# Resilient Zoning Task Force

June 26, 2019

CAMBRIDGE DEPARTMENT OF PUBLIC THE WORKS

REED HILDERBRAND

KEY FINDINGS OF UFMP

SETBACKS AND TREE HEALTH

COOLING EFFECTS OF CANOPY

RELATIONSHIP BETWEEN ZONING
& GOALS OF THE UFMP

# KEY FINDINGS OF UFMP

## SETBACKS AND TREE HEALTH

## COOLING EFFECTS OF CANOPY

## RELATIONSHIP BETWEEN ZONING & GOALS OF THE UFMP

Today, Cambridge has **26%** of its land area covered by canopy.

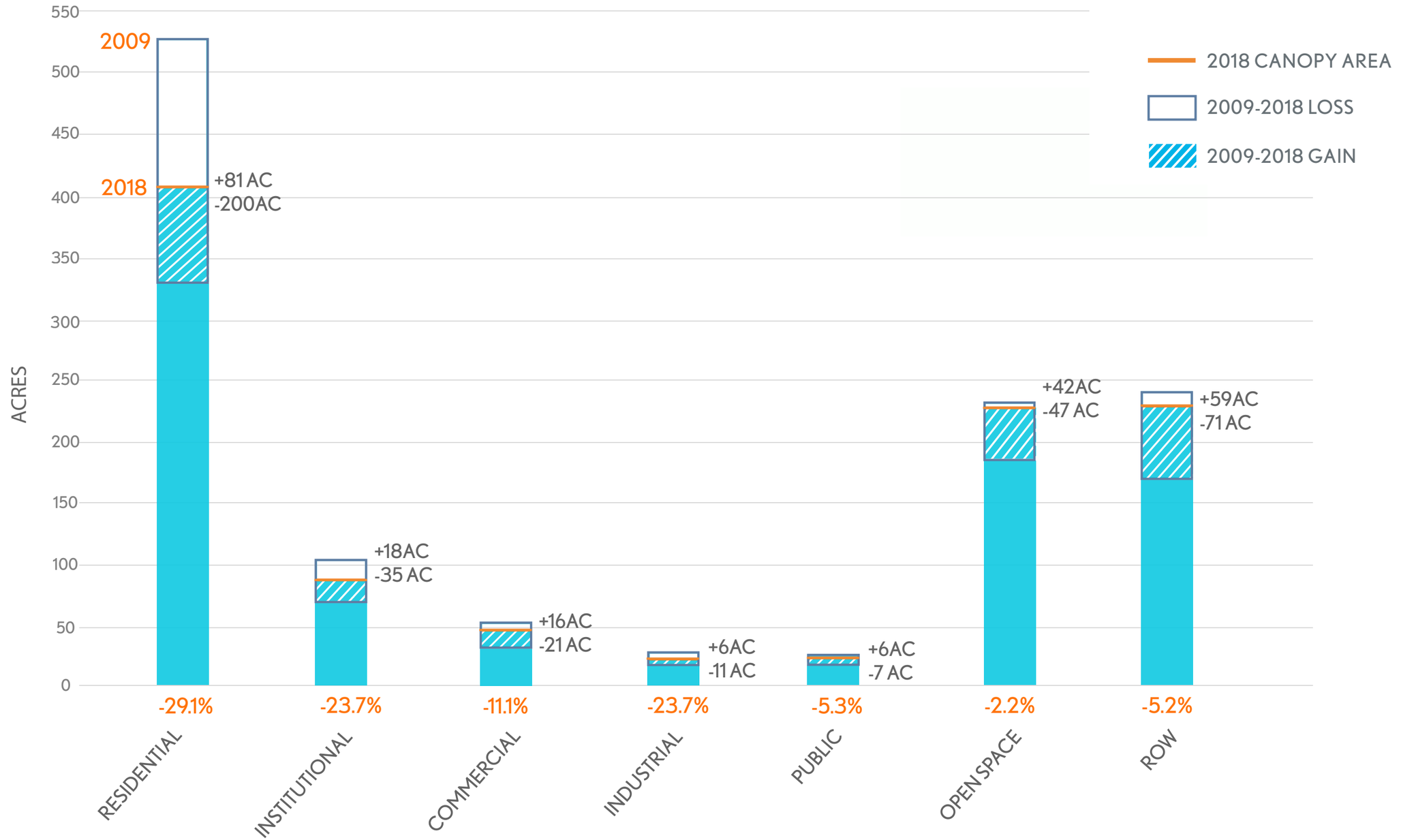
Between 2009 and 2018, Cambridge's canopy declined on average by 16.4 acres* every year.

**At this rate, canopy cover would be 21.6% in 2030.**

*Source: CUFMP 2018 canopy analysis

# CITY-WIDE CANOPY LOSS

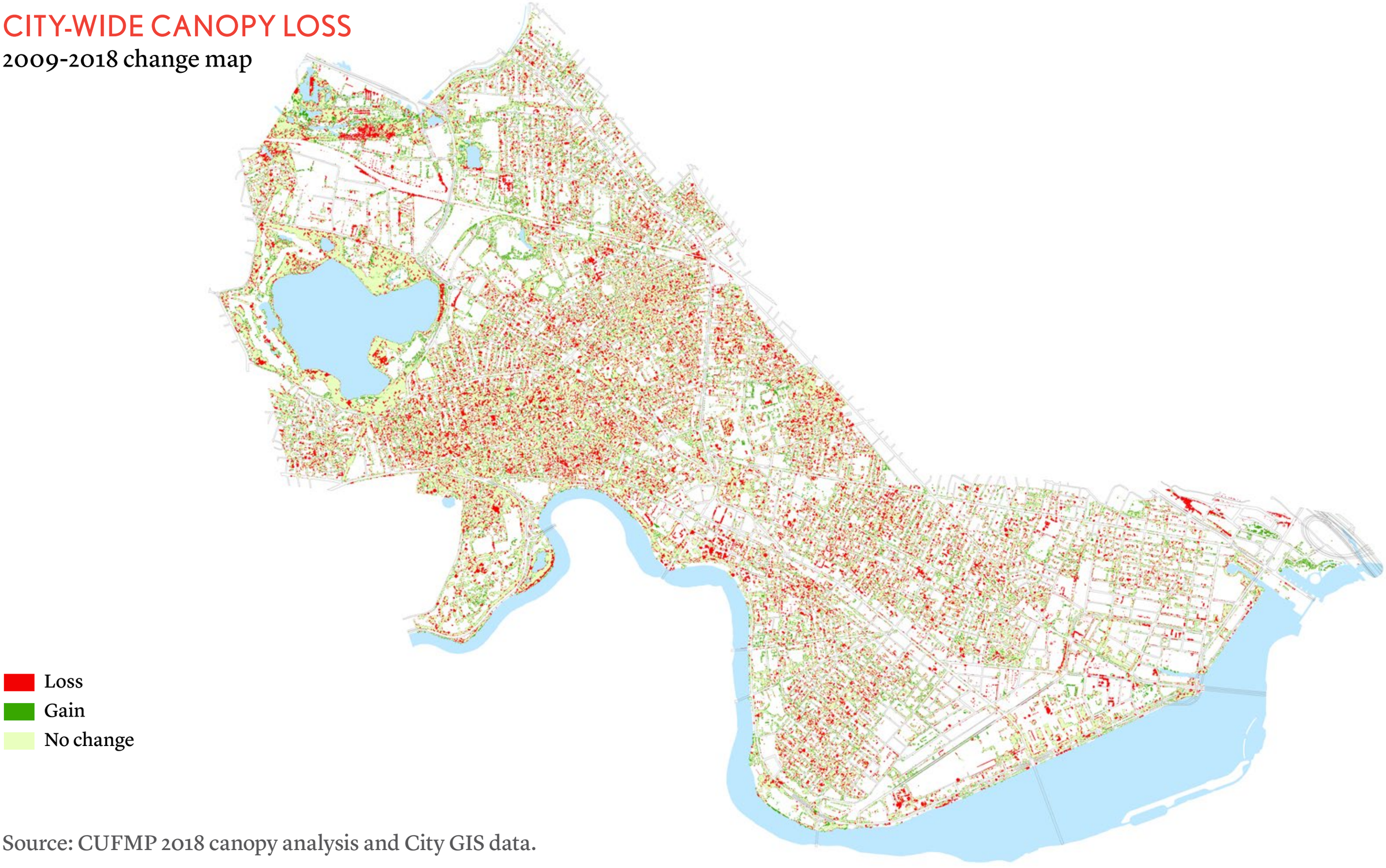
## 164 acres of canopy lost between 2009-2018




Source: CUFMP 2018 canopy analysis and City GIS data.

# CITY-WIDE CANOPY LOSS

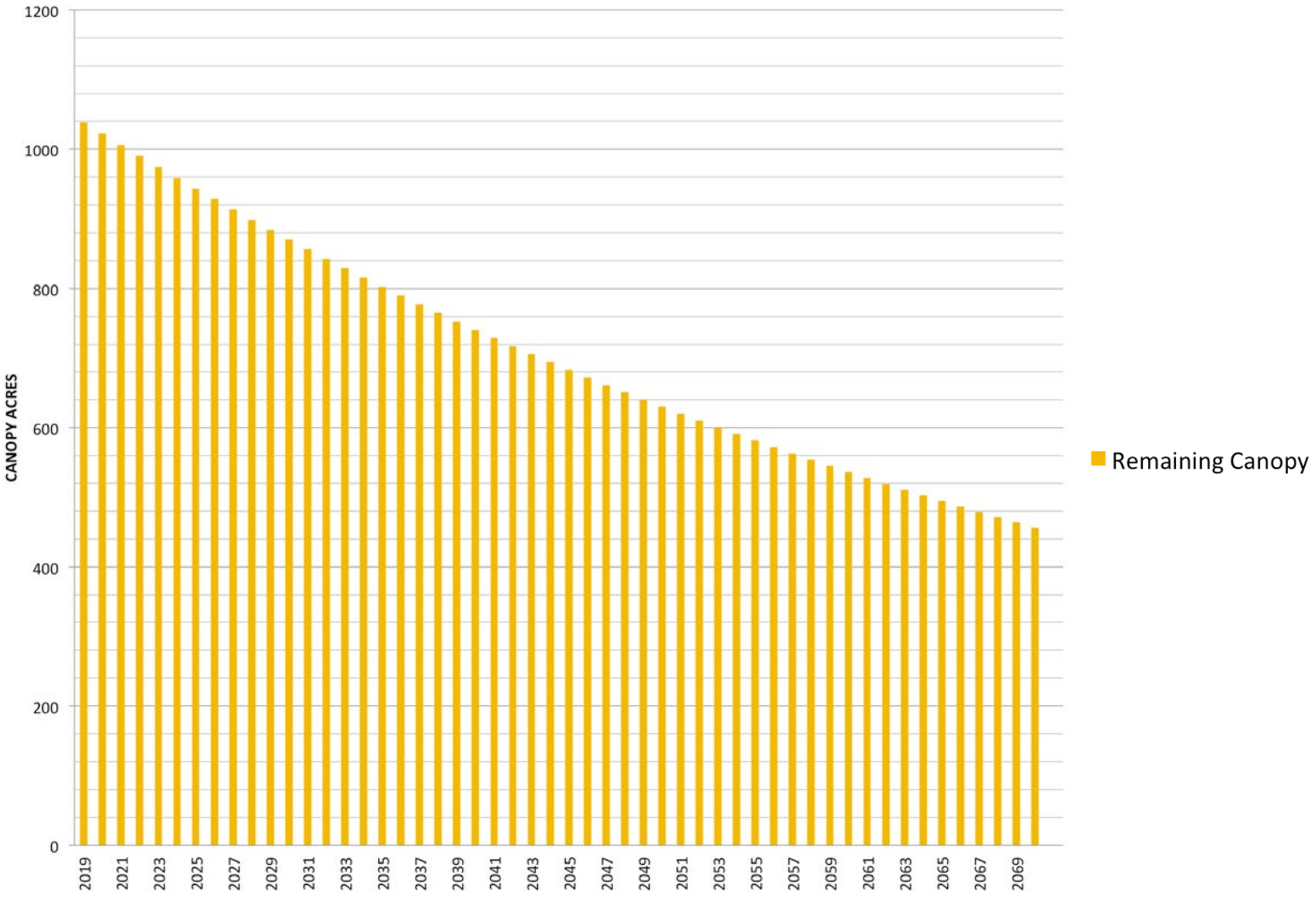
## 2009-2018 change map




Source: CUFMP 2018 canopy analysis and City GIS data.

# PROJECTING TRENDS FORWARD

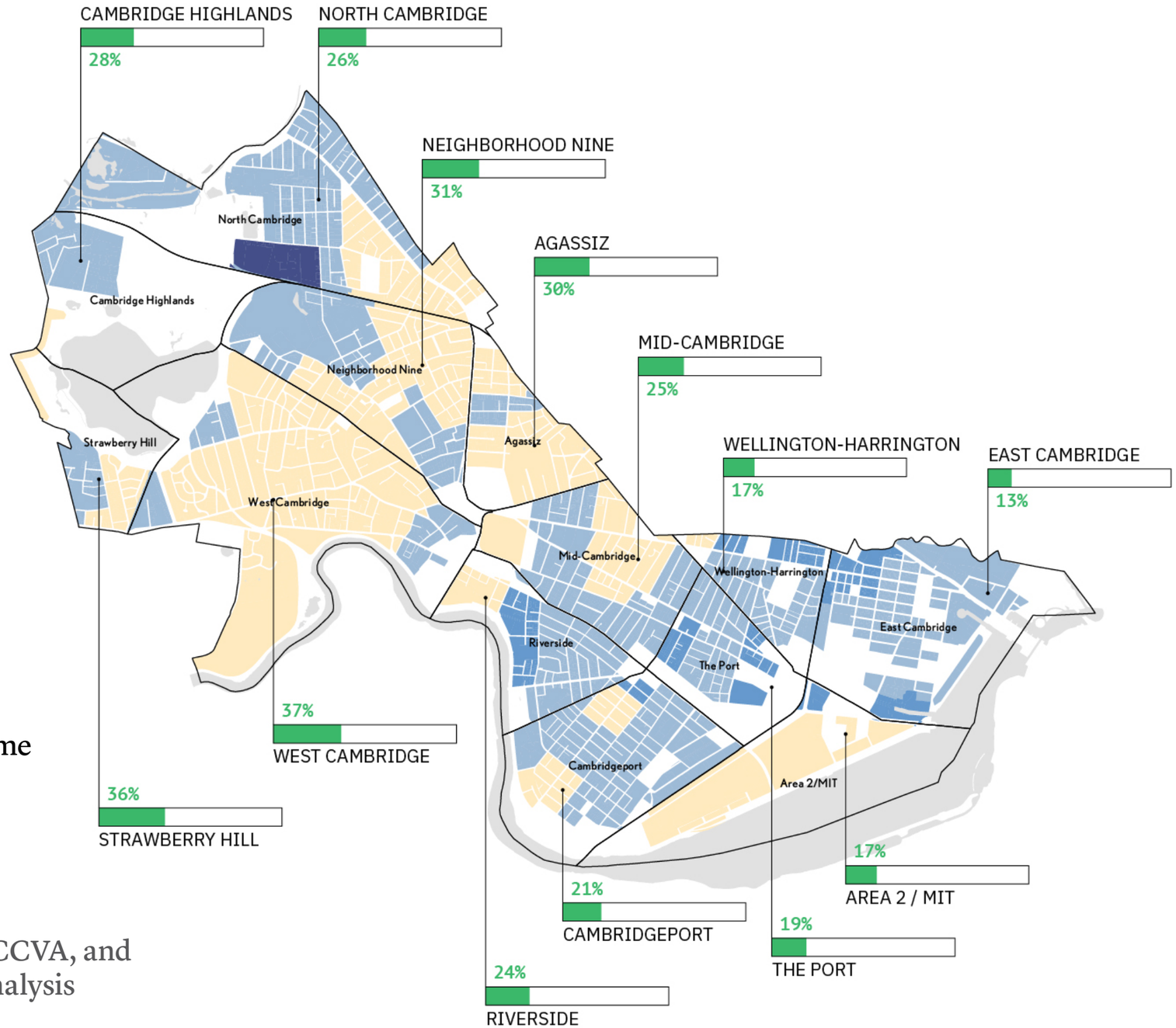
The trend is for continued loss (1.6%/year) if no action is taken.




Graph assumptions: 1.6% annual net loss rate from 2009 to 2018 derived from CUFMP 2018 canopy analysis

# CANOPY INEQUITY

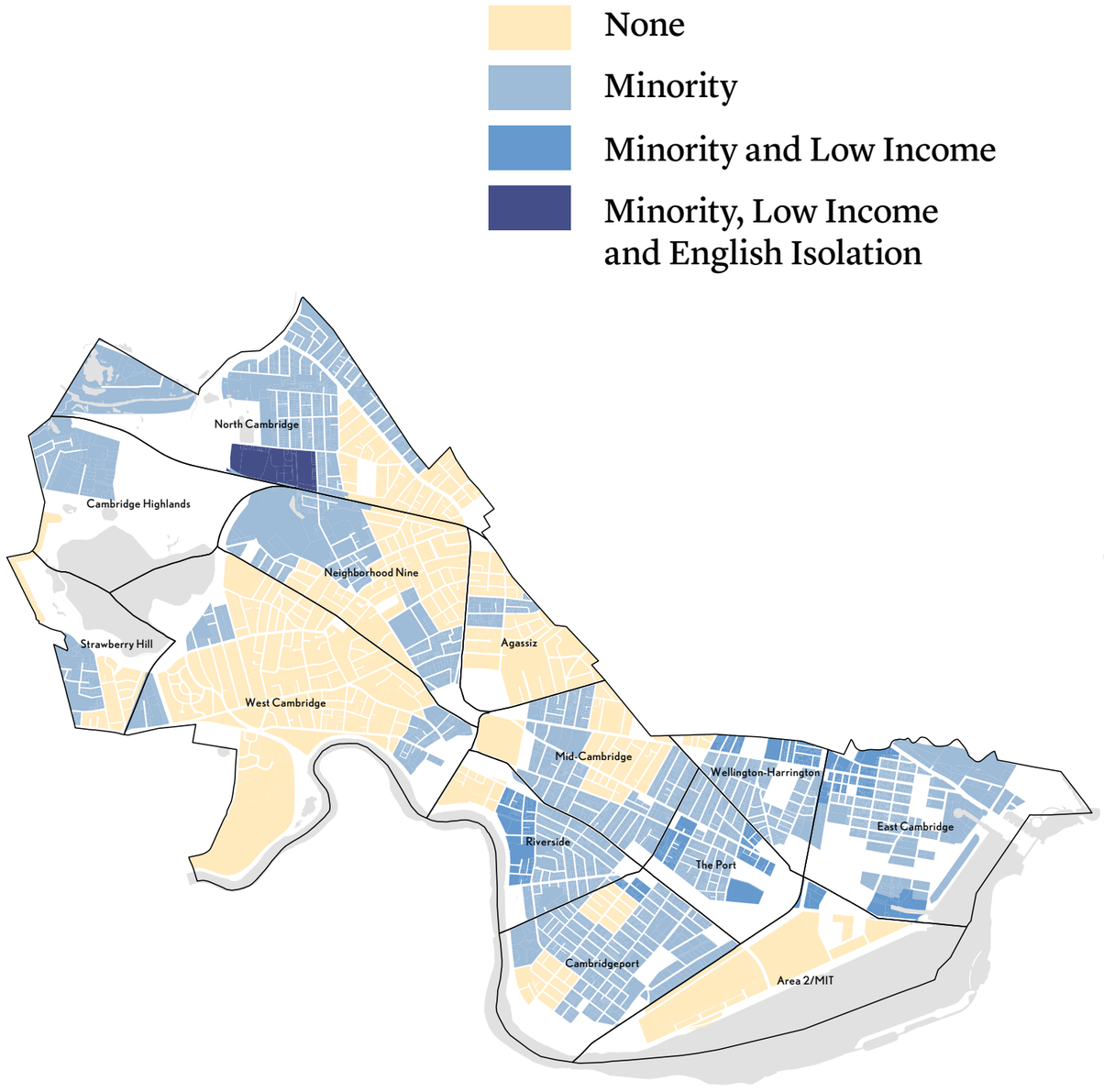
## Many vulnerable populations have lower canopy coverage



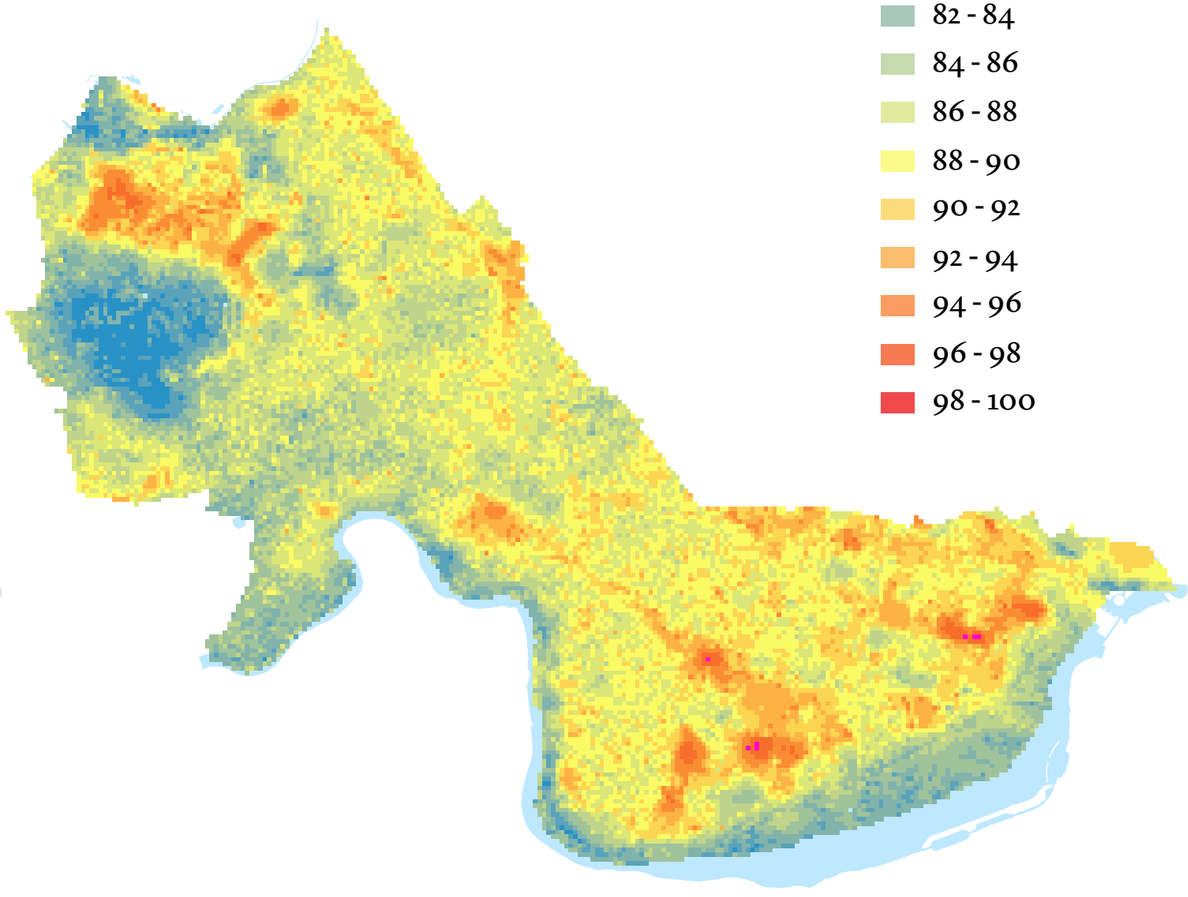

Source: 2010 US Census Data, CCVA, and CUFMP 2018 canopy analysis

# CANOPY INEQUITY

## Vulnerable populations with lower canopy coverage are more susceptible to urban heat island




Source: 2010 US Census Data and CCVA



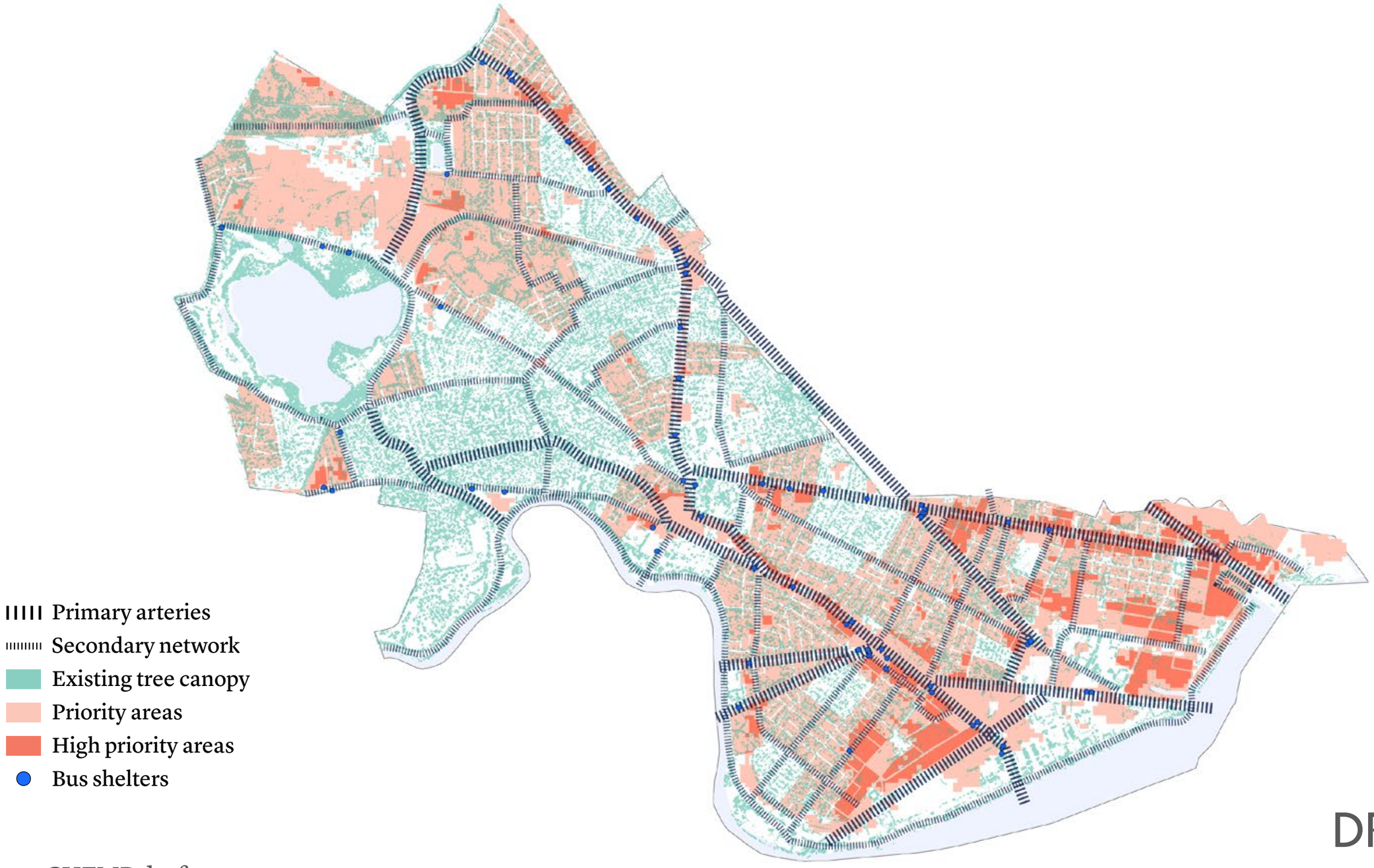

Source: CCVA and CUFMP 2018 canopy analysis.

— Value the forest as a public resource

— Invest in canopy in the public realm

— Share responsibility for a healthy forest

# DRAFT UFMP STRATEGIES




DRAFT

Source: CUFMP draft report

KEY FINDINGS OF UFMP

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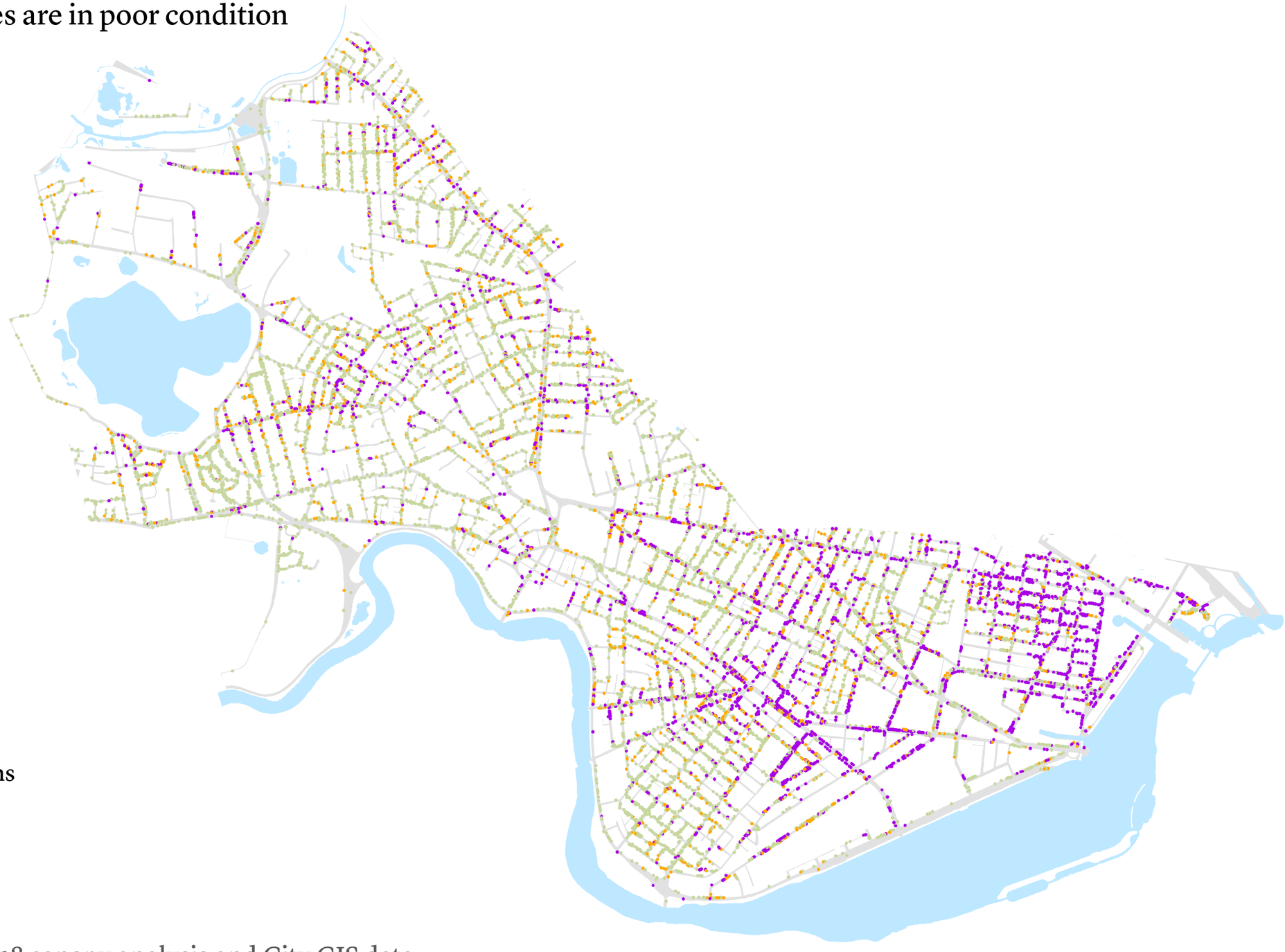
# CONDITION OF STREET TREES

24% of street trees are in poor condition



Tree Health Conditions

- Fair
- Good
- Poor

Source: CUFMP 2018 canopy analysis and City GIS data.

# CONDITION OF STREET TREES

39% of trees in sidewalks greater than 8’ are in poor condition.
Frequently these areas have no front yard setbacks



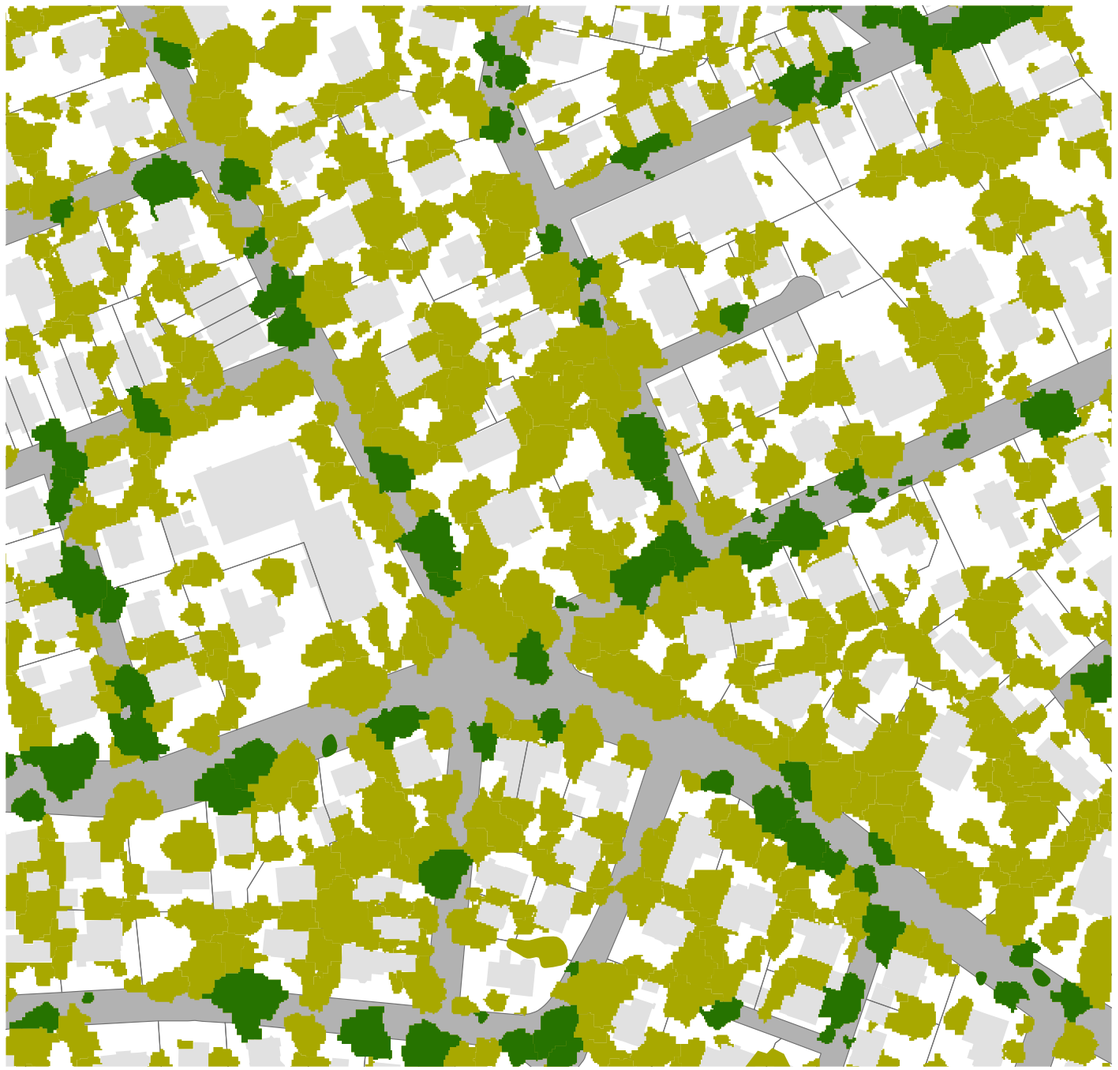

Tree Health Conditions

- Fair
- Good
- Poor

Source: CUFMP 2018 canopy analysis and City GIS data.

## R.O.W. CANOPY

# Areas without front yard setbacks rely on street trees for canopy



WEST CAMBRIDGE

EAST CAMBRIDGE

STREET TREE CANOPY

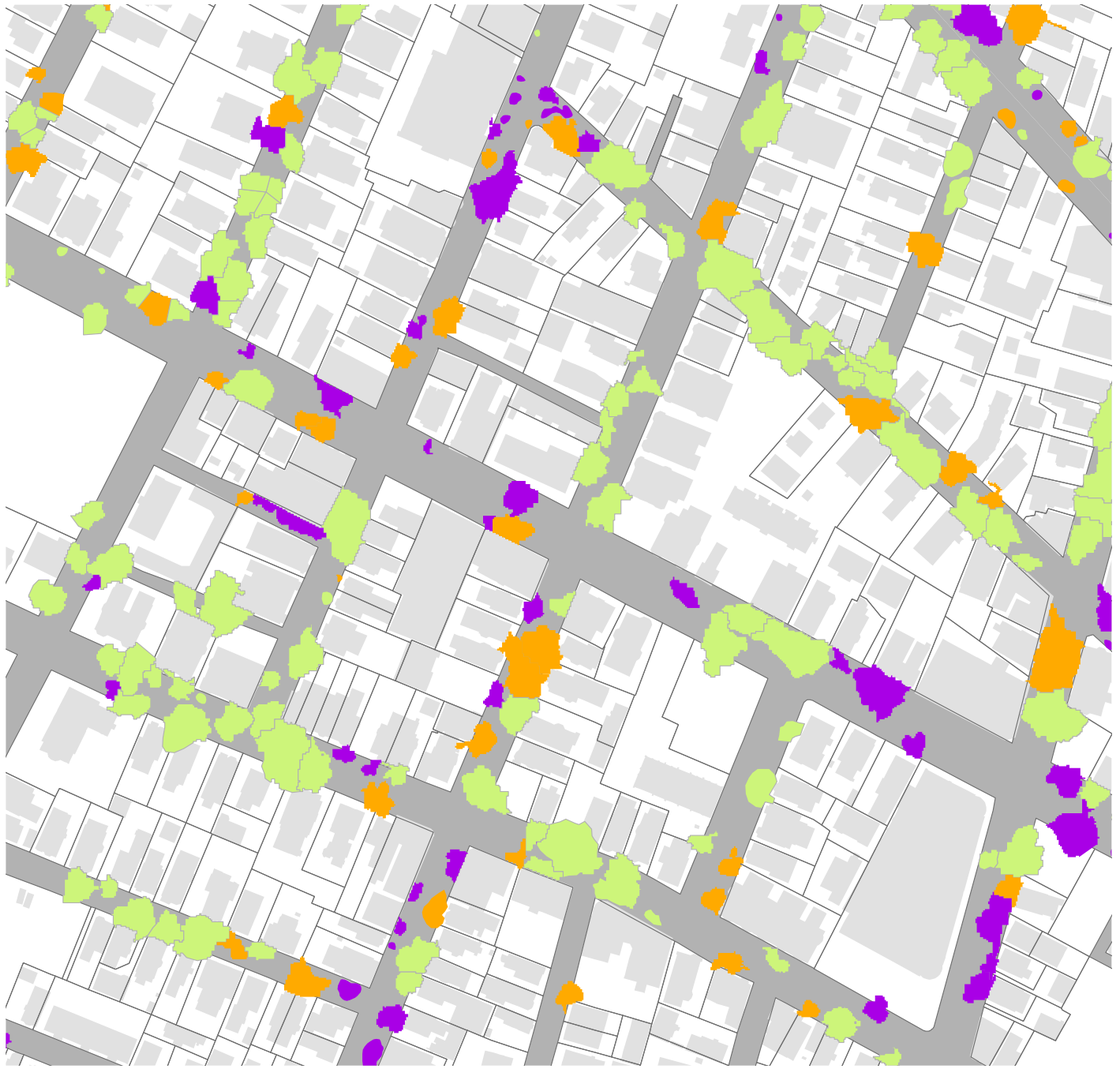
OTHER CANOPY

Source: CUFMP 2018 canopy analysis and City GIS data.

## R.O.W. CANOPY

# Street trees with setbacks are in better condition

WEST CAMBRIDGE



EAST CAMBRIDGE

GOOD CONDITION

FAIR CONDITION

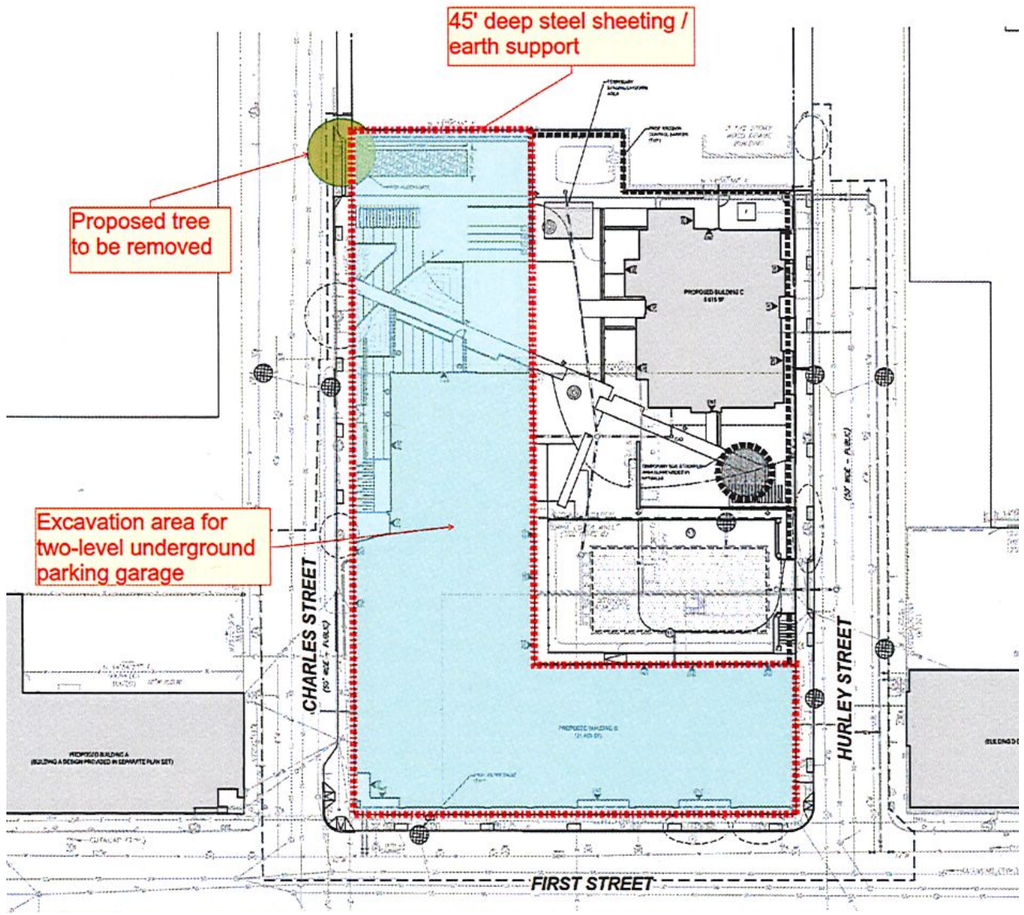
POOR CONDITION

Source: CUFMP 2018 canopy analysis and City GIS data.

# R.O.W. CANOPY

## Zero lot line construction negatively impacts large street trees

Large Zelkova was removed because proposed construction on a Charles St lot required severe pruning of canopy and cutting of major structural roots that had grown into the property.




Location of Sheet Piling and Excavation

29 Charles St. Existing Zelkova

Additional Air Spading Photos

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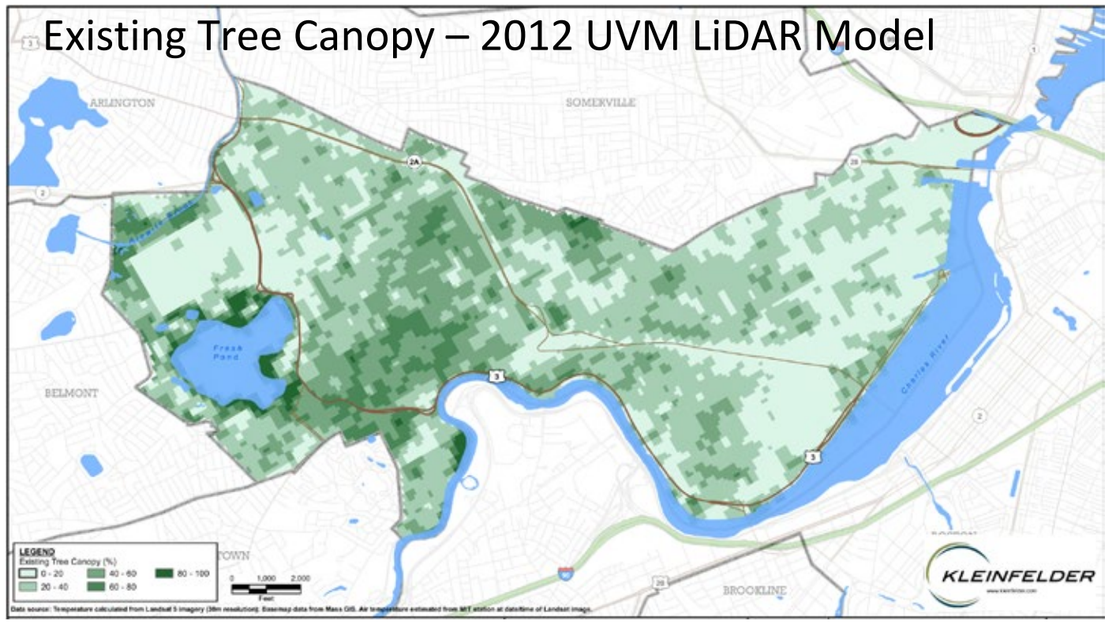
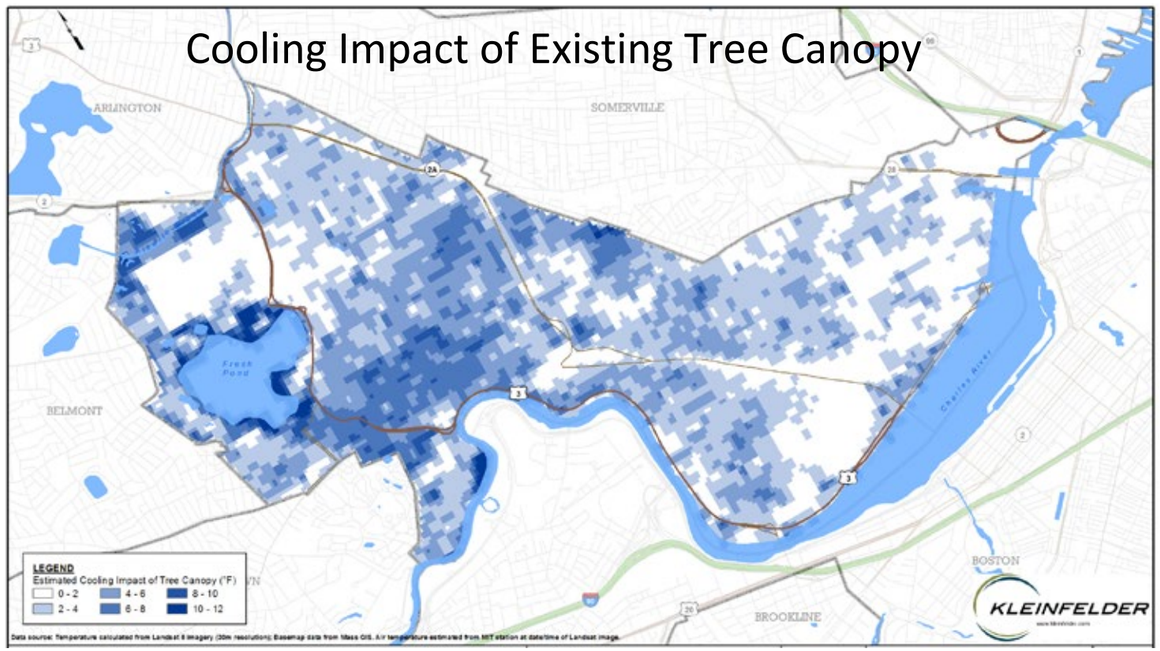
# Estimating Cooling Impact of Existing Urban Forest Canopy




Cell Resolution: 30 meters x 30 meters (100’ ft x 100’ ft)
Canopy data from 2009

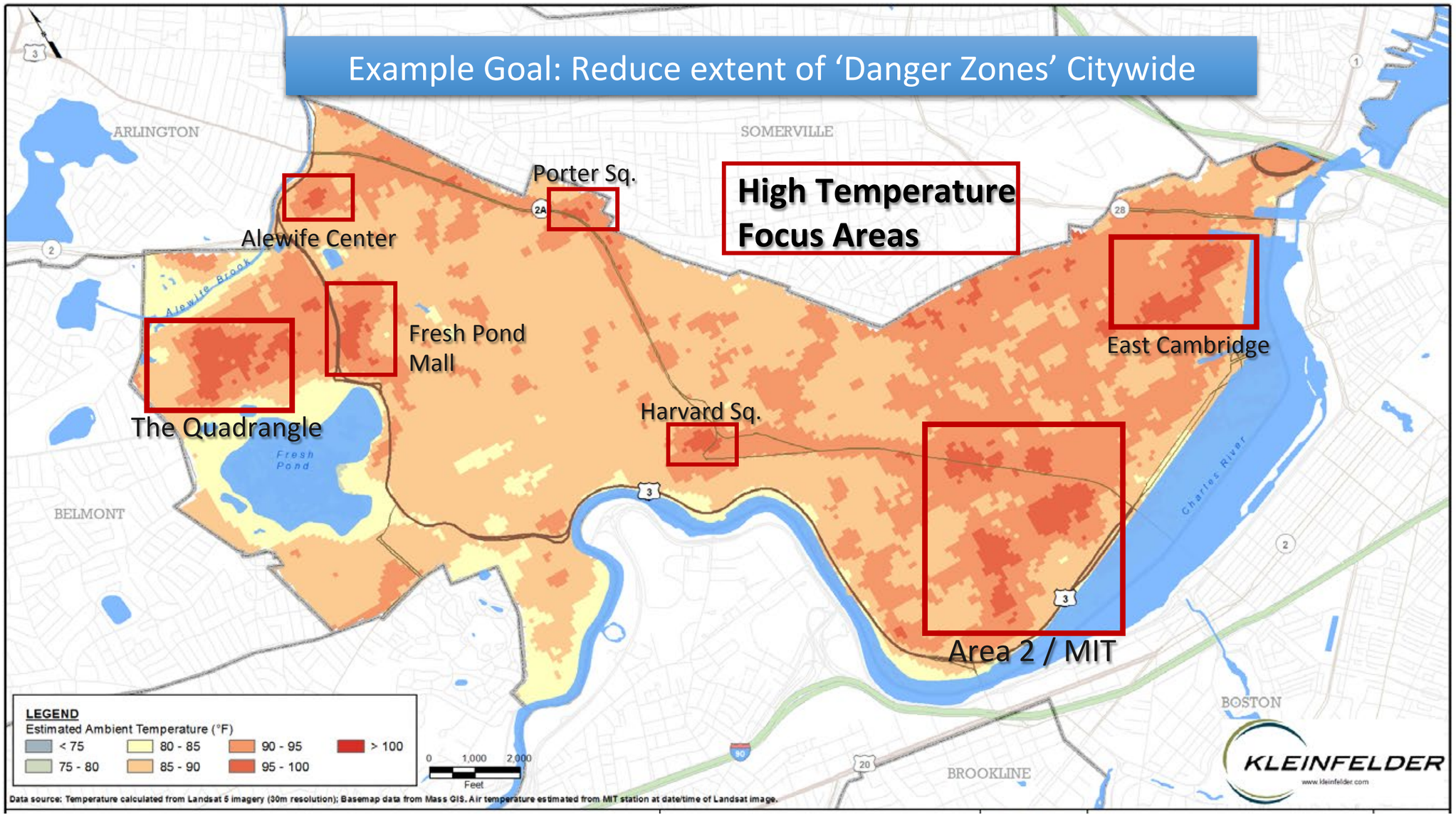
*CCPR assumed linear relationship; Ziter (2019) indicates cooling from tree canopy is non-linear (45% key threshold)*

Calculated Cooling Impact:
+1% tree canopy increase relates to 0.12°F of cooling

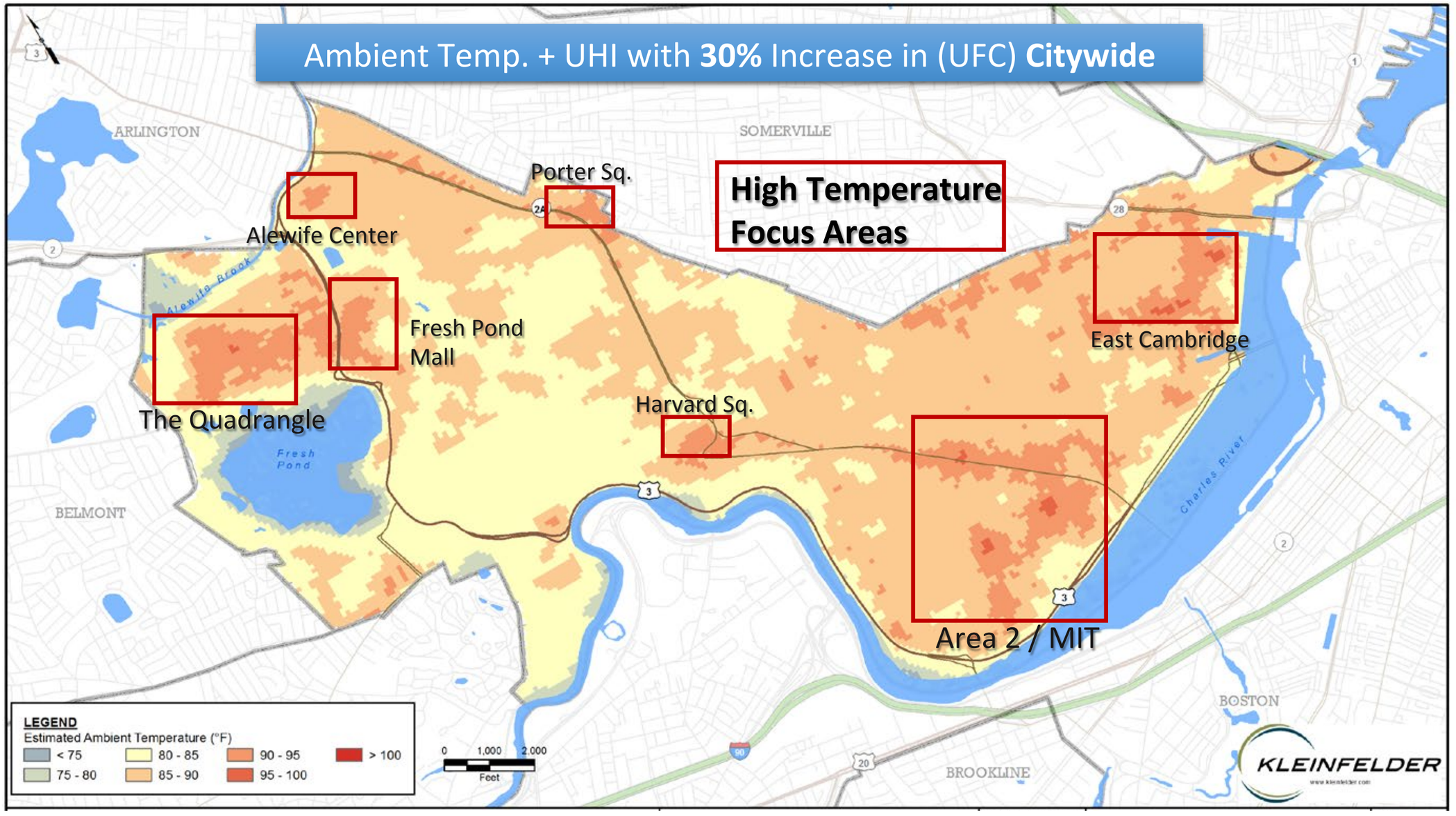



Source: Appendix D Urban Heat Island Protocol for Mapping Temperature Projections, Kleinfelder for the City of Cambridge, November 2015

# Baseline –UHI with Existing Urban Forest Canopy (UFC) at 90˚F



# Impact of Expanding the Urban Forest Canopy



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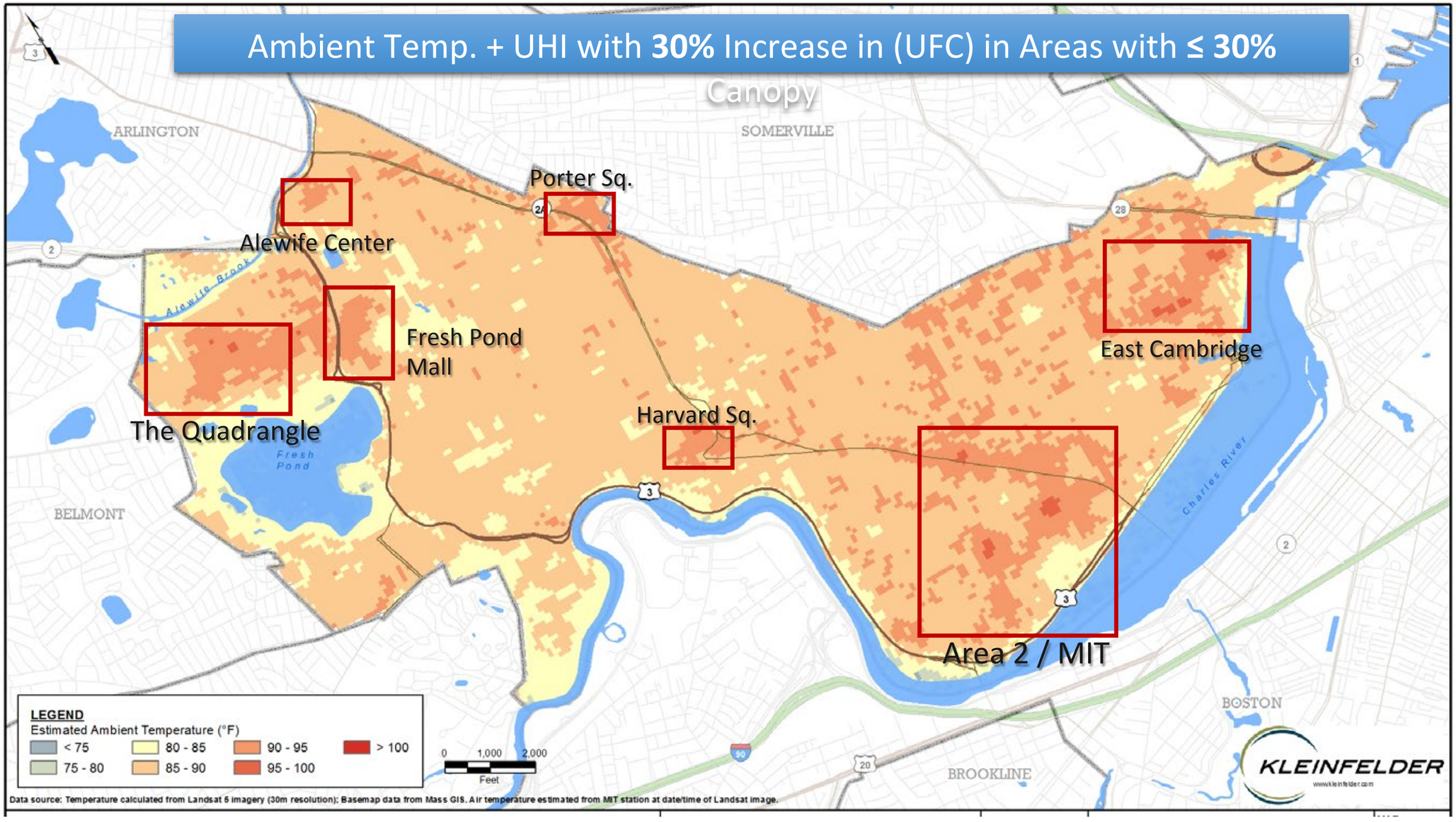

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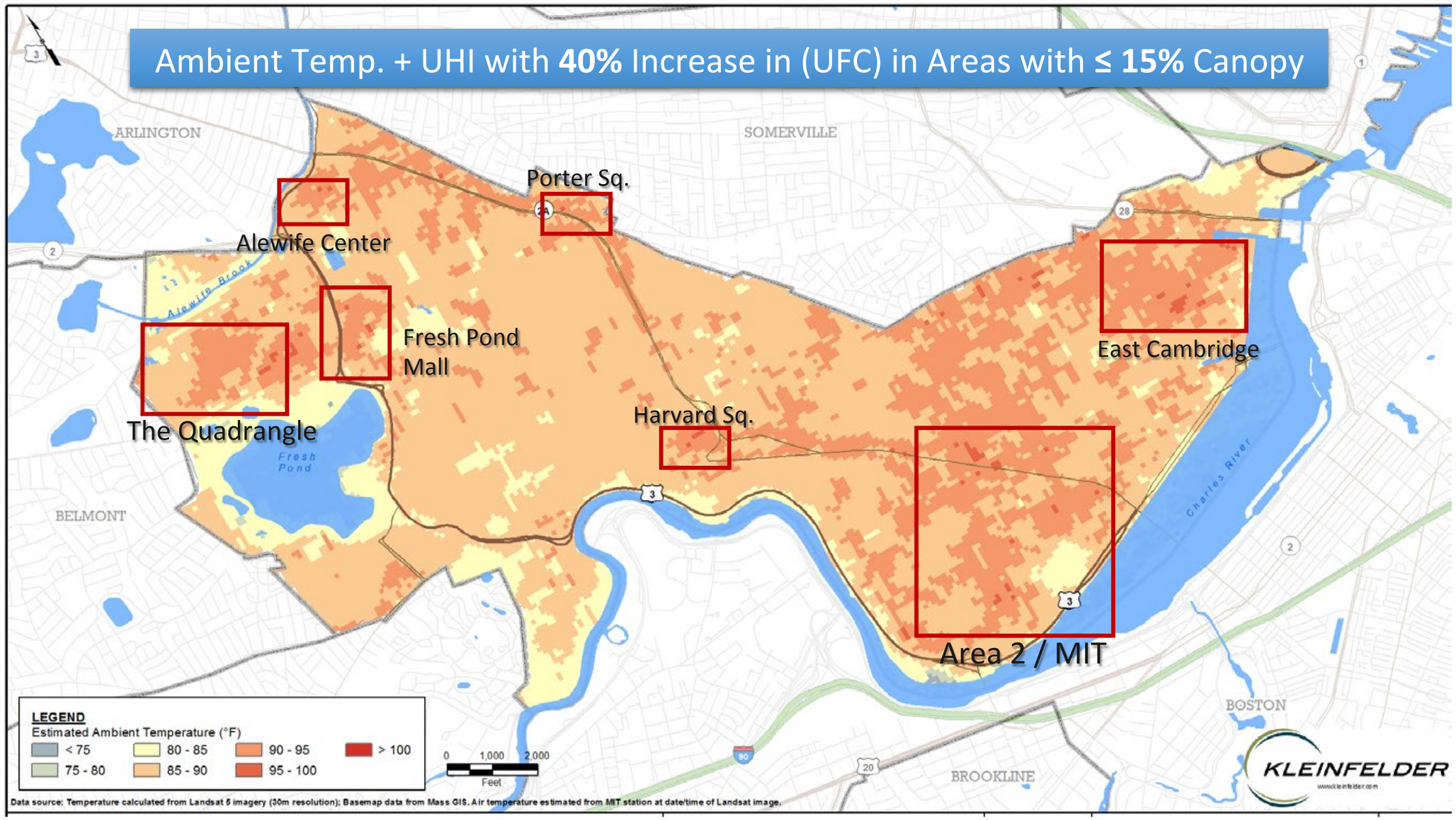
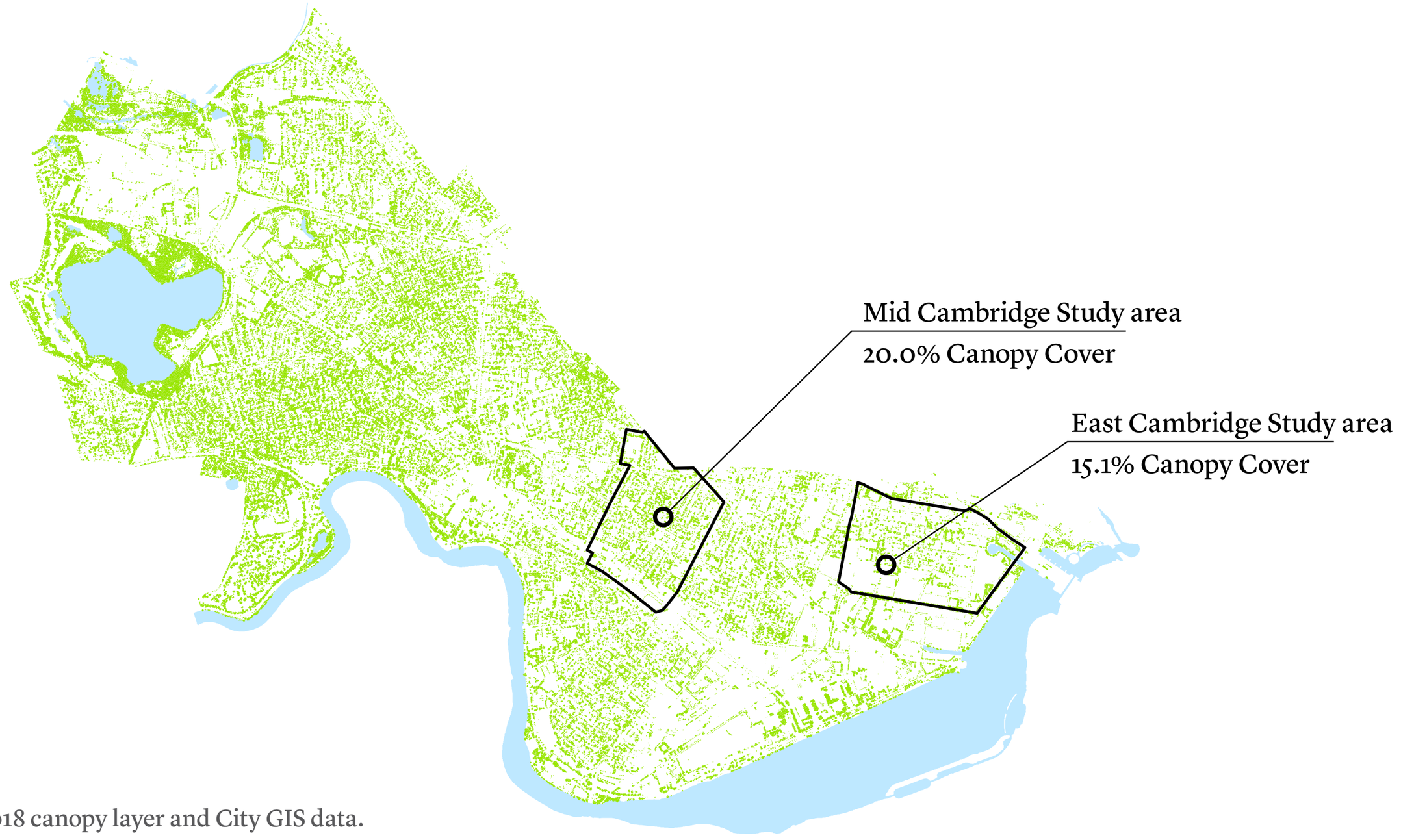


## NEIGHBORHOOD CASE STUDIES

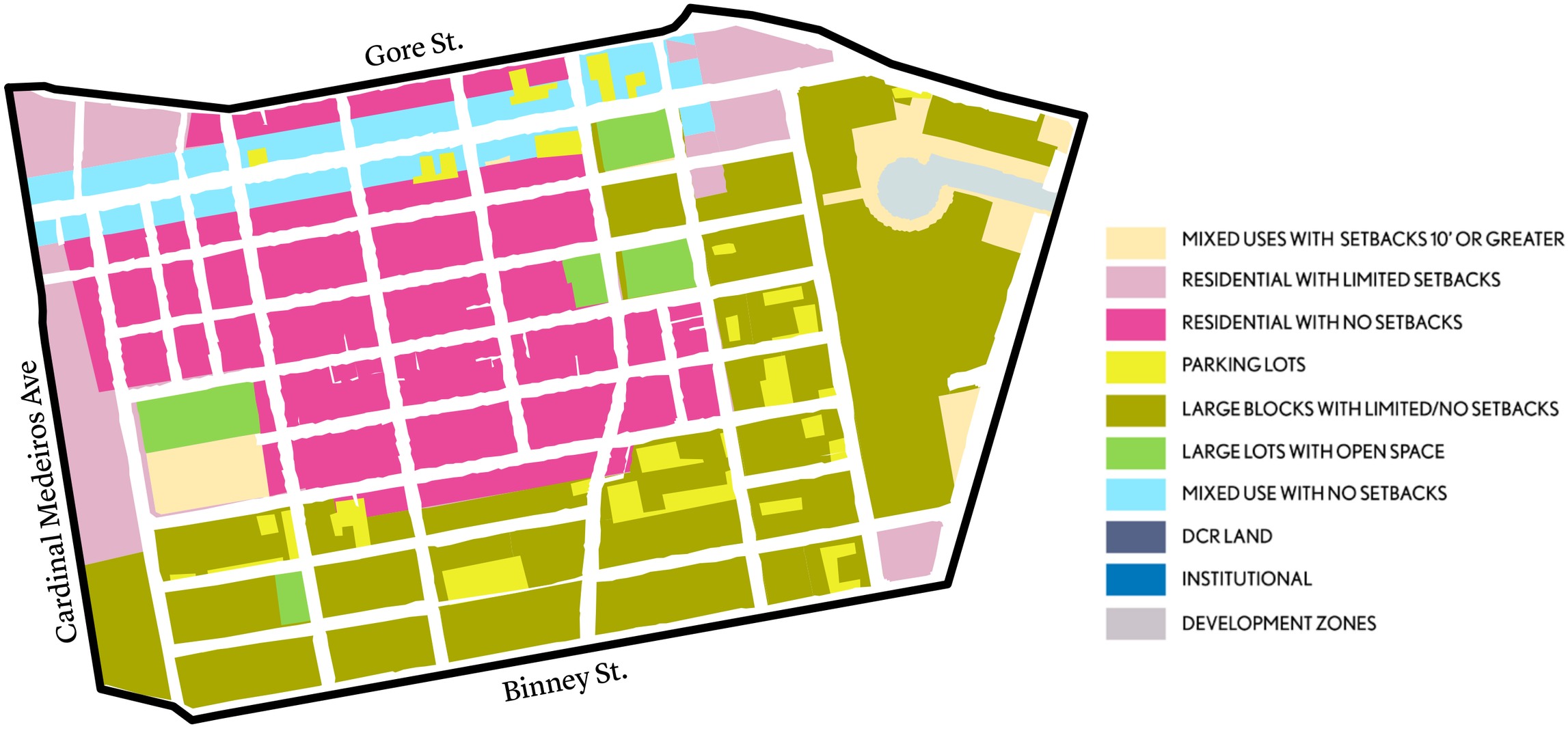
# East Cambridge and Mid Cambridge have canopy cover lower than the city average of 26%.




Source: CUFMP 2018 canopy layer and City GIS data.

## EAST CAMBRIDGE CASE STUDY

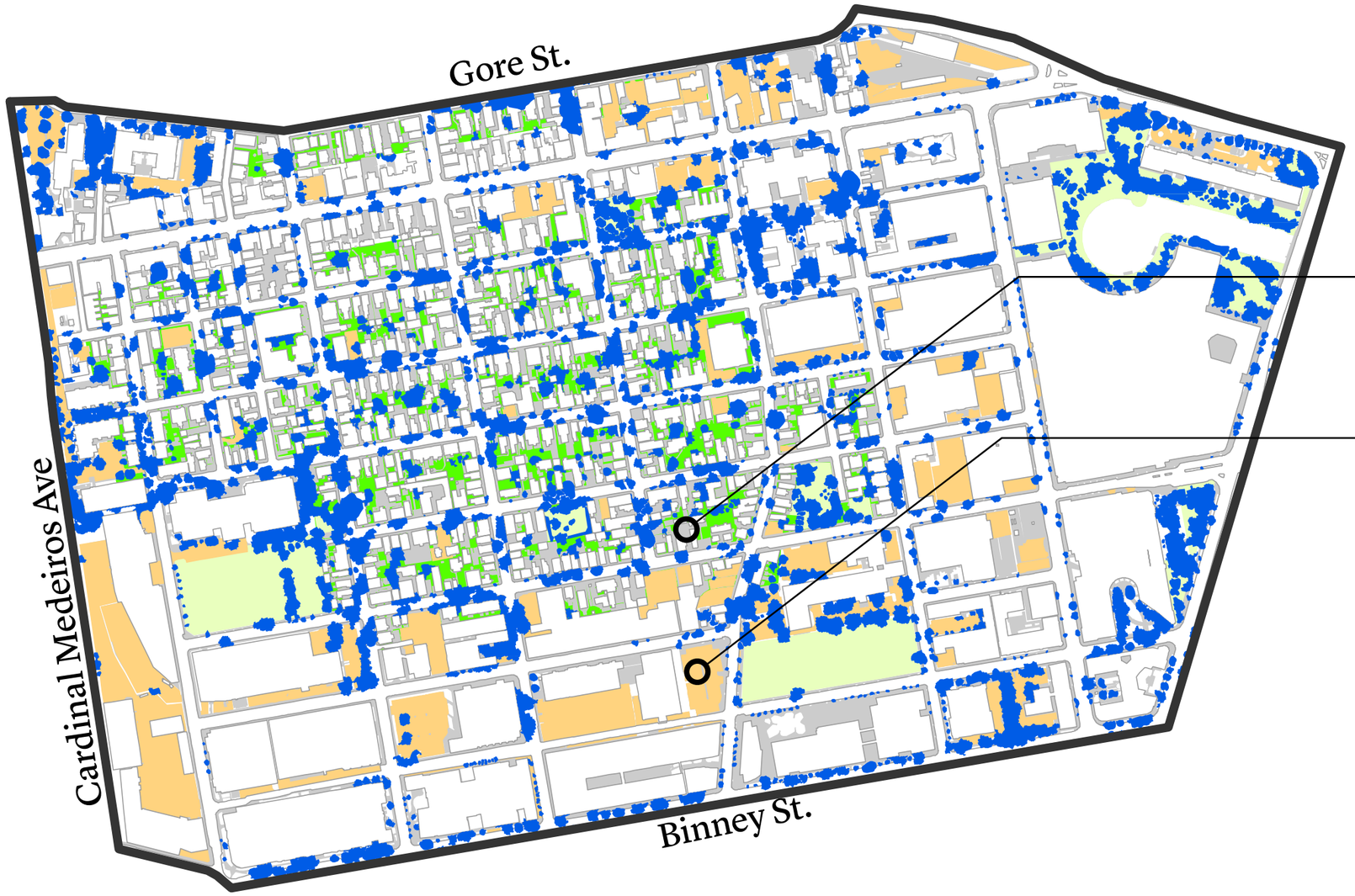
# Properties are primarily residences with no front yard setbacks and large blocks with limited setbacks.




Source: CUFMP 2018 canopy analysis and City GIS data.

# EAST CAMBRIDGE CASE STUDY

## Existing canopy cover (2018)




- 2018 CANOPY COVER
- PARKING LOTS
- OPEN SPACE
- BACK YARD PERMEABLE AREA
- IMPERVIOUS AREA
- BUILDINGS/ROAD

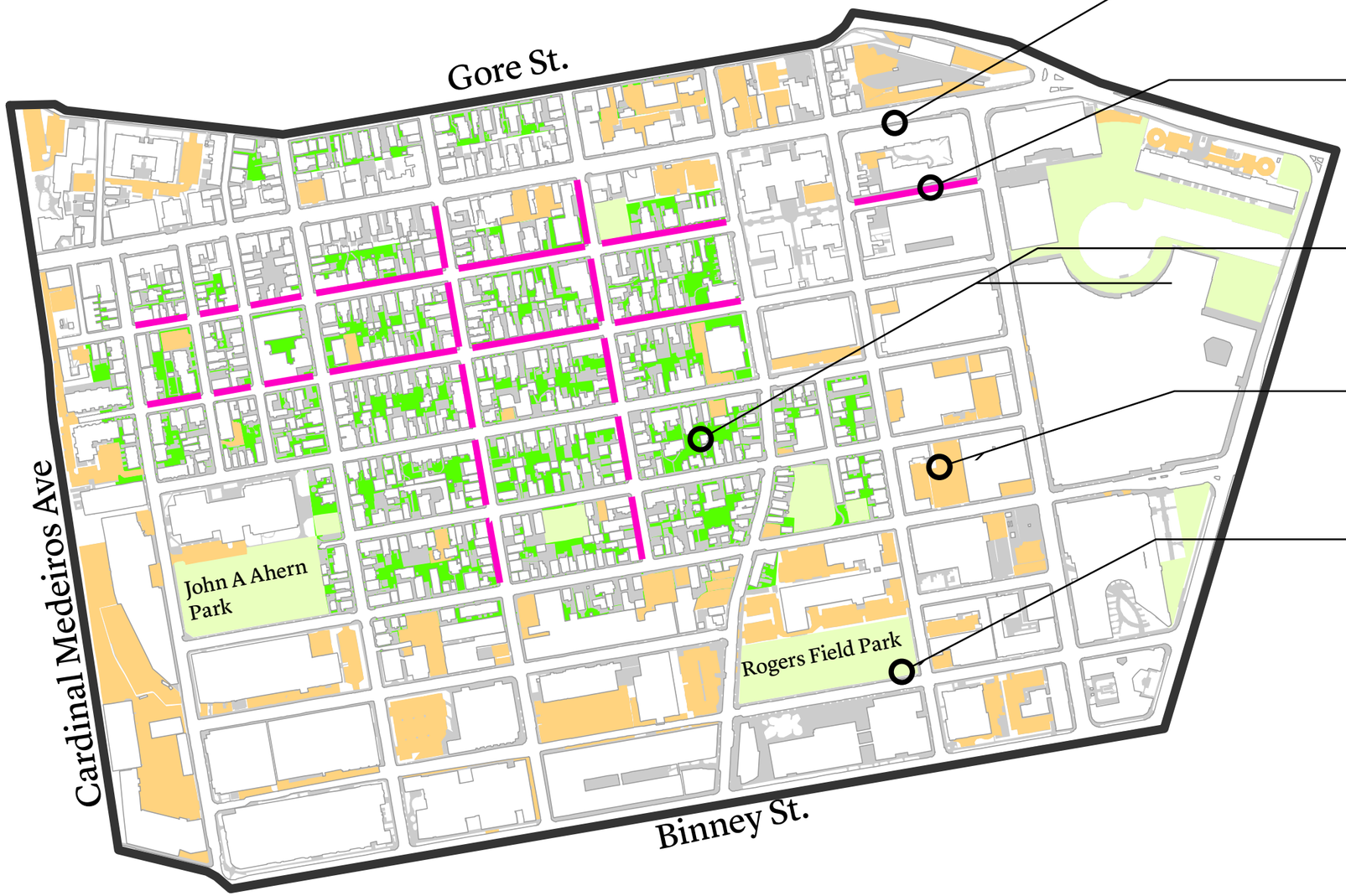
Residential areas have a high percentage of imperviousness

Large areas without canopy tend to be associated with buildings and parking lots

Source: CUFMP 2018 canopy analysis and City GIS data.

# EAST CAMBRIDGE CASE STUDY_DRAFT

## Planting opportunities are primarily on streets, in back yards, and parking lots.



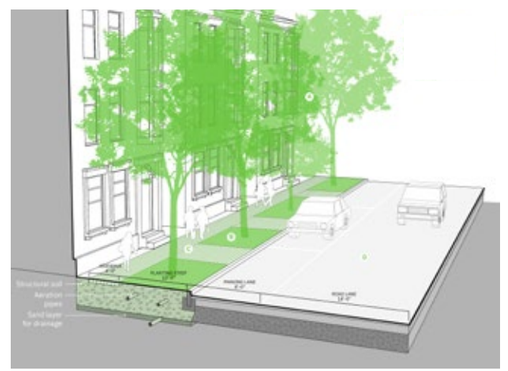

Increase R.O.W. planting

Lane diets for 4 streets- converted to one ways

Encourage backyard plantings (20% cover)

Increase canopy cover on parking lots (13% cover)

Buffer existing open spaces with more trees



Source: CUFMP 2018 canopy analysis and City GIS data.

# EAST CAMBRIDGE CASE STUDY_DRAFT

## Idealized planting scenario increases canopy cover from 15.1% to 25.4%

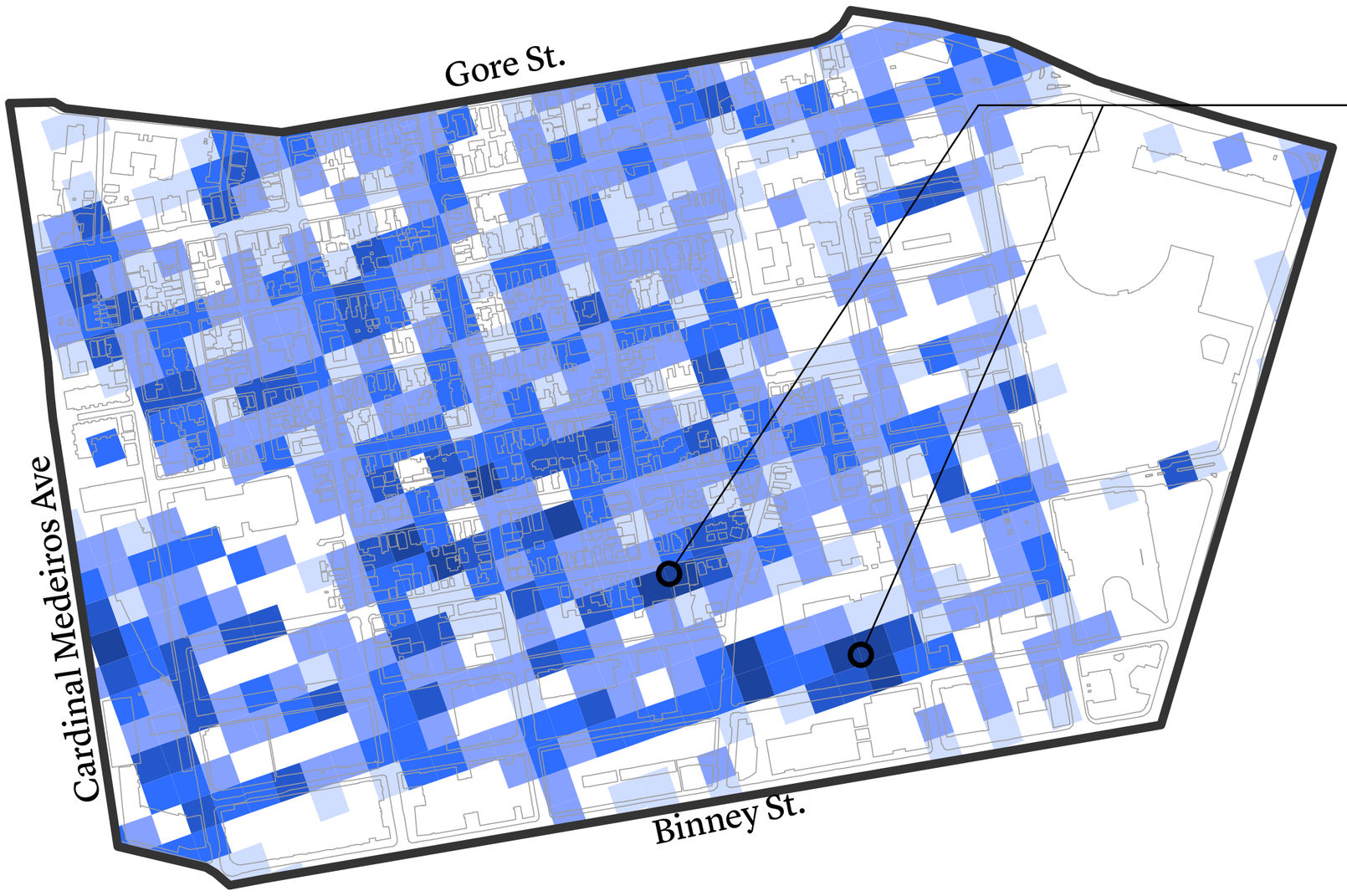

- R.O.W. planting*: 30’ tree spacing (611 trees)
- Lane diets: 30’ tree spacing (195 trees)
- Backyard planting: 30% canopy cover (575 trees)
- Parking Lots: 30% canopy cover (297 trees)
- Increase buffer planting for parks and Rogers Field Park planting (134 trees)

1814 trees

*Idealized scheme of R.O.W. planting, does not consider conflicts with utilites, etc.
Source: CUFMP 2018 canopy analysis and City GIS data.

# EAST CAMBRIDGE CASE STUDY_DRAFT

## 62% of East Cambridge experiences cooling of 0.5 degrees or more




Clustered backyard plantings and dense park plantings results in higher decreases in temperature

| CHANGE IN AMBIENT AIR TEMPERATURE °F | % OF COOLING |
|---|---|
| Change < 0.5 | |
| Decrease 0.5 - 1 | 22% |
| Decrease 1 - 2 | 43% |
| Decrease 2 - 3 | 24% |
| Decrease 3 - 4 | 9% |
| Decrease > 4 | 2% |

Source: CUFMP 2018 canopy analysis and City GIS data.

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Tree protections and new planting mandates are scattered throughout Cambridge's Zoning Ordinances.

Requirements are tied to specific site uses (such as construction of a parking garage) and districts (such as the Parkway Overlay District).

Open space requirements have varied and inconsistent performance requirements
e.g. permeability, shade.

Setback requirements do not consistently specify particular treatments
e.g. permeability, plantings

Land use strategies related to canopy cover:

-Encourage shade over paved areas, public spaces, front yards, back yards

-Encourage contiguous shaded spaces

-Incorporate trees as part of comprehensive resilience strategies

-Encourage shade in neighborhoods with canopy deficits

# Thank you

www.cambridgema.gov/ufmp