SUMMER 2023

PLANNING FOR EXTREME HEAT

IN GROTON, CONNECTICUT

AN EXECUTIVE SUMMARY
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134 Groton Long Point Road Groton, CT 06340
greatergroton.com/stay-cool-groton

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Image Credit: www.groton.ct-gov/

INTRODUCTION

Global temperatures are rising due to anthropogenic climate change, and the Town of Groton is no exception. Global warming directly contributes to extreme heat events that are more frequent and intense. People in Groton are already feeling the heat, as they experience the high cost of air conditioning and take refuge at the public library to keep cool.

Heat has numerous implications for the health of people and communities. It impacts individuals' physical and mental health, as well as broader community systems like infrastructure, agriculture, and energy grids.

However, these impacts do not affect everyone equally-- heat is a social justice issue. People may be more at-risk for the negative impacts of heat due to their exposure, sensitivity, and/or adaptive capacity. Although Connecticut is not as hot as other areas of the country, there are certain parts of the Town that are more heat-vulnerable than others due to their built environment and socioeconomic/ demographic characteristics of their populations.

Fortunately, heat-related morbidity and mortality are completely preventable. Communities around the world are taking creative actions to respond to heat through heat mitigation-- adjusting physical infrastructure-- and heat adaptation-- adjusting social behaviors and networks.

Groton can take increased action to improve its heat preparedness and protect the health of the community, while prioritizing justice, equity, diversity, and inclusion, and it can build upon this work in its future climate action. In this action, Groton should include community partners to contribute to a robust, intersectional approach.

Image Credit: www.groton.ct-gov/

PROJECT AIMS & METHODS

This project could not have been more timely-- it was conducted in the context of one of the hottest summers in recorded history. Globally, July 2023 was the hottest month on record (1).

Through the University of New Hampshire (UNH) Sustainability Fellowship program, Sustainability Fellow Clare McCarthy spearheaded the project under the guidance and mentorship of Megan Granato, Sustainability and Resilience Manager of the Town of Groton (ToG).

The project seeks to tackle the challenge of extreme heat by addressing the following questions:

1. **How is the Town of Groton vulnerable to climate-exacerbated extreme heat?**
2. **How should the Town staff respond to extreme heat to protect the health of its community?**

The general project workflow is outlined in the following Gantt Chart, followed by a description of each of the action categories:

Tasks	5/27-6/2	6/3-6/9	6/10-6/16	6/17-6/23	6/24-6/30	7/1-7/7	7/8-7/14	7/15-7/21	7/22-7/28	7/29-8/4	8/5-8/11	8/12-8/18
Week No.	1	2	3	4	5	6	7	8	9	10	11	12
Orientation/Setup												
Vulnerability Assessment			complete draft by 6/16									
Revise work plan			due by 6/16									
Prep for and attend UNH launch/final presentation									final presentation prep		slides due aug 8; present aug 10	
Draft white paper									write up recommendations		format final report	
Sustainable CT certification materials									cooling center worksheet			finish equity toolkit documentation
Research heat comm strategies						complete draft of comm & action strategies by 7/5						
Meet partners/build network												
Draft and administer survey							Finish survey by start of this week	analyze survey				
Research & prioritize solutions							complete draft of action approach summary by 7/14					
Create infographics/tabling materials												
Community tabling												
Prep for & present research (create slides)					start advertising talk June 30			public presentation 7/18				
Prep for and deliver final presentation (edit slides)												
Wrap up last tasks												deliverables due Aug 18

Key

- research
- developing deliverables
- outreach/presentation
- misc.

- **Research:** For the vulnerability assessment, the fellow researched the science of heat vulnerability of individuals and communities. For the heat communication strategies and solutions, the fellow researched heat response actions taken by public and nonprofit actors at different jurisdiction levels.
- **Developing deliverables:** Deliverables included a vulnerability assessment report, a summary report of heat communication/action strategies, a community survey and analysis, and educational handouts/flyers for community tabling. Links to these deliverables are included in the appendix of this report.
- **Outreach/presentation:** The fellow prepared and delivered presentations for UNH Fellowship events, including the Fellowship Launch and the Final Showcase. She also conducted community engagement in the Town by tabling at community events and gathering locations to speak with residents of Groton and surrounding towns about their experiences with extreme heat and their perspectives on what the Town should do in response. This more informal engagement was paired with a public presentation where residents were invited to listen to hear about the project so far and give feedback on its progress.
- **Miscellaneous:** Miscellaneous action items included developing Sustainable Connecticut (SCT) certification materials. SCT is a statewide program that guides and incentivizes municipalities to pursue sustainable actions and produces a menu of action items. It added new heat response action items in 2023, including conducting a heat vulnerability assessment and establishing cooling centers. As of Summer 2023, no towns have received credit for these new action items. The fellow completed documentation materials required by SCT with the intent of receiving credit for these items.

KEY TERMS

The following terms will be referenced throughout the report and/or commonly appear in discussions around heat action.

EXTREME HEAT: Conditions that are much hotter and/or humid than average. Because some places are hotter than others, this term is location dependent. (2).

HEAT WAVE: Official definitions of heat waves vary, often by region. The CT Governor's office defines heat waves (3) as "at least 3 consecutive days with high temperatures of at least 90 degrees" (4). On the other hand, the National Oceanic and Atmospheric Administration (NOAA) defines a heat wave as "a period of unusually hot weather that typically lasts two days," with temperatures that are above average for that specific area (5).

HEAT INDEX: Heat index is a measure that accounts for both temperature and humidity and represents how hot a day actually feels. If the temperature is 90 °F and the humidity is 60%, then the heat index is 100 -- so the temperature that day will feel like 100 °F (6).

WET BULB GLOBE TEMPERATURE (WBGT): WGBT is an alternative measurement to temperature that integrates multiple atmospheric variables including temperature, humidity, wind speed, sun angle, and cloud cover. Entities like OSHA and military agencies use WGBT to advise adjusted activity levels (7). A wet bulb temperature of 95 °F is known to be fatal (8).

HYPERTHERMIA: Any form of illness a person experiences due to heat, including heat cramps, heat exhaustion, heat strokes, etc. The most severe form of hyperthermia is heat stroke.

HEAT VULNERABILITY: How likely an individual or group is to experience negative health impacts due to extreme heat. An individual may be heat vulnerable due to a high heat sensitivity, high heat exposure, and/or low adaptive capacity.

HEAT SENSITIVITY: "The degree to which people, the environment, systems or other elements are affected by exposure to heat" (9)

HEAT EXPOSURE: "The amount of heat people, the environment, systems, or other elements experience or are subject to. Exposure considers both heat intensity as well as duration" (9)

ADAPTIVE CAPACITY: "The ability to adjust to climate change, to moderate potential damages, to take advantage of opportunities, or to cope with consequences" (9)

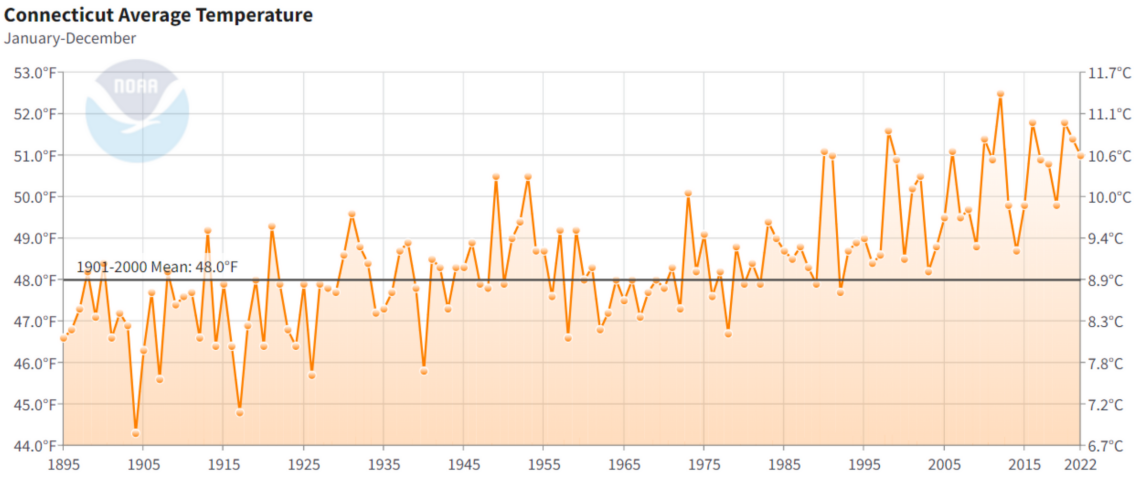
Image Credit: www.groton.ct-gov/

VULNERABILITY ASSESSMENT

Rising Heat in CT

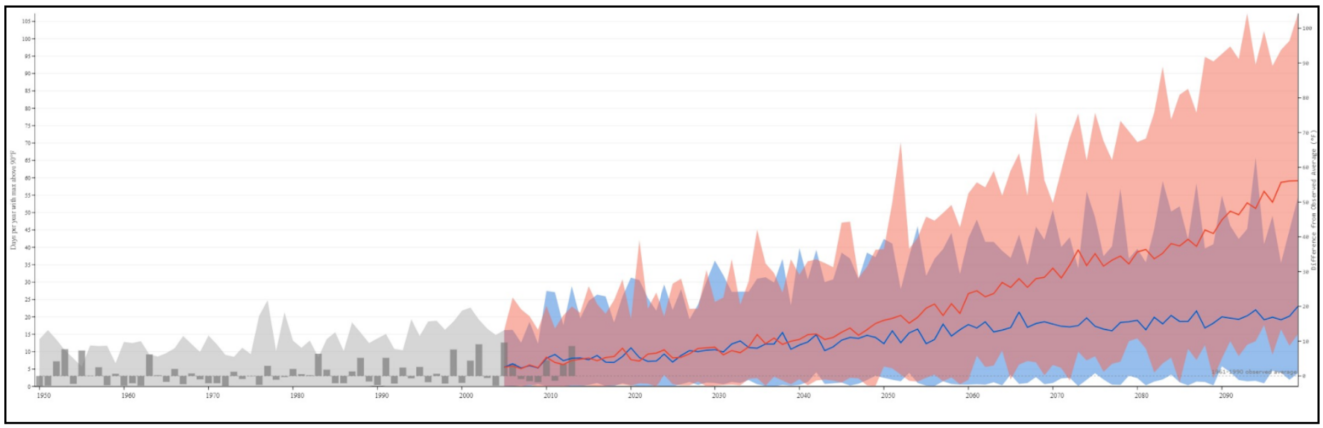
When one describes the climate of the Northeastern United States, “hot” is likely not the first word that comes to mind. Although CT is not as prone to hot weather as other regions of the country, the state’s temperatures are rising at an unprecedented rate due to anthropogenic climate change, and extreme heat is becoming more frequent and intense.

According to data recorded by the National Oceanic and Atmospheric Administration (NOAA), the average annual temperature in CT has increased from 46.6 °F in 1895 to 51.0 degrees F in 2022 (10). This temperature rise has been especially apparent in recent years. Summer months (June, July, and August) are generally the hottest months in Connecticut. Looking at the top 10 hottest Junes, Julys, and Augusts over the period 1895-2022, many have occurred in this century. Three out of the ten hottest Junes, six out of ten of the hottest Julys, and seven out of ten of the hottest Augusts recorded since 1895 also occurred in this century (10).



This trend of temperature rise is only projected to increase. From 1961-1990, New London County saw about 3 days with temperatures above 90 °F each year. Looking ahead, New London County is projected to see 20.8 extreme heat days by 2050 and 53.8 days by the end of the century (using the average of the RCP 8.5 projection, the high emissions scenario). Depending on the severity of the projection used, New London County could see as many annual days over 90 °F as Baltimore, Maryland (20 days); Jacksonville, Florida (54 days); or even Austin, TX by the end of the century (98 days) (11).

Projected Rise in Annual Days Over 90 °F in New London County, CT from 1950 to 2090



Impacts of Extreme Heat

Climate-exacerbated extreme heat is an immense danger to the health of communities. It is incredibly dangerous to human health, as the most lethal weather-related fatality in the United States (26). Outside of physical health impacts, heat influences community infrastructure, agricultural systems, and exacerbates other environmental threats. The follow chart lists heat impacts in terms of three categories: human health, human systems, and environmental systems.

Human Health	Human Systems	Environmental Systems
Physical Health: • Dehydration • Heat-related illness/hyperthermia (heat cramps, heat exhaustion, heat stroke, etc.) • Emergency room visits • Heat-related death (primarily from cardiovascular and respiratory causes) Mental health: • Mood disorders • Anxiety • Rising suicide rates Behavioral health: • Reduced productivity and performance (test scores, labor capacity) • Irritability and aggression • Increased crime and violence rates	Energy grids • Decreased efficiency • More likely power outages • Reduced energy generation from power plants that require cooling water Infrastructure and transportation • Buckling roads, bridges, railroads • Overheating engines • Grounded planes • Broken pipes Agriculture • Longer growing seaseon • Increased agricultural pests and diseases • Increased watering requiremnts • Increased drought • Decreased winter chill period Health Systems • Strain from increased emergency visits	• Worsened air quality (ozone production, ideal wildfire conditions) • Expanded range of insects that carry vector-borne disease • Sea level rise from warming global temperatures • Increased water-borne illness from warming water

Social Characteristics and Heat Vulnerability

Not all individuals are equally affected by heat. The Northeast in general may be more heat vulnerable because people are unfamiliar with effective heat-coping mechanisms (13). A Yale study on the public perceptions of the health risks of extreme heat found that CT residents believe that their heat risk is lower than the national average. Although New England does have a cooler climate compared to other regions of the country, CT residents may not fully appreciate and prepare for the danger of extreme heat when it does occur (14).

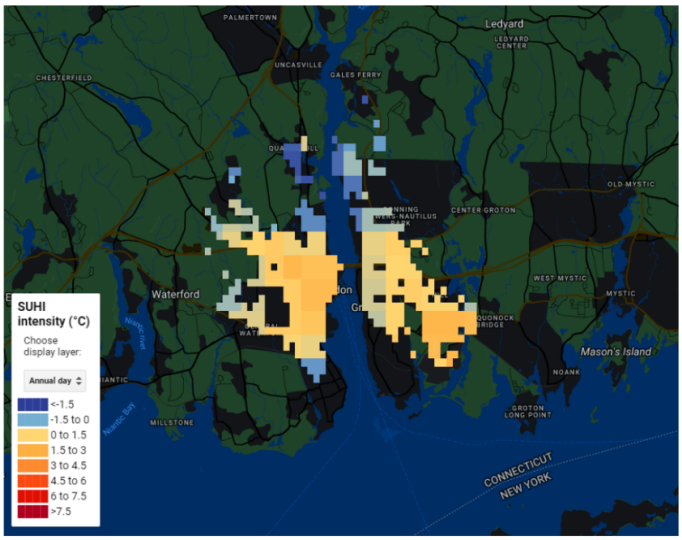
A population or individual may be more vulnerable to extreme heat because of a higher heat exposure, heat sensitivity, or lower adaptive capacity. Examples of groups with high heat vulnerability due to high heat exposure, high heat sensitivity, or low adaptive capacity are outlined in the following chart. This is a simplified example, as there may be overlap in how these groups experience heat vulnerability.

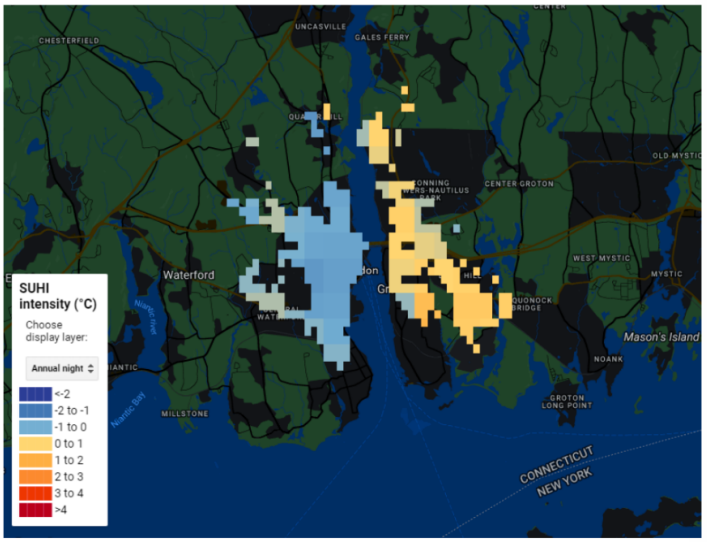
Heat-Exposed Groups	Heat-Sensitive Groups	Groups with Low Adaptive Capacity
• Athletes: *Athletes commonly exercise outdoors at a high intensity.* • Outdoor workers: *Outdoor workers labor outside at a high intensity and may not have workplace heat protection.* • Unhoused people: *Unhoused people may be exposed to extreme heat for days, without an air-conditioned space to take refuge.* • City dwellers: *Cities tend to be hotter than surrounding rural areas.*	• Older adults: *Their bodies are not able to thermoregulate as well to keep themselves cool.* • Infants and children: *Their bodies are not able to thermoregulate as well.* • Pregnant people: *Their bodies are not able to thermoregulate as well.* • People with preexisting conditions: *People with cardiovascular/respiratory conditions are sensitive because the body's heat response places stress on the cardiovascular system. They may also take medication that interferes with thermoregulation.*	• Non-English speakers: *Many heat warnings and resources are communicated in English in the U.S.* • Homebound people: *In the case that they do not have air conditioning at home, their ability to leave and move to a cooler location is limited.* • People who do not use air conditioning (AC): *AC is an effective way to protect oneself from heat-related illness.* • Home renters: *Home renters' use of AC may be limited by their landlords.*

Town of Groton Heat Vulnerability Analysis

The Town of Groton is a municipality in New London County, CT that will likely be particularly vulnerable to heat impacts due to its physical environment and community characteristics.

Portions of the Groton-New London area are an urban heat island (UHI). The Global Surface UHI Explorer, created by Yale's Center for Earth Observation, shows that in 2020, the City of Groton (CoG) generally had a land surface temperature that is higher than the surrounding more rural areas, both during the day (left image) and at night (right image) (15). Groton and New London's UHI status is likely exacerbated by the lack of public parks in the area. The Trust for Public Land found that only 50% of the residents in the urban area of ToG are a 10-minute walk from a public park, compared to a 75% national median (16).

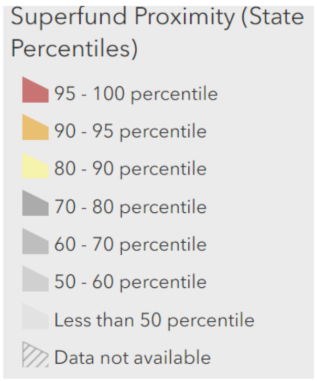


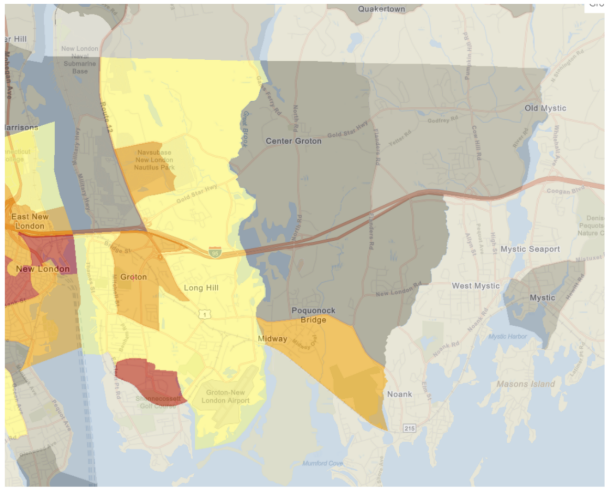


As does its physical environment, the social, economic, and demographic characteristics of ToG's population also predispose it to heat vulnerability. ToG is officially recognized as a socially vulnerable area of CT. ToG was ranked 22nd on the CT Department of Economic and Community Development's 2022 list of distressed municipalities (17).

Groton has also been defined by CT DEEP as an Environmental Justice Community (18). Areas of Groton rank highly for different EJ indicators, according to the U.S. EPA. Parts of Groton rank in the 80-90th, 90-95th, and even the 95-100th percentile for Superfund proximity, when compared to the state of CT. The part of ToG within the City of Groton also ranks relatively high for hazardous waste proximity, compared to the State (36). Air pollution is also a significant concern in CT. Ozone is particularly of note, as the entire state of CT does not meet federal ozone standards (19), and CT has been referred to as the ozone "tailpipe of the nation" (20).

Superfund Proximity, compared to State of CT





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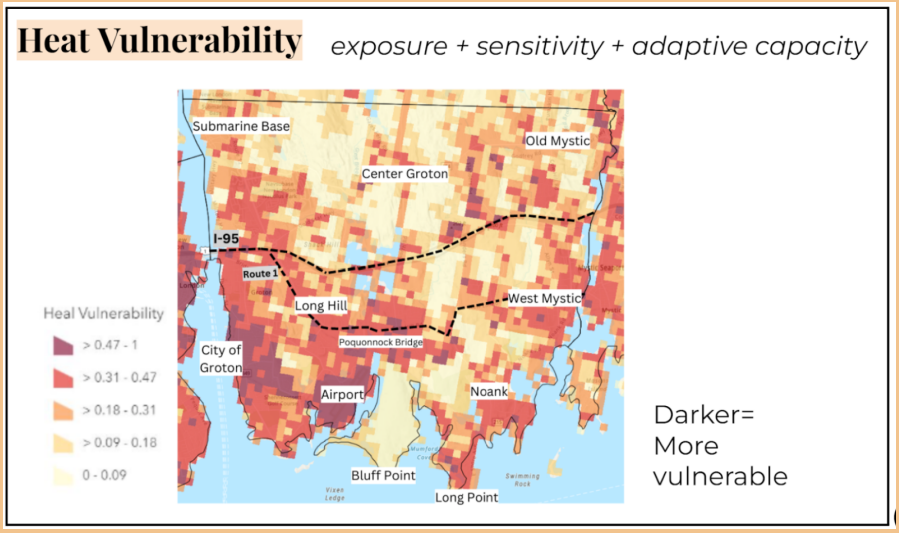
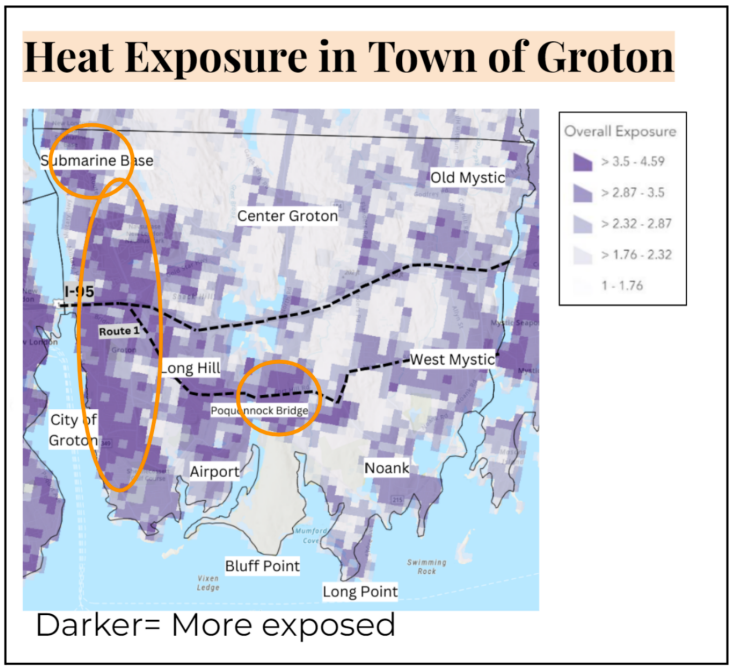
Cooling energy is another barrier to extreme heat preparedness in Groton. only about 34% of households in CT use a central AC unit (compared to 67% of homes nationally) while 60% of homes use an individual AC unit (compared to 26% of homes nationally) (21). Individual AC units are less expensive to install than central units, but each individual unit can only cool one room or space of a home, while central units cool the whole home (22).

Even for households that do have a well-functioning AC system, people may be unable to air condition their homes due to high costs. A community survey conducted by TVCCA found that 37% of respondents (845 people) indicated that they struggle to cool their homes. According to a report covered by the New York Times, CT has the fourth highest monthly energy cost among the 50 states and Washington D.C.

CIRCA Heat Vulnerability Index and Census Data

CIRCA developed a heat vulnerability index mapping tool that portrays the heat vulnerability of communities, statewide. Although this is a useful tool, it has limitations since its statewide scope does not always capture local context. Thus, discussion of the CIRCA tool has been supplemented with maps of socioeconomic/demographic characteristics from Census Data for Groton for a deeper understanding of why certain areas are more heat vulnerable than others. The following heat vulnerability map from CIRCA takes into account the three aforementioned layers of heat vulnerability-- exposure, sensitivity, and adaptive capacity. Major neigborhoods and the two major roads of Groton are labeled. Darker red means more heat-vulnerable, while yellow means less heat-vulnerable (23). The CIRCA tool provides three additional maps, one for each vulnerability layer, and each of these three maps is discussed below.

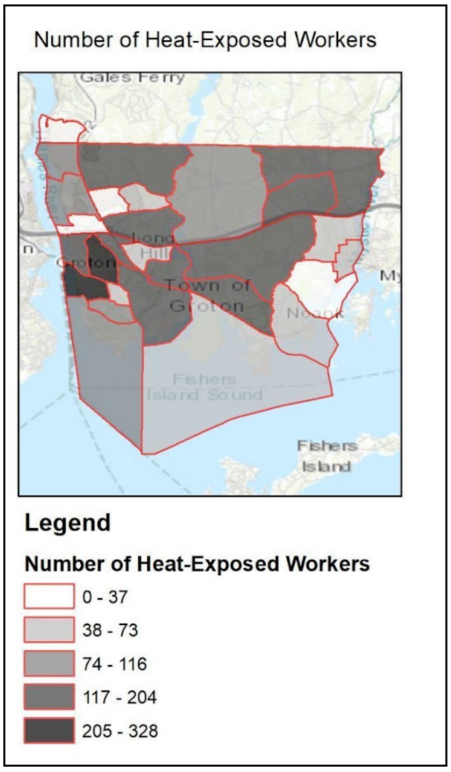


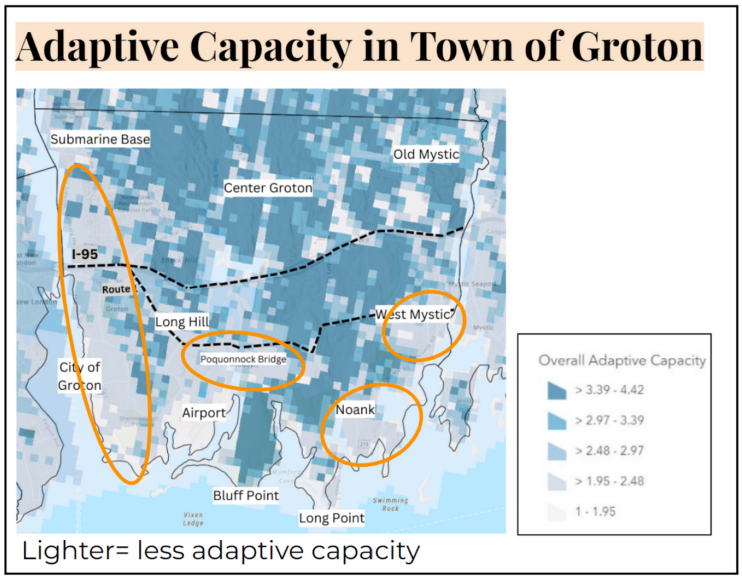


Heat exposure:

The following map is CIRCA's heat exposure map, with a few areas of high heat exposure circled. This map represents which areas/people experience the greatest amount/intensity of heat. To create this map, CIRCA accounted for climate exposure (maximum surface land temperature) and physical exposure (emissivity, roadway usage, impervious surfaces, and building density). Thus, CIRCA considers heat exposure from a perspective of climate and physical infrastructure.

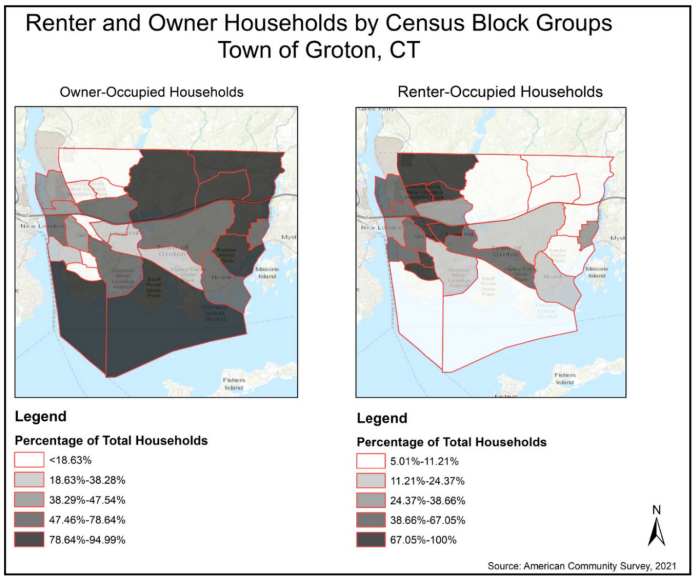
Another element of heat exposure not included in the CIRCA map is how much time individuals/groups spend time outdoors. The following map to the right shows where heat-exposed workers live in Groton (24). This category was developed using Census data on the occupation type of Groton residents. Jobs that involve outdoor work were assumed to be "heat-exposed," which is not a perfect assumption, but provides a baseline understanding that future research can further explore. The jobs marked as heat-exposed include construction, firefighting, farming, etc. The number of heat-exposed workers appears to be highest in the northern part of CoG, perhaps because Electric Boat shipyard workers live in the area.

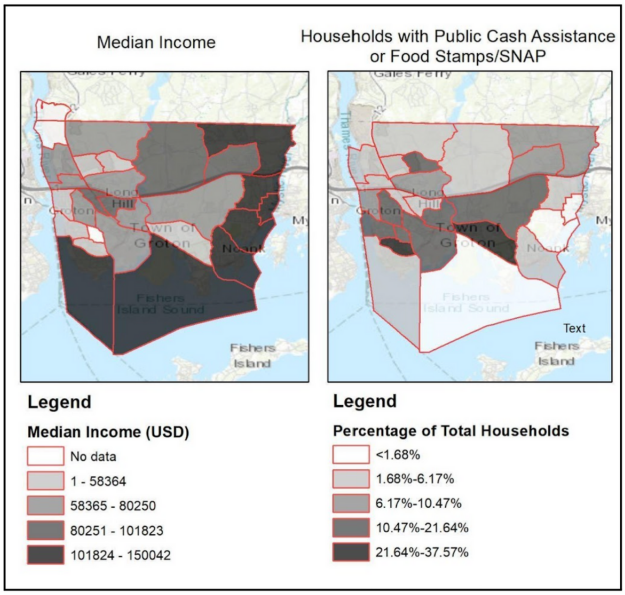




Adaptive capacity: This map represents areas with people least able to respond to/cope with heat. In this map, areas of interest are lighter areas, because this represents areas with less adaptive capacity. Four areas with low adaptive capacity are circled. CIRCA accounts for social adaptive capacity (distance to bus hubs, health insurance, owner-occupied housing, distance to swimming areas/healthcare facilities/cooling centers, etc.) and ecological adaptive capacity (tree cover). This report primarily considers adaptive capacity to be a person/group's ability to access resources to protect themselves from extreme heat.

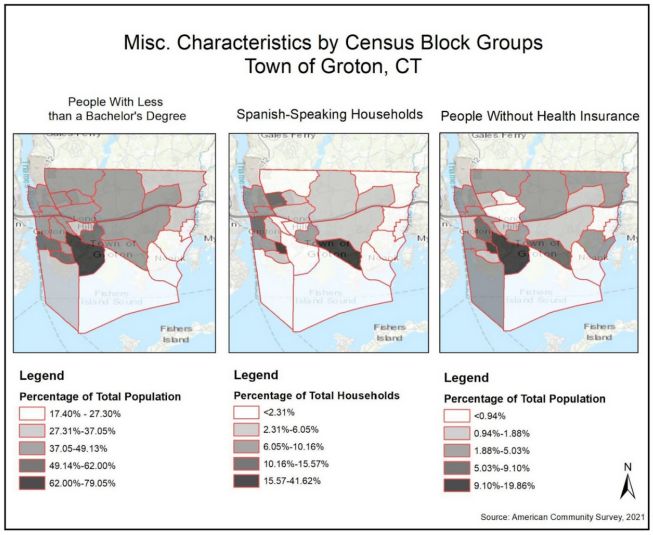
There is a clear divide between areas of Groton with homes that are primarily rented and areas where homes are primarily owned. The areas with the highest prevalence of rented households are the Northwest corner of the town, where the Navy personnel and their families live, as well as the Census block group that includes the Midway Oval neighborhood (25).



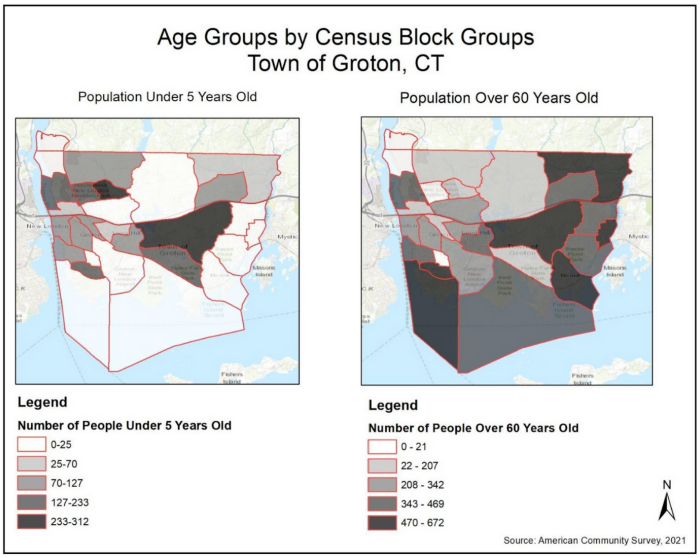


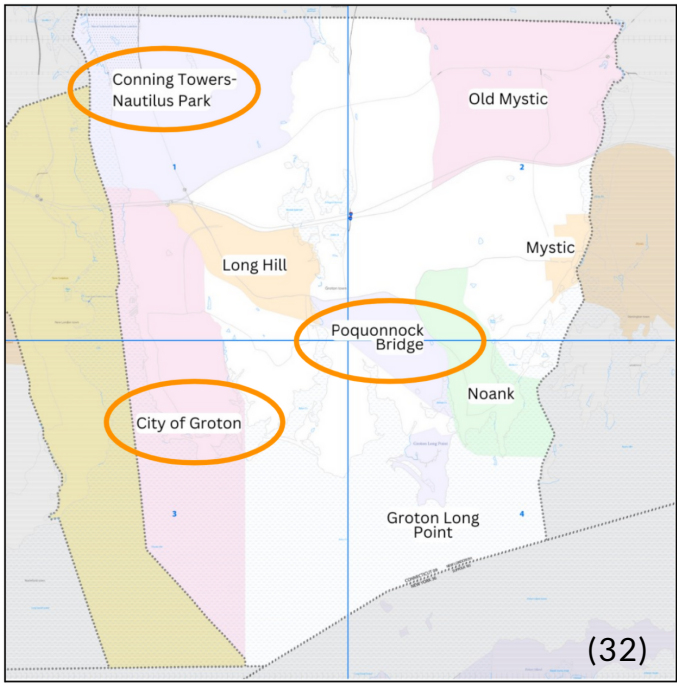
The median household income of the town is significantly along the southern and eastern edges of the town (26), while the number of households that use public cash assistance or SNAP are primarily located in the center of the town (27). Lower-income areas may have a lower adaptive capacity, in paying for AC or other measures to cool themselves or their homes.

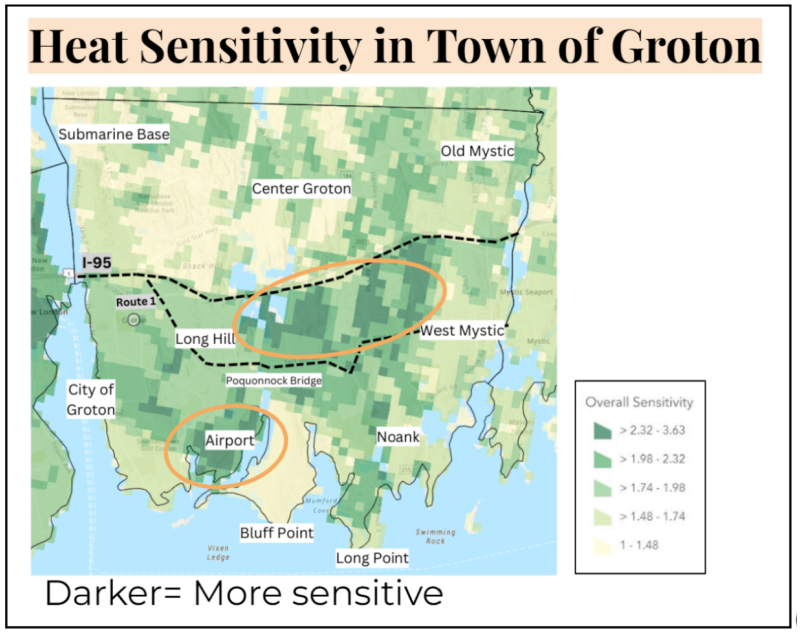
Groton's Spanish-speaking households are primarily in the Poquonnock Bridge neighborhood (29). People without health insurance, who may be less likely to seek treatment for heat-related illnesses, predominately live in Groton Long Hill and Poquonnock Bridge (30). People with less than a bachelor's degree predominately live in Groton Long Hill and northern CoG (28).



Heat sensitivity:
The following map represents the areas with people that are most affected by heat. Darker green means more heat-sensitive areas, while lighter green means less heat-sensitive areas. Two especially heat-sensitive areas are circled. CIRCA accounts for built sensitivity (private wells, median structure age, public housing units) and social sensitivity (English proficiency, median income, no vehicle, unemployed, population density, race and ethnicity, age, education, disability, poverty, heat stress, asthma-related emergency visits, heat stress, etc.). Although heat sensitivity could be defined as including built sensitivity, this report primarily considers sensitivity from a social perspective.







Groton's population under 5 years old and over 60 years old was mapped, as these residents are more heat-sensitive. There is a larger number of residents over 60 years old in Groton City, Central Groton, and the Northeast corner of the town. There are not as many infants/young children in Groton, but most live in the central and Northwestern parts of town. Given the above assessment, the following areas are likely to experience the most severe impacts of extreme heat (31).

Significantly Heat-Vulnerable Areas in Groton:

City of Groton (CoG)
- Relatively low proportion of population within walking distance from public parks
- Highly paved area that exhibits the UHI effect.
- Large number of residents that are over 60 years old
- Lies close to Superfund sites and hazardous waste sites
- Large number of outdoor workers
- Relatively lower income in some parts

Conning Towers-Nautilus Park
- Large number of renters
- Large number of outdoor workers (Navy personnel)
- Lies close to Superfund sites and hazardous waste sites
- Relatively lower income

Poquonnock Bridge
- Relatively lower income
- Large number of renters
- High proportion of medically uninsured people
- High proportion of Spanish-speaking households

HEAT ACTION STRATEGIES

Towns and cities in the U.S. and beyond are pursuing creative means of heat response actions. These actions can be grouped into categories of heat response and mitigation. Mitigation refers to reducing the temperature of an area by modifying the physical environment and adaptation refers to social and behavioral measures to decrease heat risk.

Heat Mitigation Examples	Heat Adaptation Examples
• **Cool roofs:** *Cool roofs may either have vegetation planted on them to provide cooling through evapotranspiration or be painted white to reflect heat.* • **Cool pavement:** *Cool pavement may either be designed to reflect heat or be permeable to allow water to seep into it and provide cooling through evapotranspiration.* • **Tree planting:** *Planting trees provides cooling through shade and evapotranspiration.* • **Shade canopies:** *Shade canopies provide a cooling effect and may be particularly useful in areas where trees cannot be planted due to space limitations.* • **Reducing greenhouse gas emissions:** *Greenhouse gas mitigation would address the root cause of the rise in extreme heat events.*	• **Cooling centers/shelters:** *Cooling centers are publicly accessible, air-conditioned locations that people can use to stay cool during times of extreme heat. Cooling shelters are locations opened specifically in response to extreme heat emergencies where people will be evacuated for lifesaving cooling assistance.* • **Check-in calls:** *Check-in calls to heat-vulnerable people can be a protective measure for these individuals.* • **Early warning system:** *Warning residents of an area in advance of a heat wave and activating different entities to provide heat relief services.* • **Utility assistance:** *Providing residents with funding so they can afford air conditioning during extreme heat events.* • **Public education campaign:** *Educating residents about how to protect their health during extreme heat. This can take creative forms, like education through public art.*

Examples of heat action within Connecticut are as follows:

- **CT Hot Weather Protocol:** The state of CT does have an Extreme Hot Weather Protocol. The protocol is activated when the Division of Emergency Management and Homeland Security (DEMHS) sees the potential for a heat wave, which is defined by the state as three consecutive days with high temperatures of about 90 ℉. In that case, there is an internal warning for DEMHS, but if the National Weather Service also issues a heat advisory, then the Governor's office, state agencies, and towns are contacted. DEMHS warns the United Way's 2-1-1 program to be prepared to answer calls to help people locate cooling centers (33).
- **New Haven heat island ordinance:** A section of the city's zoning ordinance requires new industrial or commercial construction, large expansions of existing industrial or commercial buildings, and some residential buildings to incorporate cooling elements, like roof reflectivity and lighter surfaces (34).
- **Norwalk-CIRCA heat monitoring study:** The City of Norwalk partnered with the Connecticut Institute for Resilience and Climate Adaptation (CIRCA) to assess the heat vulnerability of the City. From June through October 2022, CIRCA placed 13 heat sensors around the city, in a variety of locations, from shorelines and parks to more urbanized areas (35). Norwalk plans to use the findings of the study to inform public health and community planning decisions and integrate them into a resilience plan.

GROTON'S HEAT ACTION CONTEXT

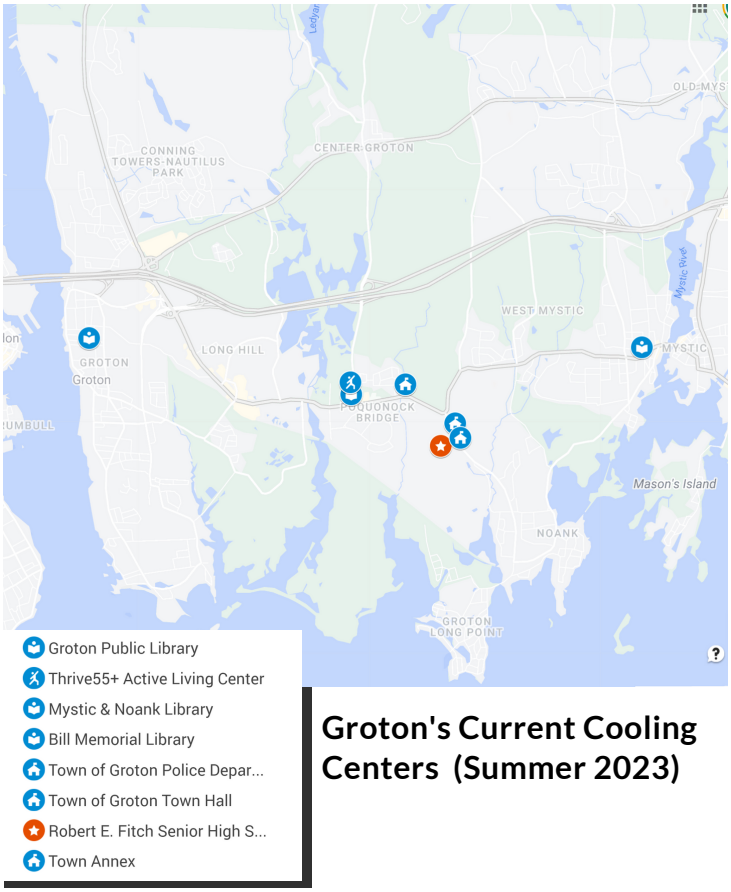
Currently, Groton has a few existing forms of heat action, as well as several community assets to integrate in into a robust heat response.

The ToG Office of Emergency Management runs a heat warning system in the Town that is activated by the Extreme Hot Weather Protocol from Governor Lamont's office. When the Protocol is activated, the Office of Emergency Management posts an alert on its social media and circulates a press release.

Groton's existing cooling centers are as follows:

- Groton Public Library (52 Newtown Rd, Groton, CT 06340)
- Thrive55+ Active Living Center (102 Newtown Rd, Groton, CT 06340)
- Mystic & Noank Library (40 Library St, Mystic, CT 06355)
- Bill Memorial Library (240 Monument St, Groton, CT 06340)
- Town of Groton Police Department (68 Groton Long Point Rd, Groton, CT 06340)
- Town Annex (134 Groton Long Point Rd, Groton, CT 06340)
- Town of Groton Town Hall (45 Fort Hill Road)

In the case of a extreme heat emergency necessitating evacuation to a cooling shelter, Fitch Senior High School would serve as the shelter, with the Thrive55+ Active Living Center as a backup shelter.



Groton's Current Cooling Centers (Summer 2023)

GROTON UTILITIES

Attic Insulation Rebate
- Up to $3,000 for a single family home and $1,000 for an apartment or condo.

Heat Pump Water Heater Rebate
- Full cost of equipment, $2,500 max.

HVAC Mini-Splits Rebate
- Up to $5,000/compressor. Max of $100,000/customer.

Smart Thermostat Rebate
- $200/thermostat or total cost of thermostat.

Resident Home Energy Savings Program
- Provides a free home assessment and offers services to save energy.

EVERSOURCE

Heat Pump Rebate
- Up to $15,000 rebate.

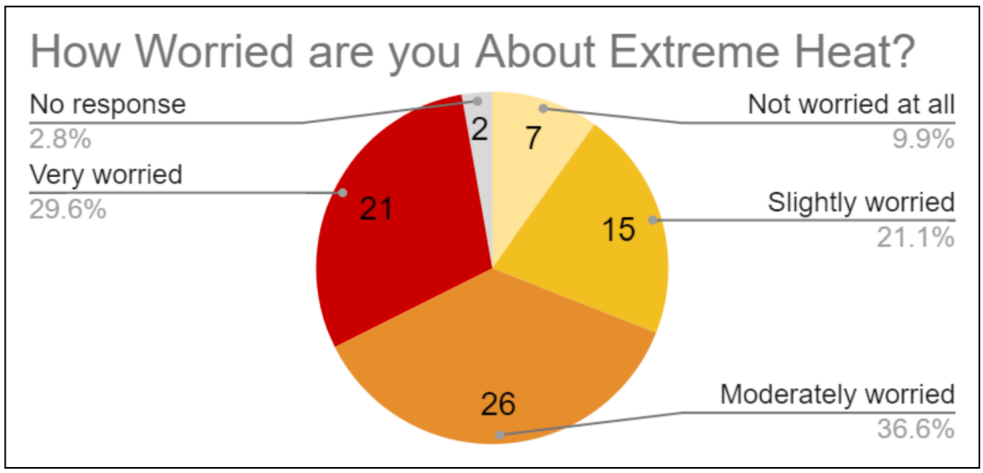
Income-Eligible Home Energy Solutions
- A technician will provide no-cost services to save ~$200/year on energy costs.

Medical Protection
- If a household member has a serious illness and you are facing a power shut-off, apply for medical protection.

Other rebates
- Rebates for power strips, dehumidifiers, insulation, and more. Visit energizect.com.

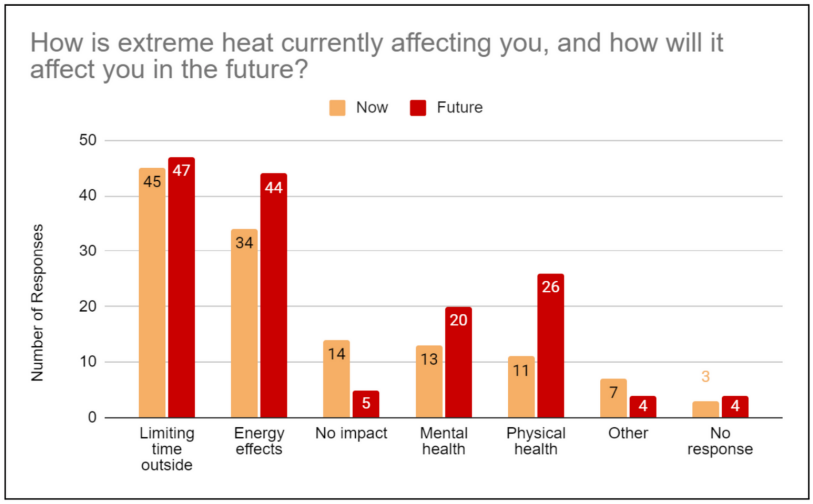
Furthermore, Groton Utilities and Eversource offer the following rebates and energy solutions programs shown above.

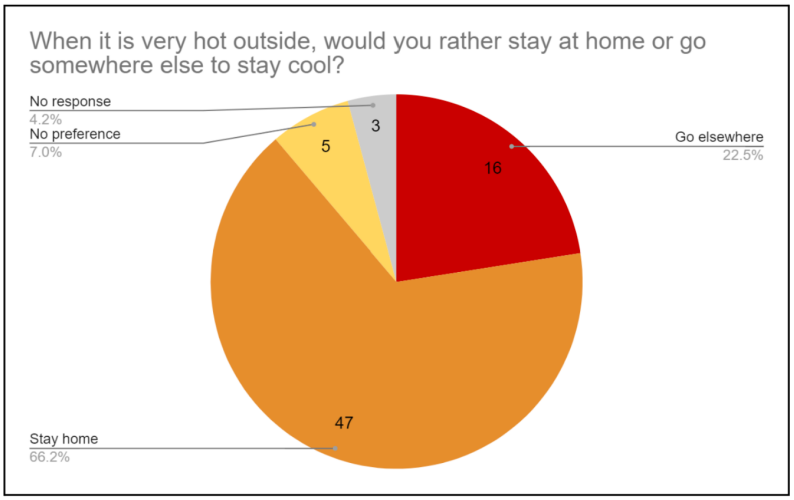
Currently, CT does not have many opportunities for cooling energy assistance; rather, heating energy assistance. However, Operation Fuel provides year-round energy assistance for households whose income does not exceed 100% of the State Median Income. The Connecticut Energy Assistance Program (CEAP) helps residents primarily with heating costs; however, enrolling in CEAP can allow households to plan ahead for summer AC costs.

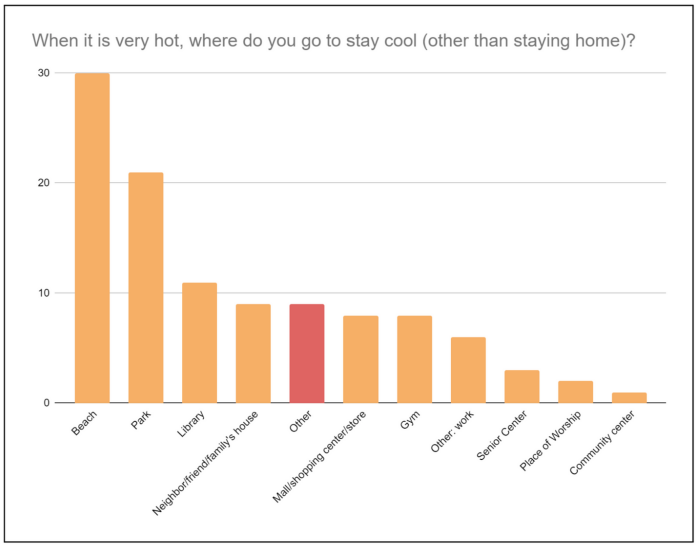


Groton residents are both impacted by extreme heat and concerned about extreme heat. Through conducting a community survey online and in-person, the perspectives of Groton residents, as well as the residents of surrounding towns, regarding extreme heat were collected. The vast majority of respondents answered that they are either moderately worried or very worried about extreme heat.

Currently, respondents believe that the primary ways that heat is currently affecting them are (1) limiting the time they spend outside and (2) energy use/cost. Respondents generally expect the impacts of heat to increase in the future, as the number of respondents who anticipate future heat impacts compared to those who experience current effects increased across all categories. The number of people who responded "no impact" when asked about current impacts of heat decreased significantly when asked about the future impacts of heat.







The majority of respondents prefer to stay home when it is very hot outside. The most common locations for respondents to go to stay cool, when they choose to leave home, are outdoors-- the beach and public parks. The most common indoor location is the public library. The responses in the "other" category include the movie theater, restaurants/bar, hotels, and driving along the coast.

RECOMMENDATIONS

This final portion of the report outlines recommended action items to guide Groton's response to extreme heat. The recommendations are grouped into eight categories. Each category has a few recommended strategies. Note that some strategies could fit into more than one category, but they have been grouped into the category they align with most closely.

Each strategy lists entities that will be important partners for effectively implementing that strategy. Some strategies are also followed by a gray box labeled "consider" that proposes additional ideas or considerations to potentially include in the adoption of the strategy.

Each recommended strategy has a few sub-strategies that are marked by the following icons to indicate their expected timeline and whether they are a high-priority and/or environmental justice-focused strategy.

Important partners to include in these response strategies are as follows. In the full recommendation report, each strategy lists the partners that should be included and the general timeframe of the strategy.

- City of Groton (CoG)
- Town of Groton Parks and Recreation (P&R)
- Thrive55+ Active Living Center
- Town of Groton Public Library
- Bill Memorial Library
- Mystic & Noank Library
- Town of Groton Police Department
  - Office of Emergency Management
- Groton Utilities (GU)
- Town of Groton Human Services Department
- Eversource
- United States Navy Base
- General Dynamics Electric Boat (EB)
- Groton Municipal Television (GMTV)
- Lawrence + Memorial Hospital (L+M)
- Groton Public Schools
- University of Connecticut Avery Point
- Thames Valley Council for Community Action (TVCCA)
- Ledge Light Health District (LLHD)

1. Research

1.1 Assess existing Town policies to understand current heat response and opportunities to support additional heat action work (Hazard mitigation Plan Annex, Age Friendly Groton Plan, etc.)

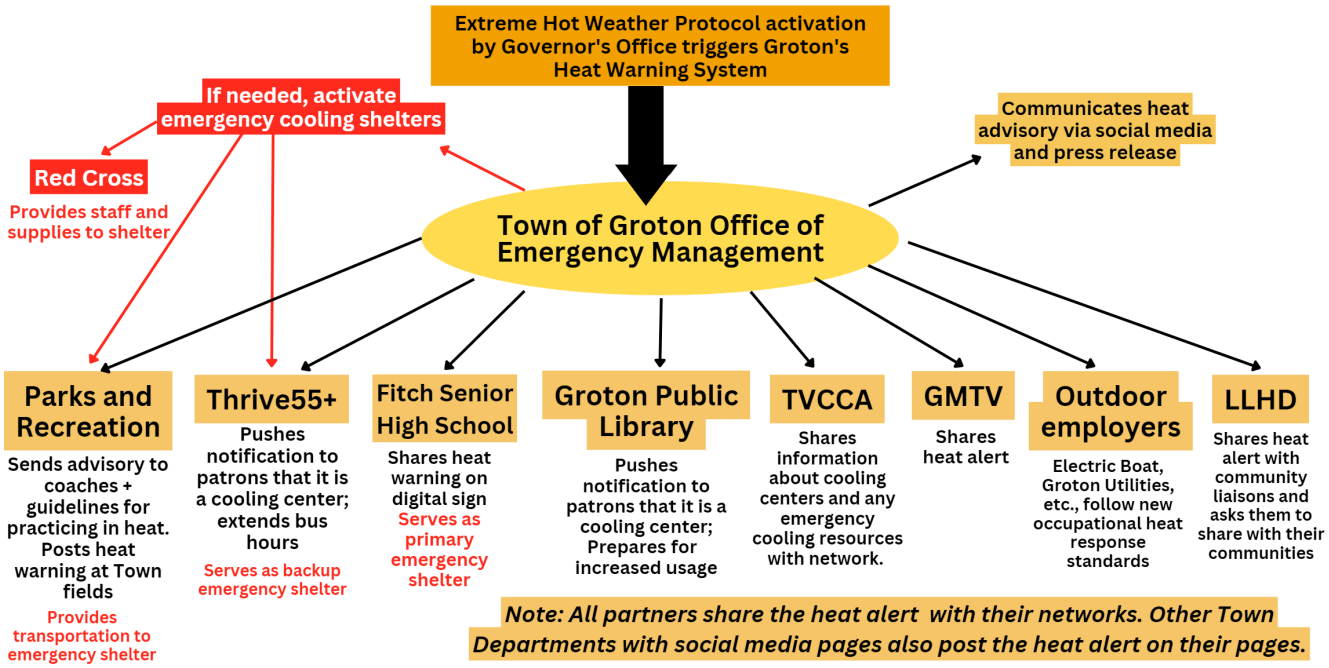
1.2 Continue to examine which parts of the Town are most heat-vulnerable, considering both physical infrastructure and social characteristics.

- Partner with CIRCA to conduct a heat mapping study.

2. Communication and Education

2.1 Expand the existing heat warning system in Groton to reach community partners and advocate for improved statewide heat warnings.

The following chart outlines the proposed communication network for the heat warning system, expanding on the existing heat warnings circulated by the ToG Office of Emergency Management. Improved statewide warnings refers to adding heat notifications to the CTAlert system.



2.2 Standardize language and communication of heat warnings. Ensure that definitions of key terms in heat response are agreed upon and heat warnings share consistent information.

2.3 Communicate heat-related information through a new Instagram page for Groton's sustainability and resilience work.

2.4 Run a public education campaign on the risks of heat and strategies for protecting oneself. Also include information on the benefits of heat pumps.

3. Community Engagement and Outreach

3.1 Continue surveying and community engagement/partnerships, prioritizing diverse outreach. Table at community events, work with LLHD to translate heat resources into Spanish, etc.

3.2 Expand the Thrive55+ "Call and Connect" program to include check-in calls during heat emergencies.

3.3 Assemble a Community Advisory Board (CAB) to inform Groton's work in heat action, and broader climate action. Prioritize having a diverse group of individuals on the board, including people whose voices are typically not represented in ToG boards.

4. Heat Mitigation Infrastructure 

4.1 Target tree planting to heat-vulnerable areas.
Ensure that the resulting Community Forest Management Plan (CFMP) after the upcoming tree canopy inventory prioritizes new tree planting in locations of greatest heat exposure.

4.2 Pursue alternative means of providing shade in areas where trees cannot be planted. Consider bus shelters, pavilions, shade sails, etc., as well as structures that integrate solar panels.

4.3 Install a splash pad.

4.4 Consider pursuing cool building and pavement measures. Connect with peer municipalities like the City of New Haven to undderstand the factors considered in their decision to institute the heat island ordinance. Research whether cool building and pavement measures would be appropriate for CT's climate.

5. Policy and Guidelines 

5.1 Pursue occupational heat policies to protect heat-exposed workers. Connect with employers of outdoor workers like EB, GU, and P&R as well as union leaders to learn about existing extreme heat provisions and gaps in coverage.

5.2 Help P&R and Groton Public Schools develop guidelines for athletes practicing in the heat.

5.3 Release guidelines for hosting events in the heat. Share the guidelines with summer event planners.

5.4 Include community partners in the process of establishing a temporary emergency cooling shelter.

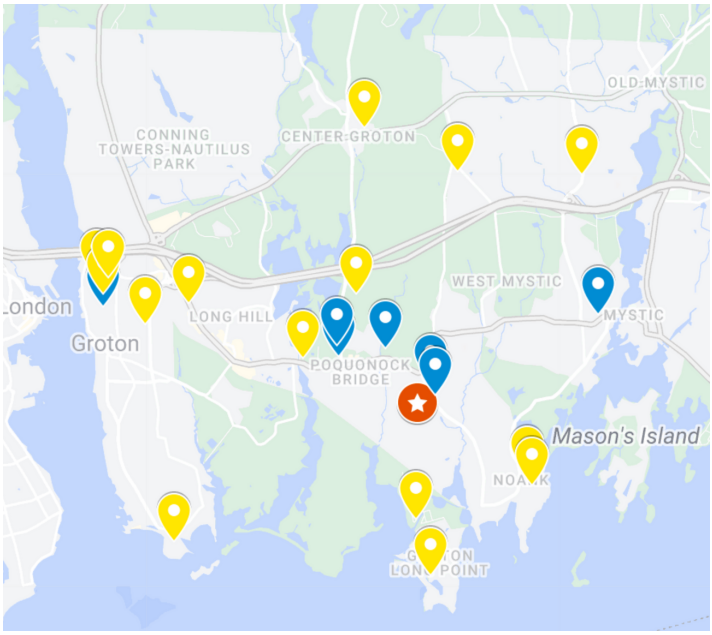
6. Cooling Centers 

6.1 Map current cooling locations around Groton.

6.2 Support and enhance existing cooling centers.

6.3 Increase accessibility of existing cooling centers. Extend bus service hours and cooling center hours during extreme heat events.

6.4 Increase the number of cooling center locations. Prioritize locations in heat-vulnerable areas that lack cooling centers (see next page for map).



Existing and Potential New Cooling Centers in Groton

Emergency shelter (Fitch Senior High)

Current cooling center

Potential new cooling center

7. Energy Assistance and Resilience

7.1 Share information on existing energy assistance programs and energy efficiency measures.
7.2 Require AC in Groton's assisted living facilities. Currently, CT does not require nursing homes to have AC.
7.3 Communicate with landlords to understand their provision of AC to their tenants. Share information about rebates and payment assistant programs that may be relevant to the complex.
7.5 Explore opportunities for providing cooling energy assistance.
7.6 Ensure that critical facilities(cooling centers/shelters, the hospital) are energy-resilient in the case of brownouts and blackouts.
7.7 Transition Groton's energy sources from fossil fuels to renewable energy. This will address the root cause of increasing extreme heat events-- greenhouse gas emissions.

8. Health Systems

8.1 Continue to partner with LLHD to improve understanding of heat morbidity and mortality in Groton.
8.2 Connect with Region IV Emergency Medical Services (EMS) at Lawrence + Memorial Hospital to coordinate response to heat-related illness.
8.3 Connect with homecare agencies in Groton to ensure they are prepared to prevent and respond to heat-related illnesses in clients.

CONCLUSION

Groton, CT is not immune to extreme heat. It too has been witnessing a rise in average temperature due to climate change, and existing extreme heat events are likely to become more intense and frequent in coming years.

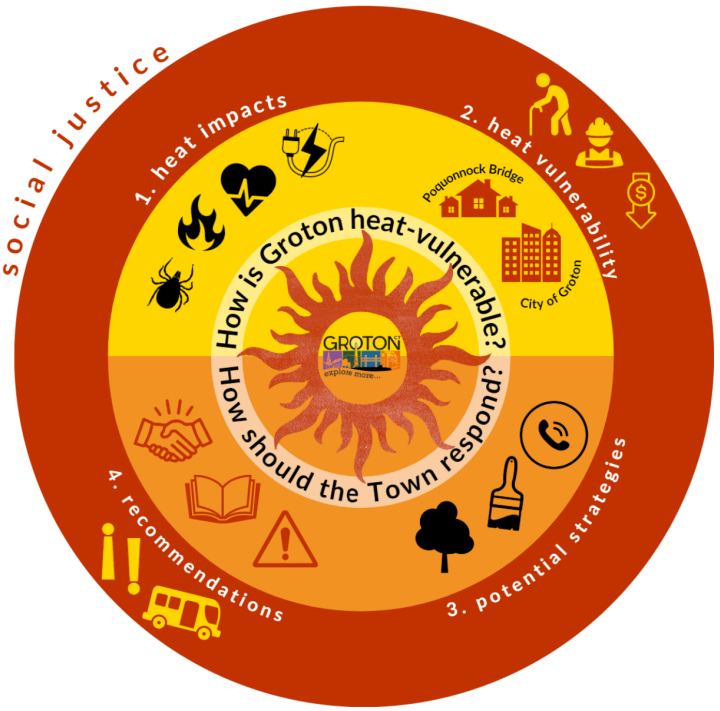
The summer work was guided by two overarching questions-- (1) How is the Town of Groton vulnerable to climate-exacerbated extreme heat? and (2) How should the Town staff respond to extreme heat to protect the health of its community? The process to answer these questions integrated social justice considerations to ensure that the recommendations adequately recognized the disproportionate impacts of extreme heat.

As for the first question, ToG is vulnerable in several ways, such as heat exacerbating environmental health issues in CT like poor air quality and the range of ticks and mosquitos. The rising cost of energy will also pose a concern, since CT has one of the highest energy costs in the country. Different neighborhoods of Groton are more vulnerable than others due to social and physical characteristics. More vulnerable neighborhoods include the City of Groton and Poquonnock Bridge.

As for the second question, the heat response strategies of other towns and cities present several potential actions ToG could undertake. Actions by other towns include setting up a volunteer program to check in on heat-vulnerable individuals during extreme heat events, painting the roofs of buildings white to reflect heat, and running a public art education campaign. This report presents several recommendations specific to the ToG's context, including strengthening partnerships, enhancing existing cooling centers by increasing bus access to them, and translating heat relief and education resources into Spanish.

This project has several limitations and leaves several remaining questions. For instance, many of the community members engaged through the process were not representative of Groton's entire population. Furthermore, the CIRCA heat vulnerability index tool, while helpful on its own, must be analyzed in concert with additional local data to capture the local context. Remaining questions include whether heat-reflective building measures would be beneficial during Groton's cold winters and the most effective way to engage individuals whose voices have historically not been reflected in Town planning processes.

Visual Depiction of Project Findings



This project has provided a space for conversation and learning around the issue of extreme heat. Before this summer, Groton residents may have not considered the different ways in which heat is already impacting their lives, such as a rise in energy costs, and how it will continue to impact their lives and communities. The project also explored different methods for community engagement and identified a few strategies that are more or less successful.

This work will feed directly into plans for extreme heat in the multihazard Town of Groton Climate Action Plan. It will also serve as an example to other municipalities in CT wanting to undertake a heat planning campaign, particularly in light of the new Sustainable Connecticut action items on extreme heat.

The following partners played an invaluable role in helping the project come to fruition:

- TVCCA
- Groton Public Library
- Ledge Light Health District
- Thrive55+ Active Living Center
- Parks & Recreation Department
- City of Groton Farmers Market

APPENDIX

- Heat Vulnerability Assessment
- Heat Action and Communication Strategies Report
- Heat Action Recommendations
- *Community Engagement Materials*
  - Survey Questions
  - Survey Analysis
  - Presentation Slides for Public Presentation
  - Heat Educational Booklet
  - Heat Infographics

Electronic copies of these documents are available upon request by emailing Megan Granato at mgranato@groton-ct.gov.

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