



5.4.3 EXTREME TEMPERATURE

This section provides a profile and vulnerability assessment for the extreme temperature hazard.

5.4.3.1 Profile

This section provides profile information including description, extent, location, previous occurrences and losses, and the probability of future occurrences for the extreme temperatures hazard.

Description

Extreme temperature includes both heat and cold events, which can have a significant impact to human health, commercial/agricultural businesses and primary and secondary effects on infrastructure (e.g., burst pipes and power failure). What constitutes *extreme cold* or *extreme heat* can vary across different areas of the country, based upon what the population is accustomed.

Extreme Cold

Extreme cold events are when temperatures drop well below normal in an area. Although no specific definition exists for Extreme Cold, temperatures at or below zero degrees for an extended period of time characterize an Extreme Cold event in New York State (NYS DHSES, 2014).

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 (CDC 2016). An extended period of extreme heat of three or more consecutive days is typically called a heat wave and is often accompanied by high humidity (NWS 2013d). Humid or muggy conditions occur when a *dome* of high atmospheric pressure traps hazy, damp air near the ground. Extreme hot days in New York State are defined as individual days with maximum temperatures at or above 90 °F or at or above 95 °F. Heat waves are defined as three consecutive days with maximum temperatures above 90 °F (NYSERDA 2014).

Extent

Extreme Cold

The extent (severity or magnitude) of extreme cold temperatures generally are measured through the Wind Chill Temperature (WCT) Index. The WCT Index uses advances in science, technology, and computer modeling to provide an accurate, understandable, and useful formula for calculating the dangers from wind chill. For details regarding the WCT Index, refer to: <http://www.nws.noaa.gov/om/winter/windchill.shtml>. The WCT Index is presented in Figure 5.4.3-1.

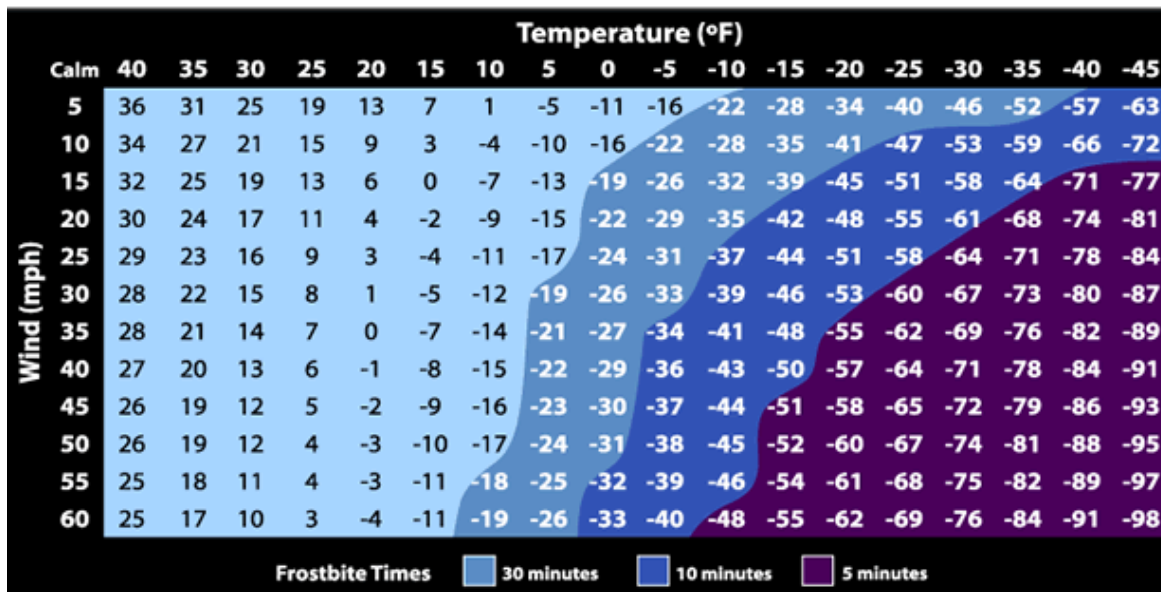
Wind Chill At a Glance

The wind chill is how cold it actually feels on your skin when the wind is factored in. It may also be referred to as the "feels-like" temperature. Bitterly cold wind chills increase your risk of developing frostbite and hypothermia.

Source: The Weather Channel (2019)



Figure 5.4.3-1. NWS WCT Index



Source: NWS 2016b

The National Weather Service (NWS) provides alerts when Wind Chill indices approach hazardous levels. Table 5.4.3-1 explains these alerts. According to NYS DHSES (2014), in the event of extreme cold conditions, the NWS does the following:

- Includes Wind Chill values in city forecasts.
- Issues special weather statements with information that includes population that is most at risk, safety rules for reducing risk, and the extent of the hazard and WCT values.
- Provides assistance to state and local health officials in preparing Civil Emergency Messages in severe cold events.

Table 5.4.3-1. National Weather Service Alerts for Extreme Cold

Alert	Criteria
Wind Chill Advisory	NWS issues a wind chill advisory when seasonably cold wind chill values, but not extremely cold values are expected or occurring.
Wind Chill Watch	NWS issues a wind chill watch when dangerously cold wind chill values are possible.
Wind Chill Warning	NWS issues a wind chill warning when dangerously cold wind chill values are expected or occurring.

Source: NWS 2018b



Extreme Heat

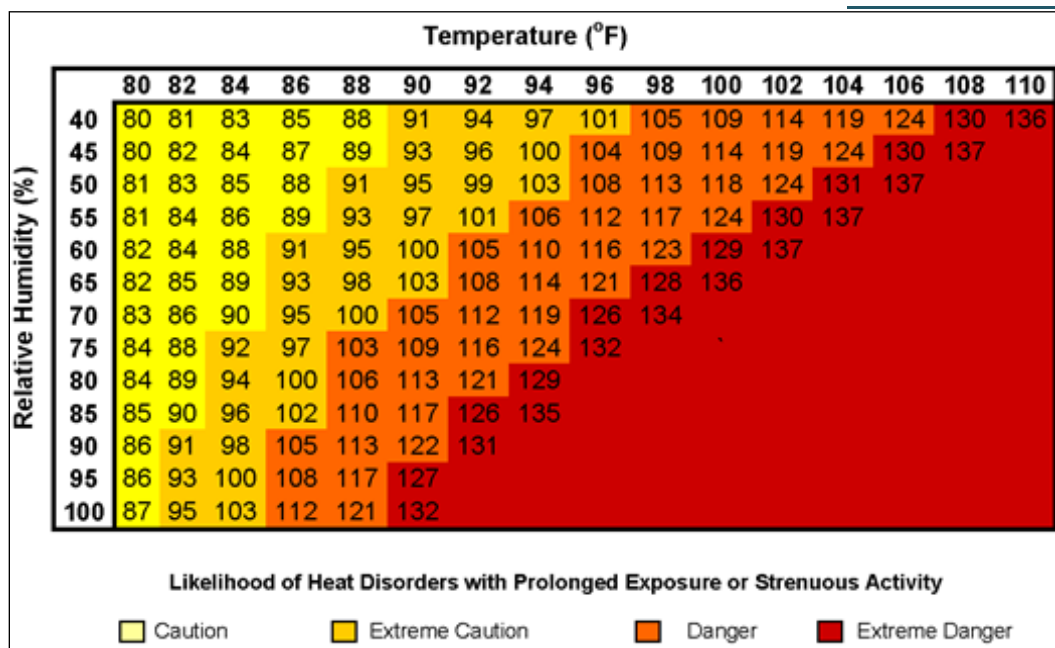
The extent of extreme heat temperatures generally is measured through the Heat Index, identified in Table 5.4.3-2. Created by the NWS, the Heat Index is a chart that accurately measures apparent temperature of the air as it increases with the relative humidity. To determine the Heat Index, the temperature and relative humidity are needed. Once both values are identified, the Heat Index is the corresponding number of both the values, as seen in Table 5.4.3-2. This provides a measure of how temperatures feel; however, the values are devised for shady, light wind conditions. Exposure to full sun can increase the index by up to 15 degrees (NYS DHSES 2014).

Relative Humidity At a Glance

Relative humidity is the amount of moisture in the air at a certain temperature compared to what the air can "hold" at that temperature...it is measured as a percentage or ratio of the amount of water vapor in a volume of air RELATIVE to a given temperature and the amount it can hold at that given temperature. Warm air can hold more moisture than cold air.

Figure 5.4.3-2. Heat Index Chart

Source: M^olekule.com, 2018



Source: NWS 2016c

The NWS provides alerts when Heat Indices approach hazardous levels. Table 5.4.3-2 explains these alerts. In the event of an extreme heat advisory, NYS DHSES (2014) reports that NWS does the following:

- Includes Heat Index values and city forecasts.
- Issues special weather statements including who is most at risk, safety rules for reducing risk, and the extent of the hazard and Heat Index values.
- Provides assistance to state/local health officials in preparing Civil Emergency Messages in severe heat waves.

Table 5.4.3-2. National Weather Service Alerts

Alert	Criteria
Heat Advisory	Issues 12-24 hours before the onset of the following conditions: heat index of at least 100 °F but less than 105 °F for at least two hours per day



Alert	Criteria
Excessive Heat Watch	Issued by the NWS when heat indices of 105 °F or greater are forecast in the next 24 to 72 hours
Excessive Heat Warning	Issued within 12 hours of the onset of the following criteria: heat index of at least 105 °F for more than three hours per day for two consecutive days, or heat index more than 115 °F for any period of time

Source: NYS DHSES 2014

Location

According to the New York State Hazard Mitigation Plan (2014), the location of New York State and the typical air masses, combined with the atmospheric circulation, provides general climatic controls for the region, making the entire State susceptible to extreme temperatures. Changes in land elevations, the landscape, and its close proximity to large bodies of water play a significant role in the temperatures of New York State. Extended periods of either extreme cold or warm temperatures are a result from movement of great high pressure systems into and through the eastern United States (NYS DHSES 2014).

New York State is divided into 10 climate divisions: Western Plateau, Eastern Plateau, Northern Plateau, Coastal, Hudson Valley, Mohawk Valley, Champlain Valley, St. Lawrence Valley, Great Lakes, and central Lakes. According to NCDC, “Climatic divisions are regions within each state that have been determined to be reasonably climatically homogeneous” (CPC 2005). Broome County is located within the Eastern Plateau Climate Division. Figure 5.4.3-3 depicts the climate divisions in New York State.



Figure 5.4.3-3. New York State Climate Divisions



Source: CPC 2005

Note: (1) Western Plateau; (2) Eastern Plateau (Catskill Mountains); (3) Northern Plateau (Adirondack Mountains); (4) Coastal; (5) Hudson Valley; (6) Champlain Valley; (7) St. Lawrence Valley; and (8) Great Lakes.

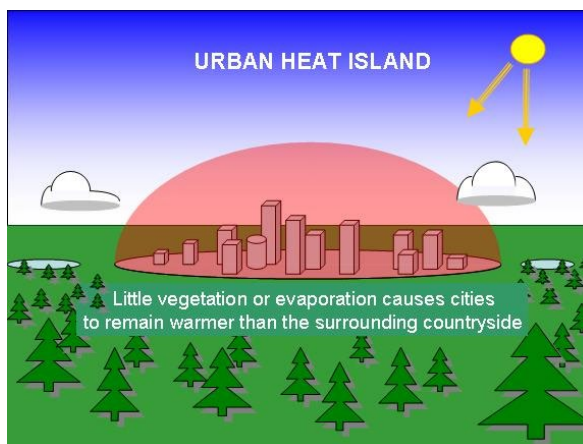
Extreme Cold

Extreme cold temperatures occur throughout most of the winter season and generally accompany most winter storm events throughout the state. Under higher than normal atmospheric pressures when Arctic air masses are present, extreme winter temperatures hover over Broome County, flowing southward from central Canada or the Hudson Bay (NYS DHSES 2014). Extreme cold temperatures of varying degrees occur throughout the county during the winter season. The northern sections of the county (Towns of Lisle, Triangle, Nanticoke, and Barker) and areas with the highest elevations (Town of Sanford, Town of Windsor) typically experience the coldest conditions.



Extreme Heat Temperatures

Extreme heat temperatures of varying degrees occur throughout the county for most of the summer season, except for areas with high altitudes. High-pressure systems often move just off the Atlantic coast and become more or less stagnant for several days, and then a persistent airflow from the southwest or south affects the weather in the state. This circulation brings the very warm, often humid weather of the summer season and the mild, more pleasant temperatures during the fall, winter, and spring seasons (NYS DHSES 2014). Areas of dense urban development, such as the City of Binghamton, are prone to the urban heat island effect phenomenon, which can further raise temperatures.



Source: weatherqusstions.com, 2019

Previous Occurrences and Losses

Extreme temperature events occur each year in Broome County. To identify the events in Broome County, the National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental Information (NCEI) Storm Events database was queried. The 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 negative 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 negative 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.

Between 1954 and August 2018, New York State was not included in any major disaster (DR) or emergency (EM) declarations due to extreme temperatures (heat or cold). However, during the same time period, the FEMA included Broome County in four winter storm-related DR or EM declarations classified as one or a combination of the following disaster types: severe winter storm, snowstorm, snow, ice storm, winter storm, and blizzard (Table 5.4.3-3.). Extreme cold temperatures are often associated with these disaster types.

Table 5.4.3-3. Winter Storm Related Disaster (DR) and Emergency (EM) Declarations 1954-2018

FEMA Declaration Number	Date(s) of Event	Event Type	Details
EM-3107	March 13–17, 1993	Snow	Severe Blizzard
EM-3173	December 25, 2002–January 4, 2003	Snow	Snowstorms



FEMA Declaration Number	Date(s) of Event	Event Type	Details
EM-3184	February 17–18, 2003	Snow	Snow
DR-4322	March 14–15, 2017	Snow	Severe Winter Storm and Snowstorm

Source: FEMA 2018
 DR Major Disaster Declaration (FEMA)
 EM Emergency Declaration (FEMA)
 FEMA Federal Emergency Management Agency

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. Between 2012 and 2018, Broome County was included in the following three USDA declarations involving extreme temperatures:

- S3249 – March 2012 – Frosts and freezes
- S3427 – June 2012 – Drought, excessive heat
- S3746 – February 2014 – Freeze
- S4023 – August 2016 – Drought, heat, excessive heat
- S4031 – September 2016 – Drought, heat, excessive heat

Information regarding specific details of temperature extremes in Broome County is scarce; therefore, previous occurrences and losses associated with extreme temperature events are limited. For this 2019 HMP update, extreme temperature events were summarized from 2012 to 2018 and are identified in Table 5.4.3-5. For events prior to 2012, refer to Appendix E (Supplementary Data).

Table 5.4.3-4. Extreme Temperature Events in Broome County, 2012 to 2018

Dates of Event	Event Type	FEMA Declaration Number (if applicable)	County Designated?	Event Details
March 17, 2012	Heat	N/A	N/A	<p>A period of record warm temperatures was experienced across central New York from March 17th to the 23rd as the jet stream was pushed farther north than is typical for this time of year and persistent southerly flow developed over an unusually large area of the United States. Both climate record stations at Binghamton and Syracuse broke records for the warmest March on record. Both locations were over 12 degrees above normal for the monthly mean temperature. Binghamton saw seven days in a row of record high temperatures, the second longest string on record. Temperatures across central New York reached well into the 70s, with typically warmer valley locations near or just above 80 degrees.</p> <p>Temperatures across central New York were anomalously warm, with record highs reached for 7 days in a row at the Binghamton Regional Airport, the second longest streak on record (8 days from August 28–September 4, 1953). Temperatures reached well into the 70s, with readings as high as the lower 80s in typically warmer valley locations.</p>

Source(s): NYS DHSES 2014; FEMA 2018; NWS 2016; NOAA-NCEI 2018



Note: Many sources were consulted to provide an update of previous occurrences and losses; event details and loss/impact information may vary and has been summarized in the above table.

- FEMA Federal Emergency Management Agency
- NOAA-NCEI National Oceanic Atmospheric Administration – National Centers for Environmental Information
- NWS National Weather Service
- NYS DHSES New York State Department of Homeland Security and Emergency Services
- N/A Not Applicable
- USDA U.S. Department of Agriculture

According to NOAA-NCEI Storm Events Database, Broome County has been impacted by 20 extreme temperature events, causing \$20,000 in property damage, no fatalities, no injuries, and no crop damage.

Table 5.4.3-5. Extreme Temperature Events 1950-2018

Hazard Type	Number of Occurrences Between 1950 and 2018	Total Fatalities	Total Injuries	Total Property Damage (\$)	Total Crop Damage (\$)
Cold/Wind Chill	13	0	0	\$20,000	\$0
Excessive Heat	2	0	0	\$0	\$0
Extreme Cold/Wind Chill	2	0	0	\$0	\$0
Heat	3	0	0	\$0	\$0
TOTAL	20	0	0	\$20,000	\$0

Source: NOAA-NCEI 2018

Climate Change Projections

The frequency and duration of heat waves, defined as three or more consecutive days with maximum temperatures at or above 90 °F, is expected to increase (Table 5.4.6-10). In contrast, extreme cold events, defined both as the number of days per year with minimum temperature at or below 32 °F and those at or below 0 °F, are expected to decrease as average temperatures rise (NYSERDA 2011). With the increase in temperatures, heat waves will become more frequent and intense, increasing heat-related illness and death and posing new challenges to the energy system, air quality and agriculture. Table 5.4.3-6 displays the projected changes in these events and includes the minimum, central range and maximum days per year.

Table 5.4.3-6. Changes in Extreme Events in Region 3 – Heat Waves and Drought Conditions

Event Type (2020s)	Low Estimate (10 th Percentile)	Middle Range (25 th to 75 th Percentile)	High Estimate (90 th Percentile)
Days over 90 degrees Fahrenheit (°F) (8 days)	15	17-21	23
# of Heat Waves (0.7 heat waves)	2	2 to 3	3
Duration of Heat Waves (4 days)	4	4 to 5	5
Days below 32°F (133 days)	119	122 to 130	134

Source: NYSEDA 2014

Probability of Future Occurrences

It is anticipated that Broome County will continue to experience extreme temperatures annually that could coincide with or induce secondary hazards, such as snow, hail, ice or wind storms, thunderstorms, drought,



human health impacts, and utility failures. Table 5.4.3-7 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. Table 5.4.3-7. Probability of Occurrences of Extreme Temperature Events

Hazard Type	Number of Occurrences Between 1950 and 2015	Rate of Occurrence or Annual Number of Events (average)	Recurrence Interval (in years) (# Years/Number of Events)	Probability of Event in any given year	% chance of occurrence in any given year
Cold/Wind Chill	13	0.19	5.31	0.19	18.84
Excessive Heat	2	0.03	34.50	0.03	2.90
Extreme Cold/Wind Chill	2	0.03	34.50	0.03	2.90
Heat	3	0.04	23.00	0.04	4.35
TOTAL	20	0.29	3.45	0.29	28.99

Source: NOAA NCEI 2018

Note: Probability was calculated using the available data provided in the NOAA-NCDC storm events database.

Based on historical records and input from the Planning Committee, the probability of occurrence for extreme temperatures in Broome County is considered *occasional* (hazard event has an annual probability of between 10 and 100 percent).

5.4.3.2 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 Broome County.

Impact on Life, Health and Safety

For the purposes of this HMP, the entire population of Broome County is exposed to extreme temperature events (197,381) (U.S. Census 2016 ACS 5-Year Population Estimate). Extreme temperature events have potential health impacts including injury and death. 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 2017a).

In Broome County, the following areas have the highest concentration of elderly population (over 100 persons per square mile): City of Binghamton and Villages of Deposit, Endicott, Johnson City, Port Dickinson, Whitney Point, and Windsor; locations of higher concentrations might also be present in areas throughout each of the county’s towns. Refer to Figure 4-9 in Section 4 that displays the densities of populations over 65 in Broome County.

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). In Broome County, areas with the highest concentration of low-income populations are very similar to those with the highest concentrations of elderly

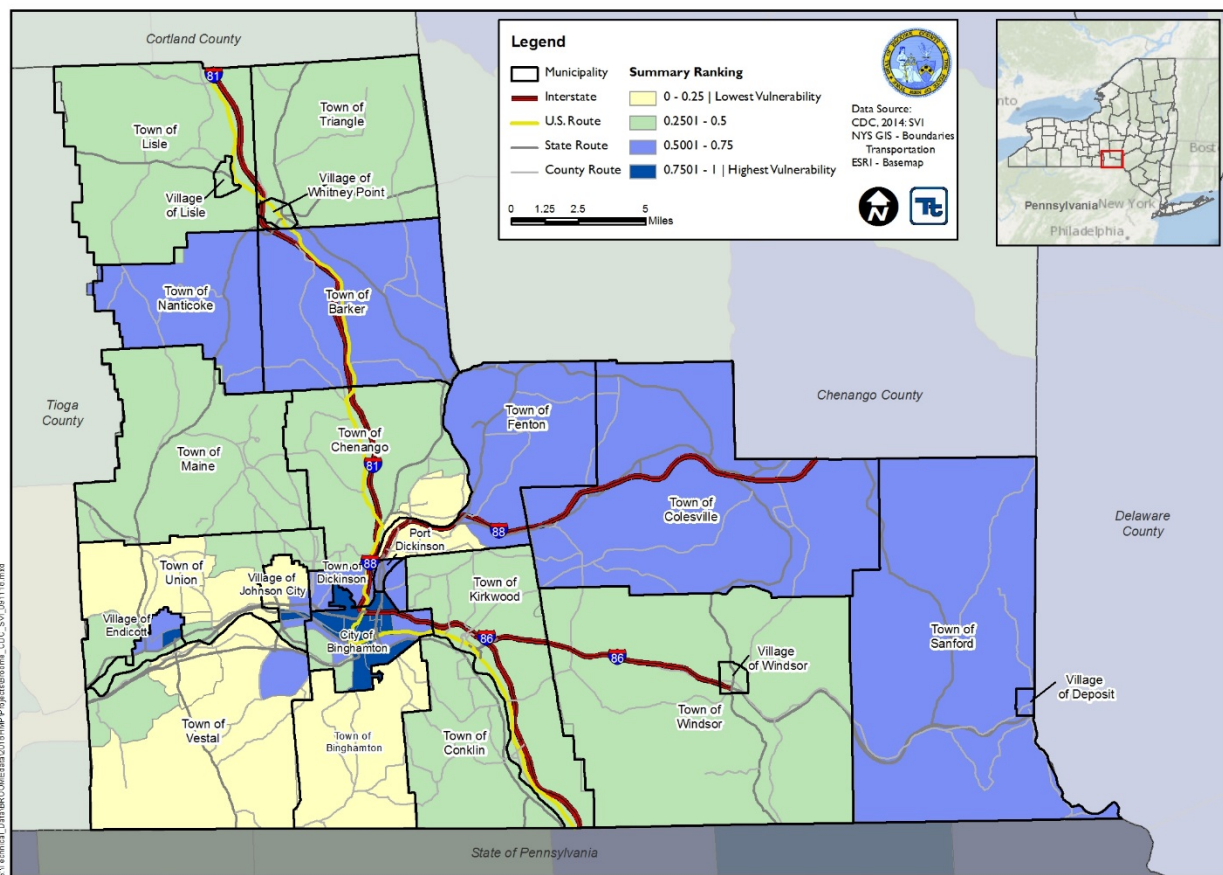


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populations; however, there is fewer high concentrations in the more rural areas of the county's towns. Refer to Figure 4-11 in Section 4 (County Profile) that displays the densities of low-income populations in Broome County.

The Centers for Disease Control's (CDC) 2014 Social Vulnerability Index (SVI) ranks U.S. Census Tracts on socioeconomic status, household composition and disability, minority status and language, and housing and transportation. Census Tracts 2, 5, 6, 11, 13, 17, and 18 in the City of Binghamton; Census Tracts 135 and 137 in the Village of Endicott; and Census Tract 139 in the Village of Johnson City are ranked in the highest vulnerability category with values between 0.759 and 0.996; Census Tract 11 in the City of Binghamton has the highest social vulnerability with a ranking of 0.996. These Census Tracts in the City of Binghamton and Villages of Endicott and Johnson City might be more susceptible to impacts from extreme temperatures. Figure 5.4.3-4 below displays the CDC 2014 SVI.

Figure 5.4.3-4. CDC's Social Vulnerability Index 2014



According to NOAA's 2008 *Winter Storms: The Deceptive Killers*, approximately 50 percent of the injuries related to extreme cold temperatures happen to people over 60 years old, more than 75 percent of those injured are male and about 20 percent occur in the home (NYS DHSES 2014). The homeless and individuals who lack proper sheltering and heating are particularly vulnerable to extreme cold and wind chill. A 2015 point-in-time survey by the coalition (Southern Tier Homeless Coalition) counted 302 homeless people around Broome County, 40 of which were unsheltered, and more than 1,000 individuals total across the Southern Tier experienced homeless at some point in 2014. Almost a third of the region's homeless population lives in Broome County (Pressconnects, 2019).

Exposure to excessive heat can pose a number of health risks to individuals. Table 5.4.3- and 5.4.3-9 identify





different health hazards related to extreme heat conditions.

Table 5.4.3-8. Health Effects of Extreme Cold

Health Hazard	Symptoms
Wind Chill	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. Animals are also affected by wind chill; however, cars, plants and other objects are not.
Frostbite	Frostbite is damage to body tissue caused by extreme cold. A wind chill of -20 degrees Fahrenheit (F) will cause frostbite in just 30 minutes. Frostbite causes a loss of feeling and a white or pale appearance in extremities, such as fingers, toes, ear lobes or the tip of the nose. If symptoms are detected, get medical help immediately! If you must wait for help, slowly re-warm affected areas. However, if the person is also showing signs of hypothermia, warm the body core before the extremities.
Hypothermia	Hypothermia is a condition brought on when the body temperature drops to less than 95 degrees Fahrenheit (F). It can kill. For those who survive, there are likely to be lasting kidney, liver and pancreas problems. Warning signs include uncontrollable shivering, memory loss, disorientation, incoherence, slurred speech, drowsiness and apparent exhaustion. Take the person’s temperature. If below 95 degrees F, seek medical care immediately!

Source: NYS DHSES 2014

Table 5.4.3-9. Health Effects of Extreme Heat

Health Hazard	Symptoms
Sunburn	Redness and pain. In severe cases: swelling of skin, blisters, fevers, and headaches
Dehydration	Excessive thirst, dry lips, and slightly dry mucous membranes
Heat Cramps	Painful spasms, usually in muscles of legs and abdomen, and possible heavy sweating
Heat Exhaustion	Heavy sweating; weakness; cold, pale and clammy skin; weak pulse; possible fainting and vomiting
Heat Stroke	High body temperature (104 °F or higher), hot and dry skin, rapid and strong pulse, and possible coma

Source: NYS DHSES 2014

In addition, safety issues include not only health-related impacts, but domicile impacts as home fires occur more often in winter than any other season (FEMA, 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 the building stock in the county is exposed to the extreme temperature hazard. Refer to Section 4 (County Profile), which summarizes the building inventory in Broome 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 *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 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).

The agricultural industry is most at risk in terms of economic impact and damage due to extreme temperature events. Extreme cold events can result in impact on crops due to a late freeze and facilities such as barns are more vulnerable to fire in the winter. Extreme heat events can result in drought and dry conditions and directly impact livestock and crop production. Based on information from the 2012 Census of Agriculture, 563 farms were present in Broome County, encompassing 79,676 acres of total farmland. The average farm size was 142 acres. Products sold from Broome County farms had a total market value of \$30.7 million (\$18.9 million: milk from cows, \$3.93 million: cattle and calves, \$2.45 million: other crops and hay, averaging \$54,553 per farm. The Census indicated that 275 farm operators reported farming as their primary occupation (USDA 2012).

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 and Change in Population

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. 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 an *island* of higher temperatures (U.S. Environmental Protection Agency [EPA] 2009). 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.

According to population projections from the Cornell Program on Applied Demographics, Broome County will continue to experience a population decrease through 2040 (a decline of over 17,400 people by 2040). However, this does not mean a reduction in vulnerability to the hazard. The County Comprehensive Plan describes the ‘flight of young people’ and the increased aging population of Broome County from 2000 to 2010. As the population continues to age they will be increasingly vulnerable to the extreme temperature hazard. According to the Comprehensive Plan (2012), the county has seen a decrease in population from the City of Binghamton and most villages, while the populations in the rural towns have increased. This may require utility system upgrades to keep up with utility demands (e.g., water, electric) during extreme temperature events. Refer to Section 4.4.2 (Population Trends) in the County Profile for a detailed discussion on population changes.



Climate Change

As discussed earlier, Broome County is projected to experience increases in the average annual temperature by 4.4–6.3 °F by the 2050s and 5.7–9.9 °F by the 2080s. 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 2013 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 systems (e.g., HVAC) if they are not properly maintained. Similarly, an increase in the elderly population remaining in the county increases the vulnerable population.

Issues Identified

The potential issues identified with extreme temperature events include:

- The aging population of the county may result in an increase of residents vulnerable to extreme temperature events as the senior population is less able to withstand extreme temperatures due to age and health conditions.
- Prolonged extreme heat events can lead to drought conditions and impact the drinking water supply for residents.
- Extreme temperature events can damage aging infrastructure and buildings as highways and roads are damaged by excessive heat as the asphalt softens, and roadways can be damaged from extreme cold temperatures causing frost heaving of road infrastructure.
- The increase in population in the rural areas might strain utility systems in affected portions of the county due to larger demand.
- The growing number of homeless in the City of Binghamton could pose an increased health risk to those without proper shelter during extreme temperature events. In order to quantify the number of homeless, the Southern Tier Homeless Coalition does annual counts of the homeless in Broome and surrounding counties.
- A review of available tax assessor data may inform policy makers of areas where the age of housing may indicate areas in need of updated construction/insulation.

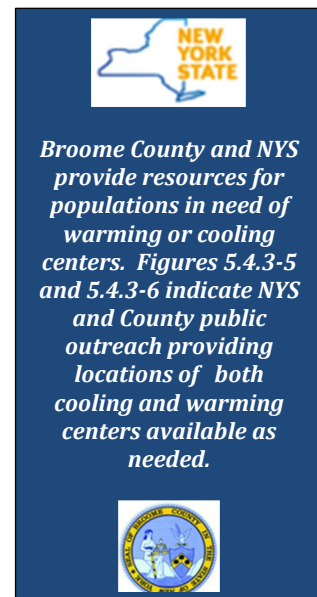




Figure 5.4.3-5. Cooling Center Resource provided by NYS Department of Health

The screenshot shows the NYS Department of Health website. The top navigation bar includes 'Services', 'News', 'Government', and 'Local'. Below this is a purple header with 'Department of Health' and sub-navigation for 'Individuals/Families', 'Providers/Professionals', 'Health Facilities', and 'Search'. The main content area is titled 'Cooling Centers' and features a sidebar with links like 'Home', 'About Cooling Centers', 'Find a Cooling Center', 'Cooling Centers FAQ', 'About Heat Stress', 'About Climate Change', 'Climate Change Research', and 'Contact Us'. The main text reads 'Cooling Centers Reported for Summer 2018 (Excludes New York City)' and includes a warning: 'Always call before you go to make sure the cooling center is open. Some cooling centers are open daily, while others are opened as needed.' It lists several cooling centers in Albany County, including Beltrone Living Center, Cohoes Community Center, and Memorial Town Hall, each with an address and phone number. It also lists centers in Allegany and Broome counties.

Source: <https://www.health.ny.gov/environmental/weather/cooling/countycenters.htm>



Figure 5.4.3-6. Broome County Informational Outreach to Identify Warming Centers

The screenshot shows the Broome County website with a news release titled "Broome County Emergency Services, Health Dept. Warn Residents of Extreme Cold, Wind Chill". The news release text includes:

NEWS RELEASE

(TOWN OF DICKINSON, NY) The Broome County Office of Emergency Services is continuing to monitor the latest weather reports from the National Weather Service in Binghamton.

The NWS Binghamton is reporting Tuesday-Thursday's forecasts include temperatures in the single digits and dangerously low wind chills below zero (-20 and below). The lowest wind chills will occur Wednesday night.

"Our top priority is making sure our residents in Broome County are safe this week with this extreme cold," said County Executive Jason Gaimar. "As soon as I received word of the dangerously low temperatures, I deployed our Office of Emergency Services and Health Department officials to work closely to inform the public of what we can expect and to take action if residents lose power and need help."

As the wind chill increases and temperatures fall to below zero in the Broome County this week, county officials are taking precautions and urging residents to stay safe.

The Broome County Health Department advises that if you must go outdoors, take precautions to keep dry and warm to protect your health. Adults and children should wear: a hat, a scarf or knit mask to cover face and mouth, sleeves that are snug at the wrist, mittens, water-resistant coat and shoes and several layers of loose-fitting clothing to trap body heat.

The outer layer of clothing should be tightly woven, preferably, wind resistant, to reduce body-heat loss caused by wind. Wool, silk, or polypropylene inner layers of clothing will hold more body heat than cotton.

Dressing appropriately for cold weather can help decrease your risk of getting hypothermia or frostbite, two cold weather concerns.

Warning signs of hypothermia include confusion, shivering, difficult speaking, sleepiness and stiff muscles.

In addition to significant risks of hypothermia/frostbite, this may cause problems such as frozen pipes if preventive measures are not taken. Broome County EMS responds to house fires each year caused by people using open flames to thaw frozen pipes.

Do not use an open flame to thaw pipes, as this presents serious risks to people and property.

Improper use of alternative heat sources could lead to carbon monoxide poisoning.

The Office of Emergency Services and Health Department are on standby to work with the American Red Cross to establish warming centers, only if there is a widespread power outage in the county.

The Health Department has compiled a list of public places residents can go to get in from the cold. Residents should check with the establishments for their hours of operation before visiting.

Those places in Broome County include:

- Broome County Public Library, 185 Court Street, Binghamton, 13901, 607-778-6400
- Broome West Senior Center, 2801 Wayne Street, Endwell, 13760, 607-785-3427
- Deposit Senior Center, 14 Monument Street, Deposit, 13754, 607-467-3953
- Eastern Broome Senior Center, 27 Golden Lane, Harpursville, 13787, 607-693-2059
- Fenton Free Library, 1062 Chenango Street, Binghamton, 13901, 607-724-8649
- George F Johnson Memorial Library, 1001 Park Street, Endicott, 13760, 607-757-5350
- Johnson City Senior Center, 30 Benton Street, Johnson City, 13790, 607-792-3445

The website also features various sidebar links such as "PROPERTY TAX SAVINGS PROGRAM", "ECONOMIC DEVELOPMENT PROGRAM", "Broome A to Z", "Broome County Economic Development Group", "Weather Outlook", "QUICK LINKS", "BROOME ONLINE", "EXPLORE BROOME", "SMALL COMMUNITIES FUND", "BOAC", "BROOME COUNTY VETERANS DISCOUNT PROGRAM", "Broome County Dental Card Program", "Greater Binghamton Airport", and "NYSAFE".

Source: <https://gobroomecounty.co.broome.ny.us/node/58535>