

NEW YORK STATE | Extreme Heat Action Planning

EXTREME HEAT IN NEW YORK STATE

SUMMARY OF IMPACTS AND VULNERABILITIES

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Preferred Citation

New York State. 2024. *Extreme Heat in New York State. Summary of Impacts and Vulnerabilities* https://dec.ny.gov/environmental-protection/climate-change/effects-impacts/extreme-heat

Keywords

New York State, Climate Adaptation, climate resilience, extreme heat, extreme heat adaptation plan, Extreme heat adaptation plan Work Group, EHAPWG, Department of Environmental Conservation, DEC, New York State Energy Research and Development Authority, NYSERDA, climate change, risk, vulnerability, equity, climate justice, environmental justice, disadvantaged communities

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I. INTRODUCTION

Extreme heat is a significant public health threat. No other weather-related hazard kills more people than extreme heat, yet it rarely attracts the same public attention as other hazards such as tornadoes, hurricanes and severe storms, or flooding disasters. Extreme heat is less visible, slow to unfold, and disproportionately impacts the most vulnerable members of our communities, which can make extreme heat impacts hard to identify—especially during the early onset of an extreme heat event—and has earned this hazard a reputation as silent killer.

Climate change will significantly increase the frequency, severity, and duration of extreme heat events in every region of New York State. By the 2050s, extreme heat events are expected to become more frequent, severe, and prolonged. Impacts are already increasing across the state and the country. Over the past 20 years, reported heat-related mortality across the United States (U.S.) has increased rapidly, and experts suggest that actual mortality might be significantly higher. By the 2050s, New York City (NYC) is expected to experience approximately 30–46 days annually with the heat index reaching 95°F or above, compared to an average of six such days per year between 1981 and 2010. By contrast, in the Saint Lawrence Valley, one New York State's regions that currently experiences extreme heat events infrequently, such events are expected to become common, with approximately three to eight annual heat waves projected to occur by the 2080s.[1] With increases in the number and severity of extreme heat events, such events have drawn greater attention and created a renewed impetus for communities and governments to develop strategies for community preparedness, hazard mitigation, and climate adaptation.

The risks, impacts, and vulnerabilities in this report are dynamically unfolding as climate change progresses and are projected to become more severe with increasing warming and under ecological or societal conditions of high exposure and vulnerability. Risks, impacts, and vulnerabilities further unfold within highly localized contexts. This report describes overarching risks and does not list them in order of severity, scale of impact, or priority.

New York State is taking action to address current and future extreme heat impacts. In her 2022 State of the State address, Governor Kathy Hochul directed the Department of Environmental Conservation (DEC) and the New York State Energy Research and Development Authority (NYSERDA) to develop the *Extreme Heat Action Plan* (EHAP) that addresses impacts on disadvantaged communities, in areas of employment, and in recreational zones across the state.[2] In her 2024 State of the State address, Governor Hochul advanced important climate adaptation initiatives, including to address the impacts of extreme heat.[3] DEC and NYSERDA have convened the Extreme Heat Action Plan Work Group (EHAPWG) in a whole-of-State-government effort to address extreme heat. The EHAPWG has begun coordinating a statewide response to extreme heat through immediate action, extreme heat emergency response, climate adaptation planning, and the

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[1] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate.* 2024.
[2] New York State 2022, New York State of the State 2022.
[3] New York State 2024, New York State of the State 2024.

continued study and monitoring of risks (Table 1). To support State and local extreme heat action planning, the EHAPWG is releasing this report, which summarizes key impacts and vulnerabilities.

The Extreme Heat Action Plan can be found here: https://dec.ny.gov/environmental-protection/climate-change/effects-impacts/extreme-heat.

Table 1. New York State extreme heat action planning initiatives

Take immediate action	In July 2022, the EHAPWG released the ***Interim Recommendations* report**[4] with recommendations for immediate actions the State could take to address acute impacts with existing resources and capacities.
Respond to emergencies	In June 2023, the Division of Homeland Security and Emergency Services (DHSES) released the **"Extreme Heat Annex"**[5] to the State *Comprehensive Emergency Management Plan* (CEMP) to coordinate the State's response to declared extreme heat emergencies.
Adapt to current and future conditions	With this document, the EHAPWG is releasing the ***State's Extreme Heat Action Plan*** to increase New York State's resilience and capacity to adapt to extreme heat. The EHAP describes recommended actions for the State to take, timeframes and anticipated outcomes for recommended actions, and opportunities for building on these actions in future updates.
Support evidence-based planning	The EHAPWG developed this report, titled ***Extreme Heat in New York State***, that examines current and projected extreme heat conditions, impacts, and vulnerabilities to help local extreme heat planning.

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[4] New York State. July 2022. *Extreme Heat Action Plan Workgroup Interim Recommendations*. Available at https://www.dec.ny.gov/docs/administration_pdf/ehapinterimrecommendationsreport.pdf.

[5] New York State. June 2023. *State Comprehensive Emergency Management Plan*. Available at https://www.dhses.ny.gov/system/files/documents/2023/05/final-nys-extreme-heat-annex-june-2023.pdf.

II. EXTREME HEAT IN A CHANGING CLIMATE

Extreme heat constitutes a significant public health threat (Figure 1), with significant extreme heat events causing severe impacts on communities across the U.S. and Europe (Figure 2). No other weather-related hazard kills more people than extreme heat. Regions that already experience frequent heat impacts will likely see increases in their severity, frequency, and duration. Regional projections of frequency, severity, and duration of extreme heat days and events are provided as part of the *New York State Climate Impacts Assessment*.[6]

Impacts associated with more frequent and severe extreme heat events may be exacerbated in communities that already experience disproportionate environmental and health burdens, including disadvantaged communities. Experiences with and impacts of extreme heat vary widely across impacted geographies, communities, and people. In most of the U.S., including New York State, heat deaths "have been concentrated in poor, minority, and marginalized communities," often due to inadequate housing, cost of air, lack of green space, and exacerbating factors related to poverty and marginalization.[7] Effective conditioning adaptation should prioritize disadvantaged, historically marginalized, and poorer communities.

Without adaptation, the expected increases in severity, frequency, and duration of extreme heat events will likely lead to significant impacts across the state's communities. Regions that have historically been less likely to experience extreme heat events today may face additional vulnerabilities due to their limited adaptive capacities. Urban areas face further challenges as the urban built environment amplifies extreme heat exposures, while rural communities and agricultural economies face challenges (some of which also apply to urban and sub-urban areas) related to occupational heat exposure, energy poverty, inefficient housing, lack of access to medical care, and limitations on solutions for heat adaptation. A focus on heat adaptation strategies specific to urban areas has resulted in the under-prioritization of solutions tailored for rural areas. Some solutions feasible for urban areas—such as cooling centers—cannot be effectively implemented in rural areas, given differences in population density and the robustness of community lifelines.[8]

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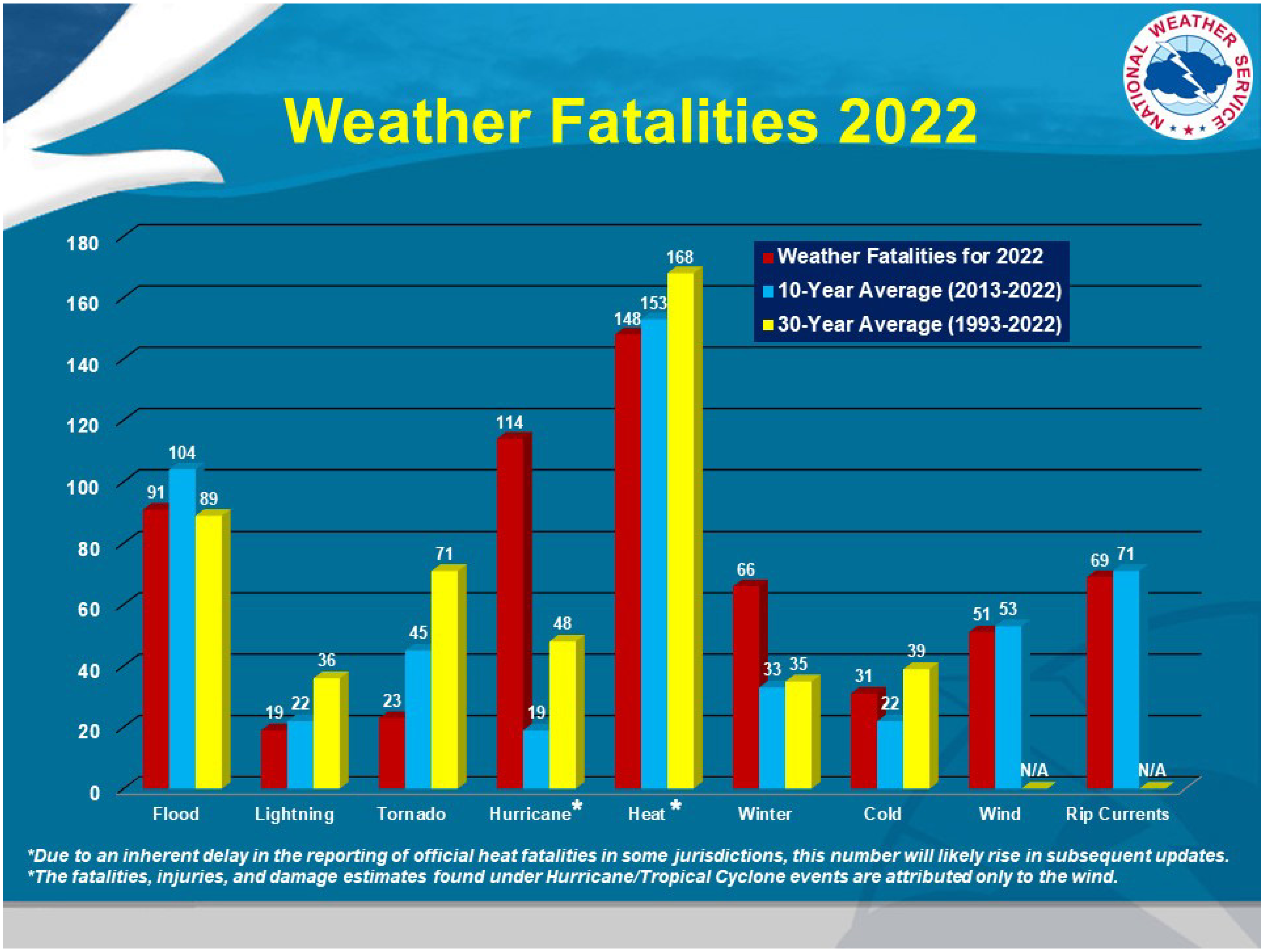
[6] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate.* 2024

[7] Jones 2023 provides a brief history of heat-health policy in the US, and discusses drivers of current impacts.

[8] Ogur 2023

Figure 1. Weather fatalities per hazard for 2022, U.S.[9]



Many solutions to reduce the impacts of extreme heat (e.g., air conditioning, recreational activities such as swimming, or seeking refuge in cooler green spaces) are not readily available, accessible, or affordable for all, particularly for those most vulnerable to extreme heat. At the same time, some common adaptations can pose new risks or shift them onto others. Adaptation must weigh numerous factors and outcomes, including immediate public health needs, long-term effects, and considerations related to equitable access to readily available solutions. Equitable access to air conditioning is a critical aspect in protecting heat-vulnerable communities from the immediate and acute risks extreme heat poses to their health. Further, the widespread but inequitable adoption of air conditioning drives up the heat in cities and can further expose those that experience housing insecurity and homelessness or cannot afford their own air conditioning. It is therefore critical to provide equitable access to cooling solutions while reducing the exposure on vulnerable groups and expanding access to sustainable solutions—including the equitable access and distribution of green spaces (especially in urban heat islands) and the equitable use of building adaptations such as green roofs and facades, passive cooling, and improved weatherization. A combination of strategies, including expansion of passive cooling, green infrastructure, and sustainable

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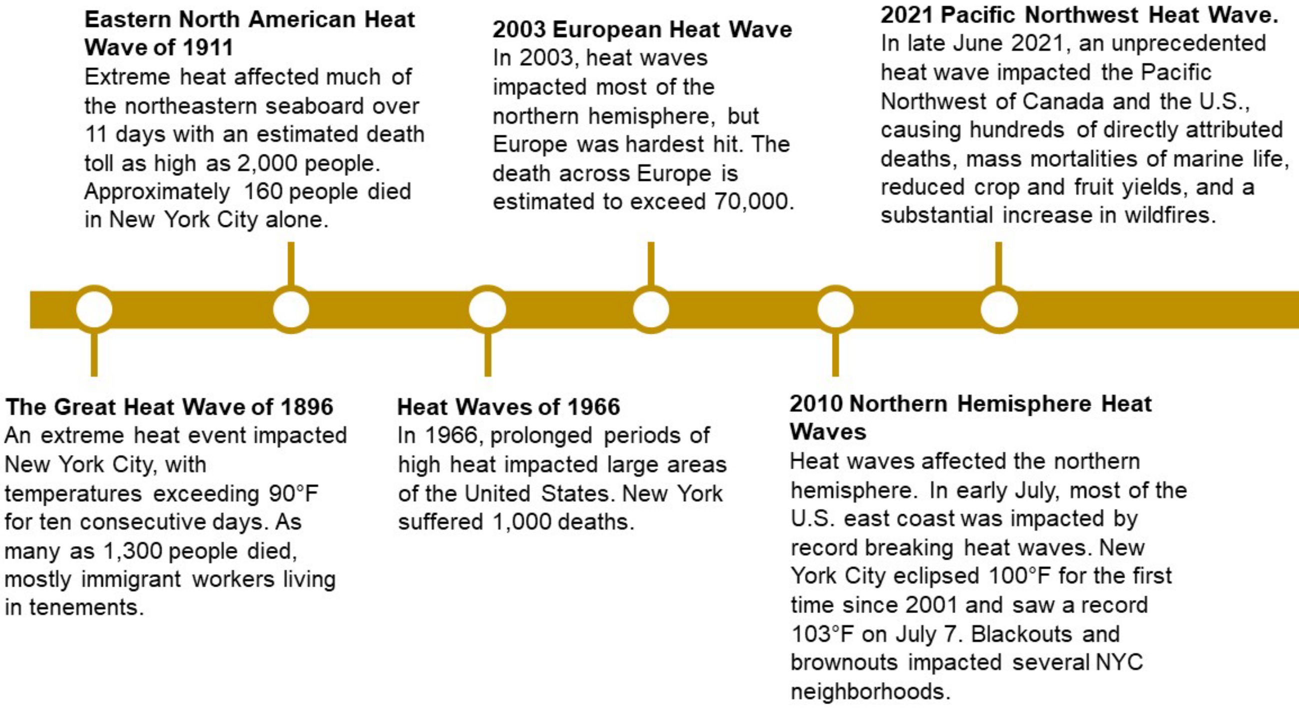
[9] NOAA *Weather Fatalities 2022*, available at https://www.weather.gov/hazstat/.

building practices, can improve equitable access to cooling while reducing additional load strain on electric grids. These strategies and practices can also reduce air pollution where fossil-fueled power plants provide peak-load power, and mitigate greenhouse gas (GHG) emissions, shifts in adaptation costs, and abate significant community-wide vulnerabilities where power outages disable air conditioning units.

Solutions to extreme heat must be more comprehensive and expansive. Solutions should address the need for equitable cooling access, and access to shelter and secure housing, and should incorporate clean energy technologies, adaptations to the built environment and infrastructure, ecosystem-based adaptation (EbA) and green infrastructure, and other solutions that reduce vulnerabilities, minimize exposures, and mitigate risks. An understanding of who is affected by extreme heat and how they are affected is critical to successful adaptation.

Figure 2. Notable heat waves caused severe impacts on communities.[10]



The Great Heat Wave of 1896
An extreme heat event impacted New York City, with temperatures exceeding 90°F for ten consecutive days. As many as 1,300 people died, mostly immigrant workers living in tenements.

Eastern North American Heat Wave of 1911
Extreme heat affected much of the northeastern seaboard over 11 days with an estimated death toll as high as 2,000 people. Approximately 160 people died in New York City alone.

Heat Waves of 1966
In 1966, prolonged periods of high heat impacted large areas of the United States. New York suffered 1,000 deaths.

2003 European Heat Wave
In 2003, heat waves impacted most of the northern hemisphere, but Europe was hardest hit. The death across Europe is estimated to exceed 70,000.

2010 Northern Hemisphere Heat Waves
Heat waves affected the northern hemisphere. In early July, most of the U.S. east coast was impacted by record breaking heat waves. New York City eclipsed 100°F for the first time since 2001 and saw a record 103°F on July 7. Blackouts and brownouts impacted several NYC neighborhoods.

2021 Pacific Northwest Heat Wave.
In late June 2021, an unprecedented heat wave impacted the Pacific Northwest of Canada and the U.S., causing hundreds of directly attributed deaths, mass mortalities of marine life, reduced crop and fruit yields, and a substantial increase in wildfires.

Past Occurrences and Current Conditions

The New York State *Climate Impacts Assessment* provides a comprehensive discussion of historical occurrences of extreme heat.[11] This section provides a summary of important points.

Changes in frequency and severity of extreme heat events have already occurred across New York State. Between 1970 and 2022, the number of days on which temperatures were above the 90th percentile significantly increased across all regions of New York State (Figure 3).[12] In NYC, for example, events during which maximum temperatures exceed 90°F over three consecutive days have almost doubled from 2001 to 2022, compared to a similar increase between 1869 and 1900.

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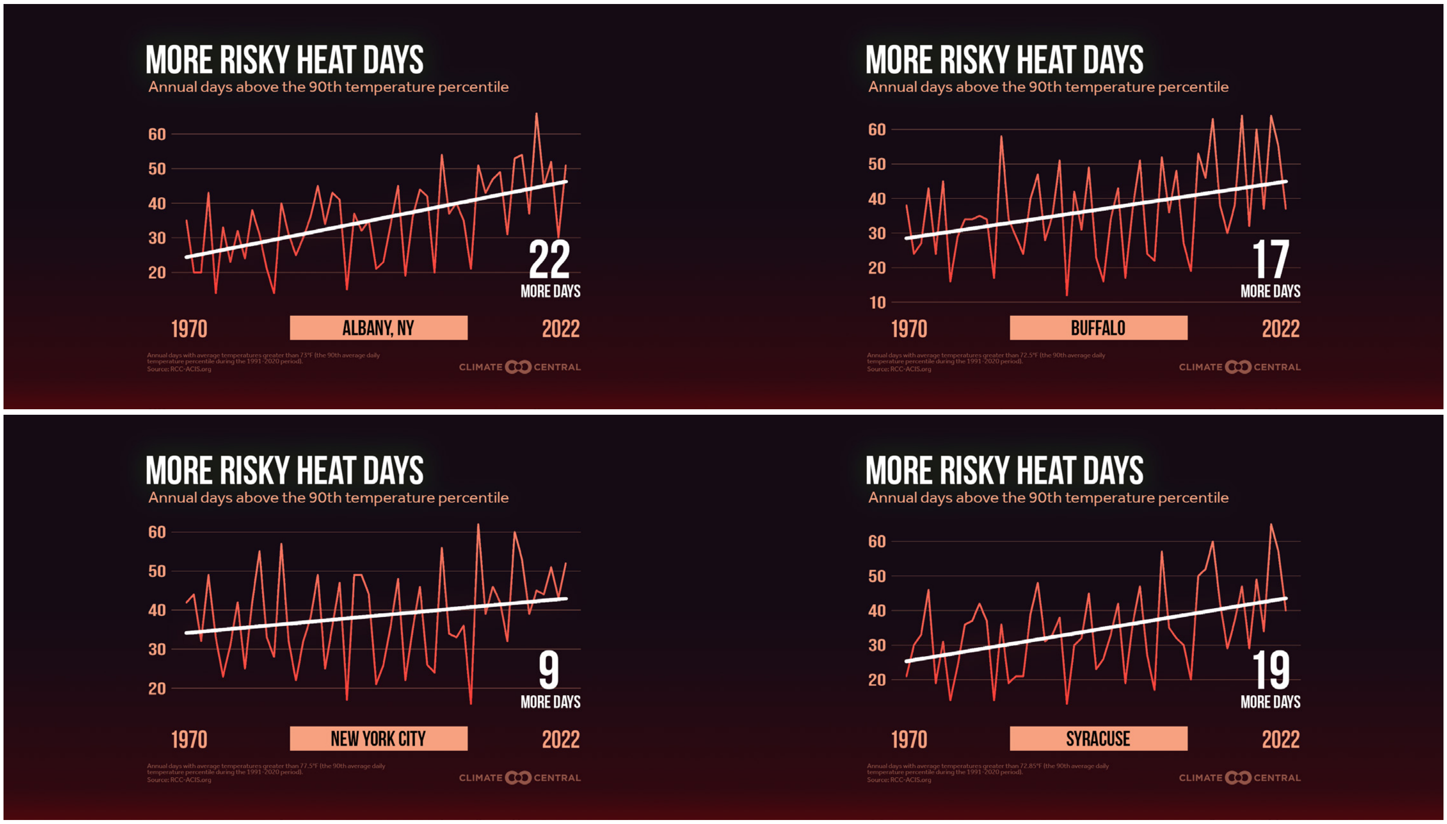
[10] Schuman 1972; Jones 2023; Kaiser et al. 2007; Keller 2019; Klinenberg 2015; White et al. 2023.

[11] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate*. 2024.

[12] 90th percentile refers to the number of days where temperatures exceeded the 10% hottest daily temperature averages that had occurred since 1970.

Figure 3. Change in annual extremely hot days[13]



Annual days with average temperatures greater than 73°F (the 90th average daily temperature percentile during the 1991-2020 period).
Source: RCC-ACIS.org

Annual days with average temperatures greater than 72.5°F (the 90th average daily temperature percentile during the 1991-2020 period).
Source: RCC-ACIS.org

Annual days with average temperatures greater than 77.5°F (the 90th average daily temperature percentile during the 1991-2020 period).
Source: RCC-ACIS.org

Annual days with average temperatures greater than 72.85°F (the 90th average daily temperature percentile during the 1991-2020 period).
Source: RCC-ACIS.org

Generally, nighttime lows have warmed much more rapidly than daytime highs, especially since 2000. Warmer nighttime temperatures can especially strain people who lack cooling and contribute to significant mental and physiological health impacts.[14] The average nighttime low temperature in NYC has increased by 2°C (3.6°F) since 1970. A U.S. Environmental Protection Agency (EPA) analysis that incorporates lack of nighttime cooling found significant changes in extreme heat event frequency for both Albany and Buffalo.[15] A National Oceanic and Atmospheric Administration (NOAA) analysis further found that summer nights in New York State are becoming warmer; the number of very warm nights was higher in the 2010–2014 period than in any five-year period before that since 1900.[16]

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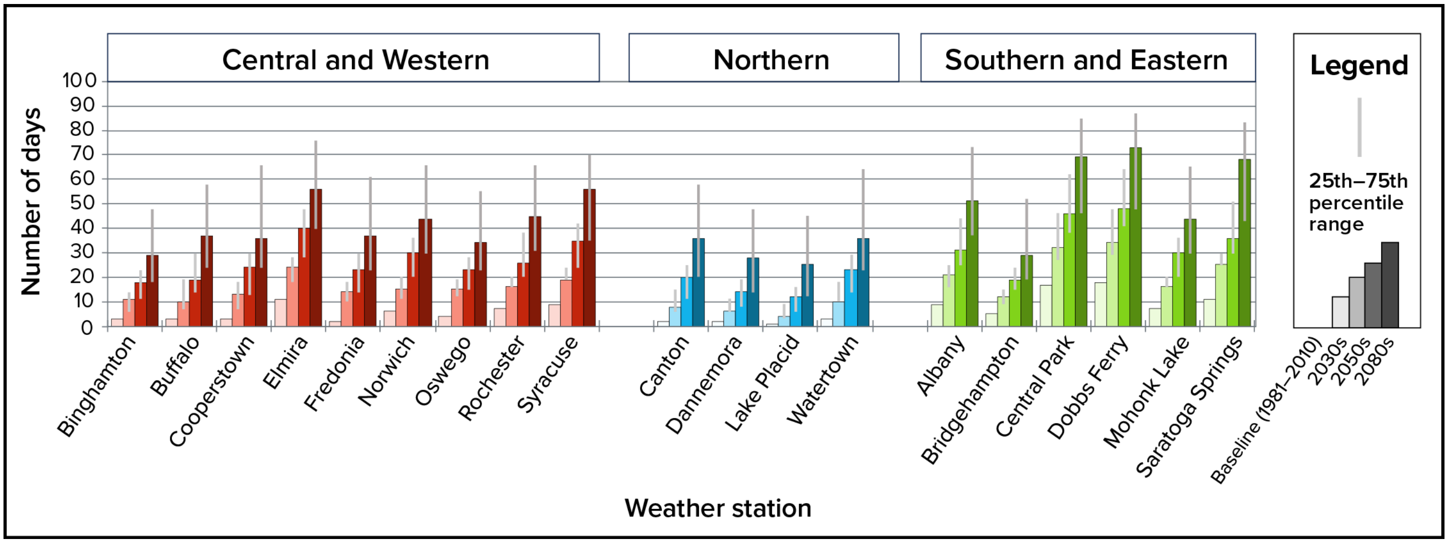
[13] Climate Central.
[14] Murage, Hajat, and Kovats 2017.
[15] US EPA 2021.
[16] Kunkel et al. 2022.

Future Projections

This section summarizes projected future changes in frequency, intensity, and duration of extreme heat events. The New York State *Climate Impacts Assessment* provides a more comprehensive discussion of future projections.[17]

Climate change will significantly increase the frequency, severity, and duration of extreme heat events in every region of the state. By the 2050s, different regions of New York State are projected to experience an additional five to 46 days above 90°F per year above their 1981–2010 baselines (Figure 4). As shown in Figure 5, the number of extreme heat events (periods of three or more days above 90°F) per year in different regions is expected to rise by an additional one—six extreme heat events per year by the 2050s, compared to a 1981–2010 baseline of zero—two heat waves per year. By the end of the century, all regions of the state are projected to experience at least three extreme heat events per year.[18]

Figure 4. Expected changes in number of days above 90°F for different regions of New York State[19]



Historical and projected future number of days per year over 90°F in New York State. Columns show the median (50th percentile) modeled results from a blend of the SSP2-4.5 and SSP5-8.5 GHG emissions scenarios, while the thinner lines show the 25th–75th percentile range from this same two-scenario blend. Data from projections developed for the NYS Climate Impacts Assessment.[20]

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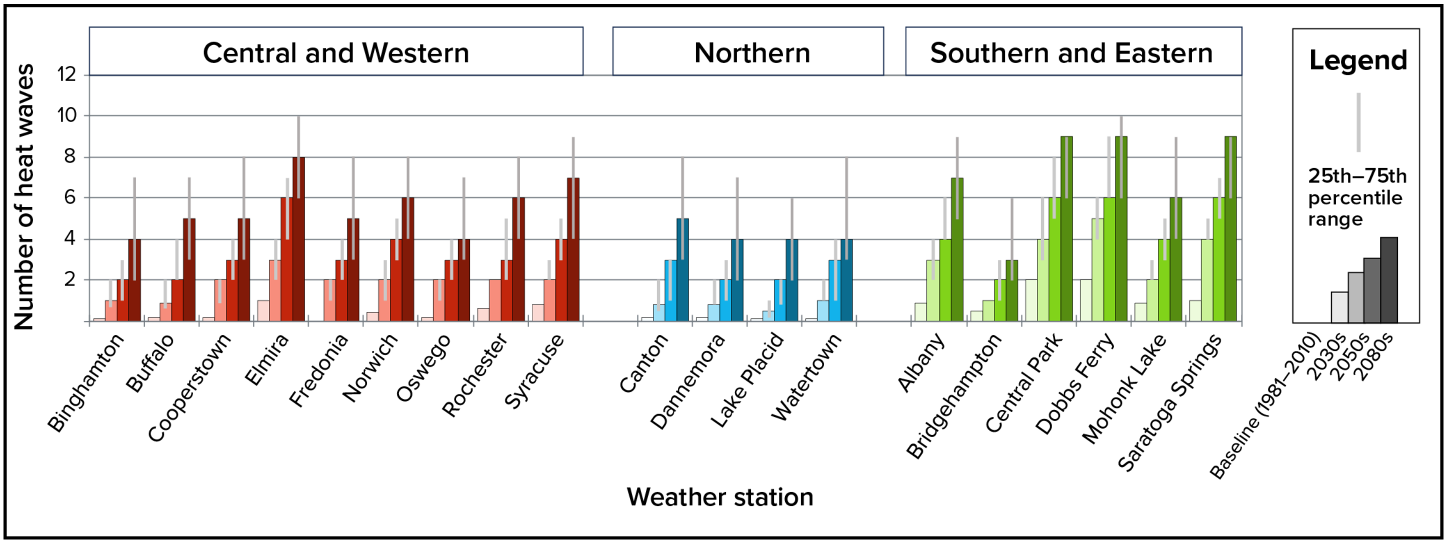
[17] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate*. 2024.
[18] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate*. 2024.
[19] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate*. 2024.
[20] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate*. 2024

Figure 5. Historical and projected annual number of heat waves in New York State[21]



Historical and projected future annual number of heat waves in New York State. Heat waves are defined as three or more consecutive days with maximum temperatures at or above 90°F. Columns show the median (50th percentile) modeled results from a blend of the SSP2-4.5 and SSP5-8.5 GHG emissions scenarios, while the thinner lines show the 25th–75th percentile range from this same two-scenario blend. Instances with no thin gray line protruding above and/or below the top of the shaded column indicate that the 25th and/or 75th percentile values are equal to the median value. Data from projections developed for the NYS Climate Impacts Assessment.[22]

In areas where extreme heat events are less common today, extreme heat impacts will occur more frequently and become more widespread by mid-century. For example, the Saint Lawrence Valley historically experiences one—two extreme heat events per decade but is expected to observe one—three events per year by 2050. Due to the relatively rapid change in frequency, severity, and duration of extreme heat events, New York State will experience new impacts, and existing impacts may be significantly exacerbated if no adaptive measures are taken.

Across all regions of the state, the number of days with a heat index (combined effects of temperature and humidity) greater than 85°F, 95°F, and the maximum heat index are all expected to increase significantly (Figure 6). New York City, Albany, Buffalo, and Rochester are expected to experience large increases; however, significant increases are also expected in the colder areas of the state. For areas that rarely experienced extreme heat events in the past, such increases may pose unique challenges and impacts compared to locations that are more used to and better adapted to such events. The combination of heat and humidity can have even greater impacts on human health than high temperatures alone.[23] DEC is developing statewide heat exposure maps that include measures that can be incorporated in future updates to the EHAP and can guide implementation of some recommended actions.

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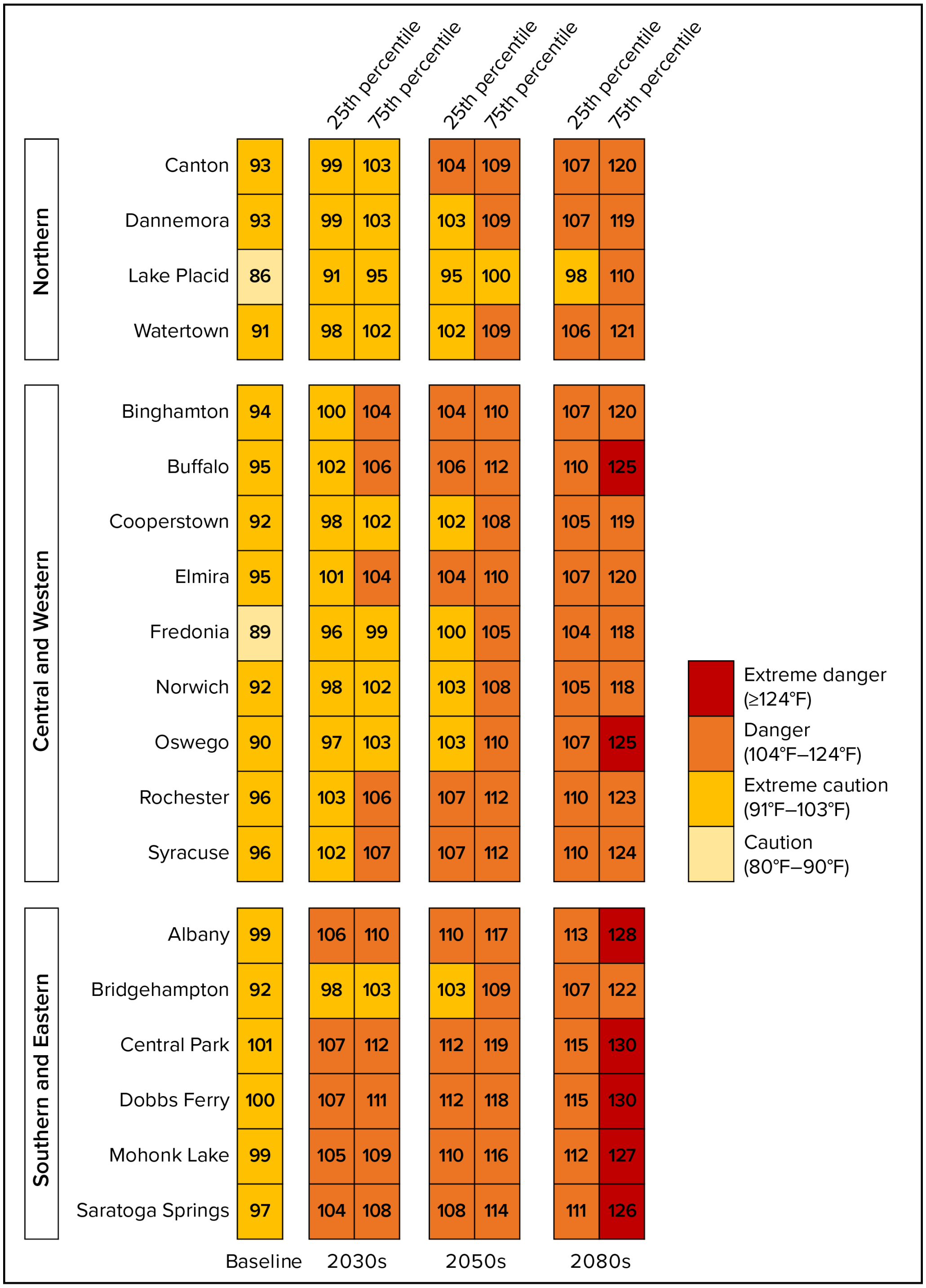
[21] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate*. 2024.
[22] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate*. 2024
[23] T. Adeyeye et al. 2019.

Figure 6. Average annual maximum heat index in New York State during the twenty-first century, by station and decade[24]



		Baseline	2030s 25th percentile	2030s 75th percentile	2050s 25th percentile	2050s 75th percentile	2080s 25th percentile	2080s 75th percentile
Northern	Canton	93	99	103	104	109	107	120
	Dannemora	93	99	103	103	109	107	119
	Lake Placid	86	91	95	95	100	98	110
	Watertown	91	98	102	102	109	106	121
Central and Western	Binghamton	94	100	104	104	110	107	120
	Buffalo	95	102	106	106	112	110	125
	Cooperstown	92	98	102	102	108	105	119
	Elmira	95	101	104	104	110	107	120
	Fredonia	89	96	99	100	105	104	118
	Norwich	92	98	102	103	108	105	118
	Oswego	90	97	103	103	110	107	125
	Rochester	96	103	106	107	112	110	123
	Syracuse	96	102	107	107	112	110	124
Southern and Eastern	Albany	99	106	110	110	117	113	128
	Bridgehampton	92	98	103	103	109	107	122
	Central Park	101	107	112	112	119	115	130
	Dobbs Ferry	100	107	111	112	118	115	130
	Mohonk Lake	99	105	109	110	116	112	127
	Saratoga Springs	97	104	108	108	114	111	126

- 🟥 Extreme danger (≥124°F)
- 🟧 Danger (104°F–124°F)
- 🟨 Extreme caution (91°F–103°F)
- ▨ Caution (80°F–90°F)

Projected annual maximum heat index in New York State during the twenty-first century by station. The grid shows 25th and 75th percentile modeled results from a blend of the SSP2-4.5 and SSP5-8.5 GHG emissions scenarios. Data from projections developed for the NYS Climate Impacts Assessment.[25]

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[24] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate*. 2024.

[25] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate*. 2024

III. EXTREME HEAT AND HUMAN HEALTH

As climate change progresses, New York State may be at higher risk for extreme heat compared to U.S. states with warmer climates. Studies suggest that the range of temperatures at which adverse health effects occur may be lower in the Northeast than in other areas of the country with hotter weather; this susceptibility to extreme heat at lower thresholds may be because residents' bodies are not acclimated to the heat, and buildings and other infrastructure do not properly counteract extreme heat.[26] Along the same lines, some regions of New York State are less acclimated to extreme heat than others. Under the current climate, for example, NYC experiences high temperatures and extreme heat events more often than northern areas of the state such as the Adirondacks. Regions that have experienced extreme heat less often may therefore be less prepared for future impacts.

The EHAP formulates strategies across four action tracks to mitigate heat-health impacts; increase community resilience; and strengthen ecosystems, the built environment, and infrastructure. The plan prioritizes actions that enhance human health and well-being and protect vulnerable New Yorkers from the effects of extreme heat. Relevant actions include initiatives to protect workers' health and improve workplace safety, reduce exposure to extreme heat in vulnerable communities, enhance access to cooling centers and other cool spaces, and foster ecosystem service benefits that help communities keep cool during extreme heat events.

Extreme heat affects the health and well-being of New Yorkers across the state. Direct impacts of extreme heat include heat-related illnesses such as heat edema, heat stroke, heat exhaustion, heat cramps, and dehydration. An investigation of emergency department visits and hospitalizations in New York State suggests that a 5°F increase in temperature may double a New Yorker's risk of heat-related illness.[27] Extreme heat can also exacerbate other existing health conditions such as renal, lung, and cardiovascular disease. In some cases, exposure to extreme heat can directly or indirectly contribute to death. Anyone can suffer from the impacts of extreme heat. Increases in emergency department visits, admissions to hospitals, and deaths are observed during and following extreme heat events. Health service providers already experience direct climate-related cost increases for additional staffing for emergency responses to extreme heat and increases in emergency medical services response costs. Figure 7 shows the relationship between emergency department visits for heat and temperature during a heat wave in early September 2023, and illustrates a sharp increase compared to before and after the heat wave.

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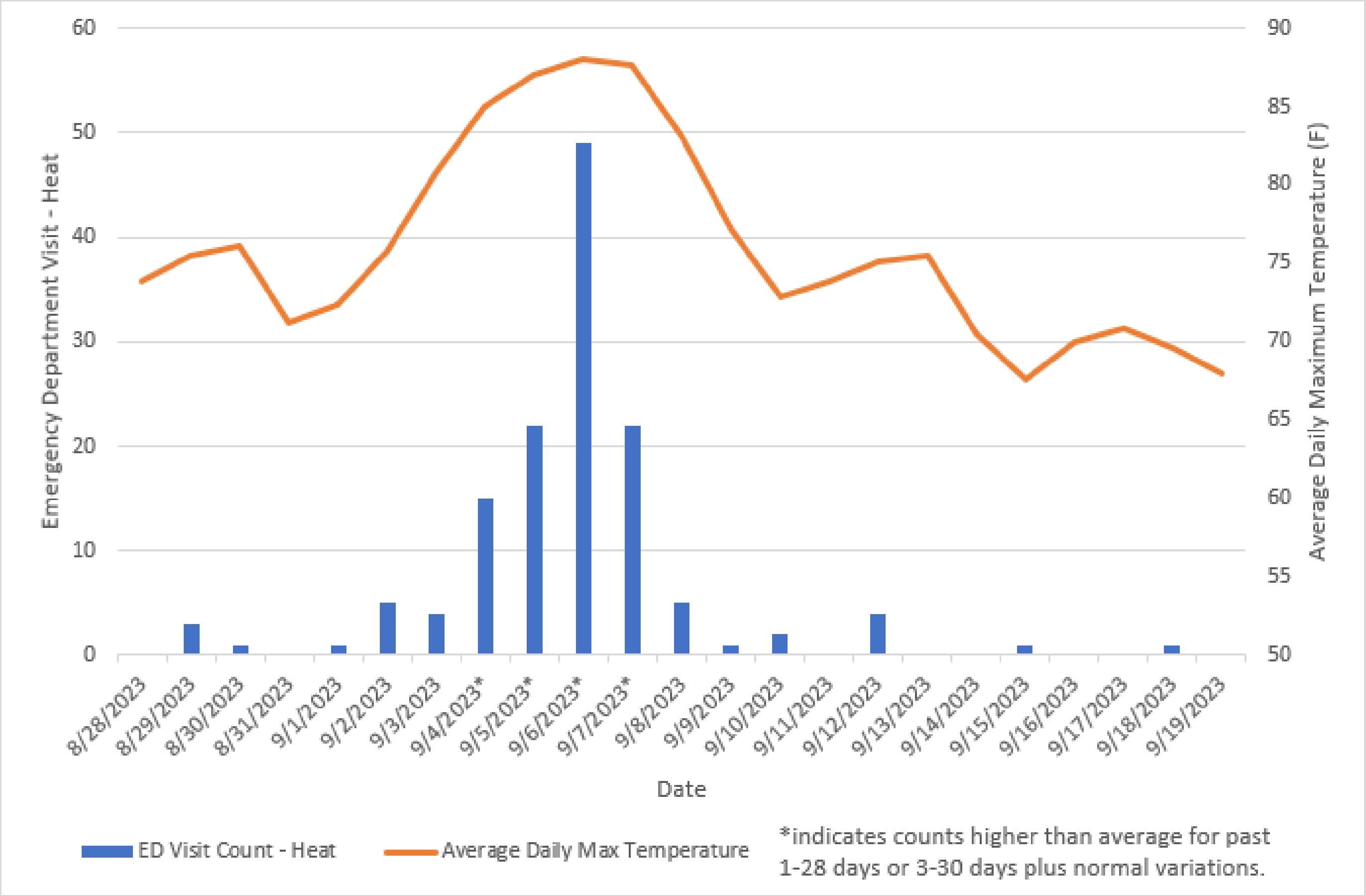
[26] Vaidyanathan et al. 2019.

[27] T. Adeyeye et al. 2019.

Figure 7. Short-term trend report of heat syndrome emergency department visits for New York State outside NYC during a heat wave in early September 2023



Extreme heat does not impact everyone in the same ways. High-risk factors correlated with adverse health outcomes include socioeconomic vulnerabilities; race and ethnicity; age; preexisting medical conditions; limited access to transportation; physiological mobility; limited linguistic capabilities; marital status; mental, physical, or cognitive impairments; and being homebound.[28] Individuals living in settings that reduce physical mobility, such as incarcerated people, are also at greater risk of extreme heat impacts. Extreme heat events may cause additional isolation for vulnerable individuals living alone, as visitations may be reduced or prevented, which increases their risk of death.

Extreme heat can cause psychological stress and anxiety over a changing climate and associated natural disasters. Individuals living with mental health challenges may be at increased risk of heat-related morbidity and mortality. An increased risk of concurrent heat-related illness with behavioral health disorder hospitalizations was observed in individuals with dementia and schizophrenia in a recent New York State study.[29] Some studies link elevated temperatures to violence and other mental health problems; the strongest association is an elevated suicide risk.[30] Medications used to help with mental health, including antidepressants, antianxiety medications, stimulants, antipsychotics, and mood stabilizers, can interfere with body temperature regulation and make staying cool difficult.[31]

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[28] Gronlund 2014.
[29] A.-G. Adeyeye et al. 2022
[30] Thompson et al. 2018.
[31] Mangoni et al. 2017; Kwok and Chan 2005.

Outdoor workers and some indoor workers are at a high risk of heat-related illness. As New York State experiences more frequent extreme heat days due to climate change, outdoor workers, such as those in construction, agriculture, and transportation, are at greater risk for heat illnesses.[32] Outdoor workers are at heightened risk of heat exposure, which can lead to dehydration, kidney damage, or renal failure when combined with strenuous physical activity. Additionally, exposure to fumes and exhaust in extreme heat can have negative health impacts. For example, higher temperatures can cause an increase in pesticide evaporation and lead to increased toxin exposure and potential health impacts for farm workers.[33] Commuting workers may face exposure risks during their commute.[34]

Climate-sensitive health problems, including those related to reduced worker productivity, can have broader impacts on the economy. Studies show lower productivity during heat waves. Assuming a pathway toward a 1.5°C rise in global temperature by the end of the twenty-first century, the International Labor Organization "projected that 2.2% of total working hours will be lost to high temperatures globally in 2030—a productivity loss equivalent to 80 million full-time jobs."[35] When temperatures are high, industries may cut labor hours and pay, which requires some workers to put their health at risk by choosing or being pressured to work on extremely hot days to avoid decreasing family earnings; this is a significant challenge given rural poverty in New York State.[36]

People exposed to extreme heat throughout the day with no relief at night are at higher risk of hospitalization or death from hyperthermia. Additionally, higher temperatures can cause poor sleep and have been linked to poor educational outcomes. When it is too cold or hot, individuals are less likely to engage in physical activity, which is a health behavior that reduces the risk of all-cause mortality, cardiovascular disease, type 2 diabetes, and several cancers.[37]

Extreme heat events can cause energy insecurity, particularly the cost of and access to cooling in homes, leading to increased health risks. Lack of access to necessary energy can cause health risks by impeding in-home care and at-home medical devices and can prevent people from going to the hospital.[38] People may experience dehydration and heat-related illness in homes without air conditioning. Low-income residents may not be able to afford energy efficiency upgrades or air conditioners.[39] Energy insecure renters may be at an added disadvantage as they may lack the ability to make decisions about energy efficiency in their homes and landlords may lack sufficient incentives to make energy efficiency improvements to units that would help lower renters' bills related to increased temperatures.[40] Many Indigenous communities are already burdened with low energy access, and affordability will be further impacted by extreme heat.[41] The results of energy insecurity include extreme home temperatures, and potential utility shutoffs or mounting charges in utility bills

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[32] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate.* 2024.
[33] Spencer, Farmer, and Cliath 1973; Amoatey et al. 2020.
[34] Harlan and Ruddell 2011; Papanastasiou, Melas, and Kambezidis 2015; Pascal et al. 2021.
[35] Ananian 2023.
[36] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate.* 2024.
[37] Obradovich et al. 2017; Murage, Hajat, and Kovats 2017; Seltenrich Nate, n.d.
[38] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate*. 2024 chap. 7
[39] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate*. 2024, chap. 6
[40] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate*. 2024, chap. 6
[41] Graff et al. 2022; Hernández 2016.

due to nonpayment. Power outages can impact the ability to keep food fresh and properly stored, which leads to bacterial growth and may have a disproportionate effect on lower income residents who cannot afford to waste the food or go out to eat.[42]

Extreme heat can have second-order effects that exacerbate other problems. An increase in ground level ozone and particulate matter, i.e., smog, exacerbated by extreme heat, can cause premature deaths, hospital visits, lost school days, and acute respiratory symptoms.[43] Higher temperatures may also contribute to increased risk for food-borne, water-borne, and vector-borne illness.[44]

Additionally, the risk of transmission of airborne diseases, including the risk of COVID-19 transmission, has been found to be elevated indoors compared to outdoors, which may be a concern when using indoor spaces for refuge from high temperatures. Public cooling centers may not have adequate space to maintain adequate separation. During heat waves, New Yorkers may remain in overheated homes—or for unhoused individuals, remain outdoors—for a variety of reasons, even as temperatures impact health.[45]

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[42] Jessel, Sawyer, and Hernández 2019; Graff et al. 2021; Hernández 2016.

[43] Kotelnikov, Stepanov, and Ivashkin 2017; Schwarz et al. 2021; Cheung 2002.

[44] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate.* 2024, chap. 7

[45] Lane et al. 2014.

IV. VULNERABILITIES TO EXTREME HEAT

Vulnerability to extreme heat as a function of exposure, sensitivity, and adaptive capacity can be better understood through environmental, demographic, and population-specific health and societal characteristics. Absolute temperatures as a measure of exposure alone do not sufficiently capture how individuals or communities cope with extremes and related impacts. Sociodemographic factors that contribute to increased vulnerability include age, pregnancy, racial and ethnic minority status, income, educational level, living alone, access to cooling, access to transportation and physical mobility, and other factors. Preexisting conditions and chronic illness, use of certain medications, and other aspects of physical and mental health and well-being are important contributing factors to an individual's vulnerability.[46]

As an equity-first plan, the EHAP prioritizes addressing impacts on vulnerable people and communities. The plan also advances measures to build community capacity in heat-vulnerable and disadvantaged communities, with the plan-wide goal to ensure at least 35%, with a goal of at least 40%, of adaptation benefits accrue to disadvantaged communities. In addition, the plan describes specific actions to reduce general vulnerabilities, enhance access to cooling at home and in public spaces, and build local community capacity to plan for, anticipate, and adapt to extreme heat.

General Vulnerabilities

Overall, heat-related death rates correlate with a range of environmental and social factors including a prevalence of poor housing conditions, poverty, impervious land cover, high land-surface temperatures, and lower access to air conditioning.[47]

Disproportionate exposure to heat occurs in the state's urban areas due to overall higher temperatures, physical microenvironments such as apartments, and high nighttime temperatures brought about by the urban heat island effect, which prevents the physical environment from sufficiently cooling off overnight. In New York State, urban heat islands can disproportionately impact neighborhoods that are home to lower-income populations and higher concentrations of older adults.[48]

People living in rural areas of the state face similar health outcomes, but the causes for their vulnerability are not always the same.[49] Adverse heat-health outcomes are reported for rural and urban communities alike, with similar overall heat-health outcomes.[50] The factors which exacerbate heat-health impacts in rural communities may more likely relate to distance and access to health care and other important services, aging infrastructure, perceptions of risk, social and physical isolation, and other drivers. Residents in rural areas are more likely to work outdoors and perform strenuous tasks related to farming, logging, and raising livestock. Agricultural workers in the U.S. are among the populations most vulnerable to the health impacts of extreme heat.[51] Rural poverty, an aging

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[46] Conlon et al. 2020.
[47] Klein Rosenthal, Kinney, and Metzger 2014.
[48] Wilhelmi, Sherbinin, and Hayden 2013.
[49] Insaf et al. 2021.
[50] T. Adeyeye et al. 2019.
[51] Tigchelaar, Battisti, and Spector 2020.

population, and overall poorer health compound impacts in rural communities.[52] In New York State, approximately 20% of the surveyed households overall, and more than 30% in households earning less than $35,000, were estimate not to have air conditioning.[53]

Access to Cooling and Housing

Lack of access to cooling is a major vulnerability across New York State. Many households across the state have no or limited access to cooling at home. In NYC, air-conditioning access is widespread overall (90% of households); however, in low-income communities, this rate drops to as low as 76%, while 15% of households in NYC cannot afford to use their air conditioning during hot weather.[54] Prevalence of air conditioning at home becomes less common outside NYC and outside affluent urban and suburban communities.[55]

Some communities have limited or no access to public spaces for cooling such as parks, public buildings and facilities, or recreational areas. Tree inequities and lack of parks and other natural environments are prevalent concerns in many urban areas, but studies have shown this factor disproportionately affects disadvantaged communities. An uneven distribution of natural environments limits access to critical public spaces for cooling for many residents in these areas.[56]

Barriers and risks faced by some individuals may preclude them from accessing public spaces for cooling. Some individual New Yorkers may face additional barriers due to perceived stigma related to homelessness, drug use, mental illness, and their perceived identity, including migrant workers who may be prevented from seeking assistance at hospitals or visiting public spaces due to perceived or real risks of prosecution related to their immigration status. People without shelter may choose to not seek out existing shelter for a variety of reasons, including perceived risks or lack of available shelter spaces that can accommodate specific individual needs.[57] Others may face alternate barriers that prevent them from accessing public spaces for relief from extreme heat, which may be related to their perceived race, ethnicity, linguistic barriers, or cultural identities.[58] Some individuals may be hindered from seeking relief from extreme heat, such as those living in confinement, including incarcerated people and people with mental or physical disabilities that constrain their ability to move without help or to recognize or articulate the need for assistance.[59]

Schools, especially in socially vulnerable communities, face heightened vulnerabilities to extreme heat and other climate impacts if no air conditioning or ventilation system is available or operational.[60] Although rules and regulations establish minimum temperatures in educational institutions, no equivalent maximum temperature thresholds have been established. At the same time, most schools do not have access to adequate cooling such as air conditioning. About 41% of U.S. public school systems need to replace or update their heating, ventilation, and air conditioning

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[52] Rural Health Information Hub n.d.

[53] These estimates are based on the 2018 New York State Behavioral Risk Factor Surveillance System

[54] New York City n.d.

[55] Romitti et al. 2022.

[56] Kabanda 2021.

[57] Seema G. Nayak et al. 2019; Widerynski et al. 2017; Mallen 2022.

[58] Seema G. Nayak et al. 2019; Widerynski et al. 2017; Mallen 2022.

[59] Skarha et al. 2022; Terwiel 2018; The Economist 2021; Cloud et al. 2023; Colucci, Vecellio, and Allen 2023.

[60] Fisk 2017.

systems in at least half of their facilities.[61] Compounding events such as airborne diseases, air pollution, or wildfire smoke further underscore the need for adequate air conditioning and circulation.

Congregate settings often lack access to cooling. Congregate settings in New York State, including prisons and jails, mental health institutions, senior housing, and temporary housing for homeless individuals, often lack access to cooling; such settings place people within those facilities at an increased risk for exposure with limited opportunities for relief. The age of the building substance and character of facilities present logistical and high-cost burdens that limit the ability to introduce comprehensive cooling.[62] Failure to ensure the health and well-being of residents of congregate settings may cause significant potential liabilities and reputational exposures for facility operators.[63]

Capacity to Plan for, Anticipate, and Respond to Extreme Heat

The EHAP formulates strategies and identifies actions across State agencies and authorities to coordinate the State's extreme heat response, address and reduce vulnerabilities, anticipate impacts, enhance planning, and support local adaptation to extreme heat.

Extreme heat response may be enhanced by addressing coordination constraints. Despite its profound impact across the U.S., extreme heat is often lacking the same level of coordination and authority to coordinate that other climate hazards receive. Local and state governments often do not have the capacity or resources for designated staff, and only a small number of jurisdictions are beginning to appoint chief heat officers or chief resilience officers that can provide leadership on extreme heat.[64]

Communities may have limited capacity or capability for identifying unfolding impacts early. Heat-health impacts are difficult to monitor in real time and may only become explicit in later stages of an unfolding emergency event. Past events were at times only recognized as health systems came under strain or event mortality spiked.[65] Without adequate monitoring, officials might recognize heat events late, which prevents critical early-onset responses. Early-onset impact recognition at the local level can prevent delays in local emergency response and escalated emergency response to higher levels of government.[66] Proactive pre-event coordination, outreach, and adaptive measures are critical components of an extreme heat response but may be limited.[67] Similarly, systems should incorporate future conditions and new climate-induced extremes emerging today due to climate change to be adequately prepared.[68]

Small and under-resourced local governments may have less capacity to adapt to extreme heat. Smaller governments may not be able to effectively adapt due to a lack of resources and capacities, such as applying for, securing, and managing existing assistance available to local governments. Similarly, such governments may need to stretch limited resources across competing

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[61] United States Government Accountability Office 2020.
[62] Skarha et al. 2022; Terwiel 2018; The Economist 2021; Cloud et al. 2023; Colucci, Vecellio, and Allen 2023.
[63] Sax 2022; Wu and Felder 2021.
[64] Heath and Wickerson 2023; Araos et al. 2016; Ford and King 2015.
[65] Keller 2019; Klinenberg 2015.
[66] Casanueva et al. 2019; Hajat et al. 2010.
[67] Yardley, Sigal, and Kenny 2011; Lagadec 2004; Keller 2019; Hess et al. 2023; Abrash Walton et al. 2021.
[68] Martín and Paneque 2022.

priorities, limiting their ability to anticipate and plan for extreme heat.[69] Bureaucratic barriers may position certain communities, organizations, and government entities to receive a disproportionate share of resources, while other entities may be disadvantaged in accessing critical resources.[70]

Existing organizational and administrative structures and frameworks may need enhancements to effectively address extreme heat under future conditions. Climate change acts as a threat multiplier and creates new and unprecedented conditions, impacts, and associated compounding effects and challenges. Existing capabilities, capacities, and organizational structures across governance levels may not be able to adequately address future conditions. Since extreme heat is not a hazard that can trigger a federal emergency declaration under the Stafford Act, agencies may be precluded from providing funds without emergency declaration and supplemental appropriations.[71] Resources and personnel may become strained, systems and mechanisms may become overwhelmed by new conditions and threats, and existing planning may not be able to adequately anticipate unexpected effects and impacts under new climate conditions.[72]

Frontline community organizations may lack the administrative capacity to leverage available funding and assistance. Small frontline organizations that serve the most vulnerable communities are often informal, volunteer-run organizations. Their capacities may be limited and preclude them from accessing available resources or key communication chains that could help them anticipate future impacts. These limited capacities could even make them ineligible to receive resources—even though they may benefit the most from financial and technical assistance.[73]

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[69] Dodman and Satterthwaite 2008; Agrawal and Perrin 2009.

[70] New York State 2021, *Barriers and Opportunities Report*.

[71] Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) ,42 U.S.C.A. §§ 5121 et seq. (enacted to provide federal assistance to victims of disasters by giving money to the states which then distribute it. Relief is usually triggered by a presidential declaration of a major disaster or an emergency situation. FEMA is now the agency directing the coordination of all disaster relief assistance, and it provides aid mainly through emergency assistance, temporary housing assistance, and grant programs).

[72] Martín and Paneque 2022.

[73] New York State 2021, *Barriers and Opportunities Report*.

V. SUMMARY OF OTHER KEY IMPACTS

The following section provides an overview of additional important impacts beyond human health, specifically, how impacts unfold within individual communities, the risks for impacts, and how the ability to cope and adapt are shaped by individual and community vulnerabilities and capacities.

Built Environment

Extreme heat events can cause damage to the built environment. Extreme heat events can burst pipes, melt power outlets, buckle floors, shorten roof life spans, and cause solar panel outages. Indoor air temperature and changes in humidity can impact the performance and life span of buildings and building materials such as drywall, wood, brick, and electrical systems.[74]

Extreme heat will increase the demand on water supply and infrastructure. Increased water temperatures from higher air temperatures can lead to inefficient cooling of wet-cooling power generation facilities. Hot water can shut down energy production capacity at both nuclear and fossil fuel power plants and can lead to even warmer water temperatures from these facilities' outflows, which may disrupt local riverine ecosystems. Other negative impacts of extreme heat on water supply include:

- increased demand for water used for drinking, recreation, and cooling;
- stressed wastewater treatment plants, causing degraded water quality (including harmful algal blooms, which can overtax microbial treatments); and
- damaged infrastructure around brownfield and Superfund sites, resulting in fugitive pollution.

Energy Infrastructure and Demand

Extreme heat can cause significant impacts on energy infrastructure and performance, including significant increases in load and failure rates. Combustion, solar, and wind energy production lose efficiency at higher temperatures and might not be able to produce expected output levels in extreme heat events or higher average temperatures. Electricity generation, transmission, and distribution are less efficient and more vulnerable to failure during extreme heat events. High nighttime temperatures can prevent cooling of transmission and distribution lines overnight, which can lower their capacity or cause damage the next day when the energy demand and loads increase. Decreased transmission of power may become necessary during extreme heat events to avoid damage to the lines, which can threaten energy supply. Warmer temperatures also lower battery capacity, efficiency, and lifetime. Combustion-based electric generation may experience a loss in generation efficiency and a decrease in cooling capacity. Air-cooled condensers can experience a loss in efficiency.[75]

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[74] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate.* 2024.

[75] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate.* 2024.

Spikes in summertime electricity demand due to an increased need for air-conditioning use could lead to grid failures, e.g., rolling blackouts or brownouts. The increased demand for cooling can strain the grid and contribute to power outages. New York State has robust reliability planning in place through the New York Independent System Operator (NYISO). Heat waves significantly increase GHG emissions due to cooling needs. Cooling is already a significant emissions source in New York State and the United States.[76]

Agriculture

Extreme heat can exacerbate drought, cause changes in crop growth patterns, require the use of more water, and reduce productivity while increasing health problems in livestock. These impacts can result not only in harvest losses but also increased costs for farmers. High temperatures coupled with precipitation variability can degrade the health and viability of ecosystems. Excess heat can cause growth disorders and may increase the need for irrigation. Drought and high heat can exacerbate each other, leading to a wide range of challenges for agricultural operations and difficult conditions during hot and dry periods.[77]

More frequent extreme heat events can lead to major harvest losses as well as changes in the growth patterns and periods of crops, placing further strain on the food production sector. Rising soil and air temperatures cause crop heat stress, which can harm plant growth and development and affect crop yields. Extreme heat can cause increased loss of water through soil and plant processes (evapotranspiration), requiring more crop watering. High heat can lead to crop loss, with cascading impacts such as livestock feed shortages. Common vegetables grown in New York State, including potatoes, cabbage, broccoli, cauliflower, and snap beans, could become more difficult to grow because of heat-related stress and prolonged periods of high temperatures. Crop yields are most likely to suffer if the adverse weather conditions—especially high temperature and excess or deficit precipitation—occur during critical developmental stages such as the early stages of plant reproduction.[78] Fruit-bearing trees may carry fruit earlier in the summer due to plant development advancing more quickly during extreme heat events; a common reaction to heat stress is dropping fruit, which leads to harvest loss. Weather-induced impacts on vegetable crops include development of small green leaves on the head, uneven head development, stunting, discoloration, flowering, bitter flavor, fruit drop, cracking, and withering.

Certain agricultural production systems may be at greater risk to extreme heat impacts. Monoculture and agricultural-scale farming are more susceptible to climate shocks due to their reliance on stable food production systems. Proliferation of pests and diseases during extreme heat may pose greater risks to such production systems with potential impacts for food security.[79] Seasonal high temperature anomalies earlier in the year may further increase pest pressures or disrupt production for maple syrup.[80]

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[76] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate*. 2024.
[77] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate*. 2024.
[78] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate*. 2024.
[79] Harrison, Cullen, and Rawnsley 2016; Bachinger 2020.
[80] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate*. 2024.

Extreme heat leads to proliferation of pests and weeds while increasing plants' susceptibility to these pressures. Many herbicides and pesticides have reduced efficacy and require more frequent application during periods of extreme heat. Increased herbicide and pesticide use could result in weeds developing resistance, which leads to more stress from weeds and increased risk of economic hardship from crop loss.[81]

Heat stress can lead to reduced productivity in livestock and an increase in economic losses, as these animals expend resources to adapt their physiology to increased temperatures. Additionally, a loss of feed quality and quantity will raise the costs of production. Milk production, calving, and feed intake can decrease in dairy cattle, while long-term impacts include compromised reproduction, increased lameness, and compromised immune function in dairy and other livestock animals.[82] Warmer temperatures can also increase the risk of heat stress for animals in transit.[83] Health risks may rise in animals—especially when extreme heat events continue for several days with little nighttime cooling; such risks may include the expansion of current diseases, emergence of new diseases, and increased incidence of parasitic infections and vector-borne diseases.

Aquaculture and Bodies of Water

Extreme heat could impact marine fisheries and the seafood industry, given higher air temperatures and subsequently higher water temperatures, which can increase foodborne pathogens, or cause populations to shift to new ranges or become extirpated.[84]

High pavement temperatures from extreme heat events can heat stormwater runoff that drains into sewers and raises water temperatures when released into bodies of water. This temperature increase can negatively affect aquatic flora and fauna.[85] Extreme heat events can cause mass fish deaths in affected waterways.

Extreme heat increases water temperatures. Water bodies can become heat sinks and cool off more slowly than the surrounding areas. Scientists expect increased water temperatures to alter the temperature composition of lakes. Stratification, or the separation of water masses by temperature, regulates important chemical and biological systems in lakes and ponds. Increased heat causes stratification to occur earlier in the year and last longer into the fall. Increasing surface water temperatures and cooling deep water temperatures are barriers to the movement of organisms, gases, and nutrients between deep waters and surface waters. Higher water temperatures create a loss of oxygen in the surface waters of lakes, which can change lake productivity. This can cause immense stress on lake and pond organisms, especially on cold water fish in New York State. Photosynthesis, which is a temperature-dependent process, may drive higher productivity in warmer waters. Rising water temperatures tend to increase the spread of cyanobacteria, which can produce

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[81] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate.* 2024.

[82] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate.* 2024.

[83] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate.* 2024.

[84] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate.* 2024.

[85] U.S. Environmental Protection Agency (EPA) 2020.

harmful algal blooms.[86] A decrease in oxygen can cause the release of phosphorus from sediments, causing an overabundance of nutrients in water bodies and potentially increasing algae.

Water resources are susceptible to a range of impacts related to extreme heat. For example, large, clear lakes are most sensitive to increases in air temperature and consequent increases in water temperature. Lakes and ponds surrounding the Great Lakes are sensitive to snowmelt and subsequent algal growths. Creeks and rivers that lack or have lost connection to floodplains, forested buffers, or contact with groundwater and headwaters are more vulnerable to altered biodiversity and flows of riverine ecosystems due to climate impacts such as extreme heat. Cascading impacts include harmful algal blooms and impacts on aquatic ecologies.[87]

Ecosystem Services, Food Security, and Environmental Burden

Extreme heat impacts are made worse by existing environmental burdens in marginalized and overburdened communities. Access to the benefits of ecosystem services, such as natural cooling and improved air quality that can help mitigate extreme heat, provide relief during extreme heat events, and support community adaptation, are limited.[88] Existing burdens include environmental contamination, air pollution, and burdens on homes, e.g., the use of certain building materials, which leads to the risk of multiple exposures in impacted communities, cascading impacts, and increased vulnerabilities.[89] Urban ecosystems are especially susceptible to compounding stresses, such as the urban heat island effect.[90]

Environmental degradation limits ecosystems' ability to adapt to and cope with extreme heat impacts. Existing burdens and impacts on ecosystems and new pressures related to climate change pose direct and indirect risks to ecosystems. For instance, existing burdens such as deforestation and degradation may limit ecosystems' ability to adapt to changing conditions such as new patterns in the occurrence, frequency, and severity of extreme heat.[91]

Hotter temperatures could impact forest growth. Extreme heat and increased temperatures will impact forests in New York State. Mature trees are likely to experience increased stress with increasing heat. Warming temperatures may cause increased evaporation, which, along with expected late-summer droughts, may decrease soil water availability and lead to tree stress and decline. Plant mortality may increase, which compromises the ecological services they provide, such as erosion control and shade. Heat-stressed or damaged forests may reduce the levels of recreational use. Wood production is a critical economic resource that extreme heat and changing environmental conditions threaten. Trees and forests in urban areas are exposed to greater risks of drought, invasive pests, and extreme heat than those in rural areas. Stressed street trees and failed establishment of new trees further exacerbate the urban heat island effect.[92]

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[86] Trainer et al. 2020**.**

[87] Zhang et al. 2022; Polazzo et al. 2022.

[88] New York State 2021; Burningham and Thrush 2003; Willow 2014; Northridge and Shepard 1997.

[89] Harlan and Ruddell 2011; New York State 2021, *Barriers and Opportunities Report*.

[90] Shen et al. 2016; Steenberg et al. 2017; Ordóñez and Duinker 2014; Endreny et al. 2017.

[91] Pecl et al. 2017; Leemans and Eickhout 2004; Weiskopf et al. 2020.

[92] *New York State Climate Impacts Assessment: Understanding and Preparing for Our Changing Climate.* 2024.

VI. IDENTIFYING VULNERABLE AND EXPOSED COMMUNITIES

This section provides information about vulnerable and exposed communities in New York State based on the above discussion of past, current, and future conditions, e.g., exposure, anticipated impacts, and vulnerabilities.

Heat Vulnerability Index and County Heat-health Profiles

The New York State Department of Health (DOH) developed a Heat Vulnerability Index (HVI) to identify geographic areas with populations that may be more vulnerable to extreme heat in the state (figures 8 and 9). NYC has its own HVI developed by the NYC Department of Health and Mental Hygiene.[93] The HVI can help direct adaptation resources based on characteristics of vulnerable populations in a certain community and can inform long-term heat adaptation planning efforts in the community. The DOH HVI is based on 13 environmental and sociodemographic heat vulnerability factors with information available on the census tract level.[94] The current DOH HVI is based on data from the 2006–2010 U.S. Census Bureau American Community Survey and the 2011 National Land Cover Database. Recommended actions in the EHAP include revisions and updates to the DOH HVI. It is important to note that the DOH HVI as a measure is separate from exposures to extreme heat.

Maps have been developed to display the HVI for each census tract and are available statewide and for individual counties. Maps are available for the overall compound HVI and each of the individual factor groups, i.e., language vulnerability, socioeconomic vulnerability, environmental/urban vulnerability, and elderly vulnerability.[95]

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[93] NYC, *"Environment & Health Data Portal",* https://a816-dohbesp.nyc.gov/IndicatorPublic/key-topics/climatehealth/hvi/ (last visited Dec. 28, 2023).

[94] NYS DOH, "Heat Vulnerability Index," https://www.health.ny.gov/environmental/weather/vulnerability_index/ (last updated July 2023).

[95] NYS DOH, "NY State Heat Vulnerability Index Maps," https://www.health.ny.gov/environmental/weather/vulnerability_index/nys_maps.htm (last updated July 2017).

Figure 8. New York State Heat Vulnerability Index map[96]

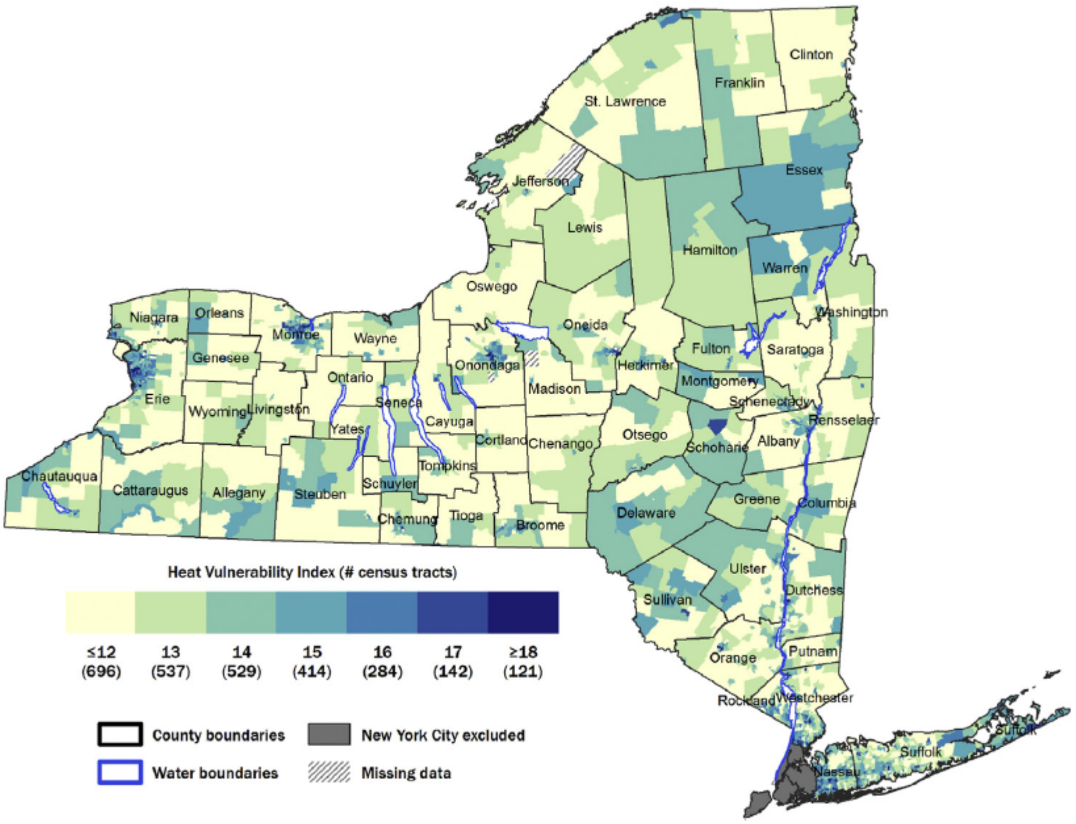

Figure 9. HVI in selected major metropolitan areas in New York State, outside NYC. a: Buffalo; b: Rochester; c: Syracuse; d: Albany; e: Westchester; f: Long Island[97]

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[96] S.G. Nayak et al. 2018.

[97] S.G. Nayak et al. 2018.

New York State Disadvantaged Communities

Climate change is a threat that exacerbates existing burdens, vulnerabilities, and stressors in communities statewide. For this reason, the Climate Leadership and Community Protection Act (Climate Act) requires the identification and consideration of disadvantaged communities in its implementation. The Climate Act mandates that no less than 35%—with a goal of 40%—of the State's investments in clean energy and energy efficiency benefit disadvantaged communities. The Clean Water, Clean Air, and Green Jobs Environmental Bond Act (Bond Act) mandates that 35%—with a goal of 40% of funds—benefit disadvantaged communities. The Climate Act requires that all State agencies, offices, authorities, and divisions must also consider impacts on disadvantaged communities in decision-making. New York State's Climate Justice Working Group (CJWG), comprising representatives from State agencies and environmental justice groups across the state, was formed to determine the criteria by which disadvantaged communities would be identified to ensure these communities directly benefit from the State's historic transition to cleaner, greener sources of energy; reduced pollution; cleaner air and water; and an increase in economic opportunities.[98]

The CJWG used 45 indicators in establishing criteria to identify 35% of New York State as disadvantaged communities pursuant to the Climate Act. The criteria include multiple indicators that represent the environmental burdens or climate change risks within a community, or population characteristics and health vulnerabilities that can contribute to more severe adverse effects of climate change. Several online maps and other resources are available to learn more about New York State's disadvantaged communities.[99]

DEC's statewide Community Air Monitoring Initiative collected air quality data in 10 disadvantaged communities for one year ending in August 2023, expanding on the required four communities in the Climate Act. Air quality monitoring focused on locations with high air pollution burdens and the data will help DEC target strategies to reduce air pollution, including GHG emissions contributing to climate change. DEC will utilize the results along with community input to prioritize air pollution areas of concern, identify sources contributing to disproportionate burdens, and inform recommended pollutant and exposure reduction strategies in disadvantaged communities. These recommended strategies are likely to include a variety of regulatory, investment, and other mechanisms across all of State government.

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[98] NYS DEC 2023 "Disadvantaged Communities Criteria" maps (Version 1.0, 2023), https://climate.ny.gov/resources/disadvantaged-communities-criteria/.

[99] NYS DEC 2023 "Disadvantaged Communities Criteria" maps (Version 1.0, 2023), https://climate.ny.gov/resources/disadvantaged-communities-criteria/.

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