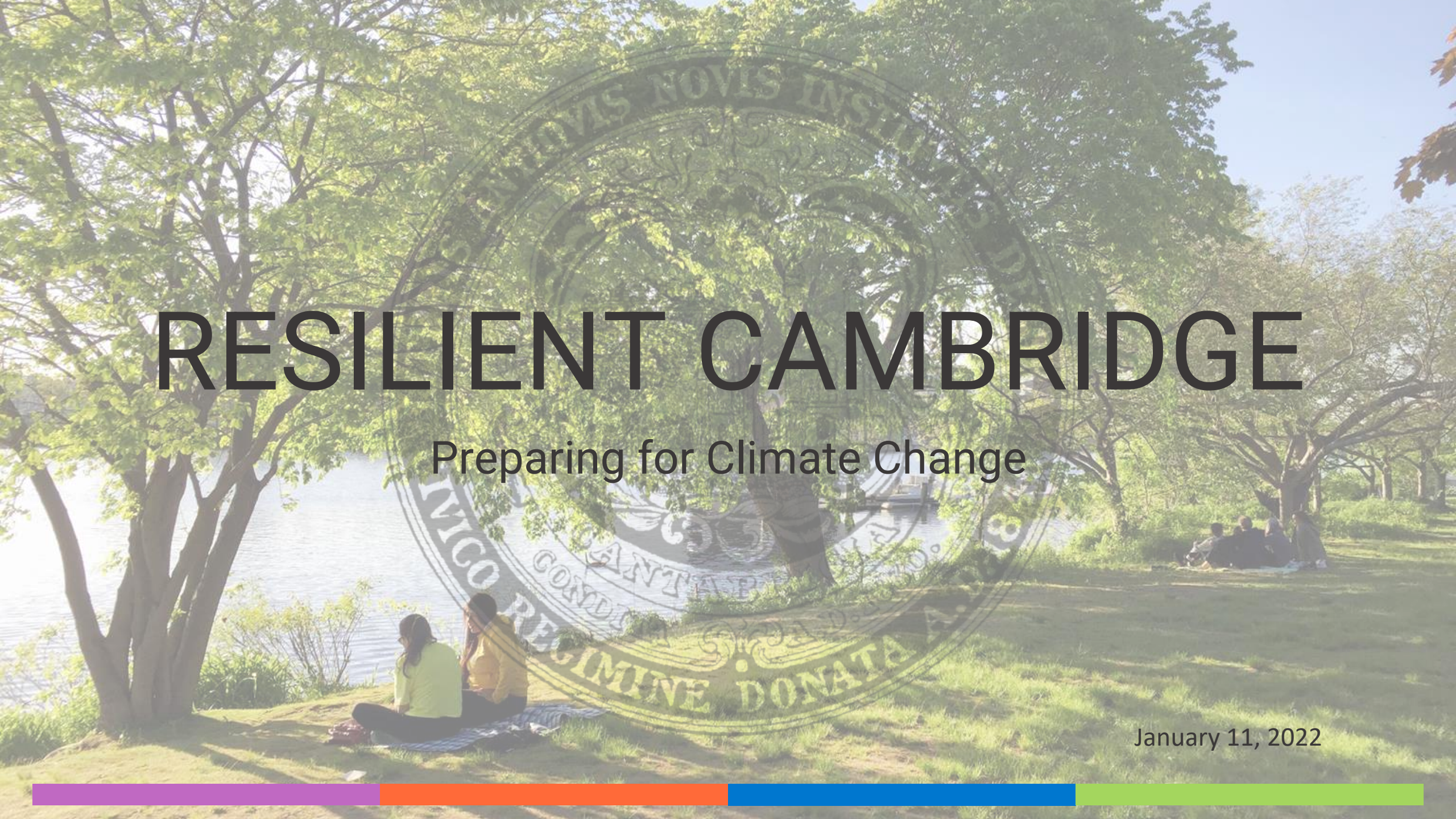


RESILIENT CAMBRIDGE

Preparing for Climate Change

January 11, 2022

Climate Change: Shifting Risks

Extreme Heat

Days over 90°F to triple by 2030. By 2070, there could be more than 2 months in a year over 90°F.

Extreme Rain

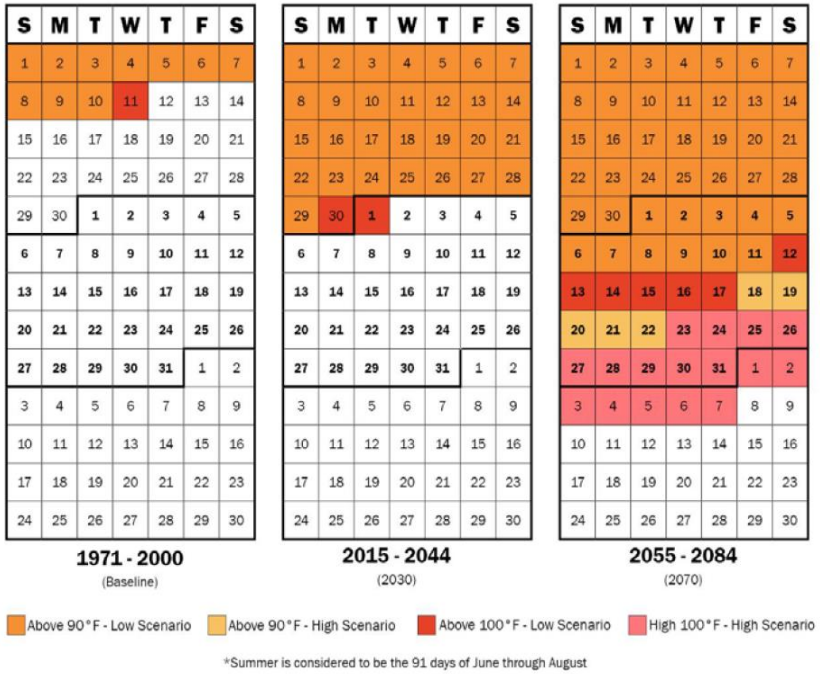
Flooding from rain more frequent and more severe

Sea Level Rise/ Storm Surge

Sea level rise and larger storm surge in Boston Harbor will overtop and flank the Mystic and Charles River dams

Increasing Heat

Warm Averages, Higher Temps, More Heat Waves

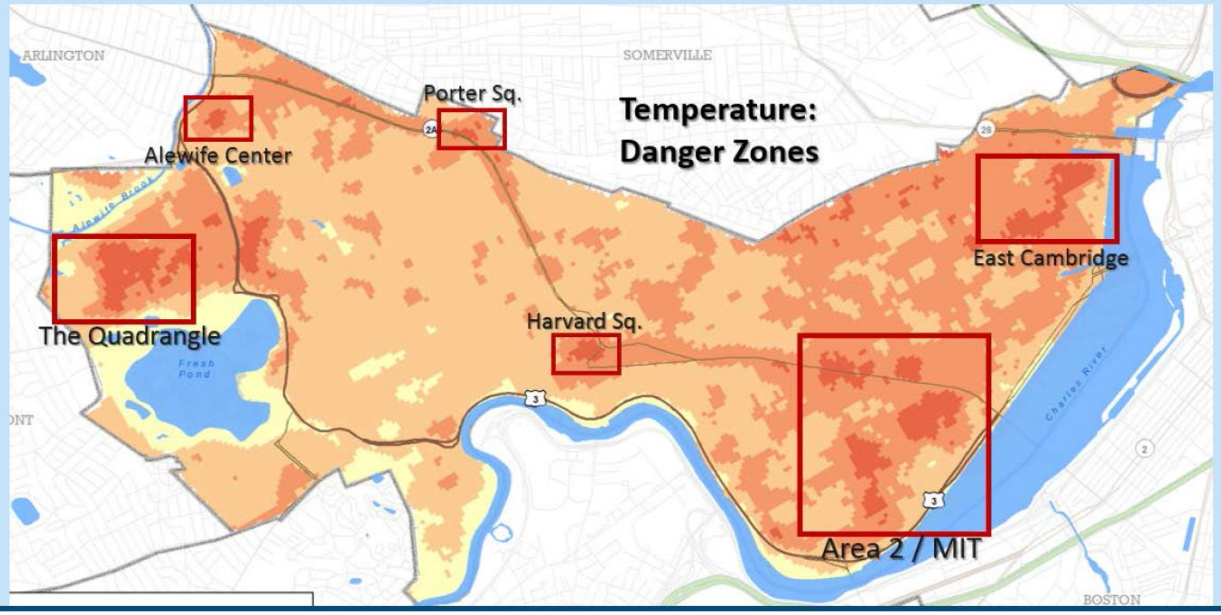


By 2030, the number of days above 90° F could triple

- Stress on human health
- Stress on infrastructure

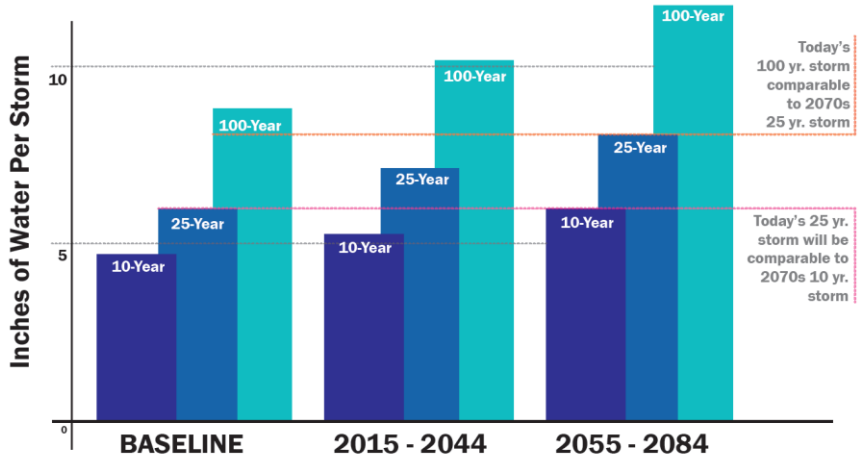
Urban Heat Island Effect Magnifies Ambient Temperature

- Darker impervious surfaces – pavement & roofs -- absorb heat
- Areas with large amounts of impervious surface and lacking tree canopy tend to be heat islands

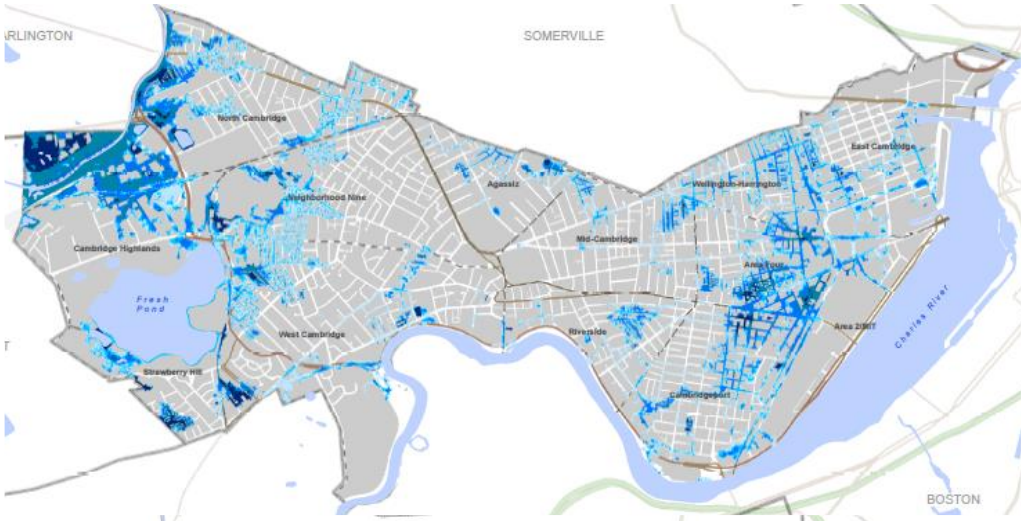


Increasing Precipitation

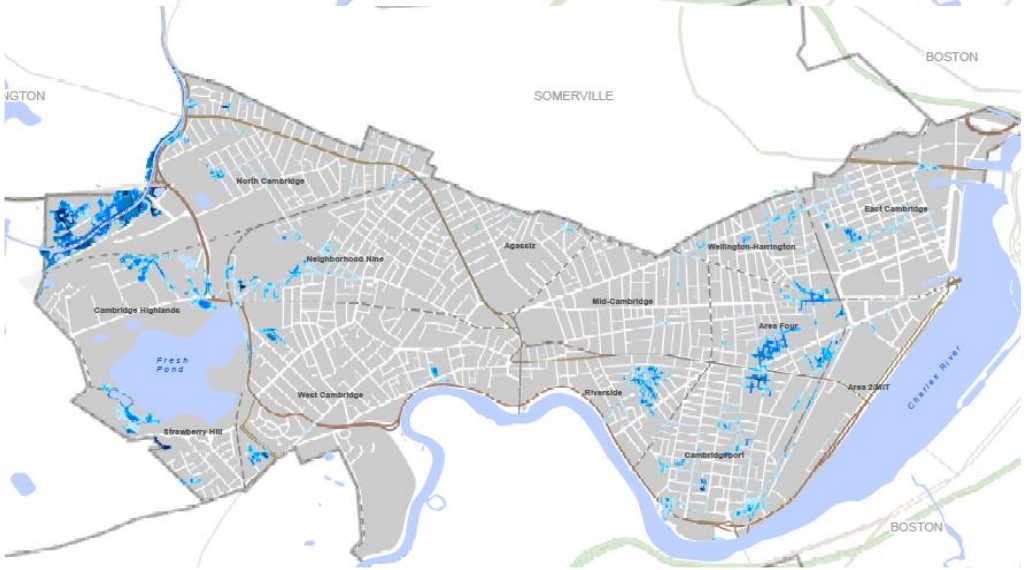
Extreme rates, Increasing frequency



(per 24 hr. event)



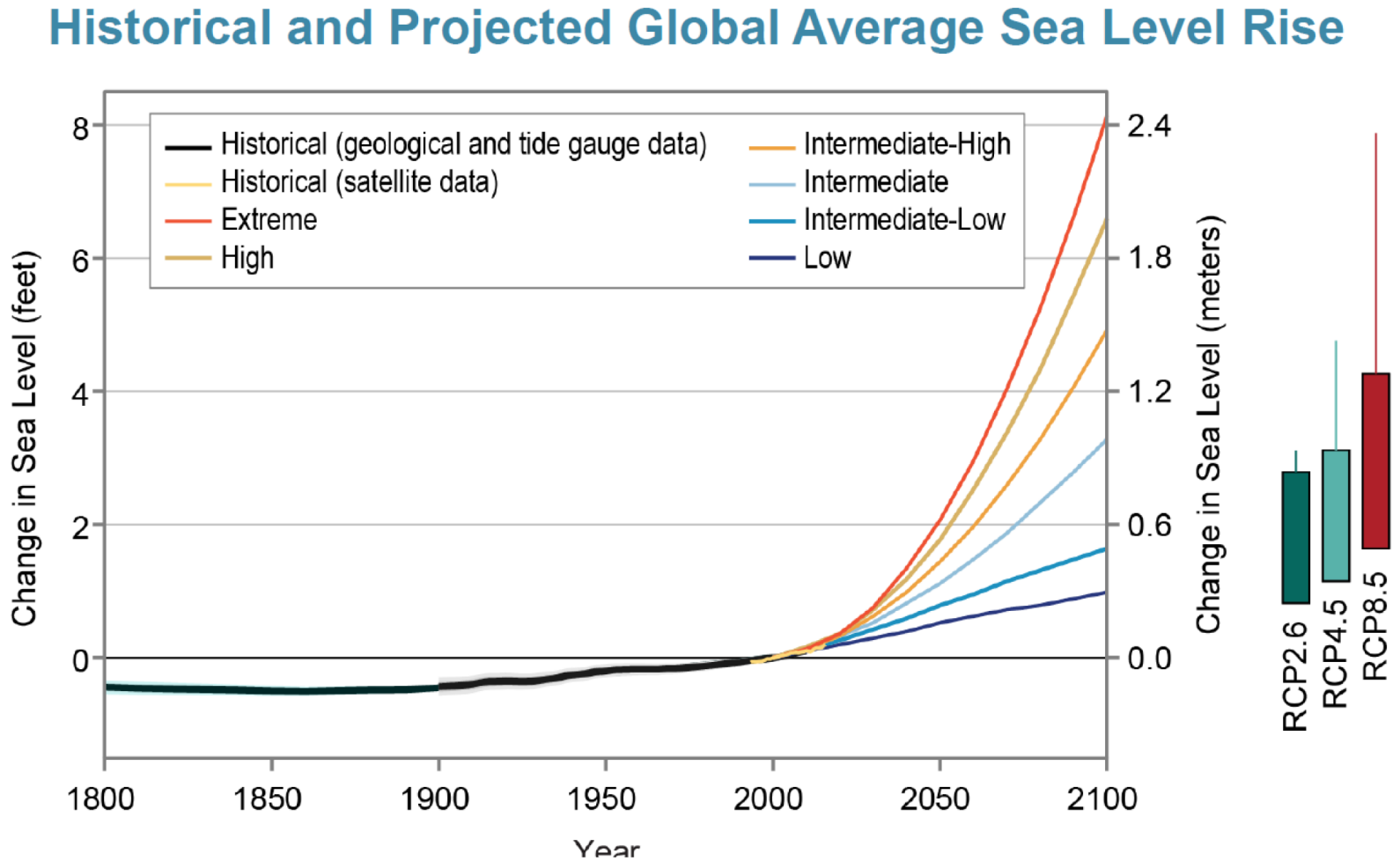
(per 24 hr. event)



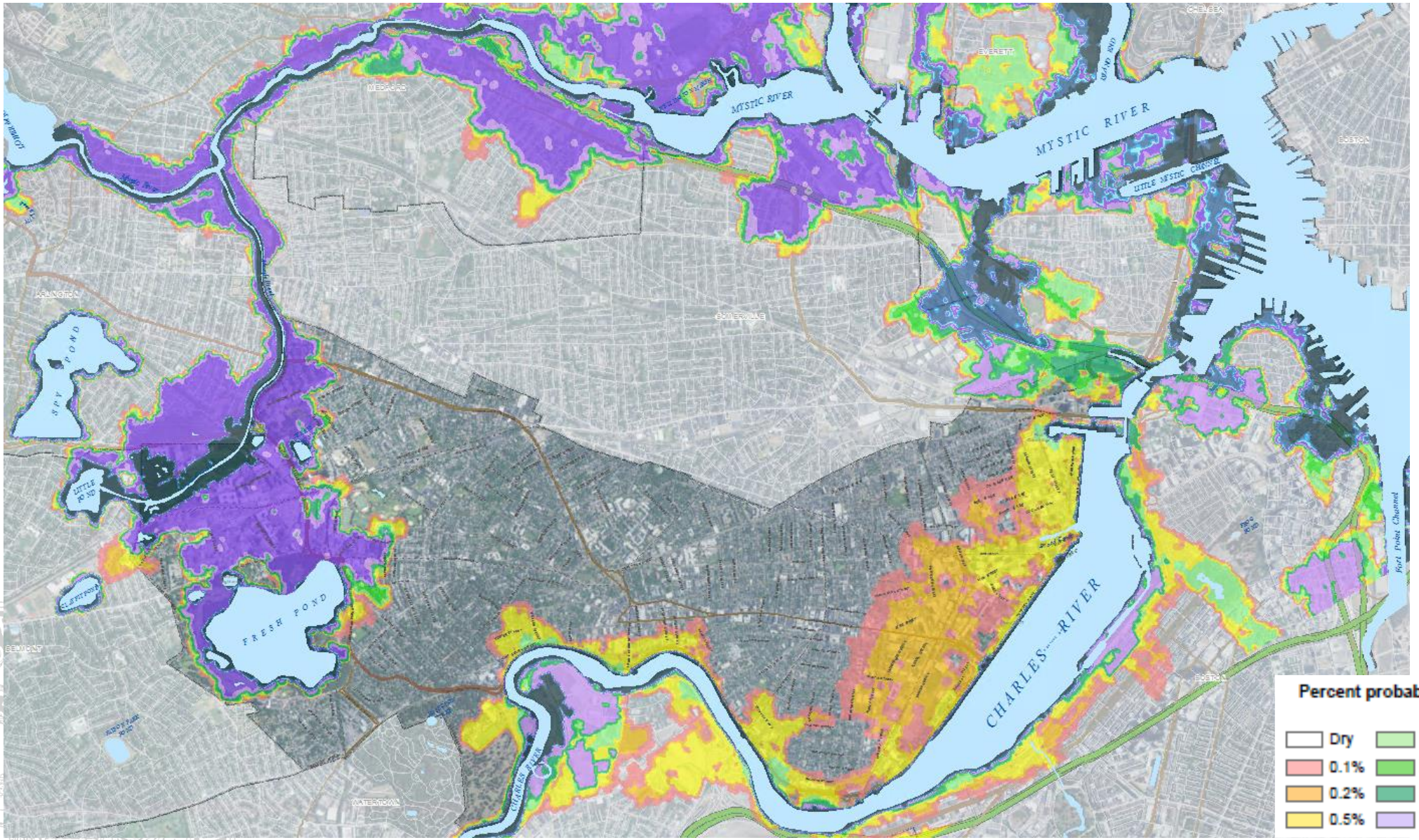
(Source: Kleinfelder based on ATMOS projections November 2015)

Rising Sea Levels

Higher Tides and Storm Surges



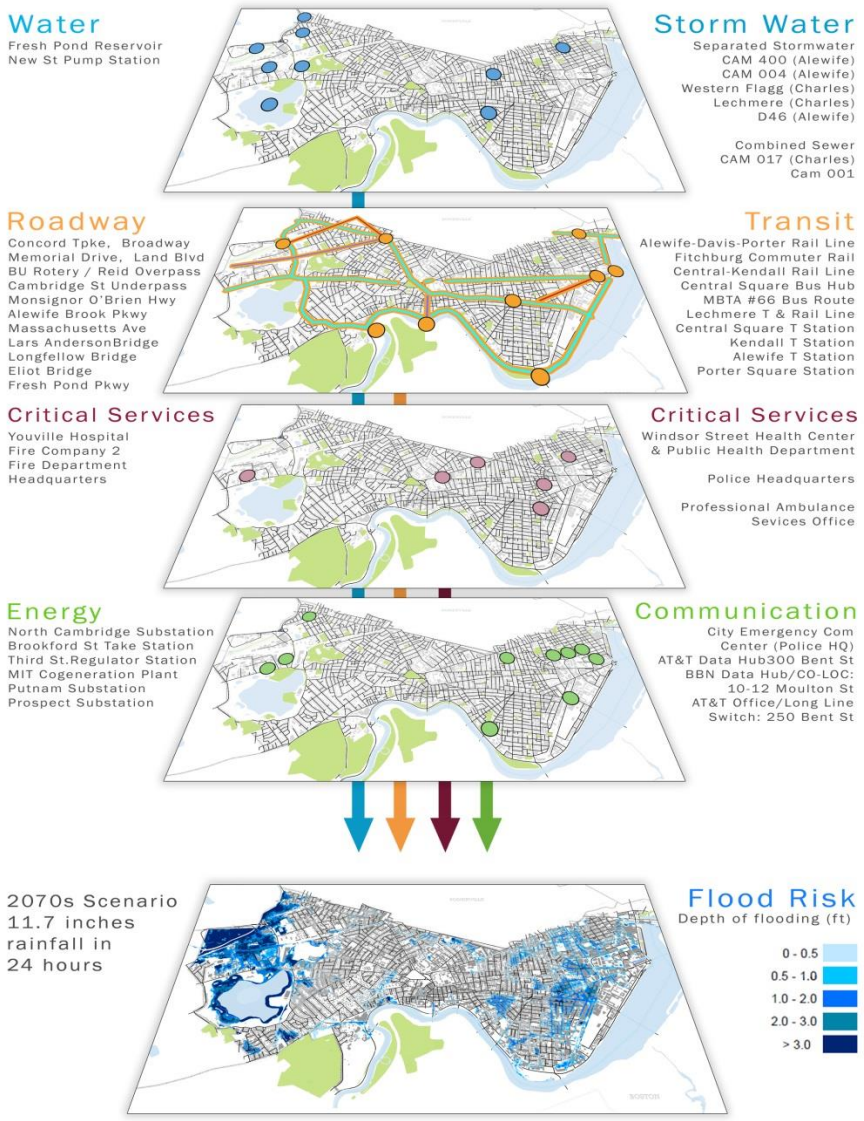
Rising Sea Level: Emergence of storm surge flooding risk by 2070

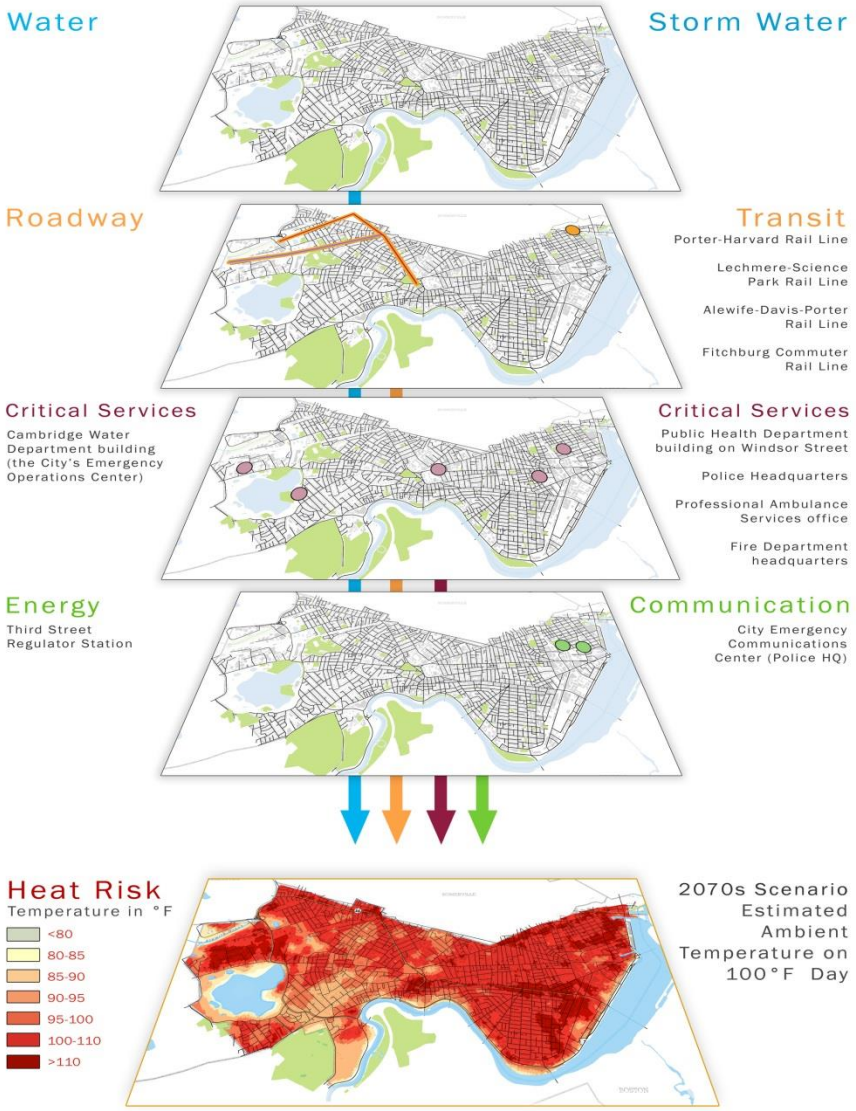


Based on Boston Harbor Flood Risk Model (BHFRM) MassDOT & Woods Hole Group

- ADCIRC & SWAN

Climate Stress Test: What Happens If No Action Taken





Impacts of Concern

Direct

- Flood damage to building structures and systems
- Flood damage to vehicles
- Flood damage to documents, paper & digital
- Health impacts, e.g. heat stroke, respiratory effects from mold, vector-borne disease
- Power outage to buildings, e.g., loss of refrigeration, AC, computers
- Pest & disease effects on trees and vegetation

Indirect

- Loss of business continuity, i.e. office or retail closures, lost wages, lost revenue
- Transportation disruption, i.e. MBTA shutdown
- Supply chain disruptions
- Employee personal impacts, e.g. property damage, access to childcare or school, health effects
- Internet & communications outage

Approach to climate change preparedness & resilience

Reduce Risk

- Reduce urban heat islands
- Increase flood storage & conveyance
- Install storm surge barriers
- Elevate structures

Prepare for Unavoidable Risks

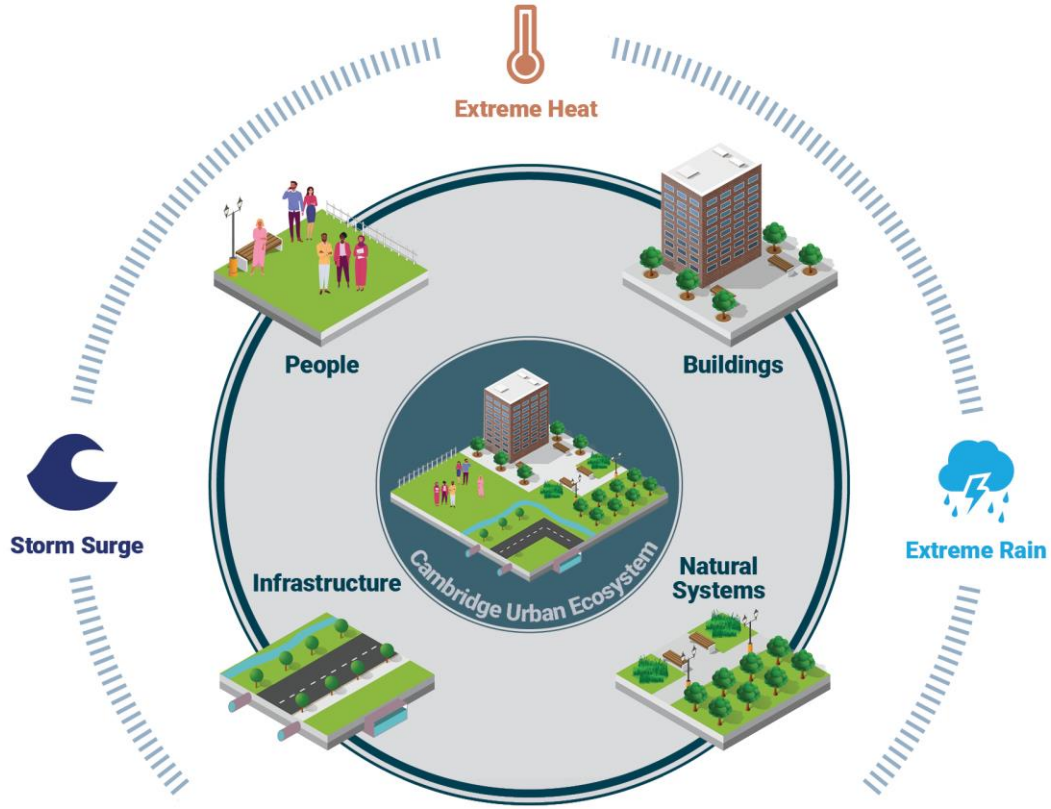
- Be transparent and open about risks, share data
- Plan for extremes and new normals
- Coordinate planning initiatives
- Engage stakeholders & community
- Develop strategies for people, buildings, infrastructure, and ecosystem
- Implement at different scales
- Coordinate and engage regionally

Resilient Cambridge Strategies

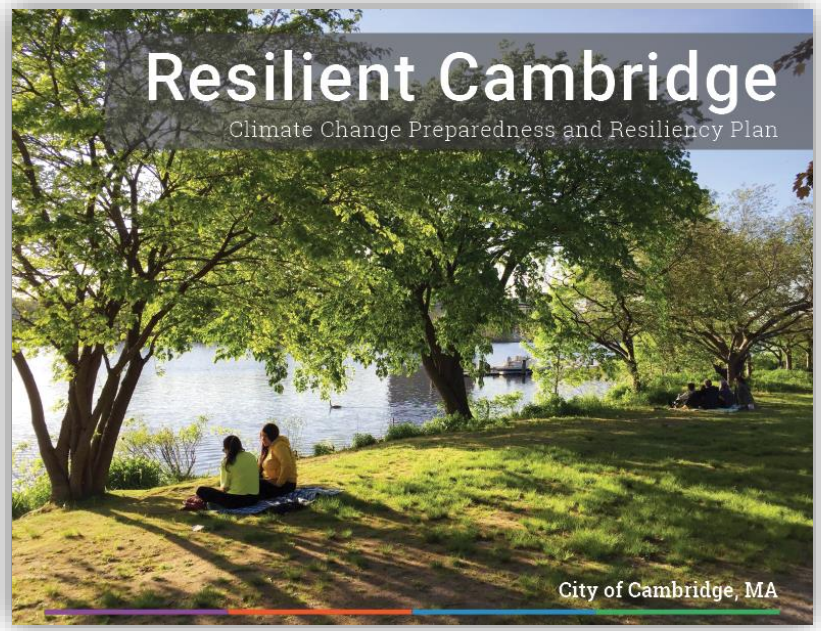
34 strategies organized around four categories

- Closer Neighborhoods
- Better Buildings
- Stronger Infrastructure
- Greener City

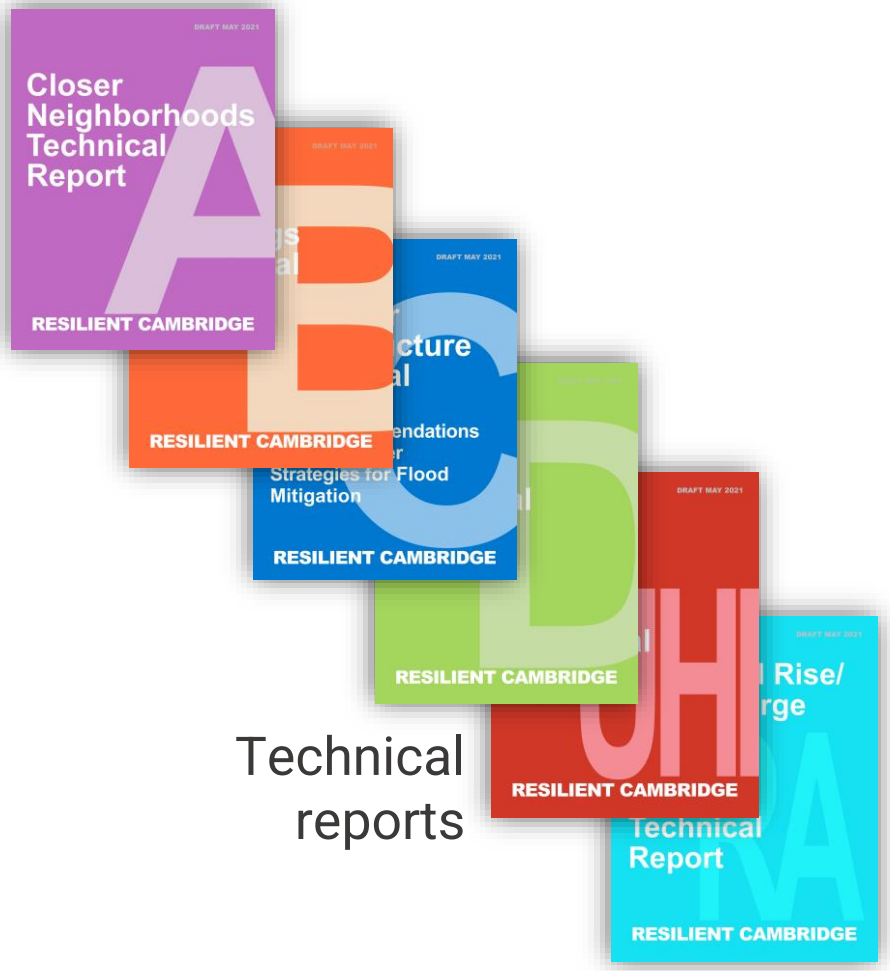
Discusses regional considerations



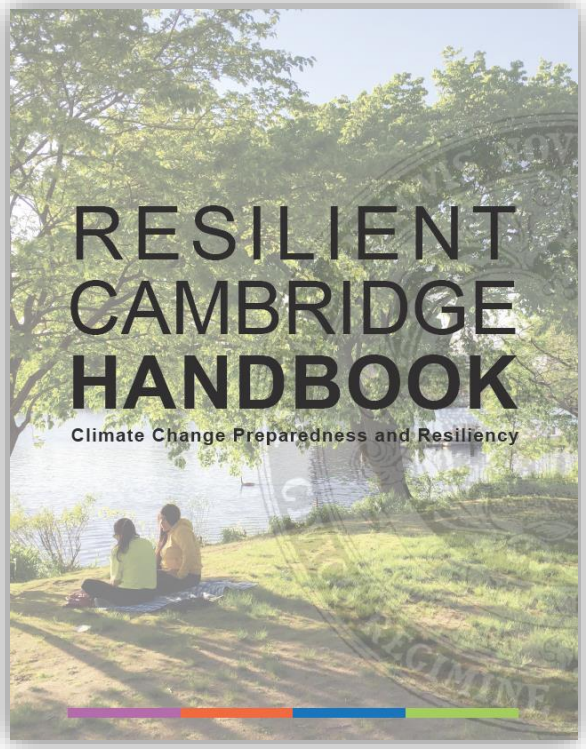
What we produced: Resilient Cambridge



Plan



Technical reports

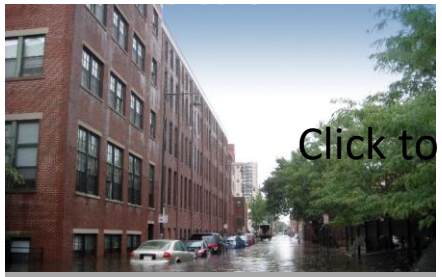


Handbook

What we produced: Additional materials

Public summary report

Story Maps

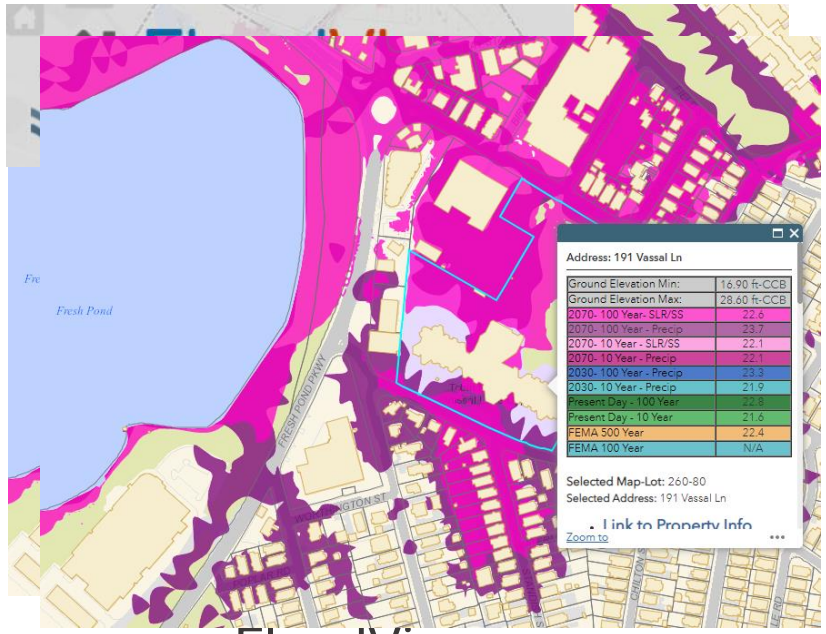


Flood Risk

Heat Risk

Flood Strategies

Heat Strategies



FloodViewer: potential flooding by parcel

Related Processes

Envision Cambridge – Community Development Department

- Climate Resilience Zoning Task Force
  - Proposing codification of 2070 flood risk standards and Cool Factor
- Cambridge Street Planning Study

Urban Forest Master Plan – Public Works Department

- Expanded urban forest staff and budget
- Update to Tree Protection Ordinance
- Increased tree plantings
- Witness Tree project with Harvard Forest
- Miyawaki micro-forests
- Ongoing urban forest assessments

Community Health Improvement Plan – Public Health Department

- Community social resilience priority
- Community Resilience Manager

Social Resilience

Social infrastructure

- the assets that shape our social interactions
- Sociologist Eric Klinenberg loosely defines *social infrastructure* "as the physical elements of community that act as a conduit to bring people together and build social capital. "

- Parks
- Plazas
- Libraries
- Streetscapes
- Retail
- Community centers

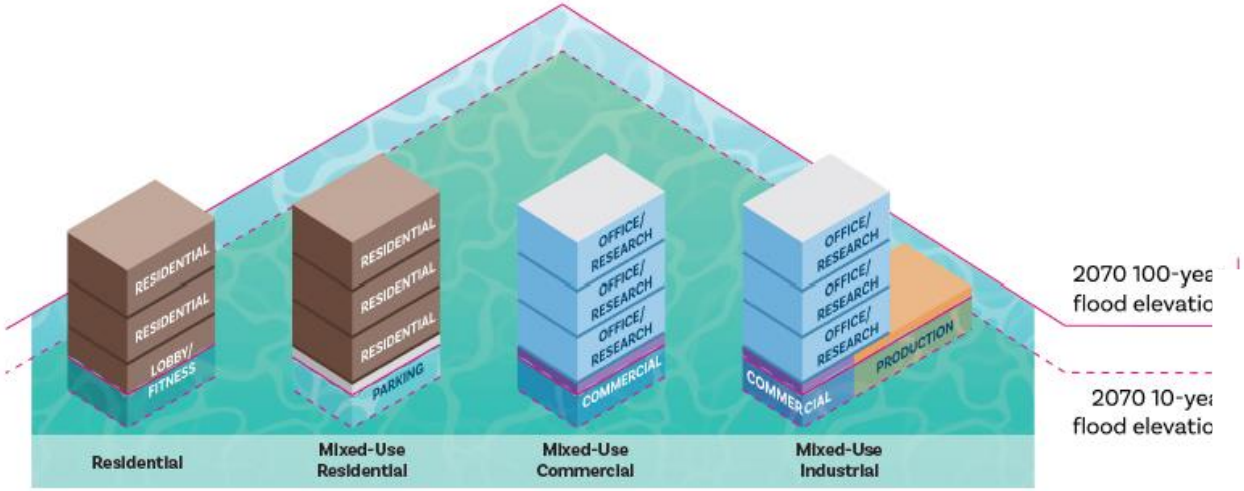
Social Capital/Connectedness

Cambridge Community Corps

Cambridge Community Center

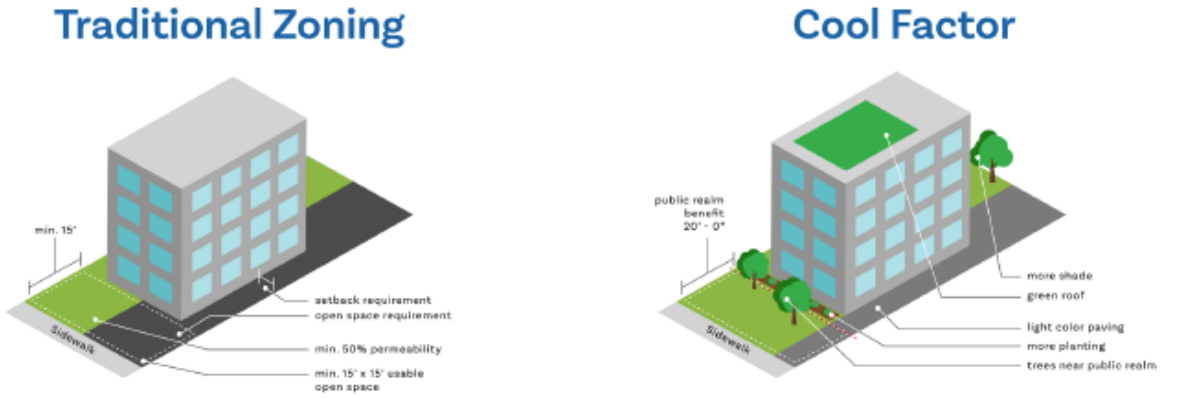
Climate Resilience Zoning

Residential		Non-Residential		
Residental	Mixed-Use Residential	Mixed-Use Commercial	Mixed-Use Industrial	
• Housing must be elevated or floodproofed • Garage levels can be floodproofed or floodable • Elevate or protect utilities and major equipment	• Housing must be elevated • Commercial or retail uses can be floodproofed • Elevate or protect utilities and major equipment	• Office uses can be floodproofed • Commercial or retail uses can be floodproofed • Elevate or protect utilities and major equipment	• Office uses can be floodproofed • Commercial, industrial, or retail uses can be floodproofed • Elevate or protect utilities, major equipment, and chemical storage	Envision Prototypes



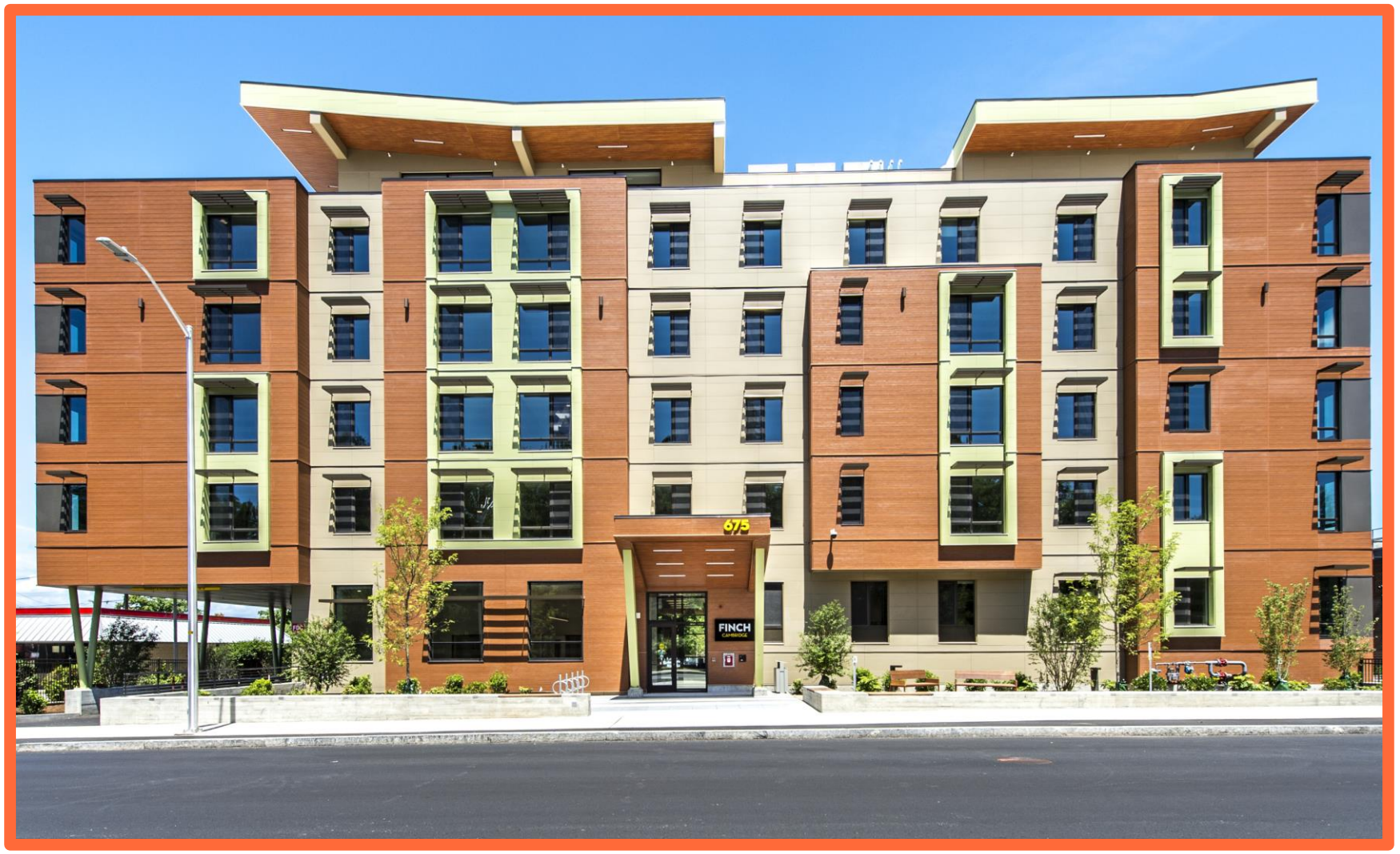
Codify Future Flood Elevations

Cool Factor Site Rating System



✓ Open Space ✓ Permeability + ✓ Shade ✓ Cool Surfaces ✓ Planting

New Construction



HRI/Finch Cambridge Affordable Housing Project, Concord Avenue

- Designed to 2070 flood elevations
- All residential units second floor and higher
- Community room on top floor
- Passive House standards for energy efficiency and passive thermal resilience

Stronger Infrastructure/Gray Infrastructure

The Port Infrastructure Project

Springfield Street High Solar Reflectance Coating

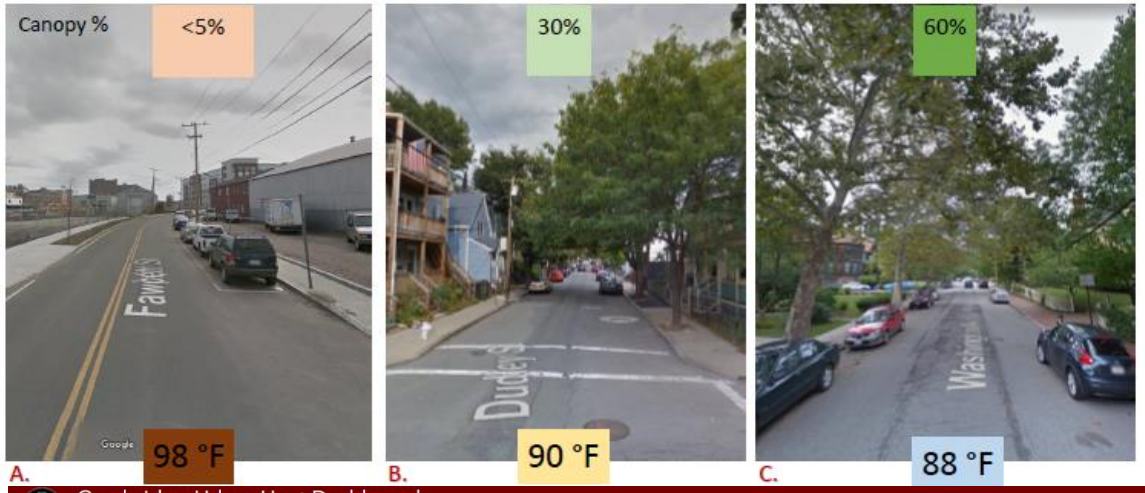
Greener City/Green Infrastructure

Urban Forest Master Plan

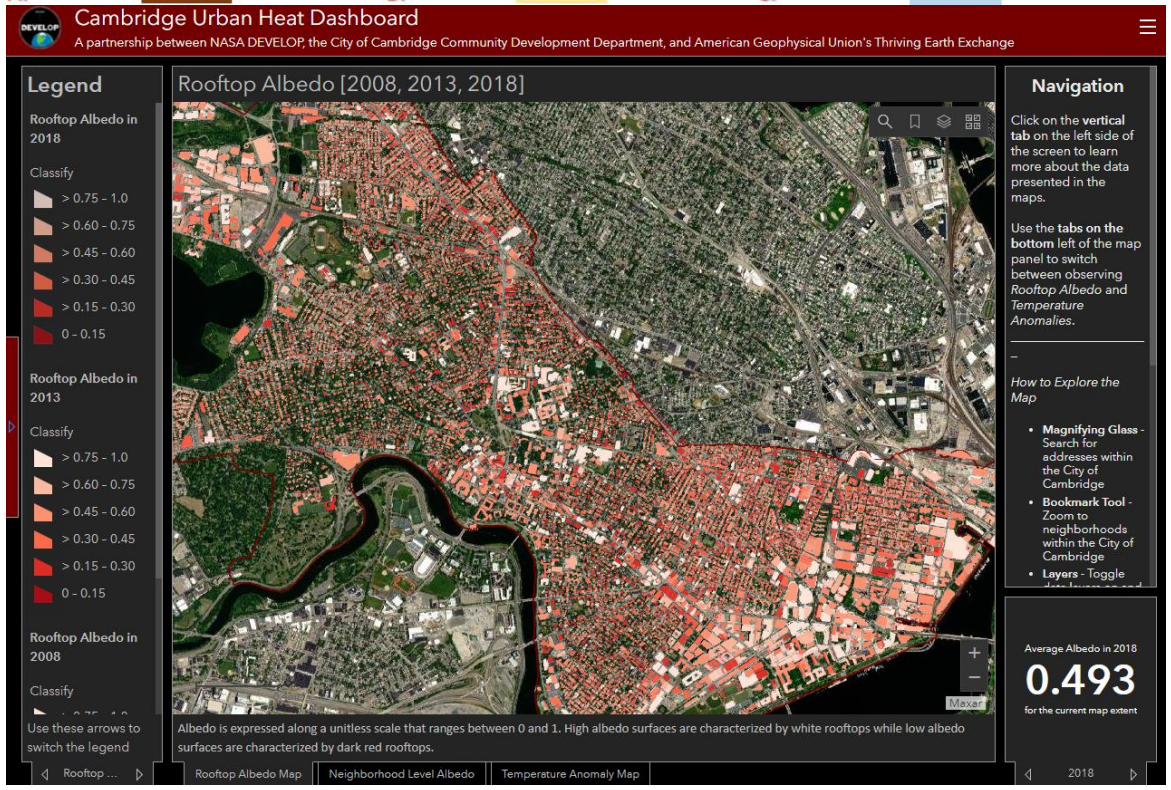
Triangle Park

- Binney Street, First Boulevard, Land Boulevard
- 1 acre
- Naturalized forest habitat
- 400 new trees, 15 species
- In construction

Shade & Solar Reflectance



- On a 90 degree day, tree canopy cools streets up to 10 degrees F or more
- Based on urban heat island mapping



- Rooftop albedo mapped for 2008, 2013, 2018
- 30% increase in albedo, 2008-2018
- LEED green building requirement & availability of high SRI roofing products
- Dr. Mehdi Heris, American Geophysical Union/Thriving Earth Exchange, & NASA Develop

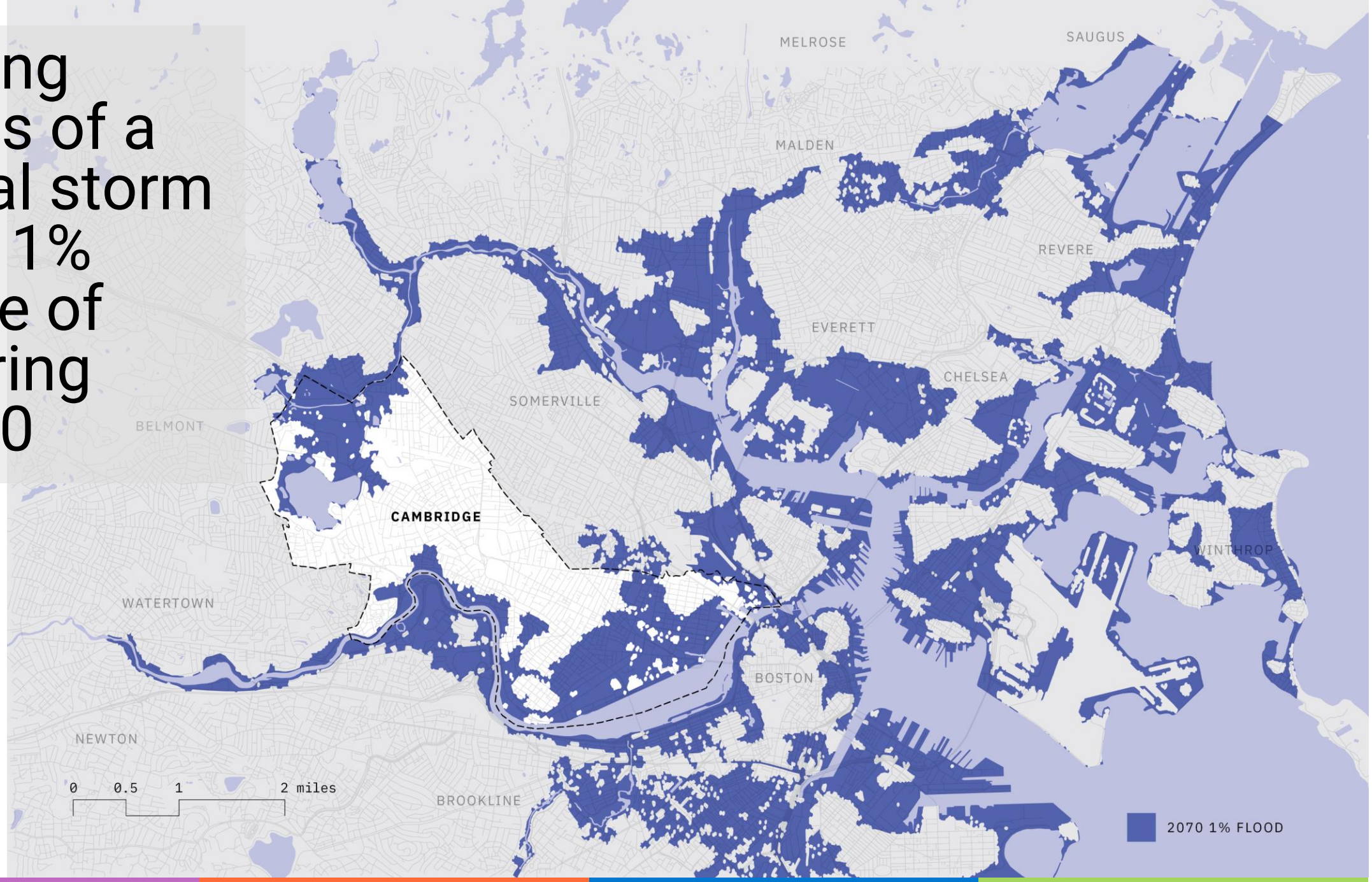
A vision for a healthy forest

Coastal flooding – regional is key

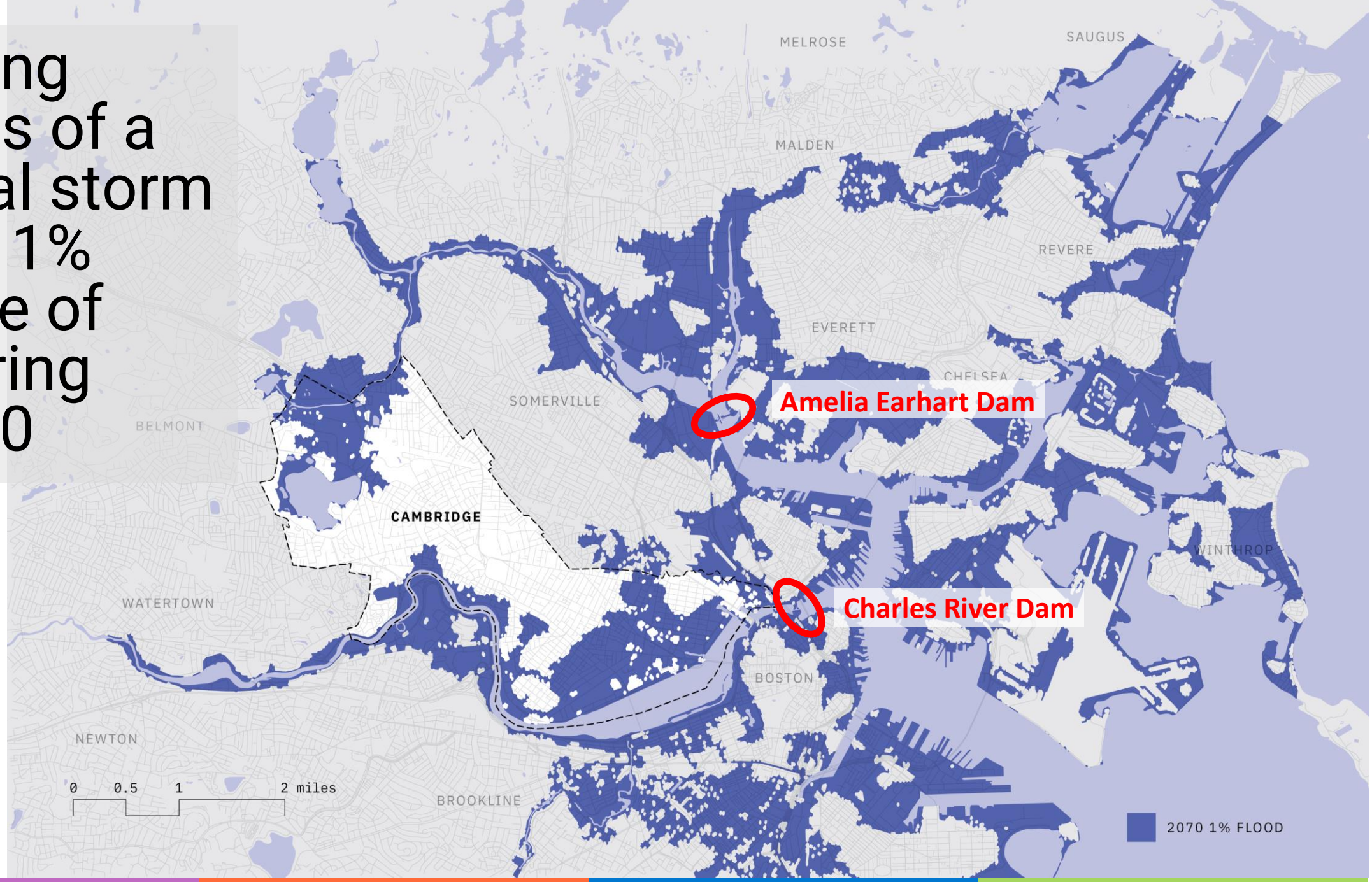
Larger than any individual community

Photo credit: Bryan Gammond

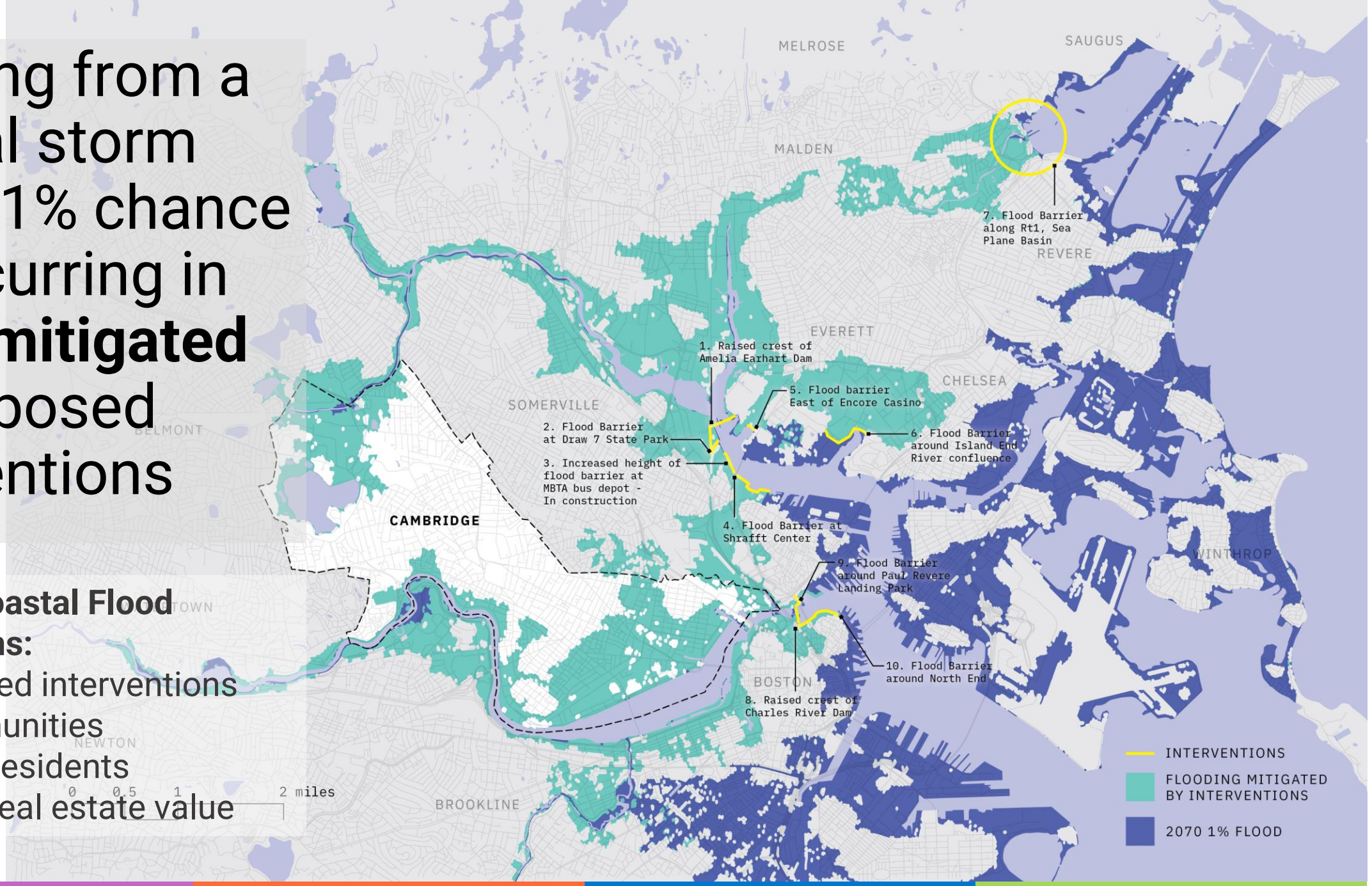
Flooding extents of a coastal storm with a 1% chance of occurring in 2070



Flooding extents of a coastal storm with a 1% chance of occurring in 2070



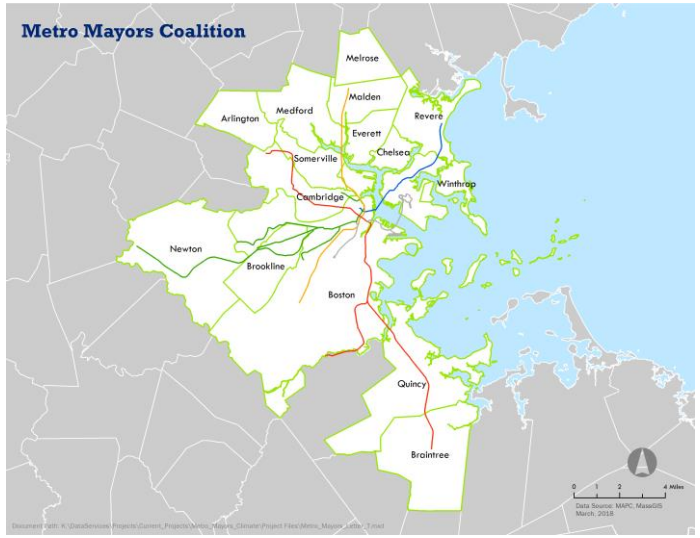
Flooding from a coastal storm with a 1% chance of occurring in 2070, **mitigated** by proposed interventions



Regional Coastal Flood Interventions:

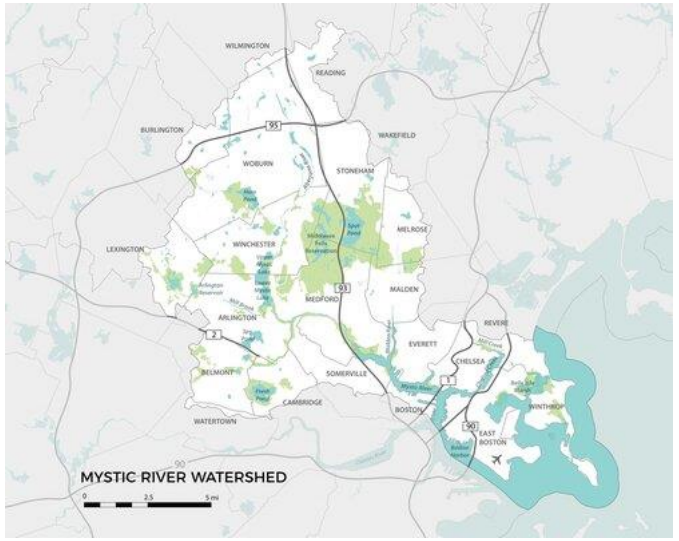
- 10 targeted interventions
- 12 communities
- 108,000 residents
- $60B of real estate value

Regional Climate Collaborations



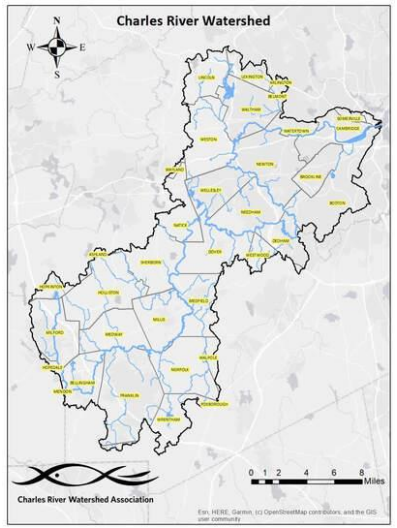
Metro Mayors Climate Task Force

- 15 inner core communities
- Coordinated by MAPC
- Building Resilience to Climate-driven Heat in Metro Boston



Resilient Mystic Collaborative

- 21 watershed communities
- Coordinated by MyRWA
- Upper Mystic Stormwater Project
- Social resilience work group
- Lower Mystic Storm proofing critical infrastructure
- Regional storm surge protection



Charles River Climate Compact

- 23 communities
- Coordinated by CRWA
- Current focus is on upper watershed stormwater management

Before

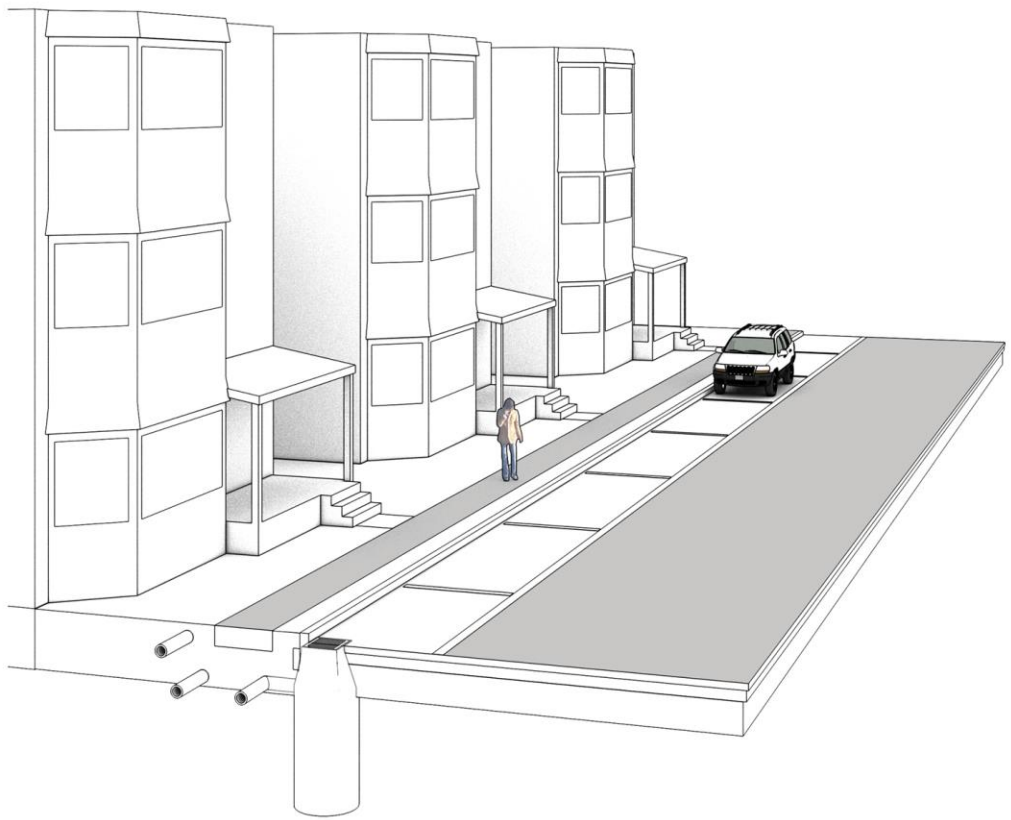
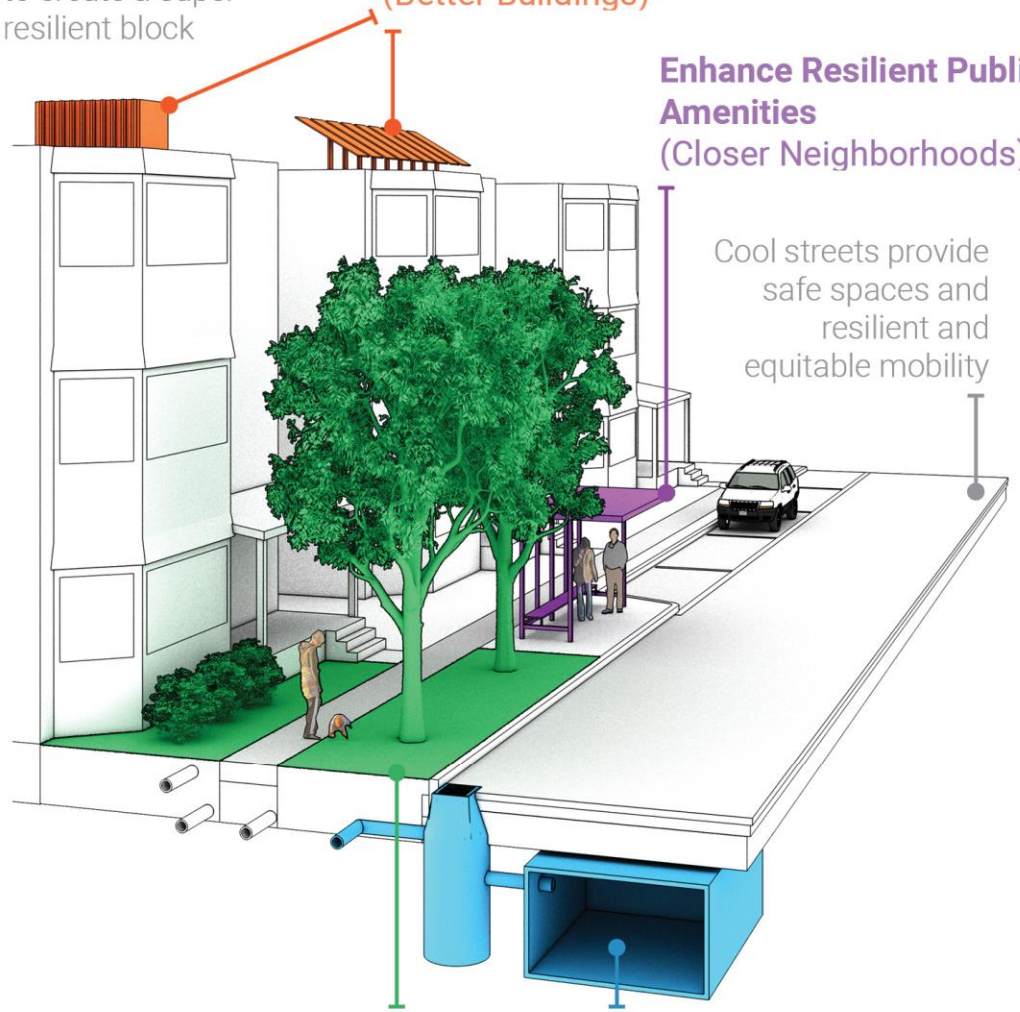


Illustration not to scale

After

Strategies combine to create a super resilient block



Additional Thoughts: Fresh Pond and Water Supply

- Some potential impacts of climate change not considered in Resilient Cambridge
  - Drought
  - Groundwater levels
- Effects on watershed outside Cambridge not considered
- Regulations are evolving to account for climate change
- Regional storm surge barrier concept proceeding faster than anticipated; berm at Fresh Pond less urgent
- Fresh Pond Reservation plays a role in urban heat island reduction and increasing social resilience
- Climate science continues to evolve, so monitoring new information and reassessing risks is a continuous task

Thank you!

To learn more, visit:
www.cambridgema.gov/ResilientCambridge

or contact John Bolduc, jbolduc@cambridgema.gov