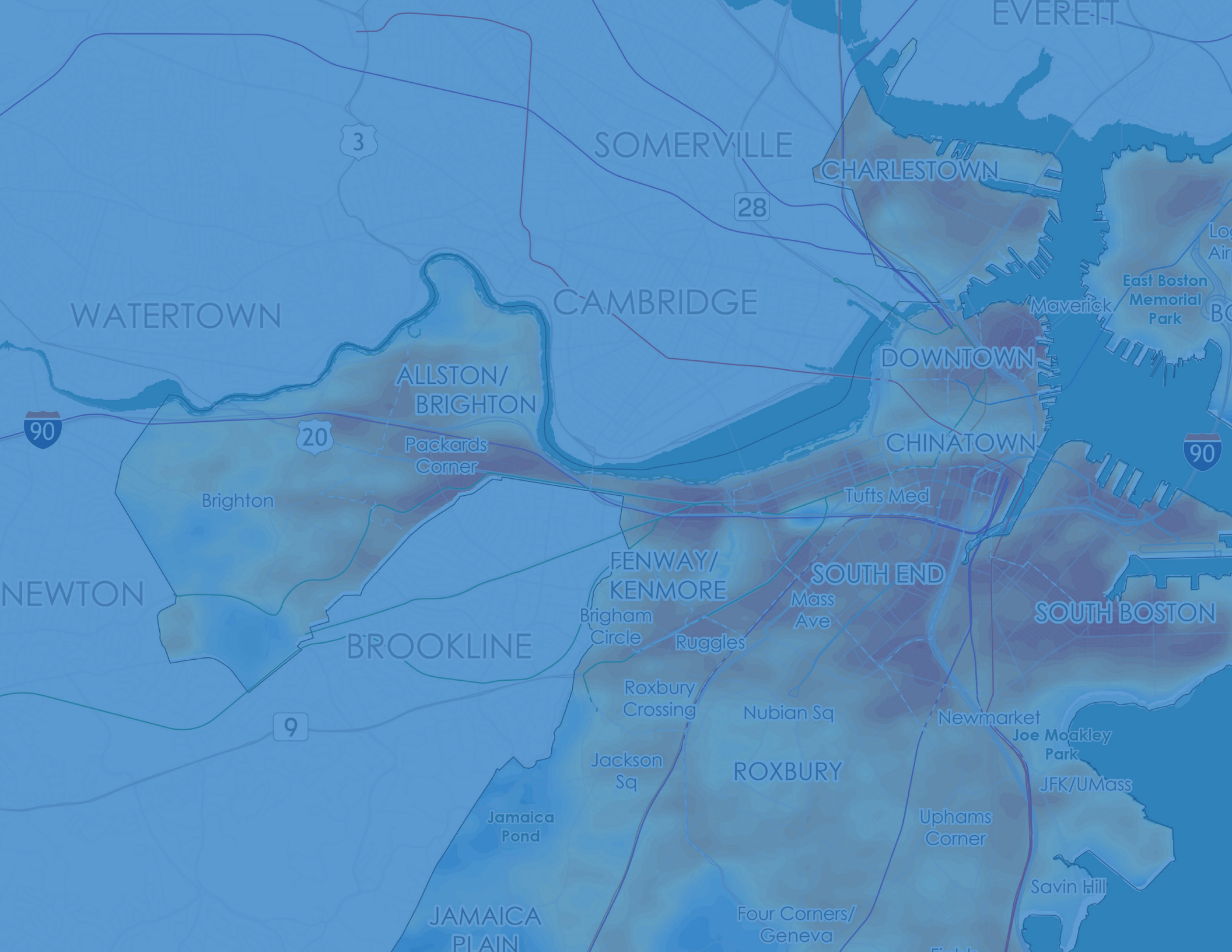

EVERETT
SOMERVILLE
CHARLESTOWN
3
28
CAMBRIDGE
WATERTOWN
East Boston Memorial Park
Maverick
DOWNTOWN
ALLSTON/ BRIGHTON
90
20
Packards Corner
CHINATOWN
90
Brighton
Tufts Med
FENWAY/ KENMORE
SOUTH END
NEWTON
Mass Ave
SOUTH BOSTON
Brigham Circle
Ruggles
BROOKLINE
Roxbury Crossing
Nubian Sq
Newmarket
Joe Moakley Park
9
Jackson Sq
ROXBURY
JFK/UMass
Jamaica Pond
Uphams Corner
Savin Hill
JAMAICA PLAIN
Four Corners/ Geneva

04 EXTREME HEAT RISK IN BOSTON

INTRODUCTION

The Heat Plan conducted an analysis of extreme temperatures across Boston to understand where the greatest heat impacts are, how different communities and populations are impacted, and what factors contribute to varying heat experiences in Boston.

This section details updated projections for extreme heat days, a citywide spatial analysis of air temperature, and community perspectives shared throughout the project's engagement process.


BOSTON PARKS & RECREATION
FACE PAINTING

HEAT TRENDS AND PROJECTIONS

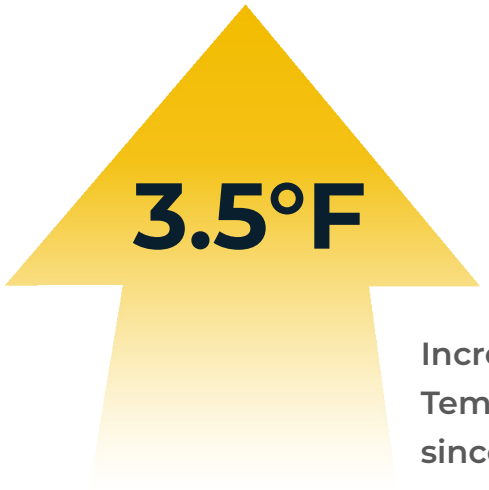
HISTORIC HEAT TRENDS

In Massachusetts, due to climate change, temperatures have increased by 3.5°F since the beginning of the 20th century.[1] In the last decade (2010–2020), Boston experienced more hot days than any decade in the previous 50 years. The total number of days at or above 90°F was 161 days in the past decade—31 days above the average by decade in the past 60 years (130 days). These daytime temperatures were accompanied by an increase in the number of warmer nights, with a total of 10 nights at or above 78°F—6 more nights compared to the 60-year decade average (4 days).[2i]

In the last decade, hot days were also hotter. Average high and low daily temperatures were higher (1.2°F and 1.6°F, respectively) than the 60-year decade average (75.6°F and 59.5°F, respectively). When comparing the average high and low daily temperatures in the 1960s to the 2010s, temperatures increased by 2.0°F and 2.7°F, respectively.[3]

Historically, days above 90°F have mostly occurred between May and September. Between 1960 and 2020, Boston experienced the most number of hot days (over 90°F) and hot nights (over 78°F) in July.[4]

Warming Temperatures

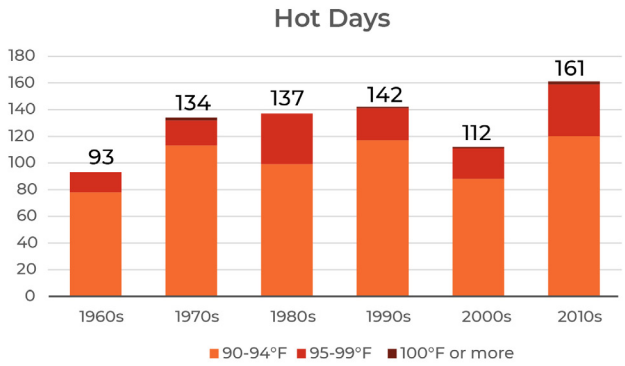


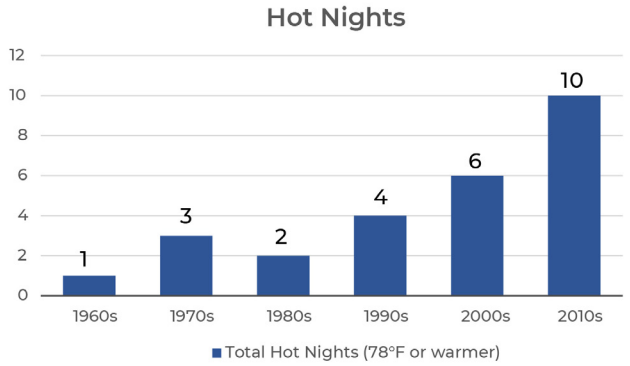
Increase in Massachusetts Temperature since 1900

The number of hot days and hot nights is expected to increase in both low and high carbon emissions scenarios through the end of the century.

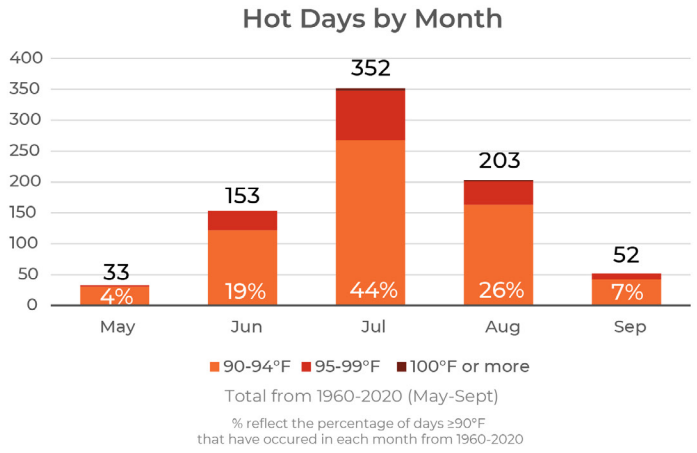
i 60-year decade average is based on 1960 to 2020; average maximum and minimum temperatures based upon May to September data.

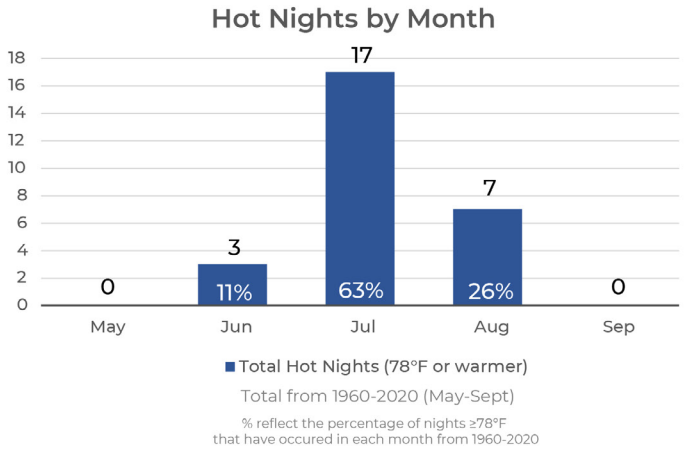
In the last decade, Boston experienced more hot days and nights than any decade in the previous 50 years.





Historically, days above 90°F have mainly occurred between May and September.



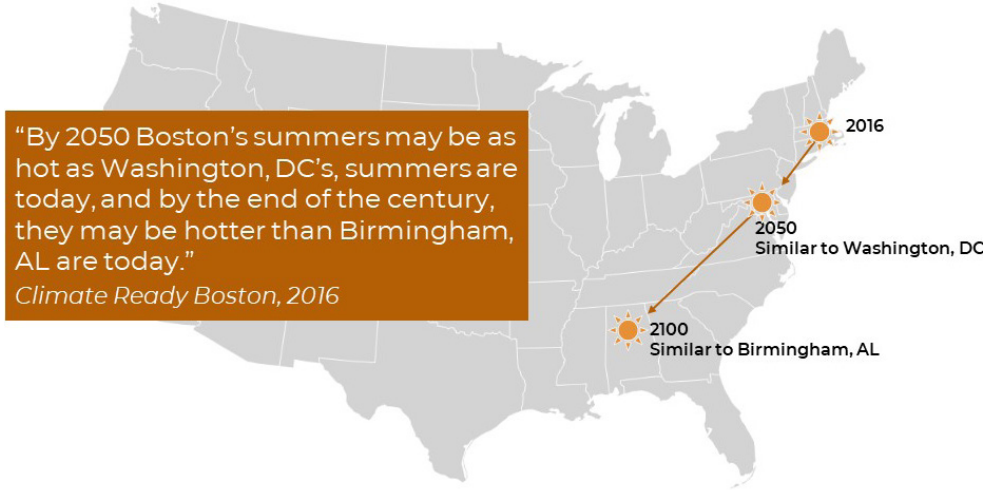


Source: NOAA National Centers for Environmental Information; data pulled for 1960-2020 Logan International Airport weather station average maximum and minimum temperatures based on May to September data

FUTURE PROJECTIONS

The Number of Very Hot Days will Increase

How much Boston's temperatures continue to increase will depend on how quickly and by how much global greenhouse gas emissions can be reduced. Even a small increase in average temperatures will lead to more frequent very hot days and nights, along with longer and hotter heat waves.[5]



PROJECTIONS FOR THE BUSINESS-AS-USUAL EMISSIONS SCENARIO

Historically, Boston summers included 10 days over 90°F (observed baseline for the 1986-2015 period from the LOCA dataset).[i] By the 2070s, the number of days over 90°F could increase six to seven-fold.[6] [ii] In a scenario where emissions trends continue at the current rate (RCP 8.5), climate projections estimate that the number of very hot days (over 90°F) will most likely (17th to 83rd percentile)[iii] increase from a range of 17 to 26 days by the 2030s, to 25 to 42 days by the 2050s, and 33 to 62 days by the 2070s. In an extreme case, the number of very hot days (over 90°F) could reach up to 87 days by the 2080s.

PROJECTIONS FOR THE REDUCED EMISSIONS SCENARIO

If aggressive action is taken to reduce emissions (RCP 4.5), the number of very hot days (over 90°F) by the 2070s will be about half (20 to 38 days) what we might see in the previous high emissions scenario. Even with reduced emissions, Bostonians will face increasing chronic heat risk as the number of days over 80°F will increase. Although Boston's extreme heat response is based on 90°F and 95°F thresholds, 80°F may be uncomfortable for some community members, especially those with greater heat vulnerability. The number of days over 80°F, currently about 62 per year, will most likely increase from 73 to 91 days in the 2030s to 84 to 107 days by the 2070s. In an extreme case, the number of days over 80°F could reach up to 140 days by the 2070s. This means that the duration of summer weather will become longer and the future summer season will likely extend beyond the typical 92-day summer from June to August.

INCREASED HEAT EMERGENCY DECLARATIONS

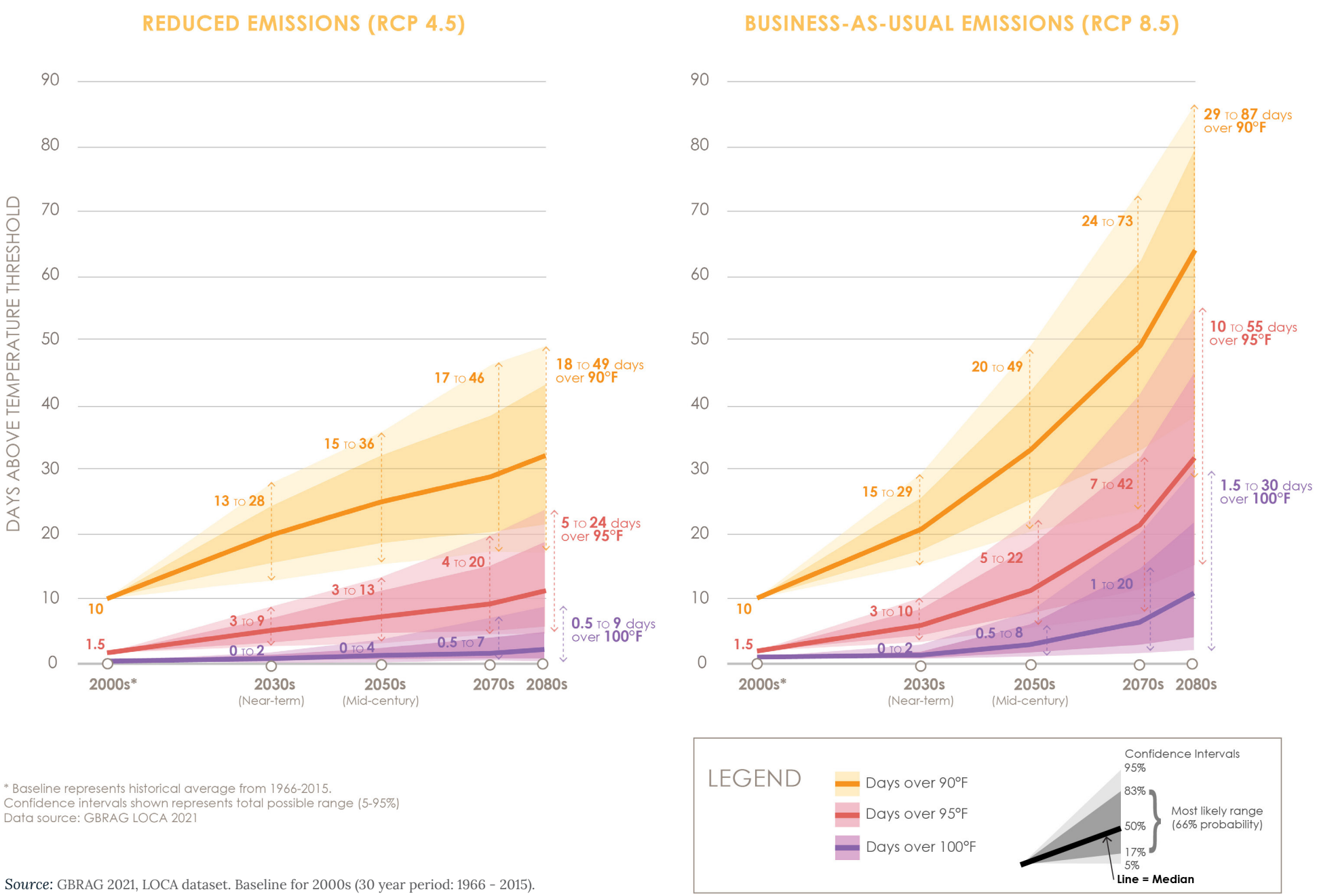
As heat risk increases, the number of heat emergency declarations in Boston may also increase with more days above the 95°F threshold. Historically, Boston experienced only 1.5 days over 95°F, annually. By the 2030s, Boston will most likely experience 4 to 8 days over 95°F (RCP 8.5), annually. This is projected to increase to 11 to 32 days by the 2070s. Historically, days over 100°F have not been common (0.1 days over 100°F). However, by the 2070s, Boston is likely to reach up to 14 days over 100°F in a year. In an extreme case, the number of days over 100°F in a year could reach up to 20 by the 2070s.

In 2021, Boston experienced 24 days above 90°F and four heat waves.[7] With temperatures increasing even in the reduced emissions scenario, preparing for the impacts of extreme heat in Boston is urgent today.

---

i The historic baseline varies depending on the period used.
ii This uses the GBRAG, Local Constructed Analogs (LOCA) dataset. The baseline used in 2016 *Climate Ready Boston* is 11 days over 90°F.
iii The most likely range reflects 17-83% confidence intervals from the GBRAG, LOCA dataset.

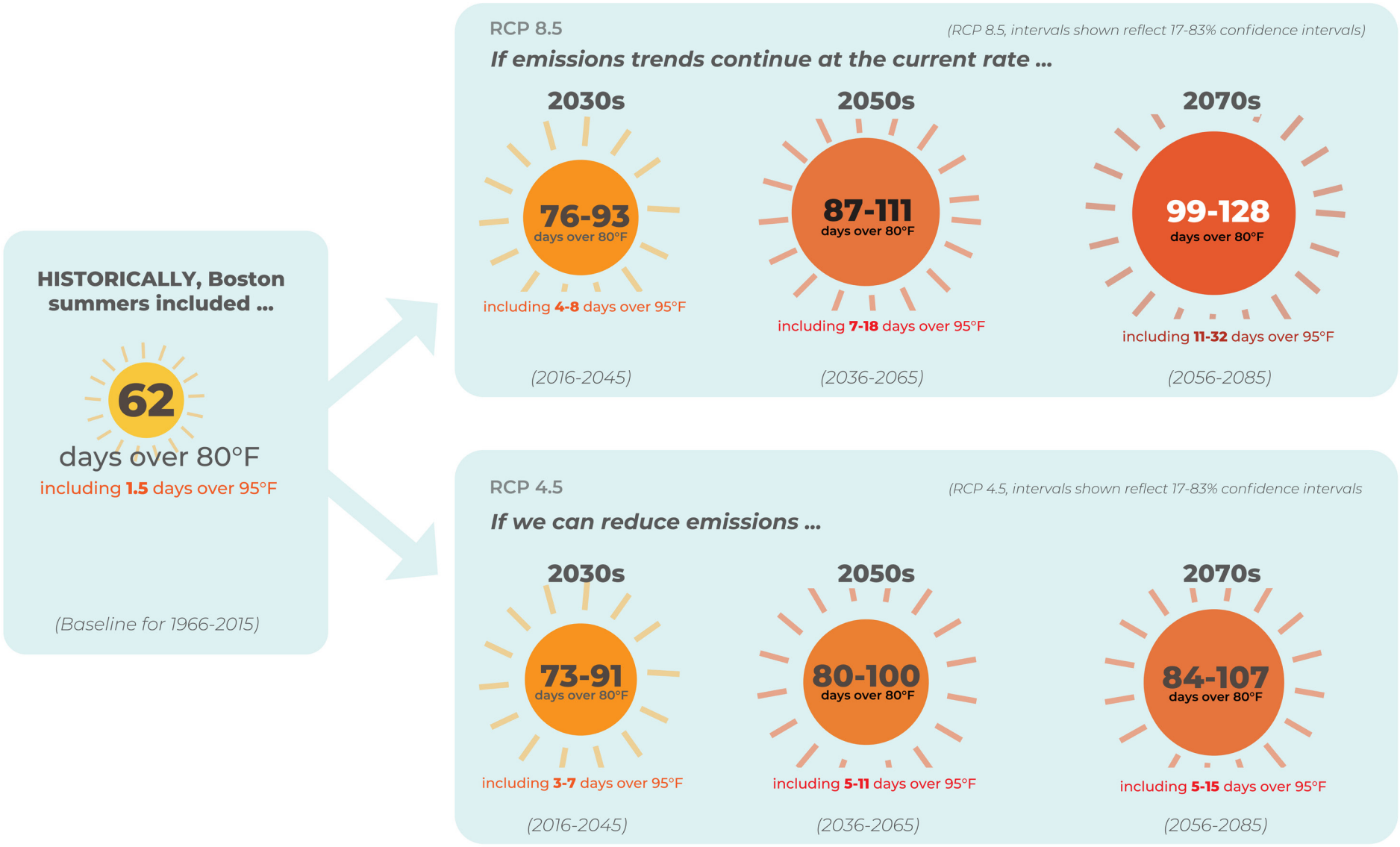
THE NUMBER OF VERY HOT DAYS WILL INCREASE, EVEN IF WE REDUCE CARBON EMISSIONS.



* Baseline represents historical average from 1966-2015.
Confidence intervals shown represents total possible range (5-95%)
Data source: GBRAG LOCA 2021

Source: GBRAG 2021, LOCA dataset. Baseline for 2000s (30 year period: 1966 - 2015).

BY THE 2070S, THE CURRENT JUNE TO AUGUST SUMMER SEASON WILL MOST LIKELY BE ABOVE 80°F EVERY DAY.



Source: GBRAG, LOCA dataset. Baseline for 2000s (30 year period: 1966 - 2015).

AN INCREASE IN DAYS ABOVE 90°F MEANS LONGER AND MORE FREQUENT HEAT WAVES.

HISTORICALLY, Boston summers included ...

10
days over 90°F
including **0.1** days over 100°F

(Baseline for 1966-2015)

RCP 8.5

(RCP 8.5, intervals shown reflect 17-83% confidence intervals)

If emissions trends continue at the current rate ...

2030s	2050s	2070s
17-26 days over 90°F	**25-42** days over 90°F	**33-62** days over 90°F
including **0.5-1.5** days over 100°F	including **1-6** days over 100°F	including **2-14** days over 100°F
(2016-2045)	*(2036-2065)*	*(2056-2085)*

RCP 4.5

(RCP 4.5, intervals shown reflect 17-83% confidence intervals

If we can reduce emissions ...

2030s	2050s	2070s
16-24 days over 90°F	**19-32** days over 90°F	**20-38** days over 90°F
including **0.5-1** days over 100°F	including **0.5-2** days over 100°F	including **0.5-4** days over 100°F
(2016-2045)	*(2036-2065)*	*(2056-2085)*

Area of sun scaled proportionally to the median

CITYWIDE HEAT ANALYSIS

A weeklong analysis period during July 18 to 24, 2019, was selected to produce modeled air temperature maps for the plan.

This week coincided with a very intense heat wave with peak temperatures of approximately 96.8°F on July 21 and 22 (measured at Logan International Airport). The air temperature maps produced for the *Heat Plan* include daytime temperature, nighttime temperature, heat event duration, and urban heat island index. A detailed technical memo on the data used and modeling methodology can be found in Appendix 1.

NEW HEAT MODELS AND DATA SETS ALLOW US TO BETTER UNDERSTAND:

Air Temperature: Localized daytime and nighttime air temperatures across the city.

Urban Heat Island Index: How urban characteristics like building massing, density, trees, and parks contribute to heat exposure.

Heat Duration: Where high heat conditions are longer and more intense.

URBAN HEAT ISLANDS AND MEASURING HEAT

The urban heat island effect in this analysis is measured as the near-surface air temperature difference between a specific urban location and rural location that is located further away from urban centers. The rural location provides a baseline temperature to compare against temperatures in the urban location. This metric is known as the Urban Heat Island Index (UHII). The UHII highlights areas that remain hot for longer, representing both the intensity and duration of localized heat within the city. The design and the built environment within cities impact how hot or cool a city, neighborhood, or a street feels. Heat experiences tend to be hotter within cities compared to more suburban or rural areas due to the urban heat island effect.

Dark, paved, and impervious surfaces, such as asphalt roads and buildings with black roofs, contribute to the urban heat island effect. These surfaces absorb more heat than vegetated or light colored surfaces, and they release this heat back into the surrounding environment. Areas with less trees, grass, and other vegetation tend to feel hotter when there is little shade or evapotranspiration to help reduce high air temperatures. Tall buildings and dense development also impact heat within a city. Building form and orientation can change how ventilating wind flows through corridors, how readily radiated heat can disperse, and how much sun or shade hits the surface.

This analysis also calculated heat event duration, which is the number of hours within the analysis week where heat conditions exceed daytime temperatures at or above 95°F and nighttime temperatures above 75°F. This metric is useful to identify neighborhoods that stay the hottest for the longest period during high-heat conditions.

The results from the citywide heat analysis were mapped at the city-scale to identify the hottest areas in Boston. The analysis then compared these areas to where community members feel the hottest according to a map-based online survey conducted as part of the *Heat Plan*'s engagement process. This data is available on the Climate Ready Boston Map Explorer website.[i]

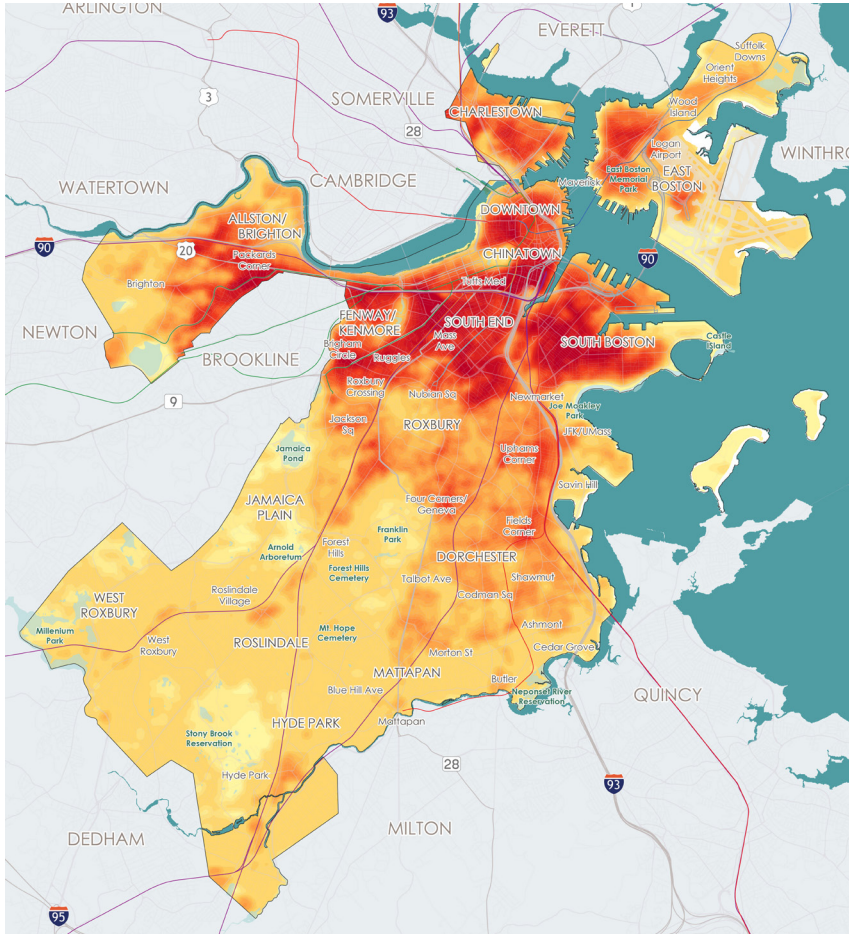
i The Climate Ready Boston Map Explorer can be found here: https://www.boston.gov/departments/environment/climate-ready-boston-map-explorer

HOW TO READ THE CITYWIDE HEAT ANALYSIS MAPS

How data is represented in a map can influence how it is interpreted. Below are two maps illustrating the same heat event hours dataset from the citywide heat analysis. The map on the left uses a yellow to red color scale to communicate that extreme heat already affects all of Boston, while the map on the right uses a blue to red color scale to highlight areas that are hottest in the city. The maps on the following pages use the blue to red color scale to help identify and emphasize the hottest hotspots in the city. While reading through this chapter, it's important to remember that although some neighborhoods experience greater extreme heat risks, all of Boston is hot and at risk during heat waves.

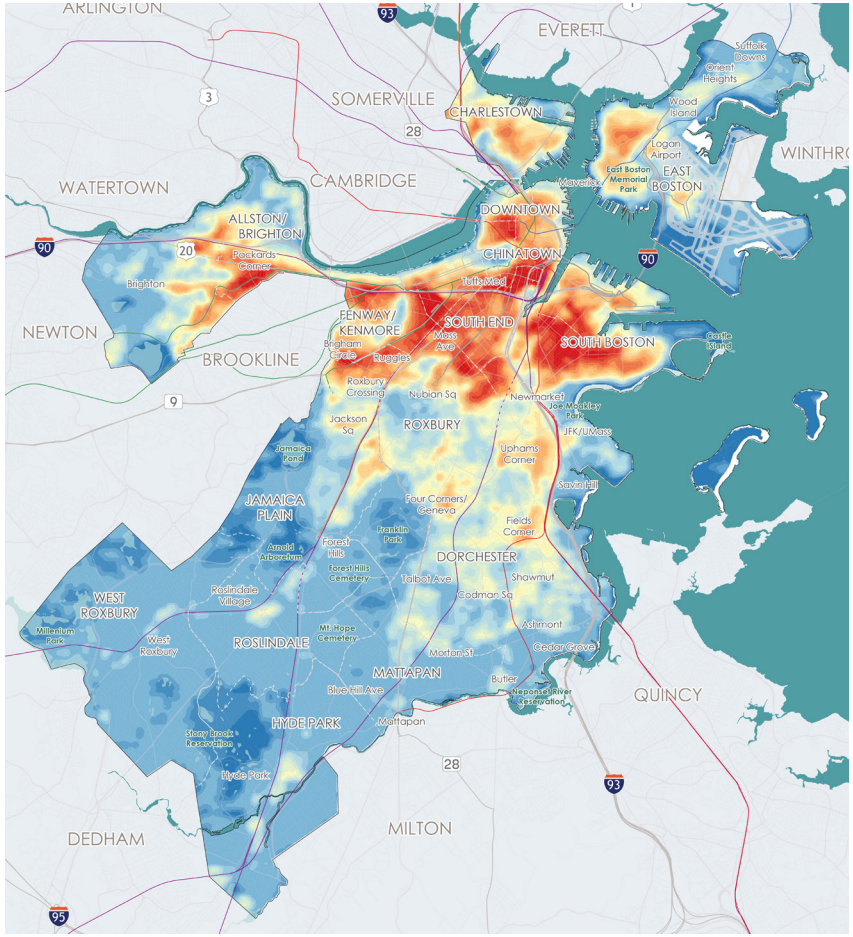
All areas of blue on the maps are still part of the urban heat island of Boston and are hotter than the surrounding suburban and rural areas.

Extreme heat already affects all of Boston.



HEAT EVENT HOURS: *Less than 25 hrs* *More than 37 hrs*

Some places are hot for longer.

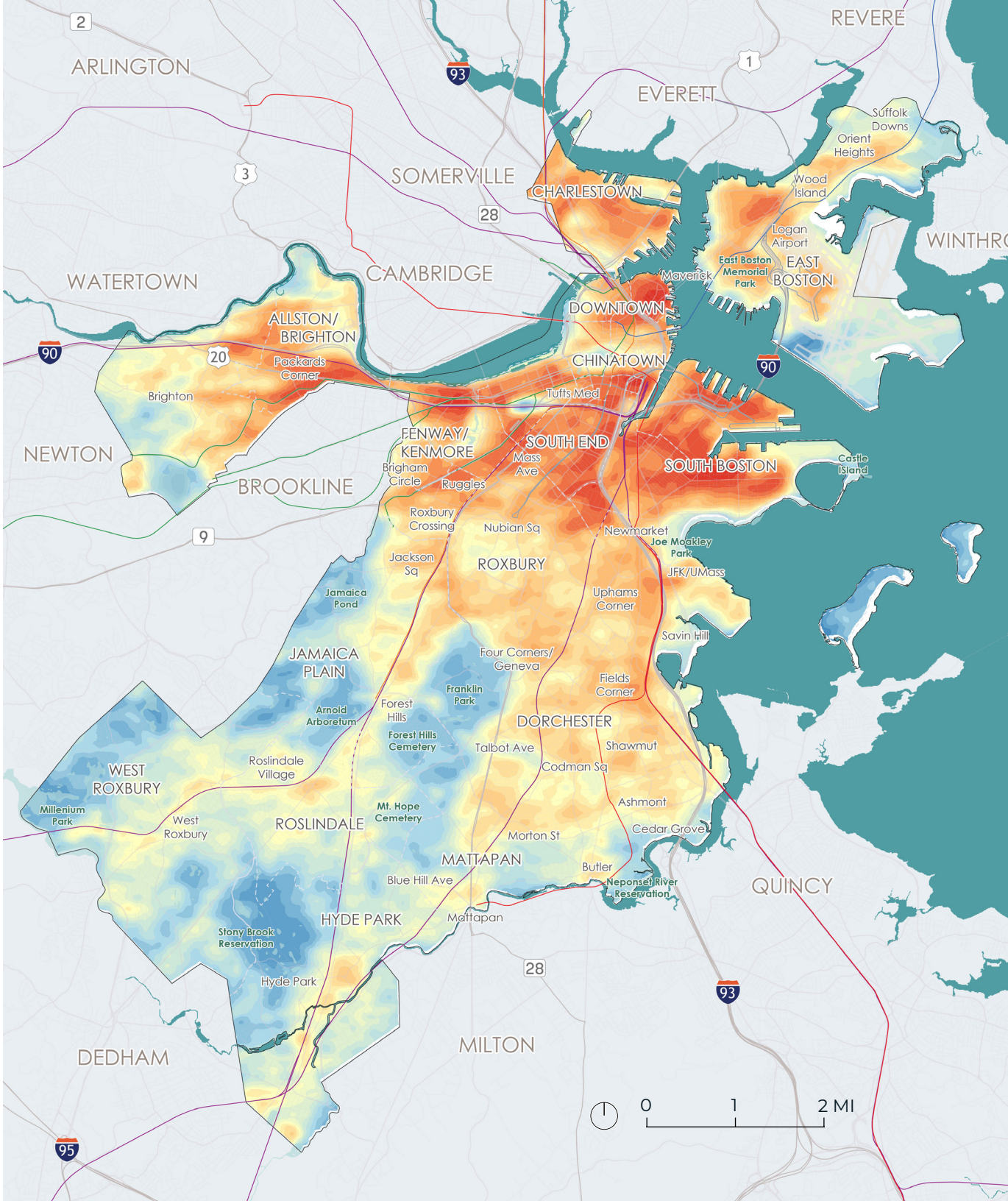


HEAT EVENT HOURS: *Less than 25 hrs* *More than 37 hrs*

DAYTIME AIR TEMPERATURE

Boston is very hot during the day...

On high-heat days, all parts of Boston experience high air temperatures. Even the coolest places in Boston—like Franklin Park or Stony Brook Reservation—still experience temperatures that are above 95°F for extended periods. The daytime air temperature map shows that most of the city, except for large open spaces like Franklin Park, can reach over 100°F during a heat wave. Daytime air temperatures are generally high in areas that have high solar exposure due to impervious surfaces, limited vegetation, or limited wind ventilation. For example, areas like downtown Boston—where there is limited vegetation, tall buildings, and a lot of paved surfaces—can reach temperatures around 105°F.

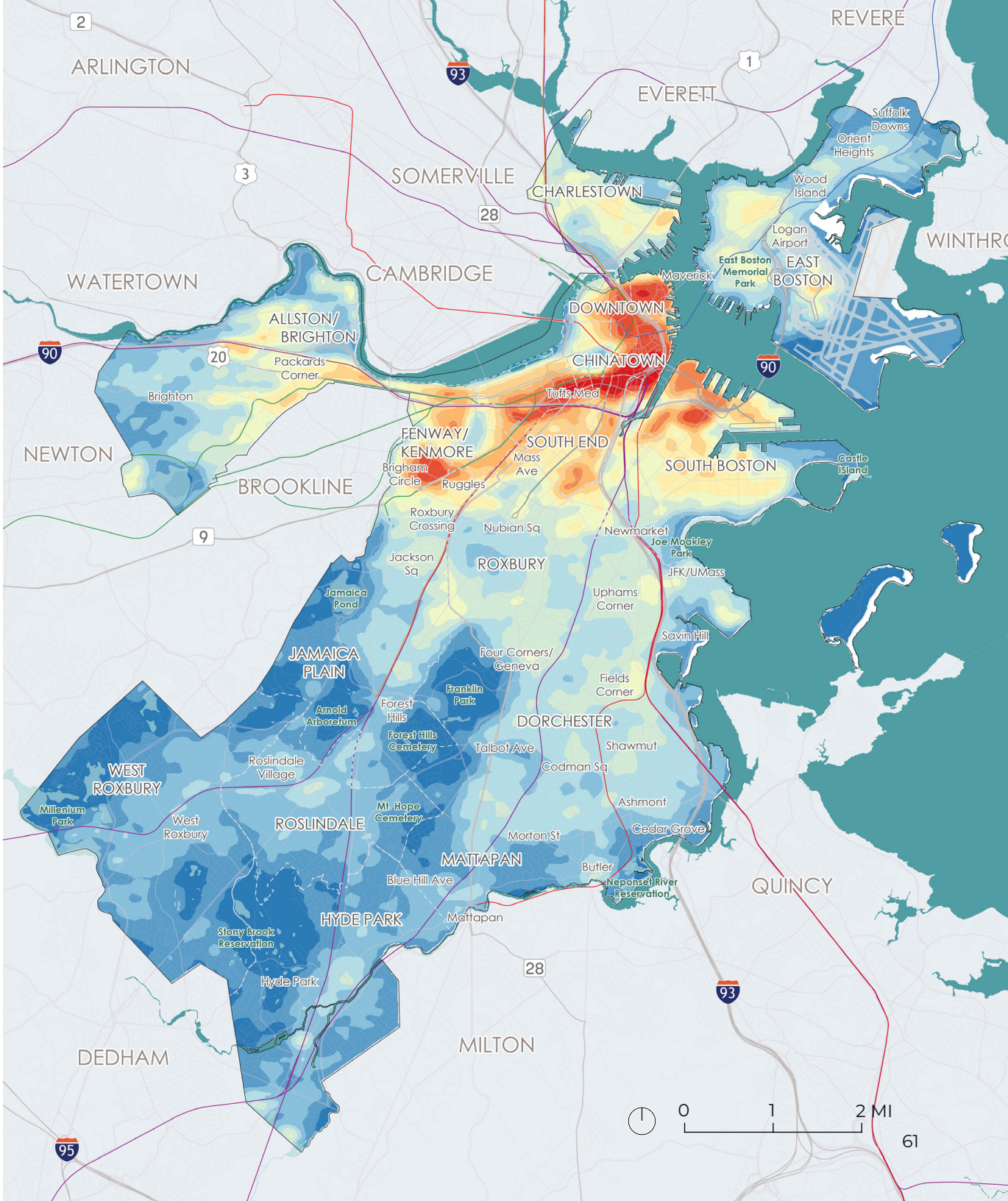


The citywide daytime median air temperature was 99.5°F during the heat wave.

NIGHTTIME AIR TEMPERATURE

...And is also hot at night

The nighttime temperature map shows that the densest part of the city isn't just hottest during the day, but is also hottest at night. This means heat relief at home is needed to address the health impacts of high nighttime temperatures, especially for residents with higher risks. High nighttime temperatures generally follow densely built urban centers that trap heat within the urban canopy. The limited ventilation, sky view, and high thermal storage of these areas tend to retain and slowly release stored heat. For example, downtown Boston can reach temperatures above 90°F at night.

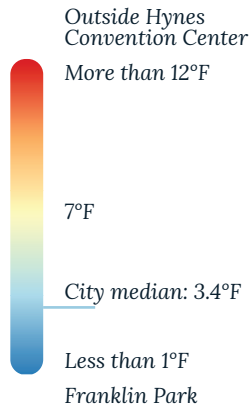


The citywide nighttime median air temperature was 81.9°F during the heat wave.

URBAN HEAT ISLAND INDEX

Coolest and hottest points in Boston

The UHII is represented in this map as an average daily temperature difference above the rural ambient temperature, or number of degrees (°F) above the coolest points in Boston. Several areas in Boston are consistent with the rural ambient temperature and are considered the coolest points in Boston, including Franklin Park, Stony Brook Reservation, and areas of West Roxbury and Jamaica Plain. Areas that are at least 10°F hotter than the coolest points include places like outside Hynes Convention Center where there are wide roads and little vegetation. The UHII map illustrates a similar spatial pattern to the nighttime temperature map. Areas experiencing the most intense and longest heat are Chinatown, Downtown Boston, the South End, South Boston, and Back Bay. Allston, Brighton, Charlestown, East Boston, and parts of Dorchester and Roxbury also experience hotter and longer heat events compared to the city median (3.4°F).



UHII: °F ABOVE COOLEST POINT IN BOSTON

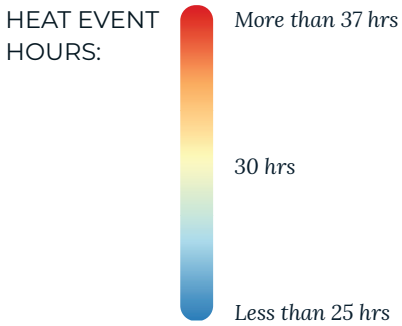
HEAT DURATION

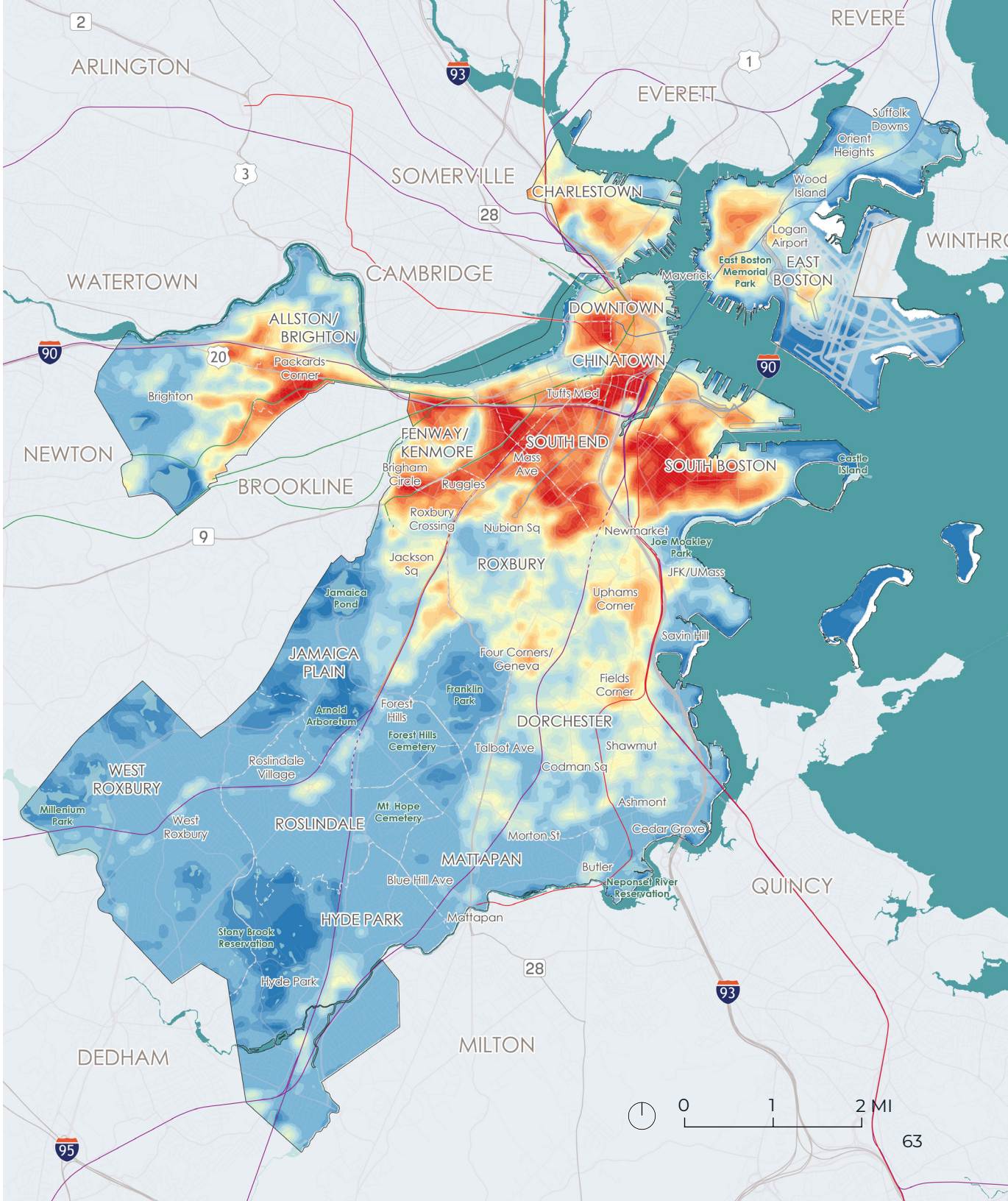
Some places are hot for long periods of time.

Understanding which areas experience extreme heat for the longest period of time helps identify where to prioritize long-term heat mitigation strategies. Heat duration is represented as the number of hours within the analysis week where air temperatures maintained a high-heat condition, exceeding 95°F during the day and staying above 75°F at night.

Some places experience disproportionately greater heat risk, with higher temperatures and extended heat wave conditions.

These neighborhoods enter high-heat conditions sooner, reach higher air temperatures, and remain in heat wave conditions longer. In this citywide heat analysis, Chinatown remained in a high-heat condition for 37 hours, with afternoon air temperatures climbing to 104 to 107°F and nighttime temperatures in much of the neighborhood remaining over 90°F. In contrast, West Roxbury's western area remained in high-heat conditions for 25 hours, with afternoon temperatures around 95°F and nighttime temperatures around 80°F. Other hotspots that are most distinct in the heat duration map include Uphams Corner, Four Corners, Fields Corner, and Jackson Square (more than 30 hours).





EXTREME HEAT RESPONSE

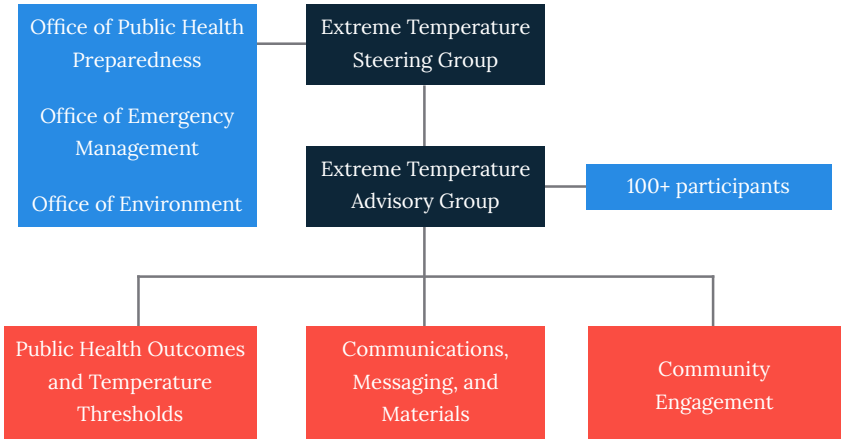
In Boston, a heat advisory is issued if there is a heat wave—a period of three or more consecutive days above 90°F. A heat emergency is declared if there is a period of two or more consecutive days above 95°F, and the overnight temperature does not fall below 75°F.[i]

From an operational perspective, the BPHC Extreme Temperatures Response Plan aims to reduce heat-related health risks and outcomes for Boston residents, especially people most vulnerable to extreme heat impacts. The Extreme Temperatures Response Plan shifts management of extreme heat and cold events to the BPHC, including coordination of the respective City of Boston departments to communicate and engage with communities to enhance preparedness to extreme temperatures.

When a heat emergency is declared, public facilities like designated Boston Centers for Youth and Families (BCYF) community centers are activated to serve as cooling centers within Boston neighborhoods. Typically, BCYF centers require registration, but during a heat emergency, facilities are open to all residents. Additionally, if residents are signed up for AlertBoston, the City's emergency alert system, they will receive emergency alerts by phone, email, or text. Residents are also often directed to non-emergency City services during heat waves by calling into the City's constituent services hotline, 311.

The City of Boston has also implemented short-term cooling strategies, such as the distribution of cooling appliances to older adult residents and residents with disabilities or chronic illness. A pilot program of the Healthy Places Initiative distributed 400 air-conditioning units to 123 lower-income and high risk residents (e.g., people with asthma and lower incomes, older adults with lower incomes) and 277 additional older adult and disabled residents of Boston Housing Authority (BHA) communities during summer 2021. An additional 700 box fans were also distributed in BHA facilities for older adult and disabled residents to support cooler, healthier homes.

Planning Structure of the Extreme Temperatures Steering Group



Source: Adapted from Collaborative Planning for Extreme Temperature Response in the City of Boston. Accessed March 2022. https://delvalle.bphc.org/mod/wiki/view.php?pageid=159

i These thresholds are relevant as of 2022. As average temperatures increase, these thresholds are subject to change in the future.

Fan distribution as part of the pilot Healthy Places Initiative in summer 2021

Hampton House Apartments in Roxbury

Eva White Apartments in the South End

Eva White Apartments in the South End

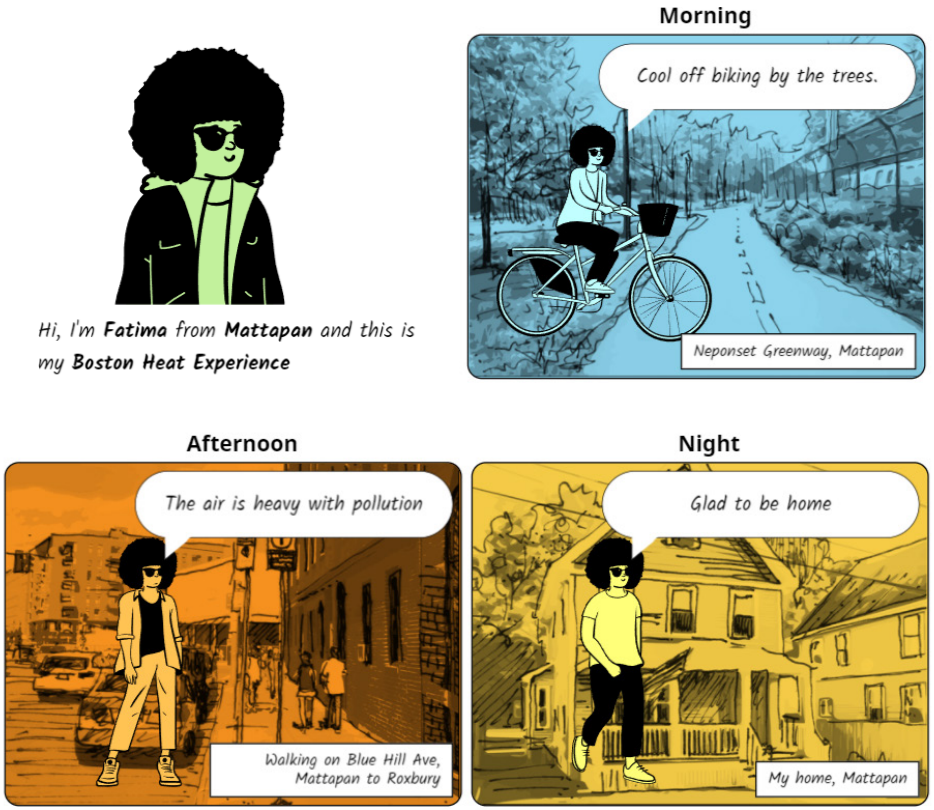
HEAT EXPERIENCES

Over 390 people participated in the heat resilience strategies process through online surveys, focus neighborhood idea sessions, a youth idea session, and open houses. In addition to engaging people from the five focus neighborhoods (Chinatown, East Boston, Dorchester, Roxbury, Mattapan), residents from nine other neighborhoods shared how they stay cool during the summer and how the built environment makes their neighborhood hotter.

WHERE IS IT HOTTEST IN BOSTON FOR RESIDENTS?

Part of the online survey included an interactive mapping portion that asked where people feel too hot inside and too hot outside, and which routes felt uncomfortably hot. Of the more than 80 people that responded to the survey form, 27 respondents mapped where they felt too hot. The majority of the 27 respondents live in Dorchester, while other respondents live in Charlestown, East Boston, Jamaica Plain, Mission Hill, Newton, Roslindale, and the South End.

HEAT RESILIENCE STORY COMIC BUILDER



The project developed an online comic builder to facilitate and empower community participants to share their heat story experience in a creative way. Participants created a character and illustrated what they do to stay cool on hot summer days.

STAYING HOME WHEN IT'S HOT

Of respondents to the online survey, 97% think that high heat is an important issue during the summer, and 91% of people feel too hot in their home when it is very hot outside. Despite feeling hot at home, two-thirds of stakeholders, which includes the majority of people 34 to 64 years old and people over 65 years old, stay home on a very hot day to limit physical activity, with 60% always using air conditioning. Those who never or sometimes use air conditioning at home mainly limit their use (or do not have access) because of unaffordable utility bills or electrical and insulation issues in older buildings.

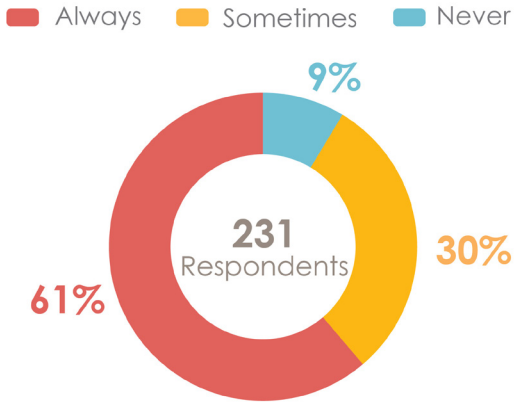
Other ways residents stay cool on a hot summer day include turning on the air conditioner at home, using fans, drinking water, and taking cold showers.

The majority of respondents always use an air conditioner at home. However, for those who sometimes or never use air conditioning at home, it is mainly because the utility bill is not affordable.

When not at home, people go to an outdoor public place, such as a pool or park, or a privately-owned place, like the mall or home of a friend.

If you feel too hot in the summer, what do you do to stay cool?

When it is very hot outside, how often do you use air conditioning in your home?



I stay home most of the time and underneath my fan all day. I have asthma and it's not safe for me to be out in the summer when it's hot.
-youth participant

PUBLIC COOLING LOCATIONS

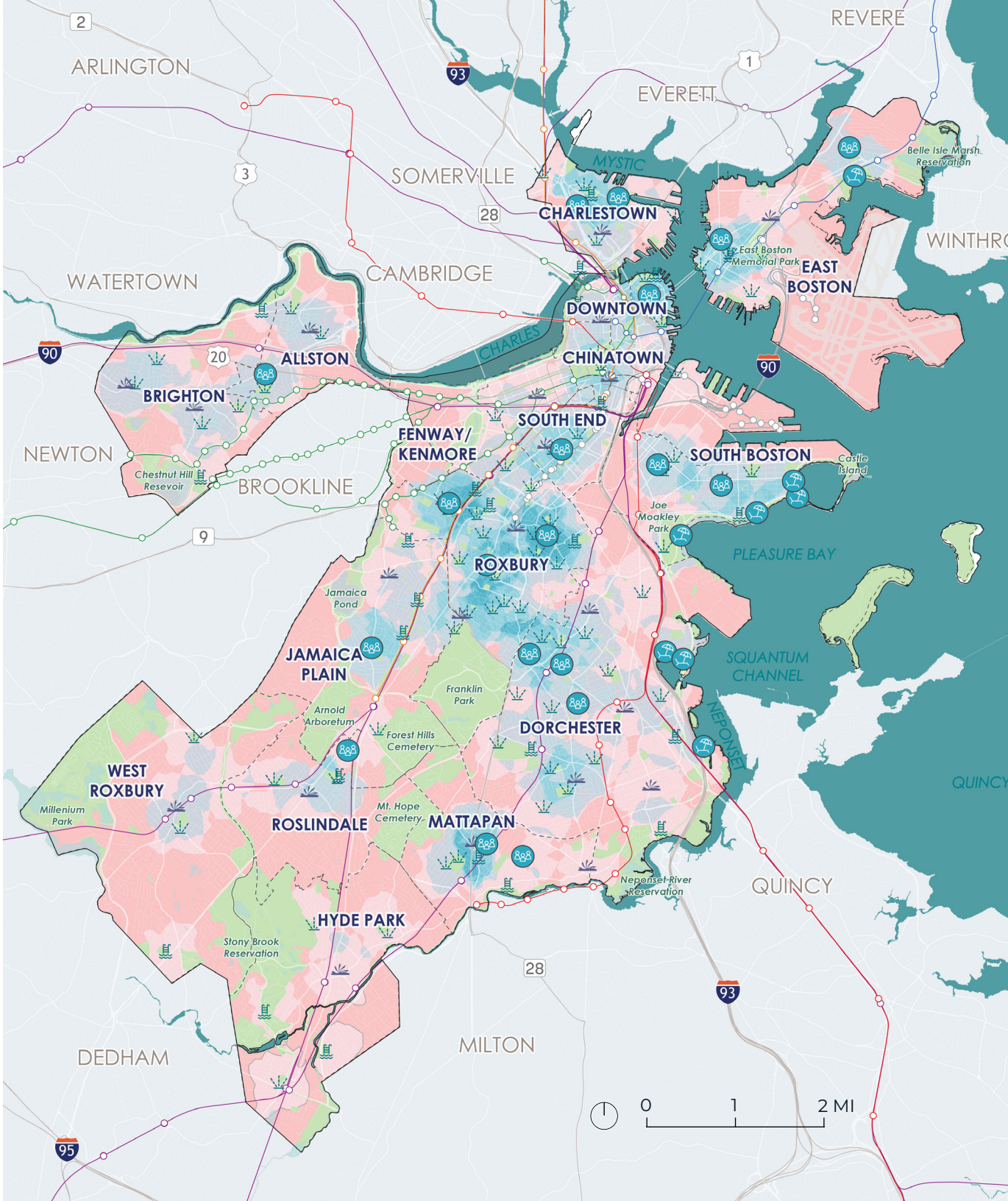
Gaps in the existing cooling network

Many parts of the city have public places to cool off within a 10-minute walk, but some areas within neighborhoods fall outside of this range. These areas are highlighted in red: East Boston and many neighborhoods in the southwest. These red gaps increase when cooling places aimed at young children, like tot sprays, are removed from consideration.

PUBLIC PLACES TO COOL OFF

- *Pools (BCYF and DCR)*
- *Tot Sprays*
- *Libraries*
- *Beaches*
- *Community Centers*[i]
- *No Cooling Centers*
- *More Cooling Centers Within 10-minute Walk*

i BCYF Summer 2020 Cooling centers were used for this map.

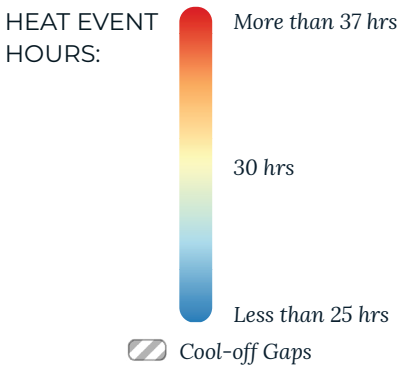


OFFICIAL COOLING CENTER GAPS

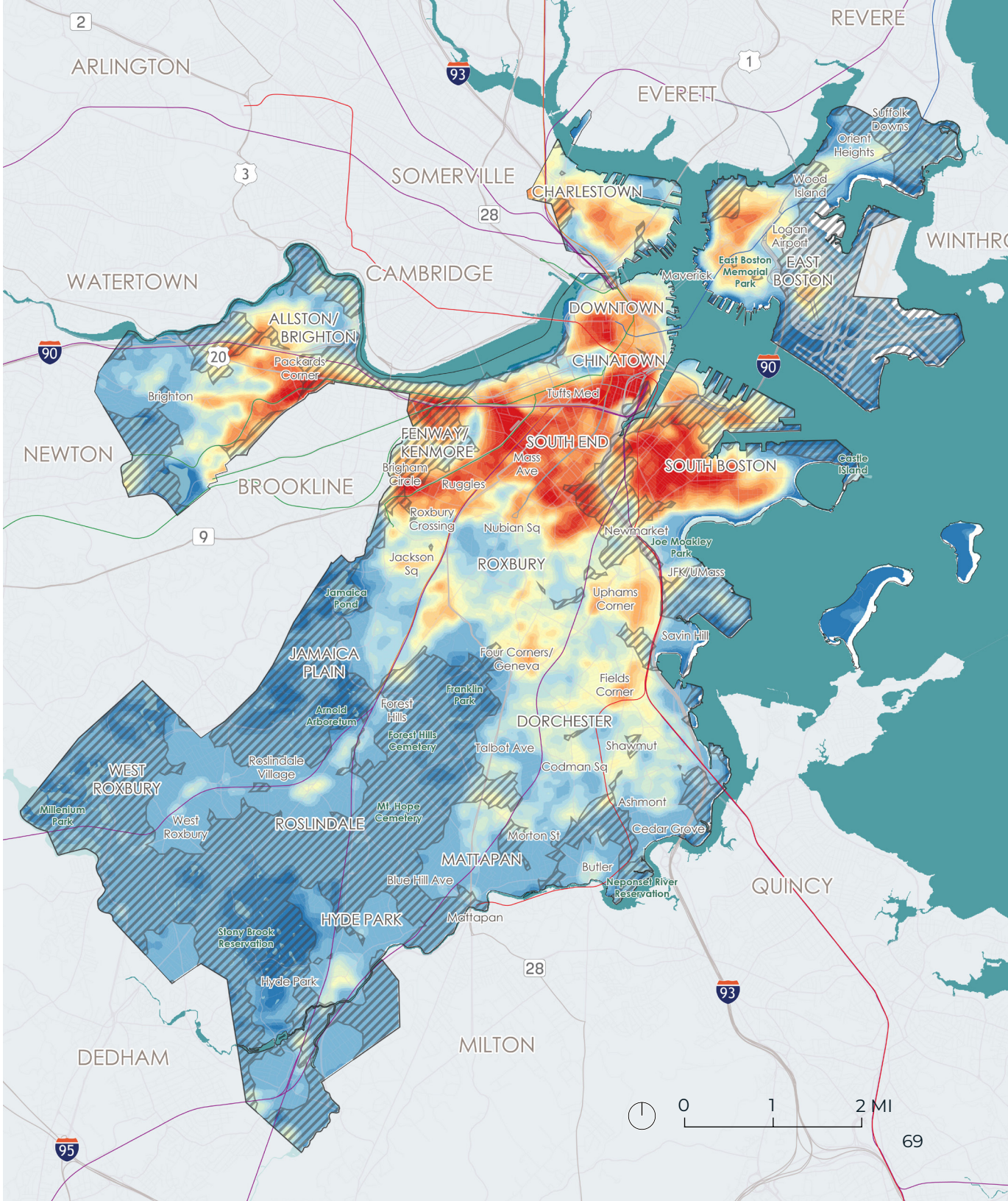
Places more than a 10-minute walk from an official cooling centers

Many of the places not within a 10-minute walk of a public cooling center[i] are near large open spaces, such as around Stony Brook Reservation and Jamaica Pond. However, some areas still experience over 37 hours of extreme heat without access to a cooling center. Some of these places include parts of Dorchester near I-93 and Fenway/Kenmore.

Survey respondents shared that additional public cooling locations and cooling centers are needed for adults, especially seniors who are more vulnerable to extreme heat.



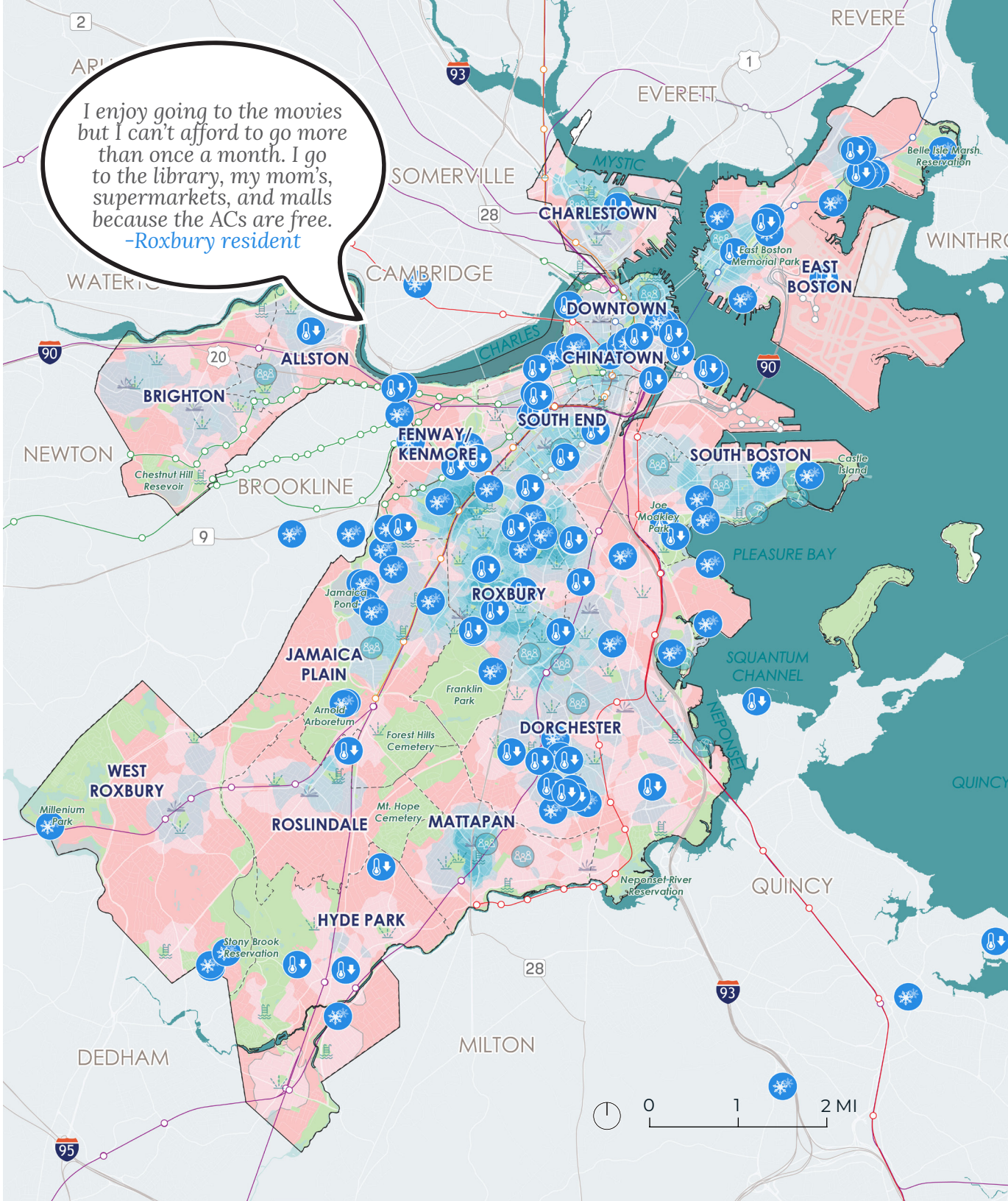
i BCYF Summer 2020 Cooling centers were used for this map.



SURVEY RESULTS: COOL DESTINATIONS

Affordable, accessible, and welcoming to all

Based on survey responses, popular options when it is hot outside include going to an outdoor public place, an indoor public place, or an indoor privately-owned place. Respondents preferred to stay cool at a friend, relative, or neighbor's home with a pool or air-conditioning. Other locations with water features like tot sprays or fountains are especially popular with people under 34 years old, while swimming pools are mostly visited by people 34 to 64 years old. Respondents shared a desire for additional public water features that serve people of all ages. In addition to outdoor places, respondents shared that air conditioned places, like movie theaters and malls, are critical community spaces on a hot day. Public indoor spaces, including cooling centers, community centers, and libraries, are also places residents use on a hot day. Respondents shared that improvements to registration, opening hours, and programming could increase their use. Respondents also shared that cool indoor public places should create a welcoming and safe environment for all, especially people of color and youth.



COOLING CENTERS

No Cooling Centers

More Cooling Centers Within 10-minute Walk[i]

WHERE DO YOU...

Go to cool off inside

Go to cool off outside

i BCYF Summer 2020 Cooling centers were used for this map.

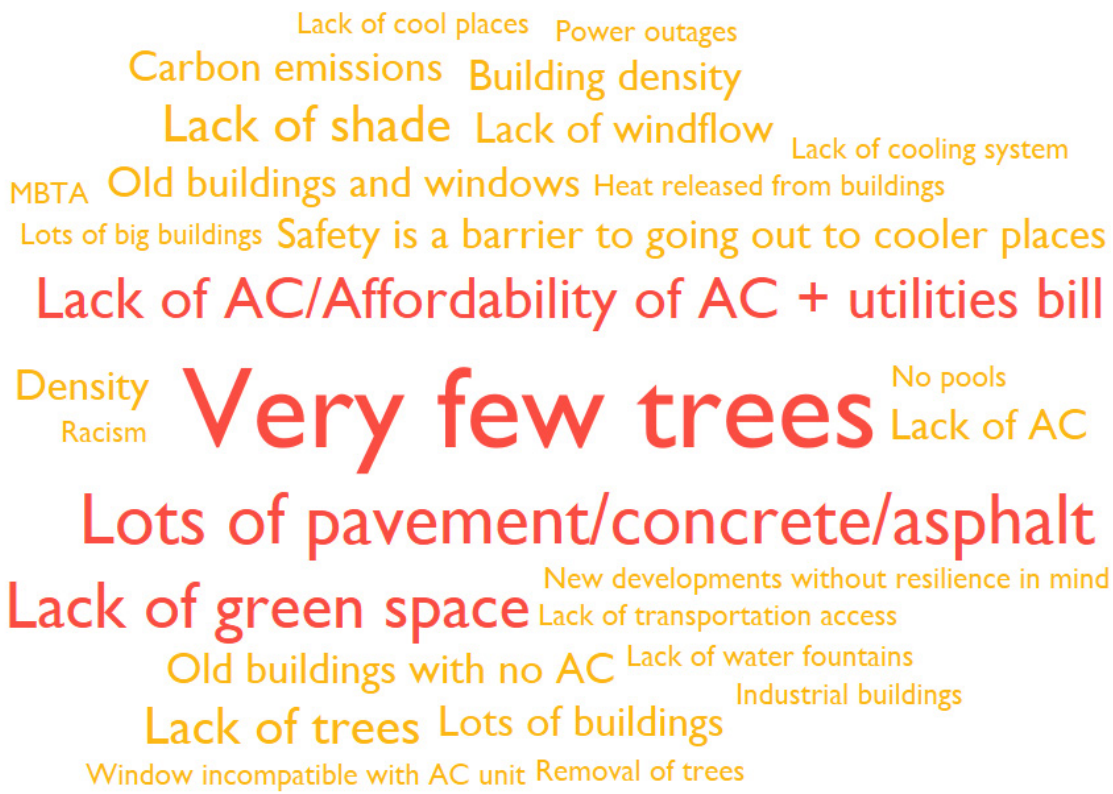
SURVEY RESULTS: STREETS AND CORRIDORS

Survey respondents shared their priority for safe pedestrian and bicycle uses on City streets. Some routes are too hot to walk, run, or wheel on a hot day. Additionally, corridors with large vehicles or exhaust from heavy traffic also contribute to hotter streets with greater pollution that can affect health and safety. Respondents shared that wide streets and those with larger areas of impervious surfaces are also creating corridors that are sometimes uncomfortably hot.

From the word cloud, the top four reasons for why respondents felt their neighborhood was hotter than other places in Boston are the following:

1. *Very few trees*
2. *Lots of pavement, concrete, and asphalt*
3. *Lack of green space*
4. *Lack of AC or affordability of AC and utility bills*

What makes your neighborhood hotter than other places you experience in Boston?



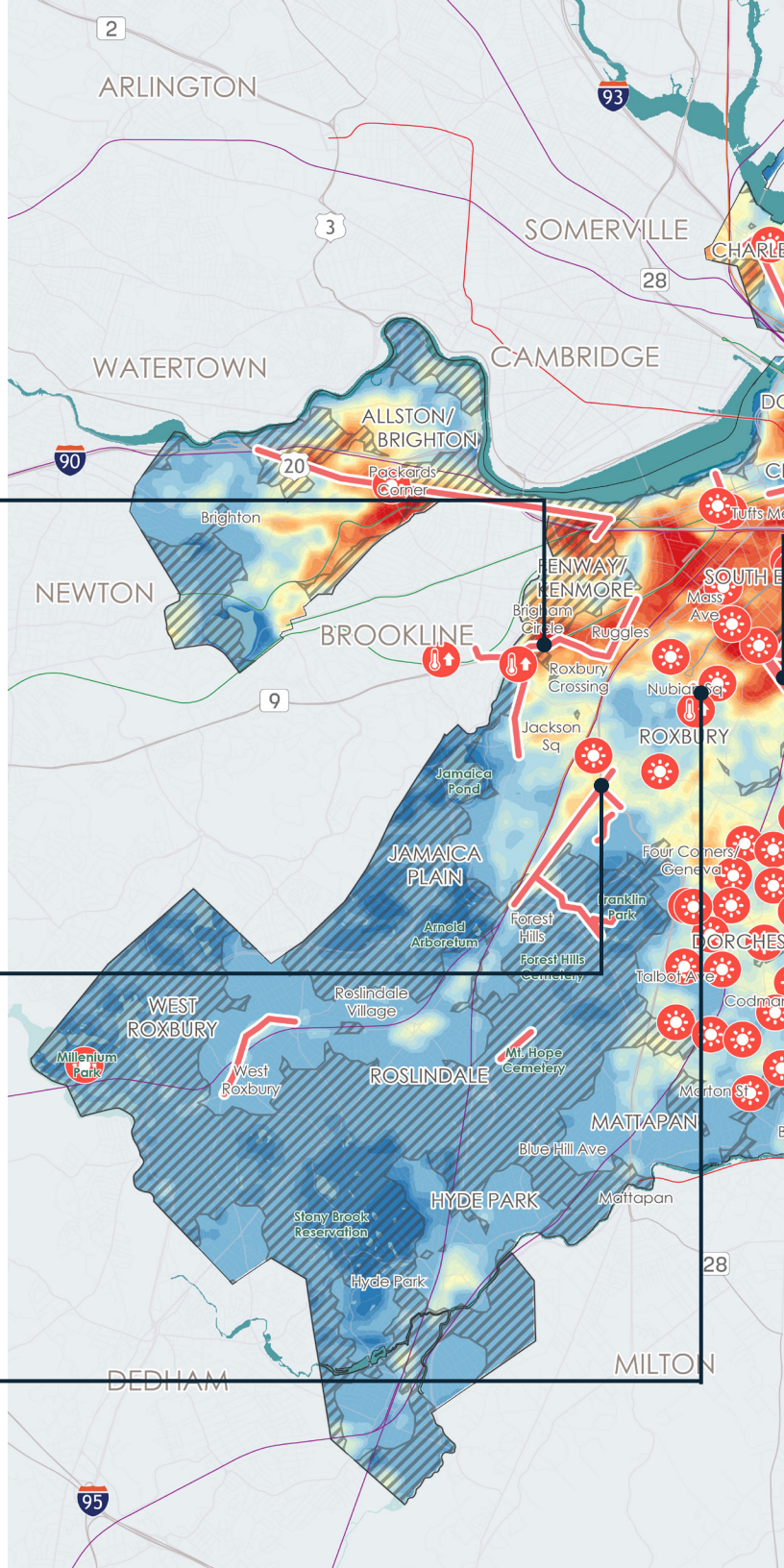
SURVEY RESULTS: WHERE DO YOU FEEL HOT OUTSIDE?

Comments on the online mapping survey allowed people to give context for why a specific location is hot.

Much of South Huntington lacks street trees and is so wide that few trees shade the opposite side.

The wide streets and high traffic through Egleston Square make it uncomfortable to walk around, though the two small parks along this route are great for gathering.

This stretch of Warren Street is unpleasant for walking or waiting for the bus. Very little shade, lots of big vehicles.

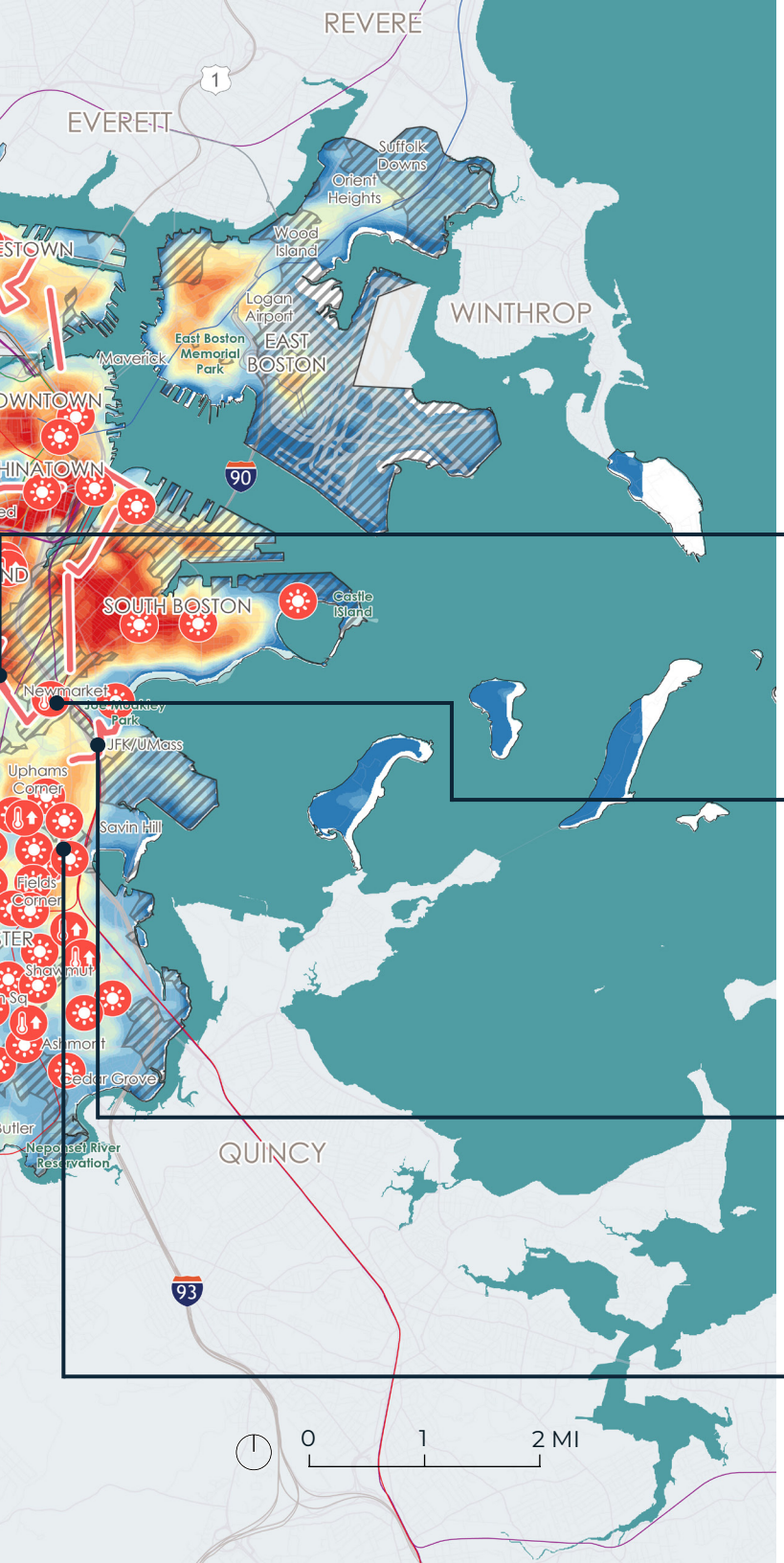


HEAT EVENT HOURS:

- More than 37 hrs
- 30 hrs
- Less than 25 hrs
- Cool-off Gaps

WHERE DO YOU...

- Feel too hot inside
- Feel too hot outside
- Uncomfortably hot routes



4

This route is all concrete, not a single tree. Many of our residents in Boston who are battling homelessness also hang out here, and look sunburned during the summer. There is no shade and riding a bike is very hot.

5

Many people come here because it has free and accessible parking, shopping, and places to eat. There is, however, no place to cool down for free. NO green areas. No trees.

6

It is so hard to get here by public transit and then it is too hot. Too much hard surface.

7

It's so much hotter, dustier, and uncomfortable to walk or bike this stretch of Dorchester Ave. than the section preceding or just after.

COMMUNITY'S PRIORITIES

Bostonians shared that their highest priorities for heat resilience include increasing shade and trees, reducing dark surfaces and pavements, increasing comfort in dense developed areas, addressing the impacts of pollution on health and wellbeing, and increasing the accessibility and affordability of places to cool off.

Many Bostonians rely on green spaces and the urban tree canopy to help stay cooler in hot weather. Residents shared that maintaining the existing tree canopy and increasing shaded seating in public spaces are critical priorities.

Additionally, many Bostonians stay at home during a heat wave, even when they are feeling hot. Residents shared that investments to purchase or upgrade air conditioners and fans, install shades and blinds, and pay for electric bills to run appliances are key priorities.

Many neighborhoods in Boston are more dense and developed areas, with more pavement and dark surfaces that absorb heat and increase air temperatures. Residents shared that developing buildings, streets, and the public realm in a way that helped cool the city was a priority.

Some roads in Boston have a large amount of traffic, both car and freight vehicles, which causes harmful air pollution that particularly affects residents living with medical illnesses. Residents shared that approaches to transportation and transit in the City that minimized air pollution, while supporting cooler streets, was a priority.

Across all issue areas, residents shared a priority for all strategies and actions of the City to acknowledge and educate residents on the drivers of disproportionate exposure to heat. They identified their vision of a City that places heat resilience within a series of interconnected opportunities around housing, affordability, development, food and health access, closing wealth gaps, and racial and environmental justice.

Hearing these priorities, the *Heat Plan* aims to center environmental justice and equity in creating an all-of-government plan to mitigate the risks and effects of extreme heat. With temperatures and extreme heat projected to increase in the future, this plan focuses on a wide range of strategies that deliver on seven categories of benefits to comprehensively address current and future heat risk for all Bostonians: heat reduction, heat relief, increased adaptive capacity, improved public health, economic opportunity, environmental benefits, and environmental justice and equity.

Taken together, these seven priority benefits speak to a range of strategies in the *Heat Plan*, allowing the City of Boston to implement high-priority strategies that focus on people, communities, neighborhoods, infrastructure systems, and the City as a whole. From long-term reductions in heat exposure to near-term relief from heat waves and a more inclusive green economy, the benefits of heat resilience investments are broad and will help put Boston on a path to becoming a Green New Deal city.

What cooling interventions would you like to see in your neighborhood?

Safe AND ACTUALLY FUN spaces outside the house. A lot of spaces are just like, go here and hang out, but there's nothing to do there. Why don't we make the places that youth want to hang out (shops, coffee places, etc.) de facto cooling spaces and support businesses to draw more people in during hot times.
-yYouth ideas session participant

Ideas that focus on systemic issues, evaluating the root cause of excessive heat .
-oOpen house participant

I'd love to see more tree planting initiatives in neighborhoods with less trees. Historically and presently, these are predominantly neighborhoods with a greater concentration of Black and Latinx families. Much research has documented the significance of trees and green spaces to help reduce violence and increase wellness (specifically respiratory health).
-Roslindale resident

I think that older apartments and homes need better cooling resources. I have an elderly grandmother that can't afford AC. She stays with me when it gets too hot.
-Dorchester resident

It does get extremely hot in Boston. I feel there's not enough cooling for the elderly and people with medical conditions who are also affected.
-Dorchester resident

Students can't learn when it's hot, teachers are at risk. Need to modernize school buildings and develop strategies to address heat.
-Open house participant

HEAT ANALYSIS OF REDLINED NEIGHBORHOODS

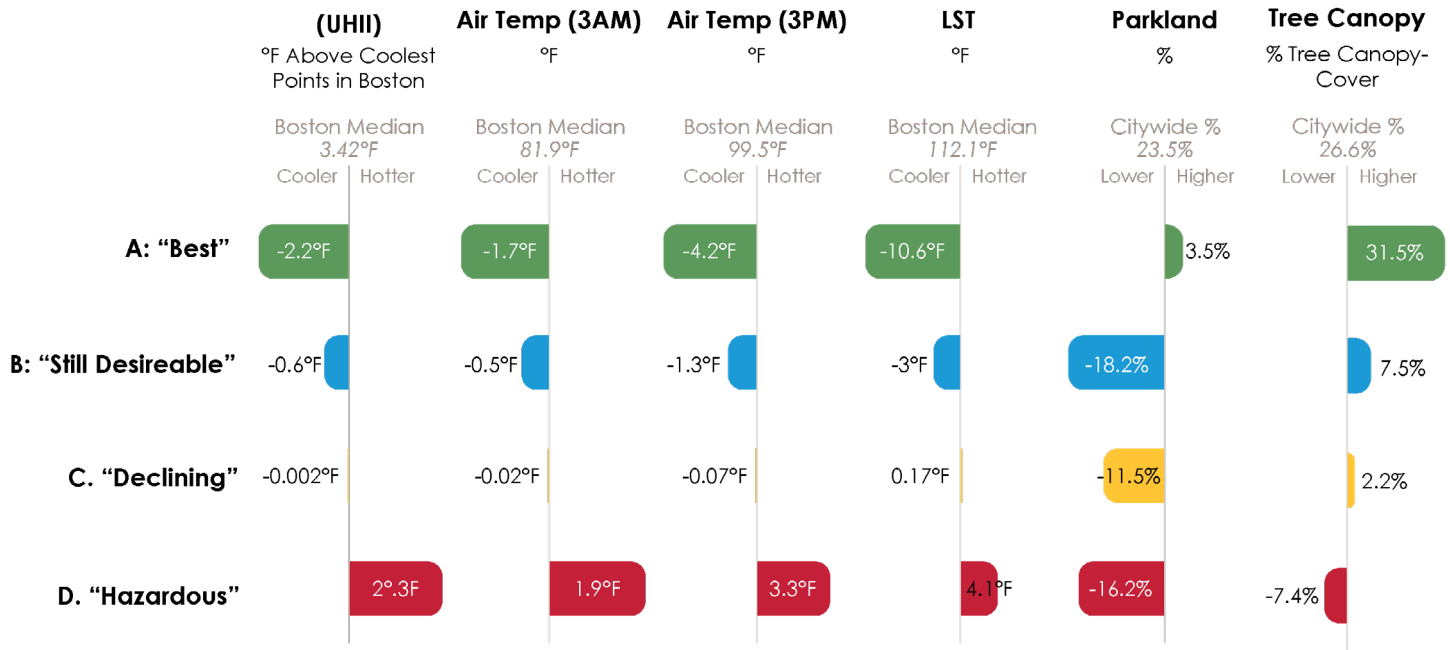
Redlined areas are 7.5°F hotter in the day, 3.6°F hotter at night, and have 20% less parkland and 40% less tree canopy than areas designated as A: Best.

REDLINED AREAS ARE HOTTER FOR LONGER

Understanding and acknowledging the historical context of disinvestment and subsequent effects on the built environment in Boston is critical to planning for heat vulnerability and resilience (see Chapter 3 for context on redlining). The plan compared the HOLC historical grading map with present day extreme temperatures and heat duration.

The analysis showed that heat event duration and air temperature overall was greater in areas that had been rated declining or hazardous compared to areas that were rated best or still desirable. Non-redlined areas are cooler when looking at UHII, nighttime air temperature, daytime air temperature, and land surface temperature, while redlined areas are hotter across these metrics. Additionally, non-redlined areas have less impervious surface and more tree canopy cover.

Redlined areas are hotter in all heat metrics than other categories



Beginning in the 1930's, many of Boston's neighborhoods were redlined by lenders. These areas experienced decades of underinvestment and today are significantly hotter places to live, work, and go to school.

HEAT EVENT HOURS:

More than 37 hrs

30 hrs

Less than 25 hrs

Redlining boundaries are overlaid on the heat event hours dataset to visually explore how heat intensity and length during a heat wave varies between redlined and non-redlined neighobrhoods.

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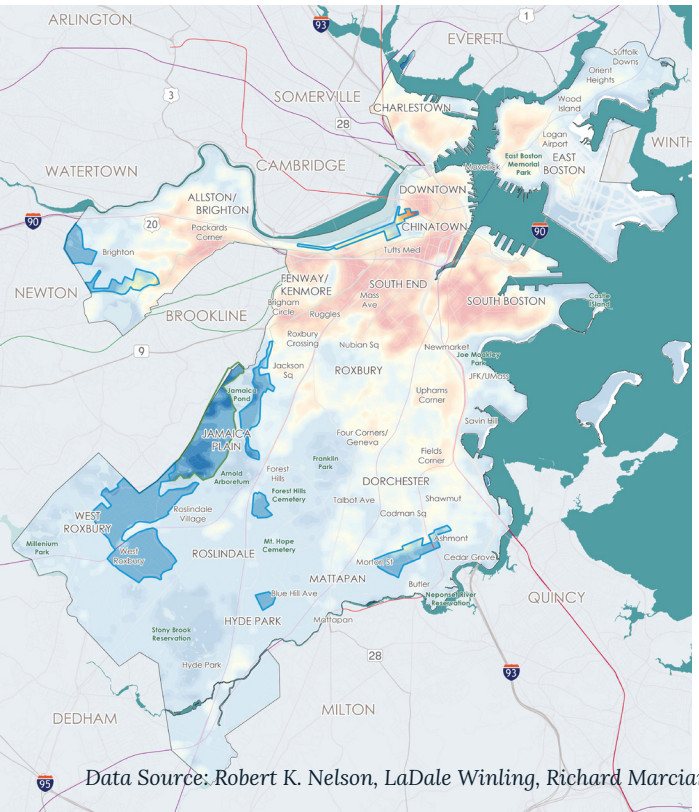
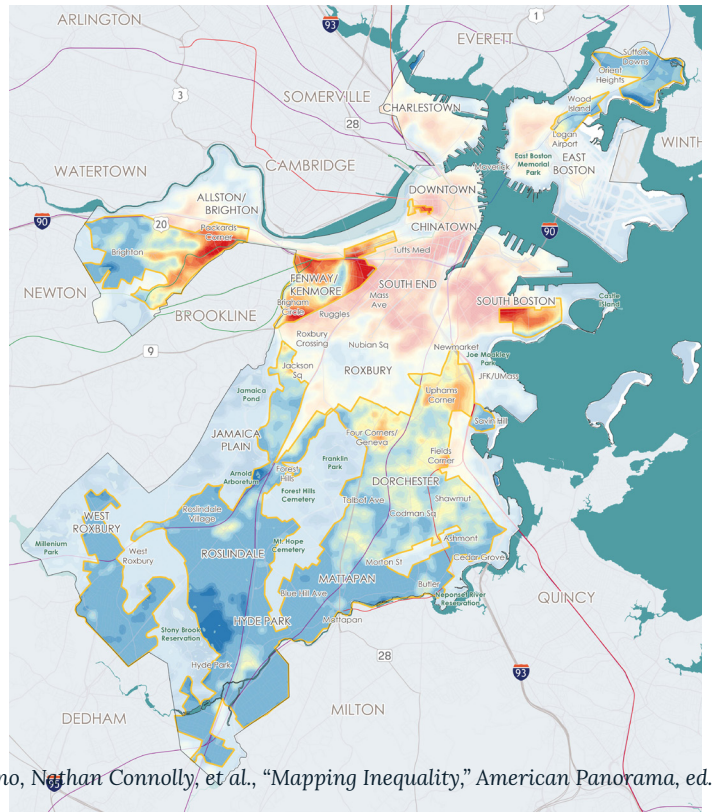
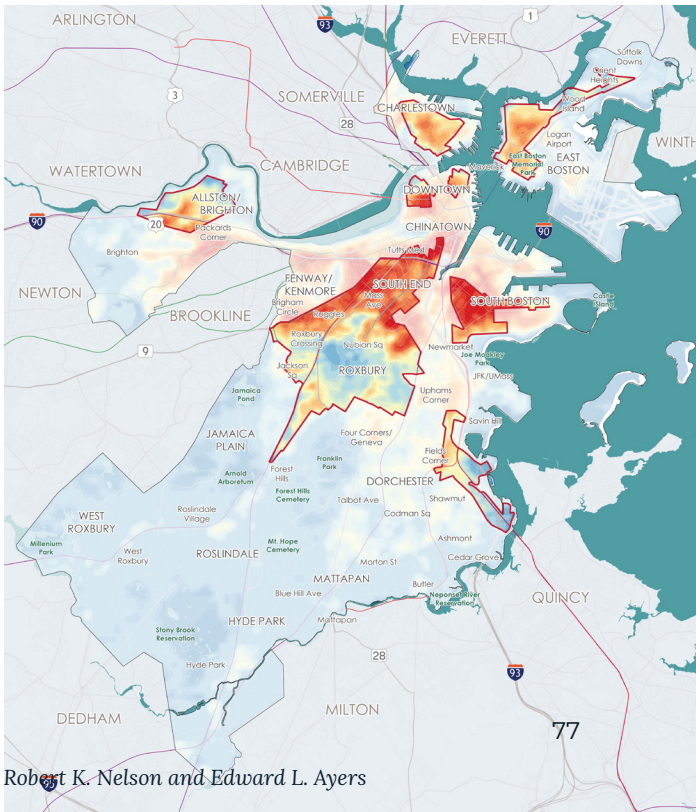
A: Best and B: Still Desirable



C: Declining



D: Hazardous



Data Source: Robert K. Nelson, LaDale Winling, Richard Marciano, Nathan Connolly, et al., "Mapping Inequality," American Panorama, ed. Robert K. Nelson and Edward L. Ayers