



5.4.5 Extreme Temperature

This section provides profile information including description, location, extent, previous occurrences and losses, probability of future occurrences, and climate change impacts as well as the vulnerability assessment for the extreme temperature hazard in Genesee County.

5.4.5.1 Hazard Profile

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 (such as burst pipes and power failure). What constitutes “extreme cold” or “extreme heat” can vary across different areas of the country, based on the population’s experience.

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 characterized by the ambient air temperature dropping to approximately 0 degrees Fahrenheit (°F) or below (National Weather Service [NWS] 2015). Extensive exposure to extreme cold temperatures can cause frostbite or hypothermia and can become life-threatening. Infants and the elderly are most susceptible to the effects of extreme changes in temperatures. 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 particularly at risk, but anyone can be affected (Centers of Disease Control and Prevention [CDC] 2009). In New York State, extreme cold days are defined to reflect the State's regional climate variations. Extreme cold days in the State are individual days with minimum temperatures at or below 32° F or 0° F (NYSERDA 2014).

There are several health hazards 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.

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. 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 2013). In New York State, high temperatures and heat waves are defined in several ways to reflect the diversity of conditions experienced across the State. Extreme hot days in New York State are defined as individual days

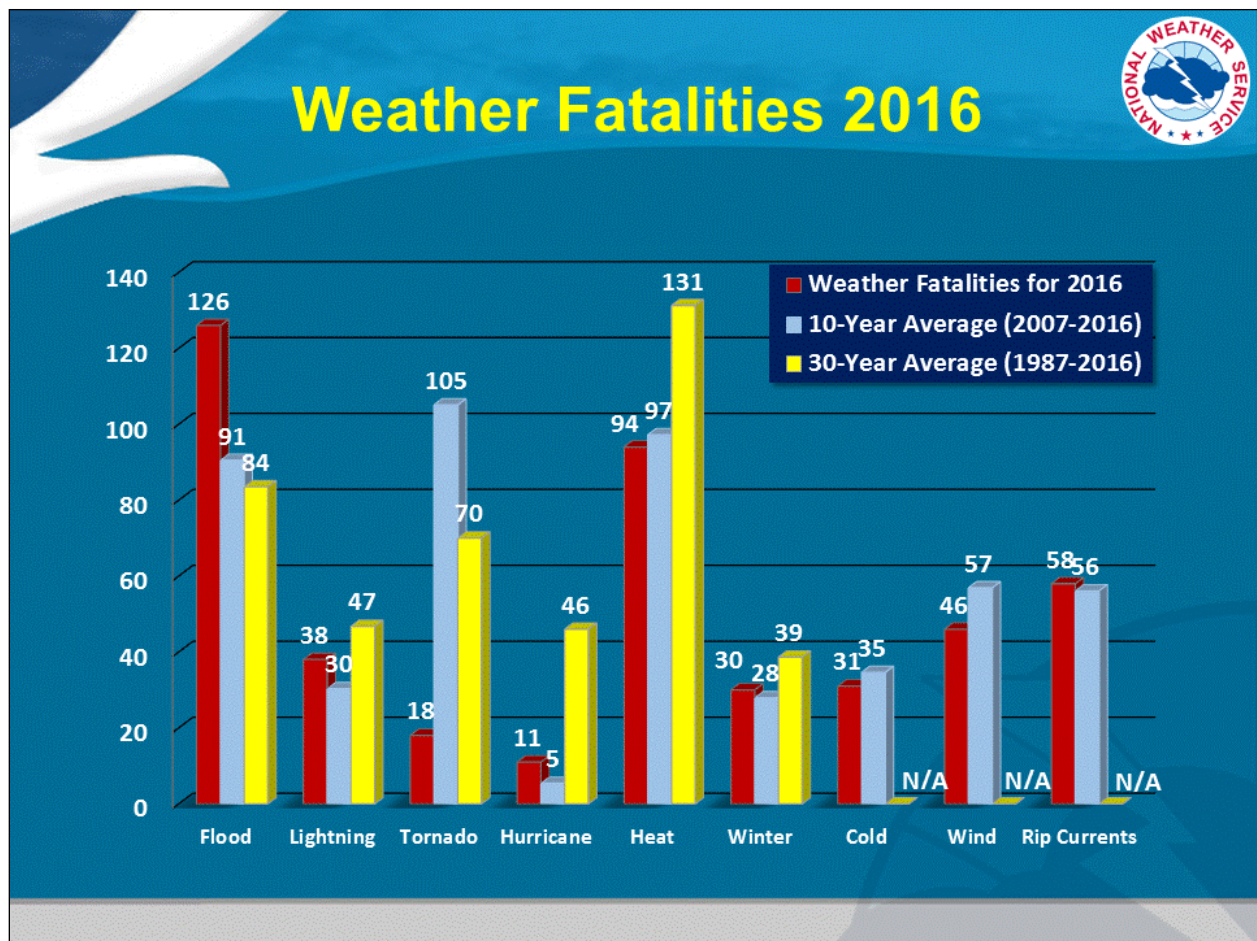


with maximum temperatures at or above 90° F or at or above 95° F. Heat waves are defined as three consecutive days with maximum temperatures above 90° F (NYSERDA 2014).

Depending on severity, duration, and location, extreme heat events can create or provoke secondary hazards, including but not limited to dust storms, droughts, wildfires, water shortages and power outages (CDC 2016). This could result in a broad and far-reaching set of impacts throughout a local area or entire region. Impacts could include significant loss of life and illness; economic costs in transportation, agriculture, production, energy and infrastructure; and losses of ecosystems, wildlife habitats and water resources (Adams Date Unknown; Meehl and Tebaldi 2004; CDC 2016; NYS DHSES 2014).

Extreme heat one of the leading weather-related causes of death in the United States. On average, 131 people die each year from excessive heat. Figure 5.4.5-1 shows the number of weather fatalities based on a 10-year average and 30-year average. Heat has the highest average of weather-related fatalities between 1987 and 2016.

Figure 5.4.5-1. Average Number of Weather Related Fatalities in the U.S.



Source: NWS 2016

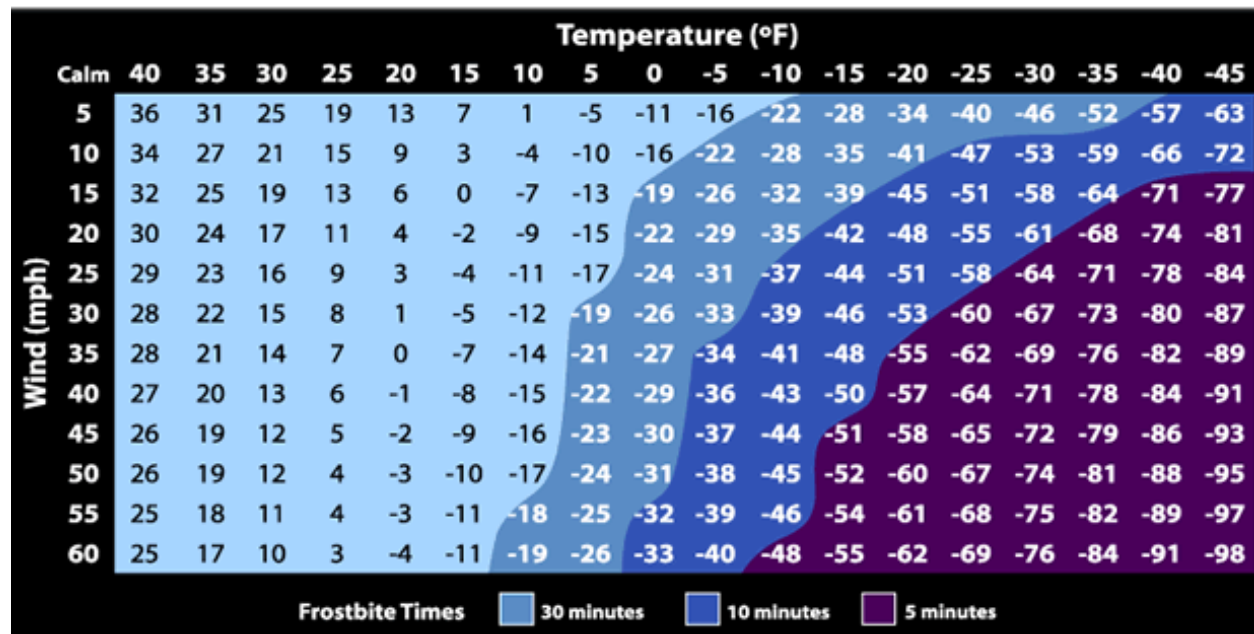


Extent

Extreme Cold

The extent (severity or magnitude) of extreme cold temperatures is generally measured through the Wind Chill Temperature (WCT) 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. For details regarding the WCT, refer to: <http://www.nws.noaa.gov/om/winter/windchill.shtml>. The WCT is presented in Figure 5.4.5-2.

Figure 5.4.5-2. NWS Wind Chill Index



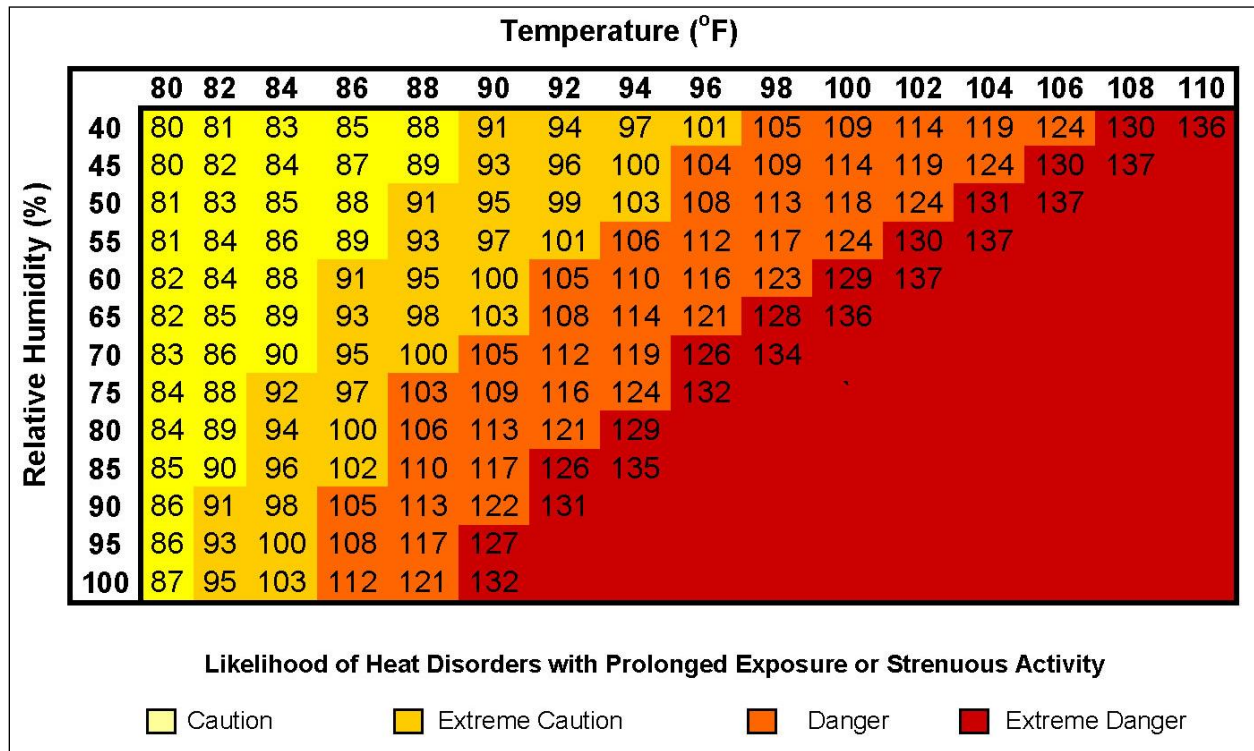
Source: NWS 2001

Extreme Heat

The extent of extreme heat temperatures is generally measured through the heat index, identified in Table 5.4.5-1. 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 (as seen in Table 5.4.5-1). This index provides a measure of how temperatures actually 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).



Table 5.4.5-1. NWS Heat Index Chart



Source: NWS Date Unknown

Table 5.4.5-2 describes the adverse effects of prolonged exposure to heat and humidity on an individual.

Table 5.4.5-2. 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/heat exhaustion possible with prolonged exposure and/or physical activity.
Extreme Caution	90°F–105°F	Sunstroke, muscle cramps, and/heat exhaustions possible with prolonged exposure and/or physical activity.
Caution	80°F–90°F	Fatigue possible with prolonged exposure or physical activity.

Source: NYS DHSES 2014

The NWS provides alerts when heat indices approach hazardous levels. Table 5.4.5-3 explains these alerts. In the event of an extreme heat advisory, the 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 (NYS DHSES 2014)





Table 5.4.5-3. National Weather Service Alerts

Alert	Criteria
Heat Advisory	Issued 12 to 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
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 3 hours per day for 2 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 (HMP) 2014 Update, 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 of movement of great high pressure systems into and through the eastern United States (NYS DHSES 2014).

Extreme cold temperatures occur throughout most of the winter season and generally accompany most winter storm events throughout the State. The New York State Climate (NYSC) Office of Cornell University indicates that cold temperatures prevail over the State whenever arctic air masses, under high barometric pressure, flow southward from central Canada or from Hudson Bay. Extreme heat temperatures of varying degrees are existent throughout the State for most of the summer season, except for areas with high altitudes (Cornell University Date Unknown). The location of Genesee County within the State makes it susceptible to both extreme cold and extreme heat temperature events.

Extreme Cold Temperatures

Extreme cold temperatures occur throughout most of the winter season and generally accompany most winter storm events throughout the State. The NYSC Office of Cornell University indicates that cold temperatures prevail over the State whenever arctic air masses under high barometric pressure flow southward from central Canada or from Hudson Bay (Cornell University). Temperature readings have been recorded at Batavia since June 1911 and have been used to represent climatic conditions in Genesee County. According to historical conditions from this recording station, Genesee County’s average annual low temperature is 38.7°F (MRCC 2017). As provided by Midwest Regional Climate Center (MRCC), average high and low temperatures during the winter months around Genesee County are identified in Table 5.4.5-4.

Table 5.4.5-4. Average High and Low Temperature Range for Winter Months in Genesee County

Month	Average High	Average Low	Record Low Event(s)
November	49°F	33°F	1°F on 11/30/1936
December	37°F	23°F	-18°F on 12/25/1980
January	32°F	17°F	-24°F on 1/15/1957
February	35°F	18°F	-28°F on 2/9/1934
March	44°F	26°F	-11°F on 3/19/1993

Source: MRCC 2017

Extreme Heat

Extreme heat temperatures of varying degrees exist throughout the State for most of the summer season, except for areas at high altitudes. Temperatures at any one place in the County normally exceed 90°F roughly nine





times each summer. It is uncommon for air temperatures to reach triple digits; however, higher temperatures combined with humidity may lead to conditions that feel much hotter (NWS Buffalo, 2015). Temperature readings have been recorded at Batavia since June 1911 and have been used to represent climatic conditions in Genesee County. According to historical conditions from this recording station, Genesee County’s average annual high temperature is 57.4°F (MRCC 2017). As provided by MRCC, average high and low temperatures during the summer months around Genesee County are identified in Table 5.4.5-5.

Table 5.4.5-5. Average High and Low Temperature Range for Summer Months in Genesee County

Month	Average High	Average Low	Record High Event(s)
May	69°F	47°F	93°F on 5/30/2006
June	78°F	57°F	95°F on 6/26/1988
July	81°F	62°F	103°F on 7/13/1936
August	80°F	60°F	96°F on 8/28/1948
September	73°F	53°F	96°F on 9/15/1939

Source: MRCC 2017

Previous Occurrences and Losses

Many sources provided historical information regarding previous occurrences and losses associated with extreme temperatures throughout New York State and Genesee County. With so many sources reviewed for this HMP, loss and impact information for many events could vary. Therefore, the accuracy of monetary figures discussed is based only on the available information identified during research for this HMP.

The MRCC operates the MRCC's Application Tools Environment (cli-MATE), which provides access to climate data and value-added tools. This application can be used to look up information that includes raw climate data, rankings of climate information, thresholds, growing season tools, maps, and graphs. The maximum and minimum temperatures and the maximum average and minimum average for the stations in Genesee County were queried for information between 2012 and 2017 for this hazard profile. Based on the cli-MATE application and the data provided by MRCC, Table 5.4.5-6 presents the extreme cold (minimum) and hot (maximum) temperature records for the Batavia weather station from 2010 to 2016.

Table 5.4.5-6. MRCC Temperature Extremes–Genesee County

Year	Max (°F)	Max Date	Min (°F)	Min Date	Avg Max (°F)	Avg Min (°F)
2010	93	7/8/2010	-5	1/30/2010	57.4	42
2011	94	7/21/2011	4	2/10/2011	61.9	42.1
2012	92	7/6/2010	1	1/4/2012	61.7	43.2
2013	92	7/18/2013	-2	12/17/2013	58.1	40.5
2014	89	9/6/2014	-9	1/22/2014	57.2	38.7
2015	91	5/10/2015	-11	2/20/2015	58.9	40.1
2016	94	7/9/2016	-15	2/14/2016	61.5	42.2

Source: MRCC 2017

Between 1954 and 2016, New York State has not been included in any major disaster (DR) or emergency (EM) declarations due to extreme temperatures. Agriculture-related disasters are quite common. 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 2016, Genesee County was included in three USDA declarations involving extreme temperatures.

- S3427 (drought, excessive heat) – June 2012
- S3672 (freeze) – December 2013-March 2014
- S3777 (excessive snow, flooding, freeze and high winds) – November 2014

United States Department of Agriculture (USDA) crop losses provide another indicator of the severity of previous events. Agriculture-related disasters are quite common. Additionally, crop losses can have a significant impact on the economy by reducing produce sales and purchases. These impacts may have long-term consequences, particularly if crop yields are low the following years as well. Table 5.4.5-7 presents the crop losses from extreme temperature events in Genesee County, as reported by the USDA. This table includes information from 2012 to 2016.

Table 5.4.5-7. USDA Crop Losses from Extreme Temperature in Genesee County

Year	Crop Type	Cause of Loss	Losses
2013	Processing Beans	Heat	\$32,644.00
2014	Wheat	Cold Winter	\$5,405.00
2014	Wheat	Cold Winter	\$3,090.00
2014	Corn	Cold Winter	\$3,541.50
2014	Corn	Cold Winter	-\$2,709.00
2014	Sweet Corn	Heat	-\$13,671.00
2014	Sweet Corn	Heat	\$26,313.00

Source: USDA 2017

Information regarding specific details of temperature extremes in Genesee 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 2007 to 2017 and are identified in Table 5.4.5-8. For events prior to 2007, refer to the 2008 Genesee County HMP. Please note that not all events that have occurred in Genesee County are included due to the extent of documentation and the fact that not all sources may have been identified or researched. Loss and impact information could vary depending on the source. Therefore, the accuracy of monetary figures discussed is based only on the available information identified during research for this HMP. For detailed information on damages and impacts to each municipality, refer to Section 9 (jurisdictional annexes).



Table 5.4.5-8. Extreme Temperature Events in Genesee County, 2007 to 2017

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	County Designated?	Losses / Impacts
January 26, 2007	Cold Temperatures	No	N/A	Maximum low temperature of -2°F was recorded at Batavia
February 5, 2007	Cold Temperatures	No	N/A	Maximum low temperature of -2°F was recorded at Batavia
February 15, 2007	Cold Temperatures	No	N/A	Maximum low temperature of -3°F was recorded at Batavia
March 6, 2007	Cold Temperatures	No	N/A	Maximum low temperature of -3°F was recorded at Batavia
June 26-28, 2007	Warm Temperatures	No	N/A	Maximum high temperatures of reached 90°F at Batavia
July 9–11, 2007	Warm Temperatures	No	N/A	Maximum high temperatures ranged from 90°F to 91°F at Batavia
August 1–4, 2007	Warm Temperatures	No	N/A	Maximum high temperatures ranged from 90°F to 93°F at Batavia
September 6–8, 2007	Warm Temperatures	No	N/A	Maximum high temperatures ranged from 90°F to 92°F at Batavia
January 3, 2008	Cold Temperatures	No	N/A	Maximum low temperature of 0°F was recorded at Batavia
February 11, 2008	Cold Temperatures	No	N/A	Maximum low temperature of 0°F was recorded at Batavia
January 14, 2009	Cold Temperatures	No	N/A	Maximum low temperature of -1°F was recorded at Batavia
January 15, 2009	Cold Temperatures	No	N/A	Maximum low temperature of 0°F was recorded at Batavia
January 17, 2009	Cold Temperatures	No	N/A	Maximum low temperature of -1°F was recorded at Batavia
February 5, 2009	Cold Temperatures	No	N/A	Maximum low temperature of -3°F was recorded at Batavia
January 30–31, 2009	Cold Temperatures	No	N/A	Maximum lows of between -5°F and 0°F were recorded at the Batavia weather station.
July 5–9, 2010	Warm Temperatures	No	N/A	For five days, the maximum high at the Batavia weather station was over 90°F. Temperatures ranged from 90°F on July 5th to 93°F on July 8th.
January 23–24, 2011	Cold Temperatures	No	N/A	Maximum lows of between -11°F and -2°F were recorded at the Batavia weather station.
July 11, 2011	Warm Temperatures	No	N/A	Maximum high temperature of 91°F was recorded at Batavia
July 20–23, 2011	Warm Temperatures	No	N/A	The County experienced four days of above 90°F temperatures.
June 21, 2012	Warm Temperatures	No	N/A	Maximum high temperature of 90°F was recorded at Batavia
July 6–8, 2012	Warm Temperatures	No	N/A	Maximum high temperatures ranged from 90°F to 92°F were recorded at Batavia
July 12–14, 2012	Warm Temperatures	No	N/A	Maximum high temperatures ranged from 90°F to 92°F were recorded at Batavia
July 17–18, 2012	Warm Temperatures	No	N/A	Maximum high temperatures reached 92°F
July 23–24, 2012	Warm Temperatures	No	N/A	Maximum high temperatures reached 90°F



Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	County Designated?	Losses / Impacts
August 4–5, 2012	Warm Temperatures	No	N/A	Maximum high temperatures ranged from 91°F to 92°F were recorded at Batavia
July 14–20, 2013	Warm Temperatures	No	N/A	Maximum high temperatures ranged from 90°F to 92°F were recorded at Batavia
December 17, 2013	Cold Temperatures	No	N/A	A maximum low temperature of -2°F was recorded at Batavia
January 2–4, 2014	Extreme Cold			An arctic air mass brought extremely cold air to the region. Overnight temperatures were around zero while daytime highs could only reach the single digits on the 3rd. The temperatures combined with winds of 10 to 20 mph produced wind chills around -20°F. In Genesee County, maximum lows ranged from -2°F to -1°F. In the Town of Byron, a 71-year-old woman wandered outdoors from her home after waking in the middle of the night. The woman’s body was found frozen later that morning about 100 yards from her home.
January 7–8, 2014	Cold Temperatures	No	N/A	A maximum low temperature of -7°F was recorded at Batavia
January 21–24, 2014	Cold Temperatures	No	N/A	Maximum low temperatures ranged from -9°F to 0°F
January 28–29, 2014	Cold Temperatures	No	N/A	Maximum low temperatures ranged from -3°F to -2°F
February 12, 2014	Cold Temperatures	No	N/A	A maximum low temperature of -7°F was recorded at Batavia
February 17, 2014	Cold Temperatures	No	N/A	A maximum low temperature of 0°F was recorded at Batavia
February 28, 2014	Cold Temperatures	No	N/A	A maximum low temperature of -4°F was recorded at Batavia
March 4, 2014	Cold Temperatures	No	N/A	A maximum low temperature of -2°F was recorded at Batavia
March 6, 2014	Cold Temperatures	No	N/A	A maximum low temperature of -3°F was recorded at Batavia
January 8, 2015	Cold Temperatures	No	N/A	A maximum low temperature of 0°F was recorded at Batavia
January 13–14, 2015	Cold Temperatures	No	N/A	Maximum low temperatures between -6°F and -4°F were recorded in Batavia
January 17, 2015	Cold Temperatures	No	N/A	A maximum low temperature of -4°F was recorded at Batavia
February 13, 2015	Cold Temperatures	No	N/A	A maximum low temperature of -5°F was recorded at Batavia
February 15-28, 2015	Cold Temperatures	No	N/A	Maximum low temperatures between -11°F and 0°F were recorded in Batavia
March 1, 2015	Cold Temperatures	No	N/A	A maximum low temperature of 0°F was recorded at Batavia
March 6, 2015	Cold Temperatures	No	N/A	A maximum low temperature of -1°F was recorded at Batavia
May 10, 2015	Warm Temperatures	No	N/A	A maximum high of 91°F was recorded at Batavia
July 29–30, 2015	Warm Temperatures	No	N/A	A maximum high of 91°F was recorded both days at Batavia
July 30, 2015	Warm Temperatures	No	N/A	A maximum high of 91°F was recorded at Batavia



Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	County Designated?	Losses / Impacts
September 8, 2015	Warm Temperatures	No	N/A	A maximum high of 91°F was recorded at Batavia
September 9, 2015	Warm Temperatures	No	N/A	A maximum high of 90°F was recorded at Batavia
February 13–15, 2016	Warm Temperatures	No	N/A	Maximum lows ranged from -15°F to -3°F at Batavia
May 28–29 2016	Warm Temperatures	No	N/A	Maximum highs ranged from 90°F to 91°F at Batavia
June 26–27, 2016	Warm Temperatures	No	N/A	A maximum high of 92°F was recorded both days at Batavia
July 7, 2016	Warm Temperatures	No	N/A	A maximum high of 90°F was recorded both days at Batavia
July 9, 2016	Heat	No	N/A	A maximum high of 94°F was recorded at the Batavia weather station
July 12–14, 2016	Warm Temperatures	No	N/A	Maximum highs ranged from 90°F to 92°F at Batavia
August 4–6, 2016	Warm Temperatures	No	N/A	A maximum high of 91°F was recorded all three days at Batavia
August 10–13, 2016	Warm Temperatures	No	N/A	Maximum highs ranged from 90°F to 92°F at Batavia

Source(s): NYS DHSES 2014; FEMA 2016; NWS 2016; NOAA-NCEI 2016; USDA 2016; MRCC 2017

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



Probability of Future Events

According to the New York State HMP 2014 Update, there is an overall 6 percent average future probability that an extreme heat occurrence will impact the State at any given year. Extreme cold events have a 7 percent average future probability of occurrence (NYS DHSES 2014). It is estimated that Genesee County will continue to experience extreme temperatures annually that may induce secondary hazards such potential snow, hail, ice or wind storms, thunderstorms, drought, human health impacts, utility failure and transportation accidents as well as many other anticipated impacts.

According to the 2014 New York State HMP Update, Genesee County had two extreme temperature events between 1960 and 2012 that resulted in \$806 in property damage. According to the NOAA National Centers for Environmental Information (NCEI) database, Genesee County experienced one extreme temperature event between 1950 and 2016. Based on previous events identified above, Genesee County has experienced extreme temperature events periodically, and will continue to experience them in the future.

Based on historical records and input from the Planning Committee, the probability of occurrence for extreme temperatures in Genesee County is considered “frequent” (hazard event that is likely to occur within 25 years) (see Section 5.3, Tables 5.3-1 and 5.3-3).

Climate Change Impacts

Climate change is beginning to affect both people and resources in New York State, and these impacts are projected to continue growing. Impacts related to increasing temperatures and sea level rise are already being felt in the State. ClimAID: the Integrated Assessment for Effective Climate Change in New York State (ClimAID) was undertaken to provide decision-makers with information on the State’s vulnerability to climate change and to facilitate development of adaptation strategies informed by both local experience and scientific knowledge (NYSERDA 2011).

Each region in New York State, as defined by ClimAID, has attributes that will be affected by climate change. Genesee County is part of geographical Region 1, Western New York and the Great Lakes Plain. Some of the climate change-related issues in this region include relatively low rainfall and increased risk of summer drought, high-value crops could need irrigation, and improved conditions for grapes projected (NYSERDA 2014).

Temperatures in New York State are warming, with an average rate of warming over the past century of 0.25°F per decade. Average annual temperatures are projected to increase across New York State by 2°F to 3.4°F by the 2020s, 4.1°F to 6.8°F by the 2050s, and 5.3°F to 10.1°F by the 2080s. By the end of the century, the greatest warming is projected to be in the northern section of the State. In Region 1, it is estimated that temperatures will increase by 4.3°F to 6.3°F by the 2050s and 5.7°F to 9.6°F by the 2080s (baseline of 47.7°F) (NYSERDA 2014). Extreme events are also projected to increase, as illustrated in Table 5.4.5-9 below:

Table 5.4.5-9. Extreme Event Projections for Region 1

Table with 4 columns: Event Type (2020s), Low Estimate (10th Percentile), Middle Range (25th to 75th Percentile), High Estimate (90th Percentile). Rows include: Days over 90 °F (8 days), # of heat waves (0.7 heat waves), Duration of heat waves (4 days), Days below 32 °F (133 days).



Sources: NYSERDA 2014

5.4.5.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For the extreme temperature events, the entire County has been identified as exposed. Therefore, all assets in the County (population, structures, critical facilities, and lifelines), as described in the County Profile (Section 4), are exposed and potentially vulnerable. The following text evaluates and estimates the potential impact of extreme temperatures on Genesee County, including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on: (1) life, health, and safety of residents, (2) general building stock, (3) critical facilities, (4) economy, and (5) future growth and development
- Change of vulnerability as compared to that presented in the 2008 Genesee County HMP
- Effect of climate change on vulnerability
- Additional data and next steps

Overview of Vulnerability

Extreme temperatures generally occur for a short period of time but can cause a range of impacts, particularly to vulnerable populations that may not have access to adequate cooling or heating. This natural hazard can also cause impacts to agriculture (crops and animals), infrastructure (for example, through pipe bursts associated with freezing and from power failure), and the economy.

Data and Methodology

At the time of this HMP, insufficient data is available to model the long-term potential impacts of extreme temperature on Genesee County. Over time, additional data will be collected to allow better analysis for this hazard. Available information and a preliminary assessment are provided below.

Impact on Life, Health, and Safety

For the purposes of this HMP, the entire population of Genesee County is exposed to extreme temperature events. Refer to Section 4 for a summary of population statistics for the County.

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 who are physically ill (e.g., heart disease or 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 2006).

According to NOAA's 2001 Winter Storms The Deceptive Killers, approximately 50 percent of the deaths related to extreme cold temperatures happen to people over 60 years old, more than 75 percent of those deaths are male and about 20 percent occur in the home (NOAA 2001; NYS DHSES 2014).

Exposure to excessive heat can post a number of health risks to individuals. Table 5.4.5-10 identifies different health hazards related to extreme heat conditions, and Table 5.4.5-11 identifies hazards related to extreme cold.



Table 5.4.5-10. 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

Table 5.4.5-11. 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

Meteorologists can accurately forecast extreme heat 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 of the building stock in the County is exposed to the extreme temperature hazard. Refer to Section 4, which summarizes the building inventory in Genesee County. Extreme heat generally does not impact buildings. Losses may 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. Additionally, manufactured homes (mobile homes) and antiquated or poorly constructed facilities may 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, appliances, etc.





Similarly, heavy snowfall and ice storms, associated with extreme cold temperature events, can cause power interruption as well. 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/loss of inventory. Business-owners may 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 heat events can result in drought and dry conditions and directly impact livestock and crop production.

Future Growth and Development

As discussed in Sections 4 and 9, areas targeted for future growth and development have been identified across Genesee County. Any areas of growth could be potentially impacted by the extreme temperature hazard because the entire County is exposed and potentially vulnerable. Please refer to the specific areas of development indicated in tabular form and/or on the hazard maps included in the jurisdictional annexes in Volume II, Section 9 of this plan.

Effect of Climate Change on Vulnerability

Climate is defined not simply as average temperature and precipitation but also by the type, frequency, and intensity of weather events. Both globally and at the local scale, climate change has the potential to alter the prevalence and severity of extremes such as extreme temperature events. While predicting changes of extreme temperature events under a changing climate is difficult, understanding vulnerabilities to potential changes is a critical part of estimating future climate change impacts on human health, society and the environment (U.S. Environmental Protection Agency [EPA] 2006).

Change of Vulnerability

Overall, the County's vulnerability has not changed since the 2008 HMP, and the entire County will continue to be exposed and vulnerable to extreme temperature events.

Additional Data and Next Steps

For future plan updates, the County can track data on extreme temperature events, obtain additional information on past and future events, particularly in terms of any injuries, deaths, shelter needs, pipe freeze, agricultural losses, and other impacts. This will help to identify any concerns or trends for which mitigation measures should be developed or refined. In time, quantitative modeling of estimated extreme heat and cold events may be feasible as data is gathered and improved.