SECTION 4. RISK ASSESSMENT

4.3 Hazards of Concern

This section provides a hazard profile and vulnerability assessment of the extreme temperature hazard in Camden County.

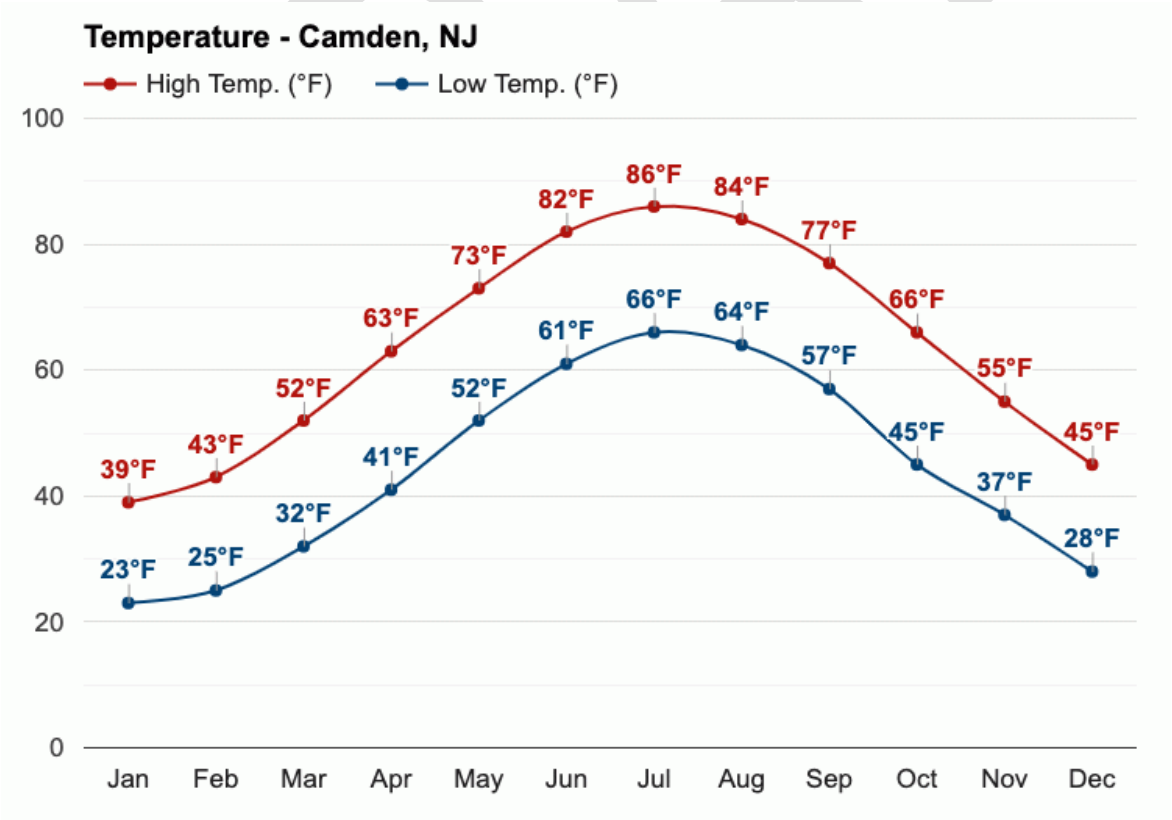
2022 HMP Changes

- All subsections have been updated using best available data.
- Previous occurrences are updated with events that occurred between 2015 and 2020.
- 5-year 2019 population estimates from ACS were used to assess population risk.

4.3.6 Extreme Temperatures

Extreme temperature includes both heat and cold events that can have significant direct impacts to human health and commercial/agricultural businesses and primary and secondary effects on infrastructure (e.g., burst pipes and power failure). Distinguishing characteristics of "extreme cold" or "extreme heat" vary by location, based on the conditions to which the population is accustomed. Figure 4.3.6-1 below shoes the average high and low temperatures for each month in Camden.

Figure 4.3.6-1. Average Temperature in Camden City, New Jersey



Source: Weather Atlas 2021

Extreme Cold

Extreme cold events are when temperatures drop well below normal in an area. In regions relatively unaccustomed to winter weather, near freezing temperatures are considered "extreme cold." Extreme cold temperatures are generally characterized in temperate zones by the ambient air temperature dropping to approximately 0ºF or below (Centers of Disease Control and Prevention [CDC] 2020a). Extremely cold temperatures often accompany a winter storm, which can cause power failures and icy roads. Although staying indoors as much as possible can help reduce the risk of car crashes and falls on the ice, individuals may also face indoor hazards. Many homes will be too cold—either due to a power failure or because the heating system is not adequate for the weather. The use of space heaters and fireplaces to keep warm increases the risk of household fires and carbon monoxide poisoning (CDC 2020a).

Extreme Heat

Extreme heat is defined as temperatures which hover 10 degrees or more above the average high temperature for a region and that last for several weeks (Centers for Disease Control and Prevention [CDC] 2020b). A heat wave is defined as a period of abnormally and uncomfortably hot and unusually humid weather. Typically, a heat wave lasts two or more days. (National Weather Service [NWS] 2009). There is no universal definition of a heat wave because the term is relative to the usual weather in a particular area. The term heat wave is applied both to routine weather variations and to extraordinary spells of heat which may occur only once a century (Meehl and Tebaldi 2004).

Urbanized areas and urbanization create an exacerbated type of risk during an extreme heat event, compared to rural and suburban areas. As defined by the U.S. Census, urban areas are classified as all territory, population, and housing units located within urbanized areas and urban clusters. The term urbanized area denotes an urban area of 50,000 or more people. Urban areas under 50,000 people are called urban clusters. The U.S. Census delineates urbanized area and urban cluster boundaries to encompass densely settled territory, which generally consists of:

- A cluster of one or more block groups or census blocks each of which has a population density of at least 1,000 people per square mile at the time.
- Surrounding block groups and census blocks each of which has a population density of at least 500 people per square mile at the time.
- Less densely settled blocks that form enclaves or indentations or are used to connect discontinuous areas with qualifying densities (U.S. Census 2010).

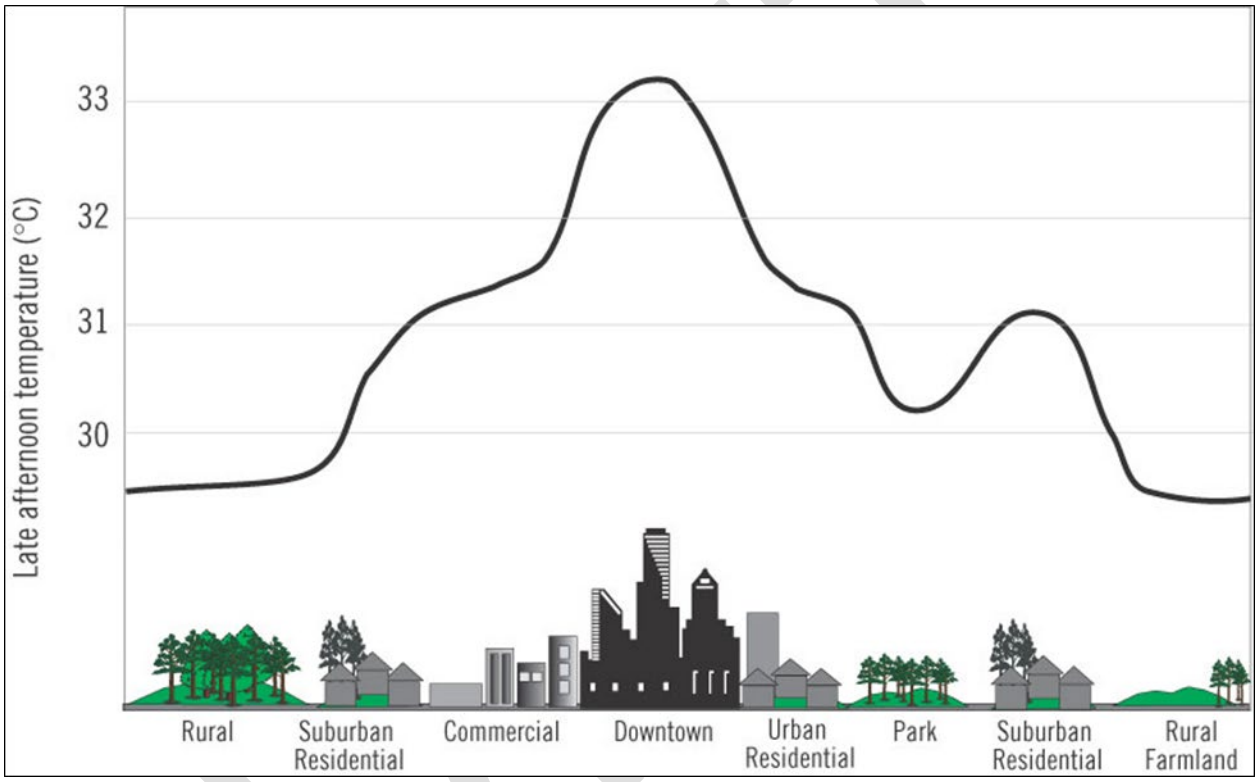
As these urban areas develop and change, so does the landscape. Buildings, roads, and other infrastructure replace open land and vegetation. Surfaces that were once permeable and moist are now impermeable and dry. These changes cause urban areas to become warmer than the surrounding areas. This forms an 'island' of higher temperatures (U.S. Environmental Protection Agency [EPA] 2009).

The term 'heat island' describes built up areas that are hotter than nearby rural areas. The annual mean air temperature of a city with more than one million people can be between 1.8 ºF and 5.4ºF warmer than

its surrounding areas. In the evening, the difference in air temperatures can be as high as 22ºF. Heat islands occur on the surface and in the atmosphere. On a hot, sunny day, the sun can heat dry, exposed urban surfaces to temperatures 50ºF to 90ºF hotter than the air. Heat islands can affect communities by increasing peak energy demand during the summer, air conditioning costs, air pollution and greenhouse gas emissions, heat-related illness and death, and water quality degradation (EPA 2010 and 2011).

Figure 4.3.6-2 below illustrates an urban heat island profile. The graphic demonstrates that heat islands are typically most intense over dense urban areas. Further, vegetation and parks within a downtown area may help reduce heat islands (U.S. EPA 2019).

Figure 4.3.6-2. Urban Heat Island Profile



Source: EPA 2019
ºC degrees Celsius

4.3.6.1 Location and Extent

According to the ONJSC, New Jersey has five distinct climate regions. Elevations, latitude, distance from the Atlantic Ocean, and landscape (e.g., urban, sandy soil) produce distinct variations in the daily weather between each of the regions. The five regions include: Northern, Central, Pine Barrens, Southwest, and Coastal (ONJSC Rutgers University n.d.). Figure 4.3.6-3 depicts these regions. Camden County is located within both the Southwest Climate Zone and Pine Barrens Climate Zone.

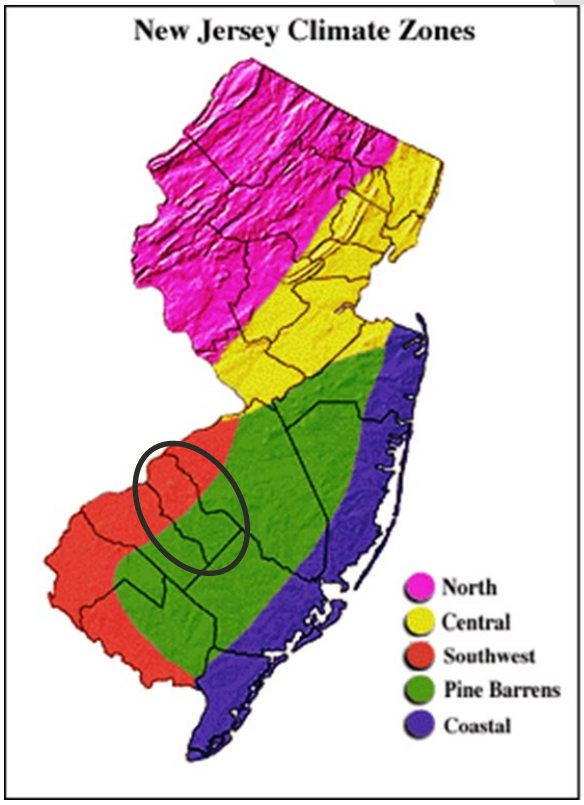
The Southwest Climate Zone lies between sea level and approximately 100 feet above sea level. The proximity to the Delaware Bay adds a maritime influence to the climate of this region. The Southwest

Zone has the highest average daily temperatures in the state and due to a lack of sandy soils, has higher nighttime minimum temperatures than in the neighboring Pine Barrens Zone (ONJSC Rutgers University n.d.).

The Southwest Zone receives less precipitation than other regions as there are no orographic features and it is further away from the Great Lakes-St. Lawrence storm track. The region is also far enough inland to be away from heavier rains from some coastal storms. Prevailing winds in this region from the southwest, expect in winter months when west to northwest winds dominate. High humidity and moderate temperatures prevail when winds flow from the south or east. The moderating effect of the water allows for a longer growing season, with autumn frosts occurring about four weeks later here than in the northern region. The Southwest Climate Zone has the longest growing season in New Jersey.

The Pine Barrens Climate Zone is characterized by scrub pine and oak forests. Sandy soils in this region are porous and not very fertile and have a major effect on the climate of the region, resulting in surprisingly low temperatures. The soil permits any precipitation to rapidly infiltrate and leave surfaces quite dry. The dry conditions allow for a wider range between daily minimum and maximum temperatures, making the area vulnerable to forest fires.

Figure 4.3.6-3. New Jersey Climate Zones



Source: *ONJSC Rutgers University, Date Unknown*
Note: *The black oval indicates the location of Camden County. The County is located in the Southwest and Pine Barrens Climate Zones.*

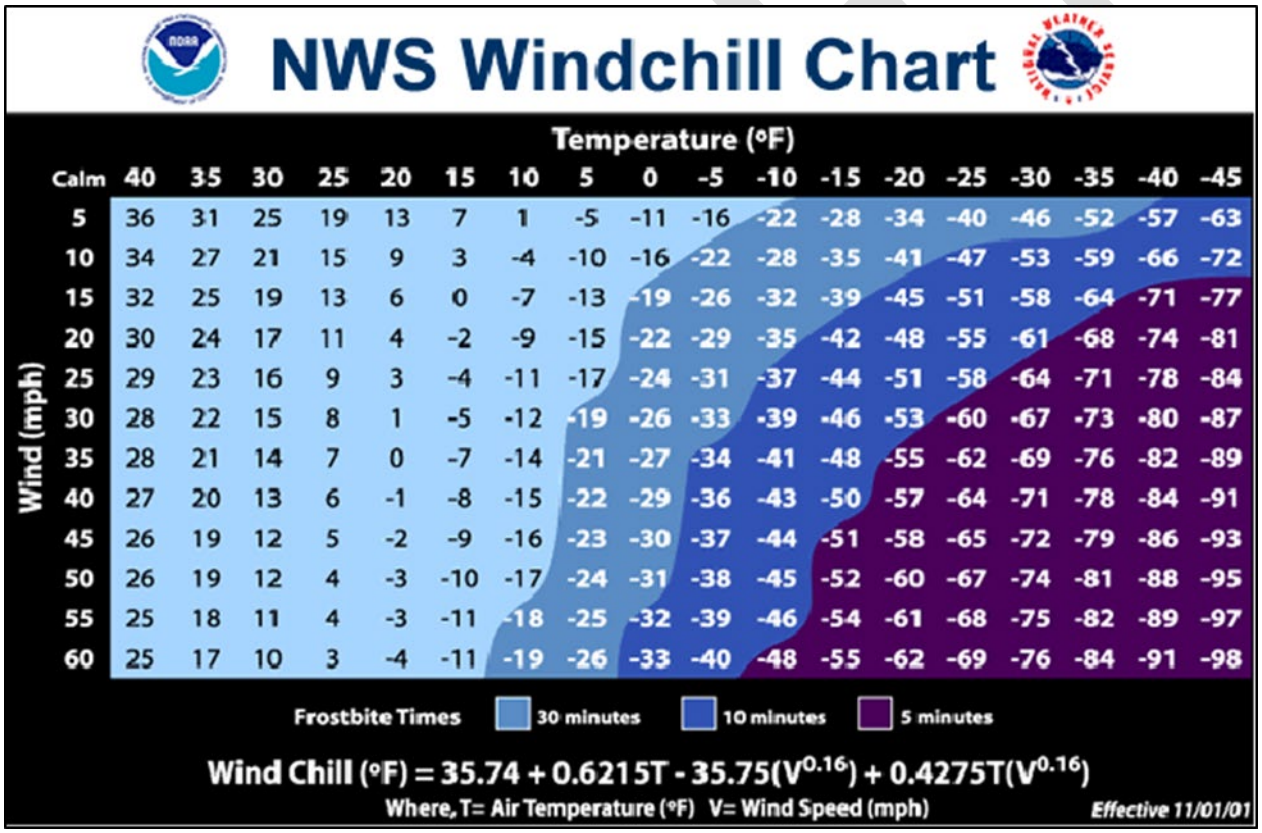
4.3.6.2 Range of Magnitude

Extreme Cold

The extent (severity or magnitude) of extreme cold temperatures is generally measured through the Wind Chill Temperature (WCT) Index. Wind Chill Temperature is the temperature that people and animals feel when outside and it is based on the rate of heat loss from exposed skin by the effects of wind and cold. As the wind increases, the body is cooled at a faster rate causing the skin's temperature to drop (NWS n.d.).

On November 1, 2001, the NWS implemented a new WCT Index. It was designed to more accurately calculate how cold air feels on human skin. The table below shows the new WCT Index. The WCT Index includes a frostbite indicator, showing points where temperature, wind speed, and exposure time will produce frostbite to humans. Figure 4.3.6-4 shows three shaded areas of frostbite danger. Each shaded area shows how long a person can be exposed before frostbite develops (NWS Date Unknown).

Figure 4.3.6-4. NWS Wind Chill Index



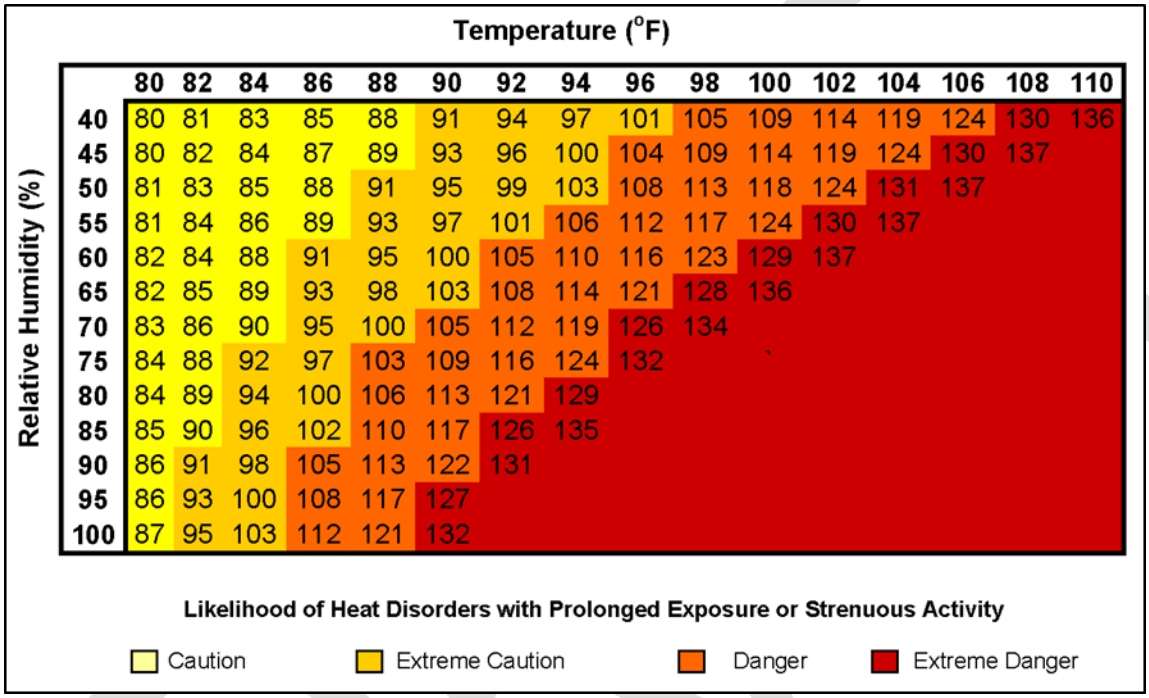
Source: *NWS 2009*
°F *degrees Fahrenheit*
mph *miles per hour*

Extreme Heat

NOAA's heat alert procedures are based mainly on Heat Index values. The Heat Index is given in degrees Fahrenheit. The Heat Index is a measure of how hot it really feels when relative humidity is factored in

with the actual air temperature. To find the Heat Index temperature, the temperature and relative humidity need to be known. Once both values are known, the Heat Index will be the corresponding number with both values (Figure 4.3.6-5). The Heat Index indicates the temperature the body feels. Adverse effects of prolonged exposure to heat are displayed in Figure 4.3.6-6. It is important to know that the Heat Index values are devised for shady, light wind conditions. Exposure to full sunshine can increase heat index values by up to 15°F. Strong winds, particularly with very hot dry air, can also be extremely hazardous (NWS 2013).

Figure 4.3.6-5. NWS Heat Index



Source: *NWS 2013*
°F *degrees Fahrenheit*
% *percent*

Figure 4.3.6-6. Adverse Effects of Prolonged Exposures to Heat on Individuals

Category	Heat Index	Health Hazards
Extreme Danger	130 °F – Higher	Heat Stroke / Sunstroke is likely with continued exposure.
Danger	105 °F – 129 °F	Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure and/or physical activity.
Extreme Caution	90 °F – 105 °F	Sunstroke, muscle cramps, and/or heat exhaustions possible with prolonged exposure and/or physical activity.
Caution	80 °F – 90 °F	Fatigue possible with prolonged exposure and/or physical activity.

Source: *NWS 2009*
°F *degrees Fahrenheit*

Warning Time

Meteorologists can accurately forecast extreme temperature event development and the severity of the associated conditions with several days lead time. These forecasts provide an opportunity for public health and other officials to notify vulnerable populations. For heat events, the NWS issues excessive heat outlooks when the potential exists for an excessive heat event in the next three to seven days. Watches are issued when conditions are favorable for an excessive heat event in the next 24 to 72 hours. Excessive heat warning/advisories are issued when an excessive heat event is expected in the next 36 hours (NWS 2013). Winter temperatures may fall to extreme cold readings with no wind occurring. Currently, the only way to headline very cold temperatures is with the use of the NWS-designated Wind Chill Advisory or Warning products. When actual temperatures reach Wind Chill Warning criteria with little to no wind, extreme cold warnings may be issued (NOAA 2013).

4.3.6.3 Past Occurrences

New Jersey has been experiencing an increase in extreme temperatures across the State. The number of very hot days has been above average since the early 2000's. However, declines in the number of extreme cold days have occurred since the early 1990's (NOAA NCEI 2020).

FEMA Major Disasters and Emergency Declarations

Between 1954 and 2020, neither Camden County nor the State of New Jersey were included in any major disaster (DR) or emergency (EM) declarations due to extreme temperatures. However, during the same time period, the Federal Emergency Management Agency (FEMA) included Camden County in six winter storm-related DR or EM declarations classified as one or a combination of the following disaster types that may have had associated extreme cold temperatures: severe winter storm, snowstorm, snow, ice storm, winter storm, and blizzard (Table 4.3.6-1).

Table 4.3.6-1. Winter Weather Related Disaster (DR) and Emergency (EM) Declarations, 1954 to 2020

Declaration	Event Date	Declaration Date	Event Description
DR-528	February 8, 1977	February 8, 1977	Ice Conditions
EM-3106	March 13 – 17, 1993	March 17, 1993	Severe Blizzard
DR-1088	January 7 – 12, 1996	January 13, 1996	Blizzard of 1996
DR-1873	December 19 – 20, 2009	February 5, 2010	Snowstorm
DR-1889	February 5 – 6, 2010	March 23, 2010	Severe Winter Storm and Snowstorm
DR-4264	January 22 – 24, 2016	March 14, 2016	Severe Winter Storm and Snowstorm

Source: FEMA 2020

Agriculture-related disasters are quite common, including excessive heat and droughts, as well as frosts and freezes. One-half to two-thirds of the counties in the U.S. have been designated as disaster areas in each of the past several years. The USDA Secretary of Agriculture is authorized to designate counties as disaster areas to make emergency loans to producers suffering losses in those counties and in counties that are contiguous to a designated county. Between 2015 and 2020, Camden County has been included in the following five declarations as outlined in Table 4.3.6-2.

Table 4.3.6-2. Extreme Temperature Related USDA Disaster Declarations, 2015 to 2020

Declaration	Event Date	Declaration Date	Event Description
S3930	April 1, 2015 – September 29, 2015	November 4, 2015	Excessive Heat and Drought
S3932	July 16, 2015 – September 29, 2015	November 4, 2015	Excessive Heat and Drought
S4071	April 1, 2016 – September 19, 2016	October 5, 2016	Combined Effects of Freeze, Excessive Heat, and Drought
S4425	June 24, 2018 – July 21, 2018	October 31, 2018	Excessive Heat and Drought
S4602	August 15, 2019 – October 16, 2019	January 1, 2020	Drought

Source: USDA 2020

Extreme Temperature Events

The National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental Information (NCEI) Storm Events database records and defines extreme temperature events as follows:

- Cold/Wind Chill is reported in the NOAA-NCEI database when a period of low temperatures or wind chill temperatures reach or exceed locally or regionally defined advisory conditions (typical value is -18 °F or colder).
- Excessive Heat is reported in the NOAA-NCEI database whenever heat index values meet or exceed locally or regionally established excessive heat warning thresholds.
- Extreme Cold/Wind Chill is reported in the NOAA-NCEI database when a period of extremely low temperatures or wind chill temperatures reaches or exceeds locally or regionally defined warning criteria (typical value around -35 °F or colder).
- Heat is reported in the NOAA-NCEI database whenever heat index values meet or exceed locally or regionally established advisory thresholds.

Extreme temperature events that have impacted Camden County between 2015 and 2020 are identified in Table 4.3.6-3. Please see Section 9 (Jurisdictional Annexes) for available information regarding impacts and losses to each municipality, where available.

Table 4.3.6-2. Previous Extreme Temperature Events

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Camden County Designated?	Description
January 7, 2015	Cold/Wind Chill	N/A	N/A	An arctic air mass brought the coldest temperatures in January to New Jersey. Low temperatures were in the single digits above zero degrees, with gusty northwest winds continuing throughout the morning and wind chill factors below zero. Low temperatures in the Township of Cherry Hill were recorded at 10 degrees.
February 13, 2015	Cold/Wind Chill	N/A	N/A	Northwest winds combined with an arctic air mass to produce wind chill factors of 10 degrees below zero and low air temperatures in the single digits. Actual low temperatures were recorded at 9 degrees above zero in the Township of Cherry Hill.
February 15, 2015	Cold/Wind Chill	N/A	N/A	The center of an arctic air mass brought some of the lowest wind chills and temperatures of the winter season to New Jersey. Wind chill factors were recorded as low as 22 degrees below zero, with actual temperatures reaching -2ºF. The extreme cold weather caused pipes to freeze and burst, displacing 16 residents from the Gloucester Township Senior Campus. Property damages in Camden County were estimated at $150,000.
February 20, 2015	Cold/Wind Chill	N/A	N/A	Another arctic air mass brought low wind chill factors and temperatures throughout the State. Wind chills reached 20 degrees below zero. Actual low temperatures were recorded at 2 degrees above zero in the Township of Cherry Hill.
February 24, 2015	Cold/Wind Chill	N/A	N/A	The high-pressure system responsible for the previous arctic air mass brought calm conditions and snow cover. Actual low temperatures were recorded at 4 degrees above zero in the Township of Cherry Hill.
June 12, 2015	Heat	N/A	N/A	An unseasonably hot and humid air mass resulted in high temperatures in the low- to mid-90s. Heat index values reached the upper 90s, forcing some schools, especially those without air conditioning to dismiss children early. Actual high temperatures reached 94 degrees in the Borough of Haddonfield.
June 23, 2015	Heat	N/A	N/A	Unseasonably hot and humid weather occurred across southern New Jersey with high temperatures reaching the low- to mid-90s and the afternoon heat index reached 100ºF. Air temperatures reached 94 degrees in the Township of Voorhees.
July 19 – 20, 2015	Excessive Heat	N/A	N/A	Unseasonably hot and humid weather affected most of New Jersey, with high temperatures in the mid-90s. The combination of heat and humidity brought heat index values as high as 105ºF on the 19th. Heat index values on the 20th peaked at 100ºF. To combat the heat, many counties, cities and municipalities opened cooling centers. The hours of air-conditioned senior citizen

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Camden County Designated?	Description
				centers were extended. In Camden County, free fans were distributed to senior citizens. Air temperatures reached 94 degrees in the Township of Cherry Hill.
February 14, 2016	Cold/Wind Chill	N/A	N/A	Bitter cold temperatures and strong northwest winds created dangerous wind chills across the northeast portion of the county. Air temperatures ranged from 12 degrees below zero to 13 degrees above zero. Wind chill values reached -46 degrees at High Point in Sussex County. Many local governments across the area set up Code Blue shelters for the vulnerable populations.
July 1 – 3, 2018	Excessive Heat	N/A	N/A	Temperatures reached the mid- to upper- 90s, with dew points in the upper 60s to low 70s resulted in excessive heat across the State. The heat index peaked at 111 degrees in Somerset on July 3rd.

Source: *NOAA-NCEI 2020; NWS 2020*
°F *degrees Fahrenheit*
N/A *Not applicable*

4.3.6.4 Future Occurrences

It is anticipated that Camden County will continue to experience extreme temperatures annually that may coincide with or induce secondary hazards such as snow, hail, ice or windstorms, thunderstorms, drought, human health impacts, and utility failures. Table 4.3.6-3 shows the annual number of events, recurrence interval, annual probability, and annual percent chance of occurrence for the hazards associated with extreme temperatures and reported in the NOAA-NCEI Storm Events Database.

Based on these historical records and input from the Steering Committee and Planning Committee, the probability of occurrence for extreme temperatures in Camden County is considered "frequent". Refer to Section 4.4. (Hazard Ranking) for more information.

Table 4.3.6-3. Probability of Occurrences of Extreme Temperature Events

Hazard Type	Number of Occurrences Between 1950 and 2020	Rate of Occurrence or Annual Number of Events (average)	Recurrence Interval (in years)	Percent (%) Chance of Occurring in Any Given Year
Cold/Wind Chill	26	0.37	2.7	37%
Excessive Heat	24	0.34	2.9	34%
Extreme Cold/Wind Chill	2	0.03	35.5	3%
Heat	63	0.9	1.1	90%
Total	**115**	**1.64**	**0.62**	**100%**

Source: *NOAA-NCEI 2020*
Note: *Probability was calculated using the available data provided in the NOAA-NCEI storm events database. Due to limitations in data, not all extreme temperature events occurring between 1950 and 1996 are accounted for in the tally of occurrences. As a result, the number of hazard occurrences is underestimated.*

4.3.6.5 Climate Change Impacts

Providing projections of future climate change for a specific region is challenging. Shorter term projections are more closely tied to existing trends making longer term projections even more challenging. The further out a prediction reaches the more subject to changing dynamics it becomes.

According to a recent state-level analysis, by the middle of the 21st century an estimated 70 percent of summers in this region are anticipated to be hotter than what we now recognize as the warmest summer on record (NOAA NCEI 2019).

Due to the increase in greenhouse gas concentrations since the end of the 1890s, New Jersey has experienced a 3.5° F (1.9° C) increase in the State's average temperature (Office of the New Jersey State Climatologist 2020), which is faster than the rest of the Northeast region (2° F [1.1° C]) (Melillo et al. 2014) and the world (1.5° F [0.8° C]) (IPCC 2014). This warming trend is expected to continue. By 2050, temperatures in New Jersey are expected to increase by 4.1 to 5.7° F (2.3° C to 3.2° C) (Horton et al. 2015). Thus, New Jersey can expect to experience an average annual temperature that is warmer than any to date (low emissions scenario) and future temperatures could be as much as 10° F (5.6° C) warmer (high emissions scenario) (Runkle et al. 2017). New Jersey can also expect that by the middle of the 21st century, 70 percent of summers will be hotter than the warmest summer experienced to date (Runkle et al. 2017). The increase in temperatures is expected to be felt more during the winter months (December, January, and February), resulting in less intense cold waves, fewer sub-freezing days, and less snow accumulation.

4.3.6.6 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed and vulnerable. For the extreme temperature hazard, the entire County is exposed. The following section discusses Camden County's vulnerability, in a qualitative nature, to the extreme temperature hazard.

Impact on Life, Health and Safety

The entire population of Camden County is exposed to extreme temperature events (population of 506,738 people, according to the 2015-2019 ACS population estimates). Extreme temperature events have potential health impacts including injury and death. According to the Centers for Disease Control and Prevention (CDC), populations most at risk to extreme cold and heat events include the following: 1) the elderly, who are less able to withstand temperatures extremes due to their age, health conditions, and limited mobility to access shelters; 2) infants and children up to four years of age; 3) individuals with chronic medical conditions (e.g., heart disease, high blood pressure), 4) low-income persons that cannot afford proper heating and cooling; and 5) the general public who may overexert during work or exercise during extreme heat events or experience hypothermia during extreme cold events (CDC 2016).

There are 77,791 persons over 65 years old, 30,972 persons under 5 years old, and 61,187 persons below the poverty level out of the total 506,738 persons that live in Camden County (ACS 2019). Higher concentrations of persons over 65 years in age reside in the Boroughs of Pine Valley and Tavistock (i.e., 100-percent of total population) and higher concentrations of persons below the poverty level reside in

the Camden City (i.e., 35.3-percent of total population). Refer to Section 3 (County Profile) which summarizes the density of these populations throughout the County.

The CDC 2018 Social Vulnerability Index (SVI) ranks U.S. Census tracts on socioeconomic status, household composition and disability, minority status and language, and housing and transportation. The SVI Score for Camden County is .6118 indicating a moderate to high level of vulnerability. In particular, the City of Camden has an SVI score of .95, resulting in the highest level of vulnerability.

Risk of structural fire in the winter months is elevated, although winter home fires only account for 8 percent of fires within the U.S., approximately 30-percent of all fire deaths occur in the winter months. Cooking, and heat sources too close to combustible materials are leading factors in winter home fires (U.S. Fire Administration 2018). Often times, power outages occur during extreme cold events. Individuals powering their homes with generators are subjected to carbon monoxide poisoning if proper ventilation procedures are not followed. Improperly connected portable generators are capable of 'back feeding' power lines which may cause injury or death to utility works attempting to restore power and may damage house wiring and/or generators (NJOEM 2019).

Meteorologists can accurately forecast extreme heat and cold event development and the severity of the associated conditions with several days of lead time. These forecasts provide an opportunity for public health and other officials to notify vulnerable populations, implement short-term emergency response actions, and focus on surveillance and relief efforts on those at greatest risk. Adhering to extreme temperature warnings can significantly reduce the risk of temperature-related deaths.

Impact on General Building Stock

All buildings are exposed to the extreme temperature hazard. Refer to Section 3 (County Profile), which summarizes the building inventory in Camden County. Extreme heat generally does not impact buildings; however, elevated summer temperatures increase the energy demand for cooling. Losses can be associated with the overheating of heating, ventilation, and air conditioning (HVAC) systems. Extreme cold temperature events can damage buildings through freezing/bursting pipes and freeze/thaw cycles, as well as increasing vulnerability to home fires. Additionally, manufactured homes (mobile homes) and antiquated or poorly constructed facilities can have inadequate capabilities to withstand extreme temperatures.

Impact on Critical Facilities

All critical facilities in the County are exposed to the extreme temperature hazard. Impacts to critical facilities that are buildings are the same as described for general building stock. Additionally, it is essential that critical facilities remain operational during natural hazard events. Extreme heat events can sometimes cause short periods of utility failures, commonly referred to as *brown-outs*, due to increased usage from air conditioners and other energy-intensive appliances. Similarly, heavy snowfall and ice storms, associated with extreme cold temperature events, can cause power interruption. Backup power is recommended for critical facilities and infrastructure.

Impact on the Economy

Extreme temperature events also have impacts on the economy, including loss of business function and damage to and loss of inventory. Business-owners can be faced with increased financial burdens due to unexpected repairs caused to the building (e.g., pipes bursting), higher than normal utility bills, or business interruption due to power failure (i.e., loss of electricity, telecommunications). Disruptions in public transportation service will also impact the economy for both commuters and customers alike.

Extreme temperature events can also impact agriculture yields and can result in drought conditions directly impacting livestock and crop production. More information about the impacts of drought on the agricultural industry is discussed in Section 4.3.4 (Drought).

Impact on the Environment

Extreme temperature events can also impact the environment. For example, freezing and warming weather patterns create changes in natural processes. An excess amount of snowfall and earlier warming periods may affect natural processes such as flow within water resources (USGS n.d). Likewise, rain-on-snow events also exacerbate runoff rates with warming winter weather. Extreme heat events can have particularly negative impacts on coastal marine aquatic systems, contributing to fish kills, aquatic plant die offs, and increased likelihood of harmful algal blooms.

Future Changes that May Impact Vulnerability

Understanding future changes that impact vulnerability in the County can assist in planning for future development and ensuring that appropriate mitigation, planning, and preparedness measures are in place. The County considered the following factors to examine potential conditions that may affect hazard vulnerability:

- Potential or projected development.
- Projected changes in population.
- Other identified conditions as relevant and appropriate, including the impacts of climate change.

Projected Development

The ability of new development to withstand extreme temperature impacts lies in sound land use practices, building design considerations (e.g., Leadership in Energy and Environmental Design [LEED]), and consistent enforcement of codes and regulations for new construction. New development will change the landscape where buildings, roads, and other infrastructure potentially replace open land and vegetation. Surfaces that were once permeable and moist are now impermeable and dry. These changes cause urban areas to become warmer than the surrounding areas forming (heat islands as described above).

The New Jersey Pinelands Commission has identified Pinelands Management Area Boundaries, including regional growth areas and rural development areas that may also provide insight to where development and growth may occur in the County. In addition, each community was requested to provide recent and anticipated new development and infrastructure projects; summarized in Section 9 (Jurisdictional

Annexes). According to the data provided by the communities, there are approximately 89 recent and anticipated new development projects for Camden County. While this number of new development projects could be underestimated, this best available data provides insight about future risk of impacts from extreme temperature events for the County.

Specific areas of recent and new development are indicated in tabular form and/or on the hazard maps included in the jurisdictional annexes in Volume II, Section 9 (Jurisdictional Annexes) of this plan.

Projected Changes in Population

Camden County has experienced population decline since 2010. According to the U.S. Census Bureau, the County's population has decreased 1.3-percent between 2010 and 2019 (U.S. Census Bureau 2020). Even though the population has decreased, any changes in the density of population can impact the number of persons exposed to the extreme temperature hazard.

Climate Change

As discussed above, most studies project that the State of New Jersey will see an increase in average annual temperatures. As the climate warms, extreme cold events might decrease in frequency, while extreme heat events might increase in frequency; the shift in temperatures could also result in hotter extreme heat events. With increased temperatures, vulnerable populations could face increased vulnerability to extreme heat and its associated illnesses, such as heatstroke and cardiovascular and kidney disease. Additionally, as temperatures rise, more buildings, facilities, and infrastructure systems may exceed their ability to cope with the heat.

Change of Vulnerability Since the 2017 HMP

Overall, the entire County remains vulnerable to extreme temperatures. As existing development and infrastructure continue to age, they can be at increased risk to failed utility and transportation systems if they are not properly maintained and do not adapt to the changing environment.