

LEHIGH AND
NORTHAMPTON COUNTIES,
PENNSYLVANIA

2024 Lehigh Valley Hazard Mitigation Plan

Historical
Hazard Data

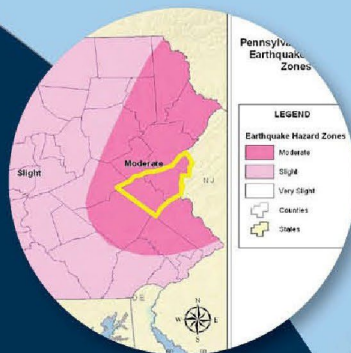


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1. Introduction

1.1 - Background

Hazard mitigation is taking sustained action to reduce or eliminate long-term risks to life and property from hazards and create successive benefits over time. The creation of a comprehensive hazard mitigation plan and actionable strategy may allow a community to anticipate potential threats and tackle them head on. Emerging weather patterns, demographic transitions, and rapid technological advancements mean that these plans need to be routinely updated to remain relevant. Lehigh and Northampton Counties in the Lehigh Valley are committed to the maintenance of their plan, as reflected in this 2024 update.

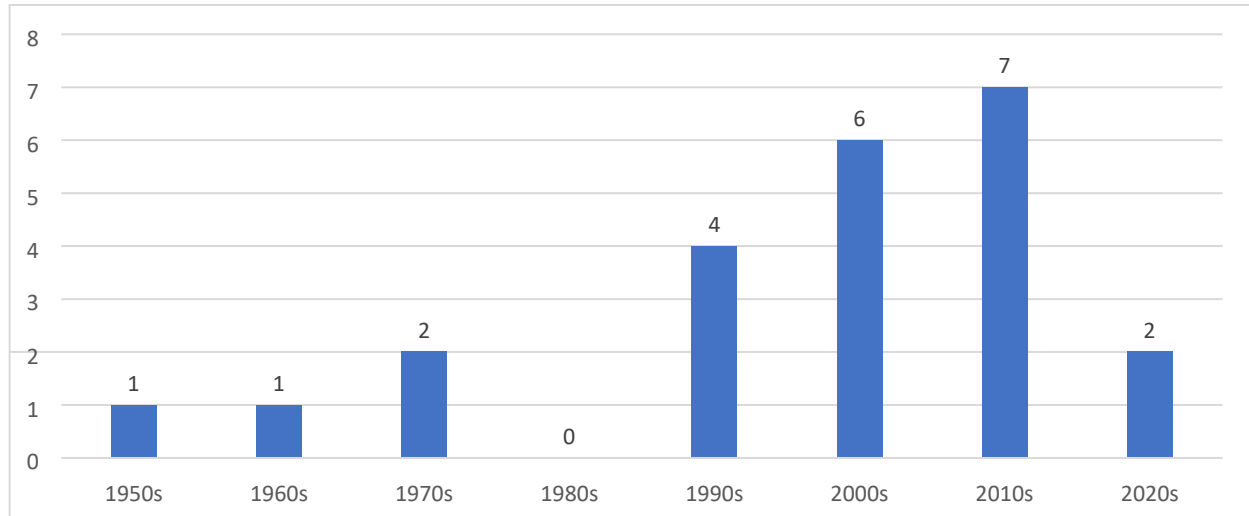
Pennsylvania has experienced 63 significant disasters and emergencies since 1955, with the Lehigh Valley directly impacted by 24 of these events.

Table 1: Presidential Disaster Declarations & Emergency Declarations

Date	Event	Counties Affected
August 1955	Hurricane Diane (DR-40)	Lehigh & Northampton
August 1965	Drought (DR-206)	
June 1972	Tropical Storm Agnes (DR-340)	
July 1973	Flooding (DR-400)	Northampton
March 1993	Heavy Snowfall (EM-3105)	Lehigh & Northampton
March 1994	Winter Storm (DR-1015)	
January 1996	Blizzard (DR-1085)	
	Flooding (DR-1093)	
February 2003	Winter Storm (EM-3180)	
September 2004	Tropical Depression Frances (DR-1555)	
	Tropical Depression Ivan (DR-1557)	
April 2005	Flooding (DR-1587)	Northampton
September 2005	Hurricane Katrina (EM-3235)	Lehigh & Northampton
June 2006	Flooding (DR-1649)	Northampton
September 2011	Hurricane Irene (DR-4025 / EM-3339)	Lehigh & Northampton
	Tropical Storm Lee (EM-3340)	
	Tropical Storm Lee (DR-4030)	Northampton
October 2012	Hurricane Sandy (EM-3356)	Lehigh & Northampton
January 2013	Hurricane Sandy (DR-4099)	Northampton
March 2016	Winter Storm (DR-4267)	Lehigh & Northampton
August 2018	Flooding (DR-4408)	Northampton
March 2020	COVID-19 (DR-4506 / EM-3441)	Lehigh & Northampton
September 2021	Hurricane Ida (DR-4618)	Northampton

According to the data, the months of September (seven) and March (six) have seen the most disaster declarations. As illustrated by the chart below, the number of federally-declared disasters by decade has increased over time.

Figure 1: Federal Disaster Declarations by Decade



In addition to the Federal Disaster Declarations noted above, there have been nine United States Department of Agriculture (USDA) Disaster Designations during the planning period, as noted in the table below:

Table 2: USDA Disaster Designations, 2019-2023

Declaration Date	County	Description
August 28, 2020	Northampton	Freeze and Frost
December 18, 2020	Northampton	High winds and heavy rain from Hurricane Isaias
October 7, 2021	Northampton	Excessive Rain
December 20, 2022	Lehigh	Drought
December 20, 2022	Northampton	Drought
December 20, 2022	Northampton	Drought and Excessive Heat
January 31, 2023	Lehigh	Drought
January 31, 2023	Northampton	Drought
December 12, 2023	Northampton	Freeze and Frost

1.2 - Purpose

This document was created to share all historical events of the 27 hazards (both natural and/or human-caused) recognized within the Lehigh Valley Hazard Mitigation Plan. Find most recent 5-years of event data within the most current Hazard Mitigation Plan.

The 27 natural and human-caused hazards analyzed in this Plan include 25 hazards from the 2018 plan as well as two new hazards: gas/liquefied pipelines and cyber-terrorism.

1.3 - Summary of Hazards

As part of the 2024 planning process, the Lehigh Valley Hazard Mitigation Planning Team reviewed the hazards of concern profiled in the 2018 Lehigh Valley Plan as well as those identified in the Pennsylvania 2023 State 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 2018 Plan.

The 27 hazards selected for profiling in the 2024 Plan are provided in the following table, hazard descriptions can be found throughout this document.

Table 3: Hazards Profiled in 2024 Lehigh Valley Plan

Natural Hazards	Human-Caused Hazards
Drought	Civil Disturbance / Mass Gatherings
Earthquakes	Dam Failure
Extreme Temperatures	Drug Overdose
Floods, Flash Floods, Ice jams	Environmental Hazards / Explosion
Hailstorms	Gas/Liquefied Pipelines
Invasive Species	Levee Failure
Landslides	Nuclear Incident
Lightning Strikes	Structural / Urban Fires
Pandemic & Infectious Diseases	Structural Collapse
Radon	Terrorism
Subsidence / Sinkholes	Transportation Crashes
Wildfires	Utility Interruption
Windstorm / Tornadoes	Cyber-terrorism
Winter Storms	

1.4 - Excluded Hazards

The Planning Team opted not to profile two hazards which are known to occur in the Lehigh Valley. These hazards, as well as the justification for their exclusion, are listed below:

- Straight line winds: Most of the available meteorological data regarding this hazard is comingled with and indistinguishable from tornado data, making it difficult to create a useful second profile. Additionally, the impacts of windstorms (from infrastructure, community impact, and mitigation perspectives) are largely the same as for windstorm/tornado, a hazard which is already profiled in full in this plan.
- Tropical cyclones and hurricanes: Due to the inland location of the planning area and lack of threat from storm surge, the expected and previously-observed impacts of tropical storms and hurricanes in the area are indistinguishable from those of hazards already profiled in the plan (namely, flooding and windstorms). For these reasons, the communities chose not to create a separate profile for this hazard.

2. Natural Hazards Historical Events



Description

Drought is defined as a deficiency of precipitation experienced over an extended period of time, usually a season or more. Drought events are defined by rainfall amounts, vegetation conditions, and soil moisture conditions, water levels in reservoirs, stream flow, agricultural productivity, or economic impacts. Droughts increase the risk of other hazards, like wildfires, flash floods, and landslides or debris flows. This hazard is of particular concern in Pennsylvania due to the prevalence of farms and other water-dependent industries, water-dependent recreation uses, and residents who depend on wells for drinking water.¹

Table 4: Past Occurrences of Drought Events from 1950 – 2023 ^{2&3}

Date of Event	Event Type	FEMA Declaration Number	County Designated	Losses/Impacts	Source(s)
September thru November 1957	Drought	N/A	N/A	Lowest PDSI of -3.07	NRCC
August 1964 thru January 1966	Drought, Water Shortage	DR-206	Northampton	In August, the Delaware River Basin was included in a FEMA disaster declaration. Lowest PDSI of -4.95	NRCC, PEMA, FEMA
June thru November 1966	Drought	N/A	N/A	Lowest PDSI of -4.21	NRCC
January thru February 1967	Drought	N/A	N/A	Lowest PDSI of -3.40	NRCC
August 1980 thru January 1981	Drought	N/A	N/A	The Lehigh Valley was under a declared drought emergency in November. Lowest PDSI of -5.07	NRCC, PADEP, PEMA
March thru July 1985	Drought	N/A	N/A	The Lehigh Valley was under a declared drought emergency between April and July. Lowest PDSI of -4.30	NRCC, PADEP, PEMA
August 1991 thru April 1992	Drought	N/A	N/A	Lowest PDSI of -3.58	PA HMP
September thru November 1995	Drought	N/A	N/A	A drought emergency was declared for the Lehigh Valley in mid-September. Preliminary crop losses caused by the drought were \$300 million statewide and \$26,799 in the Lehigh Valley.	PADEP, PEMA

Date of Event	Event Type	FEMA Declaration Number	County Designated	Losses/Impacts	Source(s)
December 1998 thru July 1999	Drought	N/A	N/A	The Lehigh Valley was under a drought warning. The precipitation in December at the Lehigh Valley International Airport (LVIA) was the second driest on record. In March 1999, the drought warning was downgraded to a drought watch. By June, the state declared a drought warning again, including all of eastern Pennsylvania. The drought intensified in July and was the driest on record at the LVIA.	PADEP
July thru August 1999	Drought	N/A	N/A	The Lehigh Valley was under a drought emergency in July. Alfalfa cutting was one quarter of normal, the soybean crop one third of normal and the corn crop one half of normal. Low water levels made it difficult or impossible to use waterways for fishing and boating. Fish were dying due to low stream flows. By August, many farms in the Lehigh Valley reported corn losses around 9%. Crop loss figures in the Lehigh Valley were \$214,388 for 1998 and \$2.2 million for 1999. The continued lack of rain resulted in wells going dry. Lowest PDSI of -3.54.	NRCC
December 18, 2001 thru November 25, 2002	Drought	N/A	N/A	In November 2001, a drought warning was issued for eastern Pennsylvania due to unseasonably dry weather. Due to low groundwater levels, a well in East Allen Township ran dry, cutting off water service to 73 area homes. Water was trucked in to restore water service between August and November. From February to September 2002, the Lehigh Valley was under a drought emergency. Groundwater levels were continuing to decline with streamflow levels reaching record low levels in some cases. In August 2002, water once again had to be trucked in to serve customers in East Allen Township. Crop losses due to drought in the Lehigh Valley for 2002 were \$4.2 million.	DIR, PADEP, PEMA, PA HMP

Date of Event	Event Type	FEMA Declaration Number	County Designated	Losses/Impacts	Source(s)
June thru November 2005	Drought	N/A	N/A	A drought warning was put into effect in September. The Pennsylvania governor asked for \$128 million in subsidence for farmers who lost a majority of their soybean, corn, hay, and alfalfa crops. Farmers were then eligible for low interest loans from the USDA. The counties eligible for assistance included Lehigh County.	DIR
June 2007 thru January 2008	Drought	N/A	N/A	As a result of a dry summer, the Lehigh Valley remained under a declared drought watch as of January 1, 2008. Surface and groundwater conditions had improved during the last quarter of 2007 and the trend continued during the first few weeks of 2008. In response to the improvement, PADEP lifted drought watch declarations in the Lehigh Valley on January 11, 2008.	DRBC
April thru November 2010	Drought	N/A	N/A	The hot, dry summer and decreasing water supplies led Pennsylvania environmental authorities to issue a drought warning for 24 counties, including Lehigh and Northampton, and asked residents to reduce their water use by 10 to 15 percent. 16 counties in Pennsylvania were declared to be natural disaster areas by the USDA due to an ongoing drought that started in May, including Lehigh and Northampton. This declaration permitted impacted farmers, ranchers, and other agricultural producers to apply for low-interest emergency loans from the Farm Service Agency.	DIR, PADEP
June 17 thru July 10, 2015	Drought	N/A	N/A	According to the PADEP Division of Planning and Conservation, the Lehigh Valley was under a drought watch.	PADEP
August 2 thru November 3, 2016	Drought	N/A	N/A	According to the PADEP Division of Planning and Conservation, the Lehigh Valley was under a drought watch.	PADEP

Date of Event	Event Type	FEMA Declaration Number	County Designated	Losses/Impacts	Source(s)
November 3, 2016 thru February 14, 2017	Drought	N/A	N/A	According to the PADEP Division of Planning and Conservation, the Lehigh Valley was under a drought watch.	PADEP
February 14 thru May 16, 2017	Drought	N/A	N/A	According to the PADEP Division of Planning and Conservation, the Lehigh Valley was under a drought watch.	PADEP
August 31, 2022 thru January 20, 2023	Drought	N/A	N/A	According to the PADEP Division of Planning and Conservation, the Lehigh Valley (Lehigh & Northampton Counties) was under a drought watch. Watch lifted in Lehigh County on October 17, 2022. Watch lifted in Northampton County on January 20, 2023.	PADEP
June 15, 2023 thru January 26, 2024	Drought	N/A	N/A	According to the PADEP Division of Planning and Conservation, the Lehigh Valley (Lehigh & Northampton Counties) was under a drought watch. Watch lifted in Northampton County on January 26, 2024.	PADEP



Description

An earthquake is the motion or trembling of the ground produced by sudden displacement of rock usually within the upper 10-20 miles of the Earth's crust. Earthquakes result from crustal strain, volcanism, landslides, or the collapse of underground caverns. Earthquakes can affect hundreds of thousands of square miles, cause damage to property measured in the tens of billions of dollars, result in loss of life and injury to hundreds of thousands of persons, and disrupt the social and economic functioning of the affected area.⁴

Table 5: Earthquake Events Occurring in the Lehigh Valley Region, 1871 – 2023 ⁵

Date	Magnitude (Richter Scale)	Losses / Impacts
May 31, 1884	2.9	Epicenter near the City of Allentown. Maximum intensity of V. In Allentown, dishes were thrown from tables.
May 31, 1908	3.1	Epicenter near the City of Allentown. Maximum intensity of VI. In Allentown, the shock shook down chimneys.
June 22, 1928	2.4	Epicenter near the City of Allentown. Maximum intensity of III. No reference and/or no damage reported.
November 23, 1951	3.3	Epicenter near the City of Allentown. Maximum intensity of IV. No reference and/or no damage reported.
September 14, 1961	4.3	Epicenter near the City of Allentown. Maximum intensity of V. The earthquake shook buildings over a broad area. There was only one report of damage of loose bricks that fell from a chimney in Allentown. Other areas that were affected included Bethlehem, Catasauqua, Coplay, Egypt, Fountain Hill, Freemansburg, and Hellertown.
December 20, 2009	2.3	Epicenter approximately 3.2 miles from Raubsville (Williams Township, Northampton County).



Description

Extreme temperature hazards are not tied to a specific temperature threshold; instead, these hazards occur when the temperature is extremely high or extremely low. Extreme heat often results in the highest number of annual deaths of all weather-related hazards. In most of the United States, extreme heat is defined as a long period (2 to 3 days) of high heat and humidity with temperatures above 90 degrees.⁶ Extremely cold air comes every winter in at least part of the country and affects millions of people across the United States. The arctic air, together with brisk winds, can lead to dangerously cold wind chill values. People exposed to extreme cold are susceptible to frostbite and hypothermia in a matter of minutes.

Table 6: Extreme Temperature Events in Lehigh Valley 2012 - 2023

Date	Type	Actual Temperature °F*	Deaths	Injuries
6/20/2012	Heat	95	0	0
6/29/2012	Heat	96	0	0
7/4/2012	Heat	99	3	0
7/18/2012	Excessive Heat	98	0	0
7/26/2012	Heat	91	0	0
7/7/2013	Heat	92	0	0
7/18/2013	Excessive Heat	98	0	0
9/11/2013	Heat	92	0	0
1/4/2014	Cold / Wind Chill	-4	0	0
1/7/2014	Cold / Wind Chill	-1	0	0
1/22/2014	Cold / Wind Chill	-1	0	0
7/2/2014	Heat	94	0	0
1/7/2015	Cold / Wind Chill	2	0	0
2/13/2015	Cold / Wind Chill	5	0	0
2/15/2015	Cold / Wind Chill	7	1	0
2/20/2015	Cold / Wind Chill	-3	1	0
2/24/2015	Cold / Wind Chill	-8	0	0
7/19/2015	Heat	93	0	0
2/14/2016	Cold / Wind Chill	2	0	0

Date	Type	Actual Temperature °F*	Deaths	Injuries
07/01/2018	Heat	95	0	0
06/29/2021	Heat	94	0	0
08/11/2021	Heat	95	0	0
12/24/2022	Cold	3	0	0
Total			5	0



Description

Flooding (includes Flood, Flash Flood, Ice Jam) is the temporary condition of partial or complete inundation of normally dry land and it is the most frequent and costly of all natural hazards in Pennsylvania.⁷ 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 warm temperatures and heavy rain cause snow to melt rapidly. Snow melt combined with heavy rains can cause frozen rivers to swell, which breaks the ice layer on top of a river. The ice layer often breaks into large chunks, which float downstream, piling up in narrow passages and near other obstructions such as bridges and dams.

Table 7: Notable Flooding Events in the Lehigh Valley, 1996 – 2023⁸

Dates of Event	Event Type	Losses / Impact	Source(s)
January 19, 1996	Flood	All of Pennsylvania was declared a disaster area and extra public assistance was given to Northampton, Bucks and Monroe Counties, the hardest hit counties in the Southern Poconos and Southeast Pennsylvania. In many places the Delaware River crested at its highest stage since 1955. Numerous vehicle rescues occurred. Adams Island in Allentown was evacuated due to Lehigh River flooding. Pennsylvania State Route 309 was closed in Orefield due to flooding along the Jordan River. The river crested at 9.13 feet in Allentown at 230 a.m. on the 20th. Flood stage is 7 feet. In Allentown firefighters responded to 123 calls of flooded basements, the most in twenty-two years. Northampton County endured the combination of both small stream and significant large river flooding. Long lengths of Pennsylvania State Route 611 were closed due to flooding, river debris and road erosion. Most of the significant flood damage occurred along the Lehigh and Delaware Rivers. In Upper Mount Bethel Township, twelve homes were damaged, and hundreds were evacuated. Portland within the township was hard hit as all small streams and the Delaware River flooded the town. Roads were filled with silt, mud and river debris. Two houses were damaged by ice chunks.	NOAA-NCEI
September 18, 2004	Flood	A slowly moving cold front caused widespread very heavy rain to fall during the first half of the day on the 18th in Northampton County. Storm totals average around 5 inches and caused widespread poor drainage, creek and river flooding throughout the county. Runoff from the heavy rain also caused the worst flooding along the Delaware River since 1955. Nearly every township in the county reported flood damage. President George W. Bush declared the county a disaster area. About 865 homes, businesses and structures were damaged including several roads and bridges.	NOAA-NCEI

Dates of Event	Event Type	Losses / Impact	Source(s)
April 2, 2005	Flood	The crests along the Delaware River were even higher than in September 2004 and were the highest crests since 1955. In many places, it was the second or third highest crest on record for the Delaware River. In Monroe, Northampton and Bucks Counties, about 2,200 homes and businesses were flooded, 40 homes were destroyed. About 4,300 people were evacuated. Shelters were opened in schools, firehouses and churches. Both the Red Cross and Salvation Army assisted with the evacuations and distributing food and drinks. Many major roads and bridges were closed. Damage from the remnants of Ivan and the latest storm was estimated at \$40 million dollars.	NOAA-NCEI
June 27, 2006	Flood	Several days of heavy rain throughout the Delaware and Lehigh River Basins culminated with major flooding along the Delaware River from the 28th through the 30th. It was the fourth highest crest on record for the Delaware River along Northampton County. The worst reported damage was in Easton and Portland. The crest was slightly lower than the April 2005 flood. President George W. Bush declared Northampton County a disaster area. Sporadic periods of heavy rain started on the 23rd, but the most widespread and heaviest rain fell from the night of the 27th into the morning of the 28th. The estimated property damage across Northampton and Lehigh Counties is \$1.25 million.	NOAA-NCEI
March 10, 2011	Flood	Northampton County was affected by the one-two combination of flooding along the Lehigh and Delaware Rivers. Flooding along these rivers also caused smaller streams and rivers to back up and flood. The flooding also caused considerable damage along the towpaths of both the Lehigh and Delaware River Canals. In Bethlehem, flooding along the Lehigh River forced the evacuation of about 100 residents along Wilson Avenue. The estimated property damage from this event is \$1.75 million.	NOAA-NCEI
August 2011	Tropical Storm Irene	Irene produced heavy flooding rain, tropical storm force wind gusts with hundreds of thousands of outages, moderate tidal flooding along the Delaware River and one flooding related death in Eastern Pennsylvania over the weekend of August 27th and 28th. Moderate stream and river flooding occurred in the Poconos and Lehigh Valley and moderate to major river flooding occurred in southeast Pennsylvania. A new August as well as all-time monthly rainfall record of 13.47 inches was also established in Allentown.	NOAA-NCEI
July 1, 2013	Flash Flood	Torrential rains caused flash flooding in northeastern Northampton County. The basements of several homes were flooded with 2 to 5 feet of water in Bangor, where one family had to be rescued. Streets were closed & some homes were without power. Numerous streets were also flooded in Pen Argyl Borough. Flooding also damaged several homes in East Bangor Borough. \$100,000 in property damage was reported. No injuries or deaths were reported.	NOAA-NCEI

Dates of Event	Event Type	Losses / Impact	Source(s)
August 29, 2013	Flash Flood	Very heavy rain caused roadway and small creek flash flooding in Allentown and Whitehall Township. About 43 vehicles were badly damaged in West Allentown and several businesses were flooded. A child was nearly swept away in floodwaters. Numerous roadways were flooded with some water rescues from trapped vehicles. Homes, garages and basements were damaged. \$100,000 in property damage was reported. No injuries or deaths were reported.	NOAA-NCEI
June 15, 2015	Flood / Flash Flood	Slow-moving thunderstorms caused flash flooding in parts of Northampton County, with estimates exceeding four inches in southcentral Northampton County. Flash flooding in Bethlehem closed Easton Avenue at Willow Park Road. Flash flooding along Nancy Run washed out sections of Willow Park Road south through Walnut Street. \$100,000 in property damage was reported. Flash flooding occurred along Monocacy Creek. Parts of Illick's Mill Road and locations behind Hotel Bethlehem were flooded. \$50,000 in property damage was reported. Monocacy Creek at the Illick's Mill Road gage reached its 4.5-foot flood stage at 8:37 pm on the 15th and crested at 5.99 feet at 10:45 pm. No injuries or deaths were reported.	NOAA-NCEI
June 30, 2015	Flash Flood	Multiple thunderstorms with heavy rain caused flash flooding with two inches of rainfall estimated in the Lehigh Valley. Flash flooding occurred in Northampton Borough as the Dry Run flooded. About 12-14 homes were flooded. One home suffered structural damage. \$100,000 in property damage was reported. Flash flooding also occurred in Coplay Borough. Several roadways were flooded with vehicles trapped in floodwaters. One water rescue was required. No injuries or deaths were reported.	NOAA-NCEI
February 24-25, 2016	Flash Flood	Strong to severe thunderstorms, heavy rain, flash flooding and stream flooding occurred in eastern Pennsylvania. Major flooding was reported on several roadways in and near downtown Bethlehem. Water rescues occurred at 33rd and Lehigh Streets. \$200,000 in property damage was reported. Motorists were also stranded due to floodwaters in Lower Macungie Township and Allentown. No injuries or deaths were reported.	NOAA-NCEI
July 18, 2016	Flood	A cold front and associated pre-frontal trough led to the development of thunderstorms in the afternoon and evening hours. Some of the thunderstorms became severe with damaging winds. The thunderstorms also knocked out power to thousands of people.	NOAA-NCEI
April 6, 2017	Flood	Low pressure tracked from the Ohio Valley into the Western Great Lakes with a warm front surging northward ahead of the low which was followed by a cold front. Moisture and instability were drawn northwest ahead of the front which led to locally heavy showers and thunderstorms. Some of these thunderstorms were strong too severe with gusty winds.	NOAA-NCEI

Dates of Event	Event Type	Losses / Impact	Source(s)
July 1, 2017	Flood / Flash Flood	Strong to severe thunderstorms developed in the afternoon and evening hours of the 1st ahead of a cold front. Several of the storms produced damaging winds. Heavy rains from the storms did result in some localized flooding.	NOAA-NCEI
July 7, 2017	Flood	A stationary frontal boundary draped across the Delaware Valley led to a period of heavy rainfall during the morning of July 7th. Widespread rainfall amounts over 2 inches occurred, with isolated amounts upwards of 4 to 6 inches in Carbon and Northampton Counties, which led to flooding.	NOAA-NCEI
July 24, 2017	Flood / Flash Flood	A stalled frontal boundary caused several rounds of thunderstorms that produced damaging winds and flooding in spots. Over 8,000 people lost power.	NOAA-NCEI
August 2, 2017	Flood	A hot and humid air mass with weak boundaries led to slow moving strong to severe thunderstorms with damaging winds, hail and flooding. A few thousand people lost power.	NOAA-NCEI
July 4, 2018	Flash Flood	Severe thunderstorms caused wind damage in the Lehigh Valley Region of Pennsylvania. One to three inches of rainfall occurred in a short period of time.	NOAA-NCEI
July 22, 2018	Flash Flood	Showers with heavy downpours occurred in southeastern Pennsylvania during the afternoon and evening hours of July 22, 2018. Rainfall totals of 2 to 4 inches were reported.	NOAA-NCEI
August 11, 2018	Flash Flood	Several areas of flash flooding occurred due to heavy rain. Rainfall totals of 2 to 5 inches were reported in southeastern Pennsylvania. Additionally, severe thunderstorms impacted the area.	NOAA-NCEI
August 13, 2018	Flash Flood	Severe thunderstorms caused rainfall totals of 2 to 4 inches were common in southeastern Pennsylvania with some locations receiving 5 to 6 inches of rain. The heavy rain resulted in flash flooding.	NOAA-NCEI
August 21, 2018	Flash Flood	Heavy rain caused flash flooding in parts of southeastern Pennsylvania and the Lehigh Valley on the night of August 21 ²² . Some locations received up to 2.5 to 4.5 inches of rain.	NOAA-NCEI
November 2, 2018	Flash Flood	A swath of 2 to 5 inches of rain fell across parts of southeastern Pennsylvania on the night of November 2. A century-old underground culvert that ran through the backyards of homes along two blocks of Messinger Street in Bangor Borough collapsed, causing damage to approximately 15 properties.	NOAA-NCEI
May 30, 2019	Flash Flood	Strong to severe thunderstorms brought 1 to 2 inches of rain to parts of eastern Pennsylvania and northern and central New Jersey during the late afternoon and evening hours of May 30.	NOAA-NCEI
June 18, 2019	Flash Flood	Showers and thunderstorms on the afternoon of June 18 brought a brief period of heavy rain to areas from the Lehigh Valley and upper Bucks County in Pennsylvania, to parts of northern and central New Jersey. Rainfall totals ranged from 1 to 2 inches with locally higher amounts.	NOAA-NCEI

Dates of Event	Event Type	Losses / Impact	Source(s)
July 11, 2019	Flash Flood	Thunderstorms brought 2 to around 5.5 inches of rain to parts of southeastern Pennsylvania on the afternoon and evening of July 11. The heaviest of the rain fell in southeastern Berks County, northern Chester County and upper Montgomery County.	NOAA-NCEI
July 21-22, 2019	Flash Flood	Thunderstorms brought 1.5 to around 2.5 inches of rain to parts of Lehigh County on the evening of July 21, and one to three inches on the afternoon and early evening of July 22.	NOAA-NCEI
October 31, 2019	Flash Flood	Showers and thunderstorms brought heavy rain to parts of eastern Pennsylvania and northern New Jersey on the night of October 31. Rainfall totals of 1.0 to 2.5 inches were common from Berks County, the Lehigh Valley and the Pocono Region in Pennsylvania into northwestern New Jersey.	NOAA-NCEI
August 4, 2020	Tropical Storm / Flash Flood	Tropical Storm Isaias brought high winds, heavy rain, several tornadoes, and coastal flooding to the mid-Atlantic region, becoming the most significant tropical cyclone to impact most of the region since Sandy in 2012. Heavy rain led to flash flooding that caused one death in Lehigh County.	NOAA-NCEI
August 18, 2021	Flash Flood	Heavy rain associated with Post-Tropical Cyclone Fred caused flash flooding in eastern Pennsylvania on the night of August 18-19, 2021. Three to five inches of rain were reported.	NOAA-NCEI
August 22, 2021	Flash Flood	Heavy rain associated with weakening Hurricane Henri caused flash flooding in Northampton County on the night of August 22. Rainfall totals were as high as 4 to 8 inches in the region.	NOAA-NCEI
September 1, 2021	Flash Flood	Post Tropical Cyclone Ida brought heavy rain to eastern Pennsylvania on September 1. Rainfall totals were as high as 5 to 10 inches. The heavy rain caused significant flash flooding, mainly in the southeastern part of the state. It resulted in widespread property damage. There were several fatalities. Widespread flash flooding occurred in Northampton County with many road closures. There was flooding along numerous waterways in the county, including the Lehigh River and the Monocacy Creek. Widespread flash flooding occurred in Lehigh County with many road closures. There was flooding along numerous waterways in the county, including the Lehigh River and Little Lehigh Creek.	NOAA-NCEI
September 8, 2021	Flash Flood	Thunderstorms brought locally heavy rain to the Lehigh Valley of Pennsylvania on the night of September 8. Rainfall totals were as high as 2 to 5 inches. A water rescue from a vehicle took place near the intersection of Mauch Chunk Road and Quarry Street in North Whitehall Township. A mudslide occurred along one of the access roads to the Portland Columbia Toll Bridge in Portland.	NOAA-NCEI
July 9, 2023	Flash Flood	Widespread showers and thunderstorms brought heavy rain to eastern Pennsylvania on the afternoon and early evening of July 9. Rainfall totals were as high as 4 to around 6 inches. A vehicle became trapped in flood waters on Union Street at Cedar Creek in Allentown. Centre Street was closed at Palmer Street in Easton due to flooding.	NOAA-NCEI

Dates of Event	Event Type	Losses / Impact	Source(s)
July 14, 2023	Flash Flood	Thunderstorms brought locally heavy rain to the Lehigh Valley and the Pocono Region of eastern Pennsylvania from the late afternoon into the evening of July 14. Rainfall totals were as high as 3 to around 6 inches. Widespread roadway flooding in Bangor and in Washington Township. South Delaware Drive in Lower Mount Bethel Township became impassable due to flooding. Several vehicles were trapped in the flood waters. Some of their occupants required assistance.	NOAA-NCEI
July 16, 2023	Flash Flood	Widespread showers and thunderstorms produced locally heavy rain in eastern Pennsylvania on July 16. Rainfall totals were as high as 3 to 5 inches. This flooding resulted in widespread road closures, bridge damage, and trapped vehicles, including in flood waters in Forks Township, Washington Township, Lower Mount Bethel Township, on PA Highway 33, and near Martins Creek. Flood waters reached the first floor of a house in Washington Township, causing a basement wall to collapse. Bushkill Creek overflowed its banks. Much of Bushkill Park in Forks Township was under water, and one apartment building needed to be evacuated.	NOAA-NCEI

Table 8: Ice Jam Events in the Lehigh Valley ⁹

Municipality	River	Jam Date	Gage Number
City of Allentown	Jordan Creek	2/20/1948	1452000
Walnutport Borough	Lehigh River	2/3/1970	1451000
Walnutport Borough	Lehigh River	2/14/1971	1451000
North Whitehall Township	Jordan Creek	2/6/2004	1451800
Walnutport Borough	Lehigh River	1/30/2004	1451000
Easton City	Lehigh River	1/8/2014	1454700



Description

Hailstorms occur when ice crystals form within a low-pressure front due to the rapid rise of warm air into the upper atmosphere and the subsequent cooling of the air mass. Frozen droplets gradually accumulate on the ice crystals until, having developed sufficient weight, they fall as precipitation in the form of balls or irregularly shaped masses of ice greater than 0.75 inches in diameter. Hailstorms can cause significant damage to homes, vehicles, livestock, and people.¹⁰

Figure 2: Map of Hailstorm Events in the Lehigh Valley Region 1955-2022

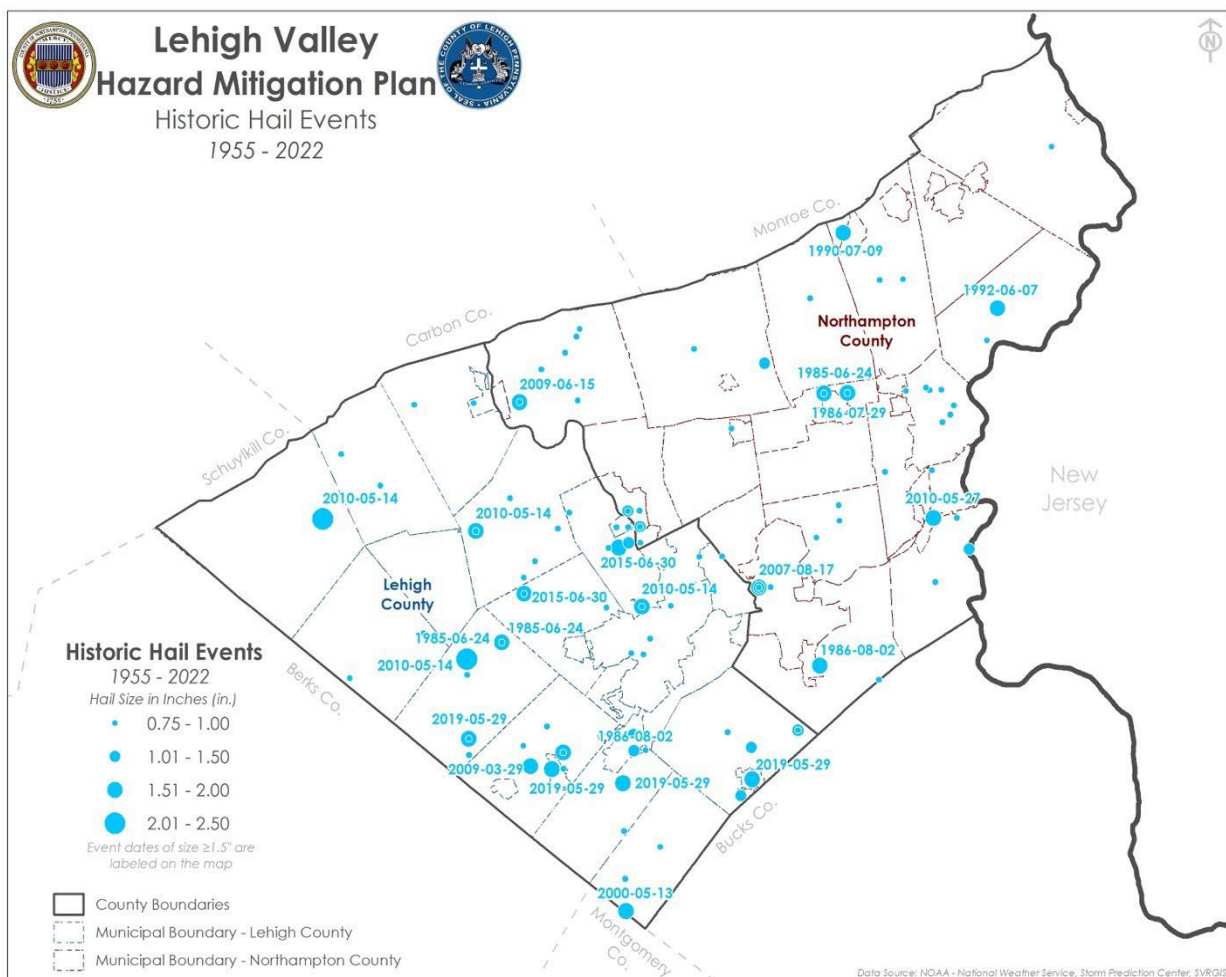


Table 9: Hailstorm Events in the Lehigh Valley, August 2011 - 2023

Location	Date	Diameter (inches)	Deaths	Injuries	Property Damage (\$)	Crop Damage (\$)
Lehigh County						
Germansville	8/19/2011	0.75 in.	0	0	0	0
Emmaus	5/24/2012	0.75 in.	0	0	0	0
Schnecksville	6/3/2012	0.75 in.	0	0	0	0
Allentown	6/3/2012	0.88 in.	0	0	0	0
Allentown	7/4/2012	0.75 in.	0	0	0	0
Macungie	7/28/2012	1.00 in.	0	0	0	0
Allentown	4/10/2013	0.75 in.	0	0	0	0
East Penn Junction	5/8/2013	0.75 in.	0	0	0	0
Coplay, Allentown, Bethlehem	5/22/2014	1.00 in.	0	0	0	0
Orefield	6/25/2014	1.00 in.	0	0	0	0
Macungie	9/6/2014	0.75 in.	0	0	0	0
Orefield, Coplay	6/30/2015	1.75 in.	0	0	\$25,000	0
Allentown	2/25/2017	0.75 in.	0	0	0	0
Coopersburg	05/29/2019	2.00 in	0	0	0	0
Orefield	08/07/2019	0.75 in.	0	0	0	0
Catasauqua	08/18/2019	1.50 in.	0	0	0	0
Coopersburg	07/06/2020	1.25 in.	0	0	0	0
Fullerton	07/06/2021	0.75 in.	0	0	0	0
Dillinger	07/08/2021	1.00 in.	0	0	0	0
Woodlawn	07/21/2021	0.75 in.	0	0	0	0
Catasauqua	08/22/2022	1.00 in.	0	0	0	0
Lehigh County Total	N/A	N/A	0	0	\$25,000	0

Location	Date	Diameter (inches)	Deaths	Injuries	Property Damage (\$)	Crop Damage (\$)
Northampton County						
Farmersville, Bethlehem (T)	6/1/2011	1.00	0	0	0	0
Mount Bethel	5/26/2012	0.75 in.	0	0	0	0
Tatamy	7/26/2012	0.75 in.	0	0	0	0
Bethlehem	4/10/2013	0.75 in.	0	0	0	0
Freemansburg	4/10/2013	1.00 in.	0	0	0	0
Bethlehem	5/23/2013	0.88 in.	0	0	0	0
Nazareth	6/24/2013	1.00 in.	0	0	0	0
Uhlers	6/24/2013	0.75 in.	0	0	0	0
Bath	7/9/2014	1.00 in.	0	0	0	0
Moorestown	7/9/2014	1.25 in.	0	0	0	0
North Catasaugua	6/30/2015	1.00 in.	0	0	0	0
Uhlers	7/17/2017	0.75 in.	0	0	0	0
Klecknersville	8/2/2017	0.75 in.	0	0	0	0
Schoenersville	08/18/2019	1.50 in.	0	0	0	0
Copella	07/22/2020	0.75 in.	0	0	0	0
Uhlers	04/21/2021	0.88 in.	0	0	0	0
Danielsville	07/06/2021	1.00 in.	0	0	0	0
Bethlehem	08/22/2022	1.00 in.	0	0	0	0
Northampton County Total	N/A	N/A	0	0	0	\$0



Description

An invasive species is a species that is not indigenous to the ecosystem under consideration and whose introduction causes or is likely to cause economic, environmental, or human harm. These species can be any type of organism: plant, fish, invertebrate, mammal, bird, disease, or pathogen.¹¹ The magnitude of an invasive species threat is generally amplified when the ecosystem or host species is already stressed, such as in times of drought or after a wildfire, as the already weakened state of the native ecosystem causes it to succumb to an infestation more easily.

Table 10: Invasive Species in the Lehigh Valley, 2007 - 2023

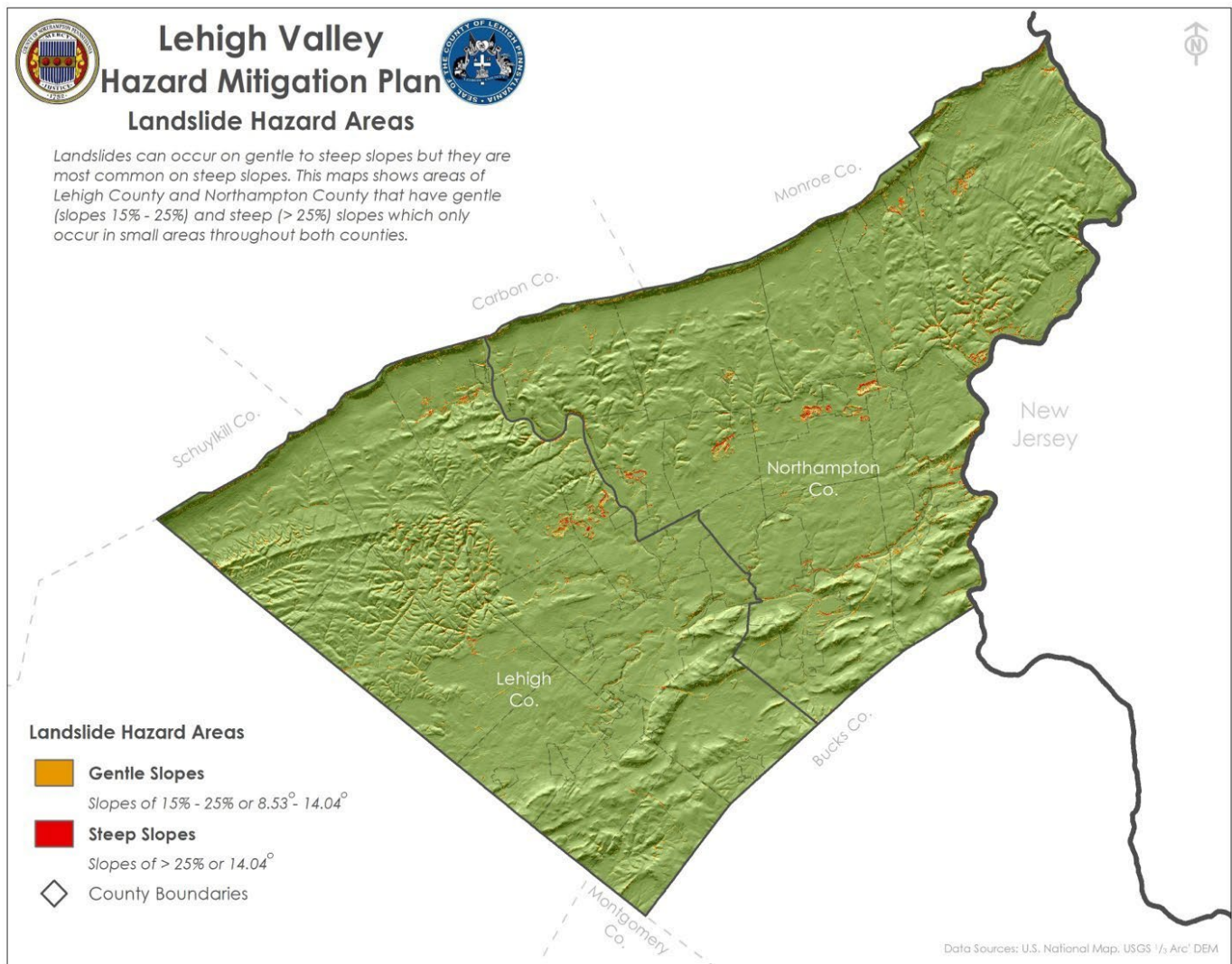
Date	Event Type	Losses/Impacts	Source(s)
2007	Emerald Ash Borer	Emerald Ash Borer was first identified in western Pennsylvania during 2007. Since then, Emerald Ash Borer has been detected in a majority of the State, including Lehigh and Northampton counties.	PADCNR
2013	Hemlock Woolly Adelgid	Hemlock Woolly Adelgid was detected in Lehigh and Northampton counties in 2013.	USDA
2014	Spotted Lanternfly	Spotted Lanternfly was confirmed in Pennsylvania in September 2014. By 2017, 13 counties were quarantined, including Lehigh and Northampton counties.	PA Department of Agriculture
2014	Gypsy Moth	Gypsy moths were detected in Lehigh and Northampton counties in 2014.	USDA
2016	Asian Tiger	The Asian tiger mosquito was detected in the Lehigh Valley.	Kennedy



Description

In a landslide, masses of rock, earth or debris move down a slope. Landslides can be caused by a variety of factors, including earthquakes, storms, fire, and human modification of land. Areas that are prone to landslide hazards include previous landslide areas, areas on or at the base of slopes, areas in or at the base of drainage hollows, developed hillsides with leach field septic systems, and areas recently burned by forest or brush fires.¹²

Figure 3: Landslide Hazard Areas in the Lehigh Valley



Past Occurrence

Pennsylvania has frequently been a hotspot for significant landslide occurrences due to its unique blend of a humid climate, locally intense topography, and the varied erosion and weathering characteristics of its sedimentary rocks. Additionally, human endeavors, including commercial, residential, and industrial development, along with transportation and mining projects, often intensify the susceptibility to landslides.

However, the documentation of landslides, compared to other hazards, is relatively incomplete. This discrepancy arises mainly because many landslides go unnoticed, rendering historical records of such events in the Lehigh Valley sparse and inconsistent.

A few notable events include:

- In March 2007, after substantial rainfall, a mudslide in Hanover Township (Lehigh County) led to precarious road conditions, resulting in the temporary closure of Dauphin Drive. Thankfully, no casualties were reported.
- On March 30, 2014, a rockslide occurred in Lower Saucon Township (Northampton County).
- A mudslide was reported on April 30, 2014, in Upper Mt. Bethel Township (Northampton County).
- Another rockslide took place on July 11, 2017, along Route 611 in Lower Mt. Bethel Township (Northampton County).

Moreover, from 1954 to 2023, FEMA designated one geological hazard-related disaster (DR) or emergency (EM) declaration for Pennsylvania, due to severe storms, flooding, and a mudslide. This declaration (DR-1649) was announced on June 30, 2006, encompassing Northampton County, and assistance was rendered to those affected by the calamity.



Description

Lightning is a giant spark of electricity resulting from the build-up of positive and negative charges within a thunderstorm. The flash or "bolt" of light can occur within the thunderstorm cloud or between the cloud and the ground. Lightning is a leading cause of injury and death from weather-related hazards. Although most lightning victims survive, people struck by lightning often report a variety of long-term, debilitating symptoms.¹³

Table 11: Lightning Events in Lehigh Valley 2018 – 2023 ¹⁴

County	Location	Date	Deaths	Injuries	Property Damage (\$)
Lehigh County					
Lehigh	Mechanicsville	06/26/2023	0	0	\$5,000
Lehigh	Wescosville	06/26/2023	0	0	\$5,000
Northampton County					
Northampton	Schoenersville	08/18/2020	0	0	-
Northampton	Bath	08/05/2022	0	0	-
Lehigh Valley Total			0	0	\$10,000



Description

Pandemic is defined as a disease outbreak affecting or attacking a large number of people across an extensive region, including several countries, and/or continent(s). It is further described as extensively epidemic. Generally, pandemic diseases cause sudden, pervasive illness in all age groups on a global scale. Infectious diseases are also highly virulent and can be spread from person-to-person.

Table 12: Previous Pandemics Transmission & Clinic Severity Scores

Disease / Flu Season	Transmissibility Score	Clinical Severity Score
1918 Spanish Flu Pandemic	5	7
1957-1958 Flu Pandemic	4	4
1968 Flu Pandemic	4	3
1977-1978 Flu Epidemic	2	2
2006-2007 Flu Season	1	1
2007-2008 Flu Season	2	3
2009-2010 Swine Flu Pandemic	3	2

Table 13: Previous Significant Outbreaks of Influenza over the Past Century

Date	Pandemic Name / Subtype	Worldwide Deaths (Approximate)
1918 – 1920	Spanish Flu / H1N1	50 million
1957 – 1958	Asian Flu / H2N2	1.5 – 2 million
1968 – 1969	Hong Kong Flu / H3N2	1 million
2009 – 2010	Swine Flu / A/H1N1	12,000

Table 14: West Nile Cases Reported in the Lehigh Valley

Year	Lehigh County		Northampton County	
	Number of Positive Cases	Positive Human Cases	Number of Positive Cases	Positive Human Cases
2001	8	0	0	0
2002	56	0	27	0
2003	59	2	16	3
2004	4	0	4	0
2005	76	0	2	0
2006	6	0	4	0
2007	10	0	7	0
2008	4	0	3	0
2009	1	0	0	0
2010	17	0	9	0
2011	94	0	19	0
2012	150	2	59	1
2013	53	0	29	0
2014	74	0	13	0
2015	72	0	40	0
2016	61	0	18	1
2017	91	1	18	1
2018	177	4	106	0
2019	23	0	20	0
2020	7	0	1	0
2021	131	1	39	0
2022	63	0	41	1
2023				
2024				
2025				

Table 15: Reported Lyme Disease Cases in the Lehigh Valley

Year	Reported Cases Lehigh County	Reported Cases Northampton County
2001	84	85
2002	62	172
2003	215	241
2004	201	197
2005	179	164
2006	105	99
2007	134	123
2008	147	109
2009	197	197
2010	102	132
2011	193	170
2012	153	129
2013	137	140
2014	140	84
2015	170	171
2016	242	139
2017	296	178
2018	209	88
2019	211	141
2020	121	71
2021	71	75
2022		
2023		
2024		
2025		

Table 16: Reported COVID-19 Infections and Deaths

Location	Cumulative Reported Cases	Total Deaths
Lehigh County	112,637	1,422
Northampton County	101,076	1,271



Description

Radon is a radioactive gas produced by the breakdown of uranium in soil and rock that can lead to lung cancer in people exposed over a long period of time. Most exposure comes from breathing in radon gas that enters homes and buildings through foundation cracks and other openings. According to the DEP, approximately 40% of Pennsylvania homes have elevated radon levels.¹⁵

Past Occurrence

In 1984, routine monitoring of employees leaving the Limerick nuclear power plant near Reading, PA, showed that readings on Mr. Stanley Watras frequently exceeded expected radiation levels, yet only natural, non-fission-product radioactivity was detected on him. Radon levels in his home were detected around 2,500 pCi/L, much higher than the 4 pCi/L guideline of the EPA or even the 67 pCi/L limit for uranium miners. As a result of this event, the Reading Prong section of Pennsylvania where Watras lived became the focus of the first large-scale radon scare in the world.¹⁶

Radon is a constant threat throughout the Lehigh Valley. As a naturally occurring element, radon has been present in the ground across the Lehigh Valley since long before the area was settled. Overall, Pennsylvania is an area with historically high radon levels due to shear fault zones in the state that contain large amounts of uranium which eventually decays into radon.¹⁷ Current data on abundance and distribution of radon in Pennsylvania houses is considered incomplete and potentially biased.¹⁸ However, a study published in 2015 reviewed 1,983,705 indoor radon tests conducted in over 800,000 buildings between 1987 and 2013 from all 67 counties in Pennsylvania. Through this work, the researchers concluded that:

1. Nearly 300,000 homes had radon concentrations which exceeded the EPA's action level (4 pCi/L)
2. Buildings located in cities had nearly 27% lower radon levels than those located in more rural townships.
3. Buildings using well water had 21% higher indoor radon concentrations than those using municipal water.¹⁹

The 2015 study also determined that the region of Pennsylvania with the highest detected levels of radon was along the Reading Prong. This is particularly relevant for Lehigh and Northampton Counties because the Reading Prong runs through both counties. The geology of the Reading Prong is characterized by elevated levels of uranium, and the radioactive decay of the uranium results in higher than-normal concentrations of radon in the region.

Another study conducted by the United States Geological Survey alongside the Pennsylvania Department of Health and Environmental Protection aimed to examine radon levels in wells throughout the state. The data for the study was collected from 1986 to 2015 and accounts for

approximately 31 percent of the land area of Pennsylvania. The study concluded that more than 14 percent of the tested wells had radon levels at or above 4,000 pCi/L.²⁰



Description

Land subsidence is a gradual settling or sudden sinking of the ground surface due to the movement of subsurface materials. A sinkhole is a subsidence feature resulting from the sinking of surficial material into a pre-existing subsurface void. Subsidence and sinkholes are geologic hazards that can impact roadways and buildings and disrupt utility services. Subsidence and sinkholes are most common in areas underlain by limestone and can be exacerbated by human activities such as water, natural gas, and oil extraction.²¹

Past Occurrence

The Pennsylvania Department of Conservation and Natural Resources' Sinkhole Inventory Online Database, along with the 2023 Pennsylvania State Hazard Mitigation Plan, recorded 470 sinkholes in Lehigh County and 677 in Northampton County between 2010 and 2013. Additionally, local data from the Lehigh and Northampton County Knowledge Center databases for 2012 and 2017 indicate 101 sinkhole incidents across 23 municipalities. Bethlehem Township experienced the highest number of sinkholes (28), followed by Palmer Township (19), Easton (12), Hanover Township in Northampton County (6), and Lower Saucon Township (5). However, details on damages or injuries are not readily available, and it's important to note that many sinkholes remain unreported, especially those occurring on private lands like farms and woodlands, which typically don't pose immediate threats to structures.

Significant sinkhole events have been documented in the region. One notable incident in Allentown in February 1994 resulted in a massive sinkhole measuring 100 feet in length, 50 feet in width, and 20 feet in depth. This event led to the collapse of a portion of 7th Street and the adjoining Corporate Plaza Building, necessitating the building's eventual demolition and its replacement with a parking lot, although the exact cost of damages remains unknown.

Another major event involved sinkholes along Bushkill Creek in 2000, resulting in the closure of a bridge connecting Tatamy Borough and Stockertown Borough. During repair efforts, another large sinkhole emerged near a residence south and west of the bridge, causing a section of the creek bank to collapse and extending the damage to the initial sinkhole repair site.

Many sinkholes have occurred on the property of George Wolf Elementary School in Bath borough between 2002 and 2019.

George Wolf

2002, 2004, 2005, 2006, 2008, 2009, 2010, 2011, 2013, 2014, 2017, 2018, 2019



Description

A wildfire is an unplanned fire that burns in a natural area. Wildfires occur throughout wooded and open vegetation areas of Pennsylvania. Open fields, grass, dense brush, and forest-covered areas are typical sites for wildfire events. Wildfires can cause injuries or death and can ruin homes in their path. Wildfires can be caused by humans or lightning, and can happen anytime, though the risk increases in periods of little rain. In Pennsylvania, 98% of wildfires are caused by people.²²

Table 17: Historical Occurrences of Wildfires in the Lehigh Valley

Date	County	Location	Acres Burned	Deaths	Injuries	Property Damage (\$)
3/26/2012	Northampton	Lower Nazareth Township	Unknown	0	0	0
4/9/2012	Northampton	Upper Mount Bethel	7	0	0	0
11/24/2013	Lehigh	South Whitehall Township	Unknown	0	0	0
11/24/2013	Northampton	Forks Township	Unknown	0	0	0
4/6/2015	Lehigh	Washington Township	27	0	0	0
4/6/2015	Northampton	Lower Saucon Township	2	1	0	\$1,000
4/18/2015	Lehigh	Blue Mountain	300	0	0	0
4/18/2015	Northampton	Unknown	5	0	0	0
6/15/2017	Northampton	Lehigh Township	10	0	0	0

Date	County	Location	Acres Burned	Deaths	Injuries	Property Damage (\$)



Description

A tornado is a narrow, violently rotating column of air that extends from the base of a thunderstorm to the ground. About 1,250 tornadoes hit the U.S. each year, with about 16 hitting Pennsylvania. Damaging winds exceeding 50-60 miles per hour can occur during tornadoes, severe thunderstorms, winter storms, or coastal storms. These winds can have severe impacts on buildings, pulling off the roof covering, roof deck, or wall siding and pushing or pulling off the windows.²³

Past Occurrence

Data from the NCEI Storm Events Database reveals a notable increase in tornado occurrences over recent decades. Comparing two periods, from 1950 to 1995, a span of 46 years, there were 493 tornadoes recorded in Pennsylvania. In contrast, a shorter period from 1996 to 2021, lasting only 26 years, saw a similar number of tornadoes at 497. This trend appears to be more pronounced regionally and might partly be attributed to advancements in reporting techniques. According to a 2018 report by the National Weather Service, part of NOAA, the overall frequency of tornadoes across the United States has been relatively steady since 1950, suggesting that the observed increase could be linked to more sophisticated and thorough reporting methods.²⁴

The year 2021 stood out in terms of recent tornado history in Pennsylvania, recording the highest number of tornadoes in the state since 1998. Two different sources, the SPC and NCEI, reported 44 and 50 tornadoes, respectively, in 2021. The year of plan update – 2023 - was marked by several significant tornado events in Pennsylvania, including the first EF-3 tornado in the state, which occurred in the Philadelphia suburbs. Additionally, Hurricane Ida was responsible for spawning several tornadoes in the southeast, resulting in one fatality. Another notable incident was an EF-2 tornado in late October that caused considerable damage in Buffalo Township. This event was part of a larger outbreak that included 18 tornadoes across eastern Ohio and western Pennsylvania, highlighting a year of particularly high tornado activity in the region.

Past occurrences and losses associated with historic tornado events prior to February 2007 are based on the former Fujita Scale.

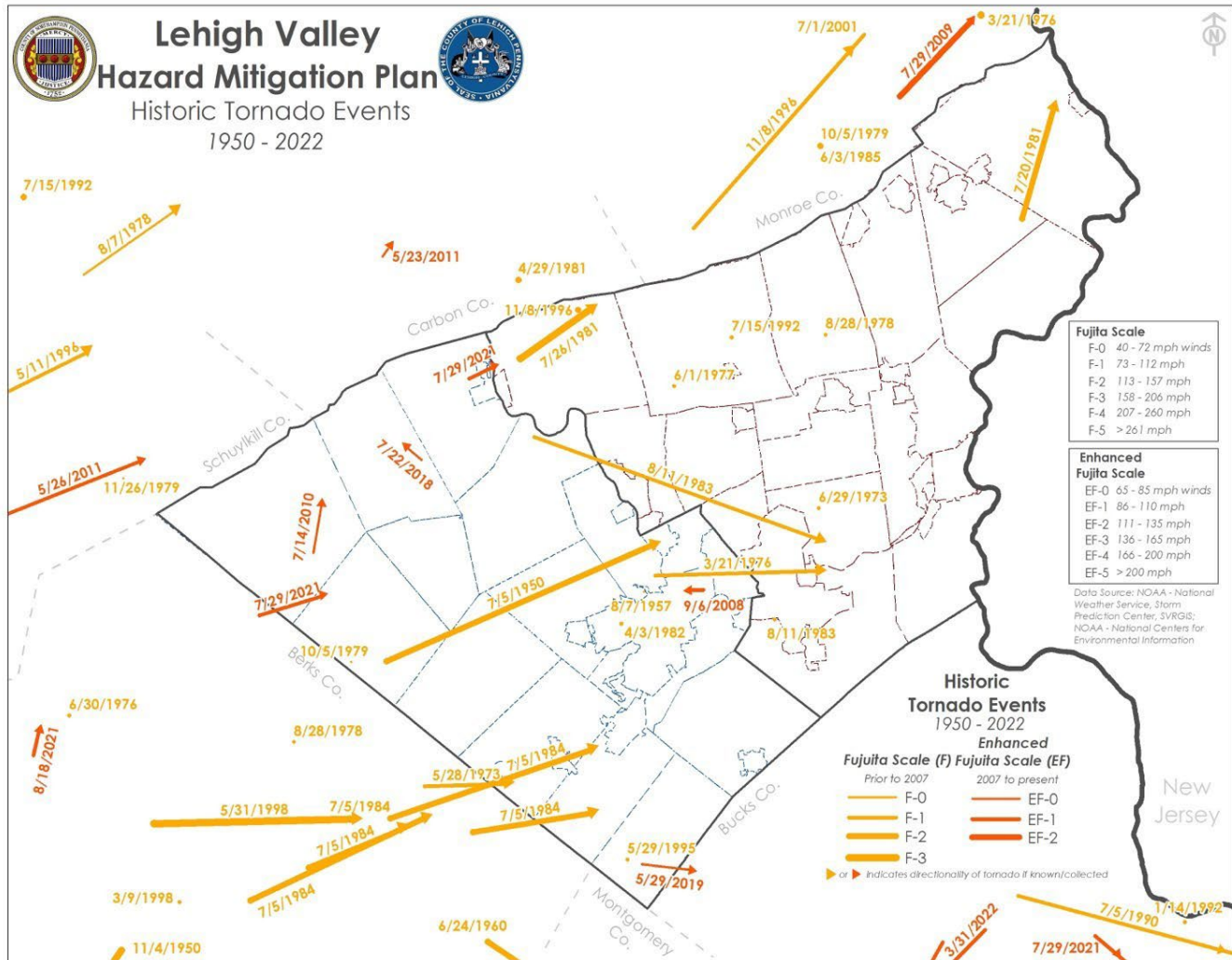
Events after February 2007 are based on the Enhanced Fujita Scale.

According to the National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental Information (NCEI) Storm Events Database, between 1950 and 2023, Lehigh County had 12 tornadic events and 491 windstorm events. Northampton County experienced 12 tornadic events and 498 windstorm events during this period. These events include funnel clouds, high winds, strong winds, thunderstorm winds. Total property damages, because of these windstorm and tornado events, were estimated at \$38.957 million in Lehigh County and \$33.098 million in Northampton County. The intensity of these tornadic events ranged from F/EF-0 to F/EF-3.

The most destructive tornado to hit Lehigh County occurred on August 11, 1983 and resulted in approximately \$25 million in property damage; this tornado was rated as an F1. This tornado also

crossed into Northampton County and is the most destructive in Northampton County history. The most destructive tornado to impact Lehigh County since the Enhance Fujita scale came into effect was an EF-1 that touched down in east Allentown in 2008. This was the only confirmed tornado in the United States associated with Tropical Storm Hanna, producing widespread damages exceeding \$1.5 million, but no deaths or injuries. Of the 12 tornadoes recorded in Northampton County, only one -- an EF-0 which has no associated property damage -- occurred since the Enhanced Fujita scale came into effect. Among the eleven tornadoes which struck Northampton County between 1950 and 2007, two were categorized as F-0, six as F-1, two as F-2, and one was categorized as an F-3.

Figure 5: Map of Tornado Events in the Lehigh Valley 1950-2022



The most recent recorded tornado in the Lehigh Valley occurred on August 7, 2023, in Allentown, when an unexpected and brief tornado struck the Midway Manor neighborhood, bordering Bethlehem, without a specific tornado warning. The National Weather Service reported that due to the tornado's swift formation and short duration, from 7:21 to 7:23 p.m., there was no time to issue a specific warning. However, the area was under a severe thunderstorm warning, and a tornado watch had been issued earlier, signaling favorable conditions for a tornado. This event was monitored by the Northampton Emergency Manager, who accompanied NOAA representatives in the field and was the person to correctly identify and document the tornado's path.

The tornado, confirmed by the weather service after surveying the damage, was the second in the Lehigh Valley in 2023 and at least the 33rd since 1950. With peak wind speeds estimated at 100 mph, it was categorized as an EF1 tornado on the Enhanced Fujita Scale. Its path was 0.30 miles long and 160 yards wide, extending into Bethlehem.

The tornado's trail began near East Pennsylvania Street, causing significant damage, including a church roof, a shed, and uprooted trees. It intensified near Club Avenue, resulting in substantial damage to homes, with some losing 30-50% of their roof covering. The tornado eventually weakened and dissipated near Pennsylvania Avenue, fortunately without causing any injuries or fatalities.

With regard to recent occurrences of high winds, strong winds, thunderstorm winds, and funnel clouds, there have been 395 such events since January 1, 2013. These events are relatively evenly split between Northampton and Lehigh County, with 178 occurring in Northampton County and the remaining 217 occurring in Lehigh County. No deaths were reported from any of these events; however, one injury was reported.

Table 18: Loss Estimates from High Winds, Strong Winds, Thunderstorm Winds, and Funnel Cloud Events in the Lehigh Valley Since 2013

County	Property Damage
Lehigh County (NCEI)	\$599,100
Northampton County (NCEI)	\$803,100
Lehigh Valley Total (NCEI)	\$1,402,200



Description

A winter storm is a storm in which the main types of precipitation are snow, sleet, or freezing rain. A winter storm can range from a moderate snowfall or ice event over a period of a few hours to blizzard conditions with wind-driven snow that lasts for several days. Most deaths from winter storms are not directly related to the storm itself, but result from traffic accidents on icy roads, medical emergencies while shoveling snow, or hypothermia from prolonged exposure to cold.²⁵ A winter storm can adversely affect roadways, utilities, business activities, and can cause loss of life, frostbite and freezing conditions. They can result in the closing of secondary roads, particularly in rural locations, loss of utility services and depletion of oil heating supplies.

Table 19: Winter Storm Events in the Lehigh Valley

Date	Event Type	FEMA Declaration?	Losses/Impacts (source: NOAA NCEI)
February 3, 2014	Heavy Snow	No	Snow fell across eastern Pennsylvania, with the greatest amounts falling in the Lehigh and Delaware Valleys. At LVIA, 9.3 inches of snow was recorded. LANTA suspended all commuter bus service. Tractor- trailers became stuck on hills. Airport Road closed due to a truck accident. No injuries or property damage were reported.
February 12-14, 2014	Winter Storm	No	A major winter storm affected all eastern Pennsylvania with heavy snow and sleet. A state of emergency was in effect in Pennsylvania. Commuter bus service from the Lehigh Valley to New York City was cancelled. 19.2 inches of snow was recorded at LVIA and all flights were cancelled. Five injuries were reported.
January 22-24, 2016	Winter Storm	Yes (DR-4267)	A major Nor'easter produced record snowfall in eastern Pennsylvania, with a 2-day total snowfall of 31.9 inches at the Lehigh Valley International Airport. The normal seasonal snowfall of 32.9 inches at the airport was almost exceeded by this one event. Pennsylvania Governor Tom Wolf declared a State of Emergency. Both Lehigh and Northampton counties were declared federal disaster areas. An Allentown man collapsed from a heart attack while shoveling snow. A second Allentown man was found unconscious in his car after being overcome by exhaust fumes and died later from related complications.
March 14, 2017	Blizzard / Winter Storm	No	Heavy snow fell across the region in the morning with a mix of sleet and freezing rain later in the day. 13.7 inches of snow was recorded at LVIA. No injuries or damages were reported. Governor Wolf signed a Proclamation of Disaster Emergency for the State on March 13, 2017.

Date	Event Type	FEMA Declaration?	Losses/Impacts (source: NOAA NCEI)
February 1, 2021	Winter Storm	No	Snow began in the county on January 31. It became heavy on February 1 as intense banding developed over the Lehigh Valley. Lighter snow continued into February 2 before the storm finally departed. By the end of the event, a report was received from Coopersburg of 31.0 inches of snow. Numerous other reports of 24 to 30 inches of snow were received in the major winter storm. The Lehigh Valley International Airport recorded a storm total of 27.3 inches of snow. A 67-year-old woman with Alzheimer's died of hypothermia in Allentown when she wandered outside during the storm.
March 12, 2022	Winter Storm	No	A complex weather system brought precipitation to the mid-Atlantic on March 12. Strengthening low pressure tracked from the Southeast US to just off the mid-Atlantic coast and began to rapidly intensify as it departed towards New England.

Human-Caused Hazards



Description

Civil disturbance is a broad term that is typically used by law enforcement to describe one or more forms of disturbance caused by a group of people. A civil disturbance is defined by FEMA as a civil unrest activity (such as a demonstration, riot, or strike) that disrupts a community and requires intervention to maintain public safety.²⁶

Table 20: Previous Un-Planned Mass Gatherings in the Lehigh Valley

County	Jurisdiction(s)	Event	Date	Estimated Population
Lehigh	Salisbury	Protest against housing immigrant	7/20/2014	Unknown
Northampton	Lower Nazareth	Union protest	11/19/2015	Unknown
Northampton	Easton City	Anti- and pro-Trump rallies	11/12/2016	Unknown
Northampton	Bethlehem City	Pantsuit rally: silent rally to promote unity	11/12/2016	Unknown
Northampton	Bethlehem Township	Northampton Community College students protest against	5/3/2017	Unknown
Northampton / Lehigh	Bethlehem City, Allentown,	George Floyd Protests	5/29 & 5/30/2020	Unknown



Description

Dam failure is the uncontrolled release of water (and any associated wastes) from a dam. This hazard often results from a combination of natural and human causes, and can follow other hazards such as hurricanes, earthquakes, and landslides. The consequences of dam failures can include property and environmental damage and loss of life.²⁷

Past Occurrence

There have been no recorded dam failures in the Lehigh Valley. However, the Lake Minsi Dam, which is categorized as a high hazard dam in Upper Mt. Bethel Township, was deemed unsafe due to limited spillway capacity. The lake was drained in 2017 for the dam to be repaired, and it has since been repaired and re-filled.

Historically, the deadliest dam break in the U.S. occurred in Johnstown, Pennsylvania. In 1889, a break in the South Fork dam resulted in more than 14 million cubic meters of water rushing downstream.²⁸ This wave of water smashed through several communities along the Little Conemaugh River, and 2,208 people were killed as a result. Subsequent analysis of this dam break revealed numerous flaws pertaining to the construction and management of the dam, and the catastrophe focused national attention to the issue of dam safety. Another significant dam failure took place in Austin, Pennsylvania (Potter County) in 1911, claiming seventy-eight lives.



Description

Addiction occurs when an individual becomes physically dependent on a drug, including opiates and narcotics. Opioids are a synthetic substance found in certain prescription pain medications: morphine, codeine, methadone, oxycodone, hydrocodone, fentanyl, and hydromorphone, and street drugs like heroin. Opioids block the body's ability to feel pain and can create a sense of euphoria.

Individuals often build a tolerance to opioid drugs, which leads them to take more of the medication than originally prescribed.

Past Occurrence

In 2018, Pennsylvania Governor Wolf declared the Heroin and Opioid epidemic a statewide disaster emergency on January 10th. This first-ever public health disaster declaration was meant to enhance state response, increase access to treatment, and save lives. A command center at the Pennsylvania Emergency Management Agency (PEMA) tracks progress and enhances coordination of health and public safety agencies.

Pennsylvania is in the midst of an unprecedented epidemic of drug abuse and drug-related overdose deaths impacting every corner of the state and all of its residents. In 2022, there were 5,150 drug overdose deaths reported across Pennsylvania.²⁹ Although the total overdose deaths in 2022 decreased by 4% from 2021, total overdose deaths in 2022 increased 142% from a decade earlier, when 2,132 overdose deaths were reported in 2012.³⁰ Additional analysis from the CDC on the overdose death rates within each of the 50 US states found that Pennsylvania had the 9th highest overdose death rate in 2021, at 43.2 overdose deaths per 100,000 people.³¹

In 2017, the United States Drug Enforcement Administration (DEA) Philadelphia Division and the University of Pittsburgh prepared "Analysis of Overdose Deaths in Pennsylvania, 2016" to assist law enforcement's efforts to identify and combat drug suppliers, and ultimately drug abuse and related overdoses. The Drug Overdose Crisis hazard was first included in the 2018 Lehigh Valley Hazard Mitigation Plan. The drugs included in the analysis were selected based on law enforcement intelligence regarding frequency of abuse, as well as those identified as the most common drugs present in drug related overdose deaths by national public safety and public health sources.

The most commonly identified drug category in toxicology reports varied for counties across Pennsylvania in 2022, and overdose deaths commonly involve more than one substance. In Lehigh County, there were 162 reported overdose deaths in 2022, and the opioid class of drugs contributed in 85.8% of these deaths.³² Troublingly, Fentanyl accounted for 95.7% of all opioid-involved overdose deaths and was specifically identified in 82.1% of all overdose deaths in Lehigh County. Non-fentanyl opioids contributed to only 3.7% of overdose deaths in Lehigh County. The second most common drug class contributing to overdose deaths in Lehigh County in 2022 was stimulants, which contributed to 59.9% of overdose deaths.

For Northampton County, 67 overdose deaths were reported in 2022. The opioid class of drugs was the most common contributor to overdose deaths in Northampton County, accounting for 86.6% of all

reported overdose deaths. As was the case in Lehigh County, fentanyl was the specific drug identified in virtually all opioid-related deaths in Northampton County; non-fentanyl opioids contributed to only 1.5% of overdose deaths in Northampton County. Vulnerable and underserved populations may be disproportionately impacted by this hazard, and these populations are examined in greater detail below.

It is worth noting that the number of overdose deaths reported in Lehigh County may be slightly inflated, due to the frequency with which Northampton County residents are transported to hospitals in Lehigh County for hospitalization, where they may then pass away.



Description

Hazardous material releases can contaminate air, water, and soils and have the potential to cause injury or death. Dispersion can take place rapidly when transported by water and wind. While often accidental, releases can occur as a result of human carelessness, intentional acts, or natural hazards.

Environmental hazards include the following:

- 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.³³
- Mining incidents; including the release of harmful chemical and waste materials into water bodies or the atmosphere, explosions, fires, and other hazards and threats to life safety stemming from mining.
- Oil and gas well incidents; including the release of the release of harmful chemical and waste materials into water bodies or the atmosphere, explosions, fires, and other hazards and threats to life safety stemming from oil and gas extraction.

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.

Table 21: Methods of Transportation Involved in Hazardous Materials Incidents in the Lehigh Valley Since 1971

Methods of Transportation Involved in Hazardous Materials Incidents			
County	Highway	Rail	Air
Northampton	1516	3	23
Lehigh	616	126	36

Table 22: Hazardous Material Incidents in the LV 2018 - 2022, per PEMA-KC & WebEOC

Year	Lehigh	Northampton
2018	24	220
2019	40	259
2020	57	452
2021	52	294
2022	42	244
2023		
2024		
2025		
TOTALS	215	1469



Description

Urban fire and explosion hazards include vehicle and building/structure fires as well as overpressure rupture, overheat, or other explosions that do not ignite. This hazard occurs in denser, more urbanized areas statewide and most often occurs in residential structures. Nationally, fires cause over 3,000 deaths and approximately 16,000 injuries each year.³⁴

Table 23: Reported Structural Fires in the Lehigh Valley, 2001 - 2022

Year	Lehigh County	Northampton County
2001	9	4
2002	5	2
2003	2	0
2004	2	0
2005	15	2
2006	16	7
2007	19	91
2008	10	73
2009	195	90
2010	194	135
2011	189	82
2012*	14	N/A
2013	16	82
2014	27	140
2015	21	96
2016	26	81
2017	21	62
2018*	N/A	84
2019*	N/A	40
2020*	N/A	64
2021*	N/A	39
2022*	N/A	34

Year	Lehigh County	Northampton County
2023		
2024		
2025		
TOTAL	781	1208

Source: Lehigh & Northampton County Knowledge Center & WebEOC databases.

* 2012 data not available for Northampton County & 2018 – 2022 data not available for Lehigh County.



Description

A levee is a human-caused structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water to provide protection from temporary flooding. A levee failure or breach occurs when a levee fails to prevent flooding on the landside of the levee. The consequences of a sudden levee failure can be catastrophic, with the resulting flooding causing loss of life, emergency evacuations, and significant property damage.³⁵

Past Occurrence

There have been no levee failures in the Lehigh Valley.



Description

Nuclear explosions can cause significant damage and casualties from blast, heat, and radiation. The primary concern following a nuclear accident or nuclear attack is the extent of radiation, inhalation, and ingestion of radioactive isotopes which can cause acute health effects (e.g. death, burns, severe impairment), chronic health effects (e.g. cancer), and psychological effects.³⁶

Past Occurrence

While no fixed facility nuclear emergencies have occurred in the Lehigh Valley, Pennsylvania is home to the only recorded nuclear emergency in the US. In 1979, the Three Mile Island Nuclear Generating Station declared a General Emergency following an internal system failure. This event led to significant changes to the regulatory environment surrounding nuclear power plants, significant decline in public confidence in the nuclear industry, and a gradual decrease in the number of nuclear stations in the country. While reports show conflicting information on the medical impact on the residential population following the disaster, cleanup costs exceeded \$1 billion.

The Limerick and Susquehanna plants have both experienced unplanned, sudden shutdowns – also known as scrams – of their nuclear reactors as recently as 2020. On May 3, 2020, the Susquehanna unit 1 reactor automatically shut down due to a trip of the main turbine. The reactor water level lowered to 1 inch causing Level 3 (+13 inches) isolation. However, the operations crew subsequently maintained reactor water level at the normal operating band, and neither the Emergency Core Cooling System nor Reactor Core Isolation Cooling were necessary.³⁷ This event was classified as a non-emergency by the NRC.

On November 13, 2020, the Limerick unit 1 reactor automatically shut down due to a valid Reactor High Pressure signal (1096psig). The NRC determined that the closure of the 1B Inboard Main Steam Isolation Valve (MSIV) caused the pressure within the reactor to rise until it exceeded the Reactor Protection System set point of 1096psig. Once the set point was exceeded automatic systems shut down the reactor, and the pressure was normalized via steam bypass valves. Like the scram at the Susquehanna plant in the same year, the 2020 scram at Limerick was classified as a non-emergency by the NRC. Despite the classification of non-emergency, both events were reported to NRC Resident Inspectors, Berks, Chester, and Montgomery Counties, as well as the Pennsylvania Emergency Management Agency.³⁸



Description

Buildings and other engineered structures, including bridges, may collapse if their structural integrity is compromised, especially due to effects from other natural or human-caused hazards. Older buildings or structures, structures that are not built to standard codes, or structures that have been weakened are more susceptible to being affected by these hazards.

Past Occurrence

Historical records for the Lehigh Valley, submitted annually to the state, note two incidents of structural collapse, not generated as a cascading impact from a separate incident, over the past two decades. In 2006, while constructing a new apartment building in Upper Macungie Township, Lehigh County construction crews reported a catastrophic failure of the structure. No injuries resulted from this incident. In 2007, a ceiling within a commercial building in Bangor Borough, Northampton County failed, temporarily trapping four individuals.

In addition to stand-alone incidents, some notable structural failures based upon other incidents have caused significant damage within the Lehigh Valley. Lehigh County has been home to notable structural collapses suspected of being generated from incidents such as water main breaks or sinkholes. The most notable of these incidents happened in 1994 in the City of Allentown. A commercial structure valued at more than \$9 million was impacted by a large sinkhole, which caused the failure of systems within the structure. Following unsuccessful mitigation attempts, the structure was imploded to minimize any additional damage to surrounding structures.

Similar to Lehigh County, Northampton County has also been impacted by structural collapses based upon cascading events. In 2008, a large sinkhole at an apartment complex in Hanover Township forced the evacuation of more than 40 residents. The incident caused the failure of load bearing walls within the structures, ultimately leading to the demolition of the two buildings. In addition, the City of Easton evacuated an apartment complex in 2004 following the development of a large sinkhole. The structure sustained partial failure of load bearing elements forcing the relocation of 25 residents. Additional information on land subsidence (sinkhole) frequency can be found in the Subsidence / Sinkhole profile.

There have been two notable bridge collapses within the Commonwealth of Pennsylvania since 2021. On January 28, 2022, the 447-foot-long Fern Hollow Bridge in Allegheny County fell approximately 100 feet into the ravine below. At the time of its collapse, there were four passenger vehicles and a bus on the bridge, and 10 people were injured in the collapse. Thankfully, there were no fatalities, and the Pittsburgh Bureau of Fire Chief stated that it was fortunate that the bridge collapse occurred before the morning rush hour.³⁹ The NTSB issued a primary report on February 7, 2022, but this did not identify any cause(s) of the collapse. At the time of writing the 2024 Lehigh Valley Hazard Mitigation Plan, the NTSB has not provided a final report identifying the events and conditions which led to the collapse of the Fern Hollow Bridge. The Philip J. Fahy Memorial Bridge in the City of Bethlehem uses a rigid K frame design similar to what was used for the Fern Hollow Bridge. The similarity of the design

led PennDOT to review the structural adequacy of the Philip J. Fahy Memorial Bridge, along with 4 other bridges in Pennsylvania, immediately after the collapse of the Fern Hollow Bridge. PennDOT assessed the condition of the bridges as “fair” and did not require posting weight restrictions. However, the cause of the Fern Hollow Bridge Collapse has not been officially determined, and officials in the Lehigh Valley should watch for any updates from the NTSB which may be relevant to the Philip J. Fahy Memorial Bridge.

On June 11, 2023, an overpass along I-95 in Philadelphia collapsed after a truck hauling gasoline crashed and started a fire underneath the overpass. The heat from the fire caused the northbound lanes of I-95 to collapse, and the southbound lanes of I-95 were significantly damaged. The NTSB is investigating the incident, and the exact mechanism of the collapse has not been determined.⁴⁰ The Pennsylvania Transportation secretary estimated that, prior to its collapse, 160,000 motorists crossed the segment each day, and motorists had to utilize a 43-mile detour after the collapse.⁴¹ Officials in the Lehigh Valley should consider the possibility of a similar event unfolding along major transit routes like I-476 and I-78.



Description

Terrorism is the 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. Cyber-attacks have become an increasingly pressing concern.⁴²

Table 24: Reported Terrorism Events in the Lehigh Valley 2018 – 2023

Year	Active Shooter	Bomb Threat / Bomb found	Hostage situation	Suspicious Activity / device / package	Terroristic Threat	TOTALS
2018	0	11	0	4	ND	15
2019	0	14	0	5	16	35
2020	0	12	2	11	5	30
2021	0	6	0	5	9	20
2022	0	10	0	1	3	14
2023 TD	2	9	0	2	0	13
2024						
2025						

NOTES: - Data received from Northampton WebEOC and reflects best available data

- 2023 To-Date runs through 09/04/2023

- ND = not documented

- Events may reflect suspected terrorism events which have not yet been confirmed through the U.S. legal system.



Description

Transportation accidents are technological hazards involving the nation's system of land, sea, and air transportation infrastructure. A flaw or breakdown in any component of this system can and often does result in a major disaster involving loss of life, injuries, property and environmental damage, and economic consequences.

Transportation incidents are defined as incidents involving highway, air, and rail travel. These incidents are collectively the costliest of all hazards in the Commonwealth in terms of lives lost, injuries, and economic losses.

Table 25: Recorded Crashes in the Lehigh Valley by County 2018 - 2022

Location	2018	2019	2020	2021	2022	2023	2024	2025
Lehigh County	4,713	5,089	4,186	4,853	4,920			
Northampton County	2,975	3,081	2,510	2,856	2,963			

Table 26: Crash Fatalities in Lehigh Valley by County 2018 - 2022 ⁴³

Location	2018	2019	2020	2021	2022	2023	2024	2025
Lehigh County	26	26	32	30	31			
Northampton County	21	14	21	13	24			

Table 27: Count of Rail Accidents/Incidents in the Lehigh Valley 2018 - 2022

Location	2018	2019	2020	2021	2022	2023	2024	2025
Lehigh County	4	9	8	8	6			
Northampton County	6	6	2	6	6			

Table 28: Aircraft Accidents in the Lehigh Valley Investigated by NTSB 2018 - 2022

Event Date	Location	Aircraft Details	Highest Injury	NTSB Report Status
08/11/2019	Allentown	Schweizer 269C	Serious	Completed
09/28/2022	Allentown	Piper PA-28-140	Fatal	In work
11/09/2022	Allentown	Piper PA-28-140	Serious	Completed



Description

Utility interruption hazards are hazards that impair the functioning of important utilities in the energy, telecommunications, public works, and information network sectors.⁴⁴ Utility interruption hazards include the following:

- Geomagnetic Storms
- Fuel or Resource Shortage
- Electromagnetic Pulse
- Information Technology Failure
- Ancillary Support Equipment
- Public Works Failure
- Telecommunications System Failure
- Transmission Facility or Linear Utility Accident
- Major Energy, Power, Utility Failure

The table below describes known utility interruptions that have occurred since the previous plan update. This table reflects data from 911 dispatch; smaller outages that did not necessitate reporting to county government would not be included, and thus this is not a comprehensive accounting of all interruptions in the planning period.

Table 29: Reported Utility Interruptions in the Lehigh Valley 2018 -2023

Year	Phone / Comms Outage	Power Outage	Underground Utility	Water Shortage / Outage	Water Supply Contamination	Natural Gas Release	Other	TOTAL
2018	9	435	14	57	0	186	39	740
2019	11	257	5	17	0	69	21	380
2020	20	427	39	9	0	217	70	782
2021	6	429	66	3	0	107	45	656
2022	6	256	42	4	4	108	19	439
2023 YTD *	3	147	29	3	0	104	11	297
2024								
2025								

* Includes best-available data from WebEOC. 2023 Year-To-Date includes incidents reported through 09/04/2023.



Description

Pipeline failures are low-probability, potentially high-consequence events. Although gas and liquid pipeline failures are infrequent, the hazardous and inflammable materials released by these events can pose a significant threat to public safety and the built and natural environment. Explosions associated with pipeline failures, for example, can cause severe injury to nearby residents and destroy homes and other property.

Table 30: PHMSA Pipeline Incidents in Lehigh County 2003 – 2023

Date	System Type	Cause of Failure	Cost (in 2023 dollars)	Barrels Spilled	Net Barrels Lost	Injuries	Fatalities
7/22/04	Hazardous liquids	Excavation damage	\$1,223,261	450	415	0	0
8/2/04	Hazardous liquids	Excavation damage	\$152,475	14	9	0	0
2/1/05	Hazardous liquids	Natural force damage	\$7,221,312	1145	727	0	0
6/21/05	Hazardous liquids	External corrosion	\$43,730	48	42	0	0
7/13/05	Hazardous liquids	Excavation damage	\$44,874	24	12	0	0
10/17/05	Hazardous liquids	Material / weld / equipment failure	\$22,343,622	1,020	420	0	0
2/28/08	Hazardous liquids	Material / weld / equipment failure	\$21,113	1	0	0	0
2/9/11	Gas distribution	Natural force damage	\$2,115,082	0	0	3	5
6/17/12	Hazardous liquids	Incorrect operations	\$108,454	100	74	0	0
7/13/12	Hazardous liquids	External corrosion	\$474,379	9	9	0	0

Date	System Type	Cause of Failure	Cost (in 2023 dollars)	Barrels Spilled	Net Barrels Lost	Injuries	Fatalities
2/1/14	Hazardous liquids	Material / weld / equipment failure	\$30,888	12	0	0	0
5/10/16	Gas distribution	Excavation damage	\$92,531	0	0	0	0
10/1/19	Hazardous liquids	Incorrect operation	\$29,693	2	0	0	0
TOTALS			\$33,901,414	2,825	1,708	3	5

Note: Net Barrels Lost reflects the volume which could not be recovered through cleanup efforts.

Source: Pipeline and Hazardous Materials Safety Administration. "All Reported Incidents." portal.phmsa.dot.gov, November 13, 2023. <https://portal.phmsa.dot.gov/analytics/saw.dll?Portalpages>.



Description

Cyber-terrorism refers to acts of terrorism committed using computers, networks, and the Internet. The most widely cited definition comes from Denning's Testimony before the Special Oversight Panel on Terrorism: "Cyberterrorism... is generally understood to mean unlawful attacks and threats of attacks against computers, networks, and the information stored therein when done to intimidate or coerce a government or its people in furtherance of political or social objectives. Further, to qualify as cyberterrorism, an attack should result in violence against persons or property, or at least cause enough harm to generate fear." (Denning, 2000)

Past Occurrence

One of largest cyber-attacks targeting an entity within the Lehigh Valley was detected in Allentown on February 15, 2018. Unfortunately, the attack was well underway by the time it was discovered, and many devices used by the Allentown city government had already been infected by a serious computer virus known as Emotet. The virus stole credentials of city workers and severely disrupted government functions, as well as other services which used information technology assets belonging to Allentown. Among other things, the finance department of Allentown could not complete any external banking transactions, video surveillance networks were down, and local law enforcement was unable to access databases controlled by the Pennsylvania State Police. It took Allentown nearly two weeks to restore some of the impacted services, and the cost to remove the virus from Allentown systems was approximately \$1 million.⁴⁵ Unfortunately, the ease with which the perpetrators of these attacks can remain anonymous makes it difficult to determine the motivation behind this attack. However, the circumstances of the attack seem to indicate that its purpose was disruption rather than personal gain, and this is a characteristic of cyber-terrorism.

Another serious incident occurred in February 2023, when the Lehigh Valley Health Network was targeted by an advanced cyber-attack. In this instance, malicious software (malware) named "BlackCat" obtained access to highly personal and sensitive information, and the group behind the attack threatened to publish this information unless a ransom was paid. The attack was traced back to a nefarious group associated with Russia, and the U.S. Department of Health and Human Services has stated that the BlackCat attack is a new but "exceptionally capable" malware.⁴⁶ While the attack appears to have been motivated by personal gain, the nature of the attack is alarming and exemplifies some of the difficulties associated with preventing cyber-attacks and cyber-terrorism. First, it can be exceptionally difficult to stop or hold accountable the perpetrators of such attacks when they originate from outside of the U.S. Second, the possibility of foreign governments providing implicit or explicit support for malicious cyber-activity may significantly increase the sophistication of attacks.

Table 31: Lehigh Valley Hazard Risk Rankings for Natural Hazards

Hazard Risk	Natural Hazards	Probability	Impact	Extent	Warning	Duration	Risk Factor
HIGH	Pandemic & Infectious Disease	4	4	4	1	4	3.7
	Extreme Temperature	3	3	4	1	3	3
	Flood	4	2	3	3	3	3
	Winter Storm	3	2	4	1	2	2.6
	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
	Subsidence / Sinkhole	4	1	1	4	4	2.5
MODERATE	Radon	4	1	2	1	4	2.4
	Wildfire	3	1	2	3	2	2.1
	Lightning	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	2	1	1	4	1	1.6

Table 32: Lehigh Valley Hazard Risk Rankings for Human-Caused Hazards

Hazard Risk	Natural Hazards	Probability	Impact	Extent	Warning	Duration	Risk Factor
HIGH	Cyber-Terrorism	4	3	3	4	4	3.5
	Terrorism	3	4	4	4	2	3.5
	Drug Overdose Crisis	4	3	3	1	4	3.2
	Utility Interruption	4	2	3	3	3	3
	Environmental Hazards / Explosions	4	2	2	4	3	2.9
	Gas / Liquid Pipeline	4	2	2	4	2	2.8
	Fire (Urban / Structural)	4	2	1	4	2	2.6
MODERATE	Transportation Crash	4	1	1	4	1	2.2
	Civil Disturbance	4	1	1	3	2	2.2
	Dam Failure	1	3	2	4	1	2.1
	Levee Failure	1	3	2	4	1	2.1
LOW	Structural Collapse	2	2	1	4	1	1.9
	Nuclear Incident	1	1	2	4	2	1.6

Any questions about the data within this document please contact one of the Lehigh Valley Hazard Mitigation Plan co-chairs, information found below. In addition, copies of the 2024 Plan will be made available for public access from each agency at:

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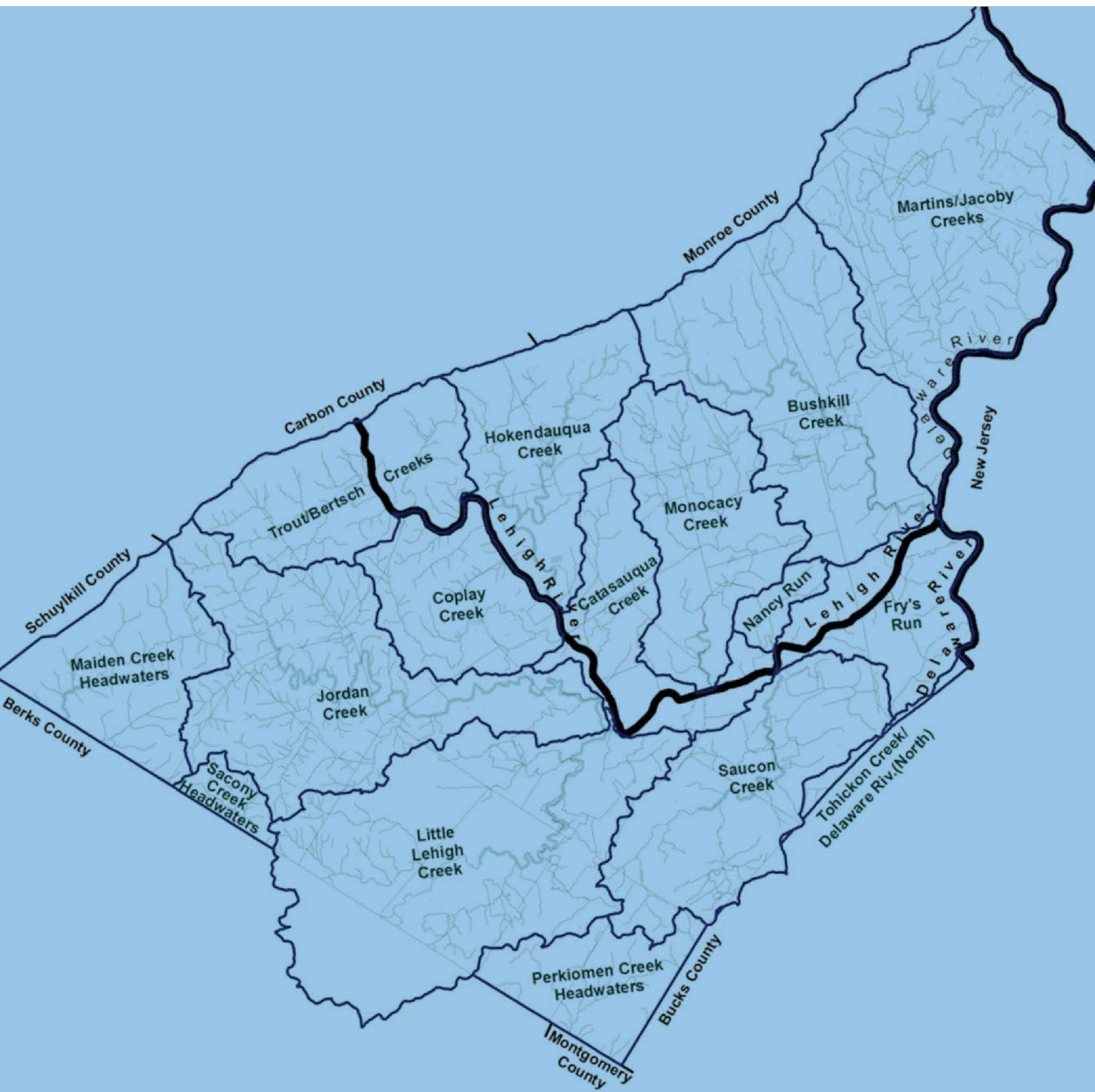
Email: tguth@ncem-pa.org

Endnotes (footnotes)

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