4.3.3.9. State Facility Loss Estimation

State facilities will not experience uniform losses in earthquake events. The losses will depend on the level of damage to the facility, from cosmetic damage to total destruction of a structure. Additionally, replacement values are not available for all critical facilities. With the values available, the estimated replacement cost of all state critical facilities located in earthquake hazard zones is $19,762,562,079.00.

4.3.4. Extreme Temperature

4.3.4.1. Location and Extent

Pennsylvania can experience many different temperature extremes. Temperatures across the Commonwealth normally remain between 0°F and 100°F and average from 43°F in the north-central mountains to 55°F in the southeast. High temperatures of 90°F or above occur about ten days per year at any one location, but southeastern localities may experience more than twice this number. Ranges of daily temperature from maximum to minimum are commonly around 20°F during the summer and are a few degrees less during the winter. Freezing temperatures occur on an average of 100 or more days per year, and the greatest number of occurrences is in the Appalachian Plateaus province in north-central Pennsylvania. The southeast (near sea level) and northwest (adjacent to Lake Erie) portions of the Commonwealth have the longest freeze-free period. Extreme temperature hazards are not tied to a specific temperature threshold; instead, these hazards occur when the temperature is extremely high or extremely low.

Figure 4.3.4-1 and Figure 4.3.4-2 show annual mean maximum and minimum temperatures throughout Pennsylvania. During July, the warmest month, high temperatures normally range from the upper-70s in northern areas of the Commonwealth to the mid-80s in southern areas. Minimum temperatures for this month range from the upper-60s in the southeast to the lower 50s in the north-central mountains. During January, the coldest month, most of the Commonwealth experiences low temperatures in the teens and high temperatures in the 30s. High temperatures usually remain near or below the freezing point during this month in northern sections of the Commonwealth. In southern sections, high temperatures hover in the mid- to upper-30s.

Figure 4.3.4-1 Map showing average minimum temperature throughout Pennsylvania based on temperature data collected between 1981 and 2010.

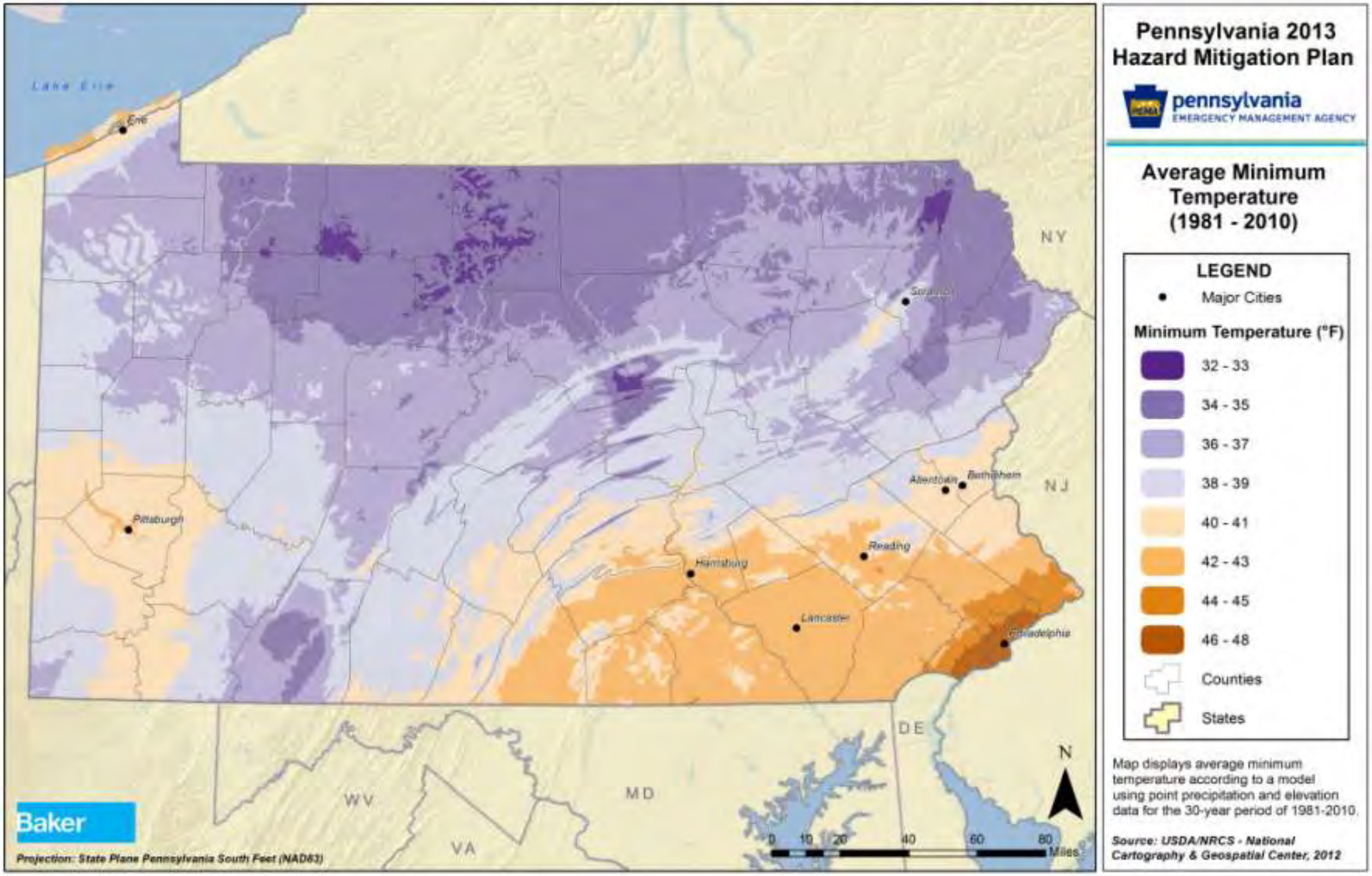
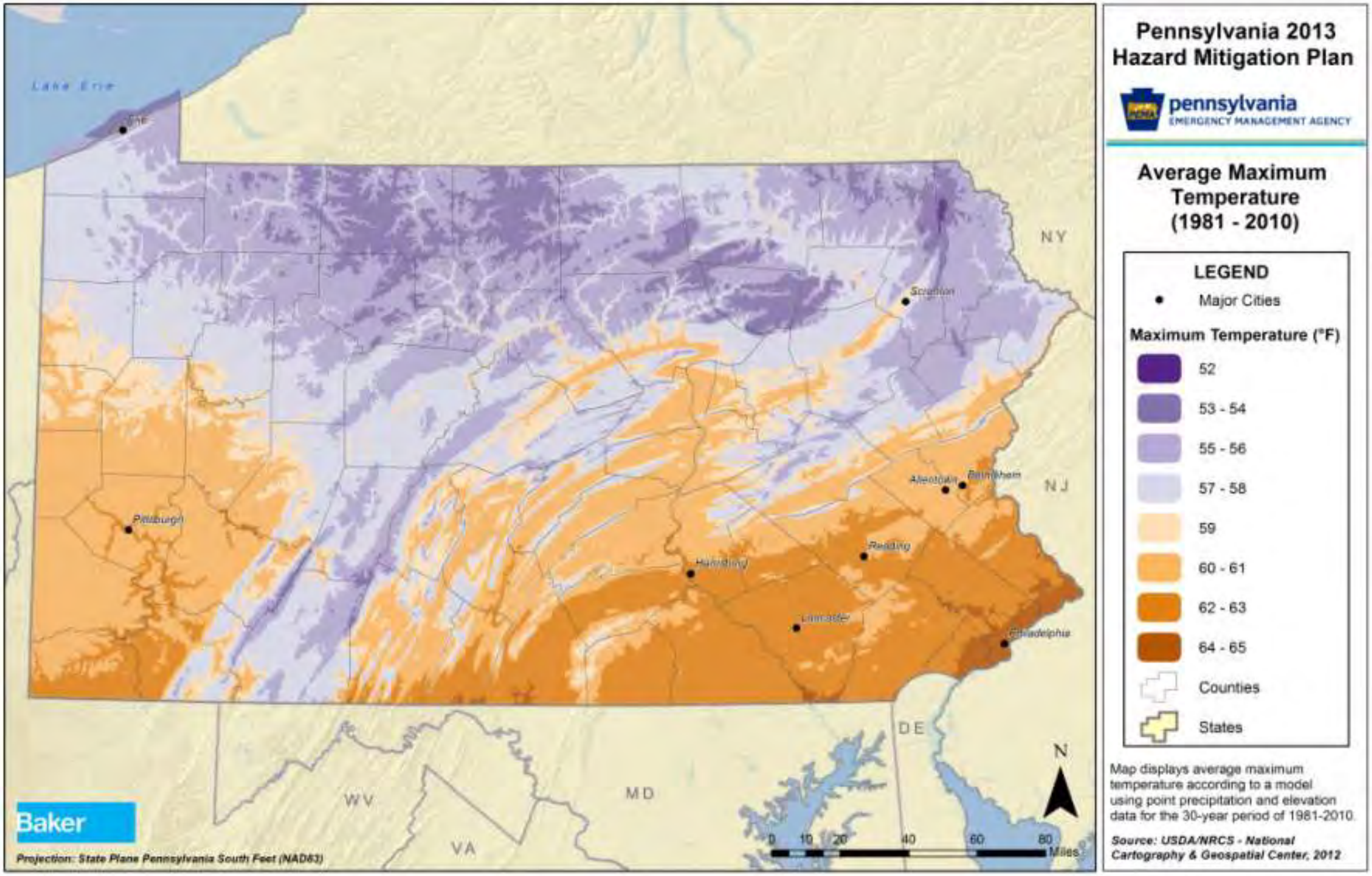


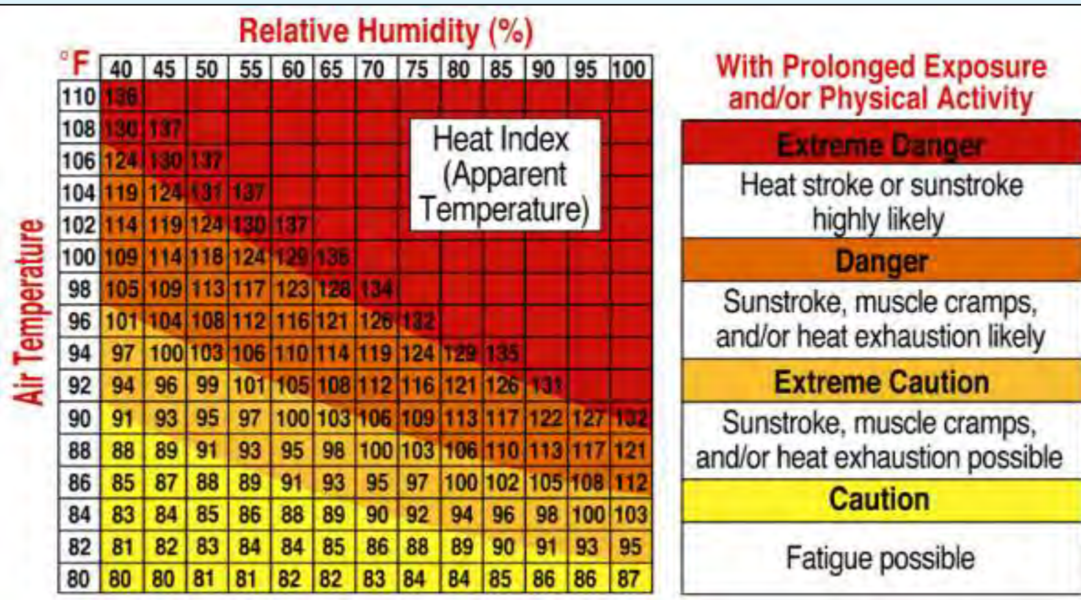
Figure 4.3.4-2 Map showing average maximum temperature throughout Pennsylvania based on temperature data collected between 1981 and 2010.



4.3.4.2. Range of Magnitude

Extreme temperatures can result in elevated utility costs to consumers and also can cause human risks. Extremely high temperatures cause heat stress which can be divided into four categories (see Figure 4.3.4-3). Each category is defined by apparent temperature which is associated with a heat index value that captures the combined effects of dry air temperature and relative humidity on humans and animals. Major human risks for these temperatures include heat cramps, heat syncope, heat exhaustion, heatstroke, and death. Note that while the temperatures in Figure 4.3.4-3 serves as a guide for various danger categories, the impacts of high temperatures will vary from person to person based on individual age, health, and other factors. The very old and the very young are most vulnerable to health-related impacts of extreme temperatures.

Figure 4.3.4-3 Four categories of heat stress (NOAA, 2010).



Temperature advisories, watches and warnings are issued by the National Weather Service relating the above impacts to the range of temperatures typically experienced in Pennsylvania. Exact thresholds vary across the Commonwealth, but in general *Heat Advisories* are issued when the heat index will be equal to or greater than 100°F, but less than 105°F, *Excessive Heat Warning*s are issued when heat indices will attain or exceed 105°F, and *Excessive Heat Watches*, are issued when there is a possibility that excessive heat warning criteria may be experienced within twelve to forty-eight hours (NOAA NWS, 2010).

Cold temperatures can be extremely dangerous to humans and animals exposed to the elements. Without heat and shelter, cold temperatures can cause hypothermia, frost bite, and death. Wind chill temperatures are often used in place of raw temperature values due to the effect of wind can have in drawing heat from the body under cold temperatures. These values represent what temperatures actually feel like to humans and animals under cold, windy conditions. Similarly to high temperatures, the effect of cold temperatures will vary by individual.

In Pennsylvania, *Wind Chill Warnings* are issued when wind chills drop to -25°F or lower. Wind Chill Advisories are issued in the southeast and western sections of Pennsylvania when wind chill values drop to -10°F to -24°F. South-central to northern sections of the Commonwealth when wind chills drop to -15°F to -24°F (NOAA NWS, 2010).

A potential worst-case extreme temperature scenario would be if widespread areas of the Commonwealth experienced 90°F or higher temperatures for an extended number of days. The heat would overwhelm the power grid, causing widespread blackouts, essentially cutting off vital HVAC services for Pennsylvanians. This kind of event could create a public health hazard for the elderly and children and would result in heat cramps, sunstroke, heat exhaustion, and death.

4.3.4.3. Past Occurrence

The highest temperature ever recorded was 111°F in Phoenixville, Chester County on July 9 and July 10, 1936, while the lowest temperature ever recorded was -42°F in Smethport, McKean County, on January 5, 1904 (NCDC, 2003). As of the 2013 version of the SSAHMP, these records still hold.

Data from the National Climatic Data Center reports that there have been 315 extreme temperature events in Pennsylvania between 1950 and 2013, resulting in a total of 586 deaths and 531 injuries. Seventy-one of these events have been a result of extreme cold, resulting in 27 deaths and 130 injuries. The database reports an event in January 1994 which resulted in 129 injuries and five million dollars in property damage. There have been 205 extreme heat events, resulting in 560 deaths and 401 injuries. The database reports six events in July 1995 resulting in 134 deaths. Past events typically affected multiple counties or the entire state (NCDC, 2013).

Pennsylvania was also the impetus for national action on extreme heat hazards. PEMA teamed with NOAA and the National Weather Service to develop the excessive heat descriptions and action thresholds that are now used nationwide.

4.3.4.4. Future Occurrence

The following six maps display the probability of extreme maximum and minimum temperatures for the commonwealth using data from thirty recording stations. Figure 4.3.4-4, Figure 4.3.4-5, and Figure 4.3.4-6 show the number of annual occurrences where temperatures exceed 90°F, 95°F and 100°F, respectively. Figure 4.3.4-7, Figure 4.3.4-8, and Figure 4.3.4-9 show the number of annual occurrences where temperatures fall below 0°F, -10°F and -20°F, respectively.

Data used to construct these maps was collected from the Pennsylvania State Climatologist Office. Every station had at least thirty years of data recorded with the majority having over eighty years. Determining the number of total extreme events over the entire period of record and then dividing that number by the total number of years calculated these values. It is important to note that frequency estimates may not be an accurate representation of future conditions due to the unknown impacts of climate change. Significant, broad evidence supports human influence to a long-term trend of global warming. It has been difficult to predict how much, how fast, or how long the warming will occur, due to the large number of variables involved. According to the Pennsylvania Climate Impacts Assessment Report (2009), annual and seasonal average temperatures are expected to increase; with one scenario predicting almost a 7 °F increase in annual average temperature by the end of the 21st century. Some areas of the world may experience greater temperature changes than others. Predictions for smaller areas and shorter time periods become more uncertain. However, Pennsylvania is preparing for the worst scenario. Even with such uncertainty, it is *highly likely* that extreme temperatures will occur in the future.

It is important to note that frequency estimates may not be an accurate representation of future conditions due to the unknown impacts of climate change. Significant, broad evidence supports human influence to a long-term trend of global warming. It has been difficult to predict how much, how fast, or how long the warming will occur, due to the large number of variables involved. According to the Pennsylvania Climate Impacts Assessment Report (2009), annual and seasonal average temperatures are expected to increase; with one scenario predicting almost a 7 °F increase in annual average temperature by the end of the 21st century. Some areas of the world may experience greater temperature changes than others. Predictions for smaller areas and shorter time periods become more uncertain. Even with such uncertainty, it is *highly likely* that extreme temperatures will occur in the future.

Figure 4.3.4-4 Map of yearly occurrences of temperature greater than 90°F in Pennsylvania (Pennsylvania State Climatologist). Note that this map was created using the frequency of occurrence of extreme values per year as data points.

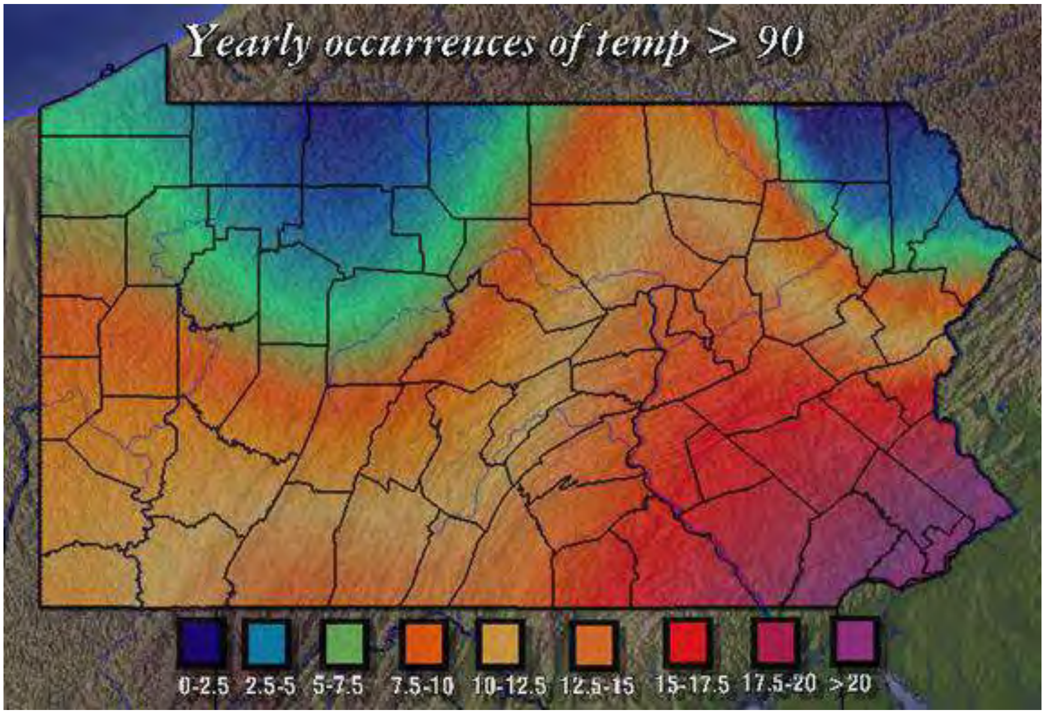


Figure 4.3.4-5 Map of yearly occurrences of temperature greater than 95°F in Pennsylvania (Pennsylvania State Climatologist). Note that this map was created using the frequency of occurrence of extreme values per year as data points.

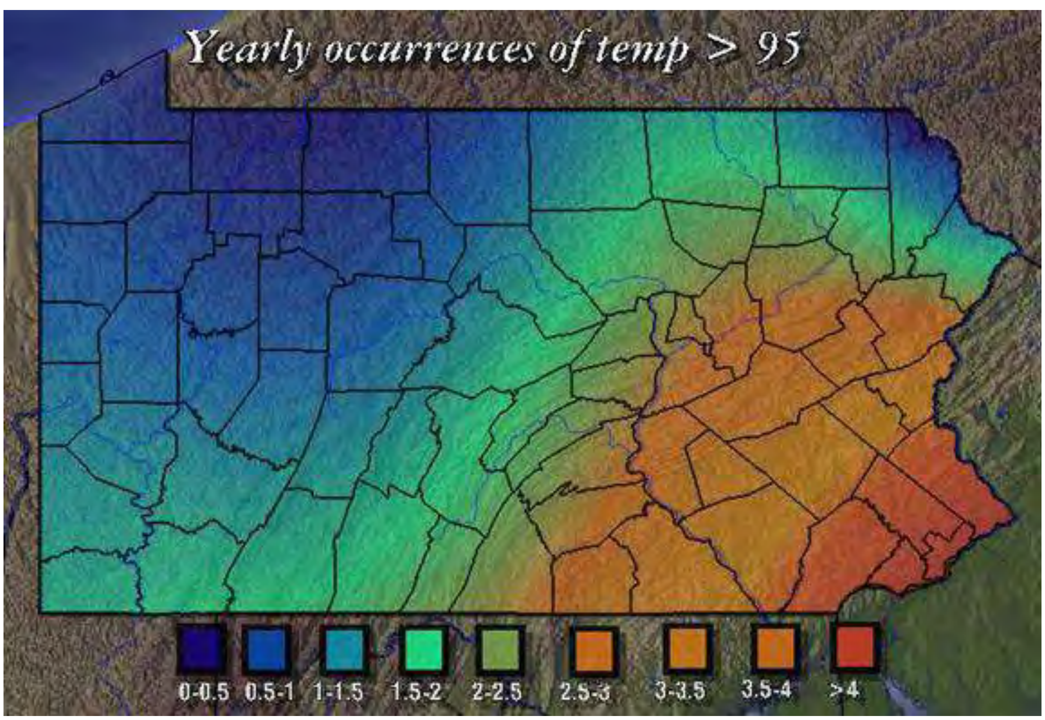


Figure 4.3.4-6 Map of yearly occurrences of temperature greater than 100°F in Pennsylvania (Pennsylvania State Climatologist). Note that this map was created using the period of years between each occurrence of the extreme.

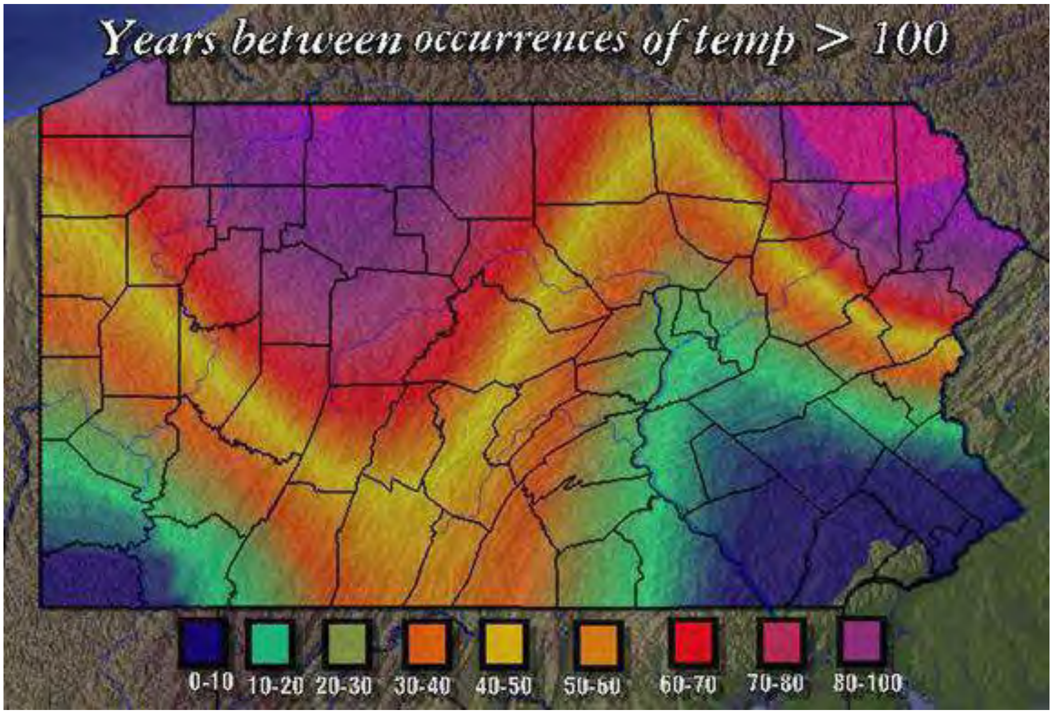


Figure 4.3.4-7 Map of yearly occurrences of temperature below 0°F in Pennsylvania (Pennsylvania State Climatologist). Note that this map was created using the frequency of occurrence of extreme values per year as data points.

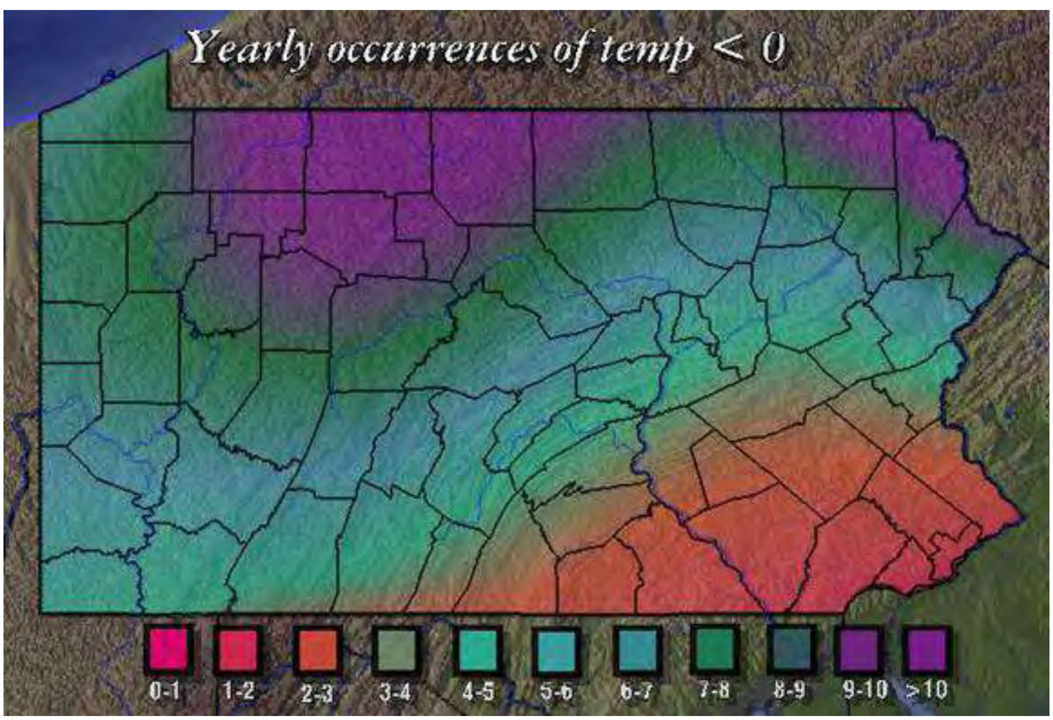


Figure 4.3.4-8 Map of yearly occurrences of temperature below -10°F in Pennsylvania (Pennsylvania State Climatologist). Note that this map was created using the period of years between each occurrence of the extreme.

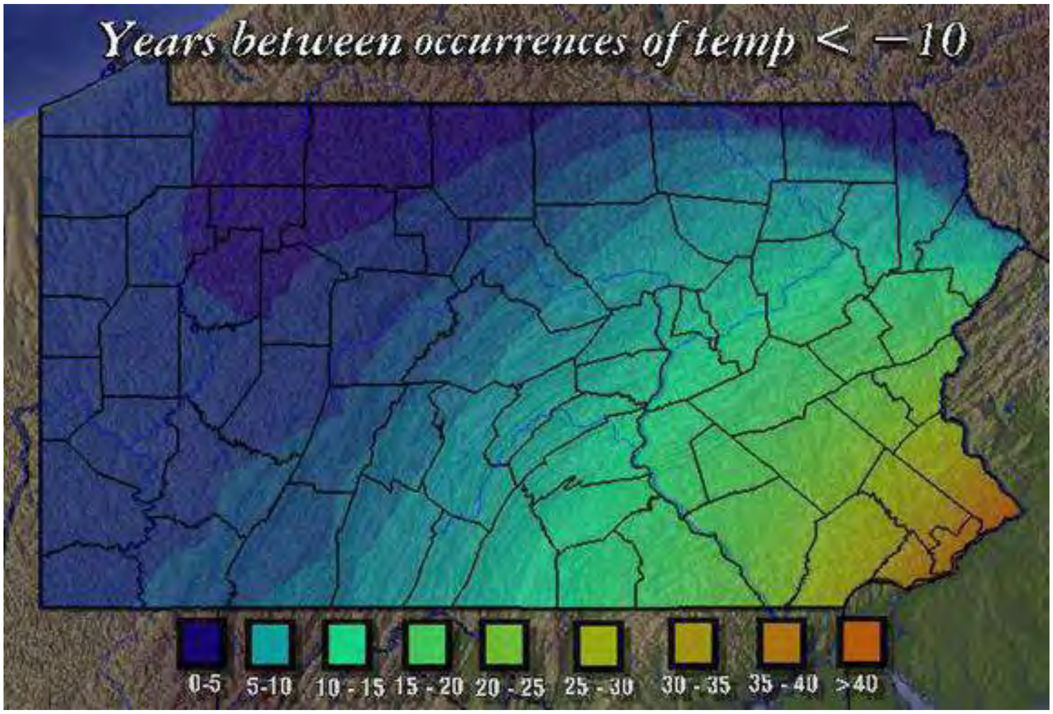
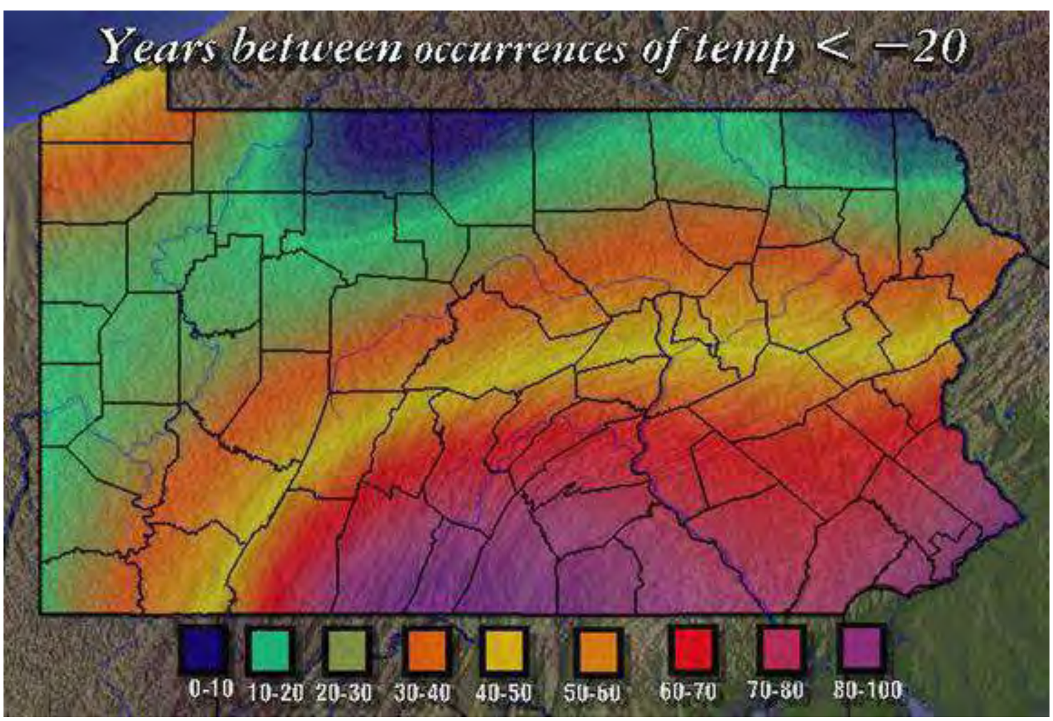


Figure 4.3.4-9 Map of yearly occurrences of temperature below -20°F in Pennsylvania (Pennsylvania State Climatologist). Note that this map was created using the period of years between each occurrence of the extreme.



4.3.4.5. Environmental Impacts

Temporary periods of extreme hot or cold temperatures typically do not have significant environmental impacts but have serious health impacts, especially in urban areas experiencing the heat island effect. However, prolonged periods of hot temperatures may be associated with drought conditions and can damage or destroy vegetation, dry up rivers and streams, and reduce water quality. Prolonged exposure to extremely cold temperatures can kill wildlife and vegetation.

Extreme temperature events are also known to have an impact on utilities. In times of extreme heat, increased use of air conditioners can cause overload existing utility grids and spur localized or regionalized brownouts. Extreme cold events, especially when coupled with severe winter weather, can cause utility pipes to burst and interrupt the distribution of utilities. Prolonged extreme temperature events can also spur fuel shortages. The impact of extreme temperatures on utilities will depend on the overall use and duration of the event.

4.3.4.6. Jurisdictional Vulnerability Assessment

As stated in Section 4.2.2, jurisdictional and state critical facility vulnerability assessments were completed by spatially overlaying hazards with census tracts and state critical facility layers in GIS. When spatial analysis determined that the hazard would impact a census tracts within a county or the location of state critical facilities these locations where deemed vulnerable to the hazard. Loss estimates were prepared based on the value of the facilities impacted by census tract and by state critical facility. Each hazard uses a methodology that is specific to the type of risk it may cause; Table 4.2.2-2 includes a complete methodology description for vulnerability assessments and loss estimates for each hazard.

The vulnerability of jurisdictions to extreme temperature differs based on the type of temperature being examined. Extreme heat and extreme cold are the two temperature types being studied. As a whole, 11 of Pennsylvania's 67 counties have identified extreme temperature as a concern in their most recent plan or plan update, as seen in Table 4.3.4-1. As stated in Section 4.1, the decision by a county to profile a hazard is one indicator of the presence of risk from that hazard. This indicator should be viewed complementary to other analysis in this section. Together this analysis from reputable sources addresses different aspects of risk for a full risk profile.

Of the counties which currently have calculated risk factor values for extreme temperature, the average value is 2.1. The State Risk Factor for extreme temperature is 2.3, while the Pennsylvania THIRA scored extreme temperature as a 6 out of 10. For more details on the State Risk Factor and THIRA rankings, please see Section 4.1.

Table 4.3.4-1 Counties profiling extreme temperature hazards with hazard ranking and risk factor (if available).

COUNTY	PROFILED HAZARD	DID NOT PROFILE HAZARD	RANKING (IF AVAILABLE)	RISK FACTOR (IF AVAILABLE)
Adams		X	Not Ranked	No RF
Allegheny		X	Not Ranked	No RF
Armstrong		X	Not Ranked	No RF
Beaver		X	Not Ranked	No RF
Bedford	X		Medium	2.3
Berks		X	Not Ranked	No RF
Blair		X	Not Ranked	No RF
Bradford		X	Not Ranked	No RF
Bucks	X		Medium	2.2
Butler		X	Not Ranked	No RF
Cambria	X		Medium	2.6
Cameron		X	Not Ranked	No RF
Carbon		X	Not Ranked	No RF
Centre	X		Low	1.4
Chester		X	Not Ranked	No RF
Clarion		X	Not Ranked	No RF
Clearfield		X	Not Ranked	No RF
Clinton		X	Not Ranked	No RF
Columbia		X	Not Ranked	No RF
Crawford		X	Not Ranked	No RF
Cumberland		X	Not Ranked	No RF
Dauphin		X	Not Ranked	No RF
Delaware	X		Medium	2.4
Elk		X	Not Ranked	No RF
Erie		X	Not Ranked	No RF
Fayette	X		Medium	2.4
Forest		X	Not Ranked	No RF
Franklin		X	Not Ranked	No RF
Fulton		X	Not Ranked	No RF
Greene		X	Not Ranked	No RF
Huntingdon		X	Not Ranked	No RF
Indiana		X	Not Ranked	No RF
Jefferson		X	Not Ranked	No RF

Table 4.3.4-1 Counties profiling extreme temperature hazards with hazard ranking and risk factor (if available).

COUNTY	PROFILED HAZARD	DID NOT PROFILE HAZARD	RANKING (IF AVAILABLE)	RISK FACTOR (IF AVAILABLE)
Juniata		X	Not Ranked	No RF
Lackawanna		X	Not Ranked	No RF
Lancaster		X	Not Ranked	No RF
Lawrence	X		Low	1.8
Lebanon*		X	Not Ranked	No RF
Lehigh	X		Medium	2.3
Luzerne		X	Not Ranked	No RF
Lycoming		X	Not Ranked	No RF
McKean		X	Not Ranked	No RF
Mercer		X	Not Ranked	No RF
Mifflin		X	Not Ranked	No RF
Monroe		X	Not Ranked	No RF
Montgomery	X		High	3.0
Montour*		X	Not Ranked	No RF
Northampton	X		Medium	2.3
Northumberland		X	Not Ranked	No RF
Perry*		X	Not Ranked	No RF
Philadelphia**	X		High	A
Pike		X	Not Ranked	No RF
Potter		X	Not Ranked	No RF
Schuylkill		X	Not Ranked	No RF
Snyder		X	Not Ranked	No RF
Somerset		X	Not Ranked	No RF
Sullivan		X	Not Ranked	No RF
Susquehanna		X	Not Ranked	No RF
Tioga		X	Not Ranked	No RF
Union		X	Not Ranked	No RF
Venango		X	Not Ranked	No RF
Warren		X	Not Ranked	No RF
Washington		X	Not Ranked	No RF
Wayne		X	Not Ranked	No RF
Westmoreland		X	Not Ranked	No RF
Wyoming		X	Not Ranked	No RF
York	X		Medium	2.4

Table 4.3.4-1 Counties profiling extreme temperature hazards with hazard ranking and risk factor (if available).				
COUNTY	PROFILED HAZARD	DID NOT PROFILE HAZARD	RANKING (IF AVAILABLE)	RISK FACTOR (IF AVAILABLE)
* Lebanon, Montour, and Perry use an alternate weighted ranking where Risk Factor = Frequency x [(0.25 x Critical facilities) + (0.40 x Social) + (0.25 x Economic) + (0.10 x Environmental)]. While this risk factor was used to comparatively rank hazards, the number does not correspond to a high-medium-low rating. **Philadelphia uses an A, B, C rating system where A is high, B is medium, and C is low.				

Extreme temperatures do not generally impact buildings; instead, they primarily impact people. In particular, the very old and the very young are vulnerable to temperature extremes. The total number of children and elderly residents in each county can be found in Table 2.3-2. Some hazards, including extreme heat and extreme cold, do not lend themselves to quantifying vulnerable structures and loss estimates. However, an effort was made to identify the locations, structures, and critical facilities that fall in areas expected to experience the highest and lowest temperatures statewide. Future SSAHMPs will work to better define vulnerability and losses for hazards expected to mainly impact health and social welfare.

Extreme Heat

This SSAHMP defines vulnerability for extreme heat as areas having a maximum average temperature over 64 degrees, according to the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) study.

Even though brick-and-mortar structures are not usually impacted by extreme temperatures, facilities need to be maintained to ensure that they operate in appropriate conditions for people. The vulnerable counties are home to 979 state critical facilities in total. Bucks, Delaware, and Philadelphia Counties have the most critical facilities located within extreme heat zones. Table 4.3.4-2 lists the number of critical facilities in each county vulnerable to extreme heat.

Table 4.3.4-2 Number of State Critical Facilities impacted by Extreme Heat in each county

COUNTY	NUMBER OF CRITICAL FACILITIES	COUNTY	NUMBER OF CRITICAL FACILITIES
Bucks	47	Lancaster	1
Chester	5	Montgomery	36
Delaware	109	Philadelphia	110
Fulton	2	York	1

Outside of GIS analysis, the EPA recognizes the urban heat island effect as a contributing factor to extreme heat events. This phenomenon is when areas that have significant amounts of dark or black surfaces, like blacktop and tar roofs, have cumulatively higher temperatures than surrounding communities with open and green space. Philadelphia is recognized as having a heat island and has worked with the EPA on mitigation programs for the heat island such as implementing white/reflective roofs and establishing cooling stations citywide during extreme heat events.

Extreme Cold

Vulnerability for extreme cold was classified as areas having a minimum average yearly temperature less than 32 degrees, according to the USDA NRCS. Even though brick-and-mortar structures are not usually impacted by extreme cold, facilities need to be maintained to ensure that they operate in appropriate conditions for people. Nonetheless, facilities need to be maintained to ensure that they operate in appropriate conditions for people.

The vulnerable counties are home to 961 state critical facilities in total. McKean and Tioga Counties followed closely by Wayne County have the most critical facilities located within extreme cold zones. Table 4.3.4-3 illustrates the number of critical facilities in each county vulnerable to extreme cold.

Table 4.3.4-3 Number of State Critical Facilities impacted by Extreme Cold in each county

COUNTY	NUMBER OF CRITICAL FACILITIES	COUNTY	NUMBER OF CRITICAL FACILITIES
Bradford	29	Pike	12
Cameron	5	Potter	19
Clearfield	21	Somerset	36
Clinton	4	Sullivan	4
Crawford	4	Susquehanna	25
Elk	21	Tioga	50
Forest	1	Union	1
Jefferson	7	Warren	18
Lackawanna	18	Wayne	42
McKean	50	Wyoming	1

4.3.4.7. State Facility Vulnerability Assessment

Extreme Heat

The vulnerability of state critical facilities was evaluated as facilities that are located within zones that experience an average maximum temperature above 64 degrees. Using this criterion, a total of 311 vulnerable critical facilities have been identified. Due to the large number of schools, fire departments, and police stations in the Commonwealth, it is unsurprising that those categories of facilities have the highest totals. 0 shows the vulnerability of state critical facilities by facility type.

Table 4.3.4-4 State Critical Facilities vulnerable to Extreme Heat by Critical Facility Type	
STATE CRITICAL FACILITY TYPE	**NUMBER OF IMPACTED FACILITIES**
Agriculture	5
Banking	10
Chemical	2
Commercial Facilities	15
Defense Industrial Base	7
Education	12
Emergency Services	2
Energy	7
Fire Departments (Non-HSIP)	114
Government Facilities	6
Healthcare & Public Health	12
Hospital (Non-HSIP)	31
National Monuments & Icons	3
Nuclear Reactors, Materials & Waste	1
Police (Non-HSIP)	60
Postal & Shipping	2
School (Non-HSIP)	2
Transportation	13
Water	7
TOTAL VULNERABLE CRITICAL FACILITIES	***311***

Extreme Cold

The vulnerability of state critical facilities was evaluated as facilities that are located within zones that experience a minimum average temperature of 32 degrees or below. Using this criterion, a total of 368 vulnerable critical facilities have been identified. Due to the large number of schools, fire departments, and police stations in the Commonwealth, it is unsurprising that those categories of facility have the highest number of critical facilities. 0 shows the vulnerability of state critical facilities by facility type.

Table 4.3.4-5 State Critical Facilities vulnerable to Extreme Cold by Critical Facility Type	
STATE CRITICAL FACILITY TYPE	**NUMBER OF IMPACTED FACILITIES**
Agriculture	1
Chemical	2
Education	2
Emergency Services	9
Energy	1
Fire Departments (Non-HSIP)	148
Healthcare & Public Health	3
Hospital (Non-HSIP)	11
Police (Non-HSIP)	69
School (Non-HSIP)	121
Water	1
TOTAL VULNERABLE CRITICAL FACILITIES	***368***

4.3.4.8. Jurisdictional Loss Estimation

Extreme Heat

As stated in Section 4.3.4.3, during the years 1950-2013, the NCDC reported 205 extreme heat events in Pennsylvania resulting in 560 deaths and 401 injuries. It is evident from past events that extreme heat is dangerous and can cause human related illnesses and death. As temperature goes up so do the number of people hospitalized for heat related illnesses. Therefore it is important to understand how many people are exposed to such conditions, and how many buildings exist, where potential problems could arise should power be lost. Additionally, extreme heat can cause damage to buildings or contents by overheating HVAC or air conditioning systems, contributing to jurisdictional losses. It is unlikely that an entire building would be impacted in an extreme heat event, though. Table 4.3.4-6 shows potential jurisdictional losses in extreme heat areas. Jurisdictional loss estimates were identified at the tract level and aggregated at the county level to show the possible losses per county. The County most prone to extreme heat is Philadelphia, with the highest populations, buildings and building costs.

Table 4.3.4-6 Estimated jurisdictional losses in Extreme Heat areas			
COUNTY	**2010 POPULATION**	**NUMBER OF IMPACTED BUILDINGS**	**DOLLAR VALUE OF EXPOSURE, BUILDING AND CONTENTS (THOUSANDS $)**
Bucks	625,249	125,454	$38,047,828
Chester	498,886	7,661	$2,319,320
Delaware	558,979	192,058	$53,731,947
Franklin	149,618	3,340	$747,545

Table 4.3.4-6 Estimated jurisdictional losses in Extreme Heat areas

COUNTY	2010 POPULATION	NUMBER OF IMPACTED BUILDINGS	DOLLAR VALUE OF EXPOSURE, BUILDING AND CONTENTS (THOUSANDS $)
Lancaster	519,445	9,079	$2,093,378
Montgomery	799,874	79,623	$24,645,189
Philadelphia	1,526,006	660,022	$170,669,801
York	434,972	2,202	$530,450
TOTAL	***5,113,029***	***1,079,439***	***$292,785,458***

Extreme Cold

As stated in Section 4.3.4.3, during the years 1950-2013, the NCDC reported 71 extreme cold events in Pennsylvania resulting in 27 deaths and 130 injuries. It's evident from this that extreme cold is dangerous and can cause death. Therefore it's important to understand how many people are exposed to such conditions, and how many buildings exist, where potential problems could arise should power be lost. Additionally, extreme cold can cause damage to structures; for example, burst pipes will damage buildings and will necessitate repairs. It is unlikely that an entire building would be impacted in an extreme cold event. Jurisdictional loss estimates were identified at the tract level and aggregated at the county level to show the possible losses per county. Table 4.3.4-7 shows potential jurisdictional losses in extreme cold areas Counties most prone to extreme cold are Wayne and McKean, having high populations, buildings and costs associated to building exposure.

Table 4.3.4-7 Estimated jurisdictional losses in Extreme Cold Temperature areas

COUNTY	2010 POPULATION	NUMBER OF IMPACTED BUILDINGS	DOLLAR VALUE OF EXPOSURE, BUILDING AND CONTENTS (THOUSANDS $)
Blair	127,089	1,310	$235,733
Bradford	62,622	22,977	$3,840,010
Cambria	143,679	3,145	$574,514
Cameron	5,085	35,465	$6,320,734
Carbon	65,249	7,426	$1,724,325
Centre	153,990	7,460	$1,358,270
Clarion	39,988	8,996	$1,433,676
Clearfield	81,642	15,890	$2,890,864
Clinton	39,238	35,380	$6,140,434
Crawford	88,765	1,323	$315,038
Elk	31,946	35,039	$6,929,319
Forest	7,716	14,549	$2,572,780
Jefferson	45,200	3,950	$752,487

Table 4.3.4-7 Estimated jurisdictional losses in Extreme Cold Temperature areas

COUNTY	2010 POPULATION	NUMBER OF IMPACTED BUILDINGS	DOLLAR VALUE OF EXPOSURE, BUILDING AND CONTENTS (THOUSANDS $)
Juniata	24,636	1,659	$325,872
Lackawanna	214,437	25,781	$5,219,143
Luzerne	320,918	20,215	$4,462,777
Lycoming	116,111	19,227	$3,283,274
McKean	43,450	42,505	$8,092,723
Monroe	169,842	17,742	$4,063,891
Pike	57,369	23,443	$5,073,245
Potter	17,457	44,250	$7,662,393
Snyder	39,702	2,388	$458,096
Somerset	77,742	16,435	$3,439,765
Sullivan	6,428	3,099	$569,719
Susquehanna	43,356	21,996	$4,146,447
Tioga	41,981	36,021	$6,383,217
Union	44,947	9,483	$1,807,132
Warren	41,815	34,588	$6,517,426
Wayne	52,822	75,638	$15,998,764
TOTAL	***2,205,222***	***587,380***	**$112,592,068**

4.3.4.9. State Facility Loss Estimation

The estimated replacement cost of all state critical facilities located in extreme heat hazard zones is approximately $2,267,745,935. The estimated replacement cost of all state critical facilities located in extreme cold hazard zones is approximately $2,267,740,062.

4.3.5. Flood, Flash Flood, Ice Jam

4.3.5.1. Location and Extent

Flooding in Pennsylvania is usually associated with abnormally high and intense rainfall amounts. However, flooding can also be caused by sudden snowmelt, landslides (see Section 4.3.9), dam failures, lock failures, or levee failures. Heavy rainfall events have the potential to produce localized or widespread flooding. Events such as a 1-inch cloudburst lasting thirty minutes may affect only a small watershed and be considered insignificant regionally. Large events, such as a broad-scale tropical storm lasting more than twenty-four hours, may affect drainage basins several thousand square miles in size. In either case, flood sources in Pennsylvania include rivers, creeks, streams, and lakes. Riverine, as opposed to coastal, flood mechanisms cause most flooding in the Commonwealth. However, portions of southeastern Pennsylvania along the Delaware River are subject to tidal or storm surge flooding. This section focuses on riverine and storm-based flooding, but floods of record caused by hurricanes and dam failures are also mentioned and cross referenced to the appropriate hazard profile. Also, the role of dams and levees as flood protection methods is mentioned in this section. Please