 would need to be sheltered.

## Debris

Certain hazard events are also likely to result in the creation of rubble and other refuse materials. To account for this, HAZUS-MH generates debris estimates for earthquakes (500-year and 2,500-year events), floods (1% annual chance) and windstorms (100-year and 500-year). Major earthquakes, though rare occurrences, produce the highest volume of debris (brick, wood, concrete and steel) of all of the identified hazards. Across the region, earthquake debris estimates are roughly 90,000 tons for the 500-year event and 579,000 tons for the 2,500-year event. Windstorms are estimated to generate 5,700 tons and 41,000 tons of

debris (brick, wood and trees) for the 100-year and 500-year events, respectively, were a storm to affect the entire Lehigh Valley. HAZUS-MH defines flood debris by its source (finish, structure and foundation) rather than its material composition. Combined from these sources, if a 1% annual chance flood were to take place in all of the region's floodplains, roughly 40,000 tons of debris is expected.

## RISK RANKING RESULTS

A comprehensive range of natural and non-natural hazards that pose significant risk to the Lehigh Valley were selected and considered in this 2018 Plan. However, it is recognized that the communities in the Lehigh Valley have differing levels of exposure and vulnerability to each of these hazards. It is important for each community participating in this Plan to recognize those hazards that pose the greatest risk to their community and direct their attention and resources accordingly to most effectively and efficiently manage risk.

To this end, a relative hazard risk ranking process was conducted for the Lehigh Valley using the Risk Factor (RF) methodology identified in Section 5 and Appendix 9 of the Pennsylvania All-Hazard Mitigation Planning Standard Operating Guide (October 2013). The guidance states:

The Risk Factor approach produces numerical values that allow identified hazards to be ranked against one another (the higher the Risk Factor value, the greater the hazard risk). Risk Factor values are obtained by assigning varying degrees of risk to five categories for each hazard: probability, impact, spatial extent, warning time and duration.

To calculate the Risk Factor value for a given hazard, the assigned risk value for each category is multiplied by the weighting factor. The sum of all five categories equals the final Risk Factor value:

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

Hazards identified as high risk have Risk Factors greater than or equal to 2.5, with moderate risk hazards ranging from 2.0 to 2.4 and low risk hazards below 2.0.

The State Guide identifies five risk assessment categories, the criteria and associated risk level indices used to quantify their risk, and the weighting factor (weight value) applied to each risk assessment category.

Risk Assessment Category	Degree of Risk			Weight Value
	Level	Criteria	Index	
<b>Probability:</b> What is the likelihood of a hazard event occurring in a given year?	Unlikely	Less than 1% annual probability	1	30%
	Possible	Between 1% and 49.9% annual probability	2	
	Likely	Between 50% and 90% annual probability	3	
	Highly Likely	Greater than 90% annual probability	4	
<b>Impact:</b> In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?	Minor	Very few injuries, if any. Only minor property damage and minimal disruption on quality of life. Temporary shutdown of critical facilities	1	30%
	Limited	Minor injuries. 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 a week.	3	
	Catastrophic	High number of deaths/injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for 30 days or more.	4	
<b>Spatial Extent:</b> How large of an area could be impacted by a hazard event? Are impacts localized or regional?	Negligible	Less than 1% of area affected	1	20%
	Small	Between 1% and 10.9% of area affected	2	
	Moderate	Between 11% and 25% of area affected	3	
	Large	Greater than 25% of area affected	4	
<b>Warning Time:</b> Is there usually some lead time associated with the hazard event? Have warning measures been implemented?	More than 24 hours	Self-Defined	1	10%
	12 to 24 hours	Self-Defined	2	
	6 to 12 hours	Self-Defined	3	
	Less than 6 hours	Self-Defined	4	
<b>Duration:</b> How long does the hazard event usually last?	Less than 6 hours	Self-Defined	1	10%
	Less than 24 hours	Self-Defined	2	
	Less than 1 week	Self-Defined	3	
	More than 1 week	Self-Defined	4	

### Summary of Risk Factor (RF) Criteria

In determining the hazard Risk Factors for Lehigh and Northampton counties, the objectives were to assess the main risk areas and their likely impact on the counties, including its people, natural areas, buildings and infrastructure. Each of the hazard risks was analyzed using the established criteria for the likelihood and consequences for the overall Risk Factor rating. Both Lehigh and Northampton County Emergency Management Agencies believe the overall risk rating system needs to be adjusted to measure the true variables from the Lehigh Valley operational standpoint and situations. In analyzing the relationships of the hazards and the elements of risk anticipated, the Lehigh Valley Risk Factors, as developed by the counties, best reflect the activity incurred since 2013 and the last Hazard Mitigation Plan update. By looking at this from an operational viewpoint, the plan is adaptable to

both the anticipated and unexpected hazards in the region's communities, in essence, personalizing the Plan for the Lehigh Valley. Please note each hazard profile included in the Appendix summarizes the probability of occurrence as calculated by the previous events identified and may differ from the probability defined by the County Emergency Management Agencies.

A hazard risk assessment result for the entire region does not mean that each municipality is at the same amount of risk to each hazard. An evaluation of the regionwide Risk Factors was completed for each municipality to determine whether their risk is greater than (>), less than (<) or equal to (=) the Risk Factor assigned to the Lehigh Valley as a whole for each hazard. The municipal risk ranking is located in the Appendix.

		RISK ASSESSMENT CATEGORY					
Hazard Risk	Natural Hazards	Probability	Impact	Spatial Extent	Warning Time	Duration	Risk Factor (RF)
HIGH	Extreme Temperature	3	3	3	1	3	2.8
	Flood	4	2	2	3	3	2.8
	Winter Storm	3	2	4	2	2	2.7
	Windstorm/Tornado	2	3	3	3	2	2.6
	Invasive Species	4	1	3	1	4	2.6
	Drought	2	2	4	1	4	2.5
MODERATE	Pandemic and Infectious Disease	3	2	2	1	4	2.4
	Radon Exposure	4	1	2	1	4	2.4
	Subsidence/Sinkhole	3	2	1	4	1	2.2
	Wildfire	2	2	2	3	2	2.1
	Lightning Strike	4	1	1	3	1	2.1
LOW	Earthquake	1	1	4	4	1	1.9
	Hailstorm	2	1	2	3	1	1.7
	Landslide	1	1	1	4	1	1.3

		RISK ASSESSMENT CATEGORY					
Hazard Risk	Non-Natural Hazards	Probability	Impact	Spatial Extent	Warning Time	Duration	Risk Factor (RF)
HIGH	Environmental Hazards/ Explosion	4	2	2	4	2	2.8
	Utility Interruption	3	1	3	4	3	2.5
	Drug Overdose Crisis	4	2	1	1	4	2.5
MODERATE	Fire (Urban/Structural)	3	2	1	4	2	2.3
	Transportation Crash	4	1	1	4	1	2.2
	Structural Collapse	2	3	1	4	1	2.2
	Civil Disturbance/ Mass Gathering	4	1	1	2	2	2.1
	Dam Failure	1	3	2	4	1	2.1
	Levee Failure	1	3	2	4	1	2.1
	Terrorism	1	3	1	4	2	2.0
LOW	Nuclear Incident	1	1	2	4	1	1.5



## WHAT'S NEW FOR 2018

- Changes to this section are largely of an organizational nature. The profiles, vulnerability assessments and methodology used to develop loss estimates for each hazard, as well as those for the three hazards previously not included in the Lehigh Valley's Hazard Mitigation Plan (Drug Overdose Crisis, Invasive Species and Pandemic and Infectious Disease), have been retained in their full forms as created by Tetra Tech in the Appendix. These reflect the content of the previous version of the Plan, with updates to underlying statistics and calculations. Changes made since the 2013 Plan are fully detailed in the full form versions in the Appendix.
- The risk ranking methodology used for the 2018 Plan is based on the Lehigh and Northampton County Emergency Management Agencies' operational experience. The overall hazard risk has changed since the 2013 Plan for the following hazards:
  - Structural Collapse (from low to moderate)
  - Drought (from moderate to high)
  - Extreme Temperature (from moderate to high)
  - Fire: Urban/Structural (from high to moderate)
  - Hailstorm (from moderate to low)
  - Levee Failure (from high to moderate)
  - Subsidence/Sinkhole (from low to moderate)
  - Terrorism (from low to moderate)
  - Windstorm/Tornado (from moderate to high )
- Risk rankings for each municipality compared to the regional ranking have been updated.
- Building stock, critical facilities and repetitive loss properties have been updated.





# CAPABILITY ASSESSMENT

The purpose of a capability assessment is to evaluate the capabilities and resources that are already in place at the municipal, county, state and federal levels to reduce hazard risk and identify where improvements can be made to increase disaster resistance in a community. The primary types of capabilities for reducing long-term vulnerability through mitigation planning include: 1) Planning and Regulatory, 2) Administrative and Technical, 3) Financial, and 4) Education and Outreach. This section describes and summarizes the capabilities of the various levels of government serving the residents of the Lehigh Valley.

## Primary types of capabilities for reducing long-term vulnerability through mitigation planning:



Planning and Regulatory



Administrative and Technical



Financial



Education and Outreach



## PLANNING AND REGULATORY

While municipalities in Pennsylvania must comply with the minimum regulatory requirements established under the Pennsylvania Municipalities Planning Code (MPC)—Act 247 of 1968, as reauthorized and amended—they otherwise have considerable latitude in adopting ordinances, policies and programs that can support their ability to manage natural and non-natural hazard risk. Specifically, municipalities can manage these risks through comprehensive land use planning, zoning ordinances, subdivision and land development ordinances, hazard-specific ordinances (e.g., floodplain management, sinkholes, steep slopes), and building codes. For the 2018 Plan, the sample planning and regulatory capability survey, as provided in the Pennsylvania Standard Operating Guide, was revised to request whether the jurisdiction’s response for each

capability category represented a change since the 2013 Plan, if the 2013 Plan findings have been incorporated into the regulatory tool or program, and how the tool or program can be expanded or improved to reduce risk. Several municipalities identified adoption of new plans and ordinances since the 2013 Plan. However, the majority of municipalities did not identify whether hazard mitigation planning was integrated into the tool/program or how capabilities could be improved.

Municipal and county responses to the survey can be found in their municipal annexes. It is noted that both counties, and many of the municipalities, have identified specific mitigation initiatives in the 2018 Plan to help build and enhance mitigation-related planning and regulatory capabilities in the Lehigh Valley.

Lehigh County	Comprehensive Plan	Capital Improvement Plan	Economic Development Plan	Continuity of Operations Plan	Open Space Management Plan (or Parks/Rec or Greenways)	Natural Resources Protection Plan	Transportation Plan	Historic Preservation Plan	Farmland Preservation	Evacuation Plan	Disaster Recovery Plan	Emergency Operations Plan	Subdivision and Land Development Ordinance	Zoning Regulations	Building Code	Fire Code
Alburtis Borough	Yes	No	Yes	No	No	No	No	Yes	No	No	No	Yes	Yes	Yes	Yes	No
Allentown City	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	U/D	Yes	Yes	Yes	Yes	Yes
Bethlehem City	Yes	Yes	Yes	U/D	Yes	U/D	U/D	Yes	No	U/D	U/D	Yes	Yes	Yes	Yes	Yes
Catasauqua Borough	Yes	No	No	U/D	No	No	No	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes
Coopersburg Borough	Yes	U/D	No	No	No	No	No	U/D	No	U/D	No	Yes	Yes	Yes	Yes	Yes
Coplay Borough	Yes	No	No	No	Yes	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Emmaus Borough	Yes	No	No	No	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Fountain Hill Borough	Yes	No	No	No	Yes	Yes	No	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes
Hanover Township	Yes	Yes	No	No	No	No	No	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes
Heidelberg Township	Yes	No	No	No	No	No	No	No	Yes	No	No	Yes	Yes	Yes	Yes	No
Lower Macungie Township	Yes	Yes	No	No	Yes	Yes	Yes	U/D	Yes	No	No	Yes	Yes	Yes	Yes	Yes
Lower Milford Township	Yes	U/D	No	U/D	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes
Lowhill Township	Yes	Yes	No	No	Yes	No	No	No	Yes	No	No	Yes	Yes	Yes	Yes	No
Lynn Township	Yes	No	No	No	Yes	No	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Macungie Borough	Yes	No	No	No	Yes	No	No	No	No	No	No	Yes	Yes	Yes	Yes	No
North Whitehall Township	Yes	No	No	No	Yes	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Salisbury Township	Yes	No	No	No	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Slatington Borough	Yes	No	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes-County	Yes	Yes	Yes
South Whitehall Township	Yes	No	No	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Upper Macungie Township	Yes	No	No	Yes	Yes	No	No	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Upper Milford Township	Yes	No	No	No	Yes	Yes	No	No	Yes	No	No	Yes	Yes	Yes	Yes	No
Upper Saucon Township	Yes	Yes	No	Yes	Yes	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Washington Township	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	U/D	U/D	Yes	Yes	Yes	Yes	No
Weisenberg Township	Yes	Yes	No	No	Yes	No	No	No	Yes	No	No	Yes	Yes	Yes	Yes	No
Whitehall Township	Yes	Yes	No	U/D	Yes	U/D	No	No	U/D	Yes	U/D	Yes	Yes	Yes	Yes	Yes

U/D: Under Development

### Planning and Regulatory Table: Lehigh County



Northampton County	Comprehensive Plan	Capital Improvement Plan	Economic Development Plan	Continuity of Operations Plan	Open Space Management Plan (or Parks/Rec or Greenways)	Natural Resources Protection Plan	Transportation Plan	Historic Preservation Plan	Farmland Preservation	Evacuation Plan	Disaster Recovery Plan	Emergency Operations Plan	Subdivision and Land Development Ordinance	Zoning Regulations	Building Code	Fire Code
Allen Township	Yes	U/D	No	No	U/D	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Bangor Borough	Yes	No	No	No	Yes	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Bath Borough	Yes	Yes	No	No	No	No	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Bethlehem Township	Yes	No	No	No	Yes	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Bushkill Township	Yes	No	No	No	Yes	No	No	No	No	No	No	Yes	Yes	Yes	Yes	No
Chapman Borough	Yes	No	No	Yes	No	No	No	No	No	Yes	No	Yes	Yes-County	No	Yes	No
East Allen Township	Yes	Yes	No	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
East Bangor Borough	Yes	No	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	No
Easton City	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Forks Township	Yes	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Freemansburg Borough	Yes	No	No	No	Yes	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Glendon Borough	No	U/D	U/D	U/D	Yes	Yes	No	No	No	U/D	U/D	Yes	Yes-County	Yes	Yes	Yes
Hanover Township	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Hellertown Borough	Yes	No	No	No	Yes	No	Yes	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Lehigh Township	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	No
Lower Mt. Bethel Township	Yes	U/D	No	No	Yes	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes
Lower Nazareth Township	Yes	No	No	No	No	No	Yes	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes
Lower Saucon Township	Yes	No	No	No	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes	Yes	No
Moore Township	Yes	Yes	No	No	Yes	No	No	U/D	Yes	No	No	Yes	Yes	Yes	Yes	No
Nazareth Borough	Yes	No	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
North Catasauqua Borough	No	No	No	Yes	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Northampton Borough	Yes	No	No	No	U/D	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Palmer Township	Yes	No	No	No	Yes	No	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	No
Pen Argyl Borough	Yes	No	No	No	No	No	No	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes
Plainfield Township	Yes	U/D	No	No	Yes	No	No	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes

U/D: Under Development

**Planning and Regulatory Table: Northampton County**

Northampton County	Comprehensive Plan	Capital Improvement Plan	Economic Development Plan	Continuity of Operations Plan	Open Space Management Plan (or Parks/Rec or Greenways)	Natural Resources Protection Plan	Transportation Plan	Historic Preservation Plan	Farmland Preservation	Evacuation Plan	Disaster Recovery Plan	Emergency Operations Plan	Subdivision and Land Development Ordinance	Zoning Regulations	Building Code	Fire Code
Portland Borough	Yes	No	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Roseto Borough	Yes											Yes	Yes	Yes		
Stockertown Borough	Yes	No	No	No	U/D	U/D	No	No	No	U/D	U/D	Yes	Yes	Yes	Yes	Yes
Tatamy Borough	Yes	No	No	No	Yes	No	No	No	No	Yes	No	Yes	Yes	Yes	Yes	No
Upper Mt. Bethel Township	Yes	No	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Upper Nazareth Township	Yes	No	No	No	U/D	No	U/D	No	No	Yes	No	Yes	Yes	Yes	Yes	No
Walnutport Borough	Yes	No	No	No	Yes	No		No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Washington Township	Yes	No	No	No	Yes	No	No	No	Yes	No	No	Yes	Yes	Yes	Yes	No
West Easton Borough	U/D	U/D	U/D	U/D	Yes	U/D	U/D	U/D	U/D	U/D	U/D	Yes	Yes-County	Yes	Yes	Yes
Williams Township	Yes	Yes	No	No	Yes	Yes	No	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes
Wilson Borough	Yes	No	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Wind Gap Borough	Yes	No	No	No	Yes	No	No	No	No	No	No	Yes	Yes	Yes	Yes	No

U/D: Under Development

### Planning and Regulatory Table: Northampton County

## Comprehensive Plan

Comprehensive plans promote sound land use and regional cooperation among local governments to address planning issues. A comprehensive plan is a policy document that states objectives and guides the future growth and physical development of a municipality. With regard to hazard mitigation planning, the MPC requires comprehensive plans to include a plan for land use, which, among other provisions, suggests that the plan give consideration to floodplains and other areas of special hazards and other similar uses. The MPC also requires comprehensive plans to include a plan for community facilities and services, and recommends giving consideration to storm drainage and floodplain management.

Pennsylvania's MPC requires counties to prepare and maintain a county comprehensive plan and to update it every ten years. While county governments are required by law to adopt a comprehensive plan, local municipalities (or groups of municipalities) may do so at their option. In the Lehigh Valley, only the boroughs of Glendon, North Catasauqua and West Easton have not adopted their own plans, however, West Easton indicated a comprehensive plan is under development. As is the case in the Lehigh Valley, counties may opt to have the comprehensive planning done on a multi-county, regional basis. Planning on the regional level allows for the coordination and cooperation of 62 municipalities, which translates to shared objectives and actions among all entities.

Lehigh and Northampton counties adopted a regional comprehensive plan in June 2005 titled *Comprehensive Plan The Lehigh Valley...2030*, which was prepared by the LVPC. The regional comprehensive plan is the official and legal strategy guiding the growth, development, redevelopment and preservation of the assets of the Lehigh Valley, including streams and floodplains, riparian buffers, wetlands, important natural areas, steep slopes and woodlands. The county plan recommends that new growth not be located in areas recommended for natural resource or farmland protection. Higher density residential growth, industrial and business expansion should occur in the recommended urban areas. Areas recommended for rural development should be planned for low density and low intensity uses. The regional comprehensive plan is inextricably tied to the *Long-Range Transportation Plan* and the *Transportation Improvement Plan*, guiding public funding for infrastructure projects that are supportive of land use goals and recommendations. Many of these improvements are in line with the

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**Comprehensive plans promote sound land use and regional cooperation among local governments to address planning issues. A comprehensive plan is a policy document that states objectives and guides the future growth and physical development of a municipality.**

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hazard mitigation actions in this plan. The goals in all of these plans reinforce the stated goals in this Hazard Mitigation Plan. Consistent reinforcement of good planning policy demonstrates a region that is unified in its broader goal of protecting the public health, safety and welfare. The Lehigh Valley has a variety of plans that address many mitigation strategies for a number of hazards, however, there is an opportunity to continue to expand actionable items, as well as knowledge of the existing work performed.

*FutureLV*, an update to the regional comprehensive plan

is underway at the time of this 2018 Plan and is further discussed in the Plan Integration section. A major aspect of the Comprehensive Plan update is the integration with the *MoveLV Long-Range Transportation Plan* (see MoveLV discussion later in this section). A variety of additional studies and plans have been prepared by the Lehigh Valley Planning Commission that will influence the Comprehensive Plan update:

■ **One Lehigh Valley (2014)** – Planning for the region’s continued success, stability and resiliency, a 14-member regional alliance, the Lehigh Valley Sustainability Consortium, embarked on a nearly three-year effort to plan for a sustainable Lehigh Valley. The Consortium partners, including the LVPC, organized ten plans and projects around four themes: Economy, Environment, Transportation and Livable Communities. The LVPC assessed each of the Consortium partner’s plans and projects and assembled a series of 31 goals intended to serve as an update to the regional comprehensive plan.

■ **Climate and Energy Element (2014)** – The *Climate and Energy Element* was created as part of the *One Lehigh Valley* planning effort. The report identifies goals, policies and strategies to incorporate into the regional comprehensive plan update, including those to lessen the impacts of hazards. Public participation was an important component of preparing the report, with climate change and energy issues being the subject of public meetings June 19, 2014 in Easton, and June 26 and July 17, 2014 at the LVPC offices.

■ **One Water (County Planning Directors Association of Pennsylvania 2016)** – The Pennsylvania MPC stipulates that comprehensive plans shall include a plan for the reliable supply of water, considering current and future water resources

availability, uses and limitations, including provisions necessary to protect water supply sources. The County Planning Directors Association of Pennsylvania formed a task force to expand the understanding and implementation of Integrated Water Resources Management as a method for Pennsylvania counties and local governments to better address complex water resources and land planning issues. The Task Force reviewed an extensive body of information available from across the Commonwealth and the nation and prepared recommended actions to expand the implementation of Integrated Water Resources Management in Pennsylvania.

■ **County Open Space Plans** – The Lehigh Valley Planning Commission, on behalf of Lehigh and Northampton counties, created open space plans for the two counties—*Livable Landscapes An Open Space Plan for Northampton County* (2016) and *Livable Landscapes A Park, Recreation, Open Space, Agricultural and Historic Lands Plan for Lehigh County* (adoption pending 2018). The LVPC will comment on open space issues identified in these plans during project reviews.

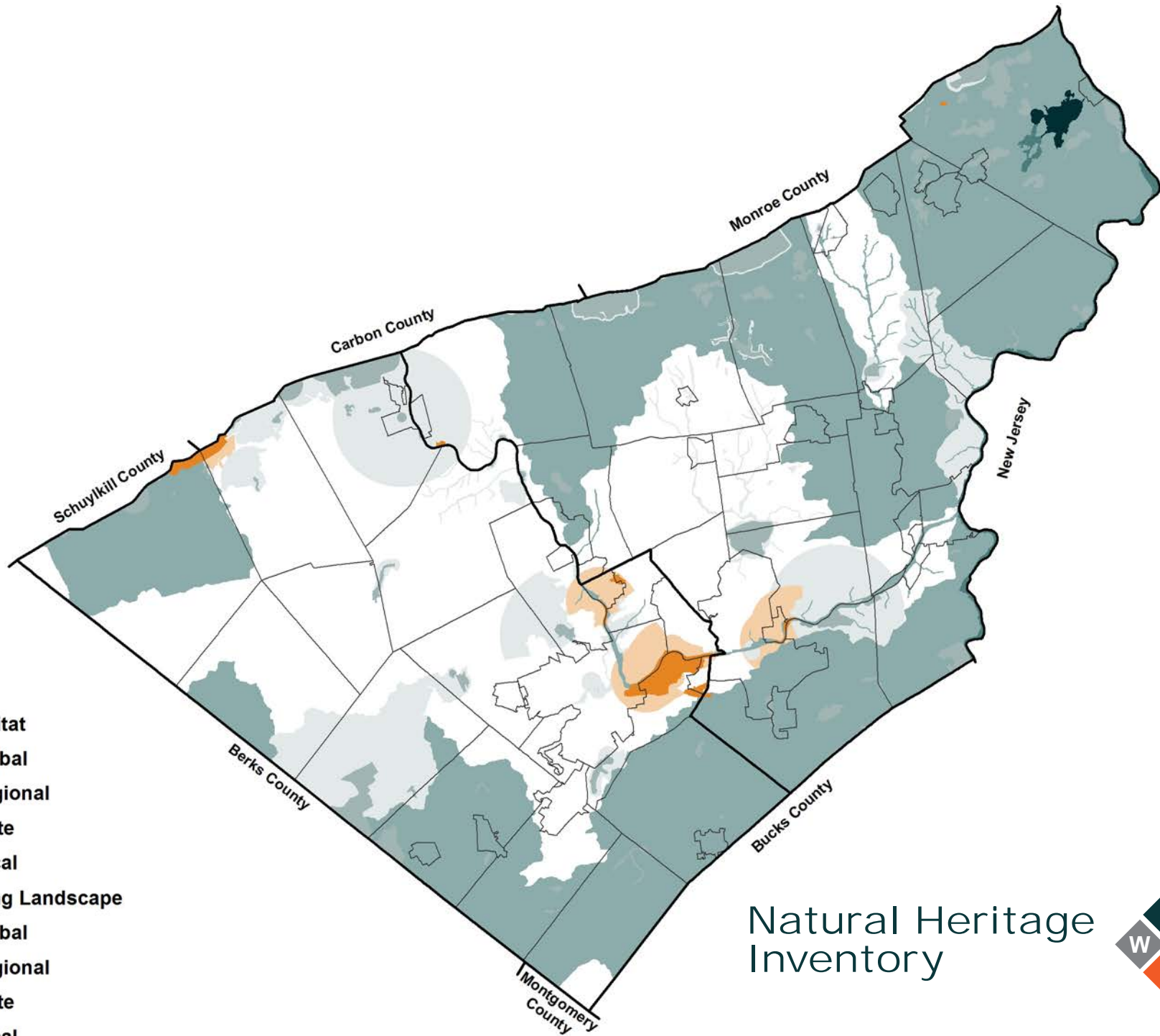
■ **Lehigh Valley Return on Environment (2014)** – Prepared by the Lehigh Valley Planning Commission and the Wildlands Conservancy, this study identified a key trend—people’s attachment to where they live and their quality of life positively impacts economic development. This study quantified the economic value of the benefits provided by open space and measured its impacts across four areas: Natural System Services (\$355.5 million annual benefit), Air Quality (\$54 million annual benefit), Outdoor Recreation (\$795.7 million annual benefit) and Property Value (\$1.8 billion total real estate premium attributed to living within ¼ mile of

protected open space). Each of these areas generate the “natural capital” or economic value from the flow of goods and services supported by natural resources. The correlating benefits represent the Return on Environment for the Lehigh Valley.

■ **Lehigh Valley Greenways Plan (2007)** – A greenway is defined as a corridor of open space that may vary greatly in scale from narrow strips of green that run through urban, suburban and rural areas to wider corridors that incorporate diverse natural, cultural and scenic features. Greenways are a critical component of any landscape—protecting the environment, providing alternate routes of transportation, supplying recreational opportunities, and connecting natural and cultural areas to one another, thus providing a linear resource for a variety of users. Connectivity is the defining characteristic that distinguishes greenways from isolated paths and pockets of open space. While individual parks, preserved lands, undisturbed natural areas and waterways are valuable resources, their conservation and recreational value is magnified when they are linked together.

■ **Natural Resources Plan** – This plan is a component of the regional comprehensive plan and identifies conservation priority areas based on steep slopes, stream quality, floodplains, wetlands, hydric soils, woodlands and important natural areas (identified in the Natural Heritage Inventory). The map shows areas considered very high, high and medium conservation priority. Very high priority areas are based on areas with the greatest combination of important natural resources. These areas should be given first consideration for public and private conservation acquisition or easement programs.

■ **Natural Heritage Inventory** – The LVPC contracted with the Western Pennsylvania Conservancy (Pennsylvania Natural Heritage Program) to complete a study titled *Natural Heritage Inventory of Lehigh and Northampton Counties Update 2013*. This document updated the 2005 report (the original study was completed in 1999) and identifies the plant and animal species of concern and outstanding natural communities in the Lehigh Valley.



**Core Habitat**

- Global
- Regional
- State
- Local

**Supporting Landscape**

- Global
- Regional
- State
- Local

Natural Heritage  
Inventory





■ ***Floodplain Guide/Model Regulation (2014)*** – The Lehigh Valley Planning Commission released an updated floodplain model regulation in March 2014. The guide and model regulation was funded in part by a grant from the Pennsylvania Department of Conservation and Natural Resources through the Delaware and Lehigh National Heritage Corridor. The new model regulation was timely in advance of Northampton County communities receiving new Flood Insurance Rate Maps (FIRMs) in July 2014, requiring each community to update their floodplain management ordinances. The current model regulation was written using the policies of the 2005 Regional Comprehensive Plan, the 2013 Regional Hazard Mitigation Plan, the updated 2012 DCED floodplain provisions and the 2013 NFIP Community Rating System Coordinator’s Manual as guides.

■ ***Riparian and Wetland Buffers Guide/Model Regulation (2011)*** - The U.S. Environmental Protection Agency estimates that more than half of all stream pollution comes from land runoff, which can contain pollutants such as sediment, oil, fertilizers and pesticides. Increasing the amount of pavement in a watershed, or changing land use from forests to fields, can increase discharge to streams since both of these greatly reduce land permeability and soil storage. Streams in the Lehigh Valley are under pressure from the combined effects of farming uses and continued urbanization. Riparian buffers are a natural, effective means of protecting watercourses. While federal legislation indirectly permits the regulation of riparian buffers, the Commonwealth’s Constitution, and more specifically the MPC, clearly authorizes local municipalities to adopt riparian buffer regulations.

■ ***Woodlands Guide/Model Regulation (2009)*** - Two regulatory approaches to protect woodlands are to adopt tree protection requirements for new development and regulate the timber harvest on private property. Tree protection can include replacement of trees removed from a development site if the tree removed meets the size threshold and that it be replaced by a native tree with the same estimated maximum height and growth rate of the tree to be removed. Another technique is to protect tree roots in the area of land disturbance and establishing a “tree protection zone” during construction around these trees. A timber harvest or forestry regulation does not prevent harvesting, but rather defines best management practices, limits damage to roads and surrounding lands, and defines the range of timber that can be removed from a property.

■ ***Steep Slopes Guide/Model Regulation (2008)*** – This model regulation is designed as a section in a zoning ordinance. Applicants proposing development on steep slopes would be required to obtain a conditional use permit, which was chosen because the conditional use permit process allows the governing body – not the zoning hearing board - the opportunity to thoroughly examine the proposal and to impose any reasonable safeguards necessary to implement the purposes of the ordinance and to protect the public’s general welfare. The model regulation is constructed as an overlay district. The overlay zoning technique modifies the system of conventionally mapped zoning districts. An overlay zone applies a common set of standards to a designated area that may cut across several underlying zoning districts. Although the model regulation is constructed as an overlay district to be inserted in an existing zoning ordinance, with a few revisions, it could

be adopted as a stand-alone ordinance or chapter in the zoning ordinance.

■ **Conservation Subdivisions Model Ordinance (2015)** – Conservation subdivisions are residential developments in which a significant portion of the overall acreage of a property is set aside as undivided, permanently protected open space, while houses are clustered on the remainder of the property. The guide provides an introductory history of conservation subdivision design in the United States and in Pennsylvania, an examination of benefits and drawbacks of the approach, and an annotated model regulation and example worksheets for Lehigh Valley municipalities to use in writing their own regulations for conservation subdivisions.

In addition to these efforts, the LVPC held a number of strategy labs during 2017 to obtain public input on a variety of topics that will influence the development of the comprehensive plan update, including agriculture, community facilities, community utilities, economy, education and training, energy conservation and climate change, environment, hazard mitigation and resiliency, land use, parks and recreation, public health, transportation, water, and urban design and historic preservation.

## Capital Improvement Plan

A capital improvement plan is a multiyear policy guide that identifies needed capital projects and is used to coordinate the financing and timing of public improvements. Capital improvements relate to streets, stormwater systems, water distribution, sewage treatment and other major public facilities. A capital improvement plan should be prepared by the respective county or municipal governments and should include a budget with identified priorities.

Both counties, but only about 26% of the municipalities that responded to the planning and regulatory capability survey, have capital improvement plans, identifying specific capital projects to be funded and completed according to a defined schedule. An additional 11% indicated that a plan was under development.

## Economic Development Plan

An economic development plan serves as a road map for economic development decision making, based on the collection of statistical data, historical perspective and human potential, and it does the following: 1) defines realistic goals and objectives, 2) establishes a defined time frame to implement goals and objectives, 3) communicates those goals and objectives to the organization's constituents, 4) ensures effective use of the organization's resources; 5) provides a baseline from which progress can be measured and 6) builds consensus around future goals and objectives. About 90% of responding municipalities indicated they do not have an economic development plan.

## Continuity of Operations Plan

Continuity of operations planning is the process of developing advance arrangements and procedures that enable an organization to continue its essential functions,

despite events that threaten to disrupt them. The continuity discipline aims to identify emergency or unconventional means to replace or work around those deficiencies in the short term until the organization can be reconstituted on a normal basis. About 74% of responding municipalities indicated they do not have a continuity of operations plan.

### **Open Space Management Plan (Parks and Recreation or Greenways Plans)**

An open space management plan is designed to preserve, protect and restore largely undeveloped lands in their natural state, and to expand or connect areas in the public domain such as parks, greenways and other outdoor recreation areas. In many instances open space management practices are consistent with the goals of reducing hazard losses, such as the preservation of wetlands or other flood-prone areas in their natural state in perpetuity. About 67 of responding municipalities indicated they have open space plans.

### **Natural Resource Protection Plan**

Natural resource protection plans are designed to protect woodlands, steep slopes, waterways, floodplains and wetlands through prohibiting or severely limiting development in these areas. Emergency managers and community planners have been made more aware of the benefits of protecting these areas as mitigation measures over the last few decades. Most municipalities in the Lehigh Valley (69%) have indicated that they do not have a natural resource protection plan, however, many preserve natural resources through development restrictions in zoning or subdivision and land development regulations.

### **Transportation Plan**

A transportation plan plays a fundamental role in a state, region, or community's vision for its future. It includes: 1) a comprehensive consideration of possible strategies; 2) an evaluation process that encompasses diverse viewpoints; 3) the collaborative participation of relevant transportation-related agencies and organizations; and 4) open, timely, and meaningful public involvement. Creating such a plan is a cooperative process designed to foster involvement by all users of the system, such as businesses, community groups, environmental organizations, the traveling public, freight operators, and the general public, through a proactive public participation process. This collaborative effort helps to better allocate new infrastructure, and provide efficient routes for both people and materials in the event of a disaster. About 77% of the municipalities that responded to the survey indicated that they do not have a transportation plan.

*MoveLV Long Range Transportation Plan (2015-2040)*, prepared by the LVPC, covers both Lehigh and Northampton counties and is the \$2.5 billion transportation investment strategy for the Lehigh Valley. The *Long Range Transportation Plan* considers the improvement of the region's roads, highways, bridges, transit system, sidewalks and trail networks. The *Long Range Plan* is updated every four years, is federally mandated and helps guide the transportation decision-making process through policy and investment decisions. The *Long Range Plan* includes a goal of constructing transportation improvements that are compatible with the built and natural environment, as well as providing a safe, well-maintained road network that facilitates the movement of traffic. These goals are compatible with the goals in the 2018 Hazard Mitigation Plan. The foundational policy of maintaining existing

infrastructure before creating new infrastructure helps to ensure that the transportation network will be able to perform in the event of an emergency. This also allows for redundancy in the road network, providing first responders a multitude of routes when responding.

## **Historic Preservation Plan**

This type of plan describes how the community will preserve the historic structures and areas within it. Since these structures pre-date building codes and modern community planning requirements, many of them are especially vulnerable to a variety of hazards. A historic preservation plan may include measures to retrofit or relocate historic treasures out of hazard impact areas. About 79% of the municipalities that responded to the survey indicated that they do not have a historic preservation plan. However, four municipalities have indicated a plan is under development.

## **Farmland Preservation**

Farmland preservation measures are important to hazard mitigation. Farms and forest land are important for recharging the community's aquifer and providing habitat for local wildlife. In addition, farmland reduces or eliminates future hazard vulnerability by maintaining the land as open space. As of April 2018, Lehigh County and Northampton County have 23,252 and 15,537 acres of preserved farmland, respectively.

## **Evacuation Plan**

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

evacuated, the demographics and characteristics of people within those area(s), transportation routes to safe areas, and how the community will support those individuals who do not have access to their own transportation. Such plans address various evacuation situations, such as evacuation plans for dam safety, hazardous material spills and radiation releases. About 62% of the municipalities that responded to the survey do not have an evacuation plan. Six municipalities have a plan under development.

## **Disaster Recovery Plan**

A Disaster Recovery Plan is a comprehensive set of measures and procedures that ensure essential resources and infrastructure are maintained or backed up by alternatives during various stages of a disaster. It is another step to ensure the preparedness and ability to respond quickly and effectively to restore the community's essential services. The plan addresses the public sector's responsibilities, including temporary shelter, refuse disposal, overall damage assessment, restoration of utility services, reconstruction priorities, financial assistance, as well as dealing with emergency demands. About 69% of the municipalities that responded to the survey indicated that they did not have a disaster recovery plan, however, seven have a plan under development.

## **Subdivision and Land Development Ordinance**

Subdivision and land development ordinances (SALDOs) are intended to regulate the development of housing, commercial, industrial, or other uses, including associated public infrastructure, as land is subdivided into buildable lots for sale or future development. Within these ordinances, guidelines on how land will be divided, the placement and

size of roads and the location of infrastructure can reduce exposure of development to hazard events.

All municipalities in the Lehigh Valley, with the exception of Slatington Borough in Lehigh County and the boroughs of West Easton, Glendon and Chapman in Northampton County, have subdivision and land development regulations. Both Lehigh and Northampton counties have a subdivision and land development ordinance, which covers these four municipalities. The LVPC, on behalf of the counties, has the authority to enforce the county regulations in these communities per the Pennsylvania MPC.

## **Zoning Ordinance**

Zoning ordinances allow for local communities to regulate the use of land to protect the interests and safety of the general public. Zoning ordinances can be designed to address unique conditions or concerns within a given community. They may be used to create buffers between structures and high-risk areas, limit the type or density of development, and/or require land development to consider specific hazard vulnerabilities. All municipalities in the Lehigh Valley, except the Borough of Chapman, have zoning regulations. Neither county has a zoning ordinance.

## **Building Code**

Building codes regulate construction standards for new construction and substantially renovated buildings. Standards can be adopted that require resistant or resilient building design practices to address hazard impacts common to a given community. In 2003, the Commonwealth of Pennsylvania implemented Act 45 of 1999, the Uniform Construction Code (UCC), a comprehensive building code that establishes minimum regulations for most new construction, including additions and renovations to existing

structures. Effective December 2009, the Commonwealth adopted regulations of the 2009 International Code Council's codes. Since all municipalities in the Lehigh Valley are required to abide by the UCC, they are required to enforce the 2009 building code regulations for all building permits submitted after December 31, 2009.

## **Fire Code**

Fire codes relate to both the construction and use of structures in terms of preventing fires from starting and minimizing their spread, and minimizing the injuries and deaths caused by a fire within a building. They govern such things as the following: 1) building materials that may be used; 2) the presence and number/type of fire extinguishers; 3) means of egress; and 4) hazardous materials storage and use. About 70% of municipalities responding to the survey indicated that their community had a fire code in place.

## **Stormwater Management Plan/Ordinance**

The proper management of stormwater runoff can improve conditions and decrease the chance of flooding. The Pennsylvania legislature enacted the Stormwater Management Act (Act 167 of 1978), commonly called Act 167, requiring counties to develop stormwater management plans for designated watersheds. This planning effort results in sound engineering standards and criteria being incorporated into local codes and ordinances to manage stormwater runoff from new development and redevelopment in a coordinated, watershed-wide approach. Without such planning, stormwater is managed through independent municipal ordinances that may not fully consider downstream impacts in other communities that could result in the compounding of existing flooding problems.



Act 167 Stormwater Management Plans are intended to improve stormwater management practices and mitigate potential negative impacts from future development or redevelopment. It is not the intent of the plans to solve existing flooding or runoff problems, but to identify them for future correction and assure that problems do not get worse. The plan does allow municipalities to establish a capital improvement program to correct storm drainage issues with the understanding that future development should not make these solutions obsolete. Since flooding is the most significant natural hazard affecting the Lehigh Valley, the hazard mitigation plan provides a thorough understanding of the current capabilities to manage stormwater and a clear action plan to mitigate future impacts.

The LVPC provides an advisory engineering review of the stormwater aspects of subdivision and land development proposals, which is atypical in Pennsylvania, to assist in creating consistent implementation throughout each watershed. The municipalities have the authority to enforce the ordinance provisions. Within Lehigh and Northampton counties, the LVPC prepares plans on behalf of both counties. The state designated 16 Act 167 study areas within the region, and the plans were approved by the Pennsylvania Department of Environmental Protection (PADEP) between 1988 and 2010, with updates to the Little Lehigh Creek Act 167 Plan in 1999 and 2005. A Monocacy Creek Act 167 Plan update has been prepared and adopted by both counties and approved by the PADEP in May 2018. The model ordinance must be adopted by all watershed municipalities by November 21, 2018. All 62 municipalities have adopted Act 167 ordinances for their respective watersheds. Act 167 planning for the Tohickon Creek Watershed was completed by Bucks County. The LVPC

does not provide review comments for this watershed.

Until 2004, stormwater planning dealt solely with runoff quantity and not quality. To comply with requirements of the National Pollutant Discharge Elimination System (NPDES) regulations from the Environmental Protection Agency, 59 of the 62 municipalities in the Lehigh Valley must adopt and implement an ordinance to reduce or prevent the discharge of pollutants into receiving waters. All Act 167 plans include water quality provisions through individual stormwater management plans (Maiden, Sacony and Perkiomen, 2010), plan updates (Little Lehigh Creek, 2005 and Monocacy Creek 2018) and the *Global Act 167 Stormwater Management Plan Water Quality Update*, 2006.

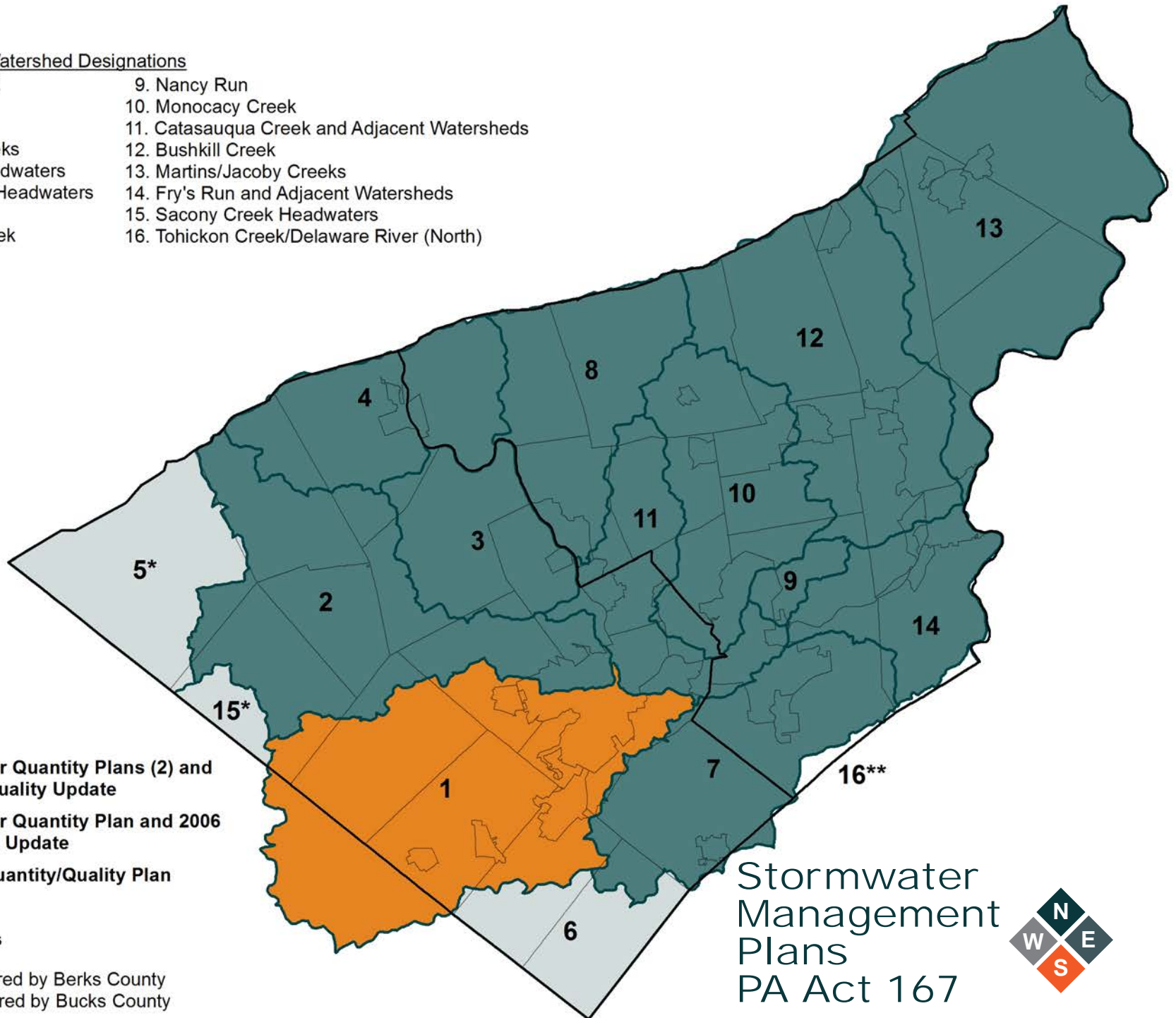
In addition to the Act 167 stormwater management plans in place, other related planning efforts in the region include the following:

***Green Infrastructure Guidelines (LVPC 2017)*** – The *Green Infrastructure Guidelines* document was prepared in conjunction with the *Monocacy Creek Watershed Act 167 Stormwater Management Plan Update*, 2018. The Guidelines are important for reinforcing the message of the outstanding natural resources present in the Lehigh Valley and their wide variety of essential services and benefits to local residents and visitors, describing the best practices available for community and site design to preserve or enhance those resources, and defining improved stormwater management design practices to better mimic natural systems. The Guidelines provide 1) an overview of green infrastructure at a regional scale and the associated benefits and 2) engineering guidance for site-specific stormwater management practices to help designers understand and comply with the water balance and green infrastructure provisions of the updated Act 167 Ordinance.



Watershed Designations

- |                               |  |
|-------------------------------|--|
| 1. Little Lehigh Creek        | 9. Nancy Run                                 |
| 2. Jordan Creek               | 10. Monocacy Creek                           |
| 3. Coplay Creek               | 11. Catasauqua Creek and Adjacent Watersheds |
| 4. Trout/Bertsch Creeks       | 12. Bushkill Creek                           |
| 5. Maiden Creek Headwaters    | 13. Martins/Jacoby Creeks                    |
| 6. Perkiomen Creek Headwaters | 14. Fry's Run and Adjacent Watersheds        |
| 7. Saucon Creek               | 15. Sacony Creek Headwaters                  |
| 8. Hokendauqua Creek          | 16. Tohickon Creek/Delaware River (North)    |



**Status of Plan**

- Original Water Quantity Plans (2) and 2004 Water Quality Update
- Original Water Quantity Plan and 2006 Water Quality Update
- New Water Quantity/Quality Plan
- Watersheds
- Municipalities

\*Original Plan prepared by Berks County  
 \*\*Original Plan prepared by Bucks County

Stormwater  
 Management  
 Plans  
 PA Act 167



***Recommended Procedures for Act 167 Drainage Plan Design (LVPC 2006)*** – This document provides a step-by-step process for creating a drainage design to meet Act 167 Ordinance requirements. Provisions include examination for possible exemption from Act 167 Plan requirements, determination of stormwater management district(s) applicable to the development site, drainage design provisions for development sites within multiple drainage districts, pre-development condition calculations, design discharge calculations, post-development calculations—uncontrolled, post-development control strategy determination and a maintenance program.

***Technical Best Management Practice Manual & Infiltration Feasibility Report: Infiltration of Stormwater in Areas Underlain by Carbonate Bedrock within the Little Lehigh Creek Watershed (LVPC 2002)*** – The intent of this Best Management Practice design manual is to provide guidance for stormwater management systems to be developed in the rapidly developing Little Lehigh Creek Watershed. The manual was developed under the Act 167 Stormwater Management Program in Pennsylvania as administered by the Department of Environmental Protection and implemented by the Lehigh Valley Planning Commission.

## **National Flood Insurance Program Participation (Floodplain Management Plan/Floodplain Regulations)**

When the U.S. Congress passed the National Flood Insurance Act of 1968, it created the National Flood Insurance Program (NFIP), which enables property owners in participating communities to purchase insurance as a protection against flood losses, in exchange for state and community floodplain management regulations that reduce future flood damages. If a community adopts and enforces

a floodplain management ordinance to reduce future flood risk to new construction and substantial improvements in floodplains, the federal government will make flood insurance available within the community as financial protection against flood losses.

In addition, the Pennsylvania Floodplain Management Act (Act 166 of 1978) mandates municipal participation in and compliance with the NFIP. It also establishes higher regulatory standards for new or substantially improved structures that are used for the production or storage of dangerous materials (as defined by Act 166) by prohibiting them in the floodway. Additionally, Act 166 establishes the requirement that a Special Permit be obtained prior to any construction or expansion of any manufactured home park, hospital, nursing home, jail and prison if the structure is located within a special flood hazard area. The Pennsylvania Department of Community and Economic Development (DCED) provides communities with a suggested ordinance document to assist municipalities in meeting the minimum requirements of the NFIP along with Act 166. The model ordinance contain provisions for municipal consideration that are more restrictive than state and federal requirements.

Through administration of floodplain ordinances, municipalities can ensure that all new construction or substantial improvements to existing structures in the 1% annual chance floodplain (and in some cases, the 0.2% annual chance floodplain) are engineered to minimize the impact of flooding and are better able to withstand the forces of a flood event.

For the 2018 Plan, all 62 municipalities were provided with the Compliance with the National Flood Insurance Program survey from the Pennsylvania Standard Operating Guide. This survey is Worksheet #3, which was not included in the 2013 Plan.

All municipalities in the Lehigh Valley participate in the NFIP, with no municipalities having outstanding sanctions or suspensions. All municipalities have adopted a Floodplain Ordinance and are required to update the ordinance whenever the regulatory NFIP flood mapping is officially updated. Since the 2013 Plan, all Northampton County municipalities adopted a floodplain ordinance to reflect the FEMA floodplain mapping for the county that went into effect on July 16, 2014. FEMA is in the process of developing new flood mapping for the Lehigh River Watershed, with preliminary mapping not anticipated to be available until September 2019. Once the map update process has been formally completed, each community in the watershed will have to update their ordinance. NFIP-participating communities in the Lehigh Valley are required to make current regulatory NFIP mapping available to their residents for review and provide mapping assistance. Typically, this mapping is available at the municipal offices in each community. About 44% of municipalities that responded to the survey indicated that, in addition to paper maps, they also have digital mapping available. Only five municipalities indicated that their floodplain ordinance exceeds the minimum requirements, including regulating properties in the 500-year floodplain and requiring a 1.5 foot freeboard above the 100-year base flood elevation. 26% of municipalities that responded have a certified floodplain administrator. Responses to the survey are found in the municipal annexes, which include descriptions of municipal permitting processes and NFIP administration services. The total number of claims, policies, repetitive and severe repetitive loss properties, and total loss payments for each municipality are included in the Flood profile in the Appendix.

The National Flood Insurance Program's Community Rating System was established in 1990 to encourage local governments to increase their standards for floodplain development. The goal of this program is to encourage communities, through flood insurance rate adjustments, to implement standards above and beyond the minimum required to:

- reduce flood damage to insurable property,
- strengthen and support the insurance aspects of the NFIP, and
- encourage a comprehensive approach to floodplain management.

The Community Rating System (CRS) is a voluntary program designed to reward participating communities for their efforts to create more disaster-resistant communities using the principles of sustainable development and management. By enrolling in the program, municipalities can leverage greater flood protection while receiving flood insurance discounts, ranging from 5% up to 45%.

Currently within the Lehigh Valley, no municipalities participate in the CRS program. The 2013 Plan incorrectly identified Hanover Township in Northampton County as participating in the CRS program. Increased participation in the Lehigh Valley will be supported by both counties as identified in their updated mitigation actions. Further, certain communities in the Lehigh Valley have identified in their updated mitigation actions that they plan to apply to the CRS program.

Flood hazard risk management in the Lehigh Valley is supported by the LVPC through the Act 167 Stormwater Management Planning program, as detailed and referenced

Lehigh County	Participating Community	Initial Entrance into NFIP	Certified Floodplain Administrator/ NFIP Coordinator	Effective Date of Flood Insurance Rate Maps	Digital or Paper Maps	Floodplain Ordinance Meets or Exceeds Minimum Requirements	Participation in Community Rating System Program
Alburtis Borough	Yes	1/16/1974	No	7/16/2004	Paper	Meets	No
Allentown City	Yes	7/26/1974		7/16/2004	Both		No
Bethlehem City*	Yes	6/15/1973	No	7/16/2004	Both	Exceeds	No
Catasauqua Borough	Yes	11/30/1973	No	7/16/2004	Paper	Meets	No
Coopersburg Borough	Yes	11/19/1976		7/16/2004			No
Coplay Borough	Yes	11/22/1974	No	7/16/2004	Paper	Meets	No
Emmaus Borough	Yes	12/28/1973	No	7/16/2004	Paper	Meets	No
Fountain Hill Borough	Yes	11/22/1974	Unknown	7/16/2004	Paper	Meets	No
Hanover Township	Yes	12/20/1974	No	7/16/2004	Paper	Meets	No
Heidelberg Township	Yes	12/27/1974		7/16/2004			No
Lower Macungie Township	Yes	6/28/1974	Yes	7/16/2004	Paper	Exceeds	No
Lower Milford Township	Yes	10/18/1974	No	7/16/2004	Paper	Unknown	No
Lowhill Township	Yes	12/20/1974	No	7/16/2004	Both	Meets	No
Lynn Township	Yes	11/29/1974	Unknown	7/16/2004		Unknown	No
Macungie Borough	Yes	1/9/1974		7/16/2004			No
North Whitehall Township	Yes	10/18/1974		7/16/2004			No
Salisbury Township	Yes	12/28/1973	No	7/16/2004	Digital	Unknown	No
Slatington Borough	Yes	4/12/1974	Yes	7/16/2004			No
South Whitehall Township	Yes	1/16/1974	No	7/16/2004	Both	Exceeds	No
Upper Macungie Township	Yes	11/26/1976	Yes	7/16/2004	Digital	Meets	No
Upper Milford Township	Yes	11/1/1974	No	7/16/2004	Digital	Meets	No
Upper Saucon Township	Yes	7/26/1974	No	7/16/2004	Both		No
Washington Township	Yes	11/15/1974		7/16/2004			No
Weisenberg Township	Yes	1/10/1975	No	7/16/2004	Both	Meets	No
Whitehall Township	Yes	1/9/1974		7/16/2004			No

\*Includes Lehigh and Northampton County portions

## NATIONAL FLOOD INSURANCE PROGRAM COMPLIANCE: LEHIGH COUNTY

Northampton County	Participating Community	Initial Entrance into NFIP	Certified Floodplain Administrator/ NFIP Coordinator	Effective Date of Flood Insurance Rate Maps	Digital or Paper Maps	Floodplain Ordinance Meets or Exceeds Minimum Requirements	Participation in Community Rating System Program
Allen Township	Yes	9/6/1974		7/16/2014			No
Bangor Borough	Yes	1/25/1974	No	7/16/2014	Both	Meets	No
Bath Borough	Yes	7/30/1976	No	7/16/2014	Both	Unknown	No
Bethlehem Township	Yes	6/14/1974		7/16/2014			No
Bushkill Township	Yes	11/8/1974	No	7/16/2014	Paper	Unknown	No
Chapman Borough	Yes	11/15/1974	No	7/16/2014	Paper	Meets	No
East Allen Township	Yes	2/11/1983	No	7/16/2014	Both	Unknown	No
East Bangor Borough	Yes	11/15/1974		7/16/2014			No
Easton City	Yes	2/9/1973	No	7/16/2014	Digital	Meets	No
Forks Township	Yes	11/8/1974	Yes	7/16/2014	Paper	Unknown	No
Freemansburg Borough	Yes	12/28/1973		7/16/2014			No
Glendon Borough	Yes	11/15/1974	No	7/16/2014	Paper		No
Hanover Township	Yes	11/23/1973		7/16/2014	Both	Unknown	No
Hellertown Borough	Yes	2/8/1973	No	7/16/2014	Paper		No
Lehigh Township	Yes	11/15/1974	No	7/16/2014	Paper	Meets	No
Lower Mt. Bethel Township	Yes	1/4/1974	No	7/16/2014	Digital	Meets	No
Lower Nazareth Township	Yes	11/15/1974	No	7/16/2014	Both	Meets	No
Lower Saucon Township	Yes	6/28/1974	No	7/16/2014	Both	Meets	No
Moore Township	Yes	8/2/1974		7/16/2014			No
Nazareth Borough	Yes	1/9/1974		7/16/2014			No
North Catasauqua Borough	Yes	5/3/1974	No	7/16/2014	Paper	Meets	No
Northampton Borough	Yes	4/5/1974	Yes	7/16/2014	Both	Meets	No
Palmer Township	Yes	4/20/1973	No	7/16/2014	Both	Meets	No
Pen Argyl Borough	Yes	11/1/1974	No	7/16/2014	Paper	Meets	No
Plainfield Township	Yes	9/13/1974	Yes	7/16/2014	Both	Unknown	No
Portland Borough	Yes	4/12/1974	Yes	7/16/2014	Paper	Unknown	No
Roseto Borough	Yes	11/15/1974		7/16/2014			No
Stockertown Borough	Yes	8/2/1974		7/16/2014			No
Tatamy Borough	Yes	4/12/1974	Yes	7/16/2014	Both	Meets	No
Upper Mt. Bethel Township	Yes	11/8/1974		7/16/2014	Both	Exceeds	No
Upper Nazareth Township	Yes	12/27/1971	Yes	7/16/2014	Digital	Exceeds	No
Walnutport Borough	Yes	1/9/1974		7/16/2014			No
Washington Township	Yes	11/1/1974	No	7/16/2014	Both	Meets	No
West Easton Borough	Yes	12/28/1973	Unknown	7/16/2014	Paper	Meets	No
Williams Township	Yes	5/17/1974	Yes	7/16/2014	Both	Unknown	No
Wilson Borough	Yes	9/13/1974	No	7/16/2014	Digital	Meets	No
Wind Gap Borough	Yes	6/28/1974	Yes	7/16/2014	Paper	Meets	No

**NATIONAL FLOOD INSURANCE PROGRAM COMPLIANCE: NORTHAMPTON COUNTY**



## Hazard Mitigation Plan

A hazard mitigation plan represents a community's plan for how it intends to reduce the impact of hazards on people and the built environment. The essential elements of a hazard mitigation plan include a risk assessment, capability assessment and mitigation strategy. State, county and local governments are required to develop a hazard mitigation plan as a condition for receiving certain types of non-emergency disaster assistance, including funding for mitigation projects.

All 62 municipalities adopted the 2006 Lehigh Valley Plan, while only 37 municipalities adopted the 2013 Plan. A priority of the 2018 Plan is to coordinate with all 62 municipalities to participate in and adopt the Plan.

## Emergency Operations Plan/Emergency Management Services

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). All 62 municipalities and both counties comply with the code.

The Lehigh Valley is supported by strong regional and county-level emergency management capabilities provided by the Lehigh County Emergency Management Agency and Northampton County Emergency Management Services. Both Lehigh and Northampton counties continue to operate emergency 9-1-1 call centers and Emergency Operations Centers (EOCs) during emergencies in their counties. In addition, both counties continue to provide or support emergency service programs and measures including emergency response, public

alert and warning systems, emergency communications systems, hazard event monitoring systems, and public information and outreach programs.

In January 2008, Northampton County underwent significant changes to its Emergency Management program and structure when the Northampton County Council approved a resolution to create the Division of Emergency Management Services. This Division combined Emergency Management and E-9-1-1 Communications under one operating structure.

### 9-1-1 Centers

9-1-1 is the telephone number used to report emergencies, wherein there is the presence or potential for an immediate threat to life or property, and response is needed by Police, Fire, and/or Emergency Medical Service Agencies. Examples include a crime which has just occurred or in-progress, odor or presence of fire, a sick or injured person requiring pre-hospital treatment and transportation to a hospital emergency department. The 9-1-1 System maintains the capability to accept calls from hearing or speech impaired callers utilizing a Telecommunications Device for the Deaf (TDD). Currently, each county operates a 9-1-1 Public Safety Answering Point (PSAP), as do the cities of Allentown and Bethlehem. These four PSAPs need to coordinate efforts during a regional hazard event until 2019. The consolidation of the Allentown and Lehigh County PSAPs and Bethlehem and Northampton County PSAPs will occur in June 2019. Opportunities will be taken to streamline the regional 9-1-1 coordination through fully-integrated mapping, databases, phone systems and Computer-Aided Design (CAD) back-up.

### Emergency Operations Centers (EOC)

In the event of an emergency or disaster, both Lehigh



and Northampton counties could activate their EOCs. The purpose of the EOC is to coordinate the response and distribution of resources to a disaster incident. Highly experienced and trained personnel staff the EOC when in operation. The EOC utilizes the expertise in the following disciplines to staff the following 15 Emergency Support Functions: Transportation, Firefighting, Public Safety, Communications/Radio Amateur Civil Emergency Services, Public Works, Emergency Management, Mass Care, Resource Support, Public Health and Medical Services, Urban Search and Rescue, HazMat, Energy, Public Information, Long-Term Recovery and Agriculture. Northampton County EOC has an additional function: Volunteer and Donations Management. When activated, the EOCs will maintain constant communications with the 9-1-1 centers and PEMA to ensure coordination of activities. Local EOCs could also be activated to coordinate the response and distribution of resources at the local level.

The Lehigh and Northampton County Emergency Management Agency (EMA) capabilities fall under two categories: Emergency Service Measures and Public Information Programs, which are provided in the Education and Outreach Capability section. The Emergency Service Capabilities are described below.

### **Emergency Service Measures**

Emergency service measures protect people during and immediately following a disaster.

- **Alert Warning System** – Emergency Alert System (EAS) – Lehigh County operates as an EAS initiating station, covering Lehigh and Northampton counties. The EAS is an alert system for disseminating emergency information and warnings to the general public within the counties, utilizing the resources of

the Broadcast and Cable Industries. The EAS System allows state and local officials to quickly send out important area specific state and local information, including to people whose first language is not English. The EAS system has the capability of providing alerts in the language normally used by the station or cable system, such as the Spanish language.

- **Monitoring Systems** – The counties have several systems they monitor that will disseminate emergency information and warnings. These systems include: SEVAN, Knowledge Center, Radio Amateur Civil Emergency Services, CodeRED, NOAA Weather Radios and 800 MHz Statewide Radio as described below.

- **SEVAN (Satellite Emergency Voice Alerting Network)** – The voice side of the satellite warning system allows PEMA, counties, regional offices and cities to communicate directly in real time regardless of the status of the telephone system. Warning messages are routinely broadcast by PEMA using the system.

- **Knowledge Center** – Knowledge Center is a web-based, interactive incident management tool used by the Northeast Pennsylvania Regional Counterterrorism Task Force (NEPARCTTF), which includes, Lehigh and Northampton counties. Knowledge Center provides emergency managers with the ability to gather large quantities of information related to incidents and coordinate that information for either small-scale events with one or two responder agencies or for large-scale events

that involve complex, multi-jurisdictional responses comprised of hundreds of agencies from the local, state, and federal government, non-governmental organizations, and the private sector. The system allows for seamless communication with neighboring jurisdictions, counties and the state about the types of incidents and emergencies that may occur in the region.

■ **RACES (Radio Amateur Civil Emergency Services)** – A group of amateur radio operators who donate their services in time of natural disaster or emergency. They provide communication to fire, police and other agencies that need assistance.

■ **CodeRED** – The system is used to send out emergency information, ranging from evacuation notices, AMBER Alerts, inclement weather, active shooter and other disaster response efforts to the residents of Lehigh and Northampton counties. The Emergency Alert System is a free service brought to the area through the Northeast Pennsylvania Counterterrorism Task Force.

■ **NOAA Weather Radio All Hazards (NWR)** – A nationwide network of radio stations broadcasting continuous weather information directly from a nearby National Weather Service office. NWR broadcasts National Weather Service warnings, watches, forecasts and other hazard information 24 hours a day. NWR also broadcasts warning and post-event information for all types of hazards, including natural and non-natural (such as chemical releases or oil spills), and public safety (such as AMBER Alerts or 911 Telephone outages).

■ **800 MHz Statewide Radio System** – This system

provides two-way voice and data communications for all county and state agencies. The primary function of this system is to provide redundant communications between the county and the partner agency facilities in the event that the primary means of communication becomes interrupted. This system is integrated with the Northampton County Communication/9-1-1 center.

The municipalities may also be equipped with several systems to monitor emergency information and warnings. They include: Radio Amateur Civil Emergency Services (RACES), National Oceanic and Atmospheric Administration (NOAA) Weather Radios, and Knowledge Center.

Emergency Response Planning

■ **Emergency Operations Plan (EOP)** - Lehigh and Northampton counties have prepared EOPs to document the counties' specific emergency response procedures during various emergency events. Emergency Operations Centers and other activities are guided by this plan.

■ **Mutual Aid Agreements** – Lehigh and Northampton counties have formal agreements in place with each other and with the Pennsylvania counties contiguous to each as a result of the PA Intrastate Mutual Assistance Program (Act 93). All municipalities in Lehigh and Northampton counties are participants in this program.

The counties also assist in planning for:

■ Lehigh Valley International Airport

■ Lehigh and Northampton County Prisons

■ County and Local (Municipal) Emergency Operations Plans

- Medical Facilities: Hospitals; Ambulatory Surgical Centers; Hospices; Psychiatric Residential Treatment Facilities; All-Inclusive Care for the Elderly; Transplant Centers; Long-Term Care Facilities; Intermediate Care Facilities for Individuals with Intellectual Disabilities; Home Health Agencies; Comprehensive Outpatient Facilities; Critical Access Hospitals; Clinics, Rehabilitation Agencies, and Public Health Agencies as Providers of Outpatient Physical Therapy and Speech-Language Pathology Services; Community Mental Health Centers,; Rural Health Clinics and Federally Qualified Health Centers; End-Stage Renal Disease Facilities

- Dams

- Mass Casualty/Fatality Management Plans

- Counterterrorism Preparedness

- Limerick Nuclear Power Station Evacuation and Sheltering/Radiological Ingestion and Response Plan

- Special Events Plans

- School District Plans

- Day Care, Group Homes, Personal Care and Special Needs Facility Plans

- SARA (Superfund Amendments and Reauthorization Act of 1986) facilities

- Commodity Flow Study

- Preparedness Prevention and Contingency (PPC) Plans

- Above-Ground Storage Tank Plans

- Rail Transportation Plans

- Pipeline Emergency Response Plans

- E-Cycling Plans

- High Hazard Dam Plans

- Water Treatment Emergency Response Plans

- Wastewater Treatment Emergency Response Plans

- Electric Generation Emergency Response Plans

- Influenza Pandemic and Points-of-Dispensing Plans – Department of Health

- Cedarbrook (Lehigh) and Gracedale (Northampton) Emergency Action Plans

- Continuity of Operations (COOP)/Continuity of Government (COG) Plan

- Historic Preservation Plans

- County Building Emergency Action Plans

- Volunteer/Donations Management Plan

- Incident Action Plans

- Mine Emergency Response Plan (Northampton County)

Each municipality is responsible to provide emergency response to their municipality in Emergency Medical Services (EMS), Fire and Police. If a municipality does not have one of these providers in their community, they have mutual aid agreements with an adjacent political subdivision to provide such.

**In Lehigh County there are:** 8 EMS Agencies, 44 Fire Companies, 13 Municipal Police Departments, 2 State Police Barracks, City of Allentown 9-1-1, City of Bethlehem 9-1-1 **In Northampton County there are:** 12 EMS Agencies, 38 Fire Agencies, 2 Rescue Agencies,

26 Municipal Police Agencies, 4 School District Police Agencies, 3 College Campus Police Agencies, 2 State Police Barracks, City of Bethlehem 9-1-1

### Evacuation Planning

**Northampton County** will follow the actions set forth in the county’s emergency operations plan. For interstate evacuations, Northampton County will follow the state (PEMA) and federal (FEMA) guidelines set forth. Northampton County follows federal and state guidance in developing a comprehensive evacuation plan at the county level to include the principles and methods of evacuation and re-entry planning and operations.

**Lehigh County** has developed an evacuation plan for the county that addresses the following basic scenarios:

- Evacuation of a large population or geographic area within the regional task force.
- Mass exodus of population from another area entering the county.
- How would the county or could the county act as host for a large influx of evacuees?

The counties, in cooperation with the American Red Cross of the Greater Lehigh Valley, have designated shelters set up throughout the counties. These shelters may be used during times of emergency and disasters.

A summary of existing federal, state, regional and county programs to manage specific hazard risks may be found in the hazard profiles in the Appendix. While the risk of certain hazards can be addressed partially through mitigation, the risks of other hazards (particularly certain non-natural hazards) are primarily managed through the preparedness and response elements of emergency management, or via other regulatory programs at the federal and state levels.

## Carbonate Bedrock Standards

The LVPC *Minimizing Sinkhole Occurrences* (1988) provides a general understanding of sinkholes and how they can form. The document provides recommended ordinance provisions for municipal consideration to minimize the potential for sinkhole occurrence as it relates to new development. Within the Lehigh Valley, 47 of the 62 municipalities are underlain entirely or in part by carbonate bedrock, which is prone to sinkholes. There are 22 municipalities within the two counties that have adopted carbonate bedrock standards since 1986.

Further, it is noted that the boroughs of Glendon and West Easton are covered under the Northampton County

Lehigh County	Northampton County
Upper Saucon Township	Forks Township
Emmaus Borough	Lower Mt. Bethel Township
Lower Macungie Township	Bethlehem Township
North Whitehall Township	East Allen Township
Whitehall Township	Stockertown Borough
Weisenberg Township	Lower Nazareth Township
Upper Macungie Township	Palmer Township
Macungie Borough	Upper Nazareth Township
Lower Millford Township	Upper Mt. Bethel Township
	Tatamy Borough
	Williams Township
	Freemansburg Borough
	Wilson Borough

Subdivision and Land Development Ordinance carbonate bedrock provisions.

## Official Map

An official map shows the locations of planned future public lands and facilities such as streets, trails, parks and open space. The official map expresses a municipality's interest in acquiring these lands for public purposes and notifies developers and property owners of this interest. The MPC defines an official map as a "land use ordinance." If a landowner seeks to build on or subdivide land noted on the official map, the municipality has up to a year to acquire the land from the owner before the owner may freely build or subdivide. Ultimately, an official map can serve as a tool to promote growth and infrastructure in appropriate areas, mitigating costs and risks to life associated with hazards. In addition to Lehigh County, the following Lehigh Valley municipalities have adopted an Official Map:

### Lehigh County

Catasauqua Borough  
Lower Macungie Township  
South Whitehall Township  
Whitehall Township  
Upper Milford Township  
Upper Saucon Township

### Northampton County

Allen Township  
Bushkill Township  
East Allen Township  
Hanover Township  
Moore Township  
Tatamy Borough

## 2009 International Property Maintenance Code

The International Property Maintenance Code (IPMC) is intended to establish minimum maintenance standards for basic equipment, light, ventilation, heating, sanitation and fire safety. Responsibility is fixed among owners, operators and occupants for code compliance. South Whitehall Township identified the IPMC as an additional regulatory tool in place in the community.



## ADMINISTRATIVE AND TECHNICAL

Administrative and technical capability refers to the community's staff and their skills and tools that can be used for mitigation planning and to implement specific mitigation actions and includes planners, engineers, emergency managers, floodplain administrators/managers, land surveyors, staff familiar with community hazards, personnel skilled in GIS, and grant writers. It also refers to the ability to access and coordinate these resources effectively. The degree of intergovernmental coordination among departments also affects administrative capability. For the 2018 Plan, the administrative and technical capability survey, as provided in the Pennsylvania Standard Operating Guide, was revised to request whether the jurisdiction's response for each capability category represented a change since the 2013 Plan, whether coordination between agencies and staff is effective and how the capabilities can be expanded or improved to reduce risk. Municipal and county responses to the survey can be found in their municipal annexes.

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**Overall, Lehigh Valley municipalities have a moderate to high level of administrative and technical capability, with smaller communities such as the boroughs having more limited capability.**

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Overall, Lehigh Valley municipalities have a moderate to high level of administrative and technical capability, with smaller communities such as the boroughs having more limited capability. About 77% of municipalities indicated they have planners with land use/land development knowledge. About 69% have planners or engineers with knowledge of natural or non-natural hazards, however, 79% indicated that they did have staff familiar with community hazards. In addition, about 84% of municipalities indicated that they have engineers or other professional staff trained in building and/or infrastructure construction practices. Municipalities are more limited in personnel related to GIS skills, as well as grant writers.

More than three-fourths of the municipalities did not identify any changes in their administrative and technical capabilities since the 2013 Plan. Most did not indicate the effectiveness of intergovernmental coordination. For the municipalities that responded to the question on how their capabilities can be improved, education and training for staff was the primary response.



Municipalities are further supported by county and regional administrative and technical capabilities, including Lehigh and Northampton counties, Lehigh Valley Planning Commission, Lehigh Valley Transportation Study, Lehigh Valley Regional Partnership, local environmental groups and watershed associations. Additional technical assistance is available for mitigation activities from a number of state

and federal agencies, including the agencies at the bottom of the page.

It is noted that both counties, and many of the municipalities, have identified specific mitigation initiatives in the 2018 Plan to help build and enhance mitigation-related administrative and technical capabilities in the Lehigh Valley.



Pennsylvania Emergency Management Agency



Pennsylvania Department of Environmental Protection



Pennsylvania Department of Conservation and Natural Resources



Pennsylvania Department of Transportation



FEMA



U.S. Army Corps of Engineers



U.S. Department of Agriculture



U.S. ECONOMIC DEVELOPMENT ADMINISTRATION



U.S. Small Business Administration



## FINANCIAL

Financial capabilities are the resources that a municipality has access to or is eligible for to fund mitigation actions and include capital improvement programming; Community Development Block Grants; special purpose taxes; gas/electric utility fees; water/sewer fees; stormwater utility fees; development impact fees; general obligation, revenue, and/or special tax bonds; and partnering arrangements or intergovernmental agreements. The costs associated with implementing mitigation activities vary. Some mitigation actions such as outreach and education efforts require little to no costs other than staff time and existing operating budgets. Other actions such as acquisition of flood-prone properties could be largely or entirely dependent on available funding. As such, it is critical to identify all available sources of funding at the local, county, regional, state and federal level to support implementation of the mitigation actions identified in the 2018 Plan. Municipalities fund mitigation projects through existing local budgets, local appropriations (including referendums and bonding), and through a variety of federal and state loan and grant programs. For the 2018 Plan, the financial capability survey, as provided in the Pennsylvania Standard Operating Guide, was revised to request whether the jurisdiction's response for each capability category represented a change since the 2013 Plan, if the 2013 Plan findings have been incorporated

into the program, and how the program can be expanded or improved to reduce risk. Municipal and county responses to the survey can be found in their municipal annexes. While most of the identified financial capabilities are available to all of the municipalities in the Lehigh Valley, the extent to which communities have leveraged these funding sources varies widely, and it is logical to expect that communities that are familiar with accessing specific grant programs will continue to consider and pursue those sources as appropriate.

The findings of the survey indicate that, overall, municipalities are limited in their financial capabilities. About half the municipalities responding indicated that they have capital improvement programming. About 61% of responding municipalities identified CDBG funding as a financial resource. Most municipalities do not have special purpose taxes and only eight indicated they collect stormwater utility fees to fund stormwater system improvements. In addition, only about 44% of municipalities collect development impact fees and 40% utilize general obligation, revenue, and/or special tax bonds. Only six municipalities indicated that they collect gas/electric utility fees. One municipality noted that a fire service tax was under development.

About 84% of municipalities did not identify any changes in financial capability since the 2013 Plan. Several of those that

did comment noted a reduction in some capabilities, including CDBG eligibility and capital improvement programming. Some municipalities provided suggested improvements to the financial capabilities, including providing additional funding to capital improvement programming, streamlining the CDBG application process and promoting intergovernmental cooperation by the counties.

## **Federal Hazard Mitigation Assistance Funding Opportunities**

### ***Hazard Mitigation Grant Program (HMGP)***

The HMGP is a post-disaster mitigation program. It is made available to states by FEMA after each federal disaster declaration. The HMGP can provide up to 75% funding for hazard mitigation measures. The HMGP can be used to fund cost-effective projects that will protect public or private property in an area covered by a federal disaster declaration or that will reduce the likely damage from future disasters. Examples of projects include acquisition and demolition of structures in hazard prone areas, flood proofing or elevation to reduce future damage, minor structural improvements and development of state or local standards. Projects must fit into an overall mitigation strategy for the area identified as part of a local planning effort. All applicants must have a FEMA-approved Hazard Mitigation Plan. Applicants who are eligible for the HMGP are state and local governments, certain nonprofit organizations or institutions that perform essential government services, and Indian tribes and

authorized tribal organizations. Individuals or homeowners cannot apply directly for the HMGP; a local government must apply on their behalf. Applications are submitted to PEMA and placed in rank order for available funding and submitted to FEMA for final approval. Eligible projects not selected for funding are placed in an inactive status and may be considered as additional HMGP funding becomes available.

### ***Flood Mitigation Assistance (FMA) Program***

FMA provides funding to assist states and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the NFIP. The FMA is funded annually; no federal disaster declaration is required. Only NFIP-insured homes and businesses are eligible for mitigation in this program. Funding for FMA is very limited and, as with the HMGP, individuals cannot apply directly for the program. Applications must come from local governments or other eligible organizations. The federal cost share for an FMA project is 75%. At least 25% of the total eligible costs must be provided by a non-federal source. Of this 25%, no more than half can be provided as in-kind contributions from third parties. At minimum, a FEMA-approved local flood mitigation plan is required before a project can be approved. FMA funds are distributed from FEMA to the state. PEMA serves as the grantee and program administrator for FMA.

### ***Pre-Disaster Mitigation (PDM) Program***

The PDM program is an annually funded, nationwide, competitive grant program. No disaster declaration is required. Federal funding is available for up to 75% of eligible activity costs and up to 90% for small, impoverished communities. As with the HMGP and FMA, a FEMA-approved local Hazard Mitigation Plan is required to be approved for funding under the PDM program.

Other federal programs that may provide financial support for mitigation actions include, but are not limited to:

- Department of Energy Weatherization Assistance Program
- FEMA Community Disaster Loan Program
- FEMA Emergency Management Performance Grants
- FEMA Environmental Planning and Historic Preservation Program
- FEMA Public Assistance Program
- FEMA Individuals and Households Program
- HUD Community Development Block Grants
- HUD Disaster Housing Assistance Program
- Department of Agriculture Watershed Protection and Flood Prevention Program
- Department of Agriculture Energy Conservation Program
- Department of Agriculture Non-Insured Crop Disaster Assistance Program
- Army Corp of Engineers Floodplain Management Services Program

### **State Funding Assistance Opportunities**

State programs that may provide financial support for mitigation actions include, but are not limited to:

- DCED Flood Mitigation Program
- DCED H2O PA Flood Control, Water Supply, Sanitary Sewer and Stormwater Projects
- DCED PA Small Water and Sewer Program
- DCED Municipal Assistance Program
- DCNR Community Conservation Partnerships Program
- DCNR Pennsylvania Recreational Trails Program
- DEP Growing Greener Program
- PennDOT Pennsylvania Infrastructure Bank Loan
- Pennsylvania Infrastructure Investment Authority



## EDUCATION AND OUTREACH

This type of capability refers to education and outreach programs and methods already in place in a community that could be used to implement mitigation activities and communicate hazard-related information to the public, including Firewise Communities certification, StormReady certification, natural disaster or safety-related school programs, ongoing public education / information program, public-private partnership initiatives, and local citizen groups of nonprofit organizations. The Firewise Communities program is a national program that emphasizes community involvement and provides information for residents to reduce the risk of wildland fire igniting homes. The National Weather Service StormReady program encourages communities to take a proactive approach to improving local hazardous weather operations and public awareness. For the 2018 Plan, the education and outreach capability survey, as provided in the Pennsylvania Standard Operating Guide, was revised to request whether the jurisdiction's response for each capability category represented a change since the 2013 Plan and how the capabilities can be expanded or improved to reduce risk. Municipal and county responses to the survey can be found in their municipal annexes.

Overall, Lehigh Valley municipalities have low to moderate education and outreach capabilities based on survey

results. About 82% of municipalities that responded have an ongoing public education or information program in place, however, only about 24% have natural disaster or safety-related school programs. Three municipalities have Firewise Communities certification. Both counties are StormReady certified, but only four municipalities indicated they have certification. Twelve municipalities cited public-private partnership initiatives. About half the municipalities responding identified local citizens groups or nonprofit organizations that provide education to the public. One municipality identified the presence of internal safety and public safety committees as an additional capability.

About 82% of municipalities did not identify any changes in education and outreach capabilities since the 2013 Plan. Of those indicating a change, enhanced websites, education provided to daycare staff and healthcare facilities, an active Environmental Advisory Council and increased outreach through newsletters were identified as some of the changes. When asked how capabilities can be improved, responses included funding, greater community/business involvement, greater focus on hazard-related information, additional public presentations, obtain StormReady certification, emergency awareness meetings and a fire prevention initiative.

Lehigh County Emergency Management Agency and Northampton County Emergency Services have the following education and outreach capabilities:

### Public Information Programs

- Flood Maps/Data – The counties have access to this type of information through their GIS departments, as well as other information that is available through the county assessment offices. The following information is available through the county assessment offices: County/Municipality Maps, District/Ward Maps, Millage Rate Schedules, Property Assessment Records and Deeds.
- Library Resources – The counties have educational materials available upon request that are used at public speaking events when appropriate. The following educational materials are available, but are not limited to:
  - Pennsylvania emergency preparedness guides
  - Various types of training videos
  - American Red Cross packets for flash flooding, hurricane, thunder and lightning, tornado, winter storms
  - Family disaster planning guides
  - Homeland Security information for businesses, families, individuals, neighborhoods and schools
  - Pandemic brochures
- Outreach Projects
  - **Are You Ready?** – An in-depth program for citizen Preparedness (individual, family and community preparedness). Provides a step-

by-step approach to disaster preparedness by walking the student through how to get informed about local emergency plans, how to identify hazards that affect their area, and how to develop and maintain an emergency communications plan and disaster supply kit. Other topics covered include evacuation, emergency public shelters, animals in disaster and information specific to people with disabilities. The course also provides in-depth information on specific hazards such as Floods, Tornadoes, Hurricanes, Thunderstorms and Lightning, Winter Storms and Extreme Cold, Extreme Heat, Earthquakes, Volcanoes, Landslide and Debris Flows (Mudslide), Tsunamis, Fires, Wildfires, Hazardous Materials Incidents, Household Chemical Emergencies, Nuclear Power Plant, and Terrorism (Explosion, Biological, Chemical, Nuclear, and Radiological hazards) and includes what to do before, during and after each hazard type.

■ **Ready...Pack...Go** – This Lehigh County program is to encourage community members and their families to be self-sufficient for at least 72 hours. The theme of “Ready...Pack...Go” is to be “ready” to have a plan for you and your family; “pack” to have pre-packed food, water and supplies; and “go” to a safe location based on the type of disaster. (What if there was an emergency today? Are you ready? Learn how to protect yourself, your family and your pets!)

■ **Red E. Fox Children’s 911 Program** – Northampton County participates in the Red E. Fox program. The mission and purpose of this program is to teach children how to save lives



and property through the proper use of 9-1-1, the Nation's universal emergency telephone number. Red E. Fox delivers this message and teaches children when to use 9-1-1 and when not to, how to place a 9-1-1 call, and what to say to the dispatcher during a Police, Fire, or Medical emergency. Red E. Fox was created as a 9-1-1 Public Safety icon in the tradition of Smokey Bear and McGruff the Crime Dog.

■ **SERVPA** - SERVPA is a secure, confidential volunteer registry site. Volunteers that register through SERVPA are open to the idea of volunteering in case of an emergency. The registration provides a little about their background, preferences and constraints. It does not guarantee that they will be called upon, nor does it mean that they must participate if called. If a volunteer is called to assist in an event or emergency, they will have the opportunity to learn more about the specific event and the commitment required. The counties are in the initial stages of building this community volunteering service.

■ **Community Emergency Response Teams (CERT)** – Training to educate citizens about disaster preparedness and training in basic disaster response skills, such as fire suppression, Disaster Medical Operations, Light Search and Rescue, Team Organization, Disaster Psychology, and Terrorism Awareness. The goal of this program is for emergency personnel to train members of neighborhoods, community organizations, or workplaces in basic response skills. If a disastrous event

overwhelms or delays the community's professional response, CERT members can assist others by applying the basic response and organizational skills that they learned during training. These skills can help save and sustain lives following a disaster until help arrives.

■ **Citizen Corps Council** – The mission of Citizen Corps is to harness the power of every individual through education, training, and volunteer service to make communities safer, stronger, and better prepared to respond to the threats of terrorism, crime, public health issues and disasters of all kinds.

■ **Emergency Management courses** are provided through the county EMA offices to the Local Coordinators and Elected Officials. The following courses are provided: Duties and Responsibilities of the Local Emergency Management Coordinator (LEMC), Elected Officials Seminar, Initial Damage Assessment, Safe Schools Training, National Incident Management System, Work Environment of the LEMC and numerous FEMA Independent Study Courses.

■ **Local Emergency Planning Committee (LEPC)** – The LEPC works closely with the business community to form a safety net around the chemical industry to protect the general population from the possible outcome of hazardous material incidents. The LEPC has a minimum of seven members and includes at least one representative from each of the following groups:

- Elected Official representing local governments within the county
- Law enforcement, first aid, health, local environmental, hospital and transportation personnel
- Firefighting personnel
- Civil Defense and emergency management personnel
- Broadcast and print media
- Community groups not affiliated with emergency service groups
- Owners and Operators of facilities subject to the requirements of SARA Title III

■ **Technical Assistance** – The county EMA offices can support local, public and private entities as needed through coordination and provision of information and equipment resources. These include both existing county capabilities, such as County Hazardous Materials Response Team and Technical Rescue Teams, and predetermined private and public resources.

- The Lehigh County Special Operations Team is/has:
  - Greater than 30 active members trained to Operations and Technician level in compliance with OSHA 1910.120.
  - Personal Protective Equipment (PPE) for all levels of HazMat entry. Level A, B, C.
  - Self-contained breathing apparatus for 22 team members with in-suit communications. Dedicated radio frequencies.

- Monitoring equipment for Radiation, Chemical & Biological Warfare, Mercury and Industrial Toxics available at any time.
- Spill Containment and Mitigation supplies for spills, large and small.
- Specialized equipment for tanker and rail car emergencies.
- Certifications in the following: Confined Space Rescue Technician, Trench Rescue Technician, Low and High Angle Rope Rescue, Structural Collapse, and Incident Command.
- Medically trained members in CPR, AED, EMT and Paramedic, Nurse and Doctors.
- Paramedics and Doctors trained in Rescue Medicine to aid in the care of Technical Rescue Patients.
- Drone program used for:
  - Damage Assessment
  - Active Incidents

■ Northampton County Emergency Management Services supports the efforts of the Lehigh County Special Operations Team during HazMat incidents by having a trained staff and support equipment. Northampton County personnel are trained to the following levels: two HazMat technicians trained, all are or in the process of being trained to HazMat Operations Level, and all are trained to HazMat awareness.

- Northampton County also has specialized vehicles to support HazMat incidents:
  - Command Post vehicle

- Supports communications and command at large incidents
- Three mobile communication vehicles
  - Supports with communications
  - Supports command
  - First out duty vehicle with limited HazMat equipment
- One Chemical, Biological, Radiological, Nuclear and Explosives (CBRNE) support truck
  - Carries specialized equipment for decontamination
  - Meters for air monitoring
  - Equipment to support HazMat operations
  - Radiological monitoring equipment
- Two HazMat support trailers
  - Equipment for mass decontamination:
  - Decontamination tent
  - Hot water heater
  - Privacy kits
  - Carries extra spill equipment for large spills
- Three foam trailers
  - One trailer carries 63 five-gallon pails of foam, for a total of 315 gallons of foam
  - Two trailers equipped with two 330-gallon totes, for a total of 660 gallons on each trailer

- Lehigh County provides contractual Hazardous Materials Response Team coverage to Northampton County.

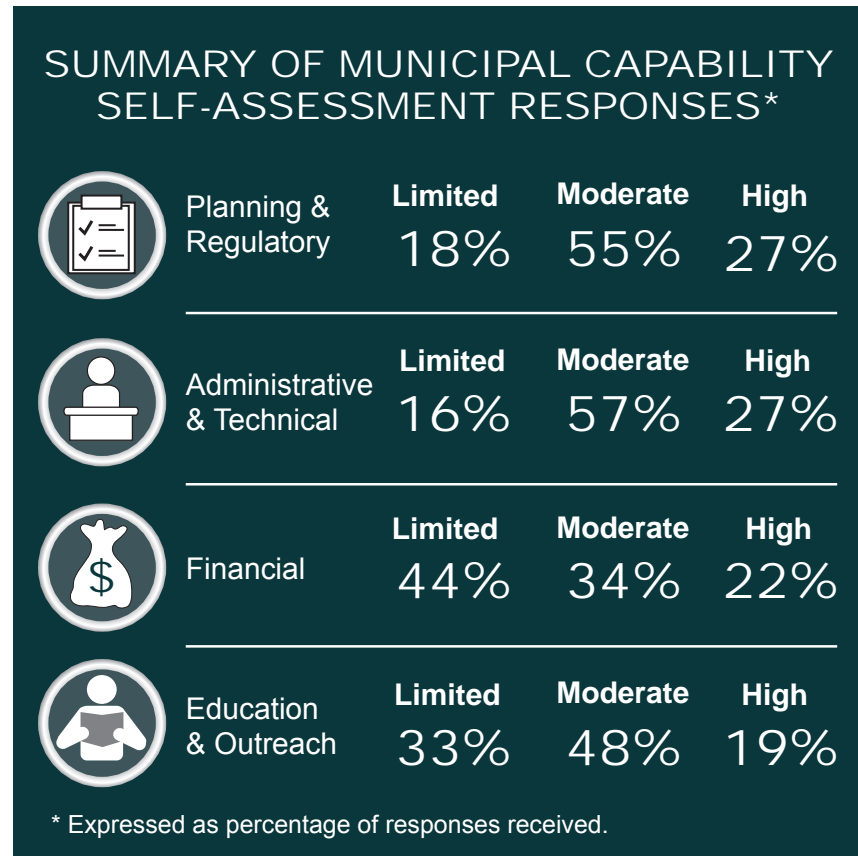
Lehigh and Northampton counties have already taken several steps to take control of the drug overdose epidemic. Northampton County created the Heroin and Opioid Overdose Task Force that secured a \$103,000 state grant in 2017 to provide communities with Naloxone and to fund the Angel program, which enables addicts to turn in their drugs at any police station, without fear of arrest, in exchange for help in finding treatment. Lehigh County has instituted the Blue Guardian program, in which police and a recovery specialist, within a few days, visit the home of anyone who has been saved by Naloxone to help them seek treatment. Both counties have joined court actions seeking monetary damages from Opioid manufacturing companies to help fund more programs to control the crisis.

The LVPC also has a variety of informational resources available to the public. Many of the publications discussed previously are available for review by the public at the LVPC office or on the LVPC website. The LVPC also provides or hosts a variety of educational workshops for the public. The Lehigh Valley Government Academy has sponsored seminars related to stormwater management, floodplain issues, model environmental ordinances, Growing Greener-Conservation by Design, and basic courses in subdivision and land development review, zoning and community planning. The LVPC, in partnership with PennDOT, hosts the Local Technical Assistance Program, providing free technical information and proven technologies dealing with roadway maintenance and safety methods. The LVPC's popular Planning and Pizza series included recent sessions on the regional Hazard Mitigation Plan, regional Comprehensive Plan,

Monocacy Creek Act 167 Plan, Lehigh County Parks and Agriculture Planning and the Transportation Improvement Program. Copies of the floodplain mapping and flood studies prepared by FEMA for Lehigh County are available for public review at the LVPC office. The floodplain mapping currently in effect in Lehigh County is dated July 16, 2004. Paper copies of the Northampton County flood maps and studies, effective July 16, 2014, are not available at the LVPC, however, the LVPC responds to floodplain information requests from the public related to the mapping and studies.

## SELF-ASSESSMENT OF CAPABILITY

In addition to the inventory and analysis of specific local capabilities, the Capability Assessment Survey required each municipality to complete its own self-assessment of its capability for each of the four categories to effectively implement hazard mitigation actions. Respondents were required to identify their degree of capability as “Limited”, “Moderate” or “High”. For the 2018 Plan, the self-assessment survey as provided in the *Pennsylvania Standard Operating Guide* was used but revised to request whether the jurisdiction’s response for each capability category represented a change since the 2013 Plan. It is noted that the 2018 Plan survey was not the same survey used for the 2013 Plan. The 2013 Plan self-assessment survey did not include the education and outreach capability category, which the 2013 State Guide survey includes. More than 80% of the municipalities responding to the survey did not identify any change in degree of capability for any of the four categories since the 2013 Plan. For those that did provide comments, several noted a higher degree of education and outreach capability due to improvements in community outreach through enhanced websites and use of social media. Several others noted an increase in the administrative and technical capability due to hiring new staff. One municipality indicated



a lesser degree of capability for all four categories due to less staff and unfunded mandates using municipal funds. From the survey findings, 44% of the respondents indicated that they had limited financial capability to address hazard mitigation activities that reduce hazard vulnerability. In addition, one-third of respondents have limited capabilities related to education and outreach. The majority of municipalities, however, indicated that they had either moderate or high levels of capability related to planning and regulatory (82%) as well as administrative and technical (84%). Responses to the survey can be found in the municipal annexes.

## PLAN INTEGRATION

Plan integration is the process by which communities look critically at their existing planning framework and align efforts with the goal of building a safer, smarter community. Plan integration involves a two-way exchange of information and incorporation of ideas and concepts between hazard mitigation plans (state and local) and other community plans. Specifically, plan integration involves the incorporation of hazard mitigation principles and actions into community plans and community planning mechanisms into hazard mitigation plans (FEMA 2015). In the Lehigh Valley, there are many existing plans and programs that support hazard risk management, and thus it is critical that this 2018 Plan continue to integrate and coordinate with, and complement, those mechanisms.

Numerous existing plans, studies, reports and technical information were reviewed and incorporated into the 2018 Plan. The use of this information is cited in the various sections where it is used. An all-inclusive list of resources used to prepare the Plan is located in the Appendix.

The Region section was prepared using existing LVPC plans and data, including the ***Comprehensive Plan The Lehigh Valley...2030*** (2005), ***BuildLV: Lehigh Valley Annual Development Report*** (2017), ***MoveLV: Long Range Transportation Plan*** (2017) and ***The People*** (2017). Data incorporated into this section included environmental information, Lehigh Valley population and employment projections through 2040, development trends and transportation infrastructure. The LVPC also provided GIS mapping using existing layers. The U.S. Census Bureau American Community Survey provided demographic and housing data.

An extensive list of data sources, vital to the identification of historical disaster events and their impacts on the region, was reviewed and incorporated into the Risk Assessment section, including the ***Comprehensive Plan The Lehigh Valley...2030*** (2005), National Climatic Data Center, Lehigh and Northampton County Knowledge Center databases, ***Pennsylvania 2013 Standard State All-Hazard Mitigation Plan***, among others. Federal Emergency Management Agency data related to Presidential Disaster Declarations, repetitive property losses and National Flood Insurance Program policies and claims were also incorporated into the 2018 Plan. Existing GIS layers were used in conjunction with existing Lehigh and Northampton County tax parcel data for the hazard vulnerability assessments. FEMA floodplain mapping for Northampton County, which became effective in July 2014, was incorporated into the Flood profile.

This Capability Assessment section provides a summary and description of the existing plans, programs and regulatory mechanisms in the Lehigh Valley that support hazard mitigation. This section also incorporates information from many existing LVPC plans and studies, including the ***Comprehensive Plan The Lehigh Valley...2030***, Act 167 Stormwater Management Plans and Long Range Transportation Plan, among others. Existing Lehigh County Emergency Management Agency and Northampton County Emergency Management Services plans and programs were identified and incorporated into the 2018 Plan. In addition, existing municipal plans and programs incorporated in the 2018 Plan are documented in the Capability Assessment Survey (Worksheet #5) located in the municipal annexes.



In the Capability Assessment survey, municipalities were asked to identify whether the 2013 Plan findings were incorporated into local plans and programs and how these plans and programs can be expanded and improved to reduce risk. Responses to this survey are located in the municipal annexes, however, many municipalities did not provide comments. It is the intention of this 2018 Plan, however, that the municipalities continue to incorporate the findings and recommendations of this Plan into future local planning efforts and into the overall execution of their land use planning process. Some of the most important planning and regulatory capabilities identified earlier for hazard mitigation integration include comprehensive plans, zoning and subdivision/land development ordinances, emergency operations plans and building codes. Further, the sample adoption resolutions in the Appendix includes a resolution item stating the intent of the local governing body to incorporate mitigation planning as an integral component of government and partner operations. The Administrative Planning Team will work with local government officials to integrate hazard mitigation goals and actions into the general operations of government and partner organizations.

The two counties and municipalities in the Lehigh Valley recognize that the findings and recommendations of the 2018 Plan need to be incorporated into their emergency planning, preparedness, response and recovery programs and operations. Specifics about response and recovery programs and efforts in the Lehigh Valley, including the management and administration of mitigation and emergency preparedness grant programs, have led to county and local mitigation actions to improve regional emergency management coordination and build related risk management capabilities. Public education and outreach to

improve personal preparedness and promote an awareness of mitigation opportunities and personal protection through risk insurance have also been incorporated in county and local mitigation actions.

#### ***FutureLV: Lehigh Valley Comprehensive Plan***

The LVPC, at the time of this 2018 Plan, was in the process of updating the ***Comprehensive Plan The Lehigh Valley...2030***, which was adopted by both counties in 2005. While the 2005 Comprehensive Plan does not specifically discuss hazard mitigation planning, the plan's goals, policies and strategies are aligned with the goals of the hazard mitigation plan. For example, the 2005 Comprehensive Plan includes a number of goals related to hazard mitigation planning, including, but not limited to the following:

- To minimize flood damage and protect floodplains
- To protect the remaining wetlands in the Lehigh Valley
- To minimize the adverse environmental impacts of steep slope development
- To minimize the hazards to development in areas where carbonate bedrock exists
- To protect and manage the region's woodland resources
- To preserve open space and important natural areas
- To provide a safe, well-maintained road network that facilitates the movement of traffic
- To construct highway and bridge improvements that are compatible with the conservation, development and redevelopment goals of the plan



- To support expansion of the public transit system and to advocate transit use as an alternative to single-occupant driving
- To manage the rate, volume and quality of storm runoff for protection of public safety and welfare, property and the environment

However, the LVPC recognizes the need to more fully integrate hazard mitigation principles in the comprehensive plan update, which will also incorporate **MoveLV**, the region’s Long-Range Transportation Plan, in an effort to create a more disaster-resilient Lehigh Valley. In addition, new federal requirements state that future Long-Range Transportation Plan updates must work on “improving the resiliency and reliability of the transportation system and reducing or mitigating the stormwater impacts of surface transportation.”

The intent of hazard mitigation planning is to be proactive by taking steps to mitigate potential impacts to persons and property prior to hazard events. Three of the four themes in **One Lehigh Valley**—environment, transportation and livable communities—are common elements shared by the comprehensive plan and hazard mitigation plan. The **Climate and Energy Element** provides a number of preventive goals, policies and implementation strategies to be included in the regional comprehensive plan that can be used to lessen the impact of hazards. The goal of protecting public infrastructure from potentially harmful impacts associated with climate change is inextricably linked to the goals in the **MoveLV: Long-Range Transportation Plan**, which will be integrated with all subsequent comprehensive plan updates. Many of the plans for the Lehigh Valley highlight the need to protect, conserve and enhance natural ecosystems to provide long-term resilience to climate change as a goal. In addition to protecting natural

resources, the **Climate and Energy Element** addresses the impacts of future development. One goal advocates providing building and site design practices that help to mitigate climate change impacts. These goals were created to protect residents, property and critical facilities from natural hazards that evolve over time due to climate change.

The **Lehigh Valley Return on Environment** (2014), which quantifies the economic benefits provided by open for natural systems services, air quality, outdoor recreation and property value, has many ties to hazard mitigation planning that can be integrated into **FutureLV**. Natural system services includes flood mitigation, water supply and soil retention benefits of open space that clearly link to hazard mitigation. Further, the air quality monetary benefits are partially based on the carbon sequestration benefits of trees to mitigate the impacts of climate change and reduce impacts such as drought, extreme temperature and severe weather. Importantly, the **Return on Environment** study assigns dollar value to these resources that aid in securing funding for projects that protect them.

The **Floodplain Guide/Model Regulation** (2014) deals directly with municipalities maintaining compliance with the National Flood Insurance Program and actions to provide higher regulation of flood prone areas, especially related to repetitive loss and severe repetitive loss properties.

The **Green Infrastructure Guidelines** (LVPC 2017) and the **Monocacy Creek Act 167 Plan** (2018) bring two important hazard mitigation elements regarding water balance and use of green stormwater practices to **FutureLV**. Water balance refers to how rainfall is distributed to groundwater recharge, runoff and evapotranspiration to the atmosphere by the natural environment versus the built environment. Replacement

## CAPABILITY ASSESSMENT SUMMARY

The described capabilities at the county and local levels when compared to the hazard risks for the Lehigh Valley identify gaps in capability that should be reconciled with recommended actions. The intention is to improve future capabilities thereby further reducing the Lehigh Valley's vulnerability to hazard risks and improving the overall resiliency of the region. The capability assessment resulted in mitigation actions identified by the counties, LVPC and municipalities to enhance the capabilities of the Lehigh Valley.

of meadows, agriculture and other pervious surfaces that allow infiltration to groundwater with impervious surfaces that prevent infiltration can significantly increase runoff and reduce groundwater recharge and evapotranspiration. Stormwater management practices also have a significant impact on water balance, whether designers choose detention basins, rain gardens or underground infiltration facilities, for example. Standards in the Monocacy Plan seek to create a built environment with stormwater management controls that mimic the natural water balance, thereby providing drought and flood mitigation benefits. The green infrastructure guidelines work hand in hand with the water balance standards by requiring green infrastructure practices "first " in a land development plan. This translates to preserving a site's natural resources as much as possible and using vegetative stormwater management practices. Both practices provide climate change mitigation along with

flood, drought and extreme temperature mitigation, among others. Further, these efforts are part of the larger **One Water** effort to consider all aspects of water management planning and integrate with land use planning and comprehensive planning.

The **Livable Landscapes** plans created for Lehigh and Northampton counties bring together the elements of the various LVPC open space and natural resources plans and policies including all the guides and model ordinances, the Lehigh Valley Planning Commission Natural Resources Plan, Natural Heritage Inventory, **Return on Environment** study and the **Greenways Plan**, among others. These efforts reinforce the hazard mitigation benefits of natural resources, build on the existing goals, policies and implementation strategies of the Comprehensive Plan and align with the natural resource goal of the hazard mitigation plan.

## WHAT'S NEW FOR 2018

- Capabilities were categorized under four headings: Planning and Regulatory; Administrative and Technical; Financial; and Education and Outreach. The 2013 Plan did not include the Education and Outreach Capability category.
- Lehigh and Northampton counties and all 62 municipalities were surveyed (Capability Assessment Survey Worksheet #5) to provide an updated assessment of their mitigation planning capabilities, including a self-assessment of capability for each category.
- Descriptions of the plans and programs in place in the Lehigh Valley, and their relation to hazard mitigation, are included in the 2018 Plan.
- A new survey is included in this Plan, which was not included in the 2013 Plan: Compliance with the National Flood Insurance Program (Worksheet #3).
- A discussion on the integration of hazard mitigation planning into local plans and programs, including the county comprehensive plan, and incorporation of existing studies, reports and technical information into the hazard mitigation plan have been added to this section.





# MITIGATION STRATEGY

This section describes the process by which the Planning Team performed the update to the county and local mitigation strategies. The 2018 Plan focuses on improving the county and local mitigation strategies from the 2013 Plan. Throughout the planning process, both counties and all municipalities were encouraged to thoroughly consider their natural and non-natural hazard risks and vulnerabilities, and to identify appropriate actions to mitigate those risks.

The 2006 and 2013 Lehigh Valley Hazard Mitigation Plans included goals and actions. Objectives were not included in these plans but have been created for the 2018 Plan. Goals are general guidelines that describe what the region would like to achieve. Objectives define strategies that must be implemented to achieve the identified goals and are specific and measurable. Actions provide more detailed descriptions of specific work tasks to help the counties and municipalities achieve prescribed goals and objectives.

2  
Counties and  
62  
municipalities  
have devised  
1,161  
actions designed  
to prepare the  
Lehigh Valley  
for disaster



For the 2018 Plan, the eight existing goals from the 2013 Lehigh Valley Plan were reviewed with the Planning Team, stakeholders and the public. The public was provided opportunities to comment on the existing goals through public meetings. All Planning Team members, including stakeholders, were provided with a 2013 Plan Goal Evaluation worksheet (Worksheet #10) to identify whether each goal should be carried forward to the 2018 Plan, whether it should be changed based on current conditions or if it should be discontinued, with explanations for any changes requested. Respondents were also asked if the goal led to reduced vulnerability in the community. About 76% of the municipalities, both counties and one stakeholder completed the worksheet. Only four comments were received on the goals. Four of the goals were confirmed and carried over to the 2018 Plan and four were revised slightly. The goals were revised in some cases to be more specific or inclusive (such as including woodlands under natural resources and including functional loss in addition to damages), to be less specific to integrate with the newly created objectives (such as removing repetitive loss structures from the hazard avoidance goal) and to better reflect actions appropriate at both the county and local government levels.

The Planning Team concurred with the proposed revisions to the goals. The Pennsylvania 2013 Standard State All-Hazard Mitigation Plan was also reviewed to ensure that the 2018 Plan goals complement and support the five state goals identified below:

- Protect lives, property, environmental quality, and resources of the Commonwealth, including Repetitive Loss (RL) and Severe Repetitive Loss (SRL) properties.

- Enhance consistent coordination, collaboration, and communications among stakeholders.
- Provide a framework for active hazard mitigation planning and implementation.
- Build legislative support and secure funding for mitigation efforts.
- Increase awareness, understanding, and preparedness across all sectors.

In the 2013 Lehigh Valley Plan, participating municipalities and the counties were asked to identify mitigation actions within their communities. In Lehigh County, 24 municipalities recommended a total of 329 actions, while in Northampton County, 38 municipalities recommended a total of 608 actions. Lehigh and Northampton counties identified 45 county-level actions/initiatives, which included actions for the LVPC, to support an improved understanding of hazard risk and vulnerability, and enhance mitigation capabilities.

To evaluate progress on mitigation actions since the 2013 Plan, each municipality and both counties were provided with a Mitigation Action Plan Review worksheet (Worksheet #7). Respondents were asked to indicate the status of each action and provide comments on each. Respondents were also asked to identify any obstacles to implementation of actions, with project costs, lack of funding and insufficient staffing as the primary responses. Responses to the worksheet are provided in the municipal annexes.

## MITIGATION GOALS AND OBJECTIVES

As stated, the 2013 Plan goals, with some revisions, have been carried over to the 2018 Plan. To ensure the goals reflect updated conditions, the goal evaluation process included a review of the updated capability assessment and risk assessment, which included three new hazard profiles. Based on this review, the Planning Team determined that the revised goals reflect the region's vision for a disaster-resilient Lehigh Valley.

For the 2018 Plan, objectives were created for each of the eight goals for a total of 23 objectives. The Planning Team reviewed and concurred with the objectives. Goals and objectives must also relate to a community's continued compliance with the National Flood Insurance Program (NFIP). The 2018 Plan goals and objectives are listed below, with those related to continued NFIP compliance identified with an asterisk.

### **Goal 1: To minimize the risk to human life associated with natural and non-natural hazards (NFIP).**

#### **OBJECTIVES:**

- A. Create a better understanding among the public and local governments of the benefits and opportunities associated with hazard mitigation planning and actions.\*
- B. Continuously promote and maintain better early warning and emergency communications.
- C. Provide added protection for vulnerable populations.\*

### **Goal 2: To promote hazard avoidance, especially in floodplains (NFIP).**

#### **OBJECTIVES:**

- A. Minimize future risks of losses associated with structures, including repetitive loss structures.\*
- B. Reduce flooding potential through planning, training and outreach.\*
- C. Encourage and facilitate the development or revision of comprehensive plans and zoning/land use ordinances to limit development in high-hazard areas.

### **Goal 3: To reduce the damages and functional loss from natural and non-natural hazards to existing and future public and private assets, including structures, critical facilities and infrastructure (NFIP).**

#### **OBJECTIVES:**

- A. Identify the current risks of critical facilities and infrastructure from hazards, and determine actions to lessen those risks in the future.\*
- B. Encourage and/or perform regular maintenance and upgrades of existing drainage systems potentially impacting critical facilities.
- C. Encourage and/or provide backup power resources (generators) for critical facilities.

**Goal 4: To preserve and enhance the effectiveness of natural resources, including woodlands, streams, rivers, wetlands, floodplains and riparian buffers to provide resiliency benefits (NFIP).**

**OBJECTIVES:**

- A. Encourage and/or provide maintenance and restoration of streams and rivers and associated floodplains to naturally provide flood mitigation.
- B. Encourage regulation of and/or regulate development in priority conservation areas, including floodplains, to minimize flood damage.\*

**Goal 5: To develop, prioritize and implement cost-effective, long-term actions that will reduce the impacts of natural and non-natural hazards (NFIP).**

**OBJECTIVES:**

- A. Thoroughly assess the community and established capabilities and identify specific cost-effective actions for improvement, relative to existing and future hazard risks.\*
- B. Establish mitigation action priorities and encourage and track progress.\*

**Goal 6: To improve local regulations to reduce the impacts of natural and non-natural hazards (NFIP).**

**OBJECTIVES:**

- A. Better integrate hazard mitigation planning with comprehensive planning and land use regulations.\*
- B. Identify and promote “best practices” for municipal regulation of land use in zoning and subdivision ordinances and official maps.
- C. Encourage proactive planning for potential hazard events and potential related property damage.\*
- D. Incorporate hazard mitigation planning into existing municipal policy.

**Goal 7: To enhance planning and emergency response efforts among federal, state, county and local emergency management personnel to protect public health and safety.**

**OBJECTIVES:**

- A. Continually improve communication capabilities, training and coordination for hazard events.
- B. Continually improve the planning for shelters, evacuation routes and disaster recovery.
- C. Continue the promotion of disaster resiliency in the business community.
- D. Maintain and/or upgrade emergency response equipment and resources.

## Goal 8: To promote public awareness on both the potential impacts of natural and non-natural hazards and actions to reduce those impacts (NFIP).

### OBJECTIVES:

- A. Encourage and/or provide education and outreach to increase awareness of hazards and opportunities for mitigation.\*
- B. Encourage and/or provide public education programs for businesses, households and individuals on mitigation, safety measures and preparedness.

## IDENTIFICATION AND ANALYSIS OF MITIGATION TECHNIQUES

The 2018 Plan mitigation strategy included an analysis of a comprehensive range of mitigation actions with an emphasis on existing and new buildings. The *Commonwealth of Pennsylvania All-Hazard Mitigation Planning Standard Operating Guide*, October 2013, and *FEMA Local Mitigation Planning Handbook*, March 2013, identify four types of actions or techniques for consideration in developing the mitigation action plan:

**Local Plans and Regulations:** These actions include government authorities and policies or codes that influence the way land and buildings are developed and built. Examples include, but are not limited to comprehensive plans, subdivision and land development ordinances, National Flood Insurance Program and Community Rating System, building codes and enforcement, among others.

**Structure and Infrastructure:** These actions involve modifying existing structures or constructing new structures to reduce hazard vulnerability. Examples include, but are not limited to, acquisitions and elevations of structures in flood prone areas, utility undergrounding, structural retrofits, floodwalls and retaining walls, detention and retention structures, and culverts.

**Natural Systems Protection:** These are actions that minimize damage and losses, and preserve or restore the functions of natural systems. Examples include, but are not limited to, sediment and erosion control, stream corridor restoration, forest management, conservation easements, and wetland restoration and preservation.

**Education and Awareness:** These are actions to inform and educate citizens, elected officials and property owners about hazards and potential ways to mitigate them. Examples include, but are not limited to, radio or television spots, websites with maps and information, real estate disclosure, education and training, NFIP outreach, and enrollment in StormReady and Firewise Communities programs.

Hazard	MITIGATION TECHNIQUE CATEGORIES			
	Local Plans and Regulations	Structure and Infrastructure	Natural Systems Protection	Education and Awareness
<b>Natural Hazards</b>				
Drought	X	X	X	X
Earthquake	X	X		X
Extreme Temperature	X	X	X	X
Flood	X	X	X	X
Hailstorm		X		X
Invasive Species	X		X	X
Landslide	X	X	X	X
Lightning Strike	X	X		X
Pandemic and Infectious Disease				X
Radon Exposure		X		X
Subsidence/Sinkhole	X	X	X	X
Wildfire	X	X	X	X
Windstorm/Tornado	X	X		X
Winter Storm		X		X
<b>Non-Natural Hazards</b>				
Civil Disturbance/Mass Gathering		X		X
Dam Failure	X	X		X
Drug Overdose Crisis				X
Environmental Hazards/Explosion	X	X		X
Fire (Urban/Structural Fire)	X	X		X
Levee Failure	X	X		X
Nuclear Incident	X	X		X
Structural Collapse	X	X		X
Terrorism	X	X		X
Transportation Crash	X	X		X
Utility Interruption		X		

**MITIGATION TECHNIQUES FOR EACH HAZARD IN THE LEHIGH VALLEY**

## MITIGATION ACTION PLAN

During the January 18, 2018 Planning Team meeting, mitigation strategy ideas were reviewed with and provided to Planning Team members for their consideration. Municipalities were informed that they need at least one mitigation action in the 2018 Plan. Further, each municipality that participates in the NFIP (all 62 municipalities) must have at least one action that relates to continued compliance with the NFIP. Municipalities and both counties were provided with a Mitigation Strategy Action Plan worksheet (Worksheet #11) to identify any new actions to be included in the 2018 Plan. During the planning process, municipalities were encouraged to identify mitigation actions, focusing on identifying well-defined, implementable projects with a careful consideration of capabilities, risk reduction, losses avoided, costs and possible funding sources, including mitigation grant programs. Each municipality has identified more than one mitigation action, with at least one that relates to continued NFIP compliance. For the 2018 Plan, 1,102 actions covering all 62 participating municipalities are included in the municipal annexes. An additional 59 county-level actions are identified for the 2018 Plan in the county annex.

At least one action is required for each hazard profiled in the Plan. More than one related action is provided for each hazard in the 2018 Plan. For the three new hazards—Pandemic and Infectious Disease, Invasive Species and Drug Overdose Crisis—expert speakers suggested possible mitigation actions for municipal consideration, during presentations at the March 15 and April 19, 2018 Planning Team meetings. In addition, “common” actions related to the three hazards were developed by the Administrative Planning Team for municipal consideration. All municipalities were asked to review the actions and

accept, amend or decline any of the actions, or develop their own actions. Fifteen municipalities included all the “common” actions, while ten other municipalities accepted some of the actions or amended them as appropriate for their community.

With the completion of the evaluation of 2013 Plan mitigation actions, those actions identified as “Complete” were removed from the 2018 mitigation actions unless they were part of a larger, ongoing action. Two examples of this are 1) multi-part projects where one or more parts were completed but other parts remain, and 2) continuous actions such as maintaining compliance with the NFIP, where a completed action since 2013 was adopting an updated floodplain ordinance. 2013 actions identified as “Discontinued” have been removed from this Plan. The 2013 actions identified as “No Progress/Unknown”, “In Progress/Not Yet Complete” or “Continuous” have been carried forward in the 2018 Plan. The status of the 2013 Plan actions is provided in the municipal annexes.

Throughout the planning process, the public, through the public meetings, was given the opportunity to identify potential mitigation actions to be included in the Plan.

With all municipal 2018 actions identified, a region-wide mitigation action plan summary was created by categorizing all municipal actions under 28 regional action headings. Specific 2018 actions for each community are identified in the municipal annexes. For each regional action listed, the number of municipalities that include that action in their municipal annex is provided. Actions related to continued NFIP compliance are also identified in the action plan summary. In addition, mitigation action numbers that apply to each municipality are documented in the Municipal Action Matrix.



Regional Action Number	Action Description	# of Municipalities	Hazards Addressed	Mitigation Technique Category	Applies to New/Existing Structures	Goal-Objective #	Priority
1	Retrofit structures in flood-prone areas, with repetitive and severe repetitive loss properties as a priority	48	Flood	Structure and Infrastructure	Existing	2-A	High
2	Purchase or relocate structures in hazard prone areas	47	Flood, Landslide, Subsidence/Sinkhole, Dam and Leves Failure	Structure and Infrastructure	Existing	2-A	High
3	Maintain compliance with the National Flood Insurance Program, including enforcement of floodplain management requirements, floodplain identification and mapping, and flood insurance outreach (NFIP)	57*	Flood	Local Plans and Regulations	Existing	2-A	High
4	Conduct and facilitate community and public outreach for residents and businesses to promote and effect hazard risk reduction (NFIP)	59*	All	Education and Awareness	Both	8-A	High
5	Begin and/or continue the process to adopt higher regulation of floodplains and carbonate bedrock areas (NFIP)	47*	Flood, Subsidence/Sinkhole	Local Plans and Regulations	N/A	2-C	High
6	Determine if CAV or CAC visit is needed and schedule (NFIP)	44	Flood	Local Plans and Regulations	Both	2-B	Low
7	Have designated Floodplain Administrator certified and/or pursue continuing education training (NFIP)	46	Flood	Local Plans and Regulations	N/A	2-B	Medium
8	Participate in the Community Rating System (NFIP)	45*	Flood	Local Plans and Regulations	N/A	2-A	High
9	Obtain/archive elevation certificates (NFIP)	47	Flood	Local Plans and Regulations	N/A	2-A	Low
10	Continue to support implementation, monitoring, maintenance and updating of the plan	61*	All	All	Both	5-C	High
11	Develo/enhance Comprehensive Emergency Management Plans	62*	All	Local Plans and Regulations	Both	6-C	Medium
12	Create/enhance/maintain mutual aid agreements with neighboring communities for continuity of operations	56*	All	All	Both	7-A	Medium
13	Improve post-disaster capabilities, including processing FEMA/PEMA paperwork and qualified damage assessment personnel	55	All	Education and Awareness	N/A	7-A	Low

## MUNICIPAL 2018 ACTION PLAN SUMMARY

\*County-level mitigation actions are also associated with these categories, noting that for actions that are specifically a municipal responsibility, such as maintaining National Flood Insurance Program compliance. the county actions include encouraging and supporting municipal efforts.

Regional Action Number	Action Description	# of Municipalities	Hazards Addressed	Mitigation Technique Category	Applies to New/Existing Structures	Goal-Objective #	Priority
14	Work with regional agencies to develop damage assessment capabilities through training programs, certification of qualified individuals such as floodplain managers (NFIP)	61*	All	Education and Awareness	N/A	5-A	Medium
15	General storm drainage/flooding projects	8	Flood	Structure and Infrastructure	Existing	5-A	Medium
16	Specific storm drainage/flooding projects (non-critical facilities)	22	Flood	Structure and Infrastructure	Existing	5-A	Medium
17	Critical facilities - storm drainage/flooding projects or relocation	3	Flood	Structure and Infrastructure	Existing	3-B	High
18	Critical facilities - back-up power projects	9	All	Structures and Infrastructure	Existing	3-C	High
19	Critical facilities - other projects	16*	All	Structures and Infrastructure	Existing	3-A	High
20	Emergency notifications/communication/traffic control	4*	All	Education and Awareness	Existing	1-C	High
21	Stream or floodplain restoration/stabilization projects	8	Flood	Natural Systems Protection	Existing	4-A	Medium
22	Work to minimize tree/electric line conflicts	9*	Windstorm/Tornado, Winter Storm	Structure and Infrastructure	Existing	3-A	High
23	Geotechnical/sinkhole evaluation (adopt construction standards, remediation)	3	Subsidence/Sinkhole	Local Plans and Regulations	Both	6-C	High
24	Hazardous materials inventory/emergency planning, education, certification	4	Environmental/Hazards/Explosion	Education and Awareness	Both	5-A	High
25	Dam/levee projects	3	Flood, Earthquake	Structure and Infrastructure	Existing	3-A	Medium
26	Specific bridge replacement or retrofits	8*	Flood	Structure and Infrastructure	Existing	3-A	Medium
27	Wildfire Mitigation	1	Wildfire	All	Existing	5-A	Medium
28	Integrate hazard mitigation into local plans and ordinances	4*	All	Local Plans and Regulations	Both	6-A	High

## MUNICIPAL 2018 ACTION PLAN SUMMARY

\*County-level mitigation actions are also associated with these categories, noting that for actions that are specifically a municipal responsibility, such as maintaining National Flood Insurance Program compliance, the county actions include encouraging and supporting municipal efforts.

Lehigh County	Regional Action Number(s)
Alburtis Borough	10-11,14,19,22
Allentown City	1-14, 16-17, 26
Bethlehem City*	1-14, 25
Catasauqua Borough	1-16, 19-21, 23
Coopersburg Borough	4, 10-11, 14-15, 19
Coplay Borough	3-5, 10-14,19, 22
Emmaus Borough	1-4, 9-11, 14-15, 19, 22
Fountain Hill Borough	3-4, 10-14, 19, 24
Hanover Township	1, 3-14
Heidelberg Township	10-12, 14, 16, 18-19, 22
Lower Macungie Township	1-14, 21, 26
Lower Milford Township	3-14, 16, 19
Lowhill Township	1-14
Lynn Township	3-4, 10-15, 18
Macungie Borough	1-4, 10-14, 16, 21
North Whitehall Township	3-4, 10-14, 19
Salisbury Township	3-4, 10-14, 23
Slatington Borough	10-11, 14,19, 22
South Whitehall Township	1-4, 10-14, 16, 18
Upper Macungie Township	1-14, 25
Upper Milford Township	1-14, 19, 22
Upper Saucon Township	1-14, 16, 26
Washington Township	10-11, 14, 19, 22
Weisenberg Township	3-4, 10-14, 19
Whitehall Township	1-14, 16, 18-20, 26

**MUNICIPAL ACTION MATRIX**

\* Includes Lehigh and Northampton County portions

Northampton County	Regional Action Number(s)
Allen Township	1-14
Bangor Borough	1-14, 16
Bath Borough	1-14, 16, 18
Bethlehem Township	3-4, 10-15, 24
Bushkill Township	1-14
Chapman Borough	1-14, 16
East Allen Township	3-4, 11, 15-16, 24, 26
East Bangor Borough	1-14, 18,26
Easton City	1-14, 16, 25-26
Forks Township	1-14
Freemansburg Borough	1-14, 16
Glendon Borough	1-14
Hanover Township	1-14
Hellertown Borough	1-17, 21, 24, 28
Lehigh Township	1-14, 18-20
Lower Mt. Bethel Township	1-14
Lower Nazareth Township	1-14
Lower Saucon Township	1-14, 16, 21
Moore Township	1-15
Nazareth Borough	1-5, 7-14, 18
North Catasauqua Borough	1-14
Northampton Borough	1-14, 18-19, 21
Palmer Township	1-14, 28
Pen Argyl Borough	1-5, 7-14
Plainfield Township	1-14, 16, 27-28
Portland Borough	1-14, 16
Roseto Borough	1-14
Stockertown Borough	1-14, 20
Tatamy Borough	1-7, 9-14, 17, 21, 23, 28
Upper Mt. Bethel Township	1-14, 16, 22, 26
Upper Nazareth Township	1-14
Walnutport Borough	1-14
Washington Township	1-14, 16, 21
West Easton Borough	1-14
Williams Township	1-14, 16
Wilson Borough	1-14
Wind Gap Borough	1-14, 16

The regional actions were prioritized against one another on a Lehigh Valley-wide basis by applying the PEMA Multi-Objective Mitigation Action Prioritization criteria. The weighted criteria include:

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

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

- Low Priority: 0-1.8
- Medium Priority: 1.9-2.4
- High Priority: 2.5-3

Through this method, the benefits that would result from a mitigation action were considered versus the cost based

on a planning-level assessment. The benefits of an action on a general basis are examined under the Effectiveness, Multi-Hazard Mitigation, Addresses High Risk Hazard and Addresses Critical Communications/Critical Infrastructure categories. Cost is examined in the Efficiency category. A full benefit-cost analysis is typically the next step in the process of implementing mitigation actions.

The prioritization results are located in the Appendix.

Within the municipal annexes, the mitigation actions that were carried over from the 2013 Plan had been evaluated and prioritized in the 2013 Plan primarily using the PA STEEL (Political, Administrative, Social, Technical, Economic, Environmental, and Legal) methodology defined by state and federal guidelines. Municipalities were requested to update information associated with their 2013 Plan actions from their annex, which includes action priority. Based on this evaluation, there were no changes in priority for these actions at the municipal level, which may differ from the priority at the regional level. Any new actions added by a community were prioritized according to community assessment of vulnerabilities, considering benefits and cost-effectiveness.

The municipal annexes present the updated mitigation strategies identified by both counties and all participating municipalities, including:

- Mitigation actions for individual and multiple hazards
- Identification of the mitigation technique category
- Department or agency primarily responsible for project initiation and/or implementation
- Estimated cost (if known) for the mitigation action, and identification of known or potential sources of funding

- Implementation schedule
- Implementation priority
- Effect of mitigation action on new or existing structures

The implementation of the specific mitigation actions identified in the municipal annexes is dependent on the approval of the local elected governing body and the ability of the municipality to obtain funding from local or outside sources. In general, mitigation actions ranked as high priority will be addressed first. However, medium or even low priority mitigation actions will be considered for concurrent implementation. Therefore, the ranking levels should be considered as a first-cut, preliminary ranking and will evolve based on prevailing priorities and decisions of local governments, the public, PEMA and FEMA as the 2018 Plan is implemented.

The county-level mitigation actions impact all the municipal mitigation actions in the form of encouragement, technical support and training as needed to accomplish the municipal objectives. In addition, Lehigh County, Northampton County and the Lehigh Valley Planning Commission have identified

a variety of mitigation actions regarding the monitoring and maintenance of the hazard mitigation plan, integration of hazard mitigation into county-level plans and specific projects to be implemented at the county level to enhance hazard mitigation and resiliency. In all, 59 projects are identified at the county level (including one project that has eight sub-parts) that are fully described in the county annex. These projects impact 13 of the regional mitigation actions as noted by the asterisks in the Municipal 2018 Action Plan Summary, most notably Action Number 4 regarding community outreach.

With the exception of the three new hazards and associated impacts on the region as identified in the Risk Assessment section of this Plan, overall plan priorities remain relatively unchanged from the previous plan. However, the Administrative Planning Team recognizes that a concerted effort is necessary to keep the momentum of the Plan going during the five-year plan update period, which did not occur over the previous five years. To that end, the county-level mitigation actions for the 2018 Plan include a greater emphasis on hazard mitigation priorities moving forward.

## HAZARD MITIGATION PRIORITIES

1. Improve the integration of hazard mitigation planning into existing plans, policies and programs, especially related to infrastructure and capital improvements programming.
2. Identify more funding opportunities and improve the ability to compete for hazard mitigation project funding, in part by encouraging development of projects that are consistent with the funding guidelines of the Pennsylvania and Federal Emergency Management Agencies, especially with regard to cost-effectiveness.
3. Improve the thoroughness and consistency of hazard mitigation outreach to the public and business community through coordinated county and municipal efforts across varied media and social media platforms.
4. Begin implementation of the Community Rating system at the municipal level to strengthen a community's floodplain management program, resulting in the reduction of flood insurance rates for those properties located within flood prone areas.
5. Commit to annual monitoring and updating of the hazard mitigation plan, as necessary, to ensure plan effectiveness and currency.

Without a strong commitment from county and local leaders, effective implementation of the Plan will not be successful. This 2018 Plan aims to ensure that participation, as well as monitoring and evaluation, continues throughout the five-year plan update period.

## MITIGATION ACTION SUCCESSES

The key to successful hazard mitigation planning is implementation of mitigation actions, demonstrating progress in risk reduction. Actions that have been implemented by Lehigh Valley communities were identified from the Mitigation Action Plan Review worksheets (Worksheet #7) completed by both counties and participating municipalities. This section describes mitigation action successes throughout the region since the 2013 Plan. A total of 123 actions have been completed by the municipalities. The list of completed actions is included in the Appendix.

Flood-related actions were the primary types of actions completed in the region, which is not surprising since flooding is one of the highest ranked hazards in the Lehigh Valley. FEMA floodplain mapping for Northampton County went into effect in July 2014. To maintain compliance and remain in good standing with the National Flood Insurance Program, all 38 Northampton County communities adopted an updated floodplain ordinance to reflect the new mapping. A number of storm drainage/flooding projects (20) were completed, involving both critical and non-critical facilities. Six projects were completed that involved retrofitting structures or purchasing/relocating structures in flood-prone areas located in five municipalities. Six municipalities indicated that their Floodplain Administrator was certified.

In addition to flood-related projects, eight back-up power projects were completed for critical facilities in eight municipalities.



## WHAT'S NEW FOR 2018

- This section was reorganized to follow the 2013 Pennsylvania Standard Operating Guide outline.
- Objectives were developed and included in the 2018 Plan.
- A mitigation technique matrix was completed to identify and evaluate possible mitigation actions for each hazard.
- Municipal actions were categorized and prioritized on a regional basis.
- National Flood Insurance Program-related actions are identified.

Lehigh County completed two actions, and Northampton County completed four actions. Lehigh and Northampton counties completed the countywide generator projects, providing grant administration and technical support as needed to municipalities awarded funding for generator projects. Lehigh County provided grant administration and technical support for the Lower Milford Township

Creek Stabilization Project, which stabilized a section of the Hosensack Creek that was threatening Schultz Bridge Road near its intersection with Buchman Road. Northampton County completed its effort to join the National Oceanic and Atmospheric Administration (NOAA) StormReady program, which is designed to enhance a community's resilience to severe storms.





# PLAN MAINTENANCE

Monitoring, evaluating and updating the *Lehigh Valley Hazard Mitigation Plan* is critical for it to be usable and valuable. Following through on the actions laid out in the Plan is important to maintaining the momentum created by the municipal, county, state, federal and community partners who worked together to build it.

This section describes the system that Lehigh and Northampton counties and their partners have established to monitor, evaluate and update the mitigation plan. It also details how progress reports will be filed, who will be responsible to lead that effort and how the public will remain involved. Since the adoption of the 2013 Plan, there were no annual meetings, annual progress reports or evaluation of the Plan's effectiveness. For the 2018 Plan, the Administrative Planning Team is committed to meeting annually, preparing progress reports for incorporation in the next plan update and meeting after significant hazard events that may require changes to the Plan.

**The *Lehigh Valley Hazard Mitigation Plan* will be subject to annual progress reports and a digital version will be available at:**

**[lvpc.org/hazard-mitigation](http://lvpc.org/hazard-mitigation)**

## MONITORING, EVALUATING AND UPDATING THE PLAN

The Lehigh Valley Hazard Mitigation Administrative Planning Team will remain intact as the group responsible for monitoring, evaluating and updating the 2018 Plan. The Administrative Planning Team will be co-chaired by the Northampton County Director of Emergency Management Services or their designee, and the Lehigh County Director of Emergency Management Agency or their designee.

Each participating municipality in the Lehigh Valley is expected to maintain a Planning Team point of contact, and the Administrative Planning Team co-chairs are responsible for maintaining an updated list of municipal points of contact who will assist in keeping the plan current. Municipal points of contact for the 2018 Plan are identified in the municipal annexes. It shall be the responsibility of each municipality to inform the Administrative Planning Team co-chairs of any changes in their municipal representation.

If any member of the Administrative Planning Team can no longer fulfill their duties to the team, it is the responsibility of the co-chairs to choose their replacement.

The co-chairs will call the annual meetings of the Administrative Planning Team and Planning Team to evaluate the Plan's progress and effectiveness. The meetings should be in October, to allow municipal participants sufficient time to review their action plans and prepare grant applications in advance of the annual FEMA Hazard Mitigation Assistance Program announcements, typically in May.

The responsibilities of the Administrative Planning Team co-chairs shall include:

- Encouraging each municipality to adopt the 2018 Plan within one year of its passage.
- Contacting each municipal point of contact to request information regarding the status of mitigation actions and whether any new actions should be added due to changing conditions.
- Compiling the updated information and public outreach completed in an annual progress report, to be posted on the Hazard Mitigation webpage at [lvpc.org/Hazard-Mitigation](http://lvpc.org/Hazard-Mitigation).
- Convening the Administrative Planning Team and the Planning Team for annual meetings and within 60 days of any significant disaster that may require changes to the plan.
- Providing FEMA and PEMA with all annual progress reports.
- Ensuring annual progress reports are incorporated into the five-year update.
- Providing opportunities for public input.

Each participating municipality, the counties and the LVPC are responsible for implementing their mitigation actions and informing the Administrative Planning Team annually of any progress made. This includes incorporating those actions into other planning documents, such as comprehensive plans, zoning ordinances, capital improvement plans and budgets, as necessary. It will

remain the responsibility of the Lehigh and Northampton County Emergency Management Agencies to monitor grant opportunities to help the counties and municipalities fund their mitigation actions and inform the municipal points of contact of those opportunities. To give the region enough time to perform the next five-year update, the counties will apply for Hazard Mitigation Planning grant funding in 2020.

## CONTINUED PUBLIC INVOLVEMENT

Public involvement that extends beyond the Plan's adoption is a priority for both counties and the LVPC. To promote continued involvement, the 2018 Plan, including municipal annexes, will remain online at [LVPC.org/hazard-mitigation](http://LVPC.org/hazard-mitigation), giving people 24-hour access. The website will include a place for people to comment, and social media will be used as part of a continued outreach effort. Any media reports and public meeting notices will be posted online, as well as any progress reports and updates of the Plan.

Annual progress reports or any proposed updates to the Plan will be open for public review online and during at least one public meeting each year. The LVPC will assist in scheduling public meetings and will be responsible for maintaining the Hazard Mitigation webpage.

As part of the Municipal Participation Survey (Worksheet #2), municipalities were asked to identify any public

outreach efforts in their community over the past five years. Responses are included in the municipal annexes. Over the next five years, municipal participation will continue to include assisting and promoting outreach to their community.

In addition, copies of the 2018 Plan will be made available for public access at each participating municipal building and at:

**Lehigh County Emergency Management Agency**  
640 W. Hamilton Street  
Allentown, PA 18101

**Northampton County Emergency Management Services**  
100 Gracedale Avenue  
Nazareth, PA 18064

**Lehigh Valley Planning Commission**  
961 Marcon Boulevard, Suite 310  
Allentown, PA 18109

The next update will be adopted by October of 2023.



## WHAT'S NEW FOR 2018

- Because the Plan Maintenance activities recommended in the 2013 Plan did not occur, the 2018 Plan identifies the position, rather than a specific person, responsible to lead the maintenance effort. Plan maintenance is now the joint responsibility of both counties.
- The discussion on Implementation of the Mitigation Plan through Existing Programs has been moved to the Capability Assessment section.





# PLAN ADOPTION

This section contains information regarding adoption of the *Lehigh Valley Hazard Mitigation Plan* by Lehigh and Northampton counties and each participating municipality.

## PLAN ADOPTION BY LOCAL GOVERNING BODIES

Adoption by the local governing bodies demonstrates the commitment of Lehigh and Northampton counties and each participating municipality to fulfill the mitigation goals and objectives outlined in the Plan. Adoption formalizes the Plan and authorizes responsible agencies to execute their responsibilities. For this multi-jurisdictional plan to be approved, each jurisdiction included in the Plan must have its governing body adopt the Plan upon notification of approval pending adoption by the Federal Emergency Management Agency (FEMA). County and municipal adoption resolution templates are provided in the Appendix and will be forwarded to each jurisdiction at the time of FEMA notification. Each participating jurisdiction understands that approval pending adoption of the Plan will be provided for those municipalities that meet the planning requirements, with the exception of the adoption requirement as stated above.

Following adoption or formal action on the Plan, each participating jurisdiction must submit a copy of the resolution or other legal instrument showing formal adoption (acceptance) of the Plan to their respective county emergency management contact for this Plan. These will then be submitted to PEMA and forwarded to FEMA. Each participating jurisdiction understands that PEMA and/or FEMA will transmit acknowledgement of verification of formal plan adoption and the official approval of the Plan to the mitigation plan coordinator.

In addition to being required by the Disaster Mitigation Act of 2000, adoption of the plan is necessary because:

- It lends authority to the plan to serve as a guiding document for all local and state government officials;
- It gives legal status to the plan in the event it is challenged in court;
- It certifies the program and grant administrators that the plan's recommendations have been properly considered and approved by the governing authority and jurisdictions' citizens; and
- It helps to ensure the continuity of mitigation programs and policies over time because elected officials, staff, and other community decision-makers can refer to the official document when making decisions about the community's future.

Source: FEMA. 2003. "How to Series" - Bringing the Plan to Life (FEMA 386-4).





