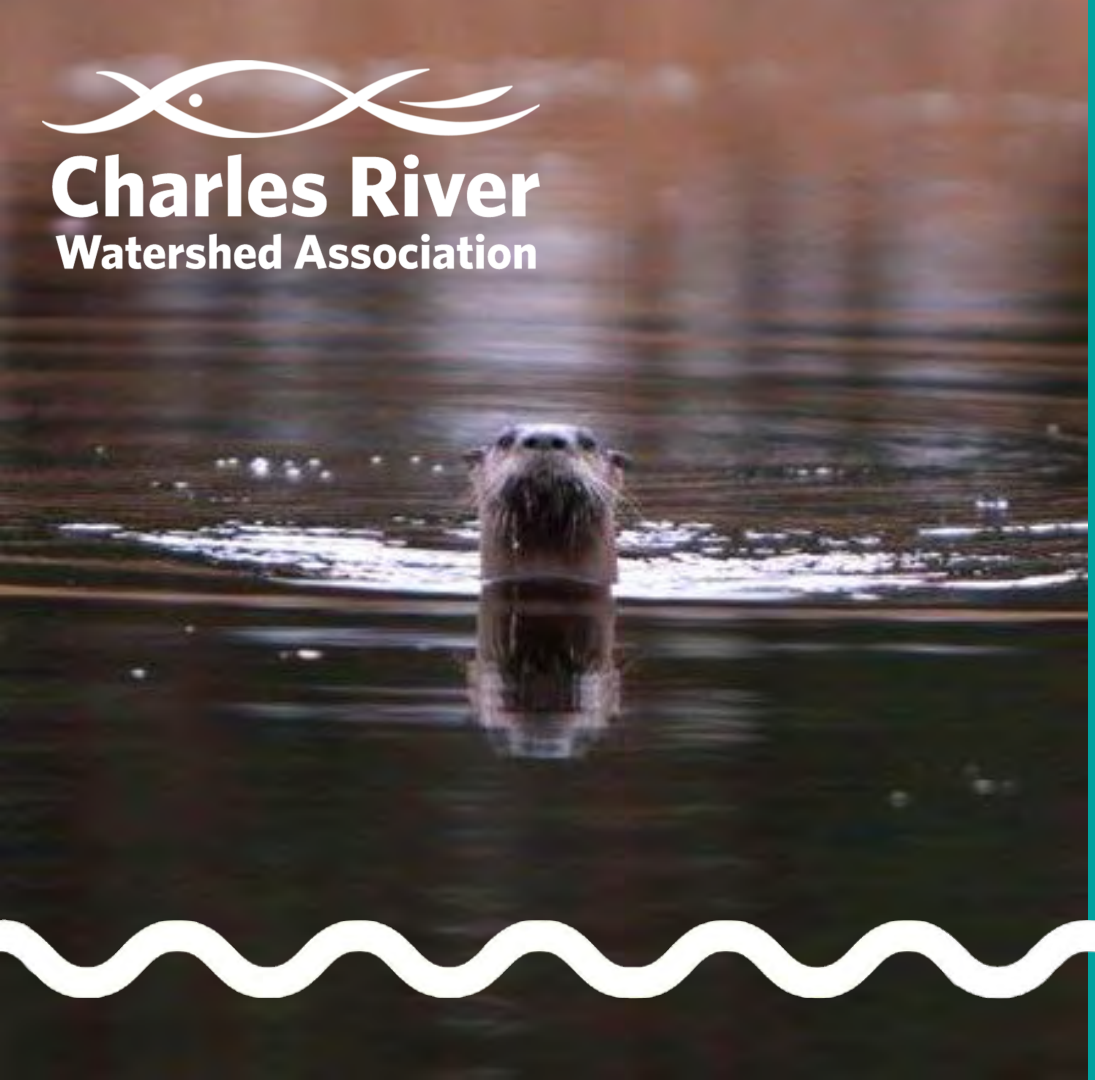


The Flood Next Time:
Reducing Pollution, Mitigation Flooding

***

Green Committee of the Neighborhood Association of the Back Bay

April 29, 2024

About Us: Charles River Watershed Association

1965: Founding

1972: Clean Water Act passed

MARIELENA LIMA River Science Program Manager

DIRA JOHANIF, GSIP Senior Climate Resilience Associate

ZEUS SMITH, ESQ. Associate Attorney

SIMRET SEMINE Development Associate

RYAN SMITH Volunteer & Outreach Coordinator

CARLY SHERMAN Communications Associate

ARRIANNA PROIA Community Organizer

CARRIE O'CONNOR Bookkeeper & Office Manager

EMILY NORTON Executive Director

HEATHER MILLER, ESQ. General Counsel & Director of Operations

CABELL EAMES Advocacy Director

JULIE WOOD Climate Resilience Director

AUDREY LEPORE Development Director

LISA KUMPF Senior Restoration Program Manager

MAX ROME Senior Stormwater Program Manager

EMILY REILING Development Manager

MISSION

To protect, restore, and enhance the Charles River and its watershed through **science**, **advocacy**, and the **law**.

Our Programs

Climate Resilience

Advocating for nature-based solutions, climate-smart development, and regional adaptation efforts to protect our communities and ecosystems from the impacts of climate change.

Stormwater Solutions

Curbing stormwater pollution with green infrastructure solutions and stronger stormwater regulations for a clean, resilient Charles.

River Science

Collecting robust water quality data to understand the health of each segment of the river and its tributaries, enable effective cleanup and restoration strategies, and protect public health.

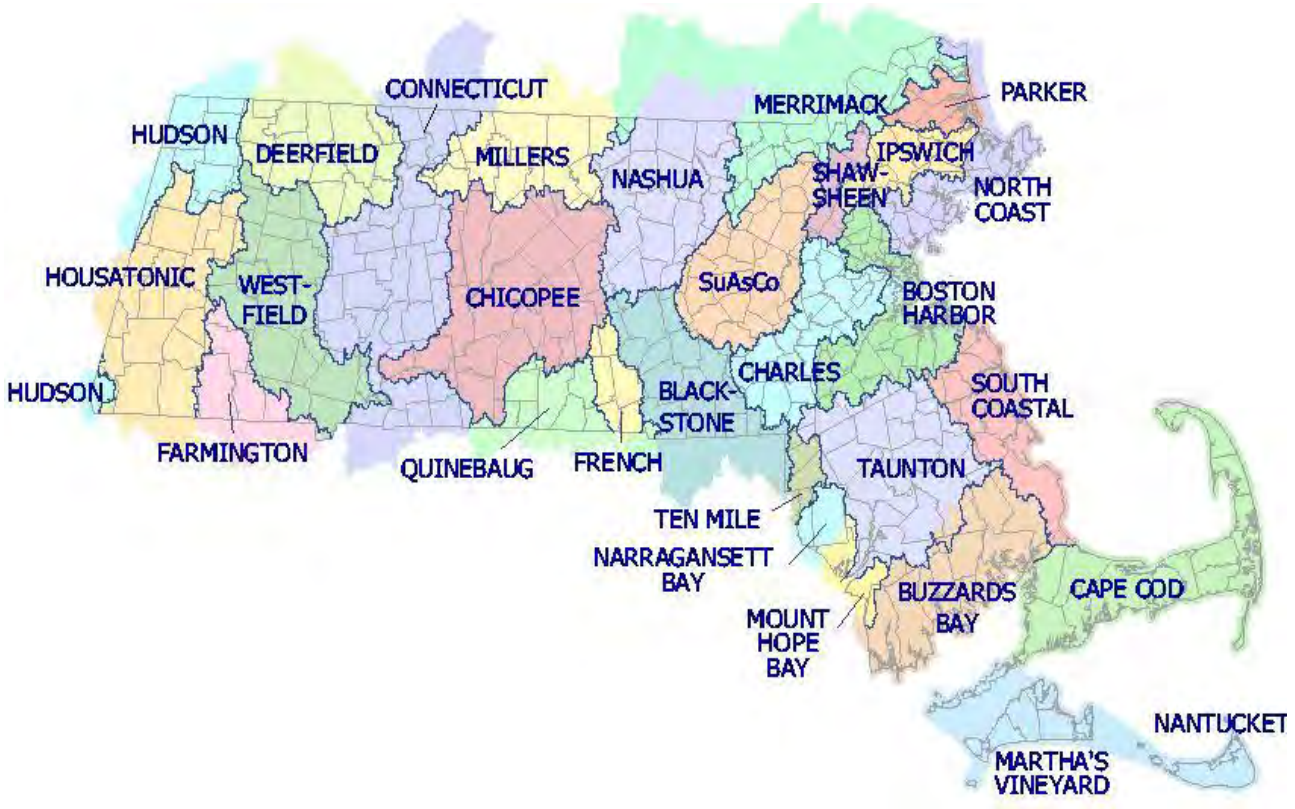
River Restoration

Restoring the natural flow and health of the river by removing defunct dams, tackling invasive species, daylighting streams, and more to achieve a clean, resilient Charles for future generations.

Outreach + Education

Informing and supporting community members to advocate for laws, policies, and behaviors that protect and restore the river and promote well-being for all in our watershed.

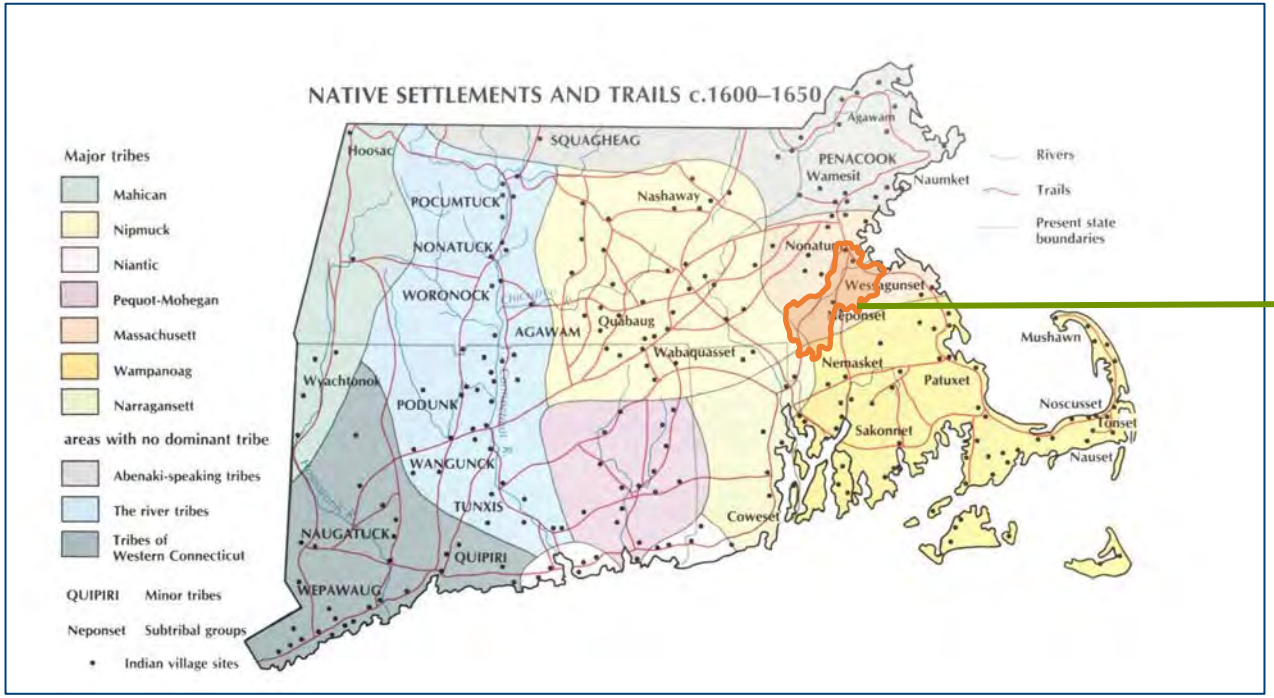
We all live in a watershed



Charles River Watershed

- 80 miles long
- 19 dams
- 308 sq miles
- 35 cities + towns
  - Begins in Hopkinton
  - Runs through 23 towns
- Flows north
- 1M+ residents

Land Acknowledgement



The Charles River watershed is within the traditional lands of the **Massachusett**, **Nipmuck** and **Wampanaog** tribes

Map image of native settlements and trails c. 1600-1650 in Southern New England. Source credit: Harvard Map Collection

How far we've come

1875: “Cleanup is Impossible”

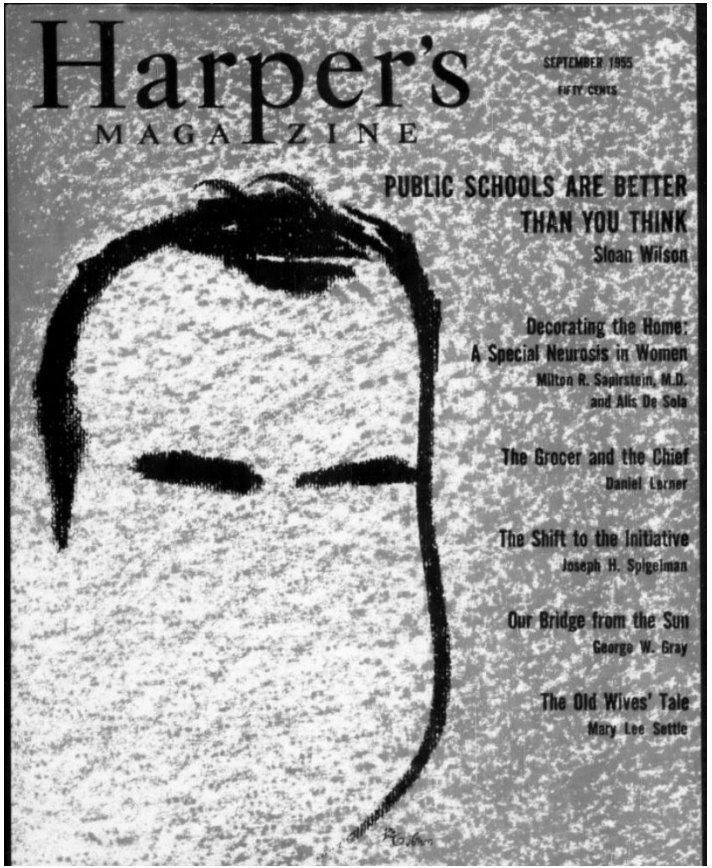
- Industrial Revolution in America begins on the Charles River in Waltham, 1813

- 1875: 43 mills from Watertown Dam to Boston Harbor.
  - Report recommends **abandoning cleanup efforts** from south Natick to harbor

“Foul and noisome”

September 1955,
Bernard DeVoto:

“By the time the Charles River reaches Cambridge it is foul and noisome, polluted by offal and industrial wastes, scummy with oil, unlikely to be mistaken for water."



1965

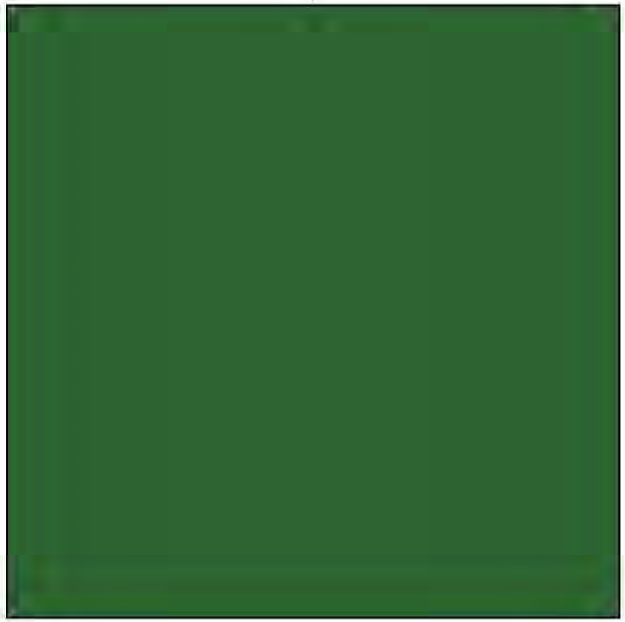
1966

The Standells' "Dirty Water" reaches #11 on the Billboard singles charts.

1988: “Dirtiest harbor in America”

Vice President George H.W. Bush gestures while touring the Boston Harbor by boat, Sept. 1, 1988, during a brief campaign stop in Boston. Bush's campaign, which labeled Boston Harbor as "the dirtiest harbor in America" served as a catalyst for the clean up of the waters. (Peter Southwick/AP)

1988
1.7 billion gallons
of wastewater



2017
30 million gallons
of wastewater

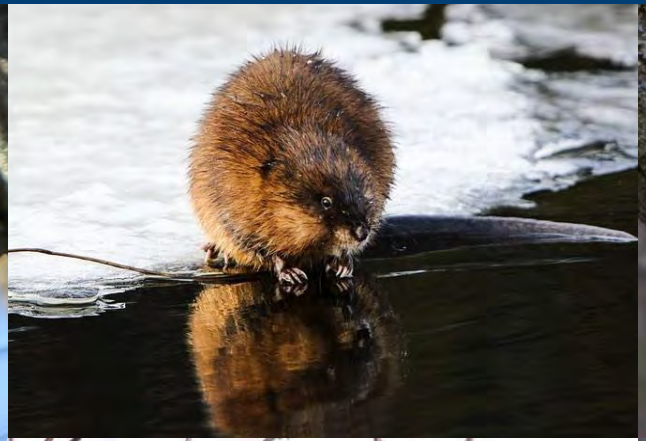
Source: https://news.northeastern.edu/2018/08/30/you-love-that-dirty-water-but-how-dirty-is-it-really/

Seaport

Harbor Beaches

Esplanade

Teeming with Life Again



We all ❤️ the Charles River

Nancy Schon
"...In my teenage days, visiting Norumbega Park to hear big bands play, next to the Charles in Auburndale."

Macky Buck
"...sitting under the trees, wondering about the microbial life, the small water creatures that find this shady place just right for themselves."

John Rufo
"...The river breaths with us; rises and falls with us; sustains us, and is depleted by us. Symbiosis may be the one truth of it. We are all interconnected, and the river, is part, of the we."

River as kin

"… Many Indigenous traditions don't consider water to be a "what" – a commodity – but a "who." **Many Indigenous people not only believe that water is alive, but that's it's kin.** You protect it in the way that you would protect your grandmother, your mother, your sister, your aunties."

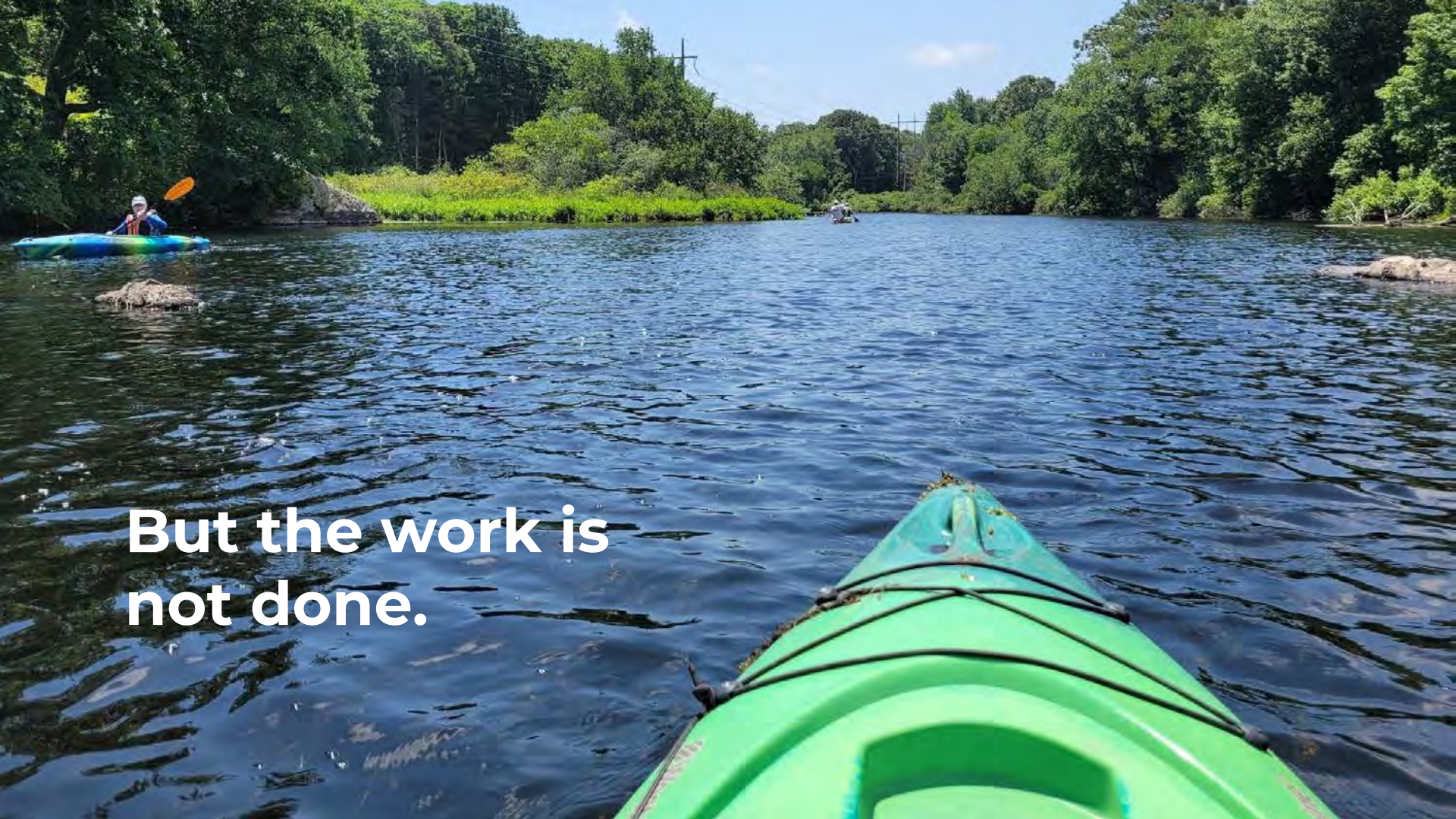
– Erica Gies, author of "Water Will Win"

Hartman Deetz, member of Mashpee Wampanoag tribe

If the River Had Rights

"The river as plaintiff speaks for the ecological unit of life that is part of it..."

U.S. Supreme Court Justice William O. Douglas

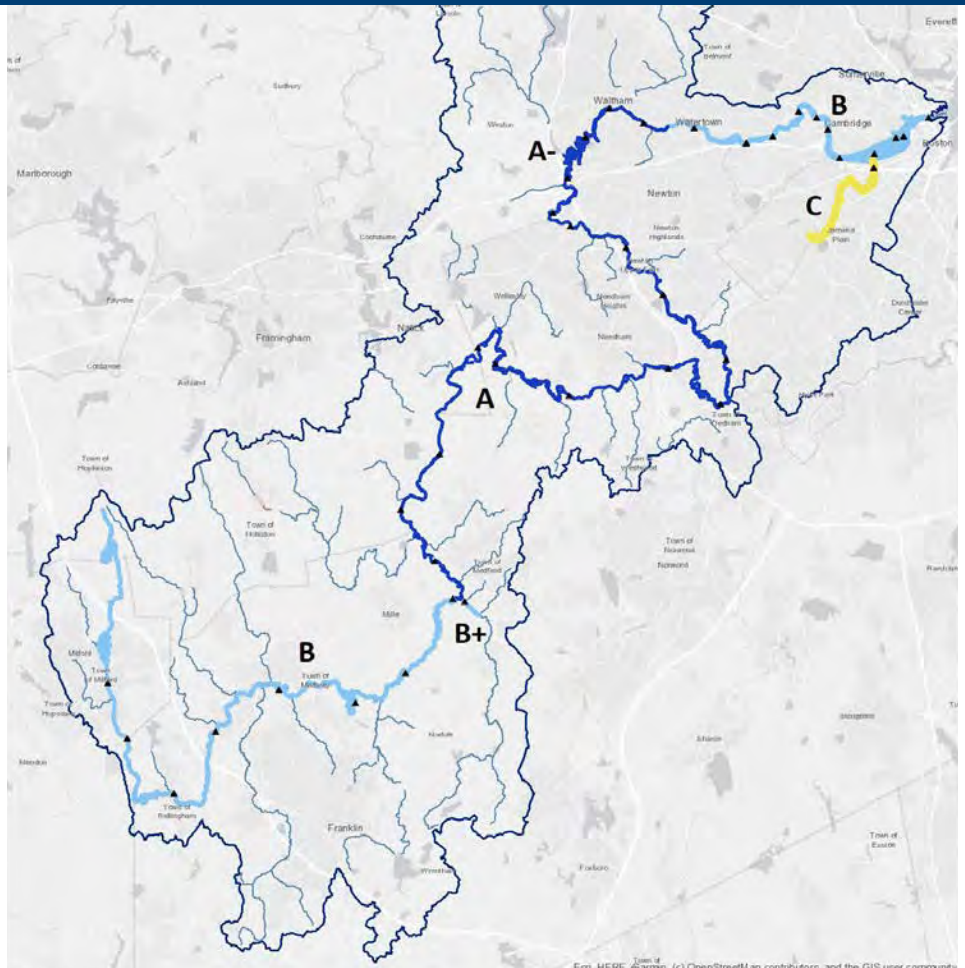

But the work is
not done.

Swimmable Charles… still waiting

- 1947: 7 public beaches
- 1949: Last one closed

- 1972 Clean Water Act: “fishable, swimmable rivers” by 1983
- 1995 Clean Charles Initiative: swimmable Charles by 2005
- 2024… still waiting

B grades in Lower Basin

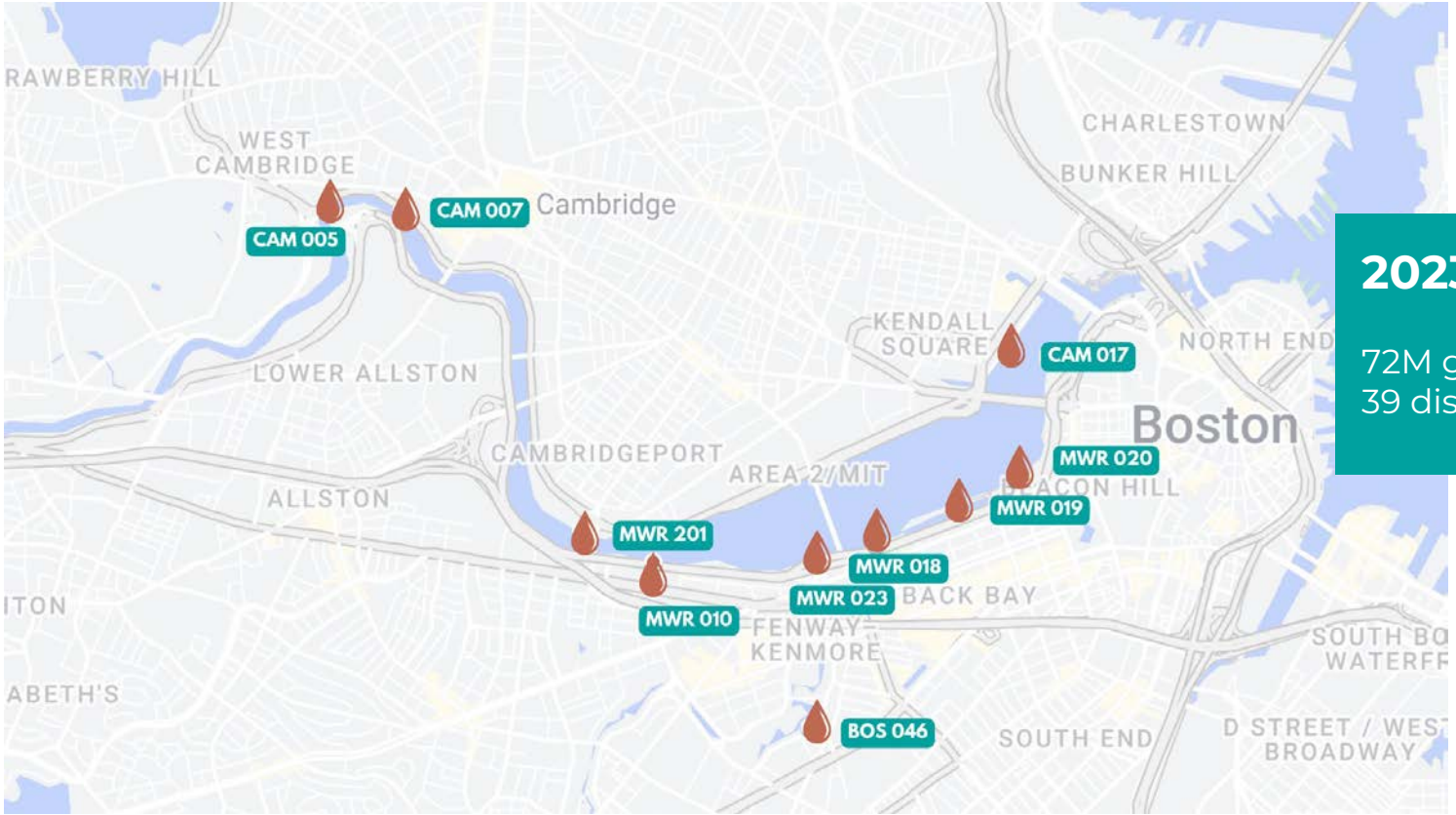


B grade: swimmable
50-75% of the time

Obstacles to a clean, healthy Charles

- **Combined Sewer Overflows (CSOs)**
- **Stormwater Runoff**
- **Climate Change**
- Dams
- Fish/wildlife passage

Threat #1 Sewage

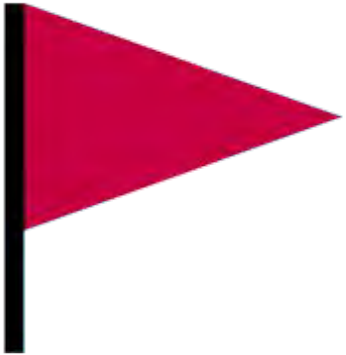


2023:

72M gals
39 discharges

CSO = Red Flag for 48 hours

Not safe to boat



Safe to boat

Union Boat Club, 2020

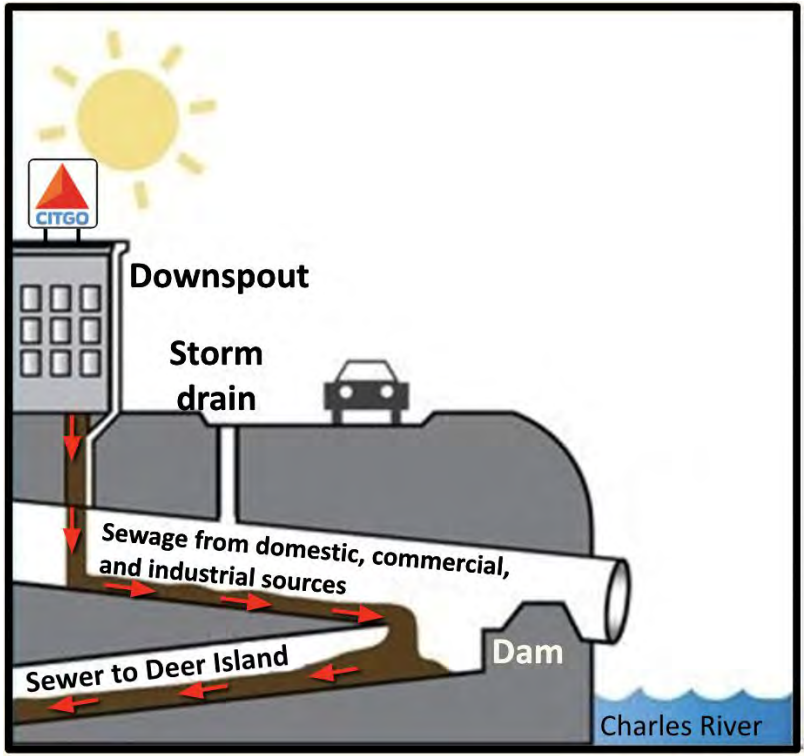
It’s not healthy to swim in sewage. . .

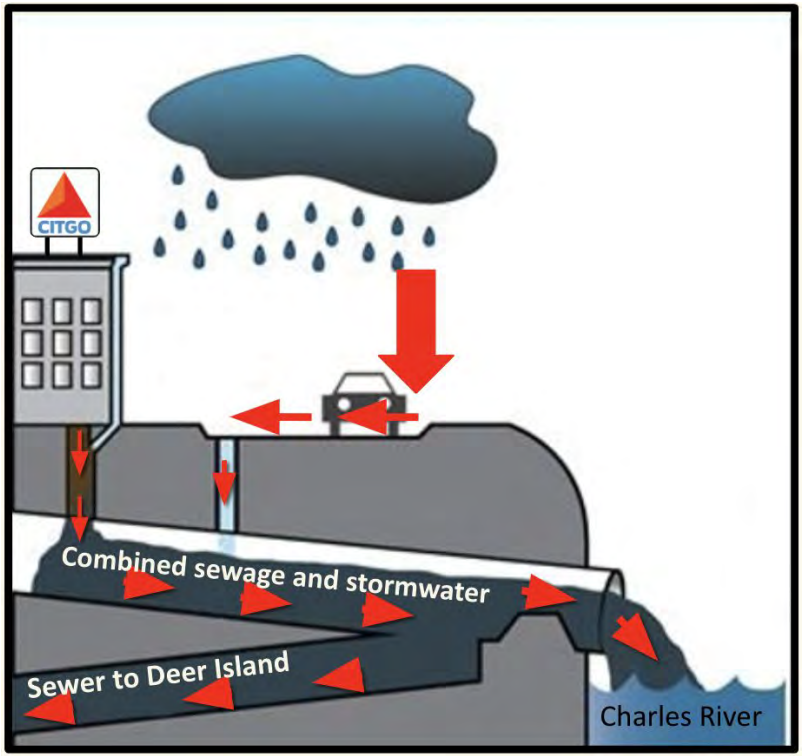
Waterborne Pathogens, Associated Illnesses, and the Wastes They’re Found In

Pathogenic Agent	Acute Effects/Chronic or Ultimate Effects[67]	Wastes[68]
Bacteria:		
Campylobacter jejuni	Gastroenteritis/death from Guillain-Barré syndrome	Human/animal feces
E. coli (pathogenic or enterovirulent strains)	Gastroenteritis/*E. coli* O157:H7, adults: death from thrombocytopenia; children: death from kidney failure	Domestic sewage
Leptospira	Leptospirosis	Animal urine
Salmonella typhi	Typhoid fever/reactive arthritis from certain strains	Domestic sewage
Other salmonella species	Various enteric fevers (often called paratyphoid), gastroenteritis, septicemia (generalized infections in which organisms multiply in the bloodstream)	Domestic sewage, animal wastes, food, compost
Shigella dysenteriae and other species	Bacillary dysentery	Human feces, domestic sewage
Vibrio cholera	Cholera/death	Domestic sewage, shellfish, saltwater
Yersinia spp.	Acute gastroenteritis (including diarrhea, abdominal pain)/reactive arthritis	Water, milk, mammalian alimentary canal
Viruses:		
Adenovirus	Respiratory and gastrointestinal infections	Domestic sewage
Astrovirus	Gastroenteritis	Domestic sewage
Calicivirus	Gastroenteritis	Domestic sewage
Coxsackievirus (some strains)	Various, including severe respiratory diseases, fevers, rashes, paralysis, aseptic meningitis, myocarditis	Domestic sewage
Echovirus	Various, similar to Coxsackievirus (evidence is not definitive except in experimental animals)	Domestic sewage
Hepatitis A	Infectious hepatitis (liver malfunction); also may affect kidneys and spleen	Domestic sewage
Norwalk and Norwalk-like viruses	Gastroenteritis	Domestic sewage
Poliovirus	Poliomyelitis	Domestic sewage

SOURCE: http://environmentalintegrity.org/pdf/publications/Swimming_in_Sewage_REPORT.pdf

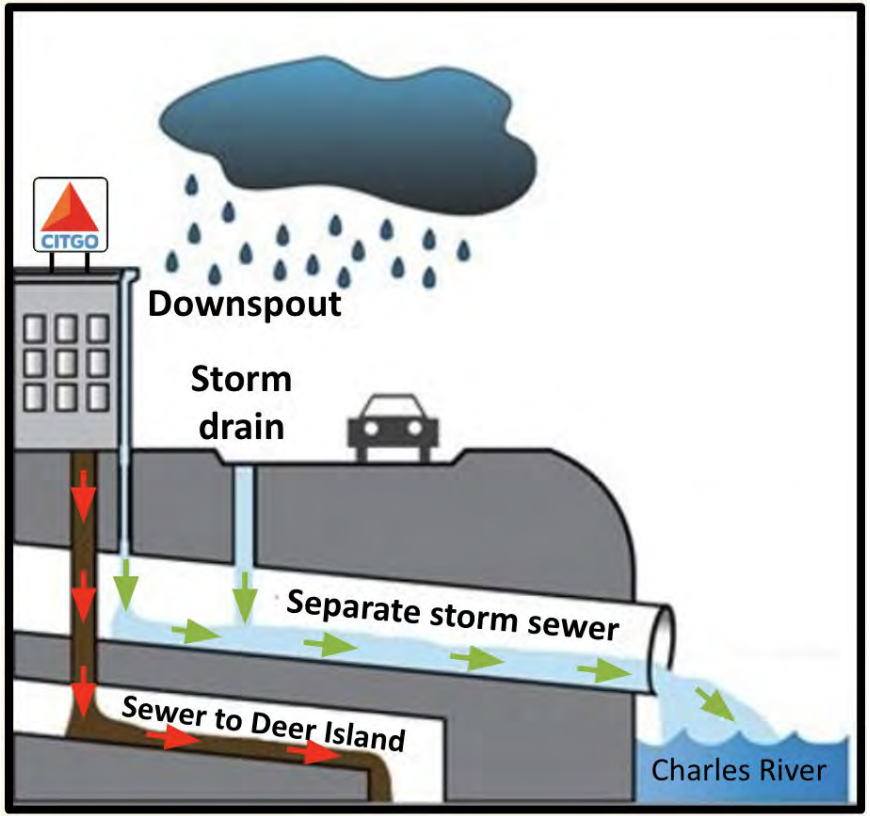
Dry Weather vs. Wet Weather





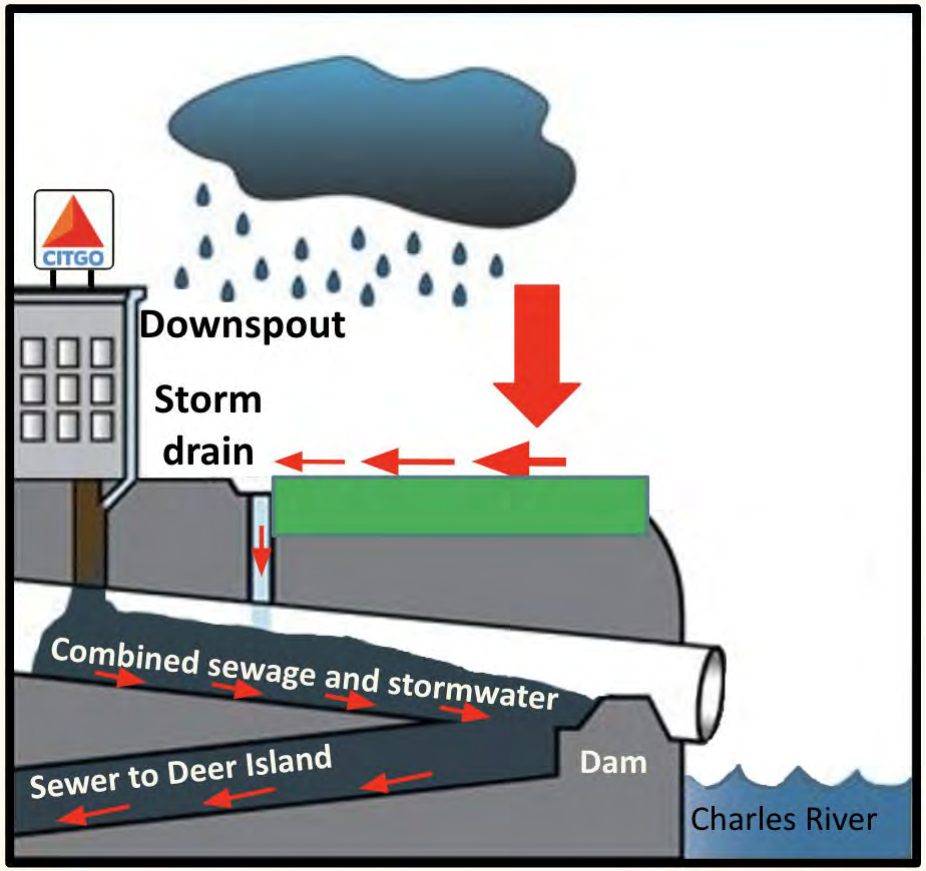
Northeastern Capstone students, 2023

Modern Separated Pipes



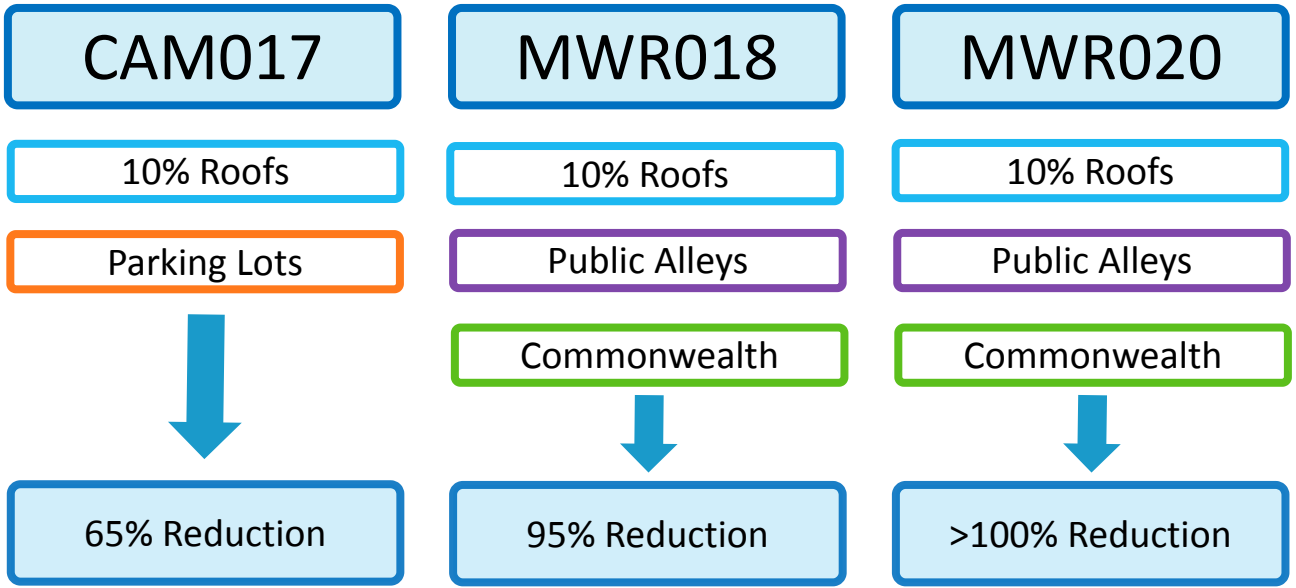
Northeastern Capstone students, 2023

Combined Sewer with Green Infrastructure



Northeastern Capstone students, 2023

Options to Reduce CSOs



Northeastern Capstone students, 2023

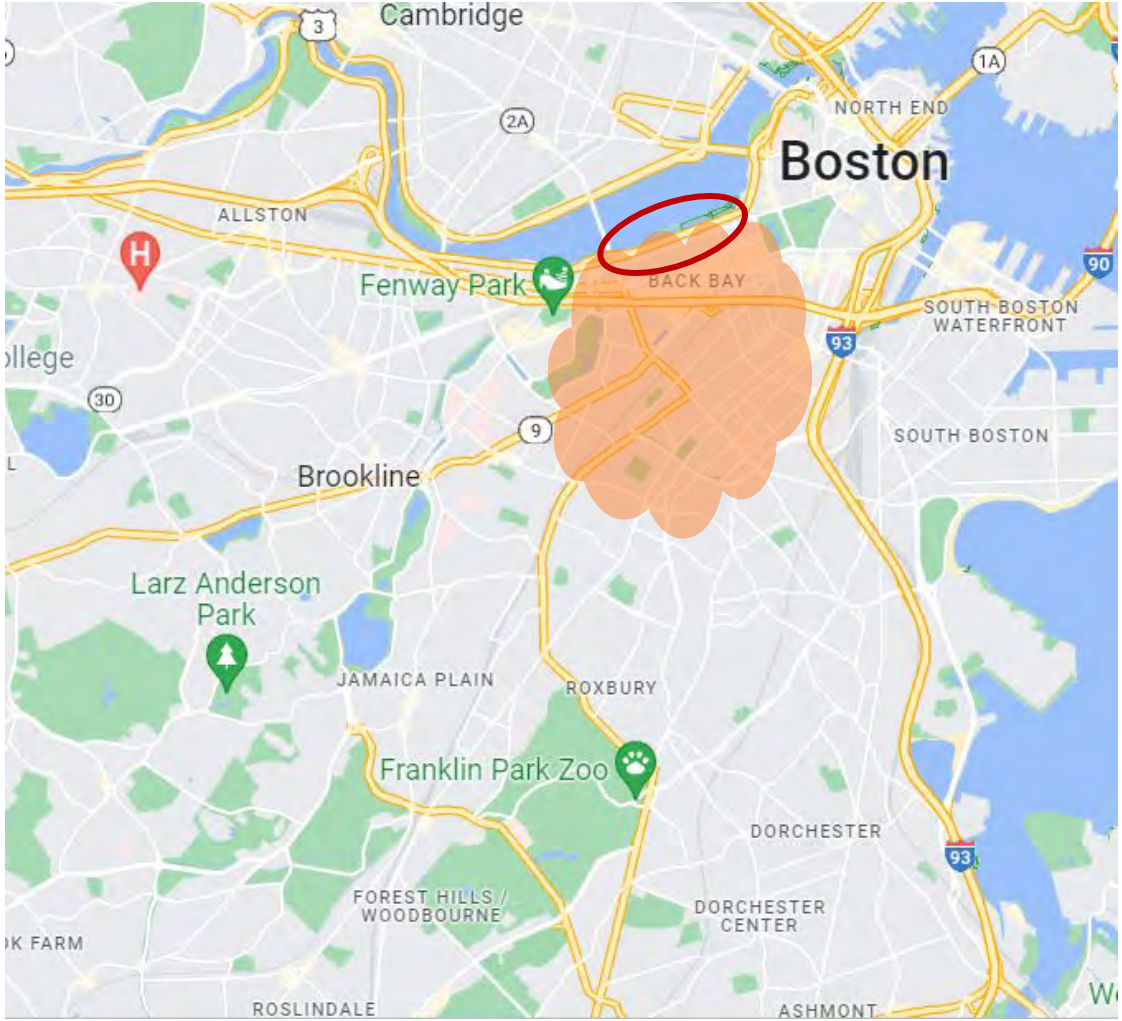
Options to Reduce or Eliminate CSOs

Underground storage

Sewer separation

Green stormwater infrastructure

Sewer system improvements



MWR 18-19-20

- 12 discharges in 2021
- 10.9 MG in 2021
- Triggered by as little as 0.9 inches of rainfall

Homes along Commonwealth Ave mall
Boston Park Plaza Hotel
Newbury Street
Northeastern University

MWRA: “Mission Accomplished”

“… some of the outfalls are proving to be difficult to solve, and solutions are not readily determinable. In the end, the analysis may show that it would **not be a useful expenditure of public resources to continue to invest in CSO mitigation** at certain outfalls when it will not meaningfully improve water quality and when attention should rather be focused on non-CSO sources of pollution.”

—Sept. 30, 2021, letter from MWRA to Federal District Court Judge Richard G. Stearns

“… Of the remaining 14 outfalls, eight have projects to meet the LTCP goals that are in design or construction and are expected to be completed by 2024. The six outfalls that remain are particularly challenging and **no clear alternatives commensurate to the minimal receiving water quality benefits have been identified.** Investigations continue for these six challenging outfalls.”

— MWRA CSO Annual Report for 2022, published April 28, 2023.

Threat #2: Stormwater Runoff

Pathogens

Excess Nutrients

Gasoline

Oil

Heavy Metals

Trash

Sand

Pet Waste

Fertilizer

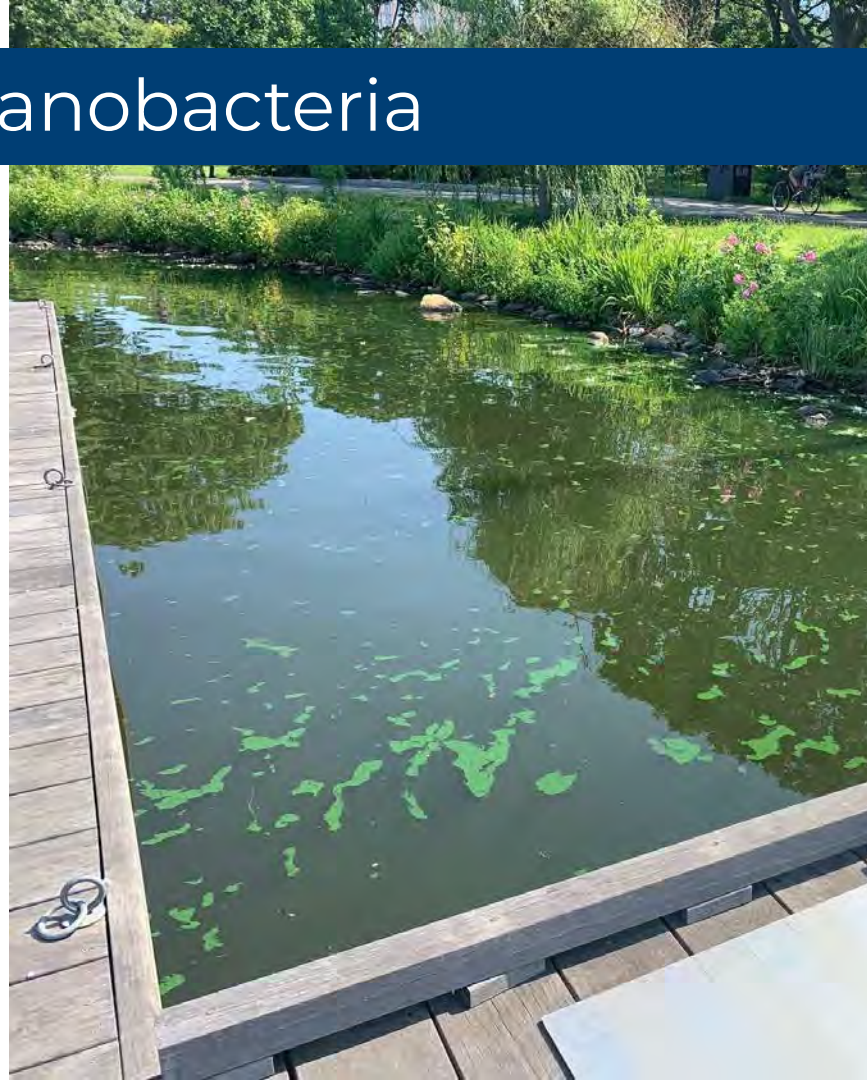
Runoff = Phosphorus → Invasive Plants

Phosphorus → Cyanobacteria

Blue-green algal blooms from naturally-occurring “cyanobacteria”.

Phosphorus + high temps = cyanobacteria

Cyanobacteria blooms can result in **fish kills** by lowering oxygen in the river and is **toxic to humans & animals**



Green Stormwater Infrastructure

Rain Garden

Bioswale

Permeable Pavers

Infiltration Chamber

Boston is a leader by hiring GI Director

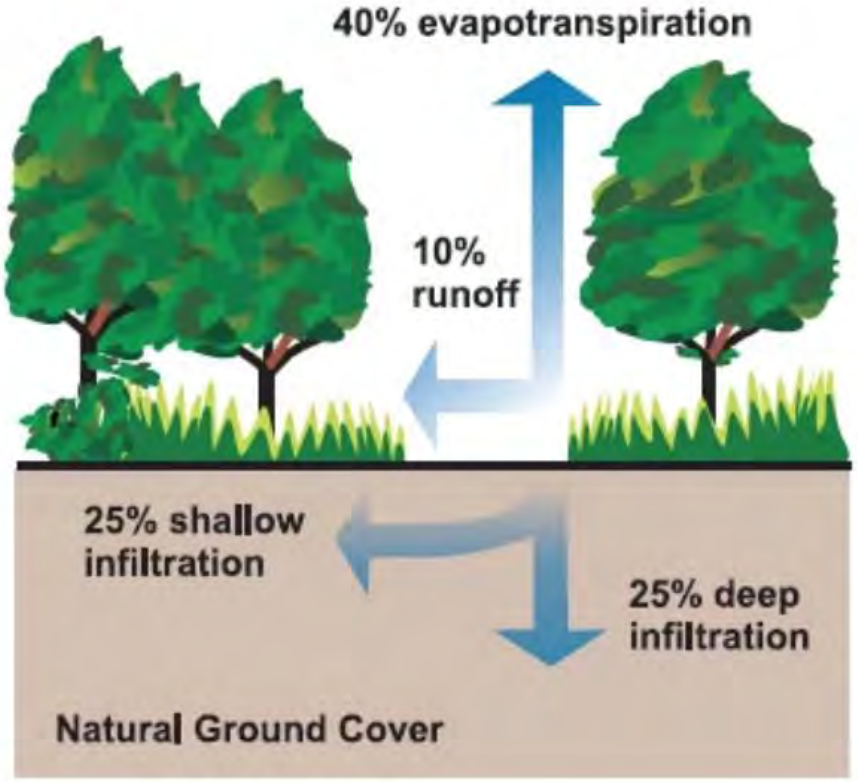
KATE ENGLAND APPOINTED BOSTON'S INAUGURAL DIRECTOR OF GREEN INFRASTRUCTURE

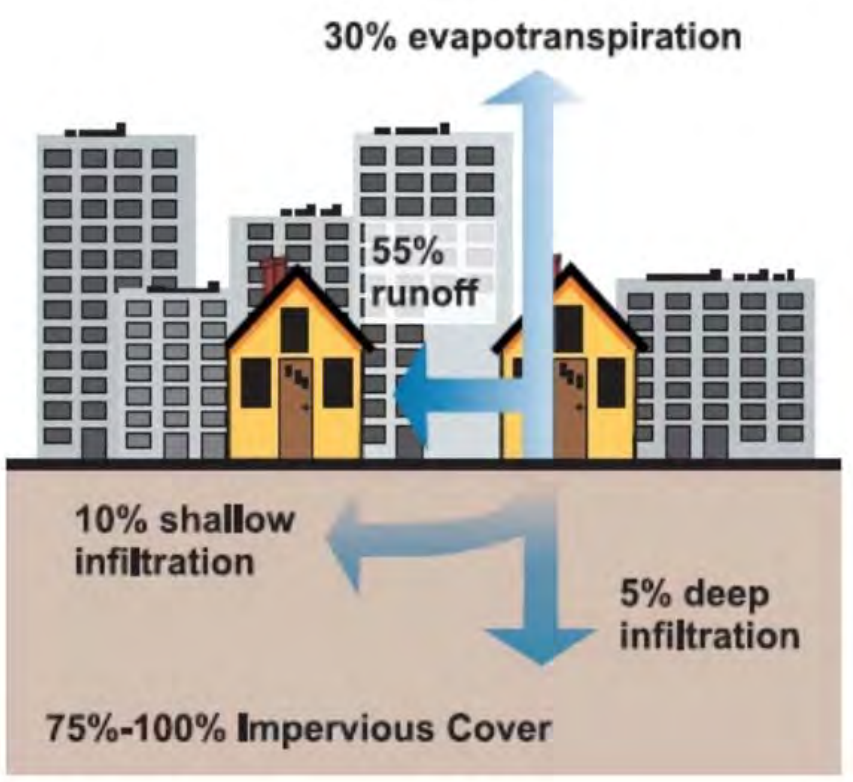
Mayor Michelle Wu today announced the appointment of Kate England as the City's inaugural Director of Green Infrastructure.

Last updated: July 28, 2022

PUBLISHED BY:
Environment

Built environment impact on absorption





Threat #3: *Climate Change*

New UMass Boston Report Details Latest Climate Risk Projections for the Greater Boston Area

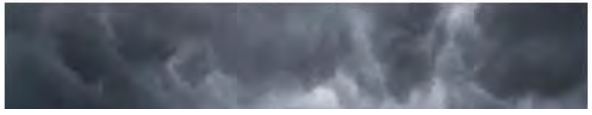
Office of Communications | June 01, 2022

'Flash droughts' and weather 'whiplash.' Welcome to New England's climate future

August 26, 2022 By Miriam Wasser

Here's how climate change will impact the Boston area, according to a new report

"We've already done a hell of a lot of damage, and this report emphasizes the need to get to net-zero emissions."



'What's the future going to be?': This summer's drought warns of increasing climate variability in years to come

By Kate Selig Globe Correspondent, Updated August 18, 2022, 11:29 a.m.

As Boston heat records fall, scientists see climate change's fingerprints

By Sabrina Shankman Globe Staff, Updated August 8, 2022, 7:40 p.m.

Heat, sewer problems and less lobster: New report details climate change's impact in Boston

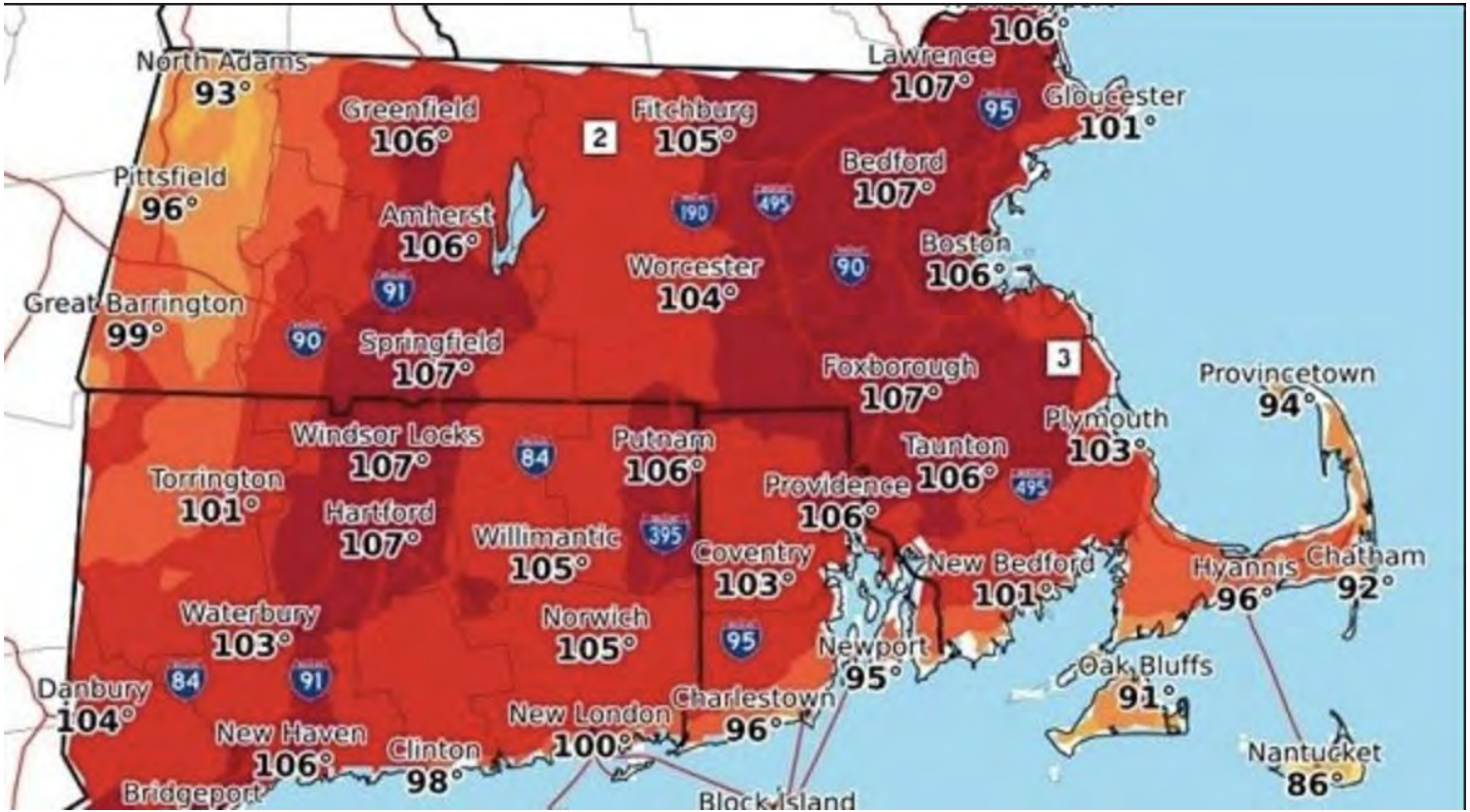
Updated August 02, 2022 By Barbara Moran

augus cooled off as he sat beside his daughter, Lisamarie, at Revere Beach as temperatures soared last month. JESSICA RINALDI/GLOBE

Climate Impacts: *Drought*

- No drought since the 1960s, then 2016, 2020, 2021, 2022
- Stress on agricultural industry, increased fire risk
- Riverbeds run dry, fish die, ecosystems collapse
- Decline in the health of forests, erosion, increase in insects (predators vulnerable to drought)

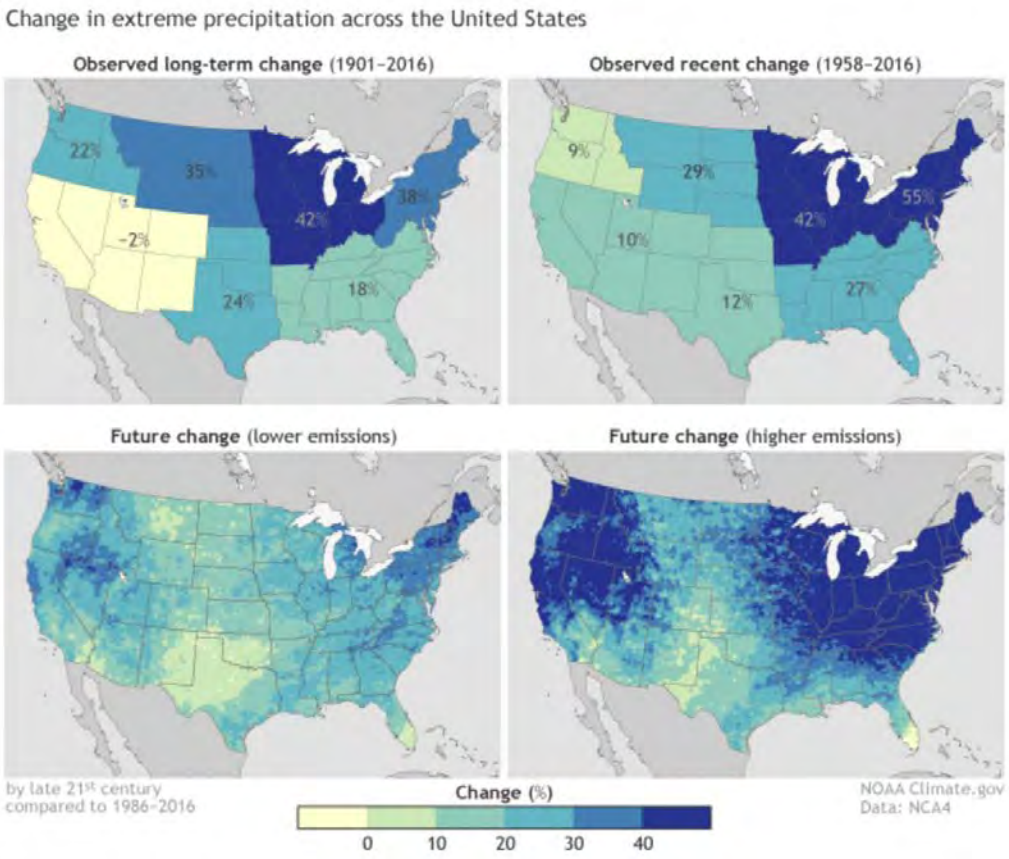
Climate Impacts: *Heat*



August 11, 2021

Climate Impacts: *Flooding*

Future is wetter (spring + winter)



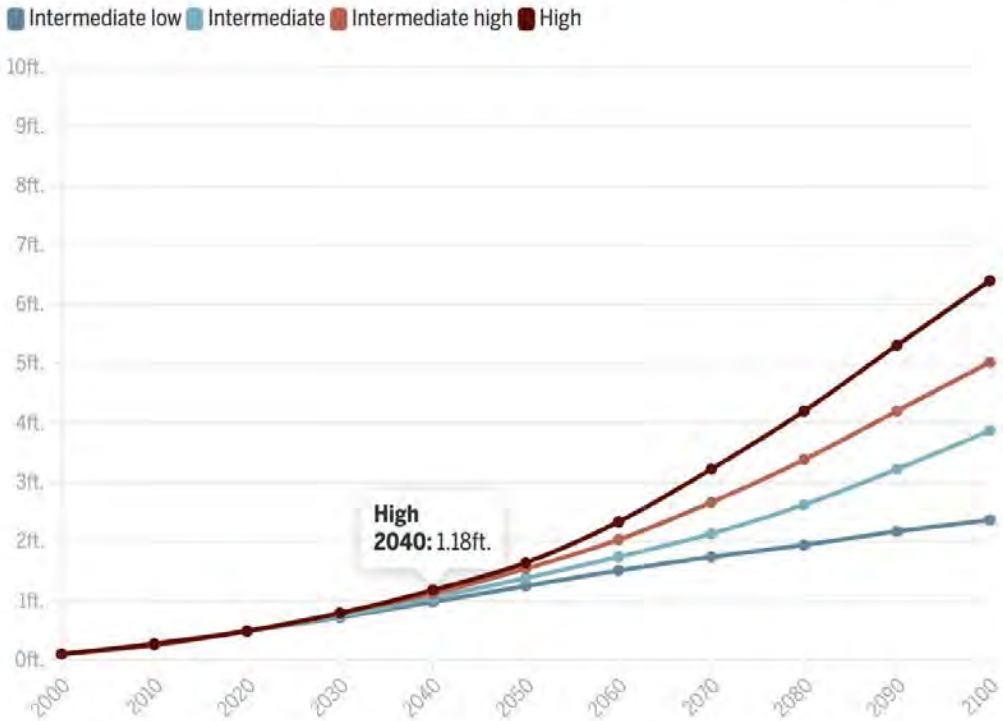
Source: https://nca2018.globalchange.gov/chapter/2/

Historical + future [projected] increases in the amount of precipitation falling in very heavy events (defined as the heaviest 1% of all daily events)

Boston very vulnerable to flooding

When will 2ft. of sea level rise occur

Here is how much NOAA expects sea levels to rise at the Boston, MA tide gauge based on four different emissions scenarios (or levels of greenhouse gas emissions)



Source: NOAA • Based on projections for the Boston, MA tide gauge. • Ryan Huddle / Globe staff

Climate Ready Boston

MENU

CITY of BOSTON | Mayor Michelle Wu

INFORMATION AND SERVICES PUBLIC NOTICES FEEDBACK

HOME › CLIMATE READY BOSTON

Last updated: 11/20/23

CLIMATE READY BOSTON

Climate Ready Boston is City's initiative to prepare for the impacts of climate change.

HAVE QUESTIONS? CONTACT:

ENVIRONMENT

Climate Ready Boston

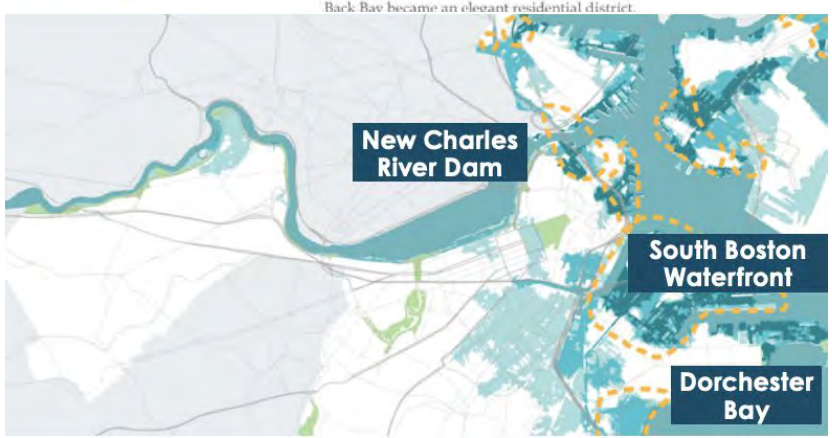
Charles River Neighborhoods

The Charles River focus area consists of the neighborhoods that lie along the Charles River, including Beacon Hill, Back Bay, Fenway/Kenmore, and Allston/Brighton.

These neighborhoods have been grouped in a focus area because they are all expected to be exposed to flooding upon overtopping or flanking of the Charles River Dam.

Beacon Hill is located in the center of the Shawmut Peninsula. The area originally had three hills, two of which were leveled for Beacon Hill development. Construction of the Massachusetts State House occurred on the south slope in the 1790s. Residential squares were laid out according to the English model on the north slope.

The Back Bay neighborhood was created through fill during the late nineteenth century, adding 450 acres to the city. In 1814, the Boston and Roxbury Mill Corporation started building a dam blocking the tidal Back Bay, which extended from Brookline to Boston Common. The dam was economically unsuccessful, so Boston started filling in the tidal area in 1857, with the process completed by 1882. Back Bay became an elegant residential district



in 1874. During the 1800s, Allston/Brighton

FLOOD PROGRESSION

In the near-term and through the middle of the century, buildings and infrastructure in the Charles River focus area have limited exposure to coastal flooding.

Later in the century, exposure of the Charles River neighborhoods to severe coastal storms with a lo probability of occurrence increases significantly due to the possibility of overtopping and flanking of the Charles River Dam.

Climate resilience planning must consider that the primary flow pathway is over and around the Charles River dam. Adaptation of or around the dam would also benefit Charlestown, Downtown, and Cambridge.

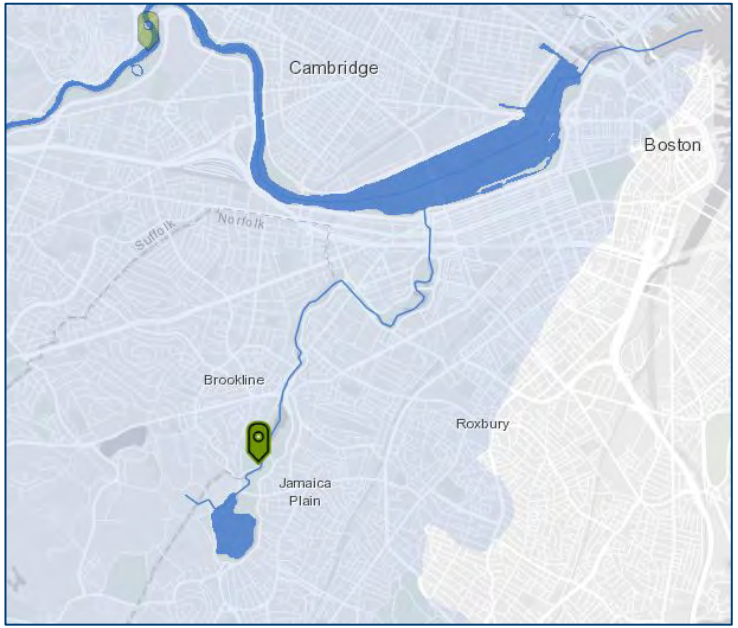
DCR, US Army Corps studying CR Dam

- DCR & Army Corps doing vulnerability assessment under various storm scenarios - to be followed by design study.
- No public process to date

Muddy River Restoration

Charles River Watershed Association

- Dirtiest tributary of the Charles River
- Flood mitigation underway
- Ecological Restoration not funded



I-90 Allston Multimodal Project

Charles River Watershed Association

MassDOT design: 12 lanes, river incursion

Charles River Watershed Association

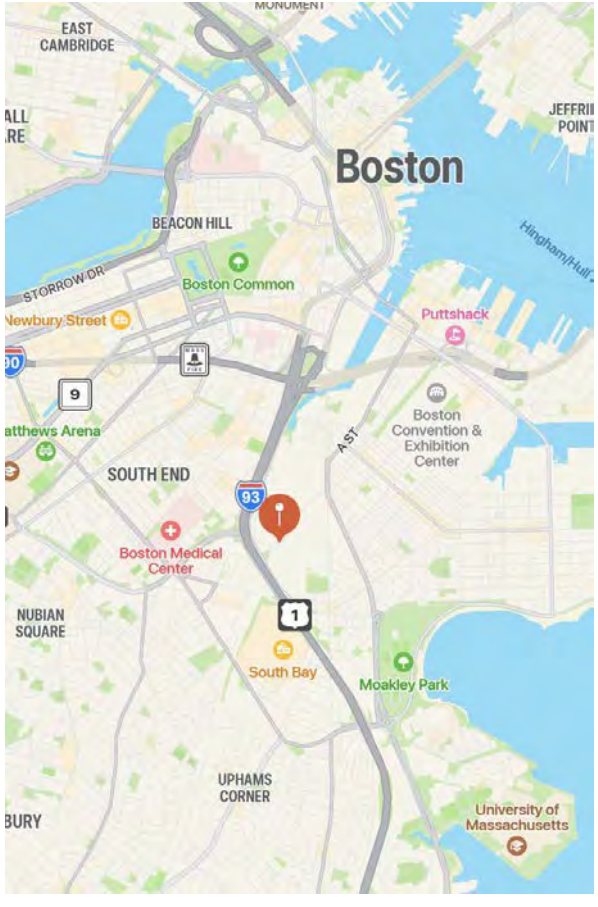
Questions

Modified At-Grade Option
(Looking East)

massDOT Highway Division

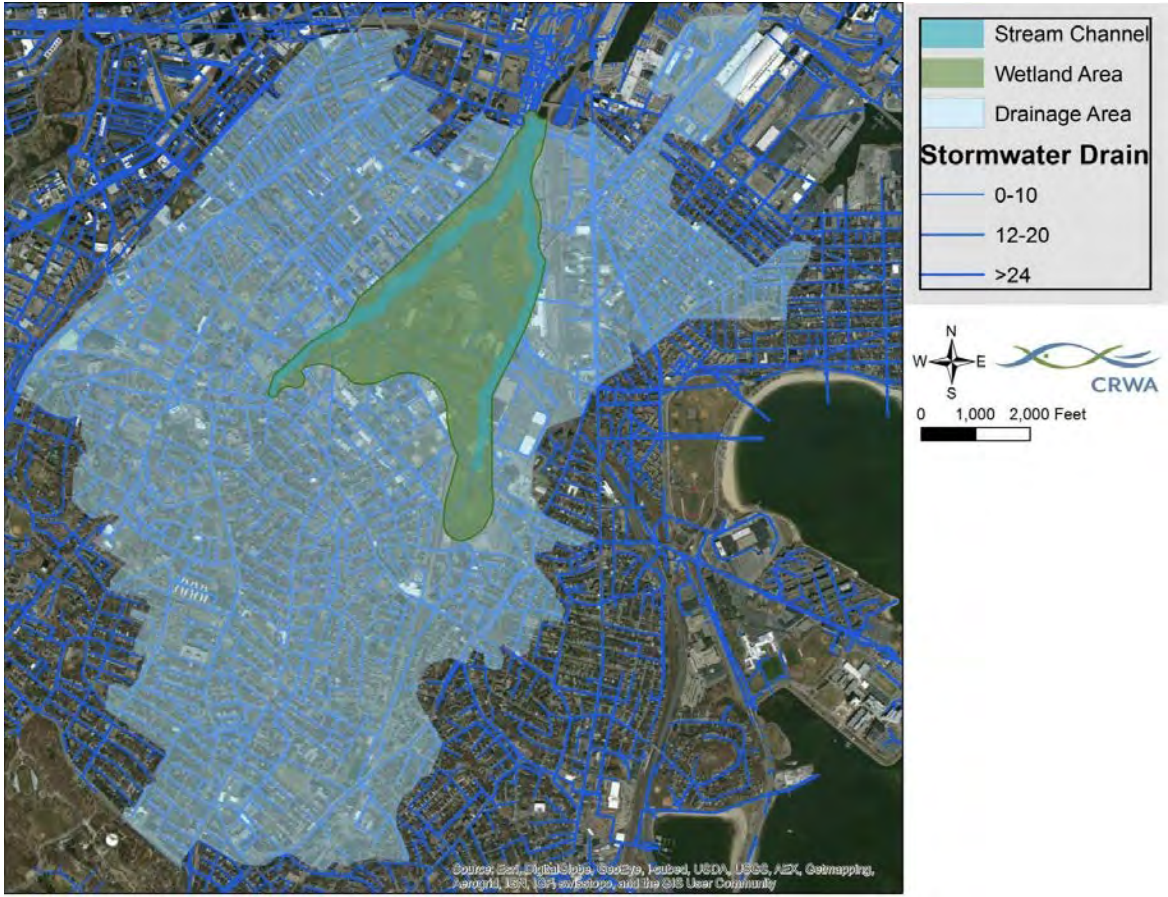
Widett Circle

Charles River Watershed Association



Widett Subwatershed

Charles River Watershed Association



Flooding in Boston's coastal neighborhoods takes residents by surprise

By Tim Logan and David Abel | GLOBE STAFF JANUARY 05, 2018

Everyone knew the snow was coming. But the flooding that swamped Boston's coastal neighborhoods Thursday came as an icy shock and raised fresh questions about how to best build along the city's waterfronts in a time of rising seas.

An unusually high tide, whipped by winds that gusted as high as 76 miles an hour, washed pools of frigid water into the streets of the Seaport, Fort Point, and the downtown waterfront Thursday afternoon. A stretch of the Blue Line in East Boston was briefly shut down, while firefighters pulled a man from a flooded car in Neponset Circle in Dorchester. Even the city's tow lot, in low-lying Widett Circle, was partly underwater.

Restoration Opportunities for Widett

Charles River Watershed Association

Option 1: Restore the Bay
Construct a large scale wetland at the "headwaters" of the Bass River

Benefits
- Protect surrounding area against extreme rain events
- Flexibility to sea level rise
- Improve water quality
- Increase property values

Option 2: Restore the Stream
Integrate constructed stream channels or culvert "daylights" into site development

Benefits
- Protect surrounding area against modest storm events
- Reduce upstream stormwater flooding
- Improve water quality
- New open space
- Increase property values

City Council stormwater hearing, Nov. 2023

Charles River Watershed Association

Require flood history disclosure

Provide more funding for stormwater management – kudos for new stormwater fee

Strengthen and broaden stormwater requirements

Adopt innovative insurance strategies to assist low-income households

Continue to investigate the causes and impacts of stormwater flooding

Educate Residents

Combined Sewer Overflows:
1) The City Council could co-sign a letter to MWRA, MassDEP and US EPA urging elimination of CSOs
2) The City can follow Philadelphia's lead and mandate a certain level of Green Stormwater Infrastructure (GSI) installations within CSO drainage areas in order to reduce CSO discharges

Boston Wetlands Ordinance - release regs, 4+ years overdue

Widett Circle

I-90 Project

Thank you!

@charlesriverwatershed

@charlesriverwatershed

@charlesriver

Emily Norton

Executive Director

enorton@crwa.org