

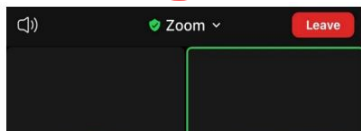
Solutions for Future Flooding: Charles River Watershed

Community Feedback Session
April 27th, 6:30 PM
MVP Action Grant Funded Project



On your cellphone / Para el celular / usando seu celular

1



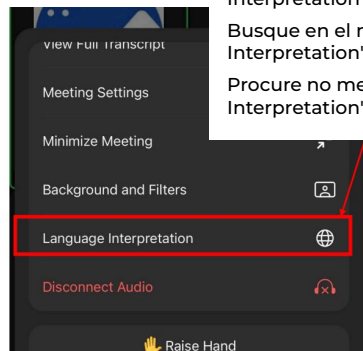
Click on the "More" icon with three dots.

Haga clic sobre el icono "More" con tres puntos

Clique no ícone "More" (com três pontos).



2



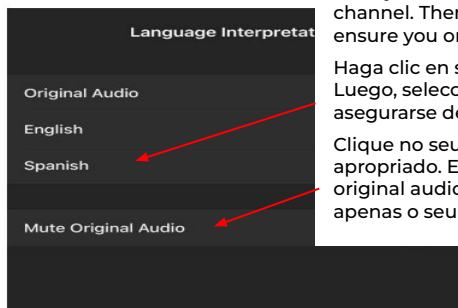
Look through the menu for the "Language Interpretation" option.

Busque en el menú la opción "Language Interpretation".

Procure no menu a opção "Language Interpretation".



3



Click your language to go to the appropriate channel. Then, select "Mute Original Audio" to ensure you only hear your language.

Haga clic en su idioma para ir al canal apropiado. Luego, seleccione "Mute Original Audio" para asegurarse de que solo escuche su idioma.

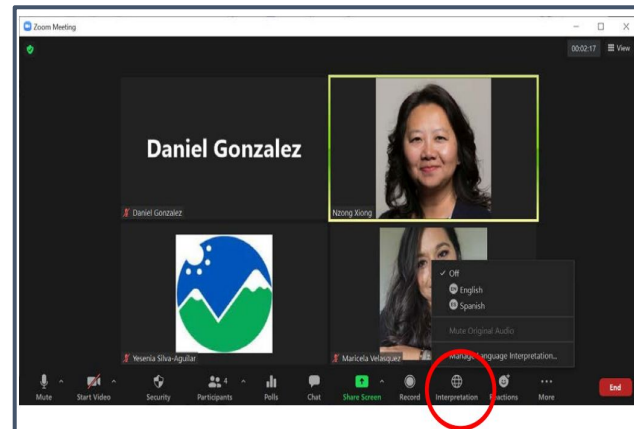
Clique no seu idioma para ir para o canal apropriado. Em seguida, selecione "Mute the original audio" para garantir que você ouça apenas o seu idioma.

On your computer Para la computadora Usando seu computador

You will see the interpretation options at the bottom of the screen, as seen below. Click the interpretation icon (globe) to view language options (English, Spanish, Mandarin).

Verá las opciones de interpretación en la parte inferior de la pantalla, como se ve a continuación. Haga clic en el icono de interpretación (globo) para ver las opciones de idioma (inglés, español, mandarín).

Você verá as opções de interpretação na parte inferior da tela, conforme abaixo. Clique no ícone de interpretação (globo) para ver as opções de idioma (inglês, espanhol, português).



Tonight's Agenda

- Project Background
- Selection of Priority Projects and “Impact Areas”
- Concept design discussions:
 - (7:00-7:20) Weston Town Center (breakout room)
 - (7:00-7:20) Milford 495 & Rt. 85 Interchange
 - (7:30 -7:50) Weston/Waltham 95 & Rt. 20 Interchange

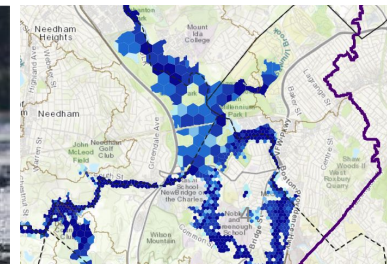


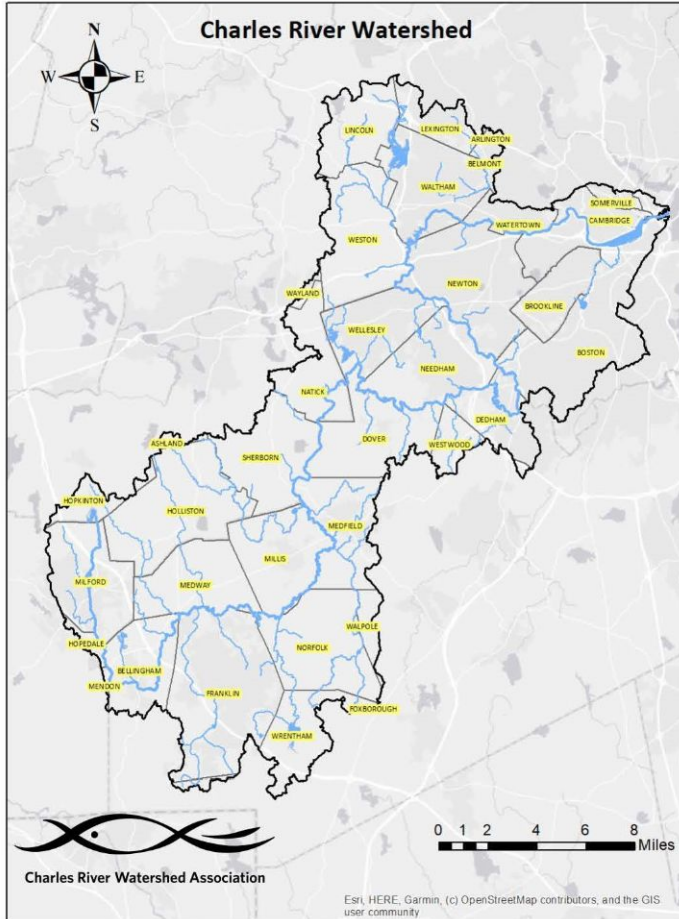
Mission: To protect, restore, and enhance the Charles River and its watershed through science, advocacy, and the law.

Nuestra misión: Protegemos, restauramos y mejoramos el río Charles y su cuenca a través de la ciencia, la defensa y la ley. Desarrollamos estrategias con base científica para aumentar la resiliencia, proteger la salud pública y promover la equidad ambiental mientras nos enfrentamos a un clima cambiante.

我們的使命

我們通過科學、**宣傳**和**法律保護**、恢復和改善查理斯河及其流域。我們制定基於科學的戰略，以在應對氣候變化時**提高復原力**、**保護公眾健康並促進環境公平**。





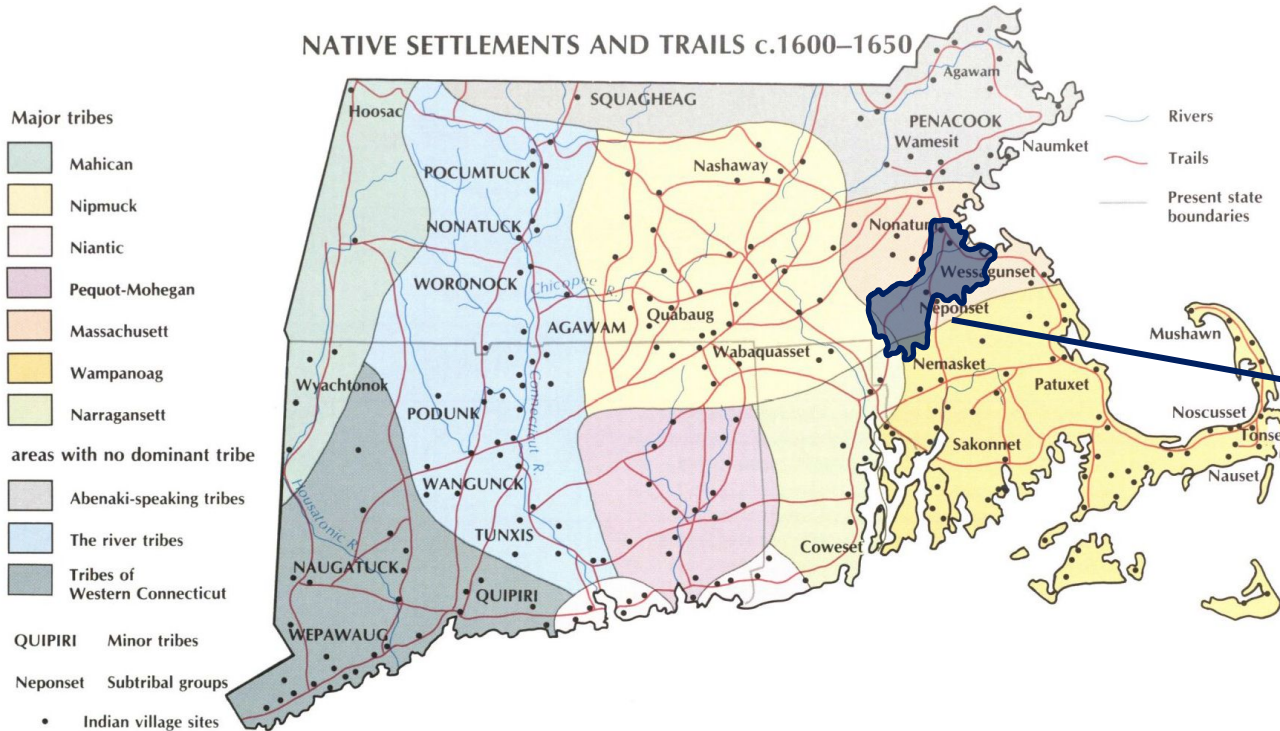
CRWA takes a watershed-scale view

- 80 mile river
- 35 towns in watershed
- 308 mi² watershed
- Approximately 1 million residents
- >60% of population lives in Environmental Justice neighborhoods



Land Acknowledgement

La CRWA reconoce humildemente a las Naciones Massachusett, Wampanoag y Nipmuck, ya que nuestro trabajo se lleva a cabo en su territorio tradicional, y los reconoce como los cuidadores pasados, presentes y futuros de esta tierra.

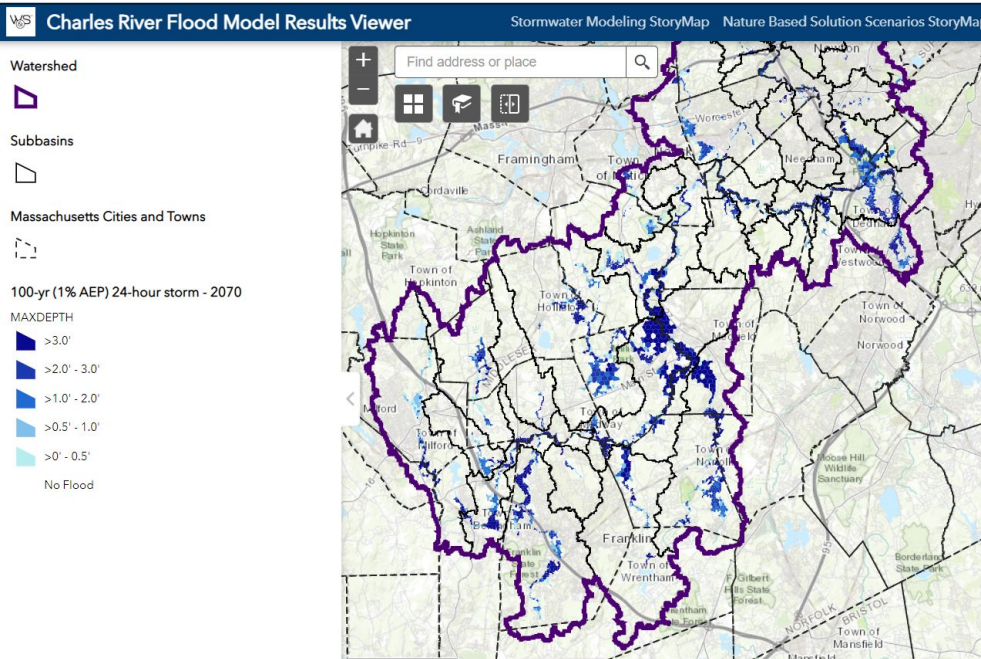


The Charles River Watershed resides on occupied territory of the **Massachusetts, Nipmuck and Wampanoag** tribes.

CRWA謙卑地承認馬薩諸塞州，萬帕諾亞格州和尼普穆克國家，因為我們的工作是在他們的傳統領土上進行的，並承認他們是這片土地的過去，現在和未來的看護人。

Charles River Flood Model

Computer Model: Shows current and future flooding impacts



www.crw.org/watershed-model

Project Team



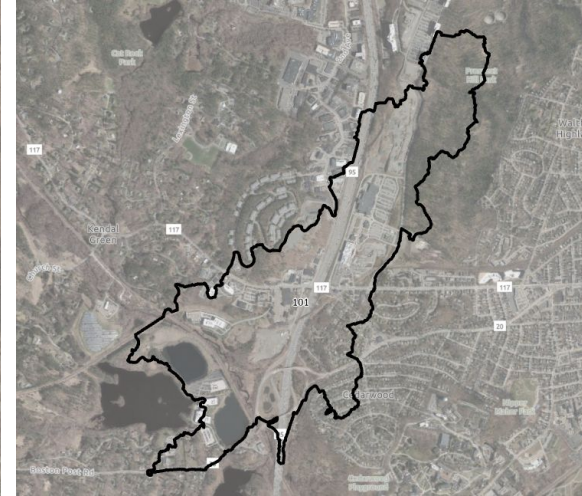
Charles River Watershed Association

Arlington
Belmont
Boston
Brookline
Cambridge
Dedham
Dover
Franklin
Medfield
Medway
Millis
Natick
Needham
Newton
Sherborn
Waltham
Watertown
Wellesley
Weston
Wrentham

Focus of Tonight's Discussion

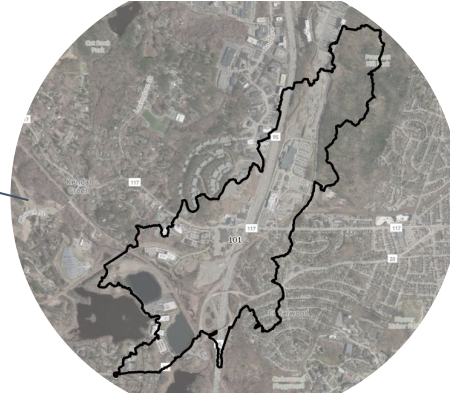
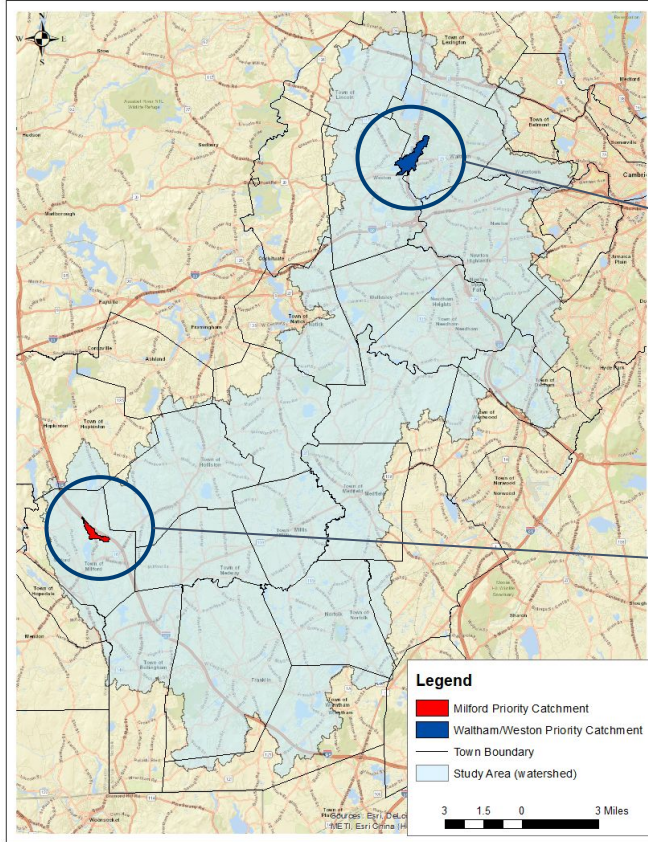


Weston Town Center



**Upper and Lower Watershed
Priority Impact Areas**

Focus of Tonight's Discussion: Upper and Lower Watershed Priority Impact Areas



Waltham/Weston



Milford

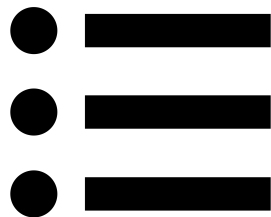
Priority Project Selection

Step 1: Develop Prioritization Method

Step 2: Collect Project Ideas

Step 3: Apply Methodology

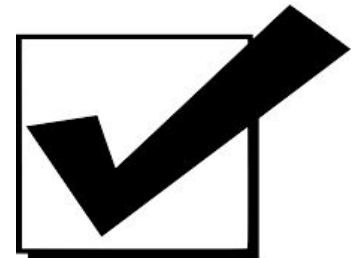
Developed last year with public input, updated this year for simplicity



Review/rescore ideas collected last year, collect new ideas



Select prioritize projects



Characteristics of a “Good” Priority Project



Results

1. Weston Town Center (Brothers Marketplace)
2. Longfellow Pond, Wellesley
3. Natick High School



Nature-Based Solutions (NBS) are

Sustainable management practices or infrastructure using or mimicking natural features and processes that can absorb stormwater

Green Stormwater Infrastructure (GSI)



Measures that **STORE**, **FILTER** and **ABSORB** stormwater where it falls & help reduce flooding and pollution runoff into the river

Priority Impact Areas

Priorities:

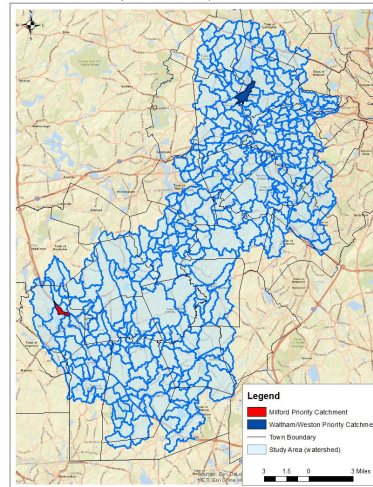
- Regional
- Current or projected flood damage
- Current or projected flooding of critical facilities
- Potential for improvements
- Environmental justice areas

1 Upper
W'shed
Priority

300
catchments

1 Lower
W'shed
Priority

Upper Watershed Impact Area Selection Criteria				Scores			
Category	Metric	Method of Determination	0	1	2	3	
Tier 1	Regional	Contains/impacts multiple communities	GIS	>1/4 mile from a municipal border	Within 1/4 mile of municipal border	Includes 2 communities	N/A
	Impact	Flooded building footprint in 2070 100 yr flood	GIS	< 75th Percentile	75th to 90th percentile	90th to 95th percentile	Top 5%
	Potential for Mitigation (response)	Flood depth reductions due to NBS scenario (1a & 2)*	Calculated based on CRFM results. Total decrease in (area weighted average) flood depth in the catchment from both scenarios.	< 75th Percentile	75th to 90th percentile	90th to 95th percentile	Top 5%
	Community support	Flooding issue known to the community	Municipal team input		N/A	Community ID'd issue	N/A
	Environmental Justice	Contains or nearby an EJ neighborhood	GIS proximity to EJ neighborhood	>1/4 mile	Within 1/4 mile but contains no EJ neighborhood	Contains EJ neighborhood	N/A
	Impact to critical infrastructure	Flooded critical infrastructure (2070 100 yr flood)*	GIS proximity to critical infrastructure (CI) parcel	>1/4 mile	Within 1/4 mile (potential to block access)	Contains flooded CI parcel	N/A
Top 8 scoring subcatchments (scores 14-16) moved to Tier 2							
Tier 2	Flood Mitigation Project Implementation Potential	Availability of public/non-forested open space	Professional review				
*weighted factor, score doubled							
Lower Watershed Impact Area Selection Criteria				Scores			
Category	Metric	Method of Determination	0	1	2	3	
Tier 1	Regional	Contains/impacts multiple communities	GIS	>1/4 mile from a municipal border	Within 1/4 mile of municipal border	Includes 2 communities	N/A
	Impact	Flooded building footprint in 2070 100yr flood	GIS	< 75th Percentile	75th to 90th percentile	90th to 95th percentile	Top 5%
	Potential for Mitigation (response)	Flood depth reductions due to NBS scenario (1a & 2)*	Calculated based on CRFM results. Total decrease in (area weighted average) flood depth in the catchment from both scenarios.	< 75th Percentile	75th to 90th percentile	90th to 95th percentile	Top 5%
	Community support	Flooding issue known to the community	Municipal team input		N/A	Community ID'd issue	N/A
	Environmental Justice	Contains EJ neighborhood	GIS proximity to EJ neighborhood	>1/4 mile	Within 1/4 mile (potential to block access)	Contains EJ Neighborhood	N/A
	Impact to critical infrastructure	Flooded critical infrastructure (2070 100 yr flood)*	GIS proximity to critical infrastructure (CI) parcel	>1/4 mile	Within 1/4 mile (potential to block access)	Contains flooded CI parcel	N/A
Tier 2							
Tier 2	Flood Mitigation Project Implementation Potential	Availability of public/non-forested open space	Professional review				
*weighted factor, score doubled							



A design that gives you the “general idea”!

Considers:

- Project goals
- Basic site information like existing space constraints and uses
- Community needs and desires

Does Not Consider:

- Precise technical details of the site:
 - Exact elevations and slopes
 - Soil conditions
 - Precise dimensions
- Precise and complete system/project design (described as 10-25% design, need to be at 100% for construction)
- All potential ADA requirements
- Thorough coordination with all town/city departments
- Maintenance needs and plan

What are we looking for? How will it be incorporated?





ABOUT OUR WORK OUR IMPACT GET INVOLVED

🌐 ENGLISH

DONATE

CLIMATE RESILIENCE
RIVER SCIENCE
RIVER RESTORATION
STORMWATER SOLUTIONS
EDUCATION & OUTREACH

A CLEAN,
RESILIENT
CHARLES RIVER.





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.

- CHARLES RIVER FLOOD MODEL**
- CLIMATE COMPACT
- RESILIENT BOSTON
- CLIMATE RESILIENCE 101
- DROUGHT
- HEAT RESILIENCE
- PUBLIC ACCESS

FLOOD SOLUTIONS IN YOUR NEIGHBORHOOD

We Want to Hear From You!

ATTEND AN EVENT:



Solutions for Future Flooding in Natick & Wellesley
Join us for a virtual meeting to learn about flooding in the Charles River watershed and provide input on some creative solutions we are exploring to protect your community from impacts!

Apr 11, 2023

Solutions for Flooding in Waltham, Weston, & Milford!

Join us for a virtual meeting to learn about flooding in the Charles River watershed and provide input on some creative solutions we are exploring to protect your community from impacts!

Apr 27, 2023

www.crwa.org/watershed-model

TELL US WHAT YOU THINK:

What project do you want to provide feedback on? *

This year, we're exploring five priority projects in Natick, Milford, Waltham, Wellesley, and Weston. Choose from drop-down.

SELECT PROJECT

What do you think of this design?

Do you support this project? Do you have any concerns? Do you have ideas for how to improve it?

Do you know of any past studies or plans for this site?

If yes, please share a link with us.





Project Team



Janet Moonan, PE



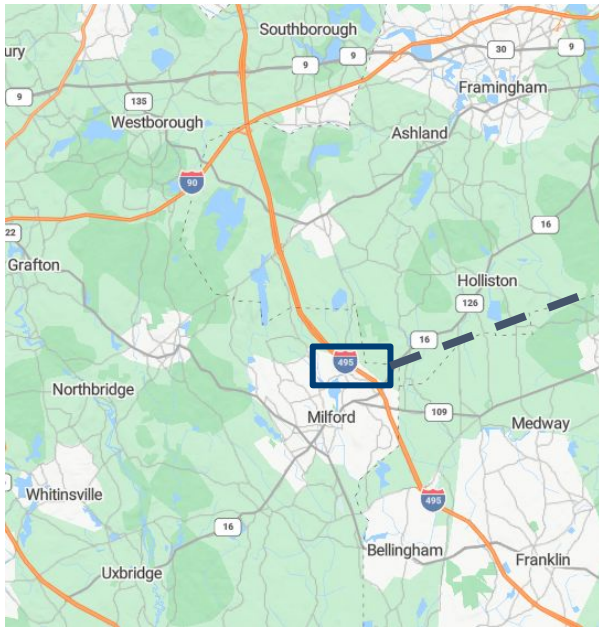
Indrani Ghosh, PhD



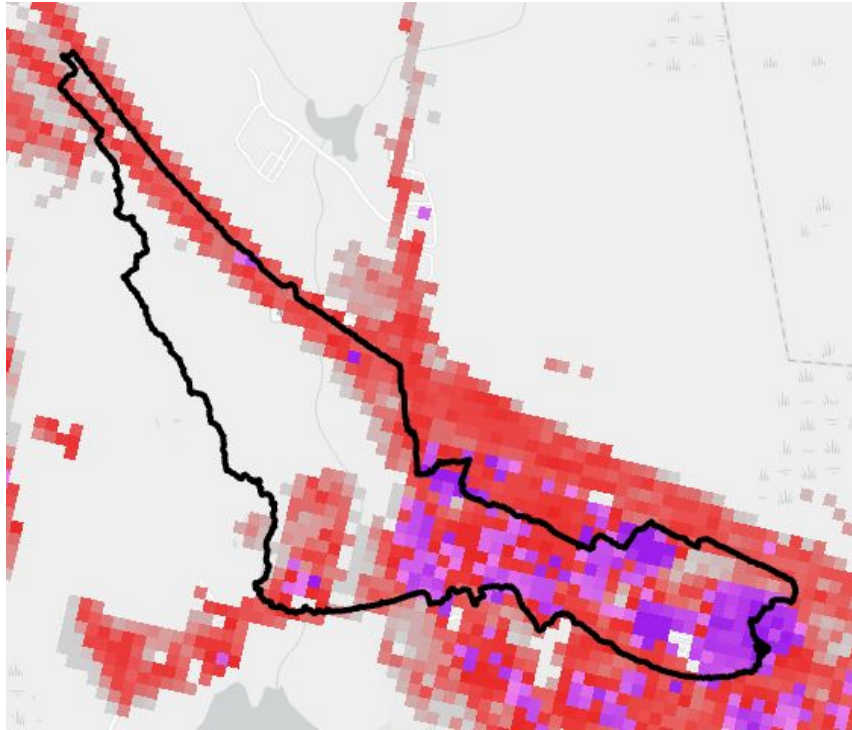
Doris Jenkins, EIT

Upper Watershed Impact Area

Opportunities to implement stormwater management and nature-based solutions were identified to the **maximum extent practicable**.



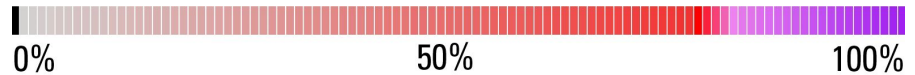
Impervious Surfaces



NLCD 2019 Impervious Data

Catchment Area: 170 Acres
Impervious Area: 110 Acres

66% Impervious



Upper Watershed Impact Area

Upper watershed

Sub-watershed: **12**

Town: **Milford**

Critical Facilities exposed to flooding:

Water treatment facility

Other site characteristics: **Large commercial plazas on the east side, open space / wetlands around the river on the west side**

Criteria	Present
Environmental Justice Neighborhood	✓
Model showed flood reduction benefits due to green infrastructure implementation and impervious reduction	✓
Critical facility exposed to flooding	✓
Impacts multiple communities	
Flooding issues known to the community/communities	

Subwatershed Contexts

Subbasins



10-yr (10% AEP) 24-hour storm - 2070

MAXDEPTH

- >3.0'
- >2.0' - 3.0'
- >1.0' - 2.0'
- >0.5' - 1.0'
- >0' - 0.5'
- No Flood

Massachusetts Boundaries

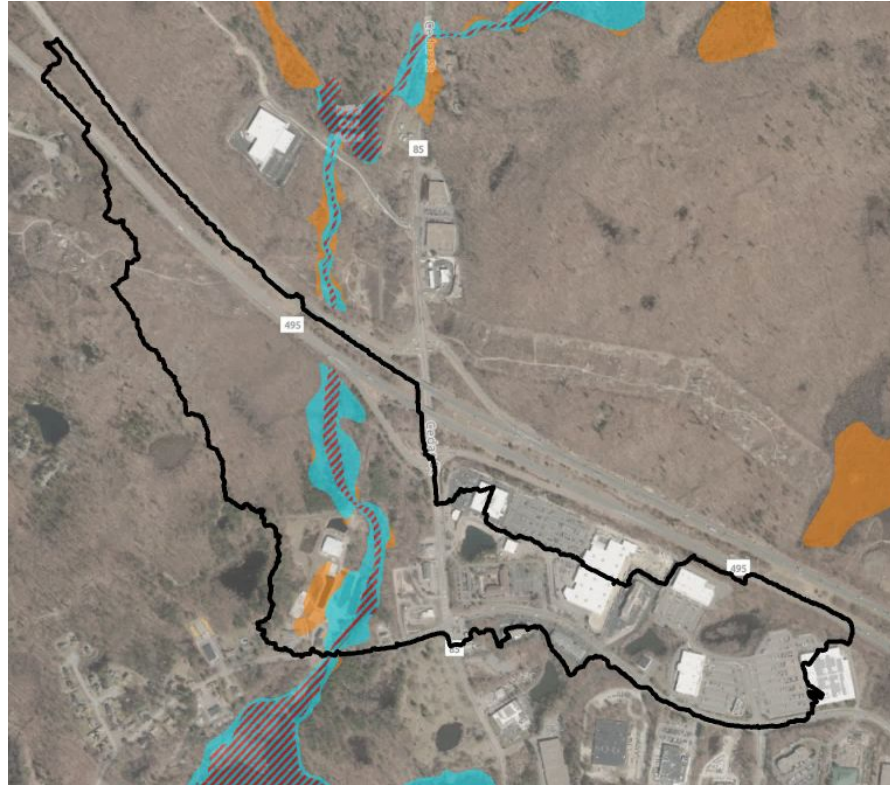
Massachusetts Municipalities



Subwatershed Contexts

Legend

- CRWA Priority Catchments
- FEMA National Flood Hazard Layer**
 - A: 1% Annual Chance of Flooding, no BFE
 - AE: 1% Annual Chance of Flooding, with BFE
 - AE: Regulatory Floodway
 - X: 0.2% Annual Chance of Flooding

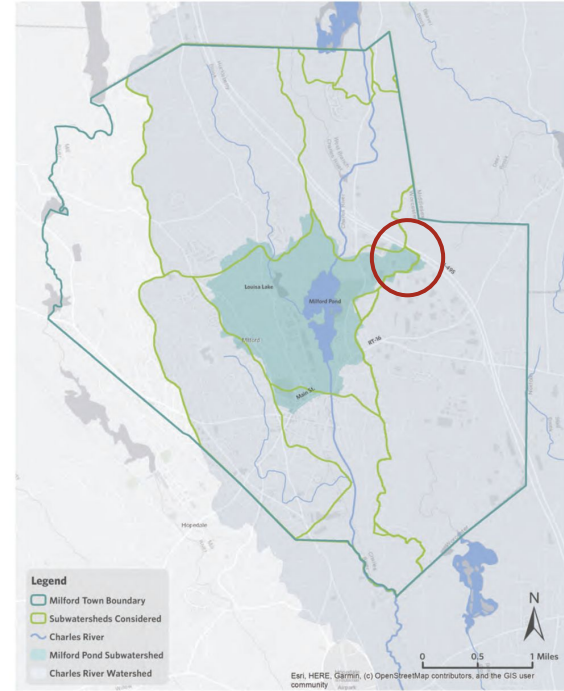


SUBWATERSHED RESTORATION PLAN FOR MILFORD, MA



PREPARED BY
The Town of Milford and Charles River Watershed Association (CRWA)

2020



Subwatersheds considered for study area within Milford. Referenced locations and features labelled.



Upper Watershed Impact Area



JOIN US TO UNVEIL NEW GREEN INFRASTRUCTURE IN MILFORD TOWN PARK!

Come celebrate the completion of new rain gardens and infiltration systems in Milford Town Park!

Attendees include CRWA, engineers from Horsely Witten, state and local officials, town staff, and community members.

This project was generously funded by the Municipal Vulnerability Preparedness program.



MAY 6TH



10 AM



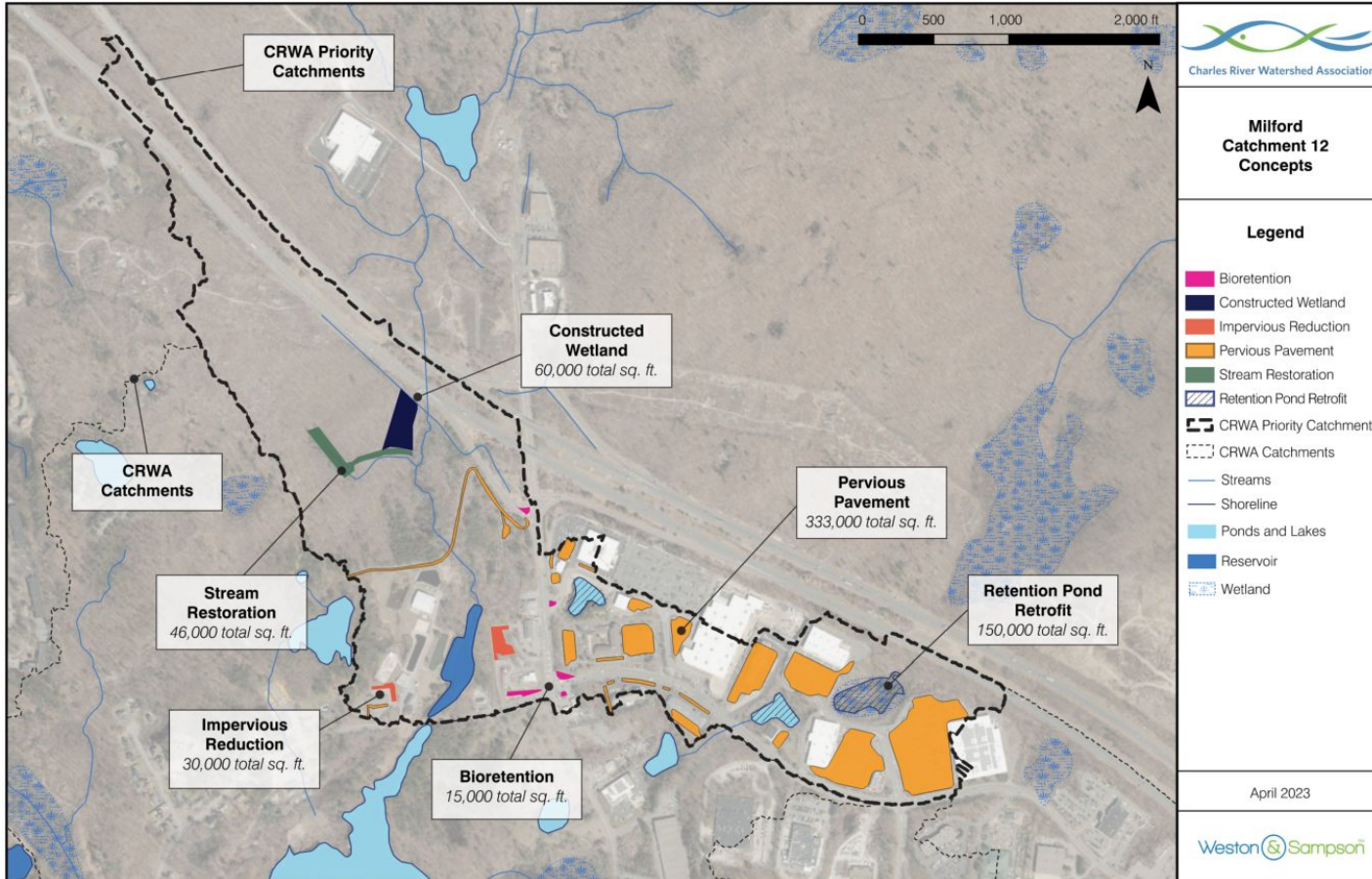
MILFORD
TOWN PARK

**REGISTER
HERE >>>**

[crwa.org/events](https://www.crwa.org/events)



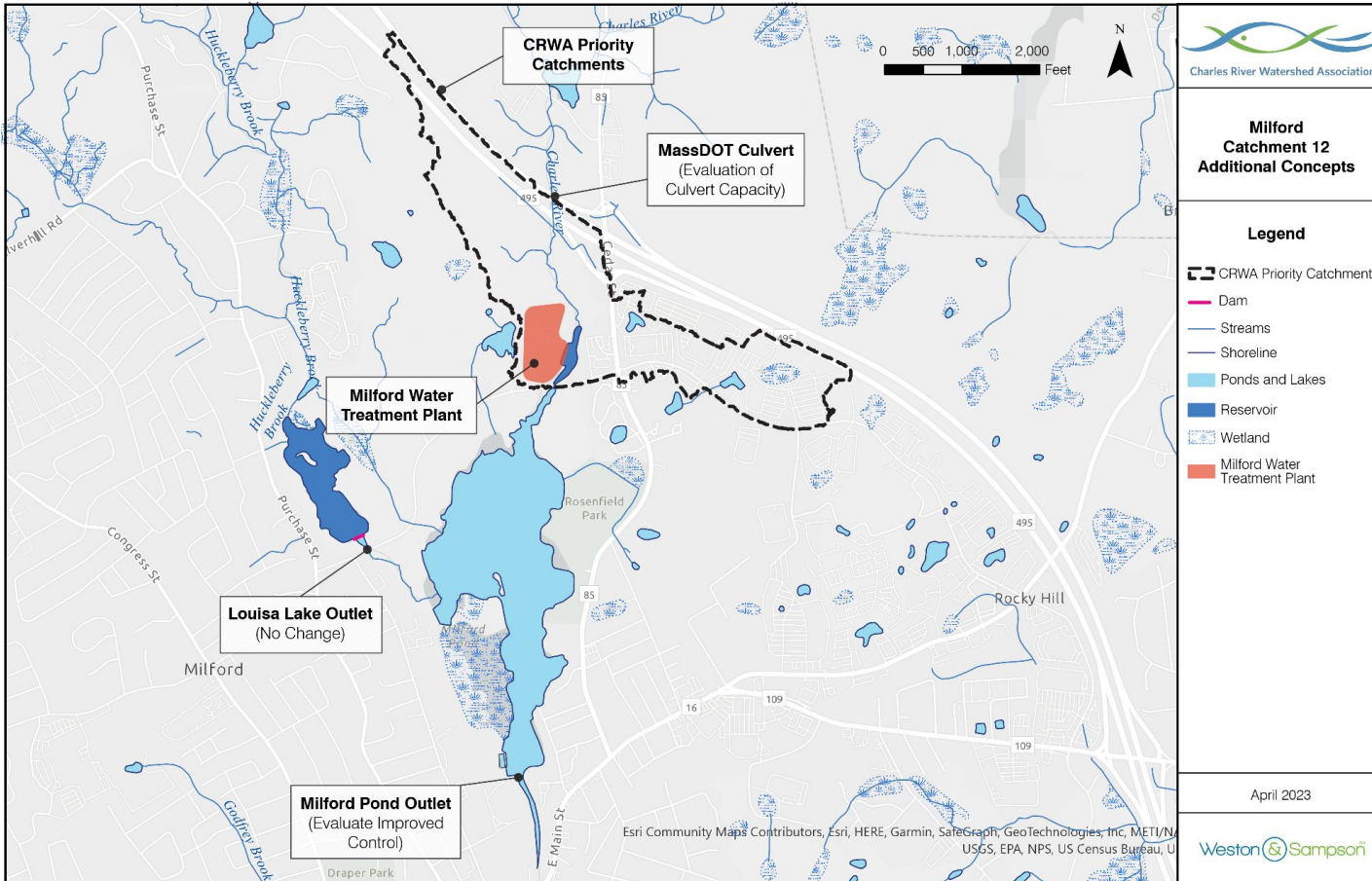
Upper Watershed Impact Area



Solutions Explored

- Subsurface infiltration and storage underneath parking stalls
- Retrofit stormwater ponds to increase capacity
- Stream restoration

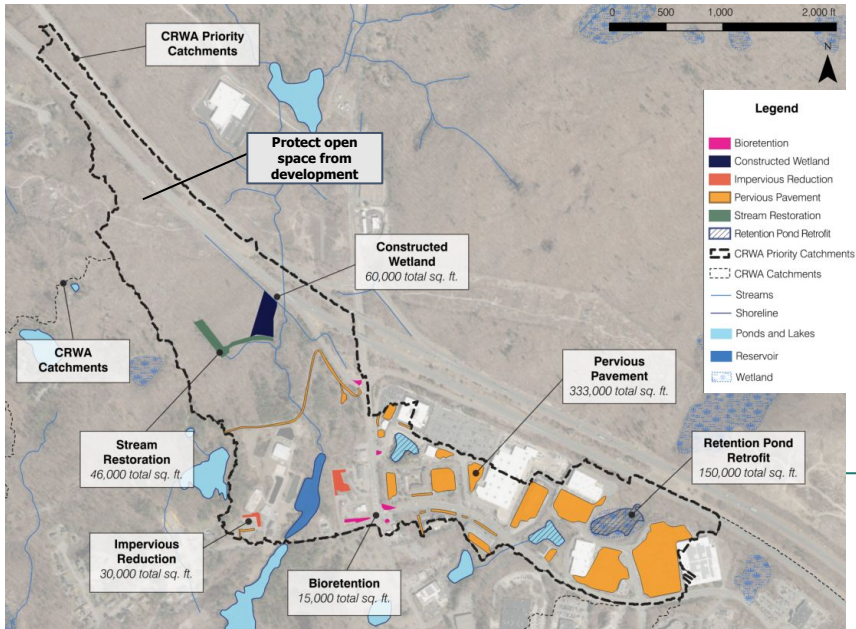
Upper Watershed Impact Area



Solutions Explored (cont.)

- Water level management through outlet control structures
- Culvert sizing evaluation

Opportunities



Increase storage and restore natural conditions

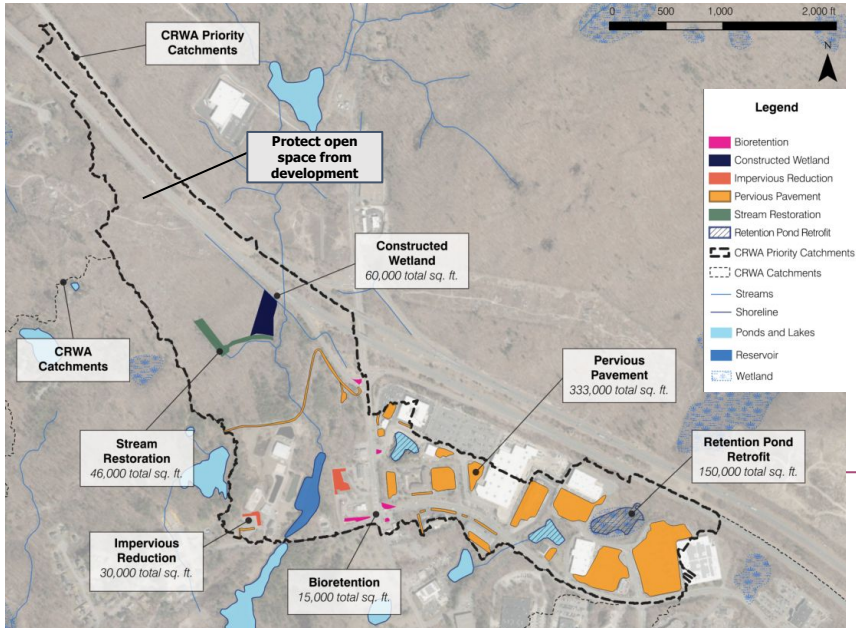


Constructed Wetland



Stream Restoration

Opportunities



Retrofit space to improve stormwater storage

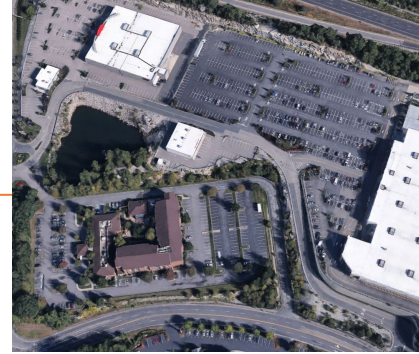
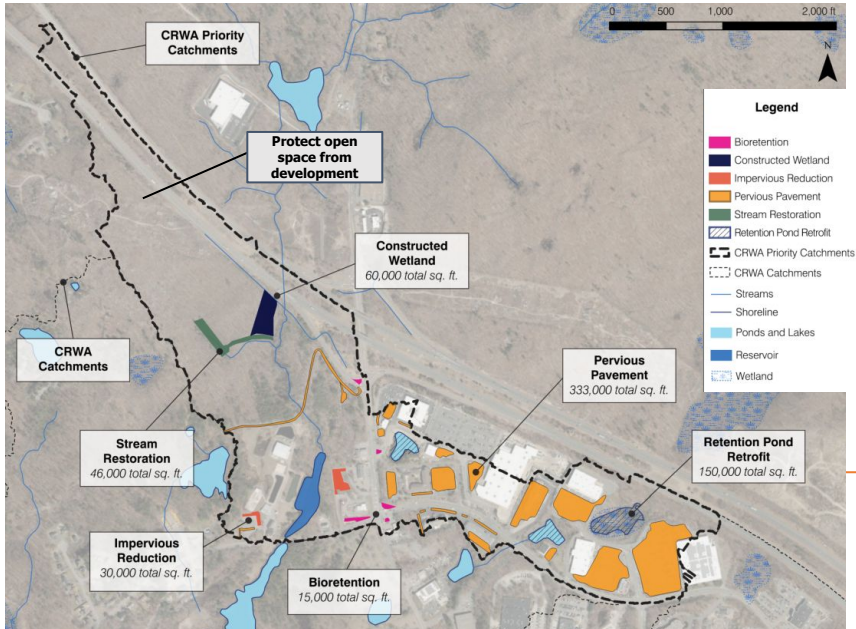


Controlled outlet structure in retention pond



Bioretention basins

Opportunities



Depave

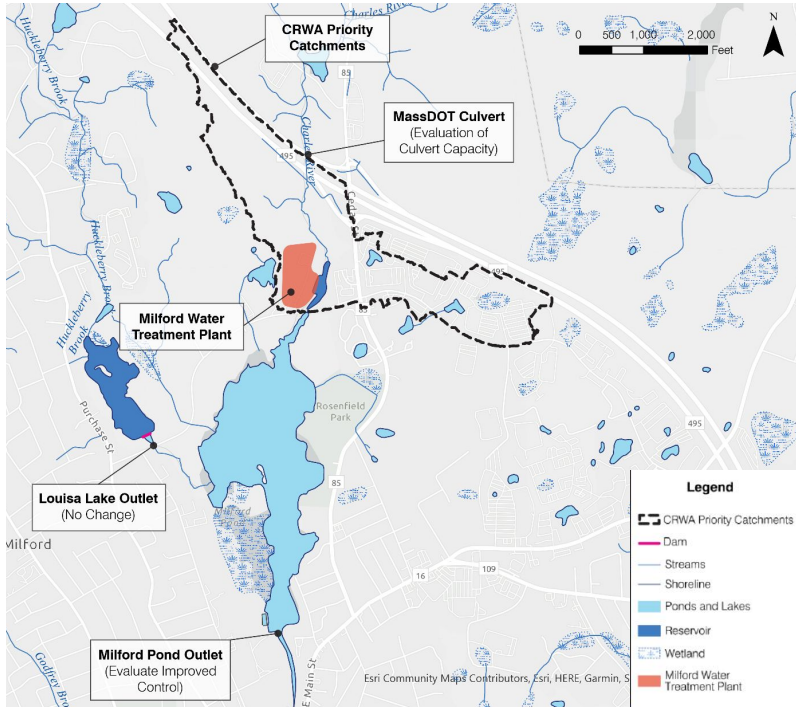


With Porous Pave



With Pavers

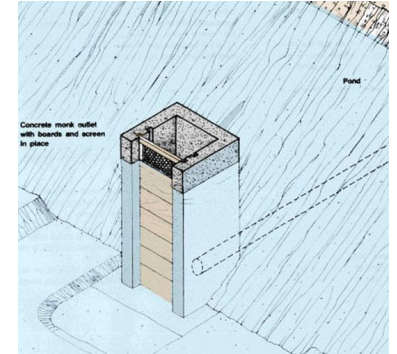
Opportunities



Increase stormwater storage through water level management



Example of a dam



Example of outlet control

Benefits and Co-Benefits

- Improved water quality
- Community education / STEM resource
- Create outdoor spaces (a.k.a. “placemaking”)
- Less-intense and more frequent storms can be managed
- Reduction in “heat islands” in parking lots and paved areas
- Addition of vegetation and potential creation of habitat

Potential Challenges and Concerns

- Significant coordination required amongst various landowners and municipality
- Coordination with drinking water suppliers
- Environmental permits necessary
- Maintenance capacity of public and private entities



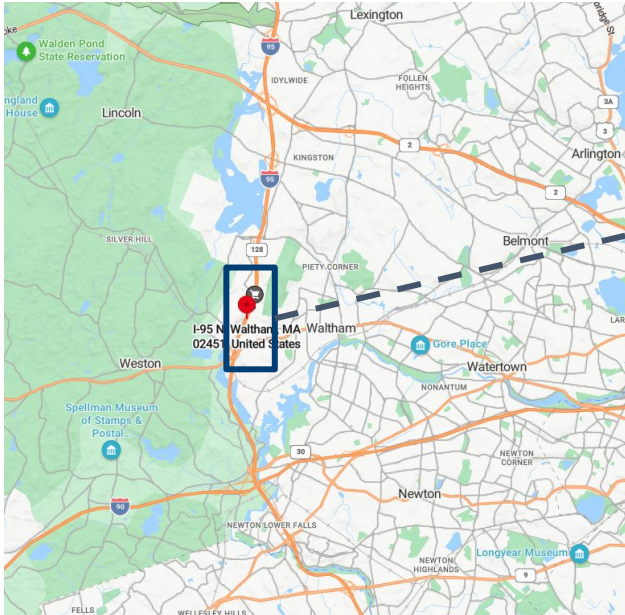
Questions or clarifications you need answered to help you provide feedback?

Big picture concerns or issues?

Please provide your feedback via the web form!

Lower Watershed Impact Area

Opportunities to implement stormwater management and nature-based solutions were identified to the **maximum extent practicable**.



Priority Impact Areas Results

Lower watershed

Sub-watershed: **101**

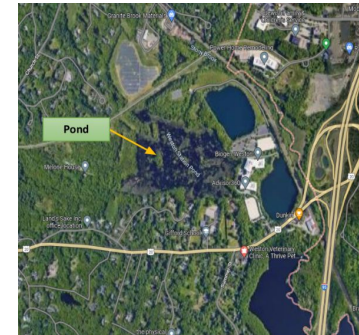
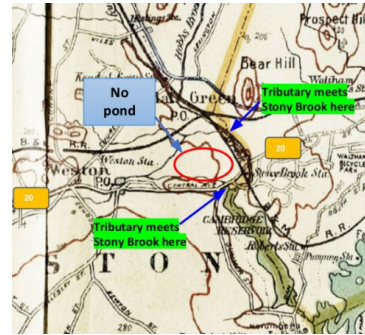
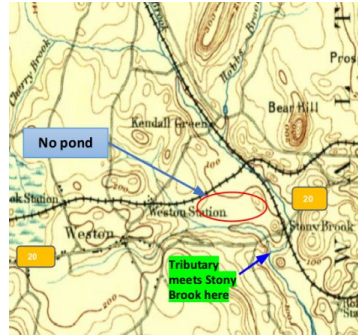
Communities: **Waltham / Weston**

Critical Facilities exposed to flooding: **The Gifford School**

Other site characteristics: **Large commercial plazas in the north, residential parcels to the west, two quarry ponds adjacent to BioGen campus to the south**

Criteria	Present
Environmental Justice Neighborhood	✓
Model showed flood reduction benefits due to green infrastructure implementation and impervious reduction	✓
Critical facility exposed to flooding	✓
Impacts multiple communities	✓
Flooding issues known to the community/communities	✓

Lower Watershed Impact Area



Early
1800s

Late
1800s

1920s

1950s

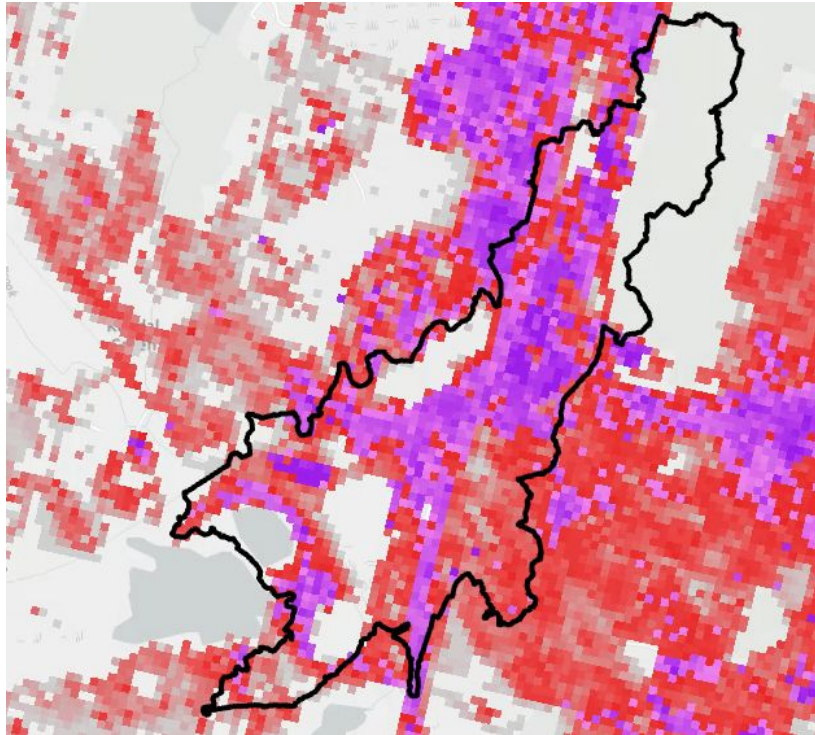
Wetland/Pond does not exist. The tributary is directly connected to Stony Brook.

Wetland/Pond does not exist. The tributary is displaced and connects with the Stony Brook farther South. May be due to the construction of a railroad.

Wetland/Pond does not exist. The tributary divides in two and meets up with the Stony Brook in the North.

Weston Station Pond was constructed.

Impervious Surfaces



NLCD 2019 Impervious Data

Catchment Area: 440 Acres
Impervious Area: 312 Acres

71% Impervious



Subwatershed Contexts

Subbasins



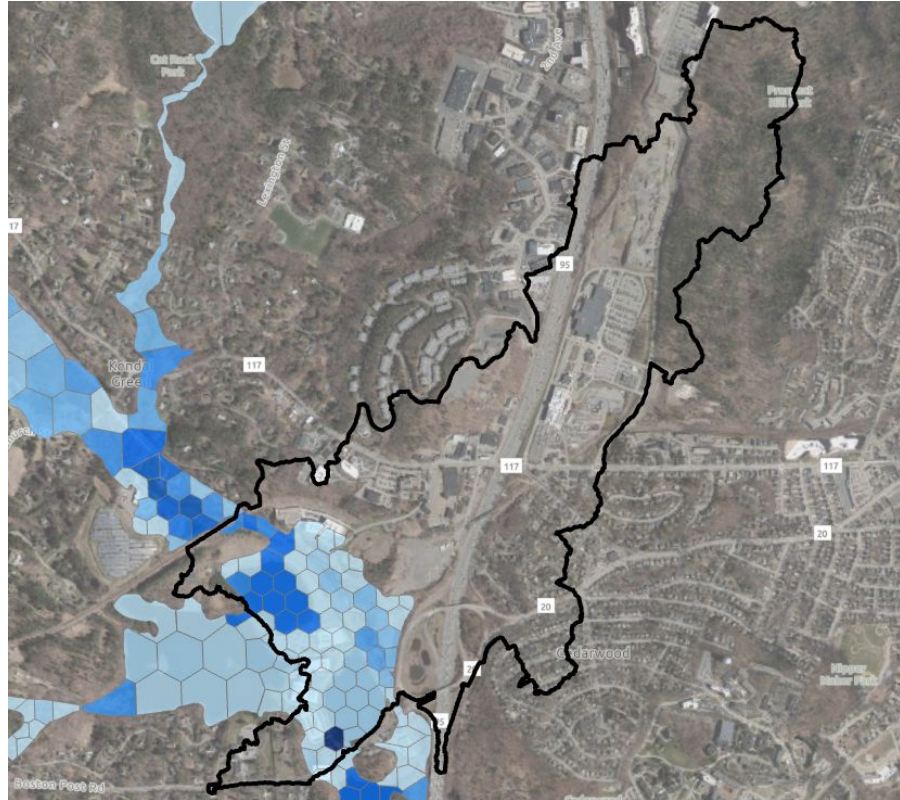
10-yr (10% AEP) 24-hour storm - 2070

MAXDEPTH

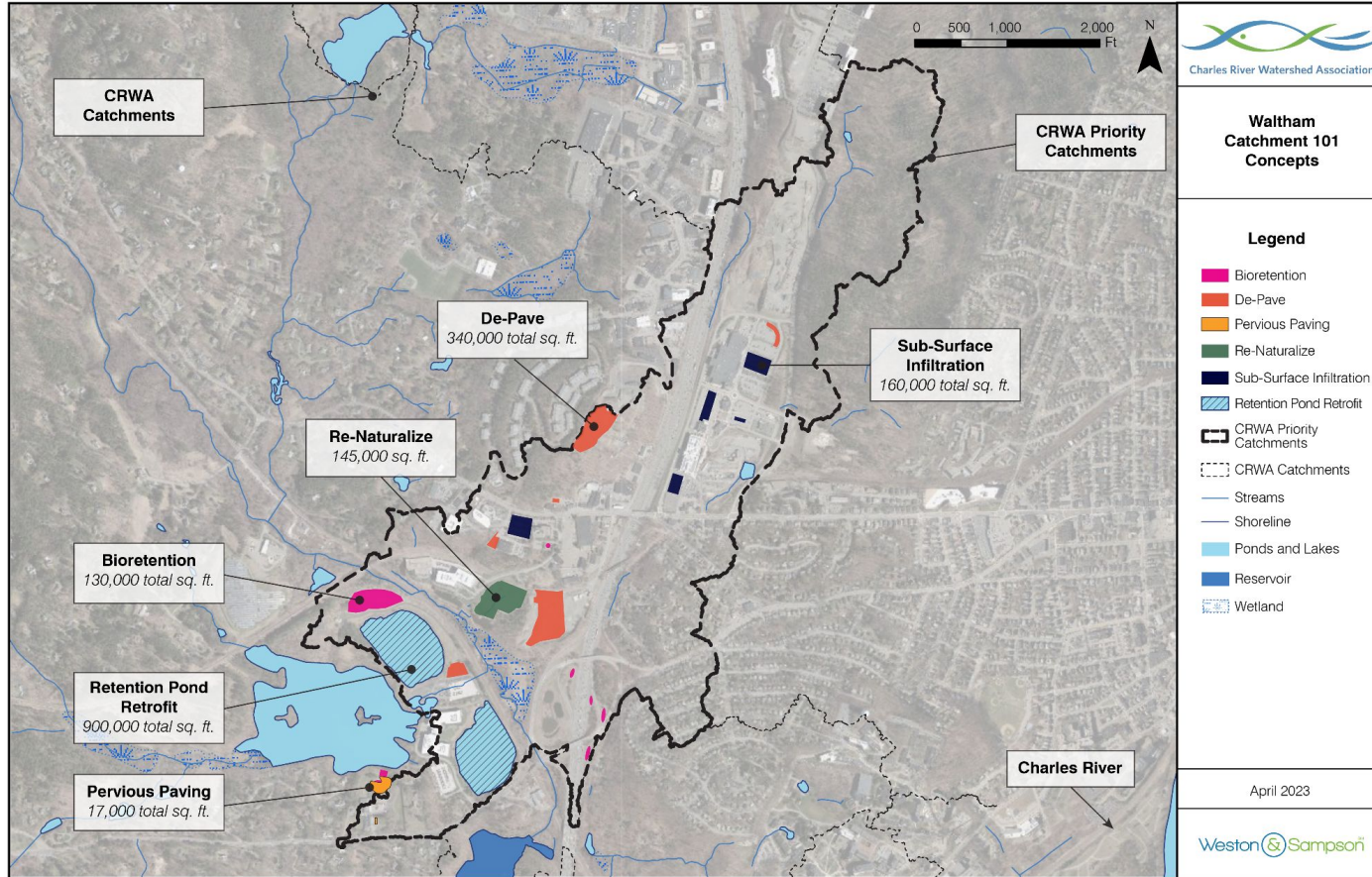
- >3.0'
- >2.0' - 3.0'
- >1.0' - 2.0'
- >0.5' - 1.0'
- >0' - 0.5'
- No Flood

Massachusetts Boundaries

Massachusetts Municipalities



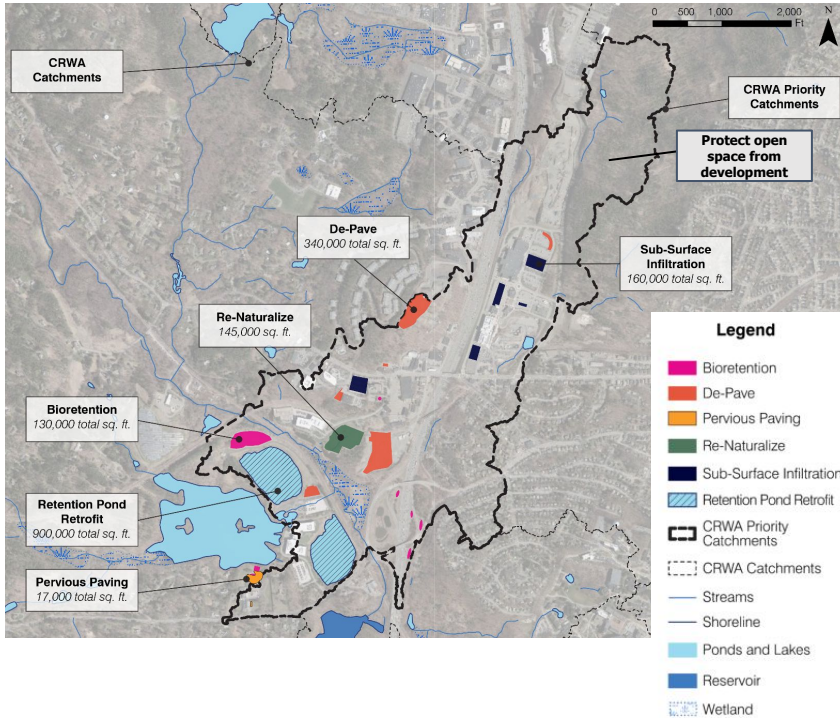
Lower Watershed Impact Area



Solutions Explored

- Subsurface infiltration and storage underneath parking stalls
- Retrofit stormwater ponds to increase capacity
- Stream restoration

Opportunities



Re-naturalize developed space and protect open spaces

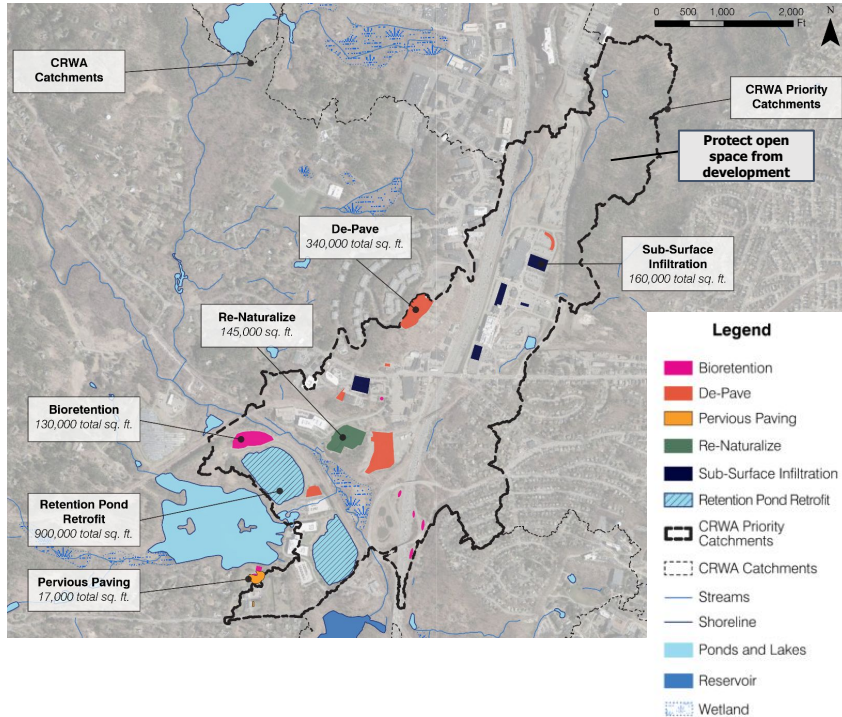


With native plants and trees



With bioretention basins

Opportunities



Subsurface Infiltration

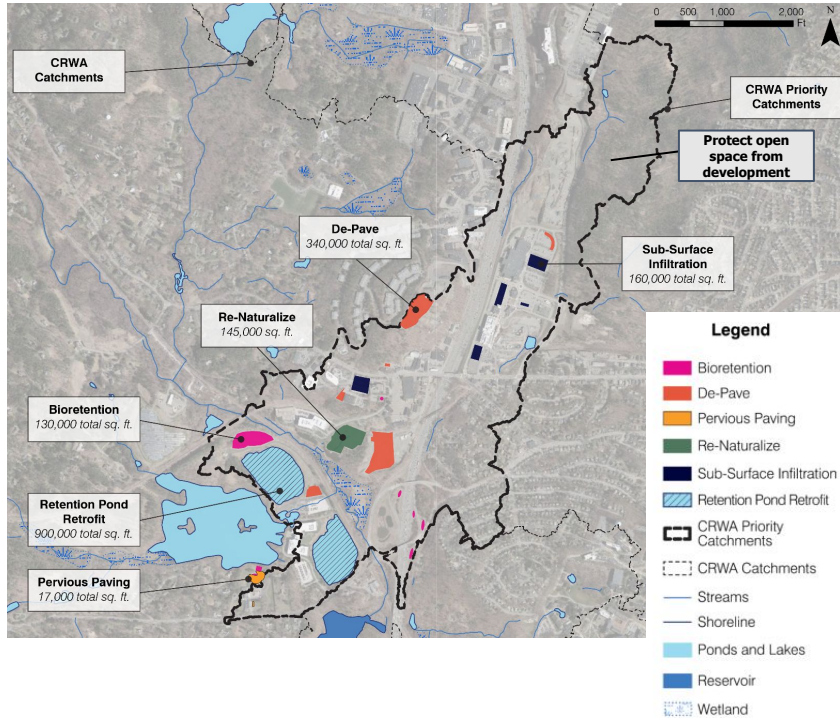


Modular storage with ability to infiltrate



Tank with controlled outlet

Opportunities



Depave

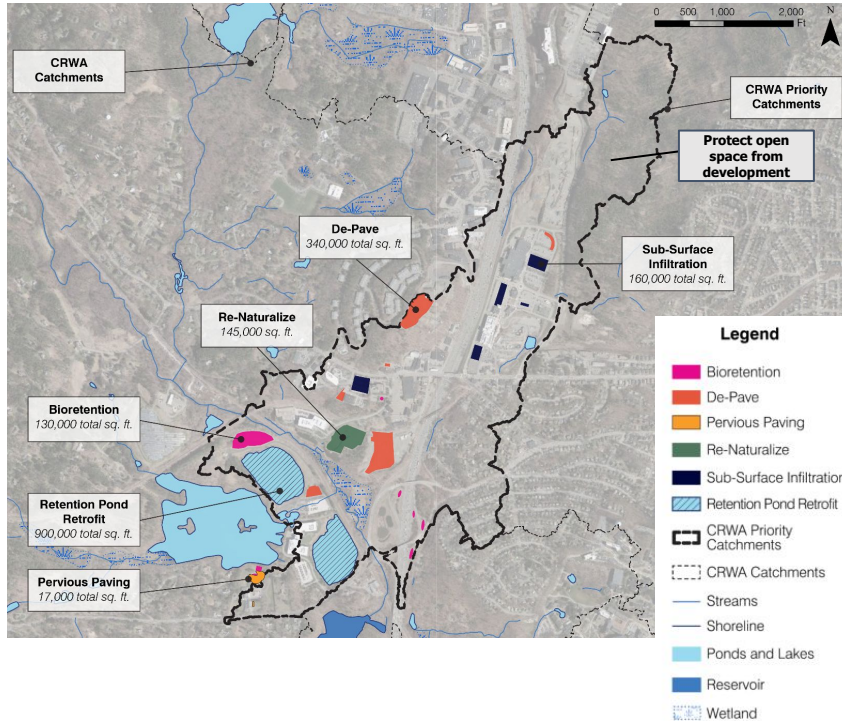


With Porous Pave



With Pavers

Opportunities



Retention Pond Retrofit



Increase storage by digging more space



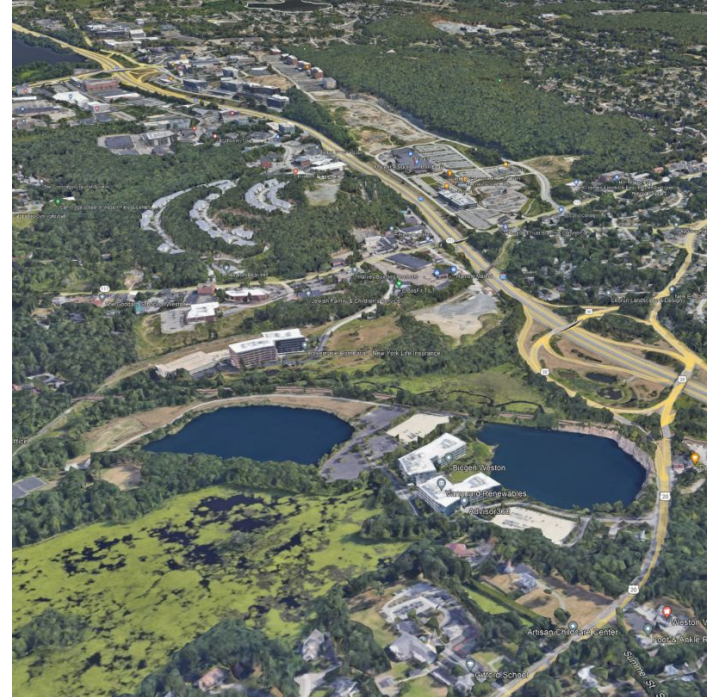
Outlet Control Structures

Benefits and Co-Benefits

- Improved water quality
- Community education / STEM resource
- Create outdoor spaces (a.k.a. “placemaking”)
- Less-intense and more frequent storms can be managed
- Reduction in “heat islands” in parking lots and paved areas
- Addition of vegetation and potential creation of habitat

Potential Challenges and Concerns

- Significant coordination required amongst various landowners and municipalities
- MassDOT owned land / stormwater infrastructure
- Maintenance capacity in the communities
- Drinking water protection areas



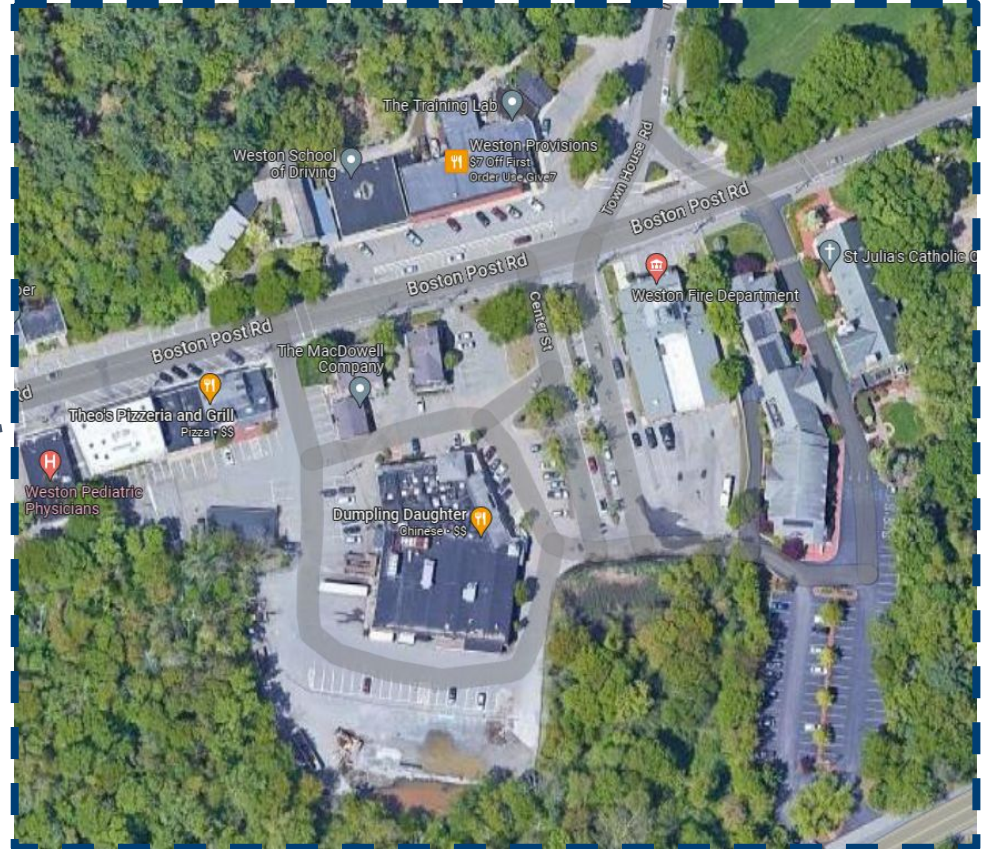
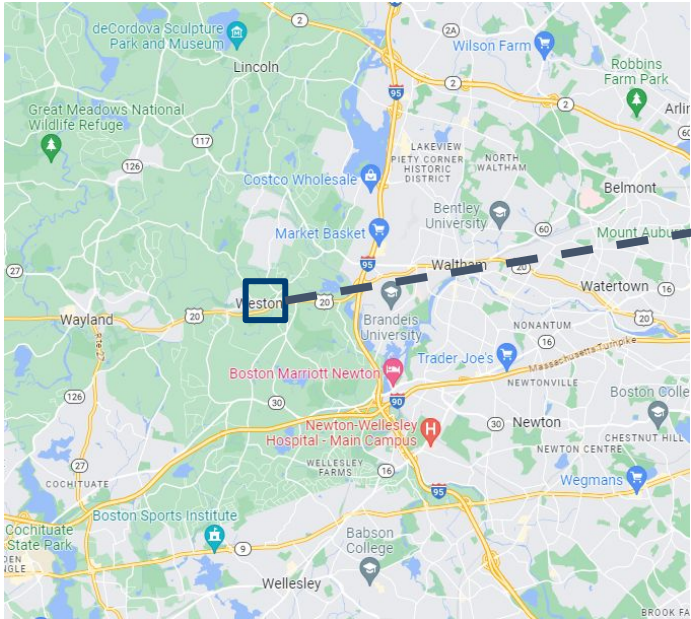
Questions or clarifications you need answered to help you provide feedback?

Big picture concerns or issues?

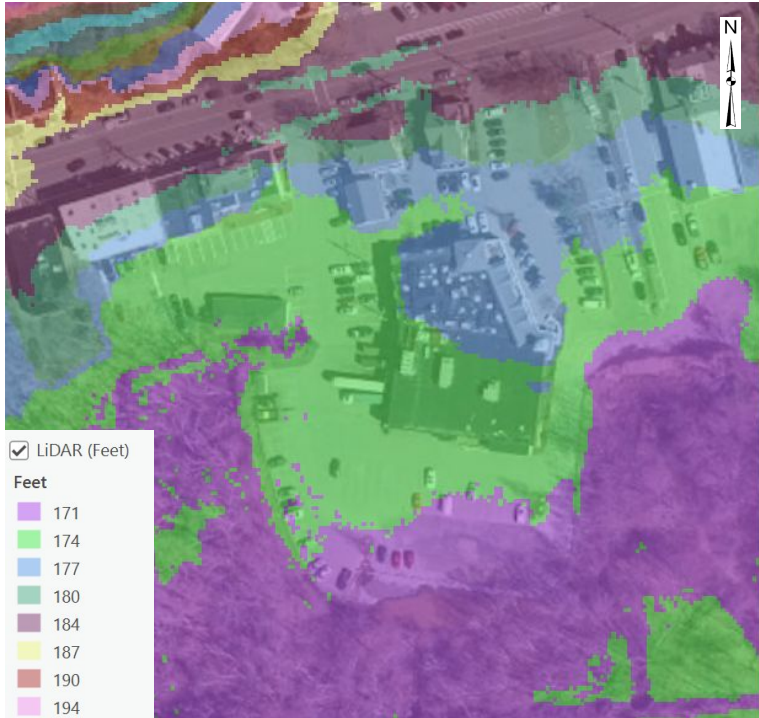
Please provide your feedback via the web form!

Weston Town Center

Opportunities to implement stormwater management and nature-based solutions were identified to the **maximum extent practicable**.



Site Description



Site Topography



FEMA 500 year flood zone

Site Description



Frequent flooding occurred at the southern end of the parking lot, in 2019 Weston raised that section



Recent photograph of actual site conditions

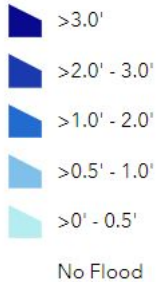
Stony Brook Subwatershed Contexts

Subbasins



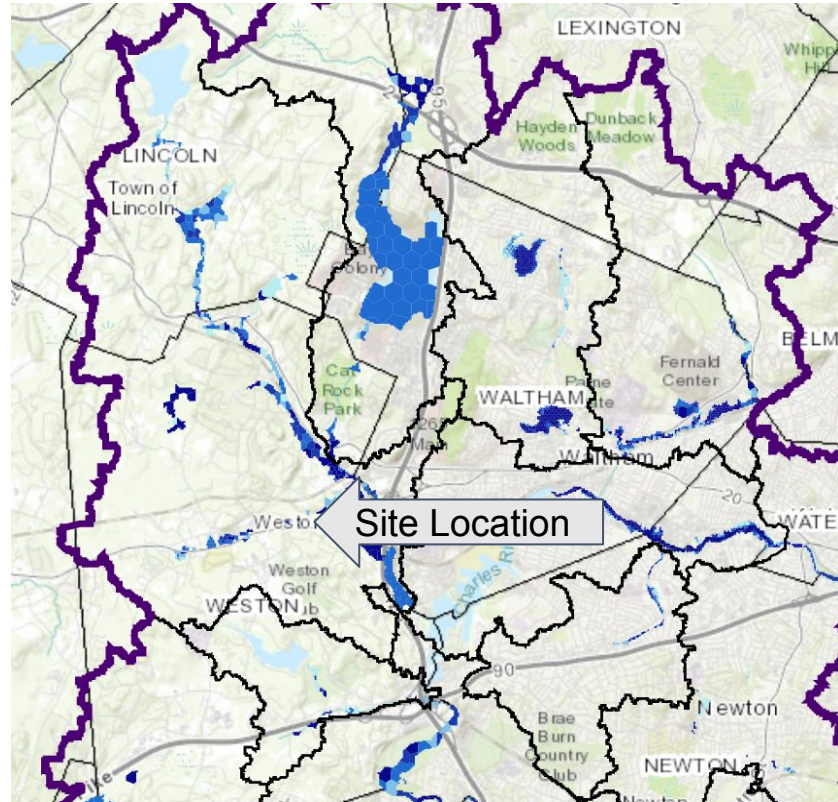
10-yr (10% AEP) 24-hour storm - 2070

MAXDEPTH



Massachusetts Boundaries

Massachusetts Municipalities



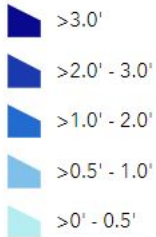
Future Flooding Projected at Weston Town Center

Subbasins



10-yr (10% AEP) 24-hour storm - 2070 (7.1 inches)

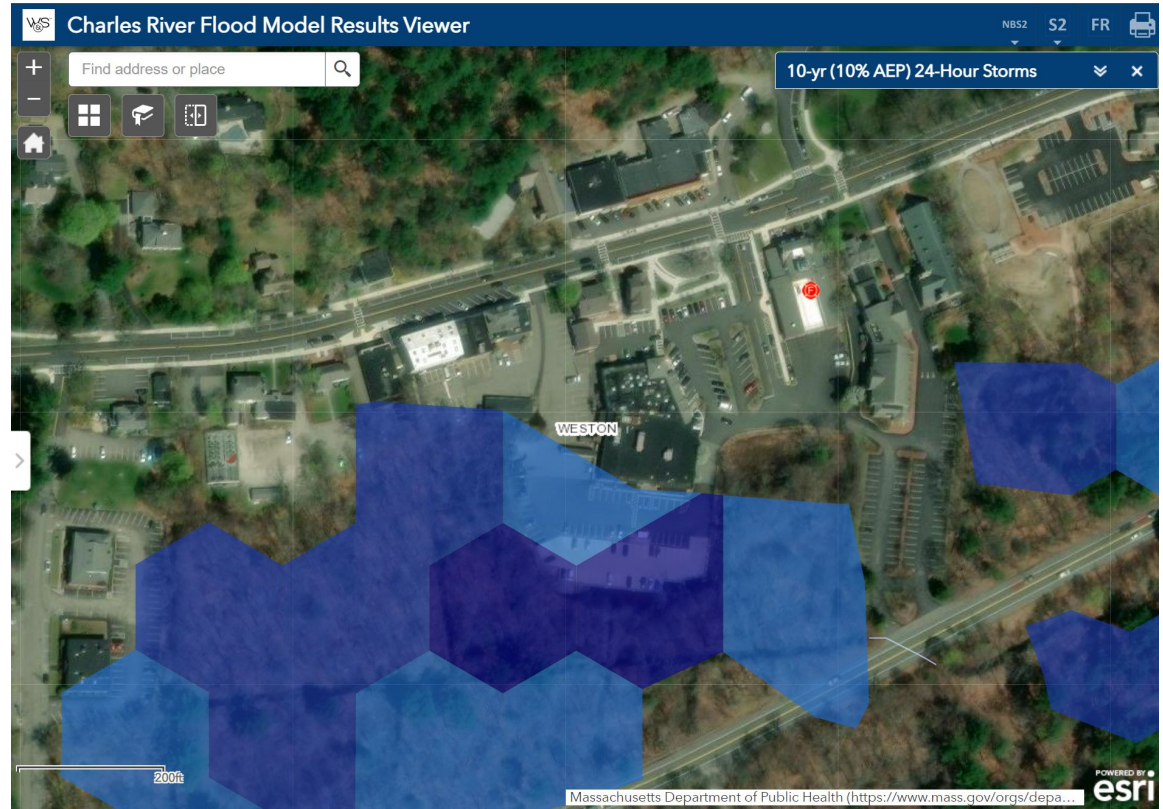
MAXDEPTH



No Flood

Massachusetts Boundaries

Massachusetts Municipalities



Opportunities



Renaturalize Paved Space



Treatment Wetland



Bioretention Basin

Opportunities



Reduce Impervious
Surfaces



Porous Pave



Pavers

Opportunities



- Drainage Features Current
 - Catch Basin - Single
 - Catch Basin - Double
 - Catch Basin w/ Hood
 - Catch Basin/Curb Inlet
 - Aux Catch Basin
 - Manholes
 - Collect Inlet
 - Collect Outlet
 - Outfall
 - Clean Out
 - Cap
 - Curb Inlet
 - Deflection
 - Junction
 - Drop Inlet
 - Dry Well
 - Pipe Drainage
 - Treatment Unit
 - Pipe End Inlet
 - Pipe End Outlet
 - Other
 - Swale
 - Temporary
 - Unknown
- Drainage Pipes Current
- Sidewalks
- Roads
 - Bridge
 - Paved Road
 - Unpaved Road
- Parking Lots
 - Paved Parking
 - Unpaved Parking
- Driveways
 - Paved Driveway
 - Unpaved Driveway
- Stream Centerlines
- Streams
 - Stream
 - Floodwall
 - Ditch
- Ponds and Rivers
 - Rivers
 - Ponds
- Parcels With Aerials
- MA Highways
 - Interstate
 - US Highway
 - Numbered Routes
- Town Boundary
- MA Towns
- MA Towns Opaque



Culvert sizing evaluation
(green circles)



Stream restoration
(yellow boxes)

Benefits and Co-Benefits

- Improved water quality
- Community education / STEM resource
- Create outdoor spaces (a.k.a. “placemaking”)
- Less-intense and more frequent storms can be managed
- Reduction in “heat islands” in parking lots and paved areas
- Addition of vegetation and creation of habitat
- Flood area creation

Potential Challenges and Concerns

- Already flood mitigation tactics in place
- Raised parking area shows signs of wear
- Environmental permitting must be considered
- Need to manage stormwater from the north and the south:
 - Runoff flowing off the impervious
 - Flooding from the stream system

Questions or clarifications you need answered to help you provide feedback?

Big picture concerns or issues?

Please provide your feedback via the web form!

Thank you for joining us tonight!

Next Steps:

- CRWA will circulate the recording, please pass it along
- Provide your feedback at: www.crwa.org/watershed-model **by May 22nd**
- Final virtual presentation in June
- Site next steps: Incorporate feedback into final designs

Julie Dyer Wood
Climate Compact Director
Charles River Watershed Association
jwood@crwa.org