4.3.5 Extreme Temperature

2024 HMP Changes

- The extreme temperature hazard was previously located in the Severe Weather hazard profile; it now has its own, separate hazard profile.
- New and updated figures from federal and state agencies are incorporated.
- Previous occurrences were updated with events that occurred between 2018 and 2022.

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the extreme temperature hazard in Burlington County.

Hazard Description

Extreme Cold

Extreme cold events occur when temperatures drop well below normal in an area. For example, near-freezing temperatures are considered "extreme cold" in regions relatively unaccustomed to winter weather. Conversely, "extreme cold" might be used to describe temperatures below 0 °F in regions that are subjected to temperatures below freezing on more of a regular basis. For the purposes of this HMP, extreme cold temperatures are characterized when the ambient air temperature drops to approximately 0 degrees Fahrenheit (ºF) or below (NWS n.d.). Extensive exposure to extreme cold temperatures can cause frostbite or hypothermia and can become life-threatening. Extreme cold also can cause emergencies in susceptible populations, such as those without shelter, those who are stranded, or those who live in a home that is poorly insulated or without heat (such as mobile homes). Infants and the elderly are most susceptible to the effects of extreme changes in temperatures and are particularly at risk, but anyone can be affected (CDC 2012).

Several health hazards are related to extreme cold temperatures and include wind chill, frostbite, and hypothermia:

- *Wind chill* is not the actual temperature but rather how wind and cold feel on exposed skin. As the wind increases, heat is carried away from the body at an accelerated rate, driving down the body temperature.
- *Frostbite* is damage to body tissue caused by extreme cold. A wind chill of -20°F will cause frostbite in just 30 minutes. Frostbite can cause a loss of feeling and a white or pale appearance in extremities.
- *Hypothermia* is a condition brought on when the body temperature drops to less than 95°F, and it can be deadly. Warning signs of hypothermia include uncontrollable shivering, memory loss, disorientation, incoherence, slurred speech, drowsiness, and apparent exhaustion (NWS 2022).

Extreme Heat

Extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for a region and that last for several weeks (CDC 2016). Humid or muggy conditions occur when a "dome" of high atmospheric pressure traps hazy, damp air near the ground. A heat wave is a period of abnormally and uncomfortably hot and unusually humid weather. A heat wave will typically last two or more days (NOAA 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 2004).

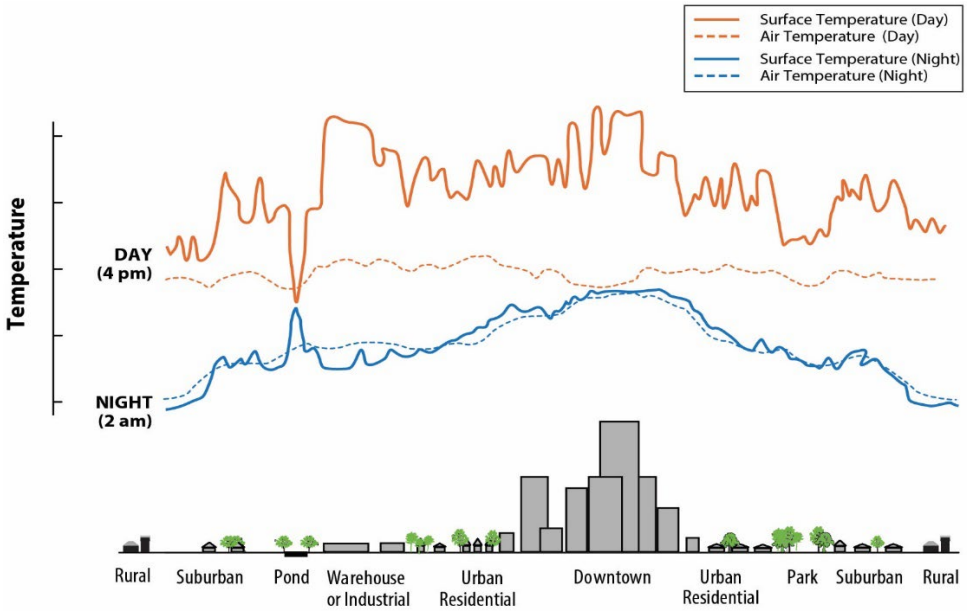
Urbanized areas and urbanization create an exacerbated type of risk during an extreme heat event, compared to rural and suburban areas. As defined by the U.S. Census, urban areas are classified as all territory, population, and housing units located within urbanized areas and urban clusters. The term urbanized area denotes an urban area of 50,000 or more people. Urban areas with at least 2,500 but fewer than 50,000 people are called urban clusters (US Census 2022).

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 (EPA 2019).

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 2019).

As shown in Figure 4.3.5-1, surface temperatures vary more than atmospheric air temperatures during the day, but they are generally similar at night. The dips and spikes in surface temperatures over the pond area show how water maintains a nearly constant temperature day and night because it does not absorb the sun's energy the same way as buildings and paved surfaces. Parks, open land, and bodies of water can create cooler areas within a city. Temperatures are typically lower at suburban-rural borders than in downtown areas.

Figure 4.3.5-1. Heat Island Effect Diagram



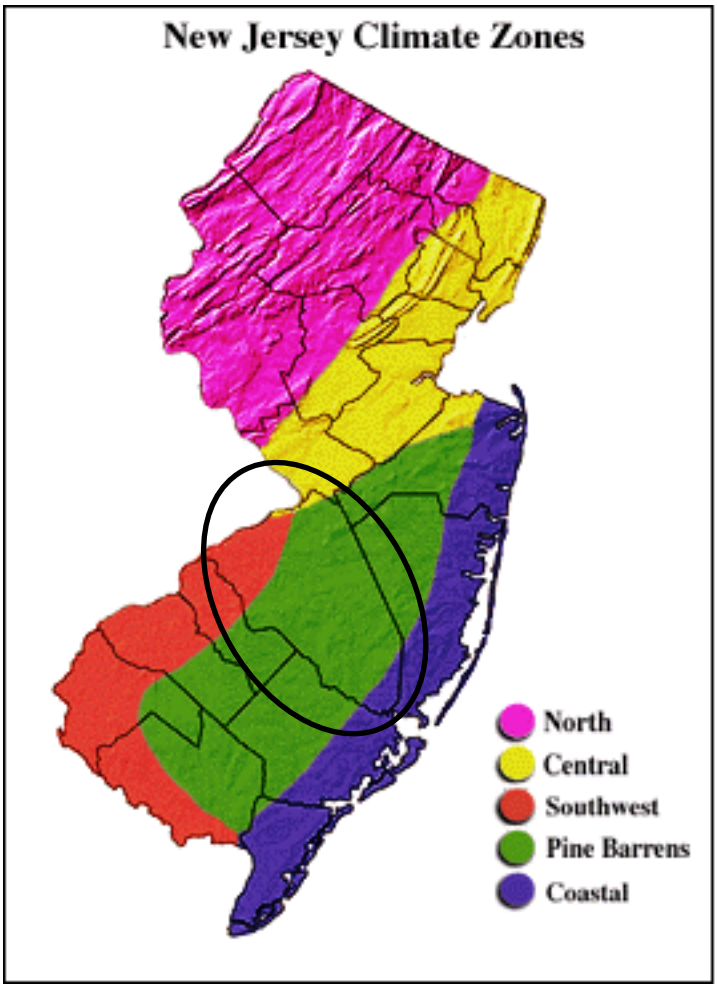
Source: US EPA 2023

Location

According to the Office of the New Jersey State Climatologist, 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 2021). Figure 4.3.5-2 depicts these regions. A majority of Burlington County is located within the Pine Barrens Region, with other portions in the Southwest, Coastal, and Central Climate Regions.

The Southwest Climate Region is located along the southwestern border of the State, stretching from Trenton all the way to the Delaware Bay. The region is relatively suburban with pockets of urbanized areas, especially in the central region along the Delaware River, across from Philadelphia. Due to the proximity to the Delaware Bay, this region adds a maritime influence on the climate, having some of the highest average daily temperatures as well as higher nighttime temperatures. In general, the region is drier than other parts of the State, and given its more inland characteristics, is not prone to major coastal storms. That being said, the region does have significant humidity during the summer, and making the high temperatures feel even hotter than recorded (Rutgers University 2019).

Figure 4.3.5-2. Climate Regions of New Jersey



Source: Rutgers University 2019

Note: The black oval indicates the location of Burlington County. The County is located in the Southwest, Pine Barrens, Central, and Coastal Zones.

The Pine Barrens Zone, which covers much of the central portion of the County, has lower temperatures than the neighboring Southwest Region due to solar radiation absorbed during the day and radiated back into space during the night. Compared to its surrounding regions, Pine Barrens Zone is 15-20 degrees cooler. In general, the region has porous and sandy soils which allow water to be absorbed quickly, causing the zone to be relatively dry, making it vulnerable to forest fires (Rutgers University 2019).

Burlington County has a sliver of its land in the northern part of the County located in the Central Zone. This region has many urban locations with large amounts of pollutants produced by the high volume of automobile traffic and industrial processes. The concentration of buildings and paved surfaces serve to retain more heat, thereby affecting the local temperatures with the "heat island effect". Areas in the south of the Central Zone tend to have nearly twice as many days with temperatures above 90 degrees than the 15-20 commonly observed in the central portion of the State (Rutgers University 2019).

The southern tip of the County is located in the Coastal Zone. The Coastal Zone is influenced by the relationship between land and sea. In autumn and early winter, when the ocean is warmer than the land surface, the Coastal Zone will experience warmer temperatures than interior regions of the State. In the spring months, ocean breezes keep temperatures along the coast cooler. Being adjacent to the Atlantic Ocean, with its high heat capacity (compared to land), seasonal temperature fluctuations tend to be more gradual and less prone to extremes. Sea breezes play a major role in the coastal climate. When the land is warmed by the sun, heated air rises, allowing cooler air at the ocean surface to spread inland. Sea breezes often penetrate 5-10 miles inland, but under more favorable conditions, can affect locations 25-40 miles inland. They are most common in spring and summer (Rutgers University 2019).

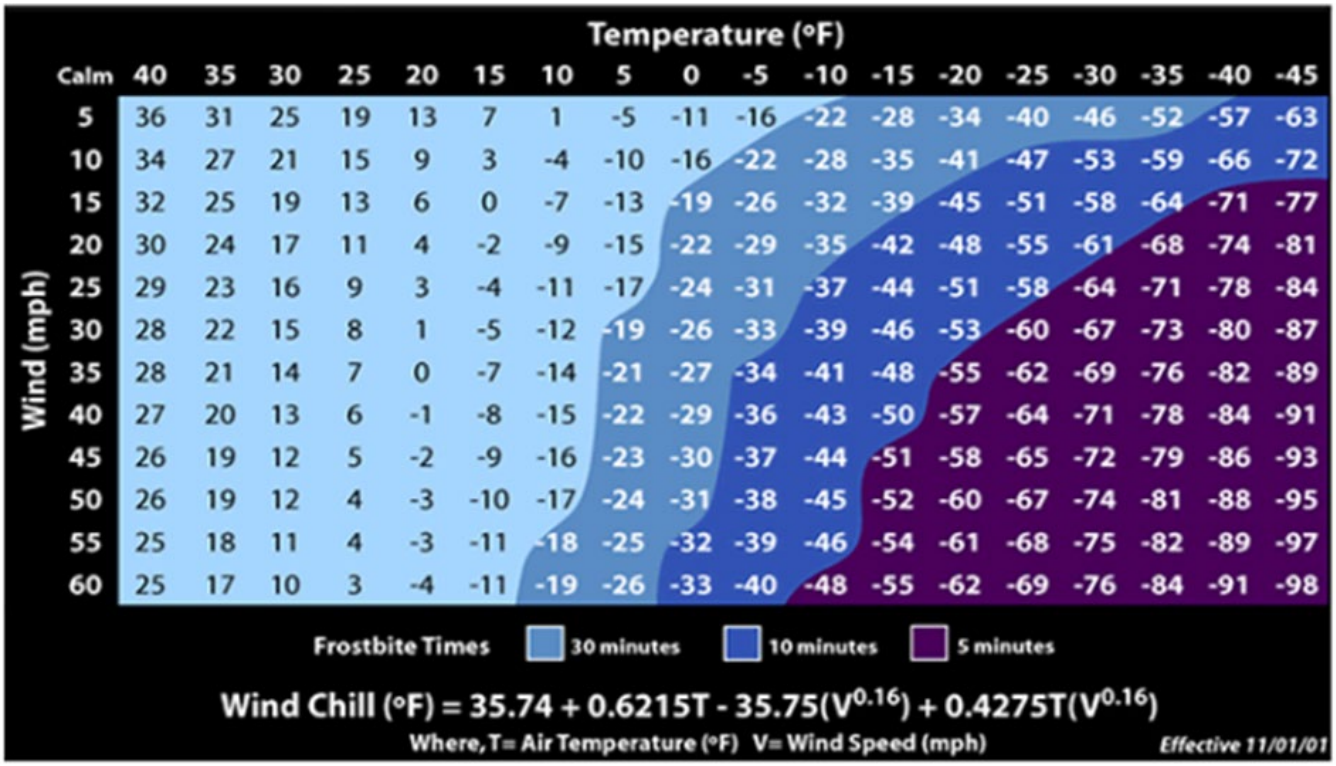
Extent

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.

Extreme Cold

The extent (severity or magnitude) of extreme cold temperatures is generally measured through the wind chill temperature index. The index uses advances in science, technology, and computer modeling to provide an accurate, understandable, and useful formula for calculating the dangers from wind chill. Wind chill temperature is presented in Figure 4.3.5-3.

Figure 4.3.5-3. Wind Chill Index



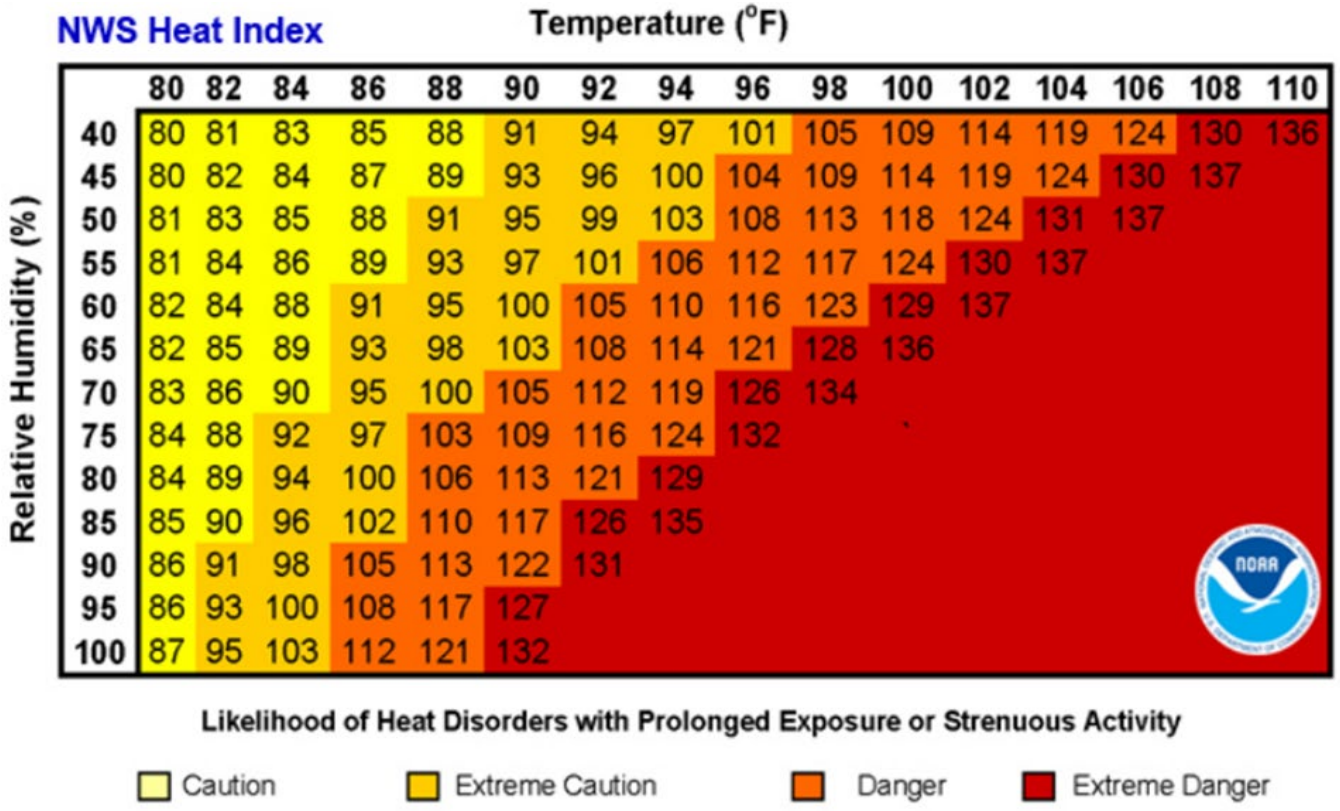
Source: NWS 2019

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 (NWS 2021).

Extreme Heat

The extent of extreme heat temperatures is generally measured through the Heat Index, identified in Figure 4.3.5-4. Created by the NWS, the Heat Index is a chart that accurately measures apparent temperature of the air as it increases with the relative humidity. The temperature and relative humidity are needed to determine the Heat Index. Once both values have been identified, the Heat Index is the corresponding number of both values. This index provides a measure of how temperatures feel; however, the values are devised for shady, light wind conditions.

Figure 4.3.5-4. NWS Heat Index Chart – Shaded Areas



Source: NWS 2023

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 2021).

Previous Occurrences and Losses

FEMA Major Disasters and Emergency Declarations

Between May 1953 and May 2023, neither Burlington County nor the State of New Jersey was included in any major disaster (DR) or emergency (EM) declarations due to extreme temperatures. However, during that period, FEMA included Burlington County in 10 DR or EM declarations classified as one or a combination of the following disaster types: blizzard, severe winter storm, snowstorm, snow, ice storm, and winter storm (see Section 4.3.8). Additionally, during that same time period FEMA included Burlington County in two drought-related DR or EM declarations (see Section 4.3.3). Detailed information about the declared disasters since 1953 is provided in Section 3 (County Profile).

U.S. Department of Agriculture Disaster Declarations

Agriculture-related heat/cold disasters are quite common. Usually, they occur along with other weather events such as drought, winter storms, frosts, and even flooding. Overall, it is difficult to separate the agricultural loss caused by

extreme temperatures from their partner weather events (drought, winter storm, etc.). However, on a cumulative scale these events can cause significant damage.

The Secretary of Agriculture from the U.S. Department of Agriculture (USDA) 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. As shown in Table 4.3.5-1, between August 2018 and May 2023, Burlington County was included in five extreme temperature-related agricultural disaster declarations.

Table 4.3.5-1. USDA Declarations for Extreme Temperature Events in Burlington County

Date of Event	Event Type	Declaration Number	Burlington County Included in Declaration?	Description
April 1 –September 29, 2015	Drought	S3930	Yes	Excessive Heat and Drought
July 16 –September 29, 2015	Drought	S3932	Yes	Excessive Heat and Drought
April 1 –September 10, 2016	Drought	S4071	Yes	Combined effects of Freeze, Excessive Heat, and Drought
June 18 –September 5, 2022	Excessive Heat	S5347	Yes	Drought and Excessive Heat
July 1, 2022 – Continuing	Excessive Heat	S5348	Yes	Drought and Excessive Heat

Source: USDA 2023

Previous 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 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.

For the 2024 HMP update, known extreme temperature events that impacted Burlington County between August 2018 and May 2023 are listed in Table 4.3.5-2. For events prior to 2018, refer to the 2018 Burlington County HMP.

Table 4.3.5-2. Extreme Temperature Incidents in Burlington County, 2018 to 2023

Date of Event	Event Type	Declaration Number	Burlington County Included in Declaration?	Description
June 29-30, 2021	Excessive Heat	N/A	N/A	A multi-day excessive heat event occurred in Burlington County. High temperatures in the 90s combined with dew points in the upper 60s caused heat index values to reach 105°F on both June 29 and 30, with some localized 110°F values on the 30th. There were no property or crop damages reported from this event in Burlington County.

Date of Event	Event Type	Declaration Number	Burlington County Included in Declaration?	Description
August 11-12, 2021	Excessive Heat	N/A	N/A	A multi-day excessive heat event occurred with temperatures in the mid to upper 90s combined with dew point values near 70 caused widespread heat index values near to above 105°F on both August 11 and 12, with localized 110°F values. There were no property or crop damages reported from this event in Burlington County.
August 9, 2022	Excessive Heat	S5347, S5345, S5348	No	Temperatures reached the mid to upper 90s with dewpoints in the low to mid 70s, resulting heat index values rose to the mid to upper 100s across the region. Heat index values reached 105°F on August 9th, locally near 110°F. There were no property or crop damages reported from this event in Burlington County.
December 23-24, 2022	Cold/ Wind Chill	N/A	N/A	Temperatures fell into the single digits and teens with wind chills ranging from -5°F to -20°F in New Jersey. Wind chills as low as -10°F occurred based on area temperature and wind speed observations.

Source: NOAA NCEI 2023; FEMA 2023; USDA 2023

Probability of Future Occurrence

For the 2024 HMP update, the most up-to-date data was collected to calculate the probability of future occurrence of extreme temperature events for the County. Information from NOAA-NCEI storm events database was used to identify the number of extreme temperature events that occurred between 1950 and May 2023. Table 4.3.5-3 presents the probability of future events for extreme temperature in Burlington County.

Table 4.3.5-3. Probability of Future Occurrences of Extreme Temperature Events

Hazard Type	Number of Occurrences Between 1950 and 2023	% Chance of Occurring in Any Given Year
Cold/Wind Chill	26	35.62%
Heat	70	95.89%
Excessive Heat	28	38.35%
Extreme Cold / Wind Chill	2	2.73%
Total	**126**	**100%**

Source: NOAA NCEI 2023

Note: Disaster occurrences include federally declared disasters since the 1950 Federal Disaster Relief Act, and selected events since 1968. Due to limitations in data, not all extreme temperature events occurring between 1954 and 1996 are accounted for in the tally of occurrences. As a result, the number of hazard occurrences is underestimated.

In Section 4.4, the identified hazards of concern for the County were ranked (Table 4.4-2). The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Team, the probability of occurrence for extreme temperatures in the County is considered 'frequent'.

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.

Climate change includes major changes in temperature, precipitation, or wind patterns, which occur over several decades or longer. 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, which is faster than the rest of the Northeast region (2 °F [1.1 °C]) 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). 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). 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. 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 (NJDEP 2020).

Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed and vulnerable. For the extreme temperature hazard, the entire County has been identified as exposed; therefore, all assets are potentially vulnerable. The following text estimated potential impacts of extreme temperatures on Burlington County.

Impact on Life, Health, and Safety

For the purposes of this HMP, the entire population of Burlington County (461,860) is exposed to extreme temperature events. Extreme temperature events have potential health impacts including injury and death. 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 and conducting appropriate mitigation and preparation measures can significantly reduce the risk of temperature-related deaths.

Several health hazards are related to extreme cold temperatures and include wind chill, frostbite, and hypothermia:

- *Wind chill* is not the actual temperature but rather how wind and cold feel on exposed skin. As the wind increases, heat is carried away from the body at an accelerated rate, driving down the body temperature.
- *Frostbite* is damage to body tissue caused by extreme cold. A wind chill of -20°F will cause frostbite in just 30 minutes. Frostbite can cause a loss of feeling and a white or pale appearance in extremities.
- *Hypothermia* is a condition brought on when the body temperature drops to less than 95°F, and it can be deadly. Warning signs of hypothermia include uncontrollable shivering, memory loss, disorientation, incoherence, slurred speech, drowsiness, and apparent exhaustion (NWS 2022).

Several health hazards are related to extreme heat temperatures and include heat exhaustion and heat stroke:

- *Heat exhaustion* is the body's response to an excessive loss of water and salt, usually through excessive sweating. Symptoms can include headache, cramping, dizziness, and weakness.
- *Heat stroke* is the most serious heat-related illness. It occurs when the body can no longer control its temperature: the body's temperature rises rapidly, the sweating mechanism fails, and the body is unable to cool down. When heat stroke occurs, the body temperature can rise to 106°F or higher within 10 to 15 minutes. Heat stroke can cause permanent disability or death if the person does not receive emergency treatment (CDC 2022)

Table 4.3.5-4 denotes the effects of prolonged exposure to direct sunlight on the human body during extreme heat events.

Table 4.3.5-4. Adverse Effects of Prolonged Exposure to Direct Sunlight

Category	Heat Index	Effects on the Body
Caution	80°F - 90°F	Fatigue possible with prolonged exposure and/or physical activity
Extreme Caution	90°F - 103°F	Heat stroke, heat cramps, or heat exhaustion possible with prolonged exposure and/or physical activity
Danger	103°F - 124°F	Heat cramps or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity
Extreme Danger	125°F or higher	Heat stroke highly likely

Source: NWS 2023

Socially Vulnerable Populations

According to the Centers for Disease Control and Prevention, 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 2022, CDC 2005).

The Centers for Disease Control and Prevention (CDC) 2020 Social Vulnerability Index (SVI) ranks U.S. Census tracts on socioeconomic status, household composition and disability, minority status and language, and housing and transportation. Burlington County's overall national score is 0.2648 and a state score of 0.3, both indicating that its communities have a low to medium level of social vulnerability (CDC 2018). This score indicates that some County residents in these communities might be more susceptible to impacts from extreme temperatures.

Low Income Populations

According to the 2021 5-year ACS estimates, there are 27,947 total persons living below the poverty level in Burlington County. Willingboro Township has the greatest population of individuals living in poverty (2,685).

Residents with low incomes might not have access to housing or their housing can be less able to withstand cold temperatures (e.g., homes with poor insulation and heating supply). Poor housing conditions, lack of adequate temperature control and inability to locate cooler shelter makes low-income populations particularly vulnerable to extreme heat and its associated health risks. According to the US Census Bureau's American Housing Survey, about 9 percent of American households lack air conditioning (US Census Bureau 2021).

Many individuals and families that are considered to be low-income reside in urban centers, which can undergo what is known as the urban heat island effect. This creates an area of higher temperatures compared to the surrounding areas that are less urbanized. As a result, daytime temperatures are higher and nighttime cooling is reduced which contributes to the prevalence of heat-related illnesses in these areas (National Geographic 2023).

Infants and Children

According to the 2021 5-year ACS estimates, there are 23,350 persons under the age of 5 years in Burlington County. As shown in Table 4.3.5-5, Evesham Township has the highest population under the age of 5 (2,237).

Infants and children under the age of four are considered to be more susceptible to the effects of high temperatures. Children often spend a significant amount of time outside recreationally and are not equipped to independently

regulate their activity levels or understand when to rest or seek out hydration and cooling. Their body temperature rises three to five times faster than an adult, and they absorb heat faster due to their increased surface area relative to their mass (Columbia University 2023).

Older Adults

According to the 2021 5-year ACS estimates, there are 78,093 persons over the age of 65 years in Burlington County. In Burlington County, each municipality has areas of high concentration of elderly population with higher concentrations located in the more urban, densely populated areas of the County. As shown in Table 4.3.5-5, Evesham Township has the highest population over 65 (8,574).

Adults over the age of 65 are more likely than other subsets of the population to have pre-existing medical conditions and/or take specific medications that can affect their body's ability to control temperature, which can lower their threshold to tolerate heat. Older adults are also more likely to be more socially isolated due to physical disability, lack of transportation, and other factors attributed to age including dependence on durable medical equipment (AARP 2022).

People with Chronic Pre-Existing Health Issues

According to the 2021 5-year ACS estimates, there are 51,899 persons with a disability in Burlington County. Willingboro Township has the largest disabled population in the County (5,100).

Many types of illness can increase an individual's susceptibility to heat-related illness, including but not limited to respiratory disease, cardiovascular disease, mental illness, obesity, and diabetes. Many chronic conditions require medication for treatment, and many of these can cause dysregulation of body temperature that lessens the body's ability to tolerate high temperatures (CDC 2017).

Those who are Pregnant and Breastfeeding

Pregnancy and breastfeeding cause significant strain on the body. The parent is sharing a blood supply and any water intake with the fetus or baby, and this greatly increases the risk of dehydration or heat exhaustion if the body is not allowed time to cool and hydrate. Overheating during pregnancy can harm a fetus and result in slow growth and premature birth (CDC 2022).

Workers

Many occupations require work in all types of inclement weather, with extreme heat being one that impacts workers both indoors and outdoors. From construction and agricultural workers to bakers and warehouse managers, heat-related illness while on the job can be attributed to a number of factors outside of the existing environmental conditions, including wearing of any protective or safety gear and lack of efficient cooling (OSHA 2023).

Athletes and People Playing Sports

Intense exercise causes in a rapid rise in body temperature, which is greatly exacerbated by high environmental temperatures. Many activities also require specific equipment or protective gear, such as helmets and pads, which can be heavy and retain a significant amount of heat and moisture that will accelerate the speed at which heat exhaustion may occur (Academy of Nutrition and Dietetics 2022).

Table 4.3.5-5. Burlington County Socially Vulnerable Populations by Municipality

Jurisdiction[a]	Decennial Population 2020		American Community Survey 5-Year Population Estimates (2021)									
			Population Over 65		Population Under 5		Non-English Speaking Population		Population with Disability		Population Below Poverty Level	
	Jurisdiction Total	% of County Total	Number	% of Jurisdiction Total	Number	% of Jurisdiction Total	Number	% of Jurisdiction Total	Number	% of Jurisdiction Total	Number	% of Jurisdiction Total
Bass River (T)	1,355	0.3%	248	18.3%	67	4.9%	0	0.0%	175	12.9%	95	7.0%
Beverly (C)	2,499	0.5%	292	11.7%	183	7.3%	0	0.0%	249	10.0%	300	12.0%
Bordentown (C)	3,993	0.9%	772	19.3%	216	5.4%	16	0.4%	422	10.6%	227	5.7%
Bordentown (T)	11,791	2.6%	1,601	13.6%	472	4.0%	289	2.4%	1,092	9.3%	194	1.6%
Burlington (C)	9,743	2.1%	1,301	13.4%	661	6.8%	208	2.1%	1,251	12.8%	1,422	14.6%
Burlington (T)	23,983	5.2%	3,526	14.7%	1,497	6.2%	385	1.6%	2,366	9.9%	2,185	9.1%
Chesterfield (T)	9,422	2.0%	760	8.1%	578	6.1%	153	1.6%	423	4.5%	165	1.8%
Cinnaminson (T)	17,064	3.7%	3,103	18.2%	929	5.4%	208	1.2%	1,661	9.7%	584	3.4%
Delanco (T)	4,824	1.0%	1,297	26.9%	191	4.0%	42	0.9%	676	14.0%	322	6.7%
Delran (T)	17,882	3.9%	2,570	14.4%	1,047	5.9%	723	4.0%	1,548	8.7%	902	5.0%
Eastampton (T)	6,191	1.3%	557	9.0%	264	4.3%	0	0.0%	478	7.7%	488	7.9%
Edgewater Park (T)	8,930	1.9%	1,571	17.6%	700	7.8%	367	4.1%	1,465	16.4%	1,645	18.4%
Evesham (T)	46,826	10.1%	8,574	18.3%	2,237	4.8%	749	1.6%	4,504	9.6%	1,476	3.2%
Fieldsboro (B)	526	0.1%	82	15.6%	64	12.2%	0	0.0%	62	11.8%	36	6.8%
Florence (T)	12,812	2.8%	2,122	16.6%	645	5.0%	260	2.0%	1,460	11.4%	827	6.5%
Hainesport (T)	6,035	1.3%	1,327	22.0%	58	1.0%	0	0.0%	744	12.3%	250	4.1%
Lumberton (T)	12,803	2.8%	2,048	16.0%	661	5.2%	107	0.8%	1,490	11.6%	805	6.3%
Mansfield (T)	8,897	1.9%	2,506	28.2%	394	4.4%	330	3.7%	1,465	16.5%	181	2.0%
Maple Shade (T)	19,980	4.3%	2,897	14.5%	1,159	5.8%	694	3.5%	2,433	12.2%	1,971	9.9%
Medford (T)	24,497	5.3%	5,151	21.0%	1,085	4.4%	31	0.1%	2,775	11.3%	724	3.0%
Medford Lakes (B)	4,264	0.9%	879	20.6%	211	4.9%	0	0.0%	407	9.5%	26	0.6%
Moorestown (T)	21,355	4.6%	3,480	16.3%	837	3.9%	603	2.8%	1,654	7.7%	807	3.8%
Mount Holly (T)	9,981	2.2%	1,199	12.0%	454	4.5%	133	1.3%	1,624	16.3%	958	9.6%
Mount Laurel (T)	44,633	9.7%	8,299	18.6%	2,011	4.5%	889	2.0%	4,203	9.4%	1,689	3.8%
New Hanover (T)	6,367	1.4%	311	4.9%	214	3.4%	29	0.4%	192	3.0%	116	1.8%
North Hanover (T)	7,963	1.7%	532	6.7%	975	12.2%	125	1.6%	631	7.9%	481	6.0%
Palmyra (B)	7,438	1.6%	1,077	14.5%	190	2.6%	44	0.6%	961	12.9%	616	8.3%
Pemberton (B)	1,371	0.3%	282	20.6%	56	4.1%	47	3.4%	308	22.5%	140	10.2%

Jurisdiction[a]	Decennial Population 2020		American Community Survey 5-Year Population Estimates (2021)									
			Population Over 65		Population Under 5		Non-English Speaking Population		Population with Disability		Population Below Poverty Level	
	Jurisdiction Total	% of County Total	Number	% of Jurisdiction Total	Number	% of Jurisdiction Total	Number	% of Jurisdiction Total	Number	% of Jurisdiction Total	Number	% of Jurisdiction Total
Pemberton (T)	26,903	5.8%	4,306	16.0%	1,429	5.3%	1,092	4.1%	4,006	14.9%	2,518	9.4%
Riverside (T)	8,003	1.7%	1,039	13.0%	354	4.4%	754	9.4%	972	12.1%	1,257	15.7%
Riverton (B)	2,764	0.6%	554	20.0%	80	2.9%	5	0.2%	187	6.8%	72	2.6%
Shamong (T)	6,460	1.4%	1,313	20.3%	324	5.0%	0	0.0%	671	10.4%	136	2.1%
Southampton (T)	10,317	2.2%	3,153	30.6%	293	2.8%	125	1.2%	1,551	15.0%	589	5.7%
Springfield (T)	3,245	0.7%	479	14.8%	129	4.0%	65	2.0%	311	9.6%	160	4.9%
Tabernacle (T)	6,776	1.5%	1,524	22.5%	380	5.6%	0	0.0%	747	11.0%	233	3.4%
Washington (T)	693	0.2%	138	19.9%	8	1.2%	8	1.1%	87	12.6%	21	3.0%
Westampton (T)	9,121	2.0%	1,139	12.5%	263	2.9%	81	0.9%	802	8.8%	268	2.9%
Willingboro (T)	31,889	6.9%	5,707	17.9%	1,916	6.0%	538	1.7%	5,100	16.0%	2,685	8.4%
Woodland (T)	1,544	0.3%	319	20.7%	49	3.2%	0	0.0%	627	40.6%	363	23.5%
Wrightstown (B)	720	0.2%	58	8.1%	69	9.6%	5	0.7%	119	16.5%	13	1.8%
Burlington County Total	**461,860**	**100.0%**	**78,093**	**16.9%**	**23,350**	**5.1%**	**9,103**	**2.0%**	**51,899**	**11.2%**	**27,947**	**6.1%**

Source: U.S. Census Bureau 2020, 2021

Note: Persons per household = 2.6

Impact on General Building Stock

All the building stock in the County is exposed to the extreme temperature hazard. Refer to Section 3 (County Profile), which summarizes the building inventory in Burlington 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 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 brownouts, due to increased usage of 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. Additionally, designating and developing emergency cooling or heating facilities can also enhance the resilience and safety of communities.

Impact on 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). In response to such vulnerabilities to the existing utility infrastructure, in July 2014 the State has established the New Jersey Energy Resilience Bank ("ERB" or the "Bank"), the first public infrastructure bank in the nation to focus on energy resilience (State of New Jersey 2021). The ERB is a direct and innovative approach to address significant energy infrastructure vulnerabilities arising in the aftermath of Superstorm Sandy. Utilizing $200 million through New Jersey's second Community Development Block Grant-Disaster Recovery (CDBG-DR) allocation, the ERB supports the development of distributed energy resources at critical facilities throughout the State that will enable them to remain operational during future outages.

Extreme heat and cold events can damage crops. Based on information from the 2017 Census of Agriculture, 915 farms were present in Burlington County, encompassing 191 acres of total farmland. The average farm size was 105 acres. Burlington County farms had a total market value of products sold of approximately $91 million in crop sales and approximately $7.5 million in livestock sales (USDA 2019).

Impact on Environment

Extreme temperature events can have a major impact on the environment. Freezing and warming weather patterns can 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 2020). Extreme heat events can have particularly negative impacts on aquatic systems, contributing to fish kills, aquatic plant die offs, and increased likelihood of harmful algal blooms. These extreme temperature events can also affect the surrounding ecosystems which can destroy food webs and deplete resources in the environment.

Cascading Impacts on Other Hazards

Extreme temperature events can exacerbate the drought hazard (reference Section 4.3.3), increase the potential risk of wildfires (reference Section 4.3.9), and escalate severe storm (reference Section 4.3.7) and severe winter weather (reference Section 4.3.8) events for the County. For example, extreme heat events may accelerate evaporation rates, which may dry out the air and soils making some terrestrial plants and soil more susceptible to catching fire. Extreme variation in temperatures could also create ideal atmospheric conditions for severe storms or worsen the outcome of severe winter weather during freezing and thawing periods.

Further 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 and consistent enforcement of codes and regulations for new construction. As a relatively suburban county, Burlington County is fortunate to have areas of greenery which decrease the overall county's vulnerability to heat waves. However, as the County increases development, preservation of such spaces can become more difficult. 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). 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

The New Jersey Department of Labor and Workforce Development produced populations projections by County from 2014 to 2019, 2024, 2029, and 2034. According to these projections, Burlington County is projected to have a population of 460,400 by 2024, 464,900 by 2029, and 472,700 by 2034 (State of New Jersey 2017). Population change is not expected to have a measurable effect on the overall vulnerability of the County's population over time. However, drastic increases less densely populated areas of the County may require utility system upgrades to keep up with utility demands (e.g., water, electric) during extreme temperature events to prevent increased stresses on these systems. Additionally, by increasing development, green space preservation will need to continue to be a priority to mitigate increased heat islands. Refer to Section 3 (County Profile) for a detailed discussion on population changes.

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. Thus, building efficiency and upgrading heating and cooling technology/HVAC will become an increasingly important issue for businesses and homeowners over the coming years.

Change of Vulnerability Since 2019 HMP

Overall, the entire County remains vulnerable to extreme temperatures. As existing development and infrastructure continue to age, they can be at increased risk of failed utility systems (e.g., HVAC) if they are not properly maintained or upgraded. Similarly, an increase in the elderly population remaining in the County increases the vulnerable population.