Town of Winthrop, MA

Community Resiliency Building Workshop

Summary of Findings












June 2018

(Funding for this project was provided by EEA's Municipal Vulnerability Preparedness Planning Grant Program)

Submitted to:

Massachusetts Executive Office of Energy and Environmental Affairs
Municipal Vulnerability Preparedness Program
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1. OVERVIEW

A coastal community, the Town of Winthrop, Massachusetts has a unique perspective on planning for climate change and preparing for a sustainable future. The evidence for the need to further address resiliency and adaptation to natural hazard events continues to become more evident each year. While several larger storm events have received much notoriety in recent years (Tropical Storm Irene, Tropical Storm Sandy, Nor'easter NEMO), in the first quarter of 2018 alone, two major coastal storm events pounded communities throughout Massachusetts causing coastal flooding, heavy-rain induced inland flooding, wind damage, power outages, coastal erosion and damage to property, including the Town of Winthrop.

Some areas where Winthrop has been particularly hard hit in recent years include:

- **Flooding at Jefferson Street/Putnam Street Intersection** – Flooding has occurred in this location on a frequent basis.
- **Ingleside Park/Walden Street** – This area of Winthrop floods when intense storm events coincide with rising tides.
- **Flooding Continues at the Winthrop Golf Course**
- **Morton Street, Pico Avenue, Washington Avenue and Shirley Street -** Significant flooding has occurred in these areas during recent storms.
- **Coughlin Park Shoreline -** Significant erosion continues to occur along this shoreline and the Town is working on a shoreline stabilization concept.

In June 2017, the Baker-Polito Administration announced over $1 million in grant funding to 71 cities and towns throughout Massachusetts for the Municipal Vulnerability Preparedness (MVP) program. The MVP Planning Grant Program was designed to provide support for communities to plan for climate change resiliency and implement priority projects. Upon completion of the MVP program, communities can become certified as an MVP Community and become eligible for MVP Action Grant funding and other opportunities in the future. The Town of Winthrop applied for a MVP Planning grant and was successful. In April 2018, Winthrop undertook the Community Resiliency Building (CRB) Workshop process, a requirement of receiving MVP funding and this report serves as the Summary of Findings for that planning process.

The CRB workshop process is based on a risk matrix exercise while also utilizing current information regarding natural hazard events, understanding the latest climate change projections, evaluating information on Town efforts to address resiliency and reviewing recent action items and projects to address resiliency issues.

1.1 Workshop Core Team

The Winthrop Community Resiliency Building Workshop was led by a local Core Team which included the following individuals and Town departments:

- Joseph Domelowicz, Assistant Town Manager | Lead Project Manager for MVP/CRB
- Laurisa Wojcik, Administrative Secretary
- Kara Campbell, Conservation Agent
- Steve Calla, DPW Director
- Norman Hyett, Conservation Commission
- Chief Paul Flanagan, Fire Department
- Police Department

In addition to staff participants, the Core Team involved residents and local business owners who participated in both the MVP Kick-Off Meeting and the CRB Workshop. Sign in sheets for the kick off meeting and workshop have been included in **Appendix A**.

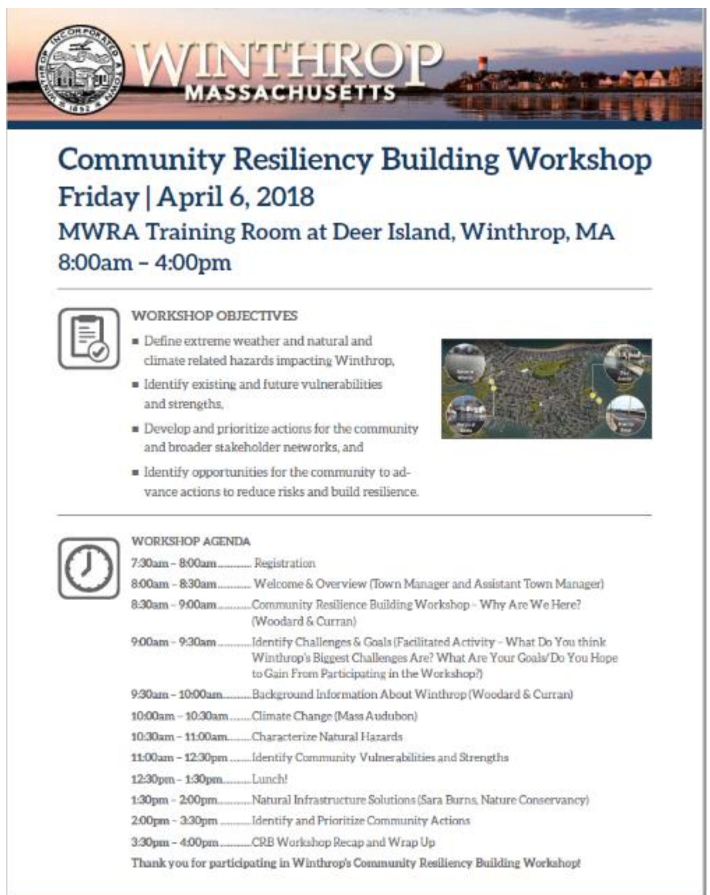
Together, Winthrop's Lead Project Manager and Woodard & Curran (MVP Technical Services provider) formed the project team responsible for the preparation work and execution associated with the CRB Workshop success.

1.2 Workshop Objectives

The Town of Winthrop held its Community Resiliency Building Workshop on April 6, 2018 at the Deer Island Wastewater Treatment Plant Training Room. Partners for the CRB Workshop included technical services provider Woodard & Curran, the Massachusetts Water Resource Authority (MWRA), The Nature Conservancy and MassAudubon. The workshop's central objectives were to:

- Define extreme weather and natural and climate related hazards impacting Winthrop,
- Identify existing and future vulnerabilities and strengths,
- Develop and prioritize actions for the community and broader stakeholder networks, and
- Identify opportunities for the community to advance actions to reduce risks and build resilience.

The focus of the workshop was to educate participants and increase awareness of risks facing the Town of Winthrop from natural and climate-related hazards. Identifying vulnerabilities and strengths in Winthrop from an infrastructure, societal and environmental perspective would serve as the foundation for discussion. Prior to the workshop, outreach to key municipal staff, residents, businesses and organizations was conducted through the kick-off meeting.



1.3 Acknowledgements

The Winthrop Community Resiliency Building Workshop was led and managed by the municipal Core Team in partnership with Woodard & Curran. The Core Team guided the work throughout the project and numerous public officials and industry professionals provided leadership, technical expertise, ideas and insight during workshop planning and execution.

Special thanks to the MWRA, The Nature Conservancy and MassAudubon for their participation and support during Winthrop's CRB Workshop.

2. SUMMARY OF FINDINGS

The purpose of the Community Resiliency Building Workshop Summary of Findings is to develop a comprehensive summary of the event with the goal of Winthrop using this information to continue its focus on reducing vulnerabilities, reinforcing strengths and continuing on the path toward greater community resilience. Winthrop's CRB was held on Friday, April 6, 2018 at the Deer Island Wastewater Treatment Plant Training Room. In total, there were 53 attendees who were present for the daylong event. With the goal of the workshop being to listen and learn from attendees on how to meet the overall workshop objectives, prior to starting the formal CRB agenda, participants were asked to think about and write down on a note card answers to the following two questions:

1) What are Winthrop's biggest challenges? (think infrastructure, societal, environment)

2) What are your goals for the day and what do you hope to gain from your participation in the workshop?

Participants provided feedback for both of these questions which is summarized in **Appendix B**.

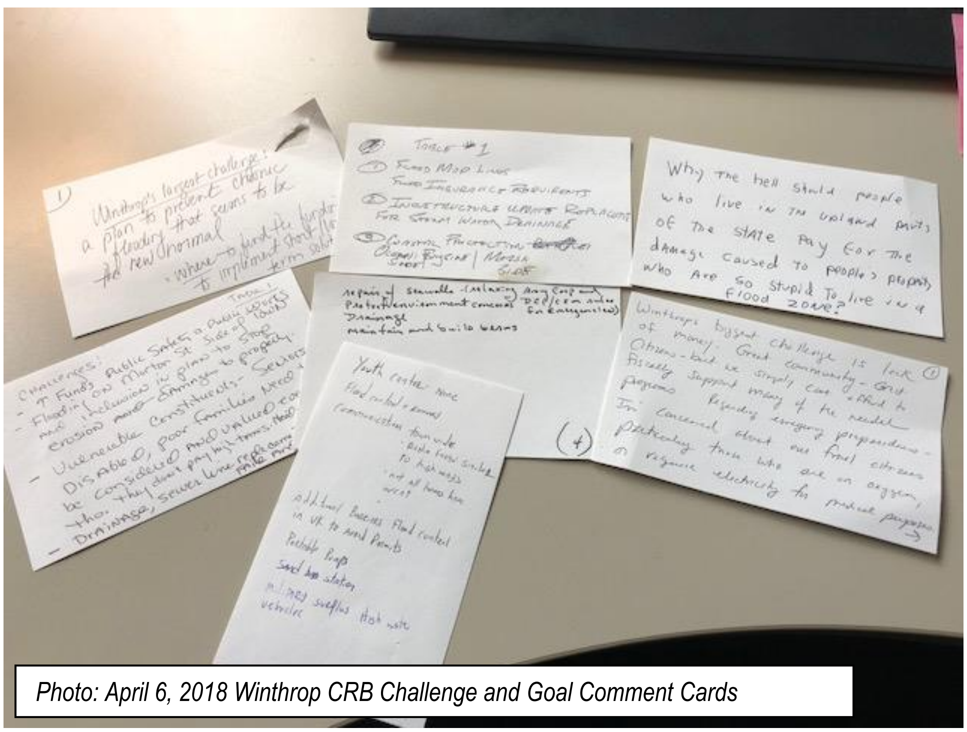


Photo: April 6, 2018 Winthrop CRB Challenge and Goal Comment Cards

2.1 Top Natural Hazards for Winthrop, MA

Prior to discussing the top natural hazards faced by Winthrop, participants in the CRB workshop listened to two presentations that included background information about Winthrop and up to date information regarding Climate Change and its impact to the community and surrounding area (see **Appendix C**). Upon completion of these two presentations, attendees were asked to work with the other participants at their table to define and characterize the top natural hazards being faced by Winthrop. In total, there were six separate tables working on this task and participants were encouraged to come up with their own list of natural hazards that they felt to be the most relevant and pressing to the community.

Winthrop is a densely developed coastal town with a population of approximately 18,000. Located on a peninsula (approximately 1.6 square miles) with a seven-mile shoreline, the majority of the flooding experienced by Winthrop is related to its coastal location due to impacts from coastal storms, waves, storm surge and sea level rise. The natural hazards facing Winthrop that were identified at the CRB workshop include:

- Sea Level Rise
- Flooding
- Hurricanes/Wind/Extreme Storms
- Wave Action/Storm Surge
- Extreme Heat
- Fire
- Erosion
- Increasing Precipitation
- Isolation

Sea level rise was identified by all of the tables as one of the top natural hazards while flooding was identified by five of the six tables. **Table 2-1** indicates the top natural hazards that were identified by each table of CRB participants.

Table 2-1: Natural Hazards Identified by CRB Participants

Table 1	Table 2	Table 3	Table 4	Table 5	Table 6
• Flooding • Wind/Storms • Wave Action • Sea Level Rise	• Flooding • Sea Level Rise • Hurricane • Heat or Extreme Weather	• Flooding • Sea Level Rise • Wind • Isolation	• Flooding • Wind/Storms • Wave Action • Sea Level Rise	• Flooding • Sea Level Rise • Heat Wave • Fire	• Sea Level Rise • Increased Precipitation • Heat or Extreme Weather • Wind

2.2 Identified Vulnerable Areas in the Community

During the CRB process, the entire Town was highlighted as being vulnerable to natural hazard events due to its location and the fact that it is surrounded by the ocean – not just a specific neighborhood. There were specific areas mentioned by attendees at the workshop as being vulnerable and those include:

- **Neighborhoods:**
    - Morton Street/Belle Isle Marsh – Low lying area, coastal surge and flooding.
    - Pico Avenue/Fisherman's Bend – Experiences flooding during storm events.
    - Ingleside Park – Backup and flooding due to lack of stormwater storage capacity and undersized drains. Floods during coastal storm/precipitation events.
    - Point Shirley/Shirley Street – Low-lying street and adjacent seawall experience wave overtopping and flooding during storm events.

- Lewis Lake – Serves as a drainage area for part of the downtown area – lake overflows during storm events and causes localized flooding in adjacent areas.
    - Yirrell Beach – Coastal surge and flooding
    - Lower Nahant Avenue – Coastal surge, high tide and high precipitation events all cause backup in undersized drain lines and flooding within adjacent neighborhood.
    - Coughlin Park – Coastal erosion and flooding during coastal storms.
    - Bayou Street Neighborhood – Flooding due to undersized drainage line that backs up during high precipitation events.

- **Ecosystems:** Belle Isle Marsh, Coughlin Park, Yirrell Beach, Ingleside Park, Lewis Lake, Beaches
- **Transportation:** Route 145 and Winthrop Parkway (also evacuation routes), Shore Drive, Morton Street, bridges, all roads in Town
- **Infrastructure:** Drainage system, Water/Sewer Infrastructure, Pump Stations, Sea Walls, Utility Power, Public Safety Building, Culverts, MWRA Deer Island Treatment Plant, Municipal Services (police, fire, emergency, shelters), Existing Buildings, Proximity to MassPort/Logan International Airport

2.3 Current Concerns & Challenges Presented by Hazards

The Town of Winthrop faces numerous challenges and has major concerns related to the impacts of natural hazard weather events from the past and those that will occur in the future and be further exacerbated by climate change. In the first quarter of 2018 alone, Winthrop was severely impacted by two large coastal storm events in January and March which caused coastal flooding, heavy-rain induced inland flooding, wind damage, power outages, unpassable streets, coastal erosion and damage to residential homes and businesses.


Photo: Pico Avenue, March 3, 2018

In prior years, Winthrop has suffered from similar coastal storms in addition to Tropical Storm Irene (August 2011), Tropical Storm Sandy (October 2012) and a Nor'easter referred to as NEMO (February 2013). In general, Winthrop is subjected to three types of flooding – coastal, inland/riverine and urban. The FEMA Flood Insurance Rate Maps (FIRM) issued in 2016 for Winthrop indicate that approximately 45% of the town is within the 1% annual chance flood (also known as the 100-year storm).


Photo: Morton Street at Banks, March 3, 2018

The impacts from the 2018 storm events to date as well as previous storms have made the topic of natural hazards and climate change in Winthrop of high importance. Improving the community's ability to be resilient before, during and after a storm event was discussed in detail at the Community Resiliency Building workshop.

2.3.1 Road Network Vulnerability & Isolation

Access to the Town of Winthrop is primarily along Route 145, Winthrop Parkway or across the Belle Isle Bridge (Main Street). Winthrop Parkway connects the town to Revere along a narrow strip of land and this connection has been closed by the Town of Revere in the past due to storm conditions resulting in unsafe passage. With only two main roadways to access Winthrop, managing this infrastructure is critical for emergency evacuation and response. Or, if evacuation and response is not possible, managing isolation and sheltering in place becomes critical. Discussion included the town's preparedness to remain isolated for a period of time and successfully shelter in place. CRB attendees expressed their concern over the need to be better prepared for this type of situation.

2.3.2 Proximity to MWRA Deer Island Treatment Plant & MassPort's Logan International Airport

The enormity of the road network vulnerability issue is raised even further since the primary travel route to MWRA's Deer Island Sewage Treatment Plant (which treats wastewater from 2.5 million people in Greater Boston) is located in Winthrop and can be compromised. In addition, concern was raised over the potential for a major incident to occur at the treatment plant or nearby Logan International Airport which could impact Winthrop and/or require the evacuation of the community.

2.3.3 Water, Wastewater & Drainage System

Photo: April 6, 2018 Winthrop CRB Workshop

During a coastal storm or heavy precipitation event, Winthrop's drainage system can become overwhelmed and cause flooding at the street level. Future climate change impacts, sea level rise and more severe storms will continue to exacerbate the conditions that the community has seen repeatedly in the past. This combined with the age of the drainage system and changing underground conditions can cause additional damage – the magnitude which may currently be unknown.

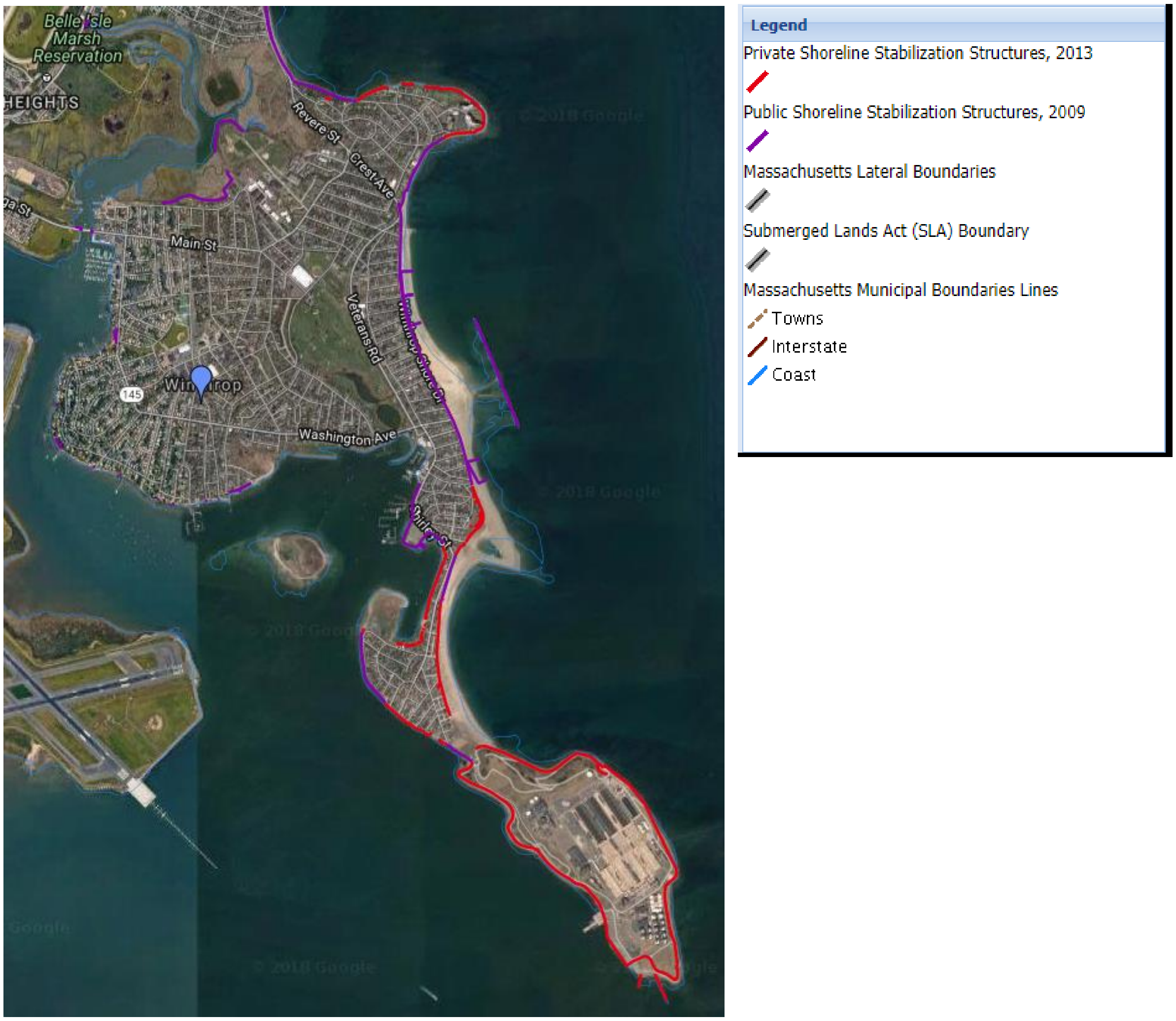
The water and wastewater systems in Winthrop are owned by the Department of Public Works and the Massachusetts Water Resources Authority (MWRA). Sewer pump stations are located at Revere Street, Pico Avenue and Pleasant Court. Winthrop's stormwater system has over 20 miles of underground piping, outfalls, catch basins and manholes. Approximately 115 outfalls are installed throughout Town in low-lying areas to help with some of the inland flooding during certain types of storm events. Many of these outfalls do not have check valves to prevent coastal flooding from entering the system.

Workshop participants discussed the need for drainage system upgrades and cleaning and education about how the drainage system functions in Winthrop. Other suggestions include identifying a local staff person to work with DPW and other Town departments on increasing the visibility of this infrastructure and developing Low Impact Development/Green Infrastructure solutions that would improve their function and condition along with funding opportunities to pay for the projects. Starting programs such as adopt a drain, using artwork to better identify location and seeking out funding opportunities for upgrades are all suggestions for improving this critical infrastructure.

2.3.4 Shoreline Structures

The Town of Winthrop has a variety of shoreline structures in place that offer a barrier between the built environment and the ocean. Some of the infrastructure includes stone revetments, concrete seawalls, bulkheads and breakwaters. According to data managed by the Massachusetts Office of Coastal Zone Management (CZM) regarding coastal infrastructure, Winthrop has six structures owned by DCR and 27 town owned structures in varying condition. Half of the public shoreline structures need moderate to significant levels of repair (see **Figure 1**).

Figure 1: Winthrop, MA Shoreline Structures



At the CRB workshop, participants expressed the need to preserve and maintain existing and exposed seawalls so they continue to function and provide protection for the built environment. Suggestions included making the existing seawalls higher, expandable (or flexible) or investigate floating dams.

2.3.5 Local Capacity, Communication, Emergency Management

During the Community Resiliency Building process, the topic of local capacity, communication and emergency management was discussed. Concern was raised about the use of the Senior Center as a shelter and accepting residents who need to be evacuated from their homes during severe weather. Currently there is no back up power or generator at the Senior Center should a power outage occur during a storm event. Another issue identified by the Housing Authority was that in the past, some of their senior housing developments have lost power, but it is difficult to get their tenants to evacuate. More communication is needed about how to manage these types of situations in the community.

In addition, a more clear, defined means of communication was indicated as an area of improvement during emergencies. Currently information is shared via phone but continuing to use resources like Facebook and Twitter will be beneficial. There was also a discussion of creating a formal Emergency Manager position (even part time) who helps manage current emergencies including operations, but also the recovery. Documentation and photographs are all necessary to obtain and manage for proper recovery and reimbursement depending on the severity of the event. Currently, Winthrop does this on an as needed, informal basis. Having designated staff for residents and businesses to call would allow for other departments like Police, Fire and DPW to focus on their roles during an emergency event. An Emergency Manager could also oversee operations during an emergency, manage a command center, help deploy/manage town staff and work with other towns and regional dispatch to provide the best service possible.

The need for a consolidated, updated Public Safety Building was identified during the CRB workshop as one of Winthrop's biggest challenges.

2.3.6 Condition and Functioning of Natural Barriers

Winthrop is fortunate to have numerous beaches, conservation areas and places of recreation to offer residents and visitors in the community. They include:

- Winthrop Beach
- Yirrell Beach
- Donovan's Beach
- Pico Playground & Beach
- Fisherman's Bend
- Belle Isle Marsh
- Coughlin Park
- Lewis Lake/Winthrop Golf Club
- Ingleside Park

One of the key issues raised during the CRB was the need to preserve, maintain and enhance natural infrastructure in Winthrop so that it can continue to function as a natural barrier for the community. Ideas include dune enhancement, building additional trees to lessen heat island impact, add more natural vegetation where it is needed, develop an overall Town wide natural barrier enhancement plan and conducting feasibility studies to determine what types of enhancement will make sense and their anticipated impact. Additional education regarding the benefits and importance of natural resource areas including regulations was also identified as important so that the value in helping reduce risk and improve resilience is better understood.

2.4 Current Strengths & Assets

Winthrop has had the opportunity during recent storm events to see how the community functions and identify areas of strength. The presence of natural barriers for residential neighborhoods in Winthrop was recognized as beneficial to the community in addition to existing seawalls and other barriers.

Other strengths identified during the CRB include:

- The local conservation commission has been working with homeowners to provide information about natural resources, building code requirements and homeowner incentives.

- Wetland restoration, floodplain and open space and enhancement through various projects in the community were recognized as a strength and continuing to support these projects and find funding for next phases is critical – Coughlin Park is an example where the Town has been investigation the feasibility of mitigating shoreline erosion using living shoreline techniques to increase coastal resiliency. A plan was prepared that quantified sea level rise for the location, assessed existing conditions, performed an alternatives analysis and identified an appropriate living shoreline project. CRB attendees expressed their support for the Town to continue doing this type of work (specifically this project) and reach the implementation phase.

- Winthrop has dedicated Police, Fire and DPW personnel who respond during natural hazard events.

- The existing reverse 911 system was recognized for the role it plays during emergency events and continuing to maintain and advertise the availability of this system will be key for future emergencies.

- Winthrop's existing water, wastewater and drainage infrastructure was identified as a strength. The need to keep this updated, maintained and managed was recognized. Recent upgrades to some of the sewer pumping stations such as elevating them, installing water resistant panels and emergency generators was recognized as a strength. Other recent infrastructure improvements include:
  - Sewer improvements on Putnam Street, Putnam Place and Walden Street.
  - Water main replacement on Jefferson Street and Fremont Street and upgrades to a section of the drainage system at the intersection of Jefferson Street and Putnam Street.
  - Sewer, water, drain and sidewalk improvements on Walden Street, Lincoln Street, Read Street, Walden Place and Jerald Street.
  - Water main, drain and sewer improvements on Bellevue Avenue, Prescott Street, Somerset Avenue, Nahant Avenue and Sewall Avenue.
  - Water main improvements with some sewer repairs on Plummer Avenue, Woodside Avenue, Woodside Park, Frances Street, Sunnyside Avenue, Pico Avenue, Corinha Beach Road and throughout the neighborhoods surrounding the water tower.
  - Sewer and water main improvements on Franklin Street and Harvard Street.
  - Lewis Lake Tide Gate project included replacement of existing failed automated tide gate with new automated tide gate.
  - Miller Field/Lewis Lake Drainage and Site Improvements included a complete renovation of Miller Field including site drainage improvements and improvements to swales along the Veterans Road and Cross Street at the Winthrop Golf Club.

- Supportive social services such as the local health center, Senior Center, Senior Housing and Housing Authority.

- Proximity to MWRA Deer Island Treatment Plant & MassPort's Logan International Airport was identified as a challenge but also a strength. The Town of Winthrop acts as a natural buffer to both of these key regional economic and environmental resources.

Photo: MWRA Deer Island Wastewater Treatment Plant

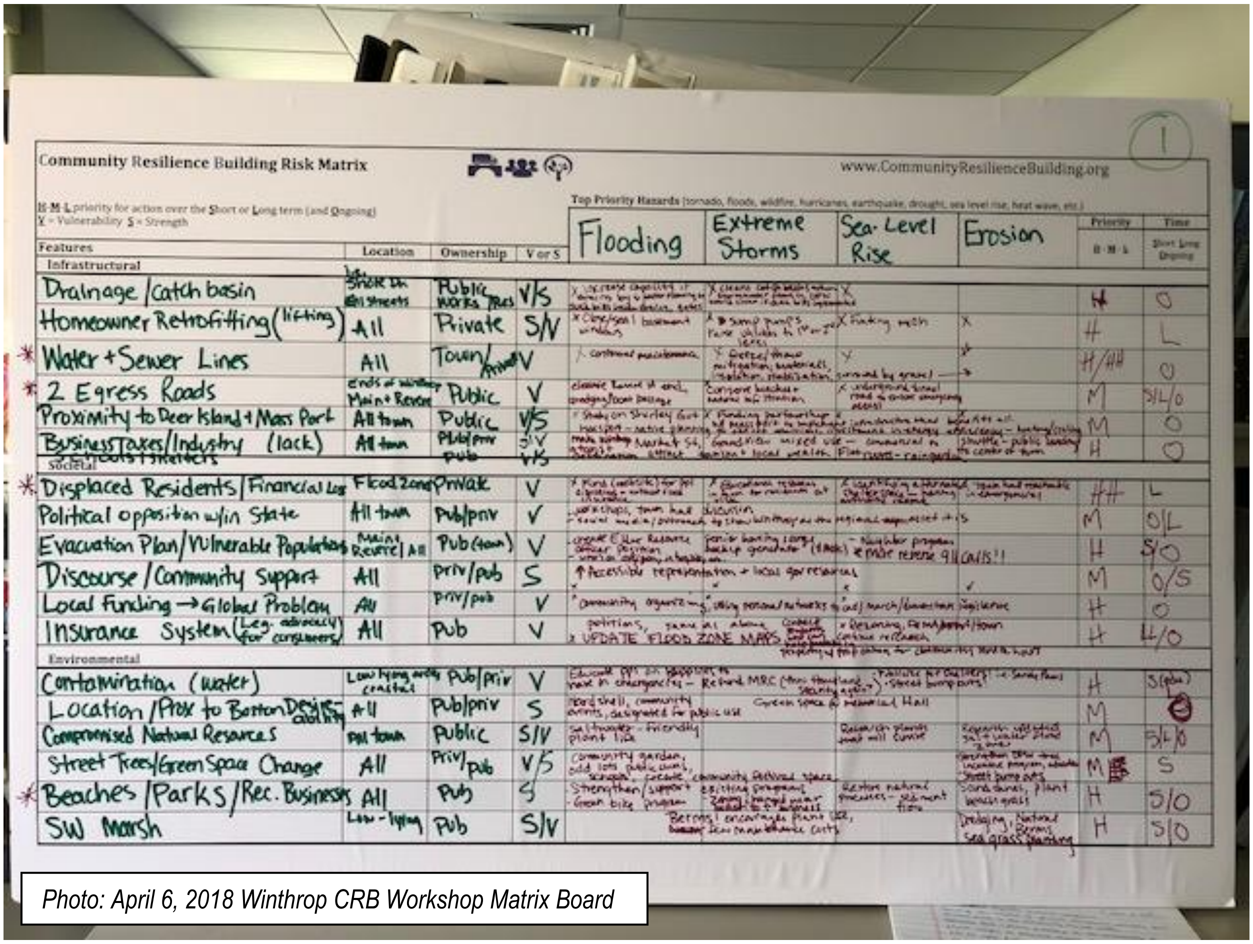


Photo: April 6, 2018 Winthrop CRB Workshop Matrix Board

3. RECOMMENDATIONS TO IMPROVE WINTHROP'S RESILIENCY

Improving Winthrop's resiliency was discussed by each individual group at the CRB based on the natural hazards, strengths, vulnerabilities and actions that they defined. At the end of the CRB workshop, each group presented their findings on key actions the community should focus on to improve overall resiliency and they were asked to identify their top three. Upon completion of each group's presentation, each attendee was given six dots to identify of all the key actions each group mentioned, which is the most critical/most important for the community. **Table 3-1** is a summary of the dot exercise.

Table 3-1: Top Six Recommendations to Improve Resiliency

Rank	Action	Notes
1	Sewer & Drainage Infrastructure	Clean, maintain and upgrade (particularly in the Town Center and low-lying areas) sewer and drainage infrastructure. Seek funding for repair and replacement, design additional storage capacity and modify bylaws and incentives that would support improved conditions for projects. Work would also include flood control projects.
2	Maintain, Replace, Upgrade Seawalls	Various existing infrastructure is in place throughout Winthrop and is in need of repair and upgrade.
3	Natural and Green Infrastructure Solutions, Low Impact Development	To support or enhance the functioning of seawalls and the shoreline as a barrier and for improved stormwater management. Work would also include flood control projects.
4	Develop or redevelop a new public safety building (police, fire, ambulance)	This includes finding a site, designing the building, securing funding and completing construction of a new facility.
5	Maintain and protect Belle Isle Marsh, Coughlin Park and beaches as assets to the community for both recreation and resiliency support.	Work for areas of the community that act as natural barriers includes dune enhancement, plantings, berms, etc.
6	Identify funding for projects to increase resilience	This includes further developing the tax base to increase revenue in the community and securing the money along with leveraging local resources and representatives to seek out and secure funding for Winthrop.

Resiliency actions that were in the top three for the groups when they reported out but did not receive the most votes include:

- Development of an Evacuation and/or Shelter In Place Plan to be better prepared for storm events. This would include consideration of food, a formal evacuation plan, multi-phase shelter strategy, emergency response and emergency communication.

- Development of a culvert ID owner and repair program where someone would be assigned to monitoring the functioning of culverts and informing the Town of any potential needed repairs.

The following are additional recommendations for the Town of Winthrop generated by the CRB Workshop participants organized from highest to lowest priority.

Highest Priority

- Develop and implement an Evacuation Plan and Shelter In Place Plan – this includes bridge and tunnel routes and coordinating with MWRA and Deer Island. This plan would include a discussion of where charging, warming and cooling stations in Winthrop are located. Reevaluate Winthrop's current emergency communication and improve the plan. Need to include emergency information in multiple languages. Consideration should be given to having Town Hall be reachable during an emergency. There is a need to publicize pet shelters and where to get emergency supplies.
- Evaluate emergency power during emergencies and make sure the Emergency Operations Center, Beach Fire Station and Council on Aging can all function.
- Evaluate back up power for elderly housing and confirm shelter in place plans for these locations.
- Update building codes so utilities are built above flooding levels and also encourage the planting of living trees and vegetation to support resiliency.
- Evaluate the need for stormwater pump stations at various locations throughout Town that would improve flooding conditions.
- Develop a Master Plan for the Town and incorporate building code and zoning.
- Complete the MVP Planning process and apply for MVP Action Grants.
- Define low lying areas of the Town that would benefit from mobile pumps during storm events and proactively position them.
- Evaluate manhole covers protecting underground utilities and floodproof if necessary.
- Support homeowners to retrofit their properties to better withstand storm events including flooding. Educate homeowners about potential funding support. This could include developing a website for people who have been displaced or do not have flood insurance. Monitor additional changes to FEMA Floodplain maps and proactively communicate about this. Offer incentives to homeowners who desire to make improvements either through community grants, low interest loans or tax incentives.
- Relocate key community functions out of floodplains and consider moving utilities or modifying utilities to better allow for their function during storm events.
- Increase and expand the Town's capacity to seek out and secure funding sources for projects and action item implementation.
- Seek to enhance and develop a better relationship with Deer Island Treatment Plant and MWRA. Participate in climate change and emergency planning discussions with these two organizations.
- Support the Conservation Commission and undertake more education and outreach to local homeowners to build their awareness for accountability of their property during storm events and flooding.
- Use message boards at key locations to inform people about the potential for flooding. Purchase or fund the purchase of these if needed.

- Develop a culvert program that identifies volunteer ownership of the structure and create a plan to decrease flooding.
- Designate neighborhood captains to know and understand who may need help in their designated area during an emergency. Where vulnerable people are identified, indicate any special needs they may have (medication, power for oxygen) and make sure they are prioritized for evacuation or storm assistance.
- To support Winthrop's business and help the community be more economically resilient, make the Town a tourist destination through marketing and attracting visitors. Support more mixed use and commercial development. Offer a shuttle from the public landing to the center of town.
- Concrete revetment on Deer Island that causes flooding needs attention from the MWRA.
- Need a seawall solution for Pico Avenue and elsewhere in Town that would improve existing conditions and help mitigation flood impacts and damage.
- Investigate the use of Yacht Clubs and Marinas during emergencies and ask them to open to non-members.
- Raise public awareness about electrical currents during flooding events and teach them how to shut off circuit breakers.

Moderate Priority

- At school and shelter locations, evaluate and maintain renewable power sources (solar, batteries) so that these community resources can function during emergencies or natural hazard events.
- Stockpile food and medical supplies like water and dry goods to support any shelter in place plans Winthrop develops should the community become isolated.
- Focus on smart Harbor Development and Management and include Low Impact Development techniques and environmentally friendly yacht clubs and marinas. Leverage Harbor Management Plan.
- Analyze past 911 data to pinpoint historic calls and more specifically how Winthrop will respond and where during storm events. Work will include proactive measures/advanced planning.
- Develop ability to mobilize a special marine rescue unit with necessary boats and equipment.
- Conduct regionalized service discussions for evacuation coordination and emergency response.
- Consider elevating Revere Street for boat passage.
- Investigate the potential of an underground tunnel for egress to allow people to evacuate Winthrop if needed.
- Address perceived politics of Winthrop not being a regional asset by having workshops and Town Hall style discussions to show Winthrop as the asset that it is. Use of social media and other outreach platforms could support this effort.
- Address community discourse by increasing local government resources and accessibility to staff and representatives.

- Research and understand the best type of salt water vegetation that would benefit the community and the existing natural resources and seek to incorporate this where it makes sense.
- Develop a hazardous waste collection program that would allow people to dispose of hazardous waste safely and more regularly.

Lower Priority

- Maintain and advertise the Reverse 911 system.
- Maintain, update and enforce the Town's regulations for property maintenance at Yacht Clubs and Marina Buildings.
- Maintain and support the local health center on Route 145 so that it can continue to provide services during natural hazard events.
- Plant trees and maintain condition of town parks, cemeteries and the golf course.
- Conduct an erosion feasibility study for the Water Tower location to determine any potential future issues.
- Engage youth in emergency management and have them help increase awareness and participation through training.

3.1 CRB Workshop Project Team: Organization and Role

Town of Winthrop, MA
Joseph Domelowicz, Assistant Town Manager | Lead Project Manager for MVP/CRB
Laurisa Wojcik | Support
Kara Campbell | Small Group Facilitator

Woodard & Curran
Mary McCrann, AICP | Lead Facilitator
Michael Hansen, PE, CFM | Small Group Facilitator

The Nature Conservancy
Sara Burns | Presenter & Small Group Facilitator

MassAudubon
Stefanie Covino | Presenter & Small Group Facilitator
Ariel Maiorano | Small Group Facilitator

APPENDIX A: EVENT ANNOUNCEMENT, AGENDA & SIGN-IN SHEETS

MUNICIPAL VULNERABILITY PREPAREDNESS
KICK-OFF MEETING
TOWN OF WINTHROP, MA
MARCH 6, 2018 | 10:00AM
SIGN IN SHEET

	Name	Email
1.	Mary McCrann, Woodard + Curran	mmccrann@woodardcurran.com
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Winthrop, MA

Community Resilience Building Workshop

When: Friday, April 6, 2018 | Time: 8am to 4pm

Where: MWRA Training Room on Deer Island

The Town of Winthrop received funding from the Executive Office of Energy and Environmental Affairs to complete a Community Resilience Building Workshop. Given previous and ongoing events like the January and March coastal storm events, like other Massachusetts communities, Winthrop now finds itself in a new era of more unpredictable and severe weather that can potentially cause more damage to our community. We are working on a Municipal Vulnerability Preparedness project that will involve an 8 hour workshop which must include input from community members. **Please consider participating!**

We will be providing breakfast and lunch to those who participate. If you are interested please contact the Town Manager's office at (617) 846-1705 or townmanageroffice@town.winthrop.ma.us by March 30th to pre-register or to receive more information on this program. **Space is limited so please sign up today!**

Please contact Terence Delehanty, Town Manager if you have any questions at townmanageroffice@town.winthrop.ma.us

WOODARD &CURRAN

Community Resiliency Building Workshop

Friday | April 6, 2018

MWRA Training Room at Deer Island, Winthrop, MA

8:00am – 4:00pm

WORKSHOP OBJECTIVES

- Define extreme weather and natural and climate related hazards impacting Winthrop,
- Identify existing and future vulnerabilities and strengths,
- Develop and prioritize actions for the community and broader stakeholder networks, and
- Identify opportunities for the community to advance actions to reduce risks and build resilience.

WORKSHOP AGENDA

7:30am – 8:00am .... Registration

8:00am – 8:30am .... Welcome & Overview (Town Manager and Assistant Town Manager)

8:30am – 9:00am ....Community Resilience Building Workshop – Why Are We Here? (Woodard & Curran)

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12:30pm – 1:30pm............Lunch!

1:30pm – 2:00pm..............Natural Infrastructure Solutions (Sara Burns, Nature Conservancy)

2:00pm – 3:30pm ....Identify and Prioritize Community Actions

3:30pm – 4:00pm ....CRB Workshop Recap and Wrap Up

Thank you for participating in Winthrop's Community Resiliency Building Workshop!

53 total attendees!

Community Resilience Building Workshop
April 6th at the MWRA

	Name		Email
1	Ariel Maiorano		amaiorano@massaudubon.org
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4	Barbara Flockhart		flockhart@verizon.net
5	Betsy Shane		betsy@winthropchamber.com
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20	Jack Dowd		jdowd622@gmail.com
21	Jesse Rosenbluth		jrosenbluth@omni-ecosystems.com
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23	Joanne Agababian	resident	jagababian@verizon.net
24	Joe Domelowicz		jdomelowicz@town.winthrop.ma.us
25	John Goodwin		jgooodwin@town.winthrop.ma.us
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60	~~Terence Delehanty~~	tdelehanty@town.winthrop.ma.us

RICHARD Profetto

Patricia Kuschel

additional attendees!

Community Resilience Building Workshop
April 6th at the MWRA

Sign In

1 ~~[illegible]~~ John Dawo
2 Paul O'Rangel – Town of Winthrop
3 Bill Harris
4 Rich Cifuni – Town of Winthrop
5 Fred Silke – Winth Housing Auth
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APPENDIX B: COMMUNITY CHALLENGES & GOALS

COMMITMENT & INTEGRITY DRIVE RESULTS
40 Shattuck Road | Suite 110
Andover, Massachusetts 01810
www.woodardcurran.com
T 866.702.6371
T 978.557.8150
F 978.557.7948

MEMORANDUM

TO: Joe Domelowicz, Assistant Town Manager

FROM: Mary McCrann, AICP

DATE: April 27, 2018

RE: Winthrop CRB – Community Challenges & Goals

TABLE 1

What are Winthrop's biggest challenges?

- The community is in need of a plan to prevent chronic flooding which seems to be the new normal.
- Where to find the funding to implement short/long term solutions.
- Flood map lines and flood insurance requirements.
- Infrastructure update and replacement for stormwater drainage.
- Coastal protection on the ocean side and bayside of town.
- Increase funds for public safety and public works.
- Flooding on Morton Street side of town and inclusion in plan to stop erosion and damage to property.
- Vulnerable constituents – seniors, disabled, poor families need to be considered and valued even though they don't pay high taxes. They need a voice.
- Drainage, sewer line replacement to be fair and equitable.
- Question about why people who live in upland areas of the town/state pay for damage caused to people's property who live in a flood zone.
- Lack of money. Winthrop is a great community, great people, but it can't afford to fiscally support many of the needed programs. Regarding emergency preparedness… concern over frail citizens, particularly those who are on oxygen or require electricity for medical purposes. Concern with the limited ability to get around town during emergencies. People need to do a better job of clearing their own areas.
- Parking/getting cars off the street.
- Flooding!
- The Town does not have a youth center.
- Flood control and recovery.
- Communication – town-wide… radio frequency similar to highways, not all homes have WCAT
- Additional barriers are flood control and avoiding permits
- Portable pumps and a sand bag station
- Military surplus vehicles
- High water
- Funding, grants, loans
- Drainage
- Seawall in marsh – move our heat and light funding money to do this.
- Helping people get back in their homes and saving our own homes.
- Army Corps of Engineers
- Flooding on Morton Street at Belle Isle Marsh – Pleasant Park Road. 10 feet of soil on Morton Street eroded into the marsh and bay. Channels are clogged with mud, etc. Need for dredging? Deepening center of the bay off the marsh?

What are your goals for the day?

- To arrive at a more clear picture of how I would like to become more involved with action items toward solutions.
- Gather insight into concerns and proposed improvements from other Winthrop citizens.
- To be the voice of vulnerable seniors who feel irrelevant and not valued because of money or disability.
- Information gathering
- Triage in order of effectiveness.
- Can waterway by Belle Isle Marsh be dredged? Soil eroded in recent storms… mud flats.
- Find resources to get my community back to the way it was.

TABLE 2

What are Winthrop's biggest challenges?

- Engaging the community
- Science/education
- Understanding short and long term trade offs of nature based solutions.
- Create inclusive action plan.
- Winthrop is the #1 most vulnerable community in MA to sea level rise/flooding.
- Winthrop is broke.
- Winthrop is not perceived as a municipality of regional importance.
- Winthrop is geographically isolated and lacks political and municipal accountability. Can't afford even basic maintenance/state of repair.
- Infrastructure/streets and maintain/improve
- Safety and protection of waterfront properties
- **Emergency Evacuation Plan** for Point Shirley Residents
- Flooding throughout the town
- Police security 24/7 on Deer Island – prohibiting public use after sundown.
- Add sand dunes at Yerrill Beach
- Limited ability to come and go in and out of town
- Repeated flooding of some homes in big storms
- Airport pollution
- Most vulnerable community to storms
- Would like to see Senators support for federal funding. Get Senator Warren to visit Winthrop or Governor baker!
- Use of natural stabilization for Coughlin Park erosion.
- Flooding and not enough resources (money, equipment)
- Evacuation routes – you can be stranded for hours in certain parts of town.
- Power outages
- Communication from officials
- Get state representative to exercise leadership (DeLeo) in the state house to address climate change mitigation and adaptation
- Coastal flooding

What are your goals for the day?

- Understand the community's understanding/knowledge of climate change and nature based solutions
- Understand work accomplished to date
- Share our communities strengths and weaknesses to better inform the action plan.
- Identify funding opportunities.
- Increase local political will and leadership.
- Community engagement
- Identify target priorities
- Better understanding of how to help with emergency preparedness
- Communicate concerns regarding flood insurance
- Communicate concerns regarding Grand View rip rap
- Communicate concerns over being cut off/pump outs/senior neighbor impacts from storm events
- Communicate concerns about the disconnect/inability to protect personal home and rip rap on property
- Assistance with seasonal berms – presently berms slowly erode and we need money and equipment to keep up.
- Seawall repair and building
- Natural dunes to minimize flooding
- Educated interpretation of future flood potential and ocean levels!
- Better understand how Winthrop is being affected by climate change
- Network with community members and leaders and connect with people who wish to take action to influence Representative DeLeo
- To gain knowledge and insight to help the community
- Want to understand and be able to communicate efforts to date to the community, funding partners and developers/businesses

TABLE 3

What are Winthrop's biggest challenges?

- Would like to see the storm drainage system updates, repaired and maintained
- Infrastructure
- Coastal flooding/erosion
- Implementing productive change
- Low lying land
- Surrounded by the ocean
- Winthrop is essentially an island with only two ways in or out
- On the coast with rest of the state less concerned than coastal communities about climate change
- Over development
- Infrastructure including drainage
- Upgrade the sewer system (street, storm drains) in the low lying areas of town with an upgrade of pumping stations in those areas

What are your goals for the day?

- To make the town aware of what actually happens during a storm… what I have personally done (built a seawall) and what needs to be done to further remedy the situation.
- To create a group of ideas that will lead to an actionable plan, allowing for funding to execute the plan.
- Learn about legislative actions and potential money

- Learn more about Winthrop's challenges
- Express concerns about severe impacts to Winthrop courtesy of climate change
- Better understand how to secure my property
- How the neighborhood can better partner in emergencies
- Better understand the future plans for our town.

TABLE 4

What are Winthrop's biggest challenges?

- Repair of seawalls – relaxing ACOE and DEP/CZM rules for emergencies
- Protect environmental concerns
- Drainage
- Maintain and build berms
- Looking at temperature change from a facilities standpoint
- The need for EMS systems and equipment – how an we better insulate our facilities to sustain preferred temperatures for longer periods. Change power sources or have multi fuel options
- Need for beach nourishment involving the movement of sand from Point Shirley
- Weather changes and flood mitigation
- Insurance coverage and affordability of premiums
- Funding to make building improvements to be better prepared for severe storms
- Drainage, infrastructure, erosion
- Figure out the future of homes in low lying areas
- Improving parks
- Improvement water, sewer and stormwater
- Education
- Investment in trees and their maintenance
- Funding, storm surge, flooding, aging infrastructure, drainage, sand
- Located on the ocean – limited to two egresses in and out of town
- Need for an evacuation plan from extreme weather or an incident at the airport or Deer Island
- Isolation of the community
- Funding
- Storm surge as sea level rises
- Seawall protection
- Flooding
- How does the community reduce carbon footprint and increase energy efficiency
- Public safety issue of coastal flooding and preparing for future storms now that we have seen the impacts three times in 2018
- Getting enough money for sand removal, wall building without overrides and burdening people
- Drainage (aged system, reliant on tide cycles, insufficient capacity)
- Water and sewer systems (funding upgrades, aged systems)
- Coastal resiliency (erosion, unable to extend seawalls, maintenance costs to existing)
- Rising sea levels
- Isolation during storms
- Aging infrastructure
- Limited budget

What are your goals for the day?

- Learn more about long term effects of extreme weather and the impact to Winthrop
- What improvements and funding solutions can be considered to protect Town buildings from severe weather conditions and costly repairs?
- Support the Governor's energy star home rating system
- Funding incentives for solar and efficiency
- Adding wave energy buoys and barriers
- Removal and relocation of sand on Yirrell Beach and reinforce walls along the harbor
- Save Coughlin Park
- Be given the ability to replace sand from private property back to where it came from
- To heighten awareness
- To contribute solutions

TABLE 5

What are Winthrop's biggest challenges?

- Please keep Winthrop a cute, small town and not an overcrowded City.
- Building coastal infrastructure to mitigate flooding, high tides and damage as a results of storms and rising tides.
- Improve drainage system to expedite flood recession, reduce ground table levels and minimize road/street damage.
- Implement a plan for future disaster readiness, awareness and safety.
- Fix remedy problem areas
- Need more help and collaboration with MWRA and Airport where Winthrop protects them.
- Repair erosion and maintain
- Isolation during storms – no help
- Building a seawall at Frances Street/Pico Area (wooden wall with slats as of now which stops nothing)
- Help in restoring homes that were affected in the Frances Street/Pico area.
- Better preparation in that area including sandbags, etc by the Town for future coastal storms until a wall is built.
- Better flow of the water when it comes over the walls/drainage.
- Actually putting these plans into action.
- Lack of education of importance of vegetation in retaining floodwater.
- Need more nature-based infrastructure solutions instead of hard seawalls and gray infrastructure.
- Flooding, wind
- Golf course sinking
- Business development
- Ingleside Park flooding
- Town Center development
- Recreation, youth, family, senior
- Harbor Walk
- Golf Club/Course sinking
- Fortify Winthrop Beach, but don't ruin use

What are your goals for the day?

- Learn about where flood zones are

- Learn about coastal resiliency – a good outcome is a decision to not build in flood zones (could new construction at Suffolk Downs cause more flooding in Winthrop Marsh?)
- Realistic report identifying Winthrop's MVP in order to obtain grant money to address coastal infrastructure
- To learn and grow.
- Grants, communication, have a community go to station identified and supplied.
- Advocate for seawall at Pico Beach and close up openings.
- To see funding for damage to our homes.
- Repair erosion areas and private property erosion areas.
- Take home ideas to implement
- Develop relationships with homeowners to help them with permitting process and development (pervious pavement, green infrastructure)

TABLE 6

What are Winthrop's biggest challenges?

- Flooding
- Groundwater (Lewis Lake, Ingleside Park)
- Coastal flooding (infrastructure, aging system)
- Funding
- Economic development and growth
- Smart development
- Winthrop Beach flood prevention and protection of beach neighbors
- Public safety response at all parts of Winthrop
- Plan for public education using Cable TV and Social Media
- Plan for sea wall protection
- Not enough is being done to address climate change
- Sea level rise, especially looking at Category 4 Hurricane near Deer Island on the map
- Need innovative trash solutions (ban plastic composting, paper solutions
- Energy resilience – would like to increase battery storage capabilities for town to help longevity of emergency shelter locations for long term displacement or destruction of natural gas pipeline infrastructure.
- Resilient construction practices for new development being in building codes – equipment above groundwater levels, etc.
- More state assistance for residents to electrify their heating systems and implement battery storage

What are your goals for the day?

- Learn about what long term preventative changes can be set in place to ensure changed needed to be ready for future conditions.
- Gain better understanding of Winthrop's vulnerabilities
- To meet other neighbors
- Action plan
- Specific tasks ahead
- Hope to gather enough information to be a strong advocate and participate towards greater resiliency
- Better understand concerns and desires of residents and how they want the town to focus on climate mitigation.

- Push to electrify heating systems, this and residential electric battery storage capability can island homes and provide power when electric grid is down.
- Effective flood mitigation technologies for commercial buildings, pump stations, etc. A lining that rolls out over walls – can this be adapted and subsidized for homeowners to protect basements from flooding??
- New construction requirements – green/cool roofs, green space requirements/stormwater runoff maintenance/gray water reuse and rainwater collection.

APPENDIX C: COMMUNITY RESILIENCY BUILDING WORKSHOP PRESENTATIONS

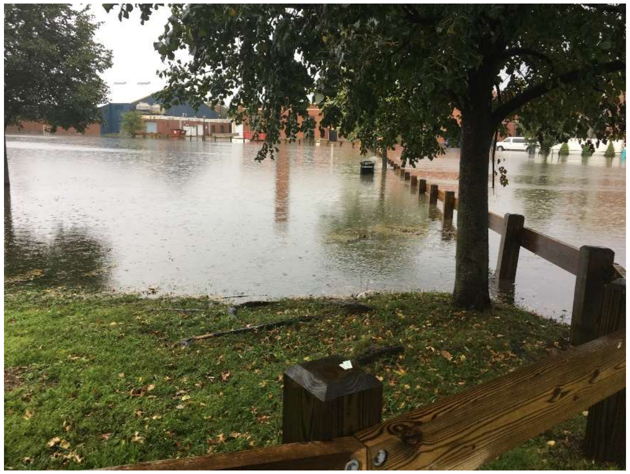
Winthrop, MA

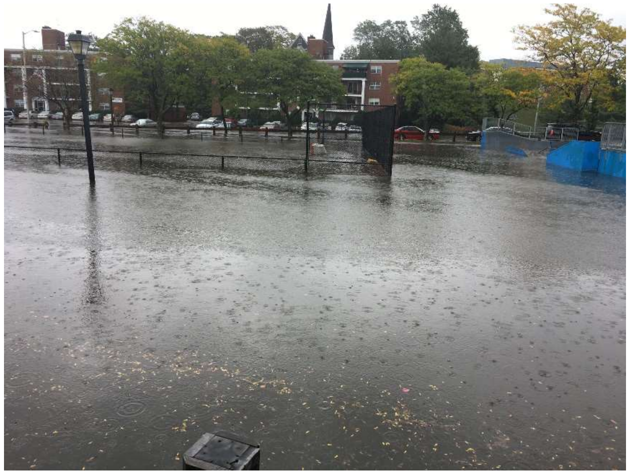
Recent Storm Event Photographs

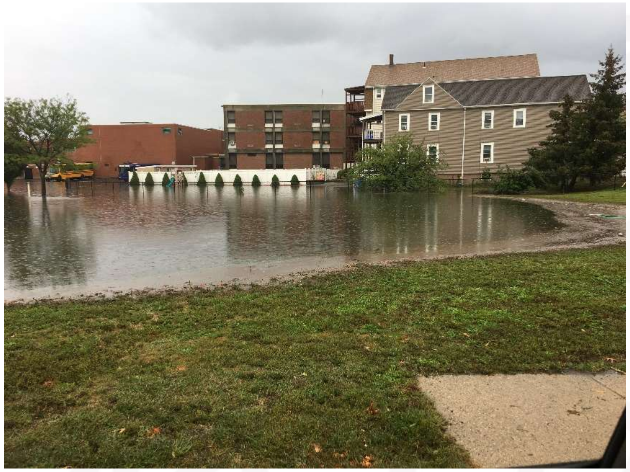
2018

WOODARD
&CURRAN

Ingleside Park







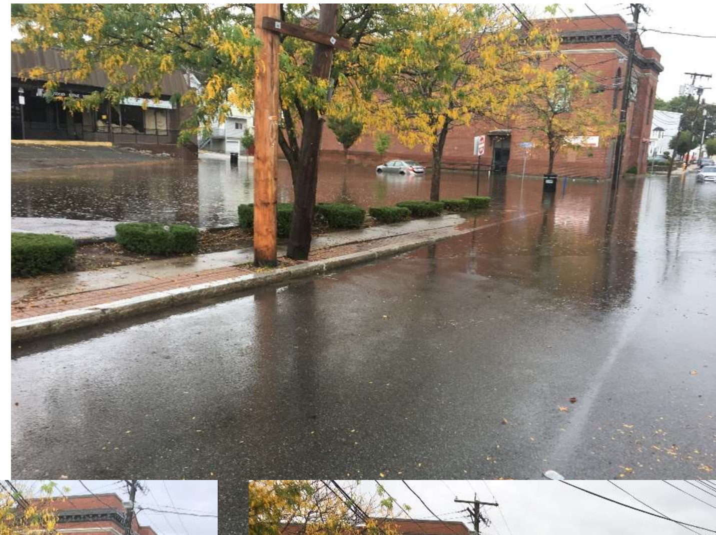
Winthrop Golf Course






Morton Street

Town Center



GOOD MORNING & WELCOME!

Winthrop Community Resiliency Building Workshop

April 6, 2018

Winthrop, MA

Community Resiliency Building Workshop

April 6, 2018

Community Resiliency Building Workshop

thank you

WOODARD
&CURRAN

Community Resiliency Building Workshop

Mass Audubon
Protecting the Nature of Massachusetts

The Nature Conservancy

Massachusetts Water Resources Authority

WOODARD & CURRAN

Agenda

- 7:30 – 8:00 | Registration
- 8:00 – 8:30 | Welcome & Overview
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- 3:30 – 4:00 | CRB Workshop Recap & Wrap Up

WOODARD &CURRAN

Executive Order 569

- In September 2016, Governor Charlie Baker signed Executive Order 569, instructing state government to **provide assistance to cities and towns to complete climate change vulnerability assessments and resiliency planning**.

OFFICE OF THE GOVERNOR
COMMONWEALTH OF MASSACHUSETTS
STATE HOUSE • BOSTON, MA 02133
(617) 725-4000

SECRETARY OF STATE
REGULATIONS DIVISION
2016 SEP 16 PM 12:44

CHARLES D. BAKER
GOVERNOR

KARYN E. POLITO
LIEUTENANT GOVERNOR

By His Excellency
CHARLES D. BAKER
GOVERNOR

EXECUTIVE ORDER NO. 569

ESTABLISHING AN INTEGRATED CLIMATE CHANGE STRATEGY FOR THE COMMONWEALTH

WHEREAS, climate change presents a serious threat to the environment and the Commonwealth's residents, communities, and economy;

WHEREAS, extreme weather events associated with climate change present a serious threat to public safety, and the lives and property of our residents;

WHEREAS, the Global Warming Solutions Act (the "GWSA") directs the Secretary of Energy and Environmental Affairs and the Department of Environmental Protection to take certain steps to reduce greenhouse gas emissions and prepare for the impacts of climate change, including setting statewide greenhouse gas emissions limits for 2020, 2030, 2040 and 2050;

WHEREAS, the statewide greenhouse gas emissions limit for 2020 is 25% below the 1990 level of emissions and the corresponding limit for 2050 is 80% below the 1990 level of emissions, but no interim limits have yet been set for 2030 or 2040;

WHEREAS, the Commonwealth can provide leadership by reducing its own emissions from state operations, planning and preparing for impending climate change, and enhancing the resilience of government investments;

WHEREAS, the transportation sector continues to be a significant contributor to greenhouse gas emissions in the Commonwealth, and is the only sector identified through the GWSA with a volumetric increase in greenhouse gas emissions;

WHEREAS, the generation and consumption of energy continues to be a significant contributor to greenhouse gas emissions in the Commonwealth, and there is significant potential

WOODARD & CURRAN

March 2018 Legislation

- Baker/Polito filed \$1.4B legislation to authorize investments for safeguarding municipalities from the impacts of climate change, protecting environmental resources, and investing in communities.
- Hearing on the Bond Bill held on April 3rd to see if there is enough money available.

CHARLIE BAKER
Governor

KARYN POLITO
Lt. Governor

FOR IMMEDIATE RELEASE:
March 15, 2018

CONTACT
Brendan Moss, Governor's Office
brendan.c.moss@state.ma.us
Katie Gronendyke, Energy and Environmental Affairs
katie.gronendyke@state.ma.us

Baker-Polito Administration Files Legislation Committing Over \$1.4 Billion to Climate Change, Environmental Protection, and Community Investments

Projects Will Continue the Baker-Polito Administration's Strong Leadership on Climate Change Adaptation and Mitigation, and Environmental Stewardship

WOODARD & CURRAN

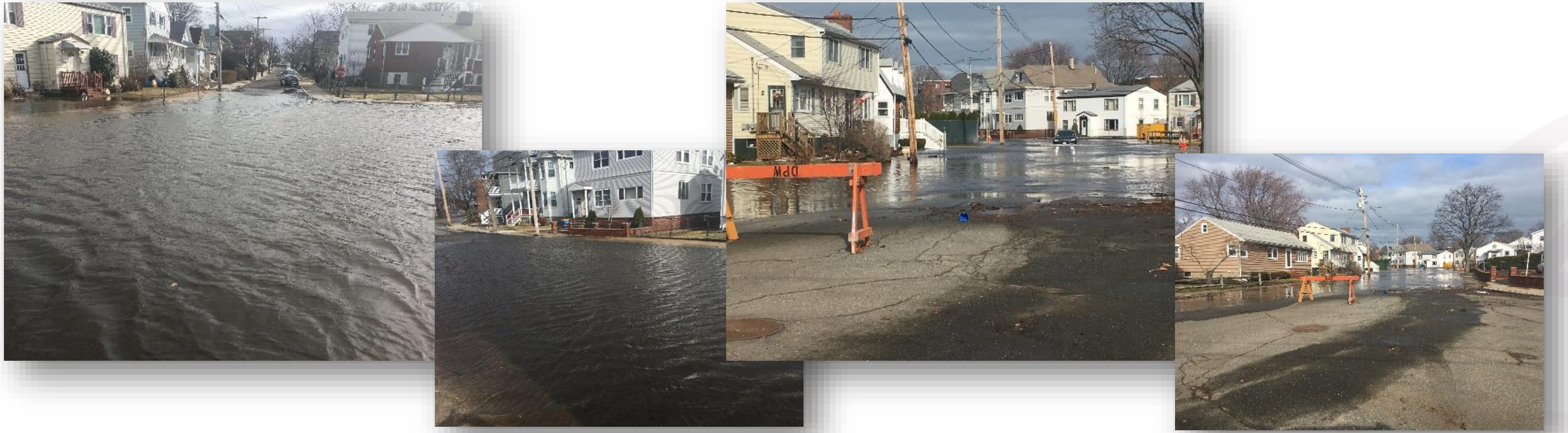
Municipal Vulnerability Preparedness (MVP) Grant Program

- The MVP grant program provides support for cities and towns in Massachusetts to begin or continue the process of planning for resiliency.
- The state awards communities with funding to complete vulnerability assessments and develop action-oriented resiliency plans.

WOODARD
&CURRAN

Municipal Vulnerability Preparedness (MVP) Grant Program

- The program helps communities achieve the following objectives:
  - Define extreme weather and natural and climate related hazards
  - Identify existing and future vulnerabilities and strengths
  - Develop and prioritize actions for the community
  - Identify opportunities to take action to reduce risk and build resilience



WOODARD &CURRAN

Winthrop, MA

Photo: Ingleside Park (2017)

Photo: January 2018

Photo: Banks at

Photo: Pico Avenue (March 2018)

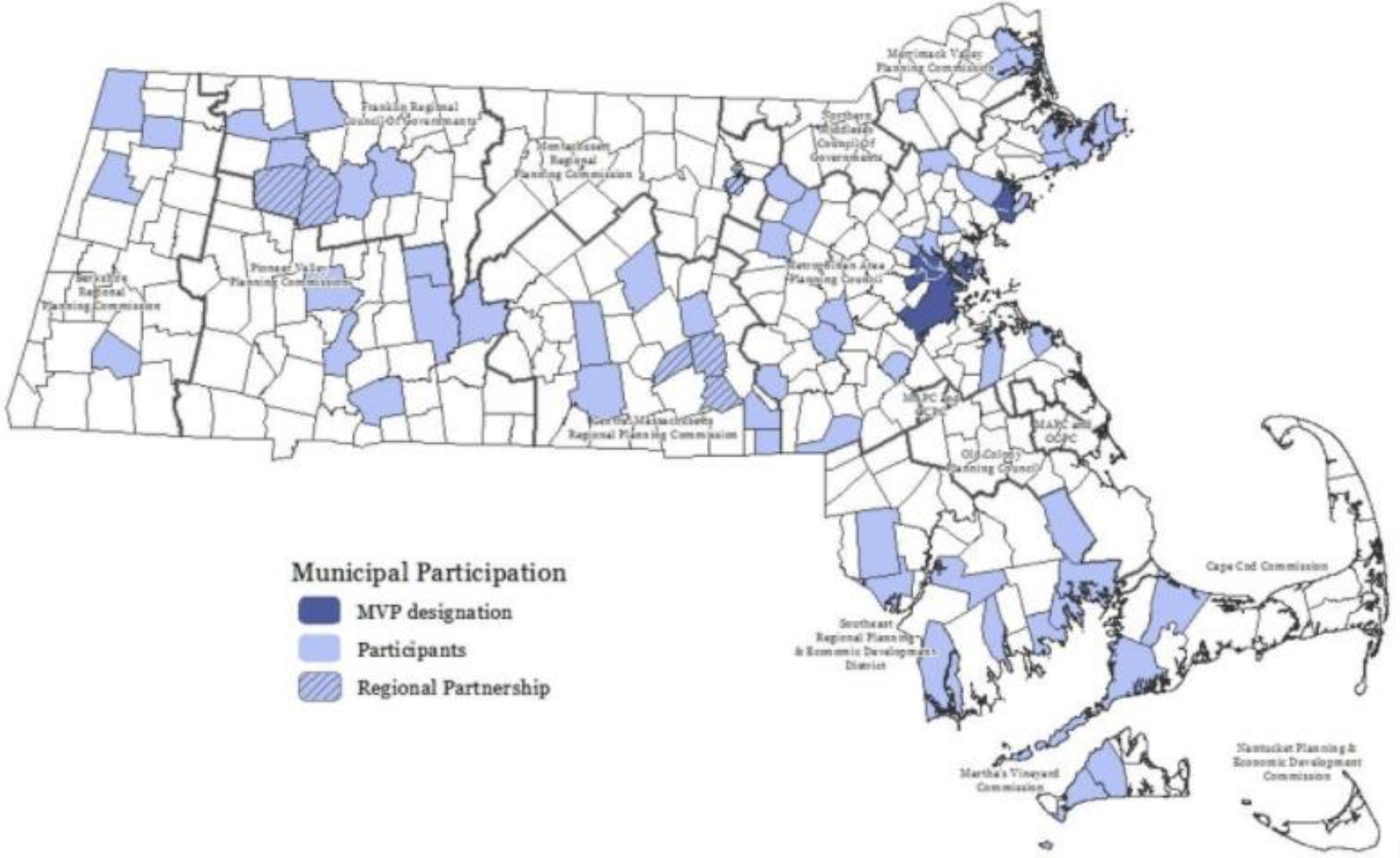
Photo: Morton at Banks

WOODARD &CURRAN

Municipal Vulnerability Preparedness (MVP) Grant Program

- Communities who complete the MVP program become certified as an MVP community and are eligible for potential follow-up grant funding and other opportunities.

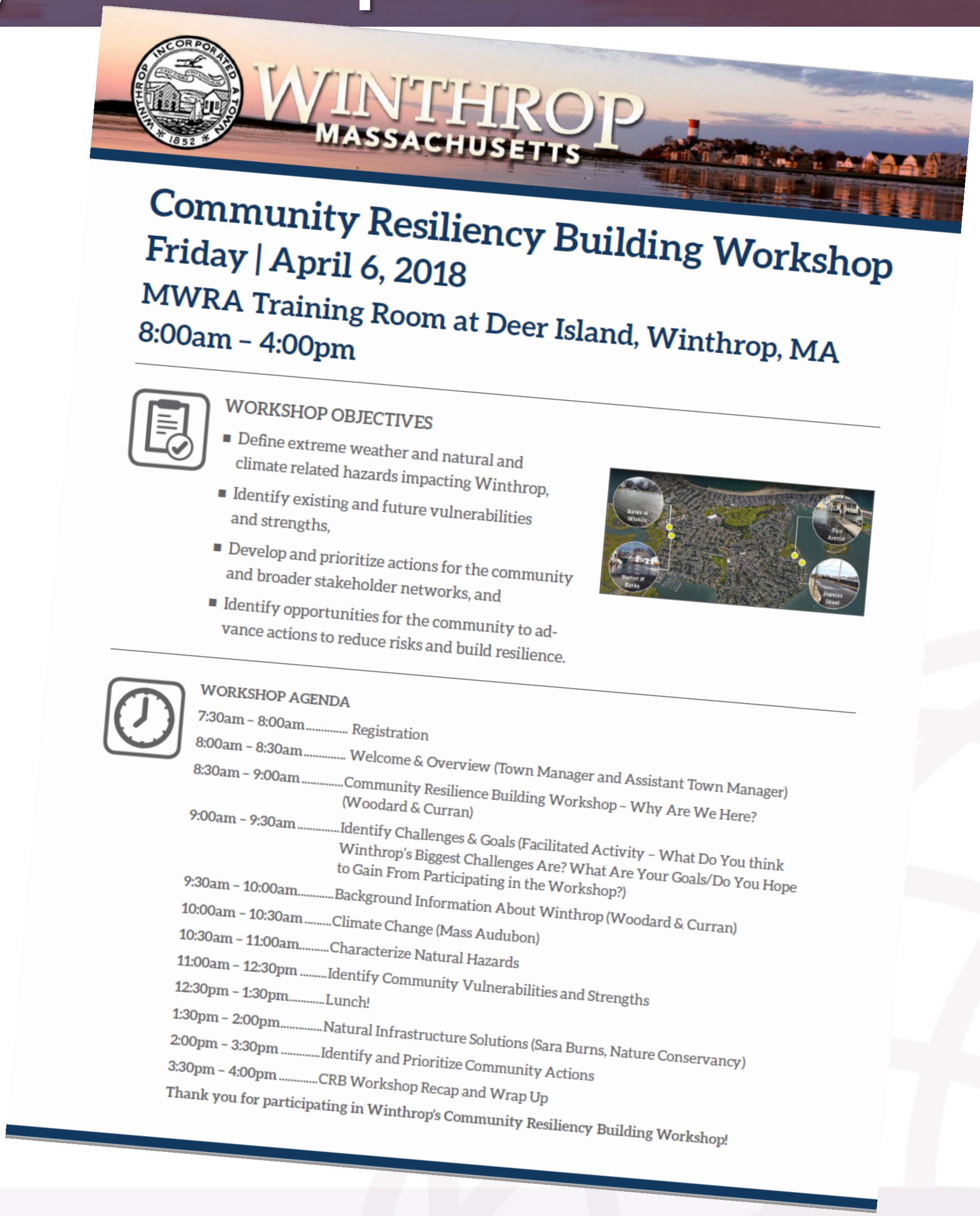
What Other Communities Are in the MVP Program?



WOODARD & CURRAN

Community Resiliency Building Workshop

- As part of the MVP program, participating communities MUST complete a Community Resiliency Building Workshop!
- Upon completion of the workshop, a summary report will be submitted to EEA.
- Winthrop will continue to use this guiding report to reinforce future planning and action item implementation.



WINTHROP MASSACHUSETTS

INCORPORATED A TOWN 1852

Community Resiliency Building Workshop

Friday | April 6, 2018

MWRA Training Room at Deer Island, Winthrop, MA

8:00am – 4:00pm

WORKSHOP OBJECTIVES

- Define extreme weather and natural and climate related hazards impacting Winthrop,
- Identify existing and future vulnerabilities and strengths,
- Develop and prioritize actions for the community and broader stakeholder networks, and
- Identify opportunities for the community to advance actions to reduce risks and build resilience.

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1:30pm – 2:00pm .... Natural Infrastructure Solutions (Sara Burns, Nature Conservancy)

2:00pm – 3:30pm .... Identify and Prioritize Community Actions

3:30pm – 4:00pm .... CRB Workshop Recap and Wrap Up

Thank you for participating in Winthrop's Community Resiliency Building Workshop!

WOODARD & CURRAN

Two Questions for You!

The goal of the workshop is to listen and learn from attendees regarding your thoughts and ideas for meeting workshop objectives!

- **What are Winthrop's biggest challenges?**
  - Think infrastructure, societal, environment
- **What are your goals for the day and do you hope to gain from your participation in the workshop today?**

Agenda

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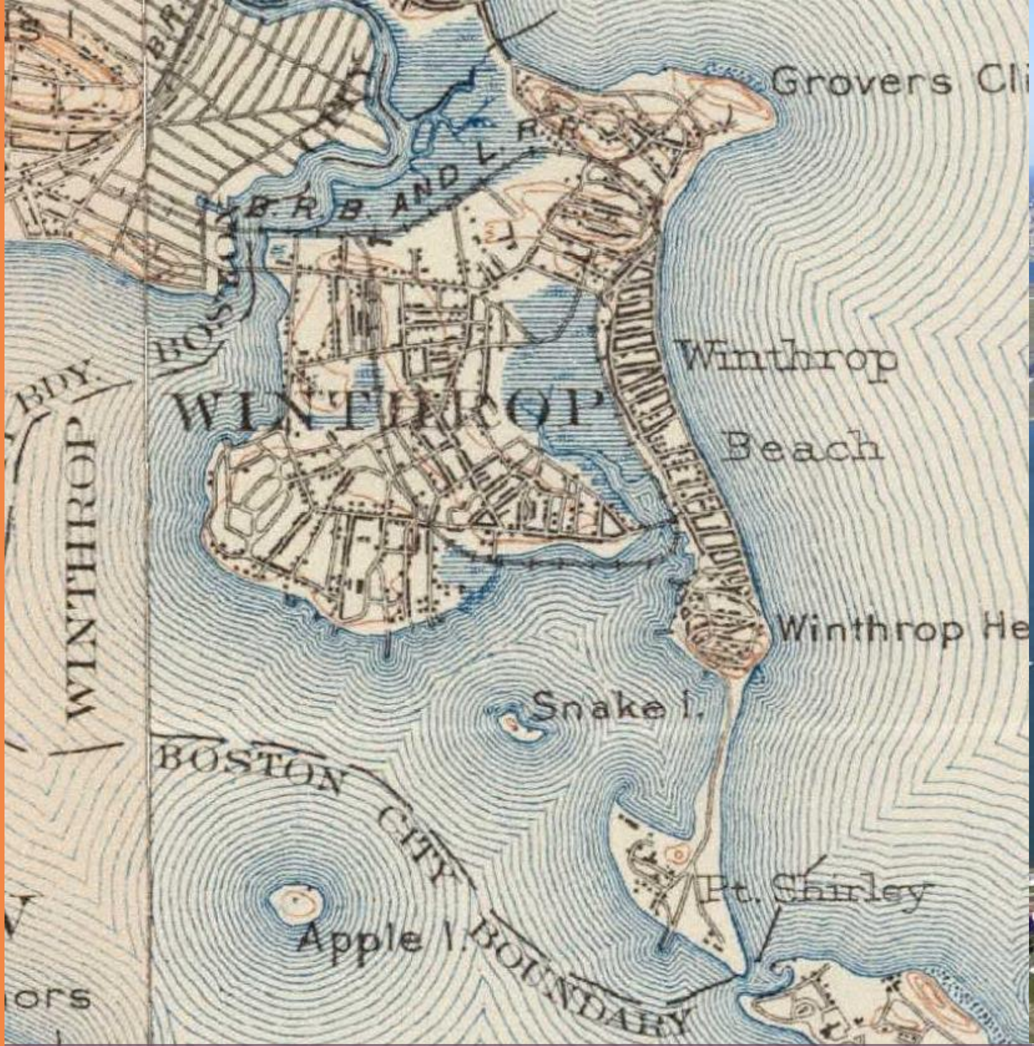
WOODARD & CURRAN

Winthrop, MA

Community Resiliency Building Workshop

April 6, 2018

WOODARD & CURRAN



Winthrop, MA

Background Information

April 6, 2018

WOODARD & CURRAN

Agenda

- **7:30 – 8:00 | Registration**
- **8:00 – 8:30 | Welcome & Overview**
- **8:30 – 9:00 | CRB Workshop Why Are We Here?**
- **9:00 – 9:30 | Identify Challenges & Goals**
- **9:30 – 10:00 | Background Information About Winthrop**
- 10:00 – 10:30 | Climate Change **(Mass Audubon)**
- 10:30 – 11:00 | Characterize Natural Hazards
- 11:00 – 12:30 | Identify Community Vulnerabilities & Strengths
- **12:30 – 1:30 | LUNCH!**
- 1:30 – 2:00 | Natural Infrastructure Solutions **(The Nature Conservancy)**
- 2:00 – 3:30 | Identify & Prioritize Community Actions
- 3:30 – 4:00 | CRB Workshop Recap & Wrap Up

WOODARD & CURRAN

Background Information

- Population: 17,497 (as of 2010 Census)
- Located on a peninsula
- 1.6 square miles | 7 mile shoreline
- Connected to Revere by a narrow piece of land and to East Boston by a bridge over the Belle Isle Marsh
- Densely populated
- One of the oldest communities in the United States (settled in 1630)

WOODARD &CURRAN

Winthrop Age Distribution

- Median Age in 2010: 43.7

Table 3 Age Distribution: 2000 and 2010				
Age Group	**2000 Number**	**2000 Percentage**	**2010 Number**	**2010 Percentage**
Under 5 years	906	4.95	886	5.06
5 to 9 years	947	5.17	850	4.85
10 to 14 years	1,020	5.57	871	4.97
15 to 19 years	900	4.92	893	5.10
20 to 24 years	970	5.30	894	5.10
25 to 34 years	2,820	15.41	2,150	12.27
35 to 44 years	3,248	17.75	2,551	14.56
45 to 54 years	2,697	14.74	2,974	16.98
55 to 59 years	1,029	5.62	1,300	7.42
60 to 64 years	742	4.05	1,234	7.04
65 to 74 years	1,443	7.88	1,518	8.67
75 to 84 years	1,140	6.23	987	5.63
85 years and over	441	2.41	409	2.33
Total	***18,303***	***100.00***	***17,517***	***100.00***
Source: U.S. Census				

Population Projections

- Population projected to get older
- Slight increase in age 25 – 34

Table 9
Population Projections by Age Group: 2010-2030

Age Range	2010	2020	2030	Change 2010-2020
00-04	884	896	909	+12
05-09	880	838	889	-42
10-14	978	892	905	-86
15-19	949	835	763	-114
20-24	1,109	1,043	921	-66
25-29	1,194	1,344	1,187	+150
30-34	1,120	1,280	1,222	+160
35-39	1,355	1,285	1,477	-70
40-44	1,534	1,231	1,412	-303
45-49	1,487	1,158	1,082	-329
50-54	1,479	1,383	1,115	-96
55-59	1,154	1,289	986	+135
60-64	926	1,069	952	+143
65-69	752	994	1,094	+242
70-74	607	919	1,063	+312
75-79	570	687	911	+117
80-85	505	449	687	-56
85+	642	638	731	-4

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Environmental Justice Population – English Isolation

Legend:

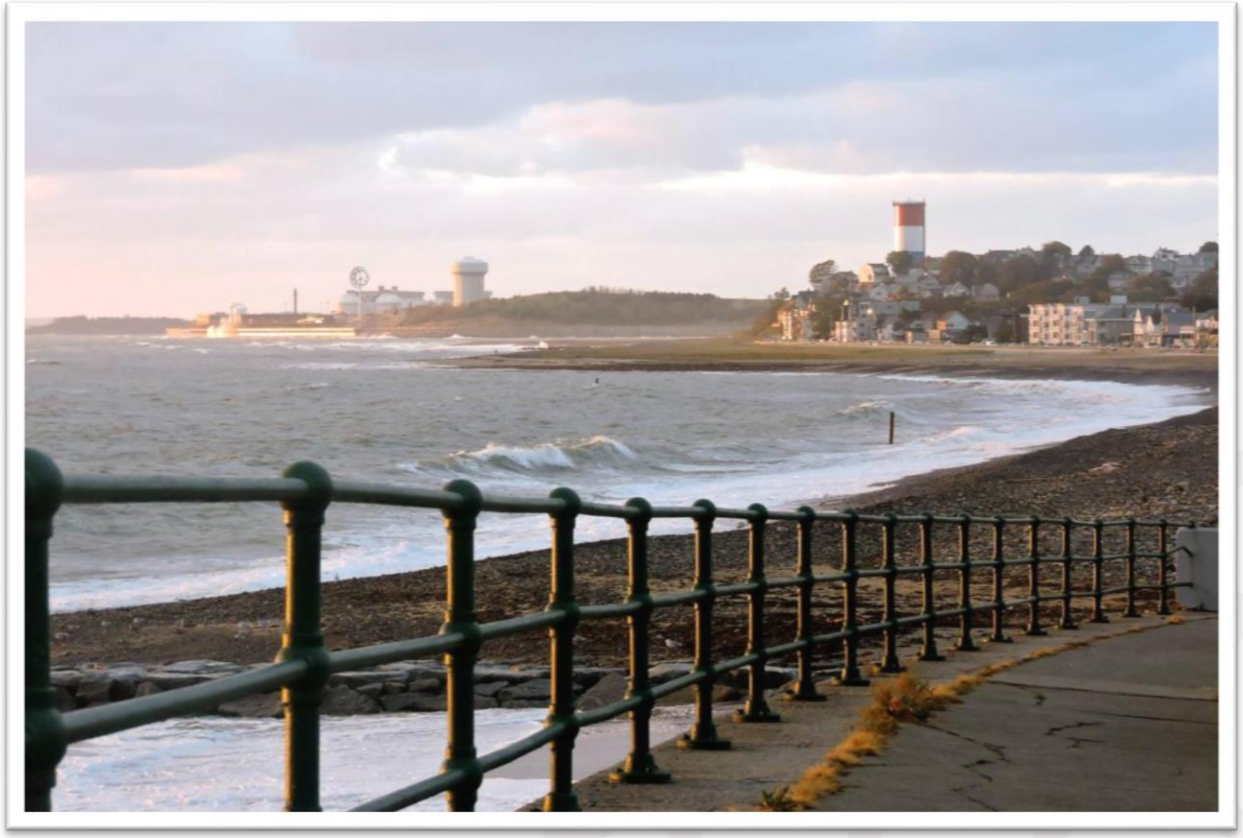
- Minority
- Income
- English Isolation
- Minority and Income
- Minority and English Isolation
- Income and English Isolation
- Minority, Income and English Isolation

Background Information

- Winthrop is the only landside connection to the Massachusetts Water Resource Authority Deer Island Wastewater Treatment Plant
- The plant removes human, household, business and industrial pollutants from wastewater that originates in homes and businesses in 43 greater Boston communities.

Transportation, Water, Sewer & Solid Waste

- Winthrop is served by State Route 145 which connects community to Revere.
- Served by bus service.
- Water is supplied by the MWRA.
  - The Town maintains an extensive distribution system.
- Sewer is Town owned and maintained – connects to MWRA interceptor and is treated at Deer Island.
- Curbside solid waste recycling contract managed by DPW.



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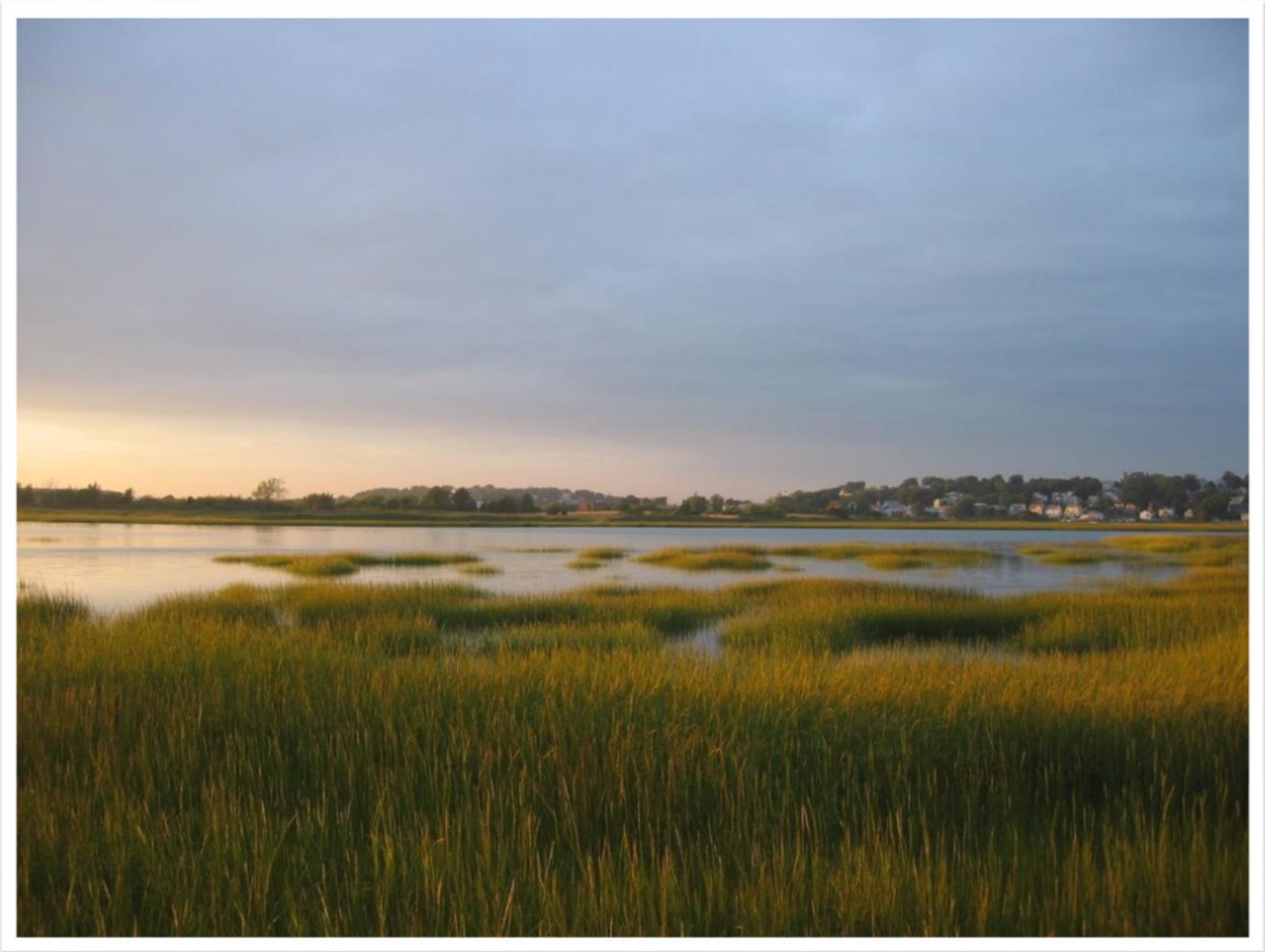
Environmental Features

- Located in Mystic River Watershed.
- Only body of surface water in town is Lewis Lake.
- Home to a portion of Belle Isle Marsh – the last remaining salt marsh in the metro Boston area.
- Major wetland areas in Town are all coastal/tidal.



Environmental/Natural Features & Parks

- Winthrop Beach
- Yirrell Beach
- Donovan's Beach
- Pico Playground & Beach
- Fisherman's Bend
- Belle Isle Marsh
- Lewis Lake/Winthrop Golf Club
- Coughlin Park
- Ingleside Park

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Severe Weather

- 16 coastal flood events between 2006 – 2014 resulting in over $3M in property damage
    - **3 coastal flood events during the first quarter of 2018!**
- 40 heavy snowfall events between 1996 – 2014
- 10 severe winter storms recorded between 1978 – 2013 – seven of which occurred after the year 2000

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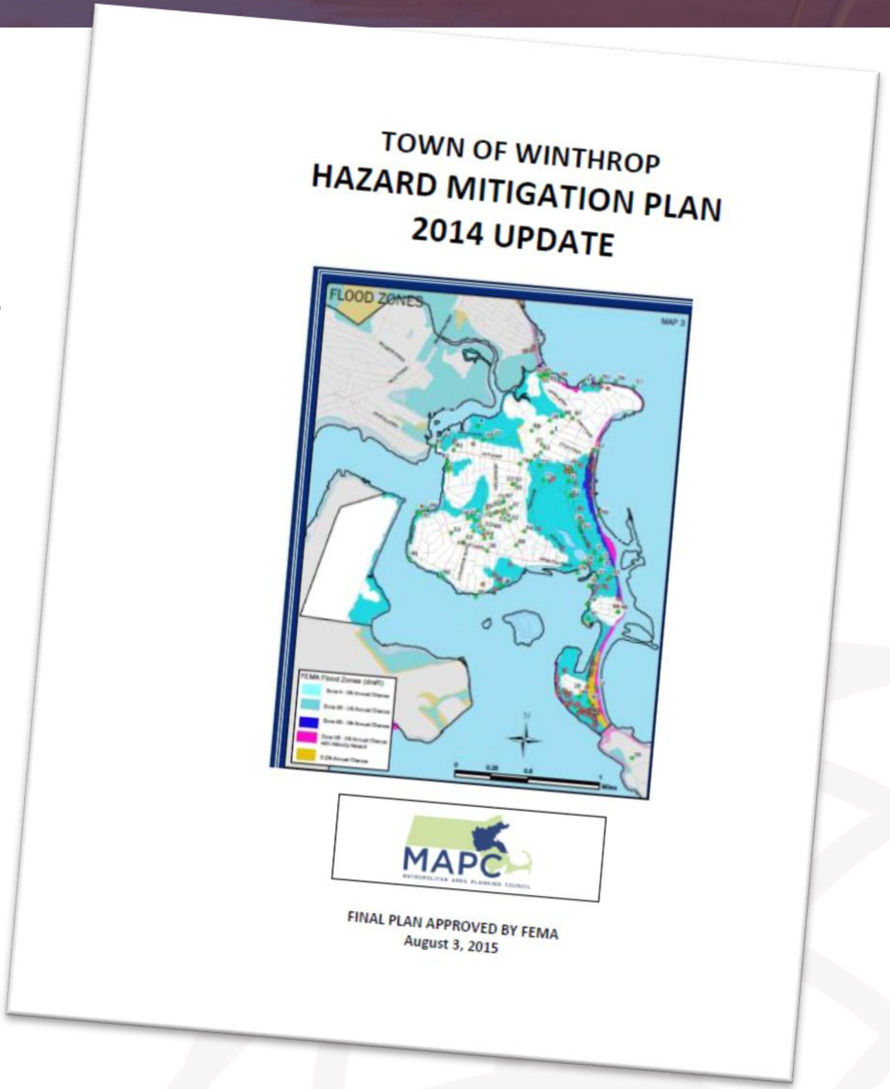
Winthrop Hazard Mitigation Plan

- FEMA Approved
- Identifies the following natural hazards that impact Winthrop: **flooding, wind, hurricane, nor'easter, wildfire, tornado, landslide, earthquake**

Hazard Mitigation Goals

1. Ensure that critical infrastructure sites are protected from natural hazards.
2. Protect existing residential and business areas from flooding.
3. Maintain existing mitigation infrastructure in good condition.
4. Continue to enforce existing zoning and building regulations.
5. Educate the public about zoning, flooding and building regulations, particularly with regard to changes in regulations that may affect tear-downs and new construction.
6. Encourage future development in areas that are not prone to natural hazards.
7. Educate the public about natural hazards and mitigation measures.
8. Make efficient use of public funds for hazard mitigation.
9. Protect the Town's ability to respond to various natural hazard events.


TOWN OF WINTHROP
HAZARD MITIGATION PLAN
2014 UPDATE

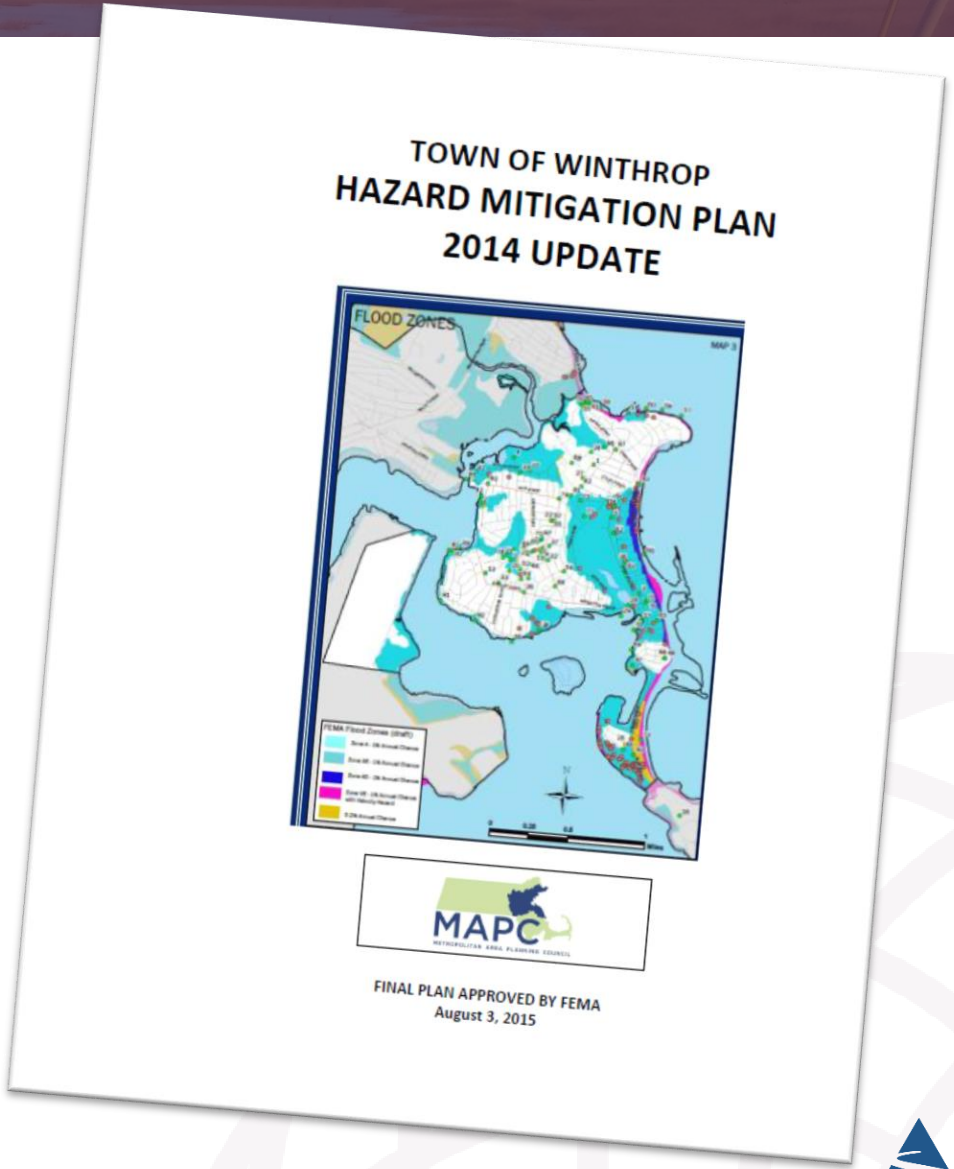
FINAL PLAN APPROVED BY FEMA
August 3, 2015

WOODARD
&CURRAN

Winthrop Hazard Mitigation Plan

Highlighted Potential Hazard Mitigation Actions

- Complete the Yirrell Beach seawall extension.
- Upgrade the storm drain system in the area between Winthrop Shore Drive and Lewis Lake.
- Add coastal storm surge and flooding protection for the Shirley Street neighborhood adjacent to Winthrop Shore Drive.
- Complete the drainage assessment at Ingleside Park and upgrade existing drainage infrastructure.
- Provide for more frequent maintenance of Town-owned drainage infrastructure.
- Finish mapping all stormwater outfalls and catch basins on GIS.
- Incorporate hazard education awareness, mitigation planning and natural hazard incentives into Town planning and community development operations.


TOWN OF WINTHROP
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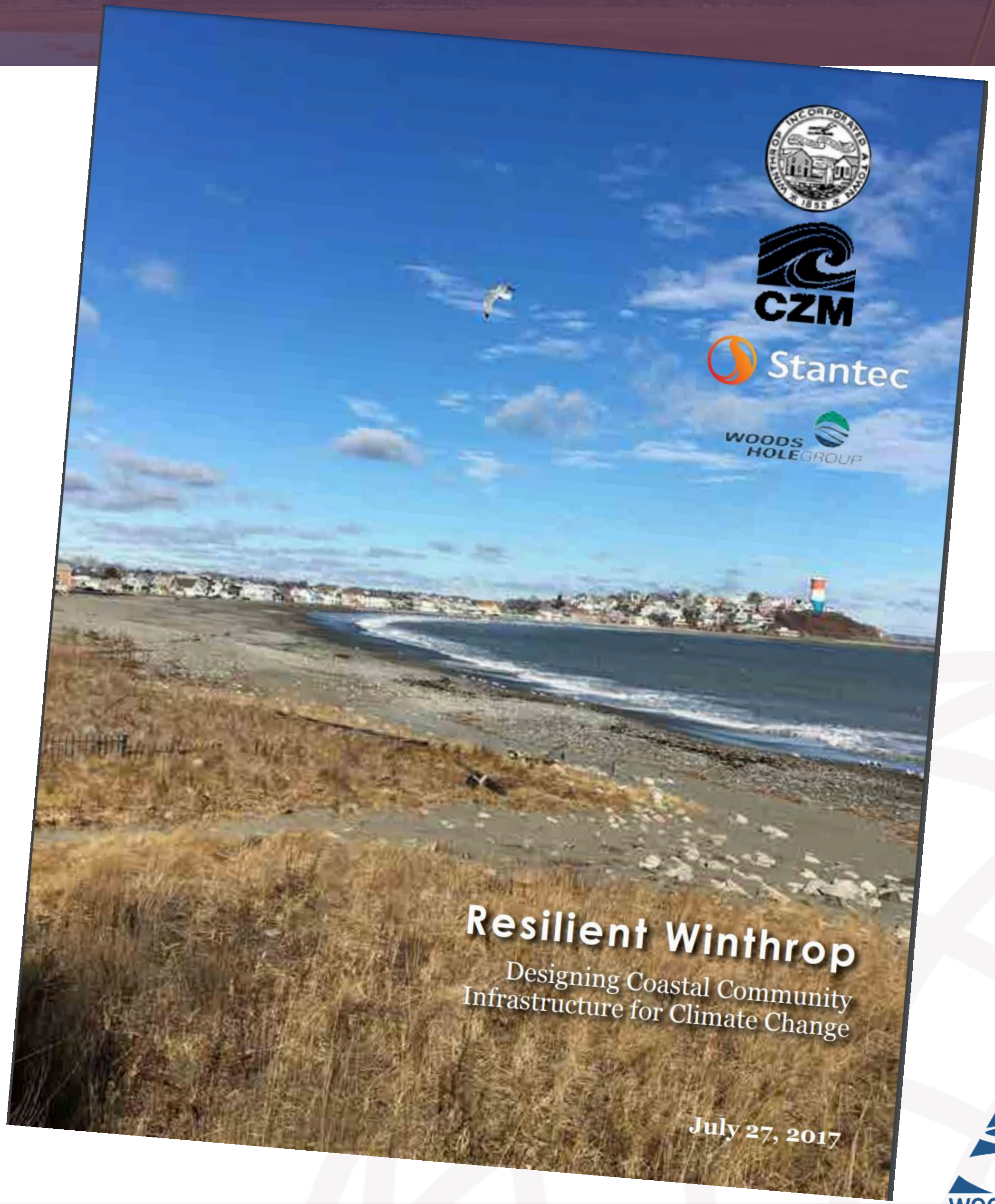
Resilient Winthrop

- Goal of project to identify and prioritize critical public infrastructure and explore adaptation measures to improve infrastructure and natural resource resilience in a number of future conditions.
- Within mapped coastal flooding areas are critical public infrastructure assets/facilities that support daily life in Winthrop
  - Sewer Pump Stations, Evacuation Routes, Substation, Pressure Reducing Valve Stations, Winthrop High School, Fire Station, Town Landing, others…



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Critical Public Infrastructure

- Ⓐ Beach Fire Station
- Ⓑ Belle Isle Bridge
- Ⓒ Loring Rd. Boat Ramp
- Ⓓ Main Street (evacuation route)
- Ⓔ Pico Sewer Pump Station
- Ⓕ Pleasant Court Sewer Pump Station
- Ⓖ Pleasant Street (evacuation route)
- Ⓗ Power Substation (Argyle Street)
- Ⓘ Pressure Reducing Valve Station (Bayview Ave)
- Ⓙ Pressure Reducing Valve Station (Revere St)
- Ⓚ Pressure Reducing Valve Station (Underhill St)
- Ⓛ Public Landing
- Ⓜ Revere St. Sewer Pump Station
- Ⓝ Shirley Street (evacuation route)
- Ⓞ Washington Street (evacuation route)
- Ⓟ Winthrop High School

Figure 4-1 Town-Identified Critical Public Infrastructure Locations

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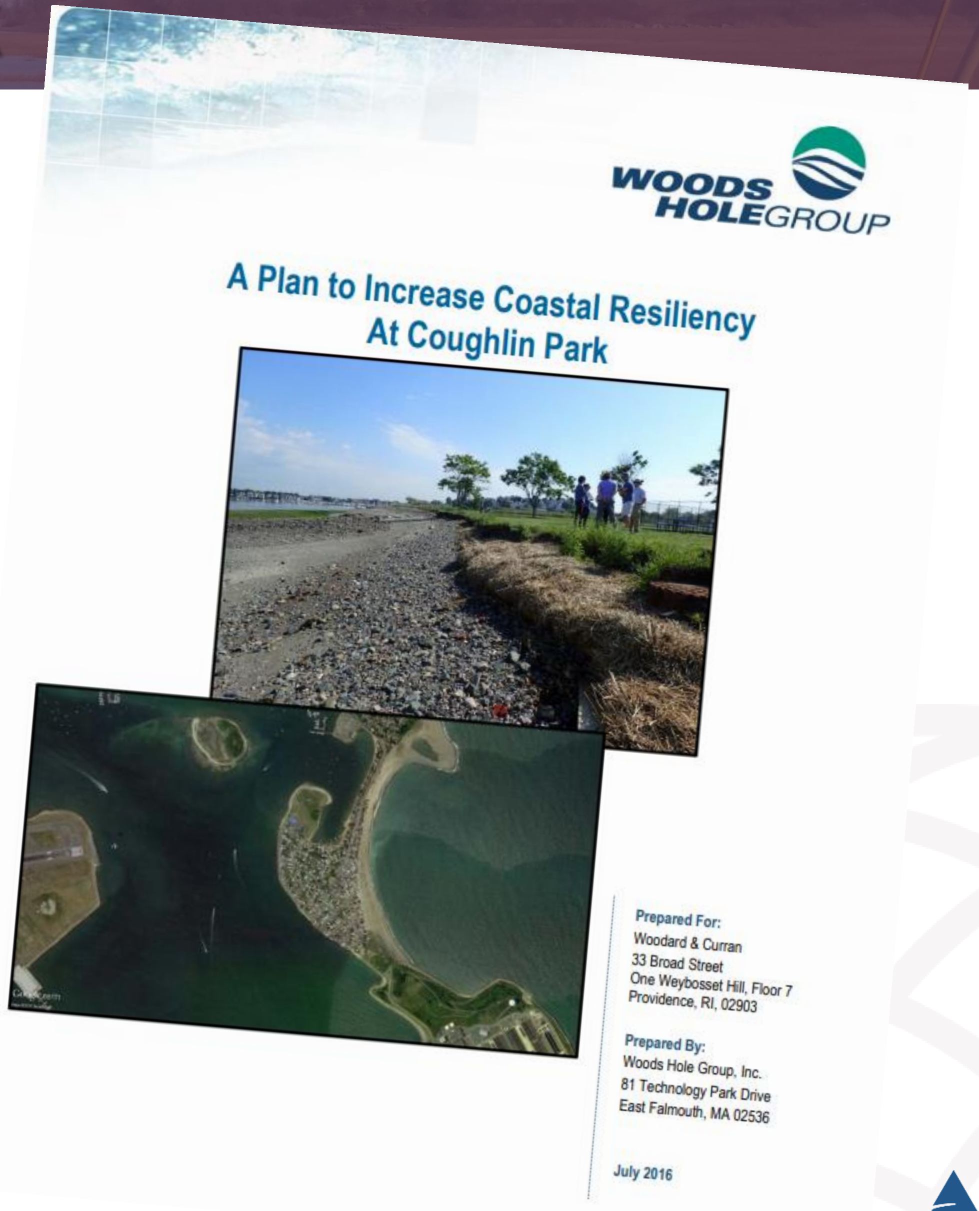
Coastal Resiliency at Coughlin Park

- Specific plan to increase resiliency at Coughlin Park.
- Report evaluated installations that could help slow erosion and identified green infrastructure along the western shoreline as the best alternative to increase coastal resilience of the park.


WOODS HOLE GROUP

A Plan to Increase Coastal Resiliency
At Coughlin Park

Prepared For:
Woodard & Curran
33 Broad Street
One Weybosset Hill, Floor 7
Providence, RI, 02903

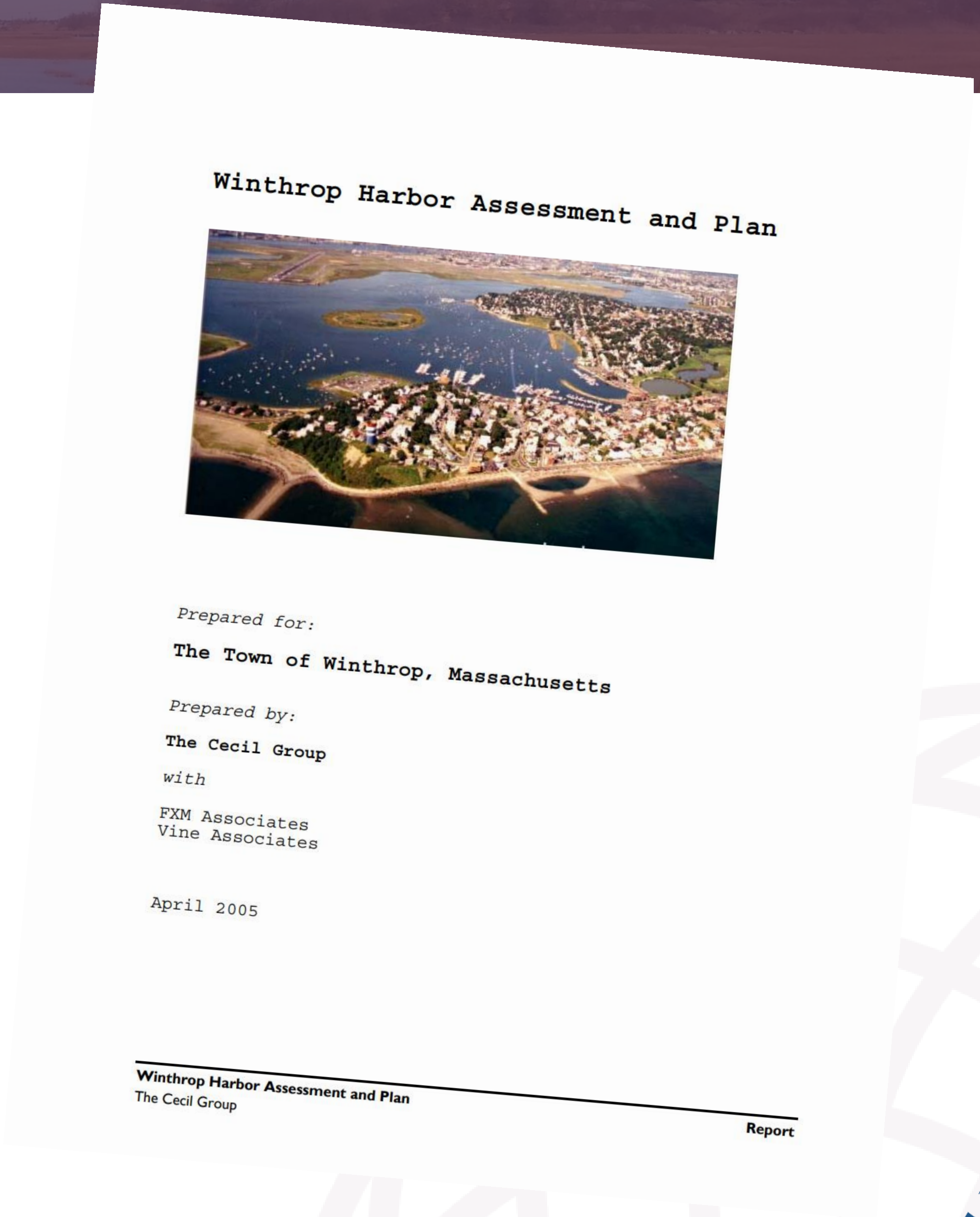
Prepared By:
Woods Hole Group, Inc.
81 Technology Park Drive
East Falmouth, MA 02536

July 2016

WOODARD & CURRAN

Other Work in Winthrop

- Winthrop Harbor Plan
- Improvements along Winthrop Shore Drive, Winthrop Beach, Tafts Avenue, Lewis Lake
- Community Development Plan


Winthrop Harbor Assessment and Plan

Prepared for:

The Town of Winthrop, Massachusetts

Prepared by:

The Cecil Group

with

FXM Associates
Vine Associates

April 2005

Winthrop Harbor Assessment and Plan
The Cecil Group
Report

Other Work in Winthrop

- Sewer improvements on Putnam Street, Putnam Place and Walden Street. Project included water main replacement on Jefferson Street and Fremont Street and upgrades to a section of the drainage system at the intersection of Jefferson Street and Putnam Street.
- Sewer, water, drain and sidewalk improvements on Walden Street, Lincoln Street, Read Street, Walden Place and Jerald Street. Drainage improvements included upgrading existing drainage to increase capacity in portions of Walden St., Lincoln St. and approximately 550 LF along Brookfield Rd. to the outfall structure at Donovan's Beach.
- Water main, drain and sewer improvements on Bellevue Avenue, Prescott Street, Somerset Avenue, Nahant Avenue and Sewall Avenue.
- Water main improvements with some sewer repairs on Plummer Ave., Woodside Ave, Woodside Park, Frances St., Sunnyside Ave, Pico Ave, Corinha Beach Rd. and throughout the neighborhoods surrounding the water tower.
- Sewer and water main improvements on Franklin Street and Harvard Street.

Other Work in Winthrop

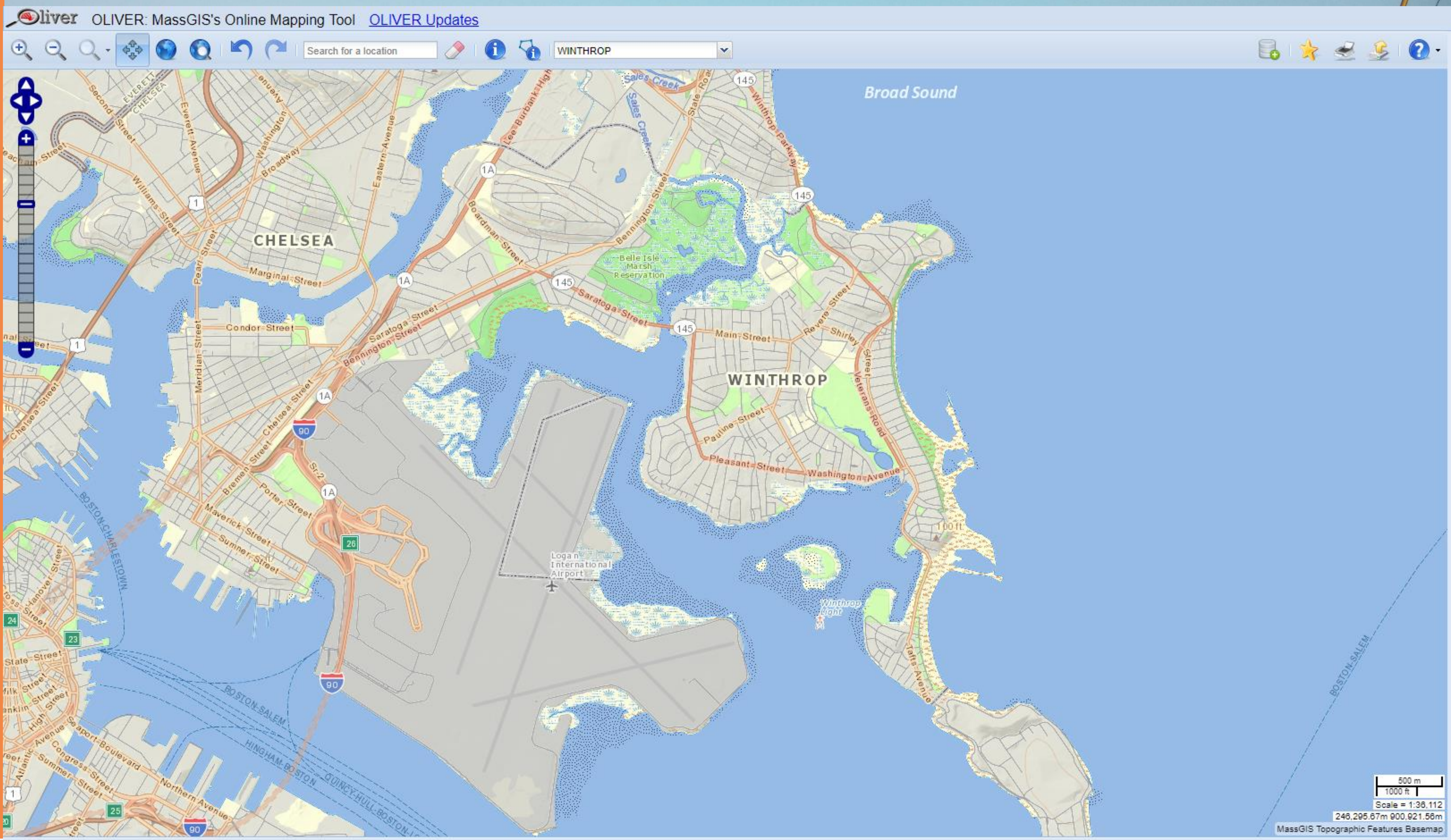
- Water main on Central Street, South Main Street, Hutchinson Street, Taylor Street and Underhill Street. Drainage improvements on Taylor Street and Hadassah Way. Pavement and sidewalk improvements on Winthrop Street.
- Lewis Lake Tide Gate – Replace existing failed automated tide gate with new automated tide gate. Provided a manually operated tide gate on seaward side to provide needed redundancy.
- Miller Field/Lewis Lake Drainage and Site Improvements: Complete renovation of Miller Field including site drainage improvements and improvements to swales along the Veterans Road and Cross Street at the Winthrop Golf Club.
- Various water and sewer emergency repairs.
- Current projects include infrastructure improvements in the Centre Business District and shoreline stabilization at Coughlin Park.

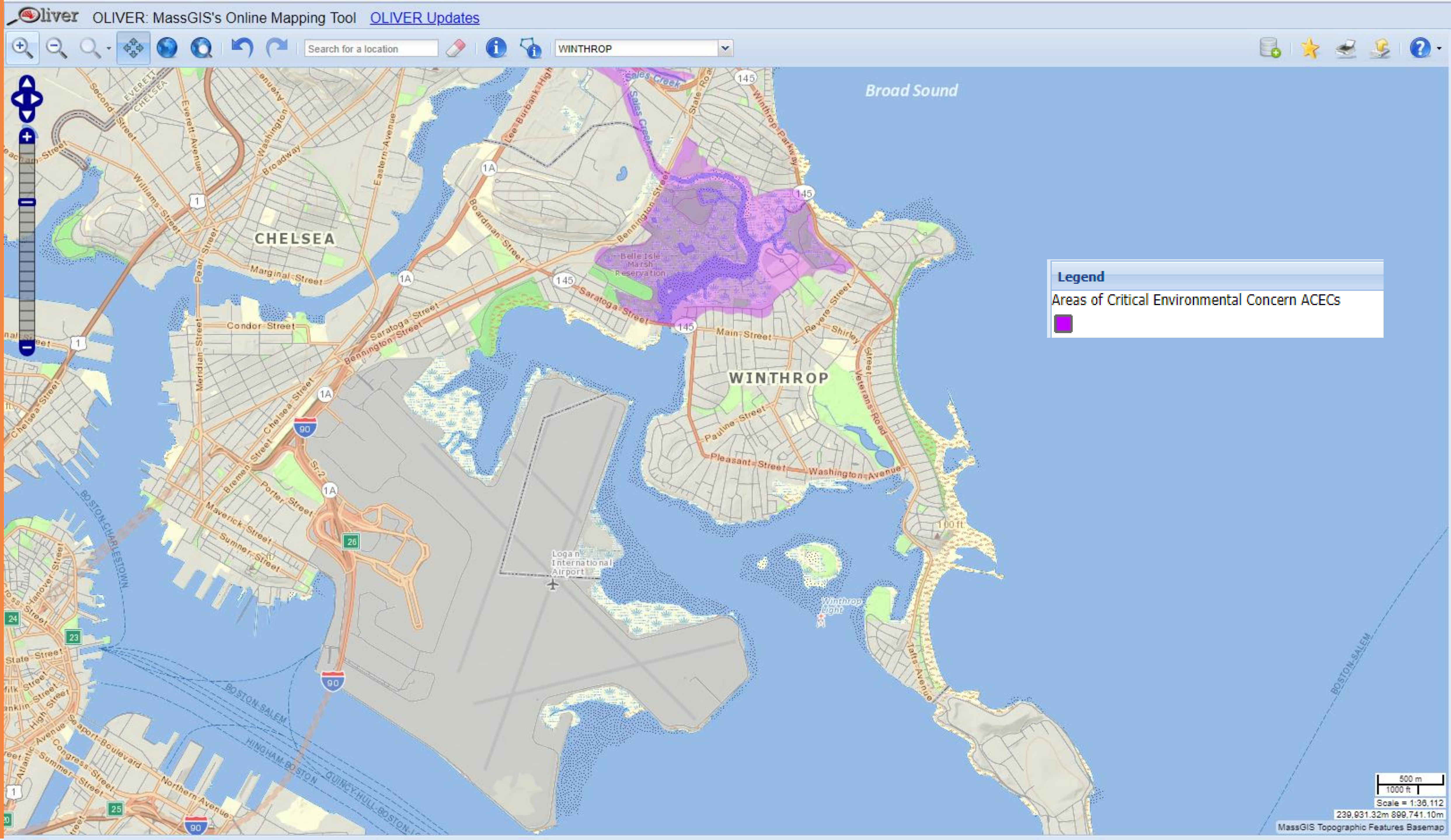
Severe Weather

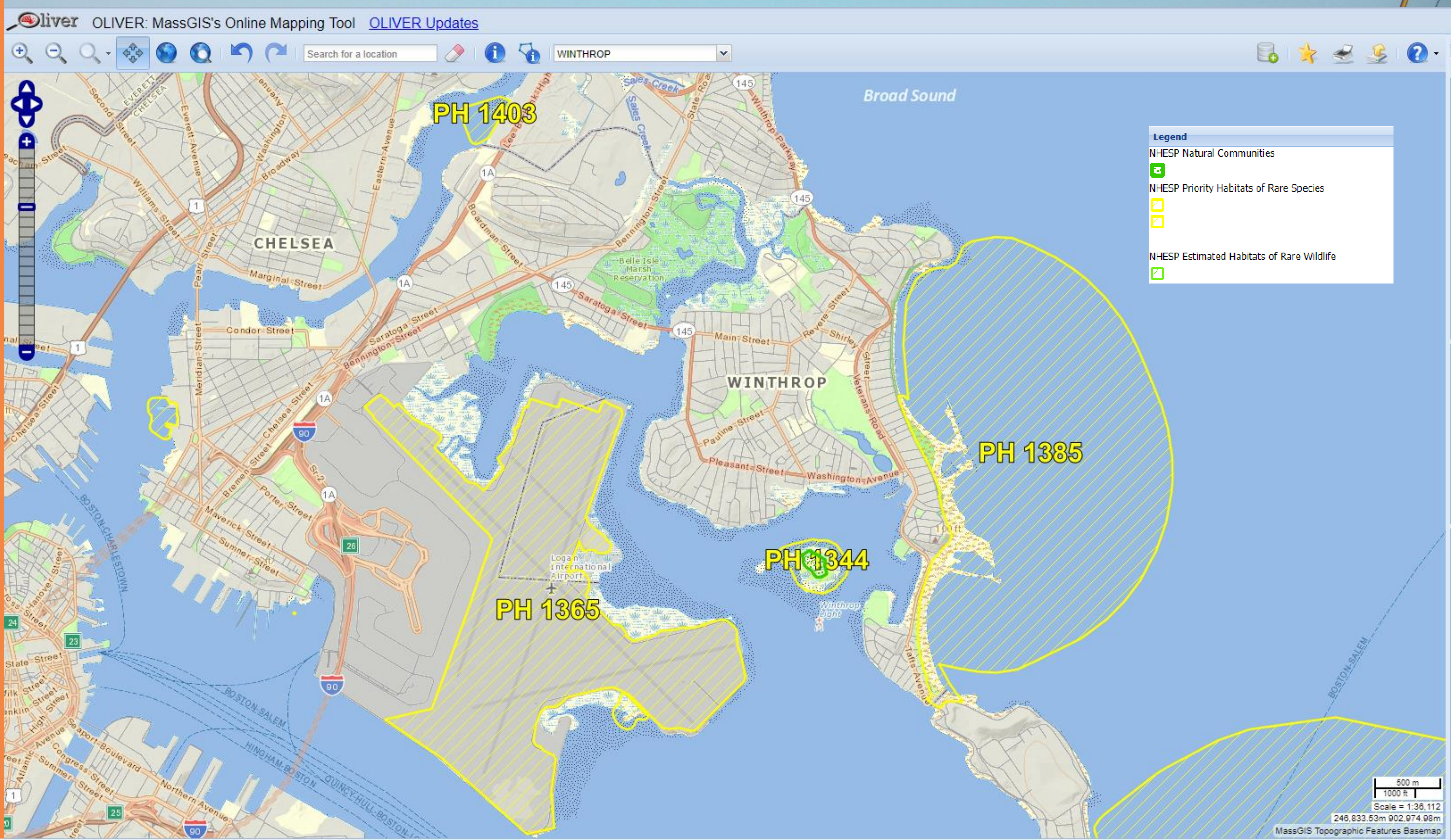
- Areas of local flooding include:
  - Yirrell Beach
  - Nahant Avenue
  - Belle Isle Marsh
  - Winthrop Beach
  - Point Shirley
  - Lewis Lake
  - Ingleside Park
  - Lower Nahant Avenue
  - Coughlin Park
  - Fisherman’s Bend Marsh
  - Pico Avenue
  - Morton Street

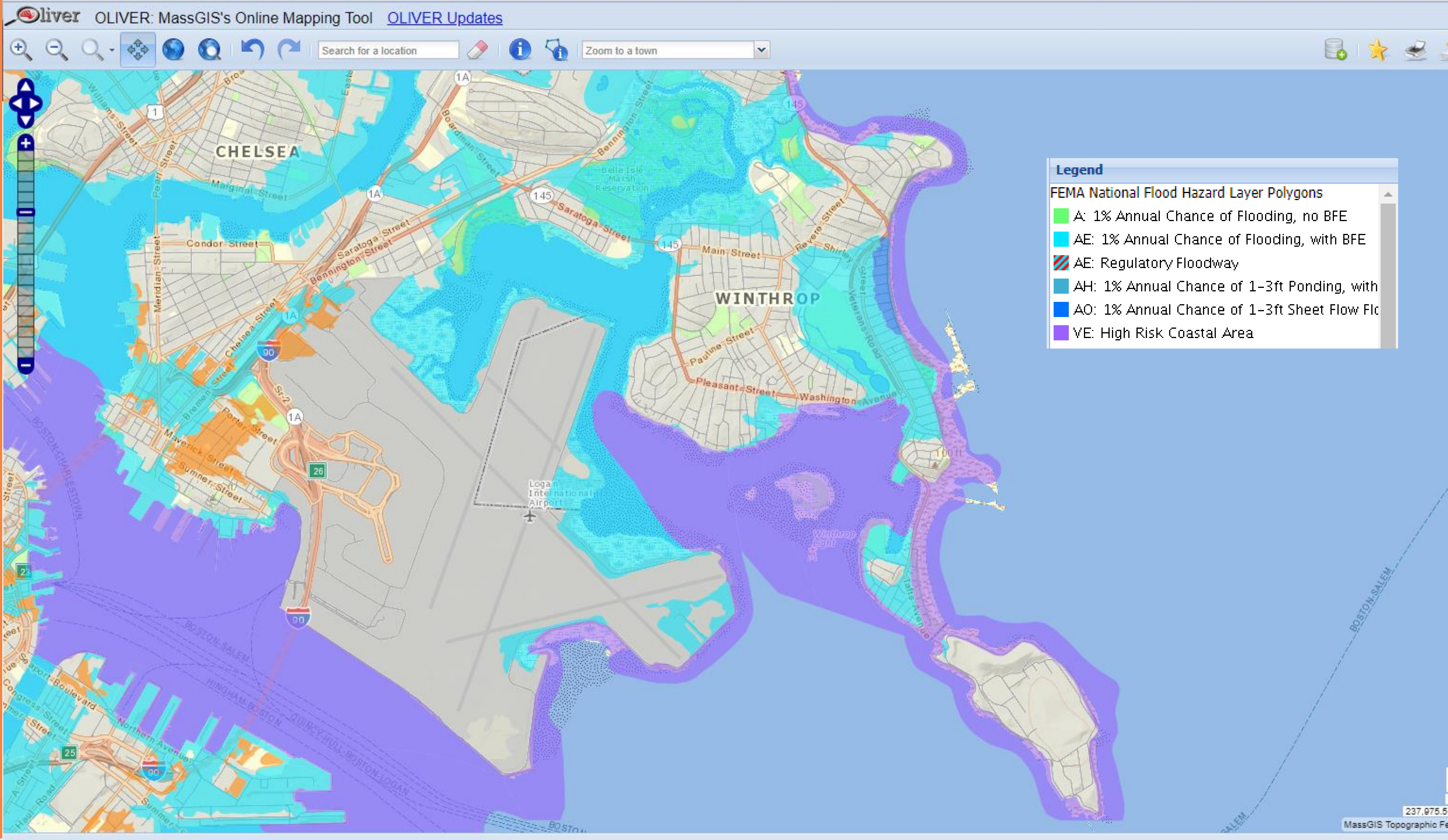
Severe Weather

- Flooding at Jefferson Street/Putnam Street intersection: Previous improvements helped reduce the frequency of flooding in this area. Additional infrastructure improvements planned under the Centre Business District project are designed to provide additional capacity for larger storm events.
- Ingleside Park/Walden Street: Area floods when intense storm events coincide with rising tides. Previous improvements have reportedly helped alleviate the frequency and duration of flooding in this area. Additional improvements to the outfall and outfall structure at Donovan's Beach and the drainage system in Ingleside Park have been recommended to further alleviate flooding issues.
- Flooding continues at the Winthrop Golf Course. Grading proposed to improve these conditions under the Miller Field/Lewis Lake Drainage and Site Improvements project were not constructed due to funding concerns.
- Morton Street, Pico Avenue, Washington Avenue and Shirley Street: Significant flooding has occurred in these areas during recent storms. The Town will be evaluating options to improve these conditions.
- Coughlin Park shoreline: Significant erosion continues to occur along this shoreline. The Town is in the process of permitting improvements for a shoreline stabilization project. Construction of these improvements is anticipated to begin in late 2018 or early 2019.

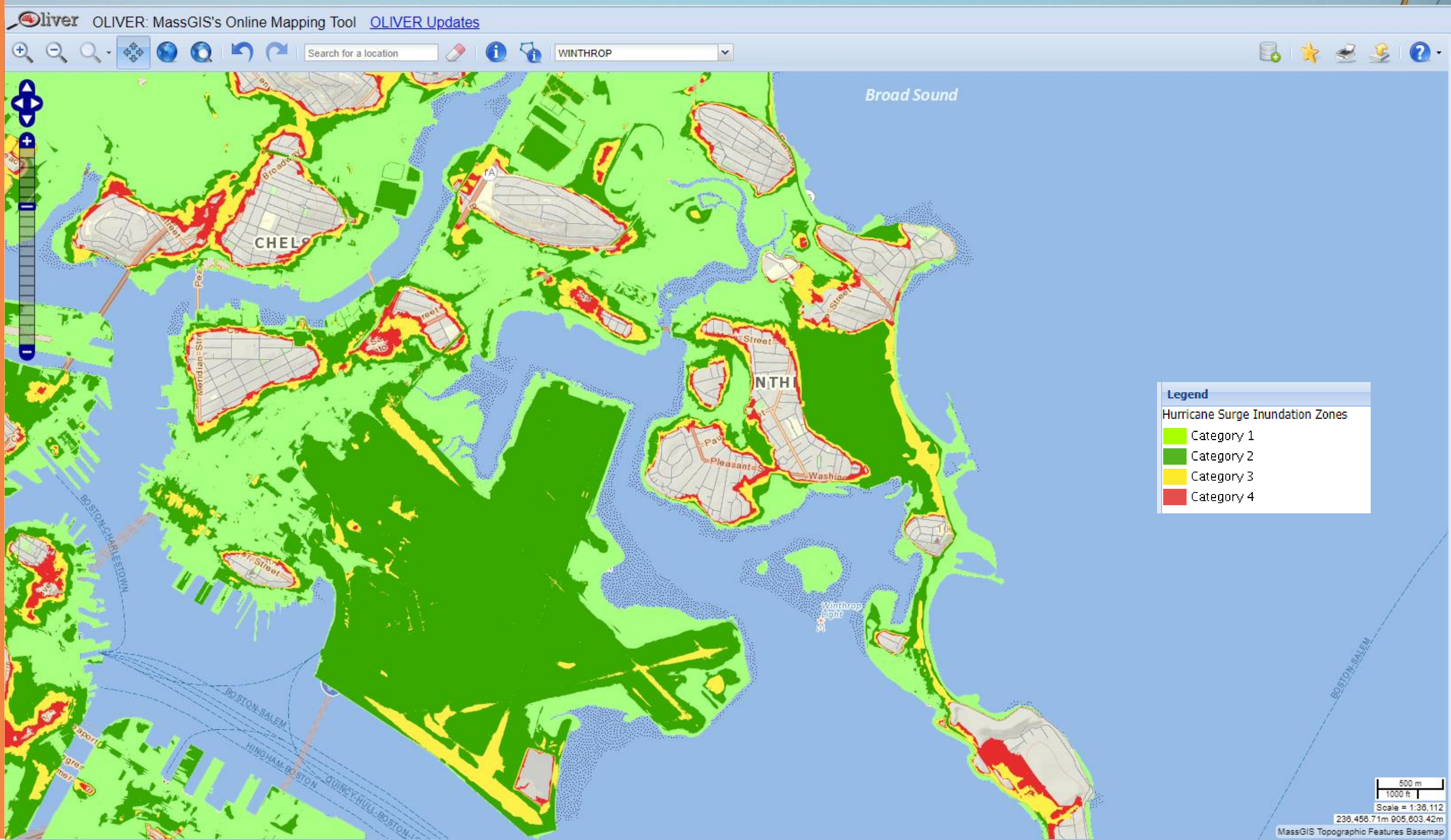

OLIVER: MassGIS's Online Mapping Tool
OLIVER Updates
Search for a location
WINTHROP
Broad Sound
CHELSEA
WINTHROP
Belle Isle Marsh Reservation
Logan International Airport
Winthrop Light
Saratoga Street
Bennington Street
Main Street
Shirley Street
Revere Street
Pauline Street
Pleasant Street
Washington Avenue
Veterans Road
Tafts Avenue
Winthrop Parkway
Boardman Street
Marginal Street
Condor Street
Meridian Street
Chelsea Street
Maverick Street
Sumner Street
Porter Street
Bremen Street
Broadway
Washington Avenue
Eastern Avenue
Everett Avenue
Williams Street
Pearl Street
Second Street
Seaport Boulevard
Congress Street
Summer Street
Northern Avenue
Atlantic Avenue
State Street
High Street
Milk Street
Hanover Street
Sales Creek
BOSTON-CHARLESTOWN
BOSTON-SALEM
HINGHAM-BOSTON
QUINCY-HULL-BOSTON
100 ft
500 m
1000 ft
Scale = 1:36,112
246,295.67m 900,921.56m
MassGIS Topographic Features Basemap


Oliver
OLIVER: MassGIS's Online Mapping Tool
OLIVER Updates
Search for a location
WINTHROP
Broad Sound
CHELSEA
WINTHROP
Belle Isle Marsh Reservation
Logan International Airport
Winthrop Light
Legend
Areas of Critical Environmental Concern ACECs
Main Street
Saratoga Street
Bennington Street
Condor Street
Marginal Street
Pleasant Street
Washington Avenue
Pauline Street
Revere Street
Shirley Street
Veterans Road
Maverick Street
Porter Street
Sumner Street
Chelsea Street
Meridian Street
Broadway
Eastern Avenue
Boardman Street
Sales Creek
Winthrop Parkway
Tafts Avenue
Scale = 1:36,112
239,931.32m 899,741.10m
MassGIS Topographic Features Basemap


Oliver
OLIVER: MassGIS's Online Mapping Tool
OLIVER Updates
Search for a location
WINTHROP
Legend
NHESP Natural Communities
NHESP Priority Habitats of Rare Species
NHESP Estimated Habitats of Rare Wildlife
Broad Sound
PH 1403
PH 1385
PH 1344
PH 1365
CHELSEA
WINTHROP
Belle Isle Marsh Reservation
Logan International Airport
Winthrop Light
Scale = 1:36,112
MassGIS Topographic Features Basemap



Oliver
OLIVER: MassGIS's Online Mapping Tool
OLIVER Updates
Search for a location
Zoom to a town
CHELSEA
WINTHROP
Logan International Airport
Legend
FEMA National Flood Hazard Layer Polygons
A: 1% Annual Chance of Flooding, no BFE
AE: 1% Annual Chance of Flooding, with BFE
AE: Regulatory Floodway
AH: 1% Annual Chance of 1-3ft Ponding, with
AO: 1% Annual Chance of 1-3ft Sheet Flow Flo
VE: High Risk Coastal Area
MassGIS Topographic Fe

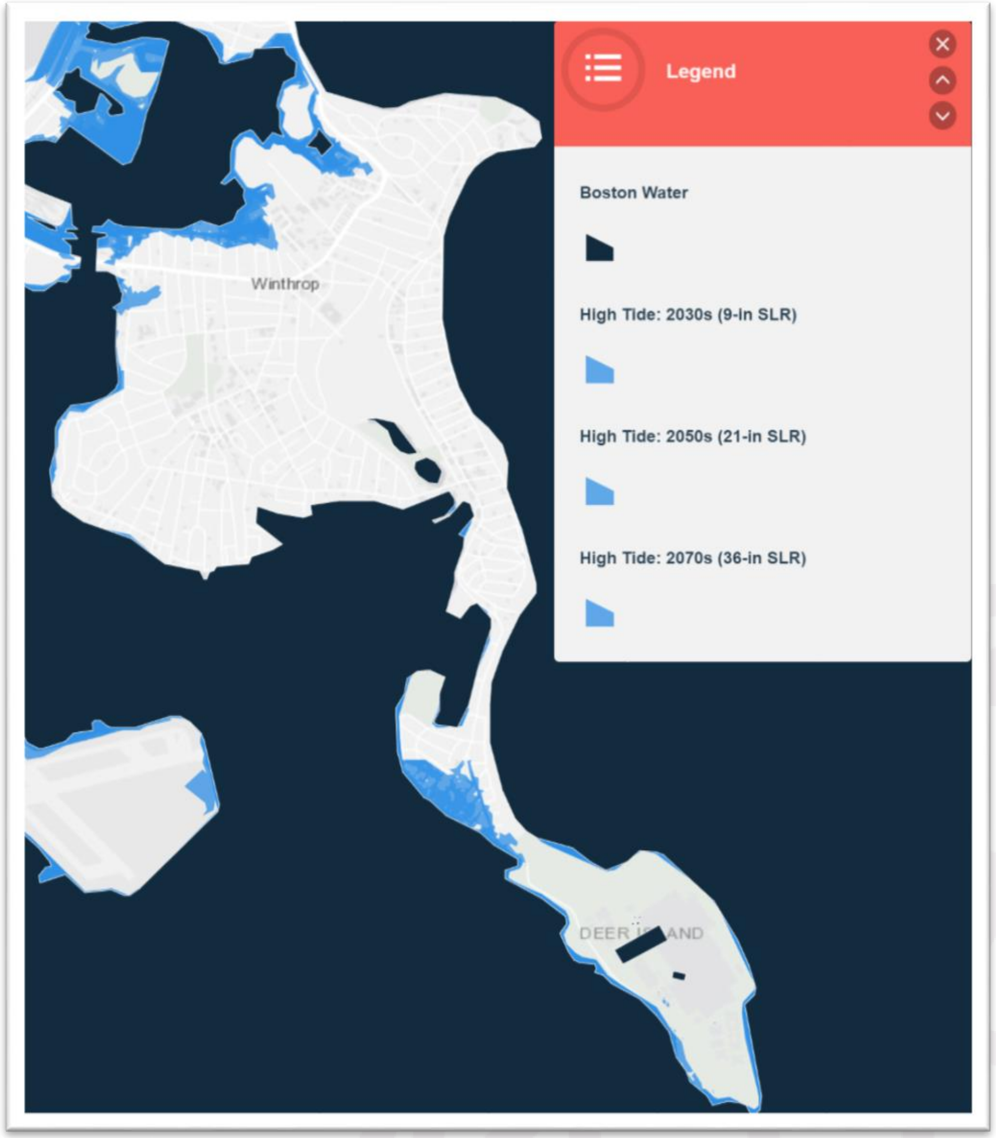


Oliver
OLIVER: MassGIS's Online Mapping Tool
OLIVER Updates
Search for a location
WINTHROP
Broad Sound
CHELS
Legend
Hurricane Surge Inundation Zones
Category 1
Category 2
Category 3
Category 4
Winthrop Light
BOSTON-SALEM
500 m
1000 ft
Scale = 1:36,112
236,456.71m 905,603.42m
MassGIS Topographic Features Basemap

WHAT ABOUT THE FUTURE?

Flood Risk

- According to Boston Harbor Flood Risk Model – 480 acres (45%) of Winthrop's 1.6 miles is within a coastal flooding area.
- By 2070, 800 acres (60%) will be within a coastal flooding area.
- The flood area does not expand dramatically, but the depth of flooding during a storm event DOES.



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Areas of Probable Flooding

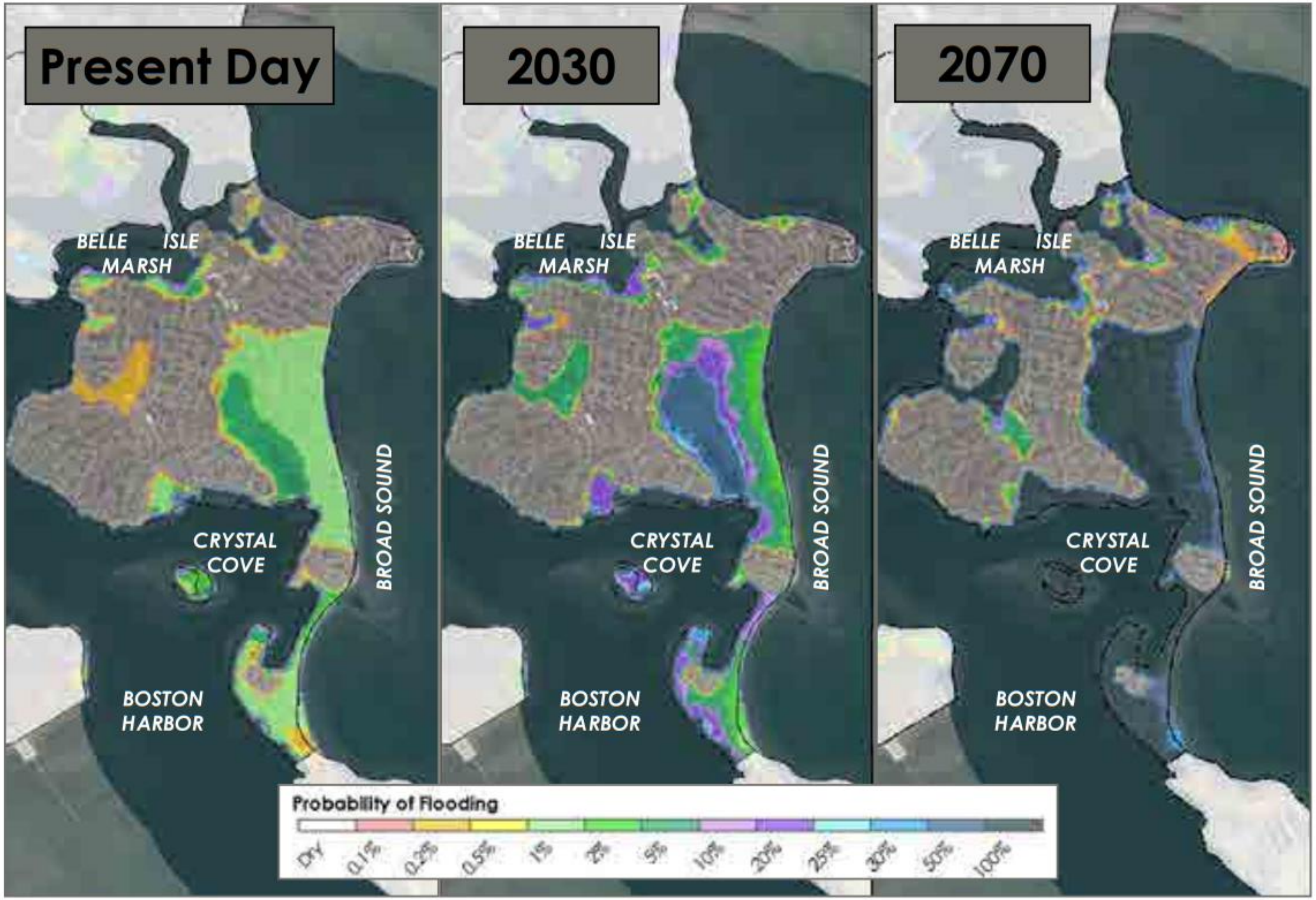

Figure 3-3 Winthrop Areas of Probable Flooding

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Depth of Flooding (1% Change Water Level)

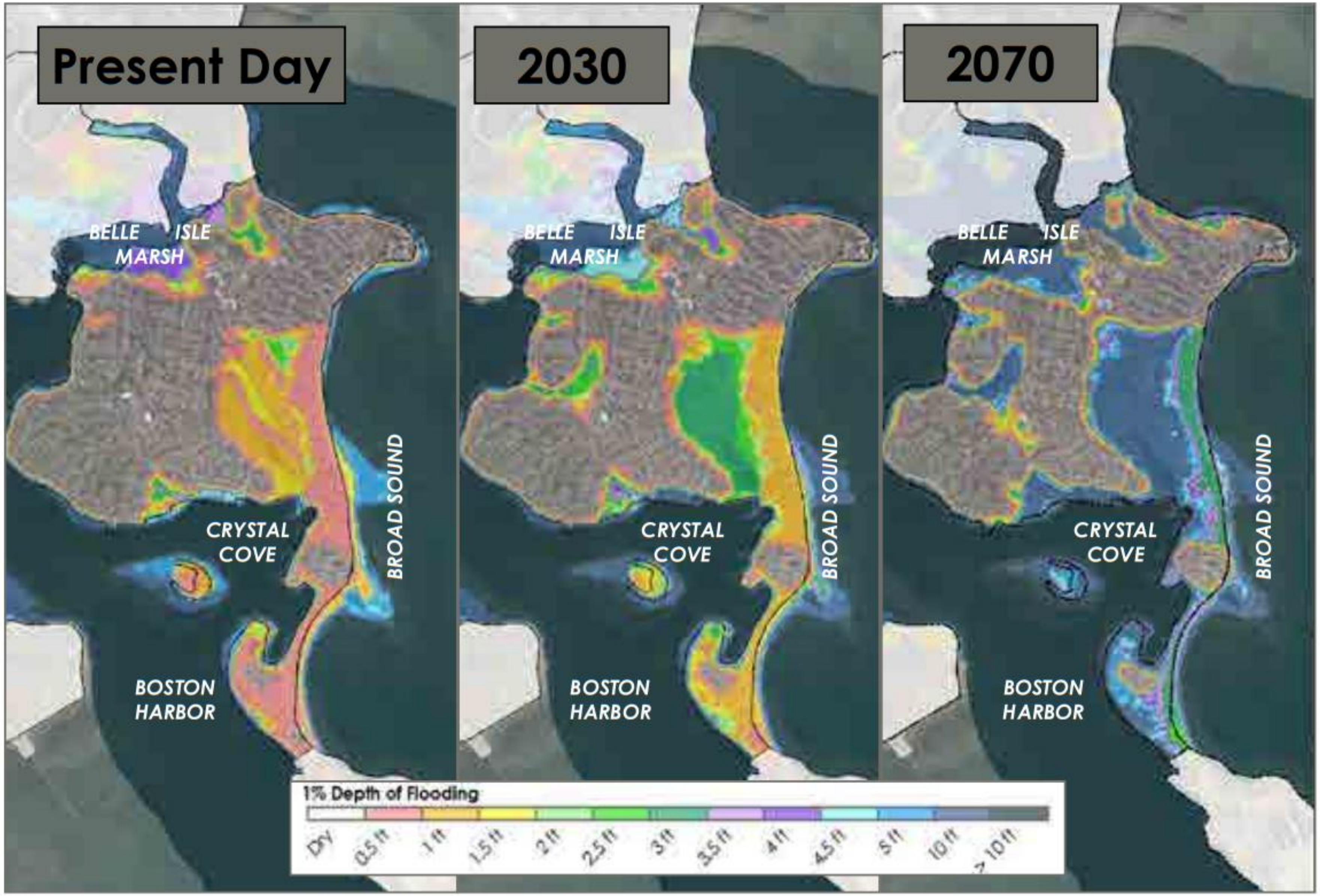

Figure 3-4 Winthrop Depth of Flooding (1% Chance water level)

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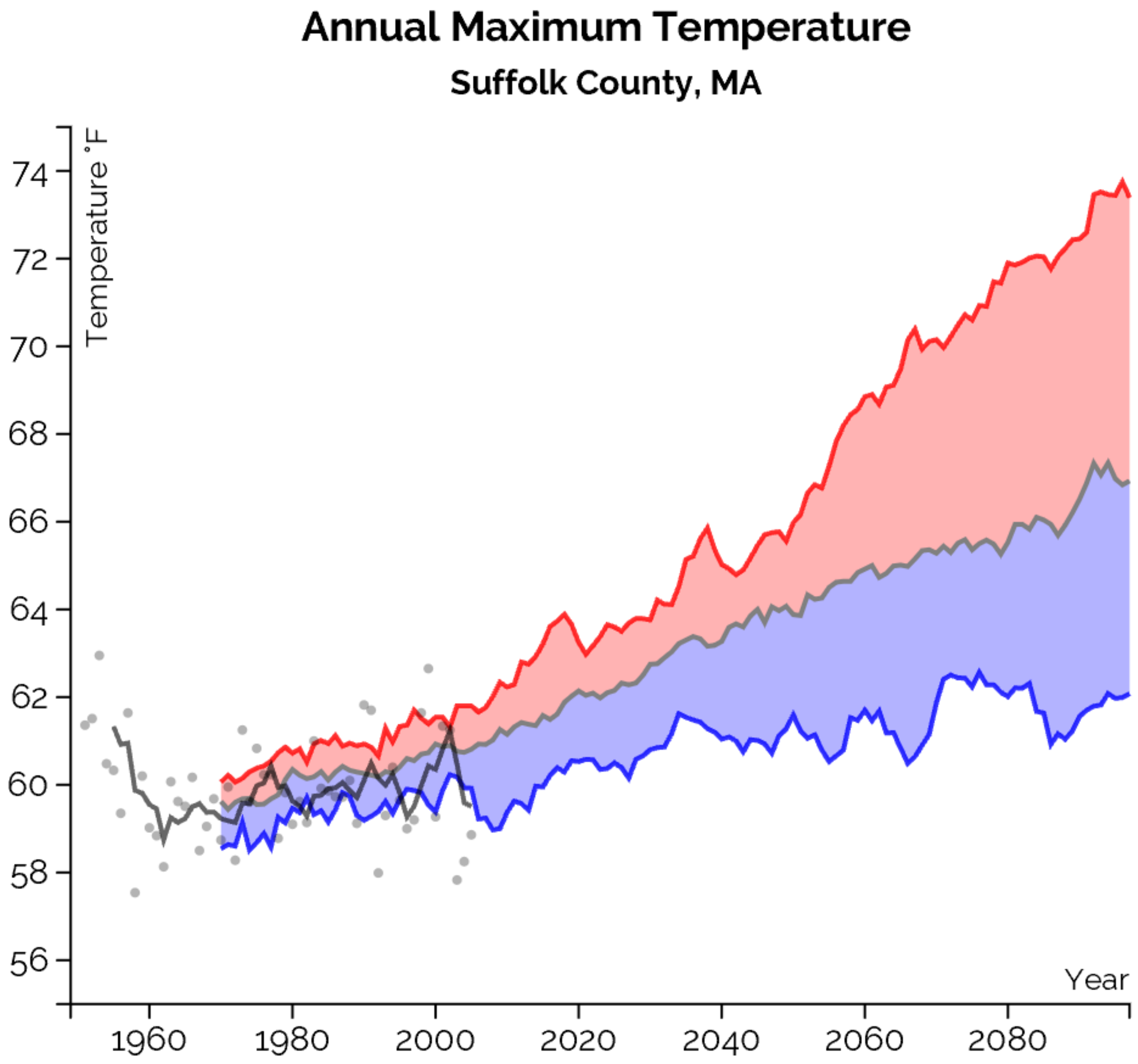
Annual Maximum Temperature



Observed

˚F

5-yr Mean

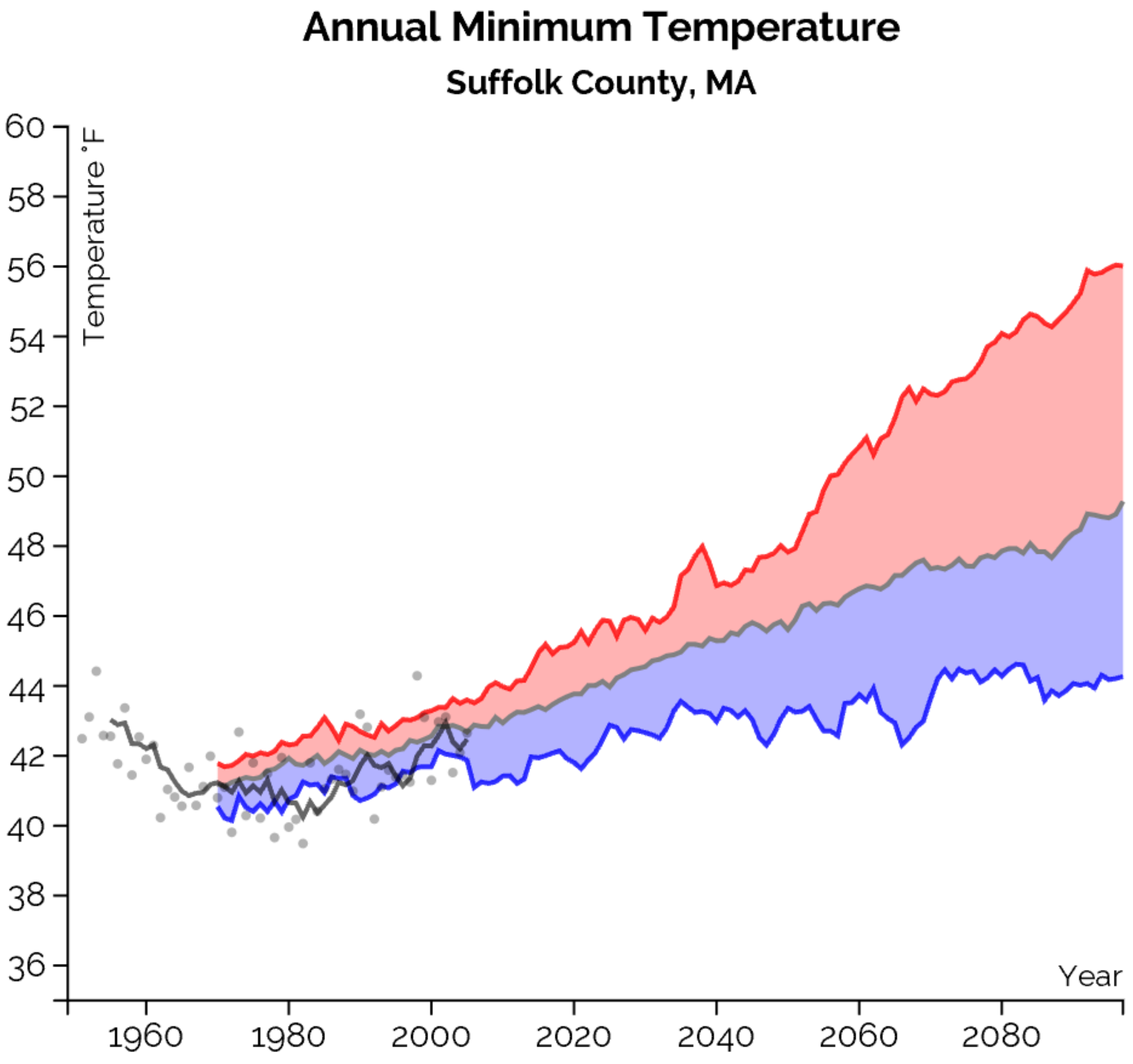
Modeled ˚F 2056–2060

Max	68.44	
Median	64.64	
Min	61.53	

Changes from 1971-2000 for:

2020 - 2049	3.40˚ F
2040 - 2069	4.64˚ F
2060 - 2089	5.69˚ F
2080 - 2097	6.38˚ F

Annual Minimum Temperature



Observed

	˚F
5-yr Mean	

Modeled ˚F 2066–2070

Max	52.15
Median	47.52
Min	42.82

Changes from 1971-2000 for:

2020 - 2049	3.62˚ F
2040 - 2069	5.02˚ F
2060 - 2089	6.25˚ F
2080 - 2097	6.81˚ F

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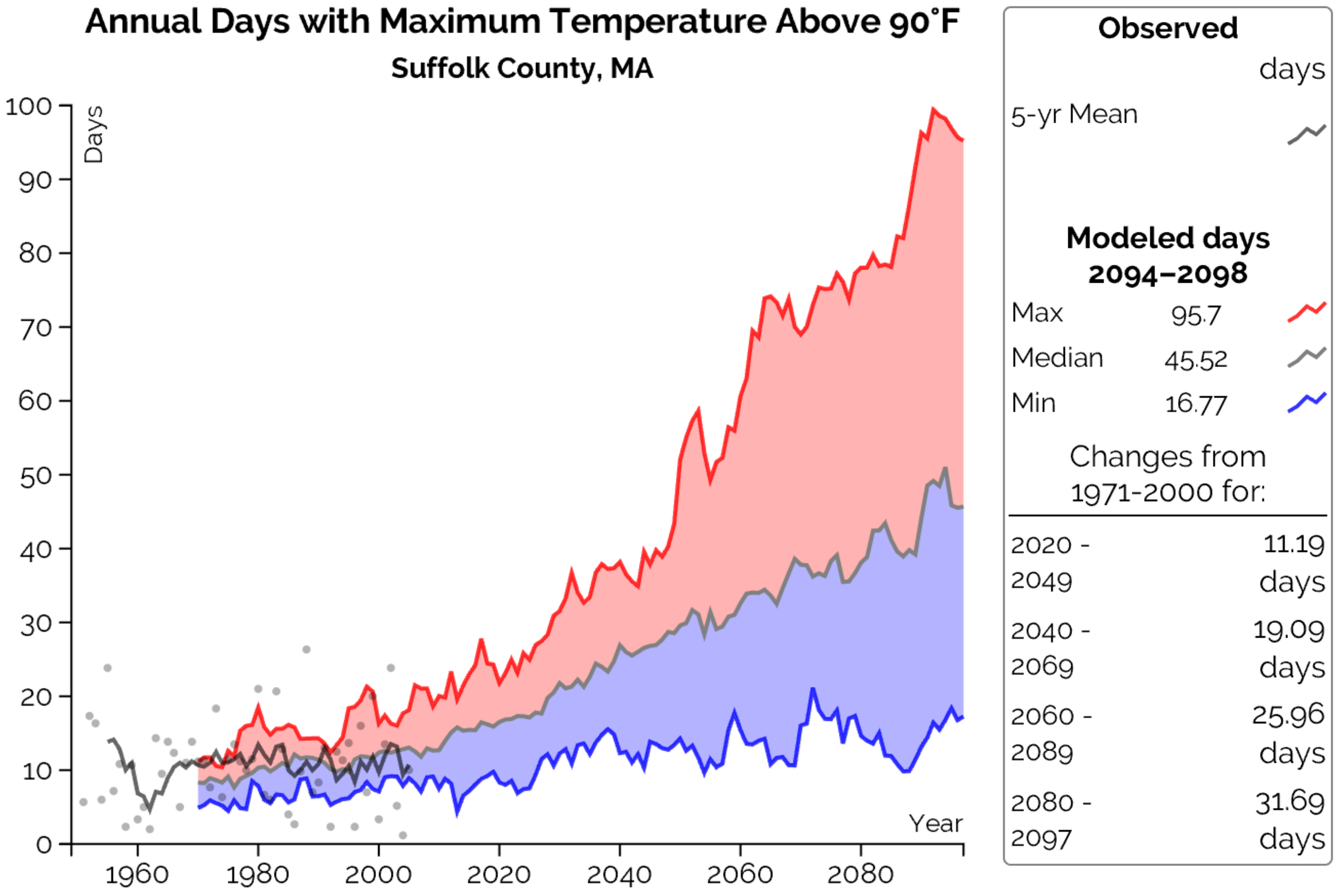
Annual Days With Maximum Temperature Above 90



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NE CSC Northeast Climate Science Center

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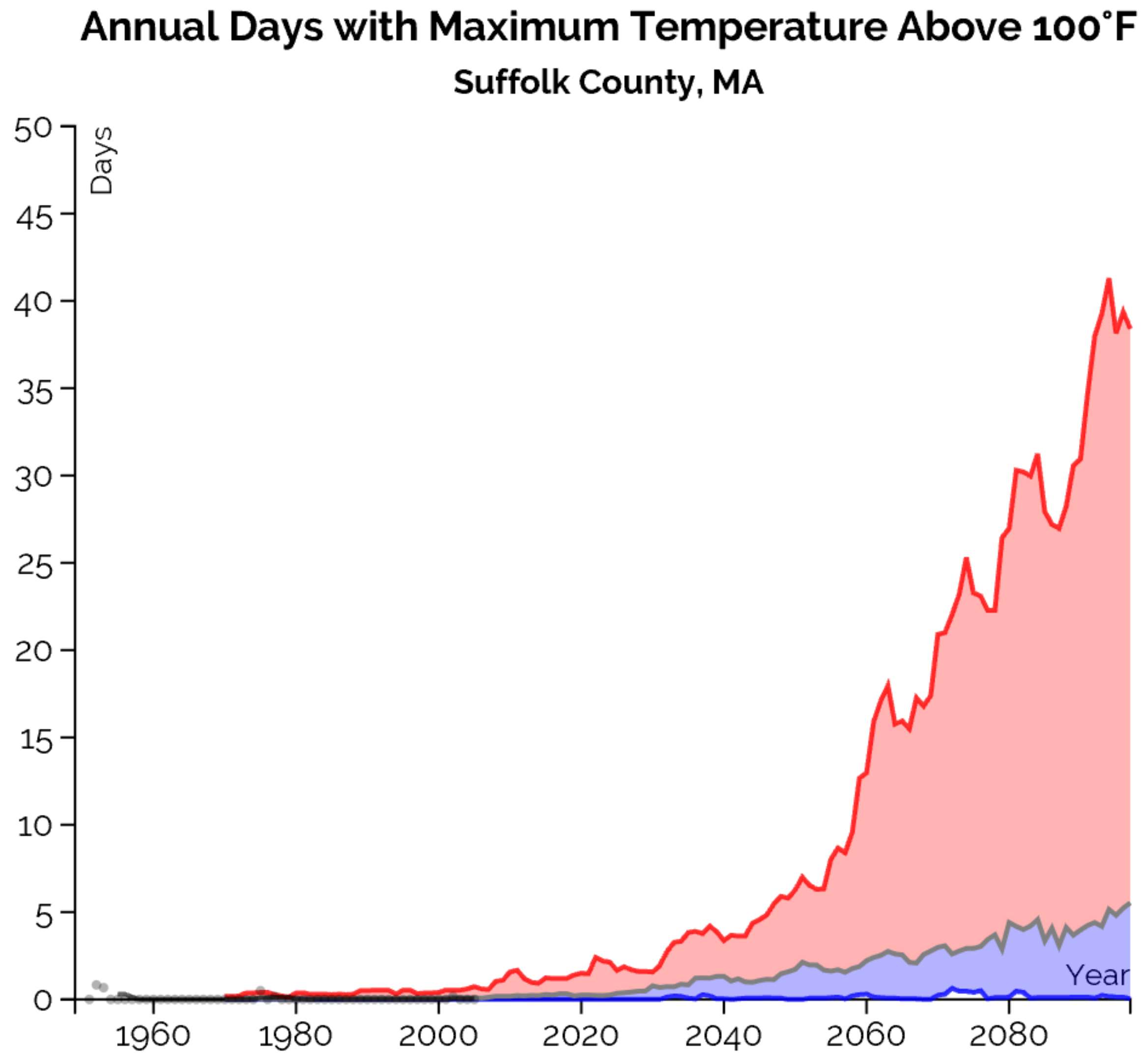
Annual Days With Maximum Temperature Above 100



Observed

	days	
5-yr Mean		

Modeled days 2077–2081

Max	26.44	
Median	2.88	
Min	0.1	

Changes from 1971-2000 for:

2020 - 2049	0.85days
2040 - 2069	1.75days
2060 - 2089	2.95days
2080 - 2097	4.19days

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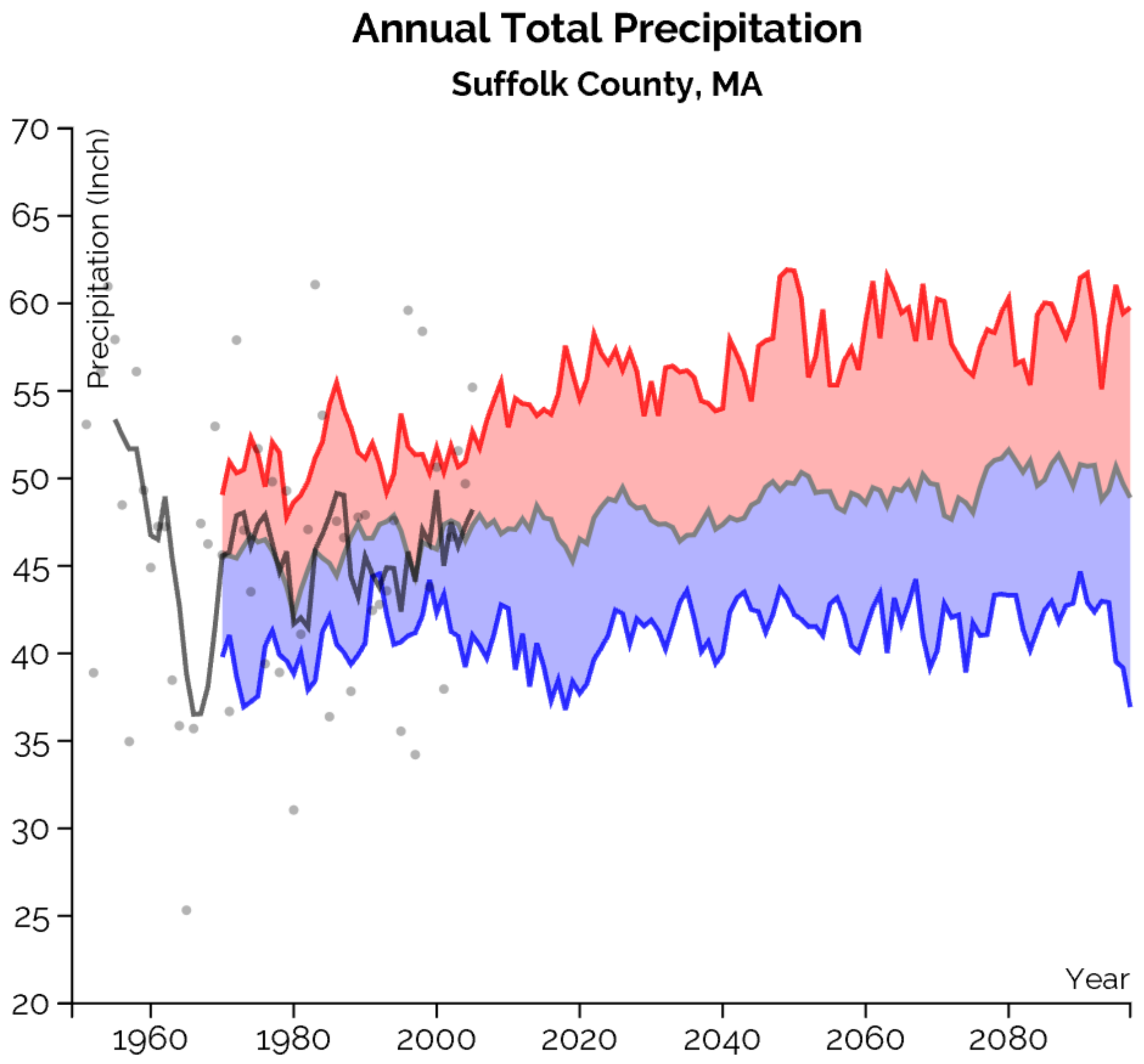
Annual Total Precipitation



Observed

Inches

5-yr Mean

Modeled Inches

Max

Median

Min

Changes from 1971-2000 for:

2020 - 2049	0.94"
2040 - 2069	2.42"
2060 - 2089	2.78"
2080 - 2097	3.77"

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NE CSC Northeast Climate Science Center

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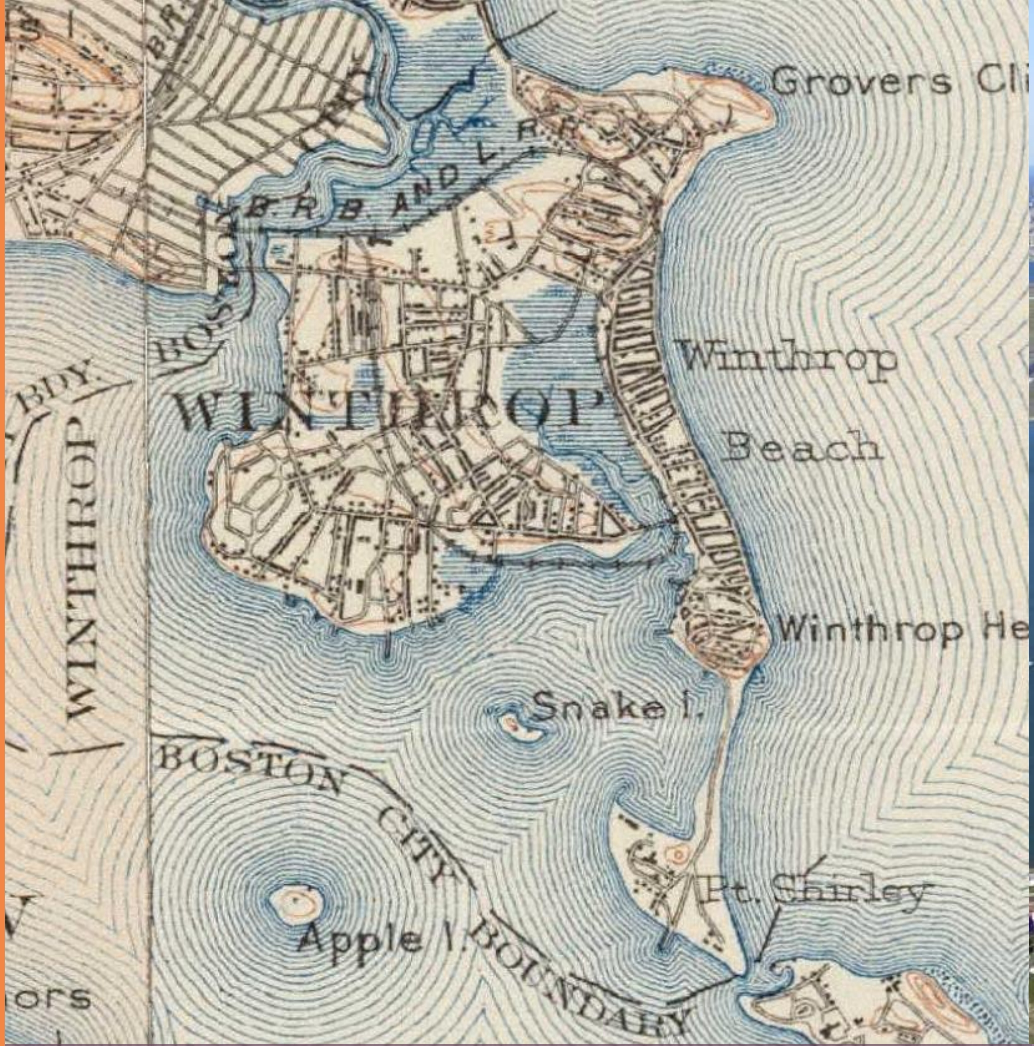
WOODARD & CURRAN



Winthrop, MA

Community Resiliency Building Workshop

April 6, 2018

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Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.com

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

H-**M**-**L** priority for action over the **S**hort or **L**ong term (and **O**ngoing)
V = Vulnerability **S** = Strength

Features	Location	Ownership	V or S					Priority H - M - L	Time Short Long Ongoing
Infrastructural									
Societal									
Environmental									

Climate Change in Winthrop

Daniel Brown
Climate Change Program Coordinator
dbrown@massaudubon.org

Mass Audubon

Key changes already observed in Massachusetts.

Temperature: ↑ **2.9°F** Since 1895

Growing Season: ↑ **11 Days** Since 1950

Sea Level Rise: ↑ **11 inches** Since 1922

Strong Storms: ↑ **55%** Since 1958

Source: Climate Science Special Report, 2017; NOAA NCEI nClimDiv; NOAA Ocean Service

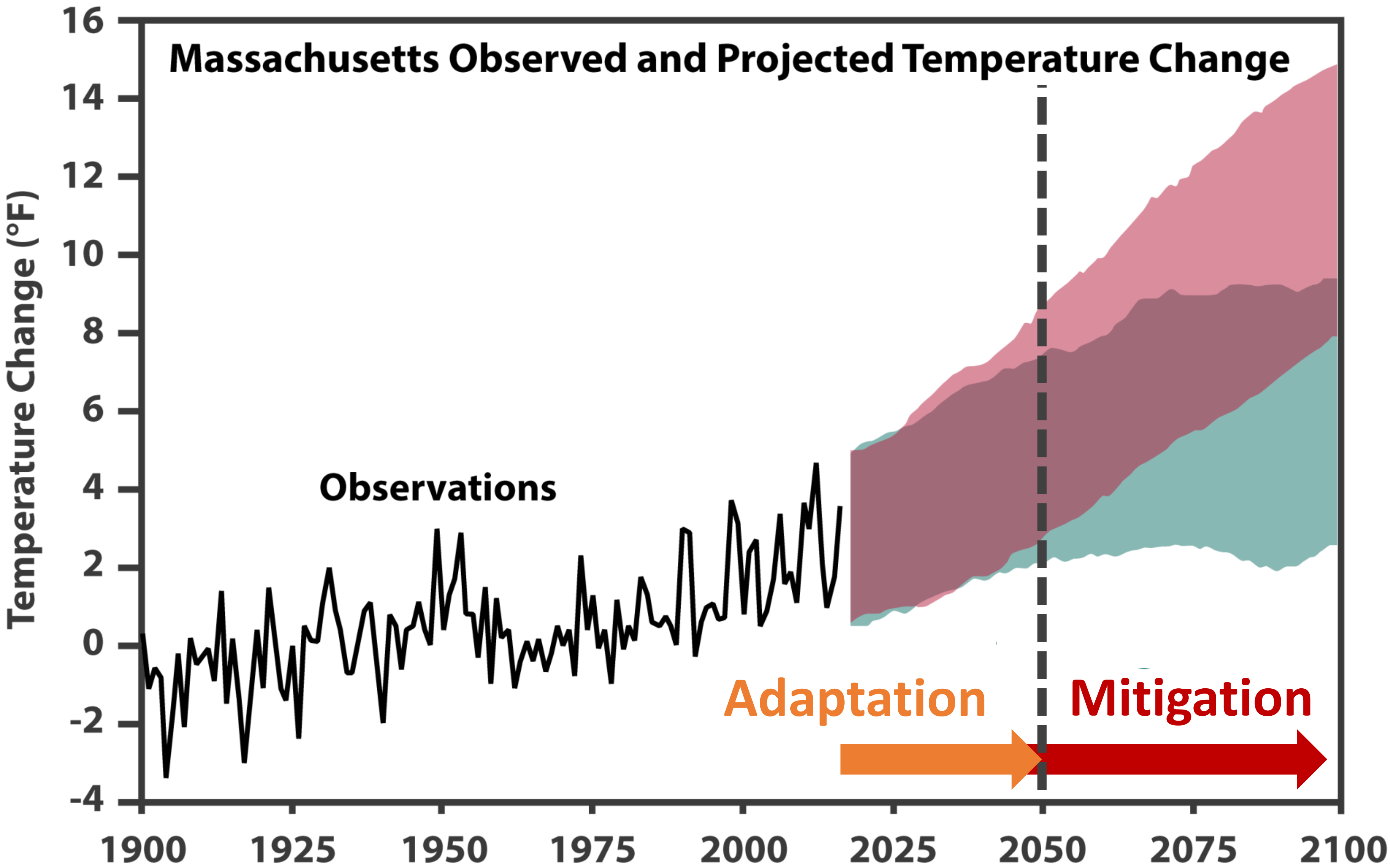
Suffolk County Projected Changes
(2040-2069)

Annual Average Temperature	↑	4.9°F
Days Above 90°F	↑	19 Days
Sea Level Rise	↑	2.4 feet
Days with >2" Precipitation	↑	44%

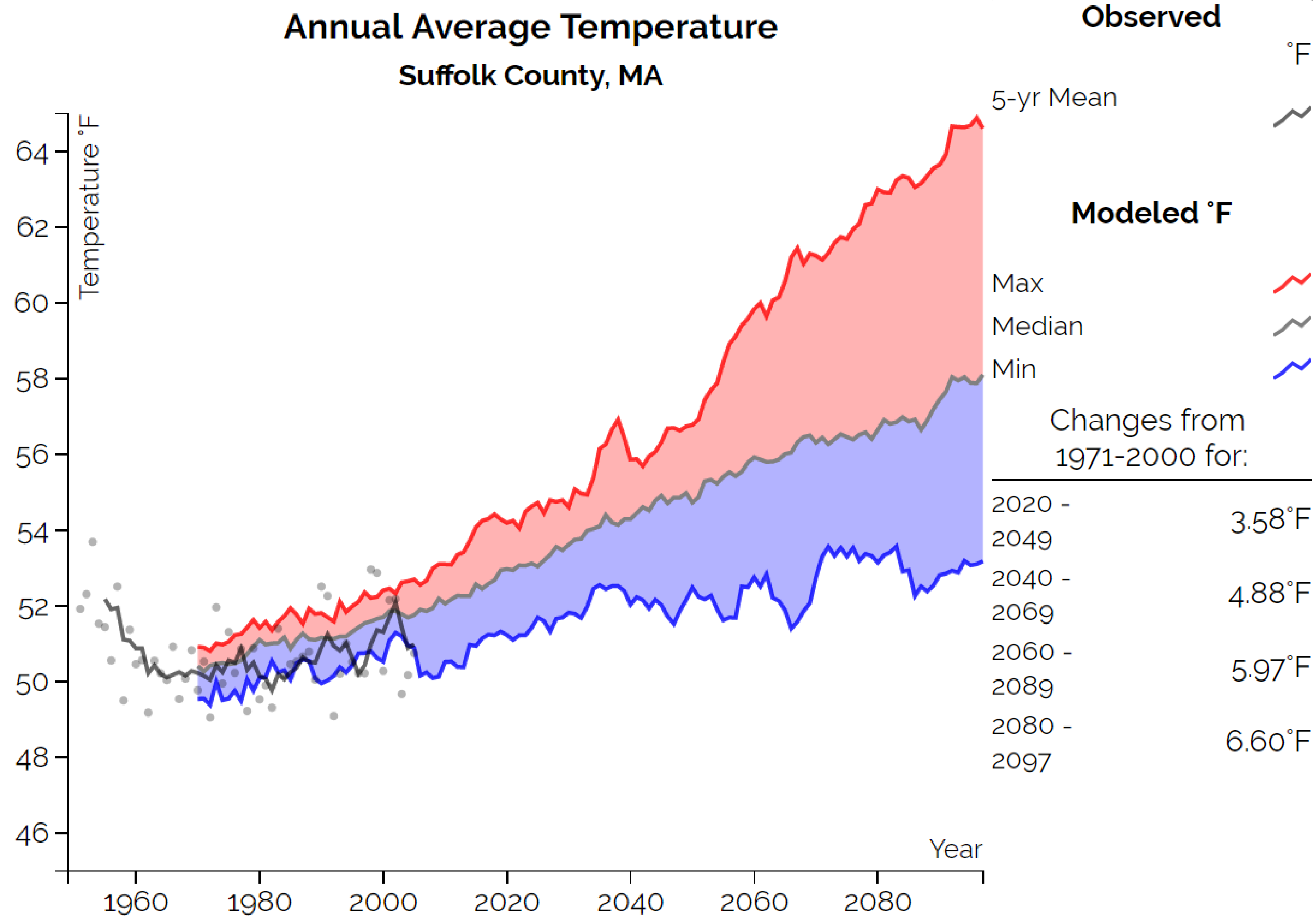
Source: Northeast Climate Science Center, MassClimateChange.org, Values shown for the Blackstone River Watershed.

What’s in a degree?

During the last ice age, temperatures were 9°F cooler than today.



Source: NCICS State Climate Summaries. Observational data from NOAA nClimDiv dataset. Accessed 2017.



Source: Northeast Climate Science Center, MassClimateChange.org, accessed 2018.

Changing Energy Use and Demand

More Warm Winter Days, Less Heating Demand
(based on annual Heating Degree-Days, base 65)

11 – 24%

by the 2050s

1971-2000
6079 Heating Degree-days

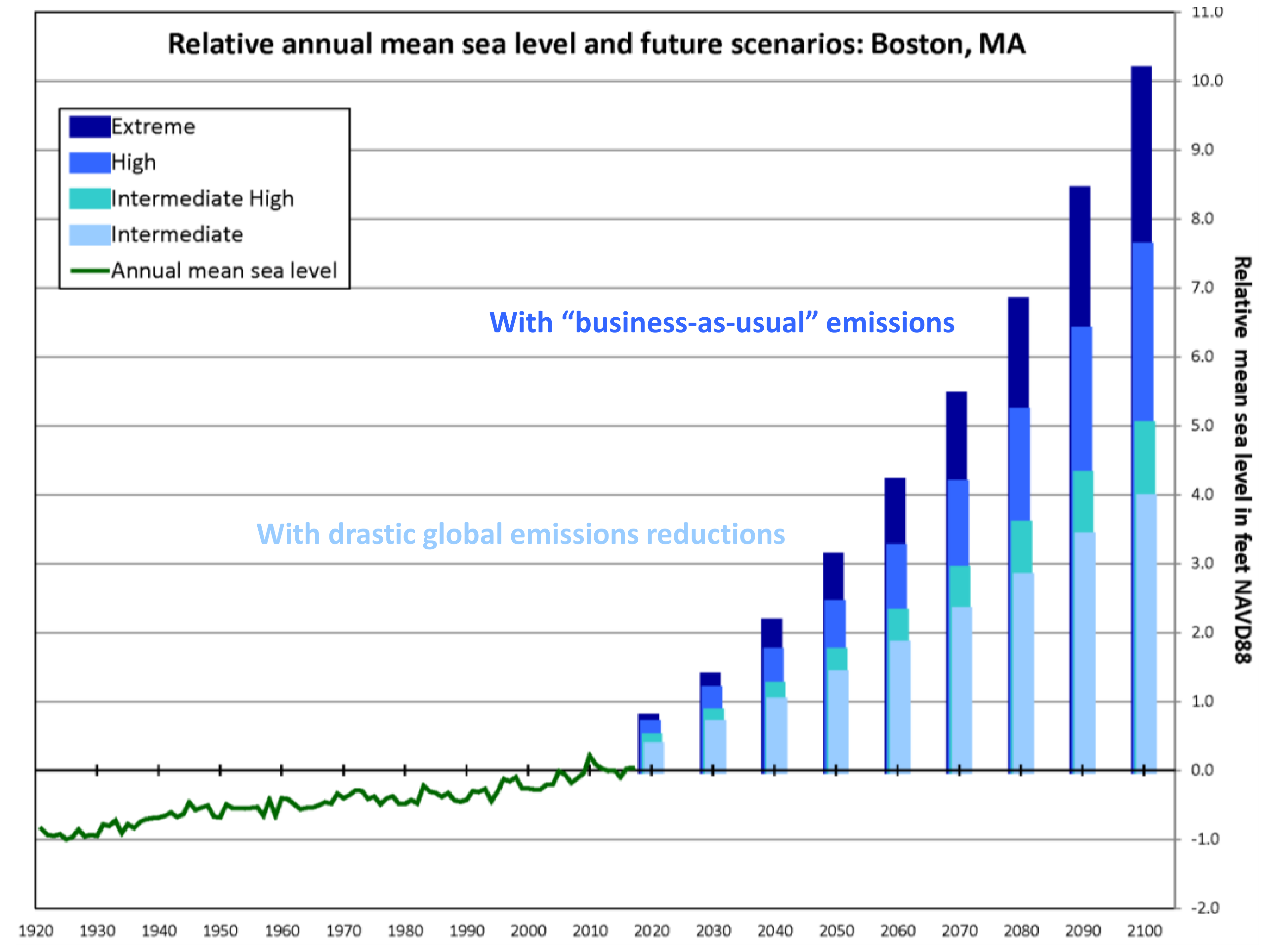
More Warm Summer Days, More Cooling Demand
(based on annual Cooling Degree-Days, base 65)

44 – 120%

by the 2050s

1971-2000
636 Cooling Degree-days

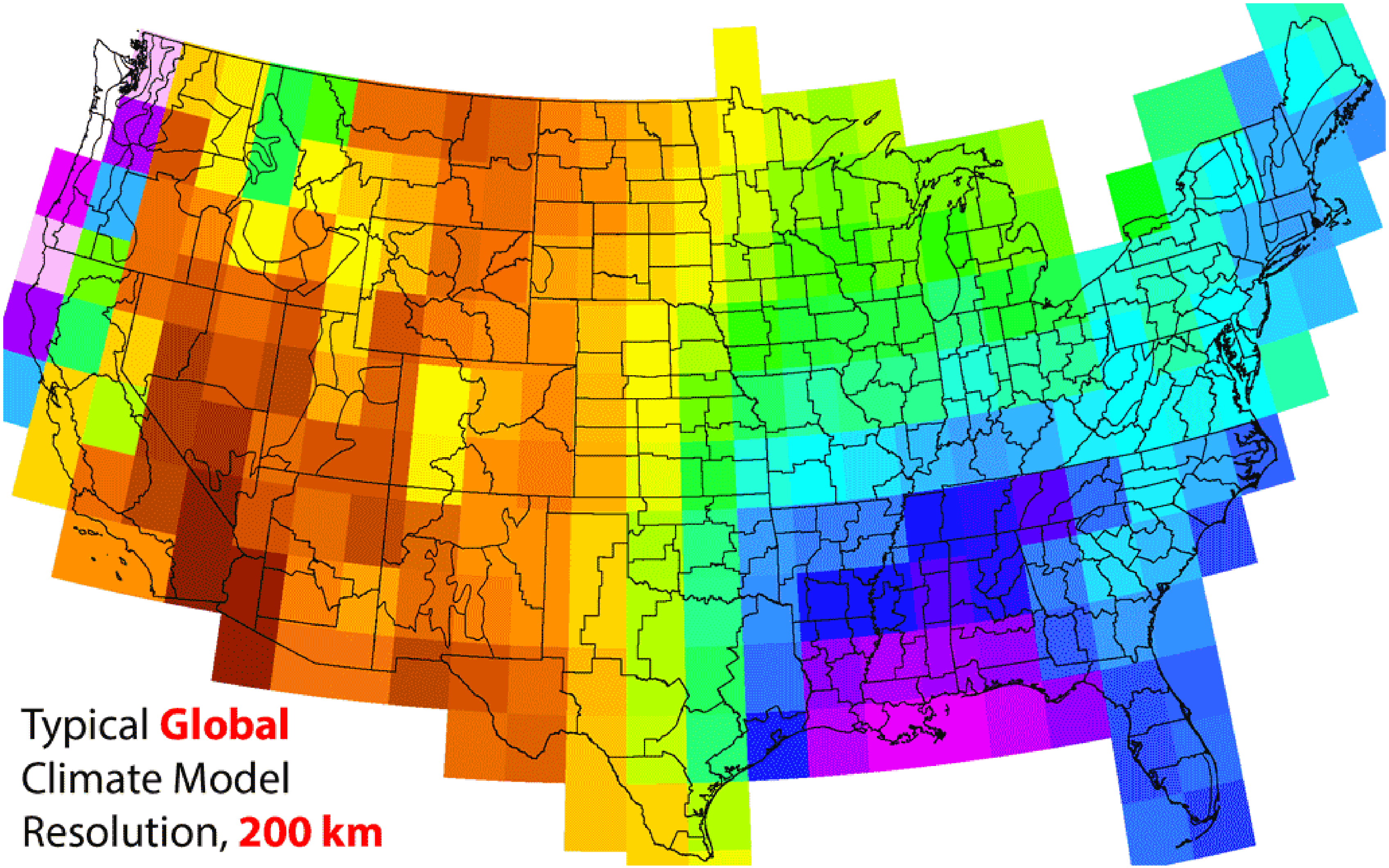
Source: Northeast Climate Science Center, MassClimateChange.org, accessed 2018.


Relative annual mean sea level and future scenarios: Boston, MA
Extreme
High
Intermediate High
Intermediate
Annual mean sea level
With “business-as-usual” emissions
With drastic global emissions reductions
Relative mean sea level in feet NAVD88
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
-1.0
-2.0
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020
2030
2040
2050
2060
2070
2080
2090
2100

Middlesex
Suffolk
Chelsea
Chelsea River
Suffolk Downs
Belle Isle Marsh Reservation
Belle Isle Inlet
Winthrop
East Boston
Winthrop Golf Club
Yirrell Beach
Boston Harbor
Deer Island
Massport-Marine Terminal
Economic Dev Industrial Corporation
3' SLR


Middlesex
Suffolk
Chelsea
Chelsea River
Suffolk Downs
Belle Isle Marsh Reservation
Belle Isle Inlet
Winthrop
East Boston
Winthrop Golf Club
Yirrell Beach
Boston Harbor
Deer Island
Massport-Marine Terminal
Economic Dev Industrial Corporation
6’ SLR

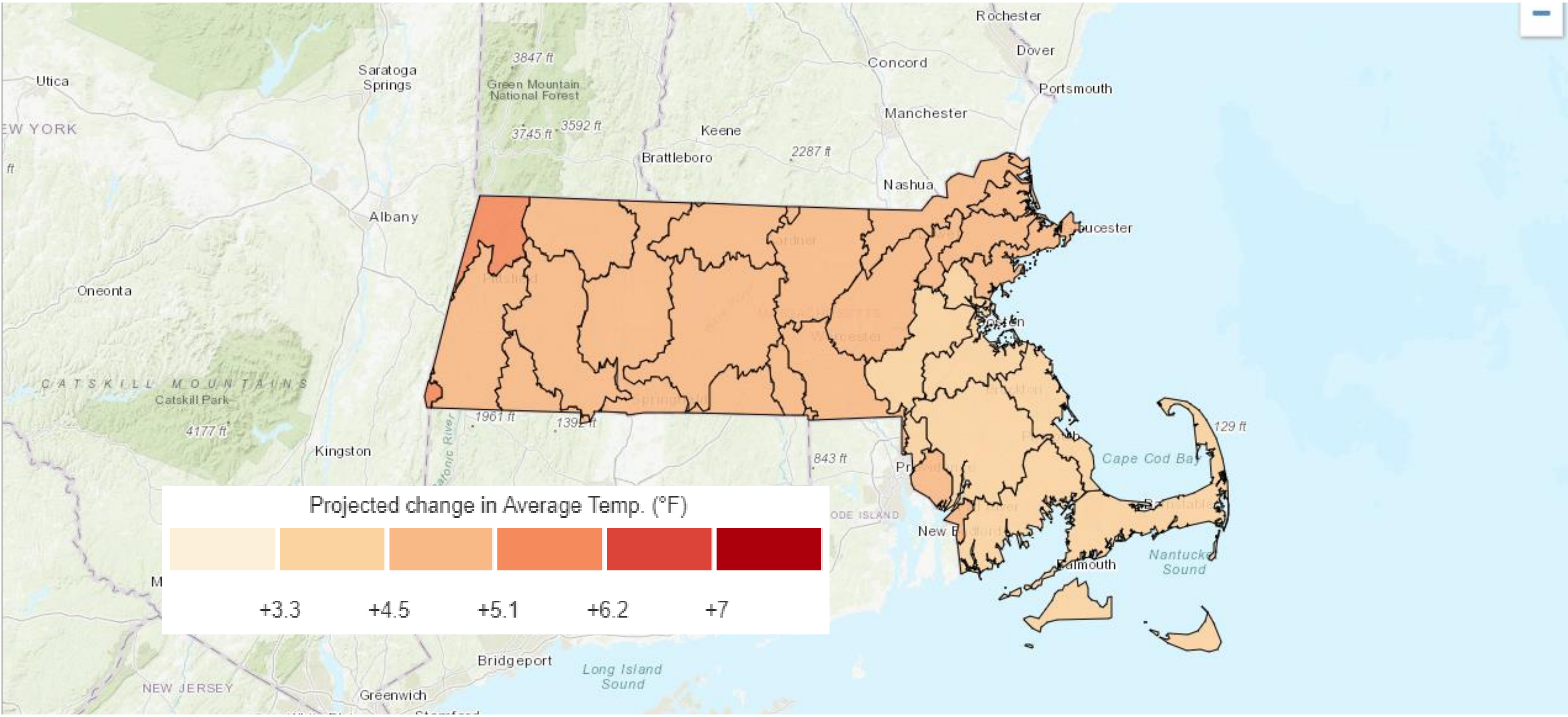
Typical Downscaled and Global Climate Model Resolution



Elevation data from PRISM, shown at 200 km and 24 km resolutions. Elevation profile is a key local and regional factor on climate.

Climate Change Indicators by Geographic Scale

2050s Annual Average Temperature Change



HUC-8 Watersheds

Climate Data and Planning

- The current and projected trajectory of many changes in climate are clear.

- Local variations are most often within the projected margin of error of climate models. Local variations are usually not practically significant.

- The resolution of climate data is not usually a limiting factor in planning. At the local scale, other factors may play a larger role.

More Precipitation

Total annual precipitation has increased by:

15%

1.2 trillion more gallons **of water equivalent falling on Massachusetts each year.**

~9,700 filled Prudential Towers

Changes are calculated from a linear regression of annual totals from 1895-2015, 1901-2000 reference period.

Source: NOAA

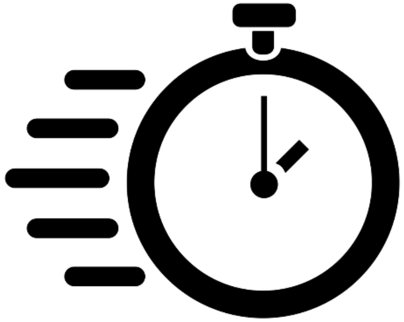
Change in 24-hour, 100-year Design Storms (inches)

	NOAA TP-40	NOAA Atlas 14	Change
Taunton	6.9”	7.7”	**12%**
Boston	6.6”	7.8”	**18%**
Worcester	6.5”	7.6”	**17%**

NOAA Atlas 14: http://hdsc.nws.noaa.gov/hdsc/pfds/

An anecdotal rule of thumb for anticipating changes in extreme precipitation…

Models often project a return period shorter by a factor of 2 to 4.



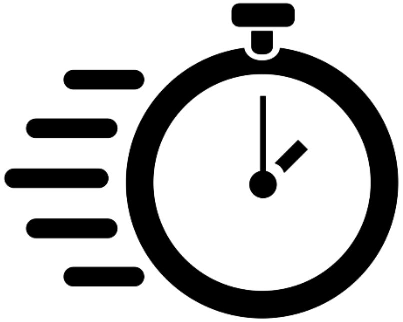
Often:

100-year storm → **25-year storm** → **10-year storm**

But projections vary place-to-place.

An anecdotal rule of thumb for anticipating changes in extreme precipitation…

Models often project a return period shorter by a factor of 2 to 4.



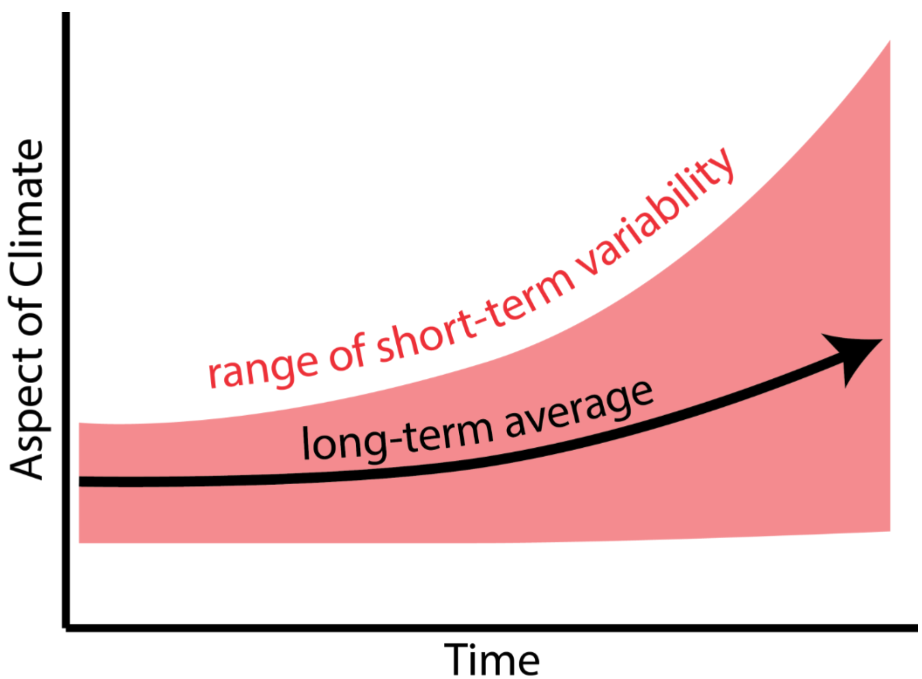
Often:

1% Annual Chance → **4% Annual Chance** → **10% Annual Chance**

But projections vary place-to-place.

Long-term change doesn't rule out shorter-term variability.

Example: Even as average temperatures warm, we will still experience winter storms.



Impact Example: Water Infrastructure
Freeze Vulnerability

Rising winter temperatures reduce spring snow cover.

+

Risk of spring cold snaps remains relatively stable.

=

Increased subsurface freeze risk

Impact Example: Public Health
Algal Blooms

West Monponsett Pond, Halifax, Massachusetts

Stronger Storms → More Runoff → Greater Nutrient Loading

Warmer Lake Temperatures → Changed Lake Dynamics → Algal Blooms, Fish Kills

Suffolk County Projected Changes
(2040-2069)

Annual Average Temperature	↑ 4.9°F
Days Above 90°F	↑ 19 Days
Sea Level Rise	↑ 2.4 feet
Days with >2" Precipitation	↑ 44%

Source: Northeast Climate Science Center, MassClimateChange.org, Values shown for the Blackstone River Watershed.



NATURAL & NATURE-BASED SOLUTIONS FOR VULBERABILITY REDUCTION & RESILIENCE

The Nature Conservancy
Protecting nature. Preserving life.

Sara Burns
Sara.burns@tnc.org



What We've Learned Today

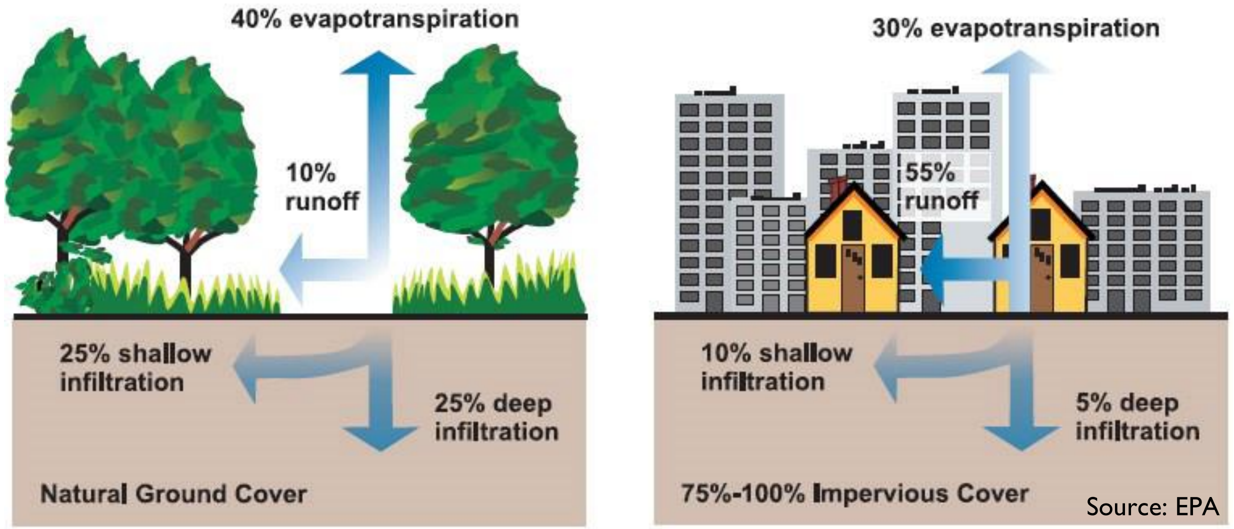
- We are all here to be proactive and find solutions!
- Climate change is already affecting how we experience storms.
- Winthrop is a great place with many strengths and coming challenges.

Key Observed Climate Changes in Suffolk County

Annual Average Temperature	↑	4.9°F
Days Above 90°F	↑	19 Days
Sea Level Rise	↑	2.4 feet
Days with >2" Precipitation	↑	44%

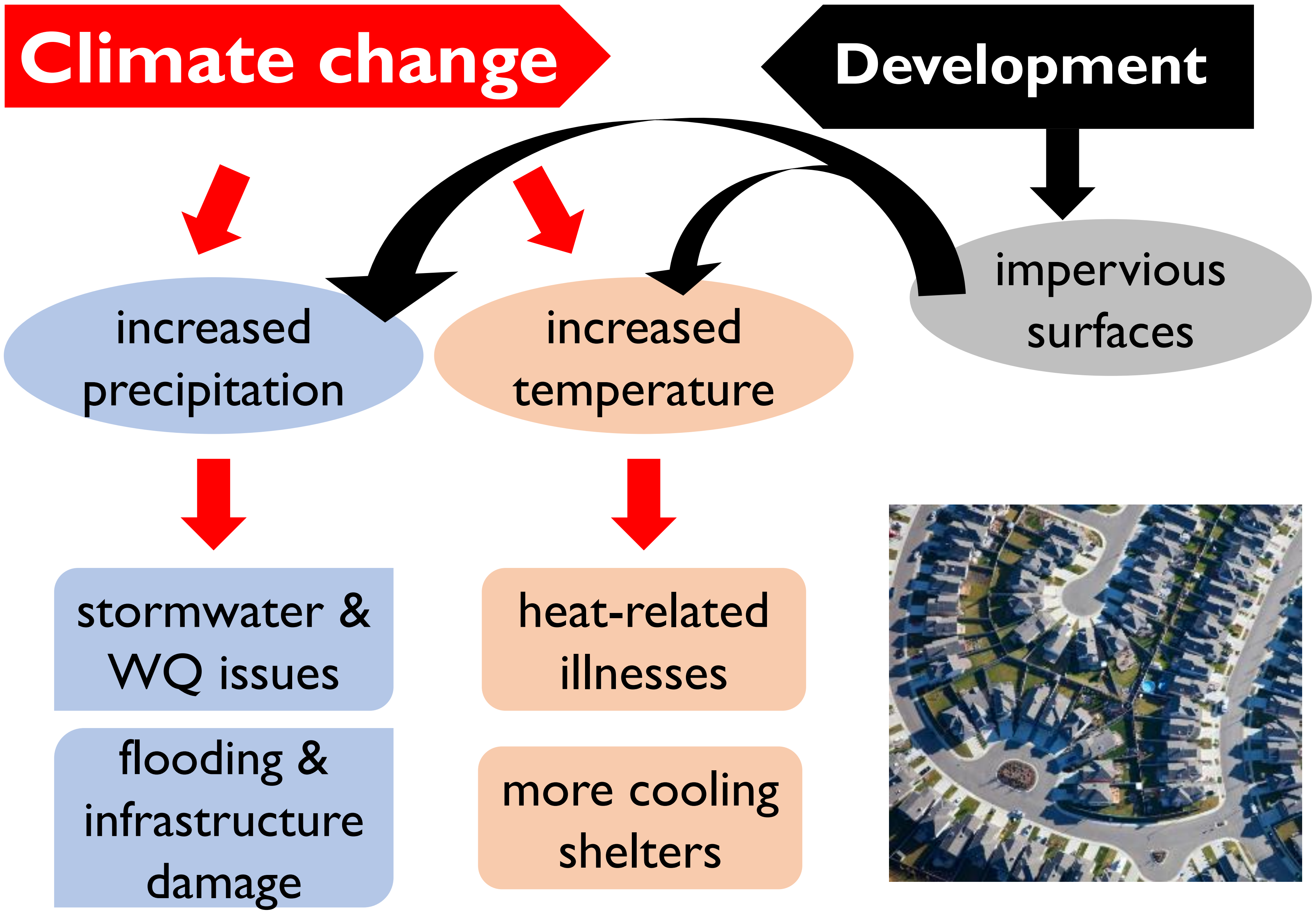
Source: Northeast Climate Science Center, MassClimateChange.org, Values shown for the Blackstone River Watershed.

What's the problem?



Impervious surface → Runoff →

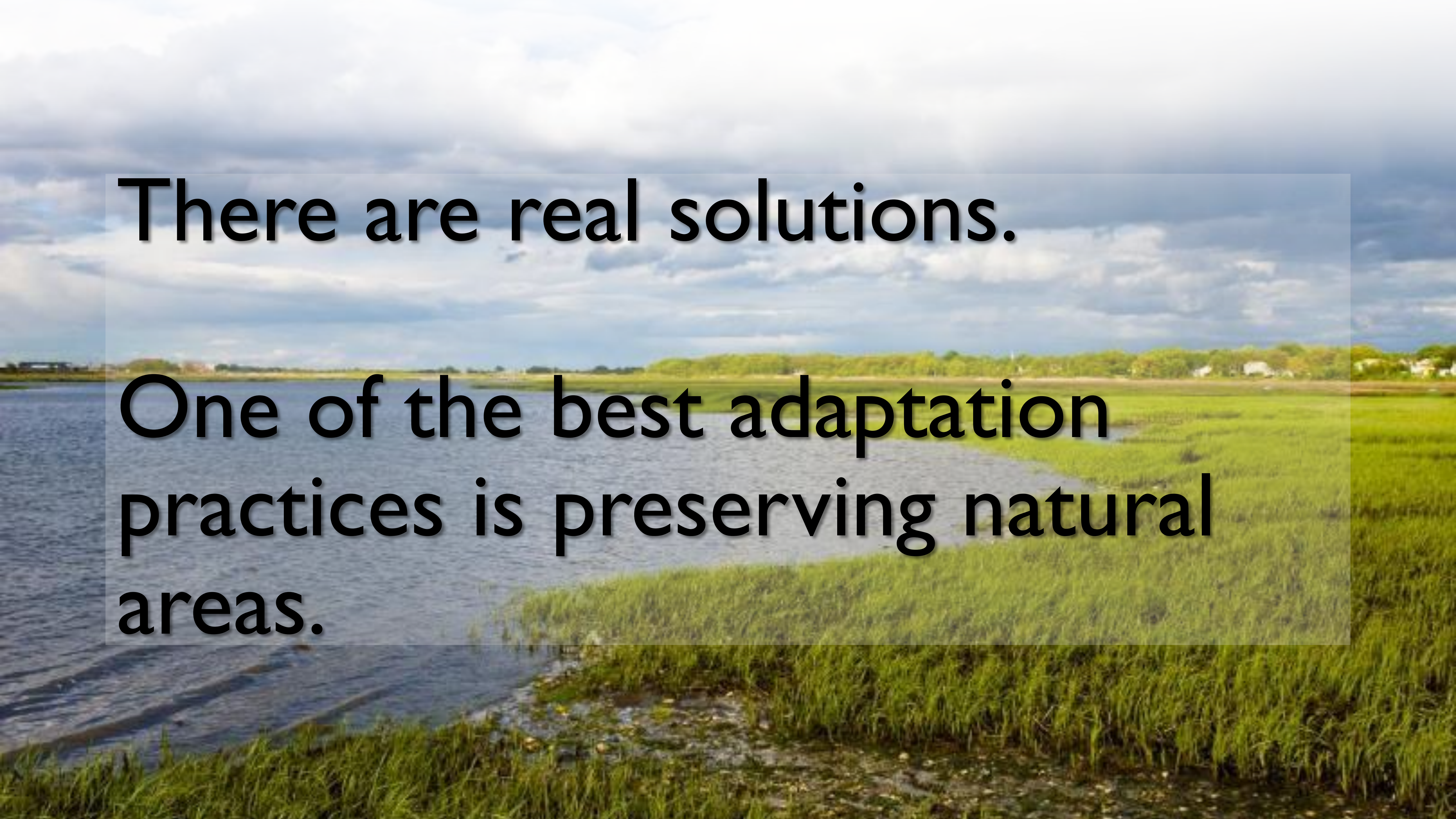
Large lawns → Fertilizer →


Climate change
Development
increased precipitation
increased temperature
impervious surfaces
stormwater & WQ issues
flooding & infrastructure damage
heat-related illnesses
more cooling shelters

Impacts: dry rivers, flooding, algae blooms, erosion, beach closures







There are real solutions.
One of the best adaptation practices is preserving natural areas.

Nature-Based Solutions

Nature-Based Solutions *use* natural systems, *mimic* natural processes, or *work in tandem with* traditional approaches to address natural hazards like flooding, erosion, drought, and heat islands.

Green Infrastructure

Low Impact Development (LID)

Solutions for Every Place

Conserve the natural green infrastructure already providing free ecosystem services

Integrate LID and green infrastructure design into development

Restore the resiliency of landscapes through LID

Conserve

Conserve the natural green infrastructure already providing free ecosystem services

Integrate LID and green infrastructure design into development

Restore the resiliency of landscapes through LID

Integrate

Conserve the natural green infrastructure already providing free ecosystem services

Integrate LID and green infrastructure design into development

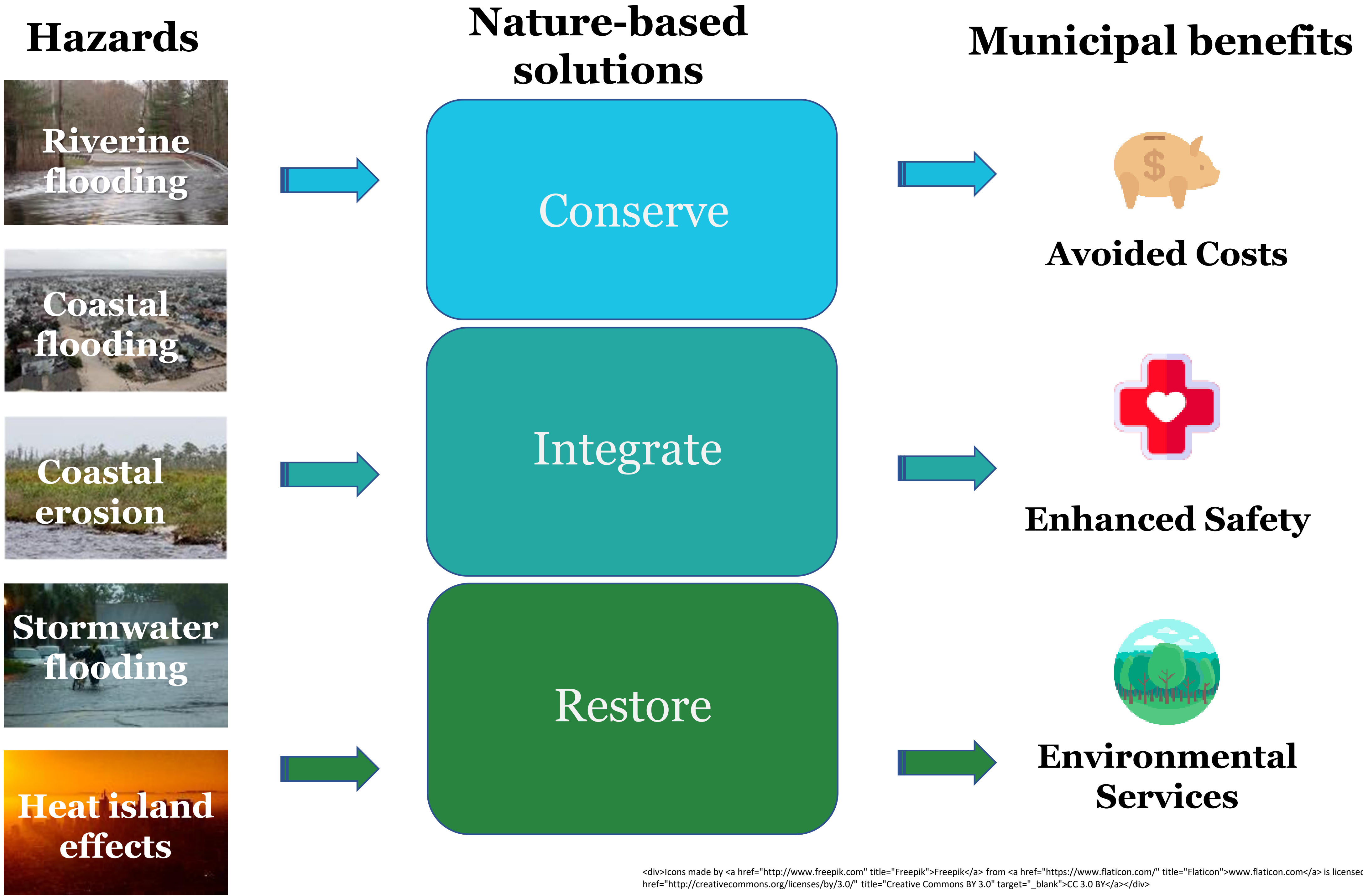
Restore the resiliency of landscapes through LID

Restore

Conserve the natural green infrastructure already providing free ecosystem services

Integrate LID and green infrastructure design into development

Restore resiliency of landscapes through nature based solutions


Hazards
Nature-based solutions
Municipal benefits
Riverine flooding
Coastal flooding
Coastal erosion
Stormwater flooding
Heat island effects
Conserve
Integrate
Restore
Avoided Costs
Enhanced Safety
Environmental Services

Co-benefits

Benefit	Reduces Stormwater Runoff											Improves Community Livability						
Practice	Reduces Water Treatment Needs	Improves Water Quality	Reduces Grey Infrastructure Needs	Reduces Flooding	Increases Available Water Supply	Increases Groundwater Recharge	Reduces Salt Use	Reduces Energy Use	Improves Air Quality	Reduces Atmospheric CO_2	Reduces Urban Heat Island	Improves Aesthetics	Increases Recreational Opportunity	Reduces Noise Pollution	Improves Community Cohesion	Urban Agriculture	Improves Habitat	Cultivates Public Education Opportunities
Green Roofs	●	●	●	●	○	○	○	●	●	●	●	●	◒	●	◒	◒	●	●
Tree Planting	●	●	●	●	○	◒	○	●	●	●	●	●	●	●	●	◒	●	●
Bioretention & Infiltration	●	●	●	●	◒	◒	○	○	●	●	●	●	●	◒	◒	○	●	●
Permeable Pavement	●	●	●	●	○	◒	●	◒	●	●	●	○	○	●	○	○	○	●
Water Harvesting	●	●	●	●	●	◒	○	◒	◒	◒	○	○	○	○	○	○	○	●

● Yes ◒ Maybe ○ No

Source: Center for Neighborhood Technology's The Value of Green Infrastructure

Avoided costs

Land Protection as Water Protection

- Quabbin & Wachusett Reservoirs serve 2.5 million
- Over 20 years, Massachusetts Water Resources Authority spent $130M to protect 22,000 acres of watershed lands
- Avoided ratepayer cost of $250M on a filtration plant and $4M/yr in operations

Avoided Costs

Enhance Safety: Charles River Natural Valley Storage Area. US Army Corps of Engineers

- 8,095 Acres Conserved
- From 1977 - 2016, the project has provided $11,932,000 in flood protective services
- Co-benefits include recreation and natural resource benefits

http://www.nae.usace.army.mil/Missions/Civil-W... ...k-Management/Massachusetts/Charles-River-NVS...

Environmental Services

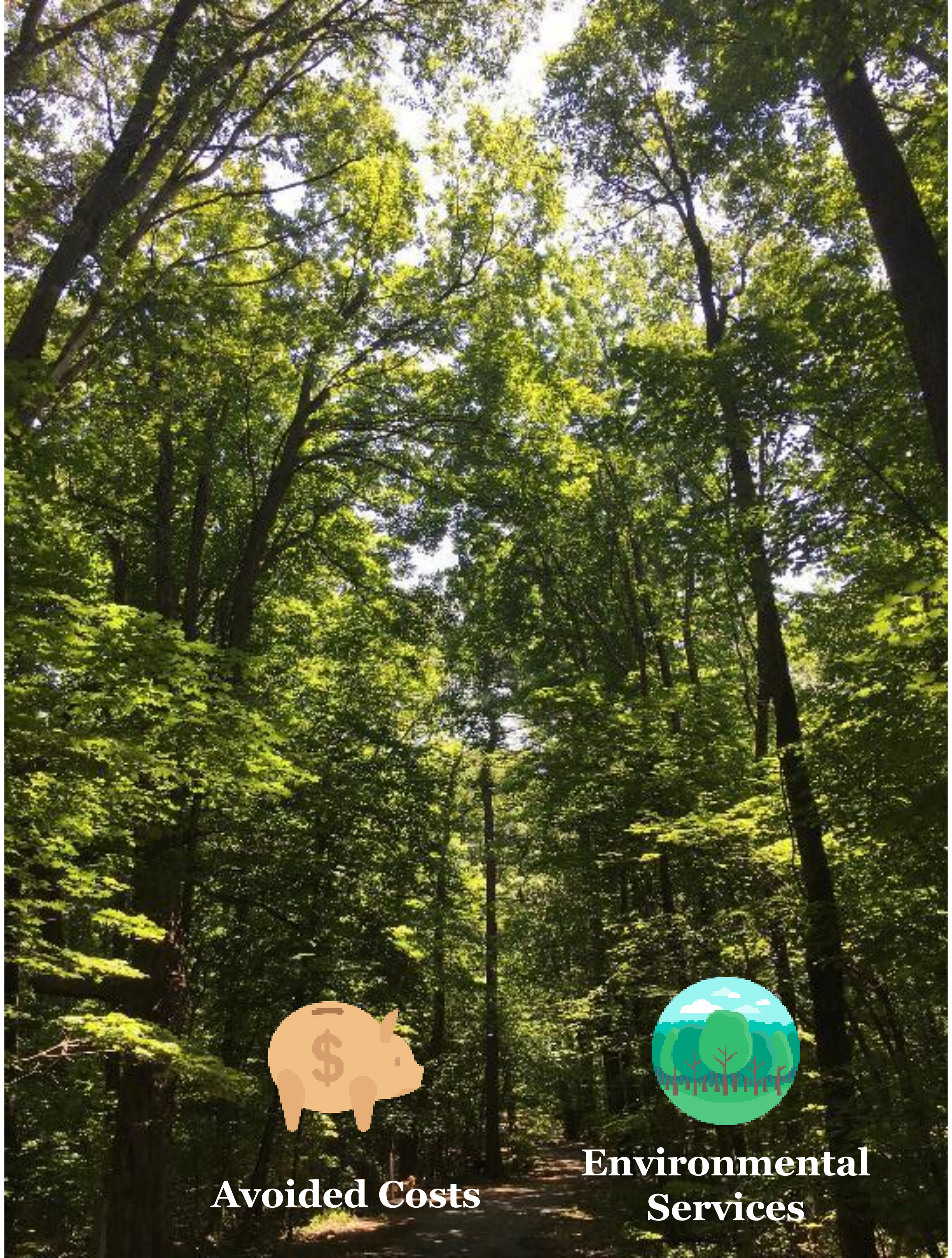
Massachusetts Forests Mitigate Climate Change

- MA forests **sequester 14%** of the state's gross annual carbon emissions
- Average acre stores **85 tons carbon**
- Capacity **increases** over time as forests mature

Environmental Services

Return on Investment Studies in MA
Trust for Public Land

- Outdoor recreation generates:
    - $10 billion in consumer spending
    - $739 million in state and local tax revenue
    - 90,000 jobs
    - $3.5 billion in annual wages and salaries
- Agriculture, forestry, commercial fishing, and related activities generate:
    - $13 billion in output
    - 147,000 MA Jobs
- **Conservation Projects Return $4 : $1 spent**



Return on Investment Studies in MA
Div. of Ecological Restoration

Massachusetts Department of Fish and Game
Division of Ecological Restoration
Invested in Nature and Community

Restoration results in

- **12.5 jobs** and
- **$1.75 Million economic output**
- “Restoration economy” in Massachusetts

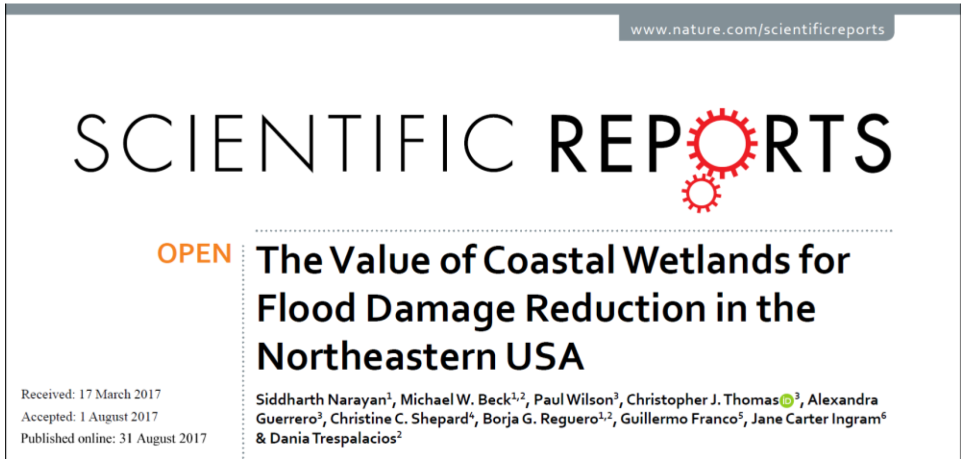
Return on Investment Studies Northeast US
Scientific Reports

- Wetlands saved $625,000,000 in direct flooding damages in New Jersey
- In New England, wetlands reduce storm damage by approximately 16%

Environmental Services

Enhanced Safety

Avoided Costs


www.nature.com/scientificreports

SCIENTIFIC REPORTS

OPEN

The Value of Coastal Wetlands for Flood Damage Reduction in the Northeastern USA

Received: 17 March 2017
Accepted: 1 August 2017
Published online: 31 August 2017

Siddharth Narayan[1], Michael W. Beck[1,2], Paul Wilson[3], Christopher J. Thomas[3], Alexandra Guerrero[3], Christine C. Shepard[4], Borja G. Reguero[1,2], Guillermo Franco[5], Jane Carter Ingram[6] & Dania Trespalacios[2]

https://www.nature.com/articles/s41598-017-09269-z

Resources for Nature-Based Solutions

Guidance/Case Studies

- Naturally Resilient Communities successful project case studies from across the country to help communities learn and identify nature-based solutions
- EPA's Soak Up the Rain stormwater outreach tools, how-to guides and resources
- EPA's RAINE database of vulnerability, resilience and adaptation reports, plans and webpages at the state, regional and community level.
- Climate Action Tool explore adaptation strategies and actions to help maintain healthy, resilient wildlife communities in the face of climate change.

Mapping/Planning

- Mapping and Prioritizing Parcels for Resilience (MAPPR) ID priority parcels for protection and climate change resilience
- Living Shorelines in New England: State of the Practice and Profile Pages for Solutions are case studies, siting criteria, and regulatory challenges for coastal resilience in New England.
- Low Impact Development Fact Sheets cover valuing green infrastructure, conservation design, development techniques, regulations, urban waters, and cost calculations.

Cost/Benefit

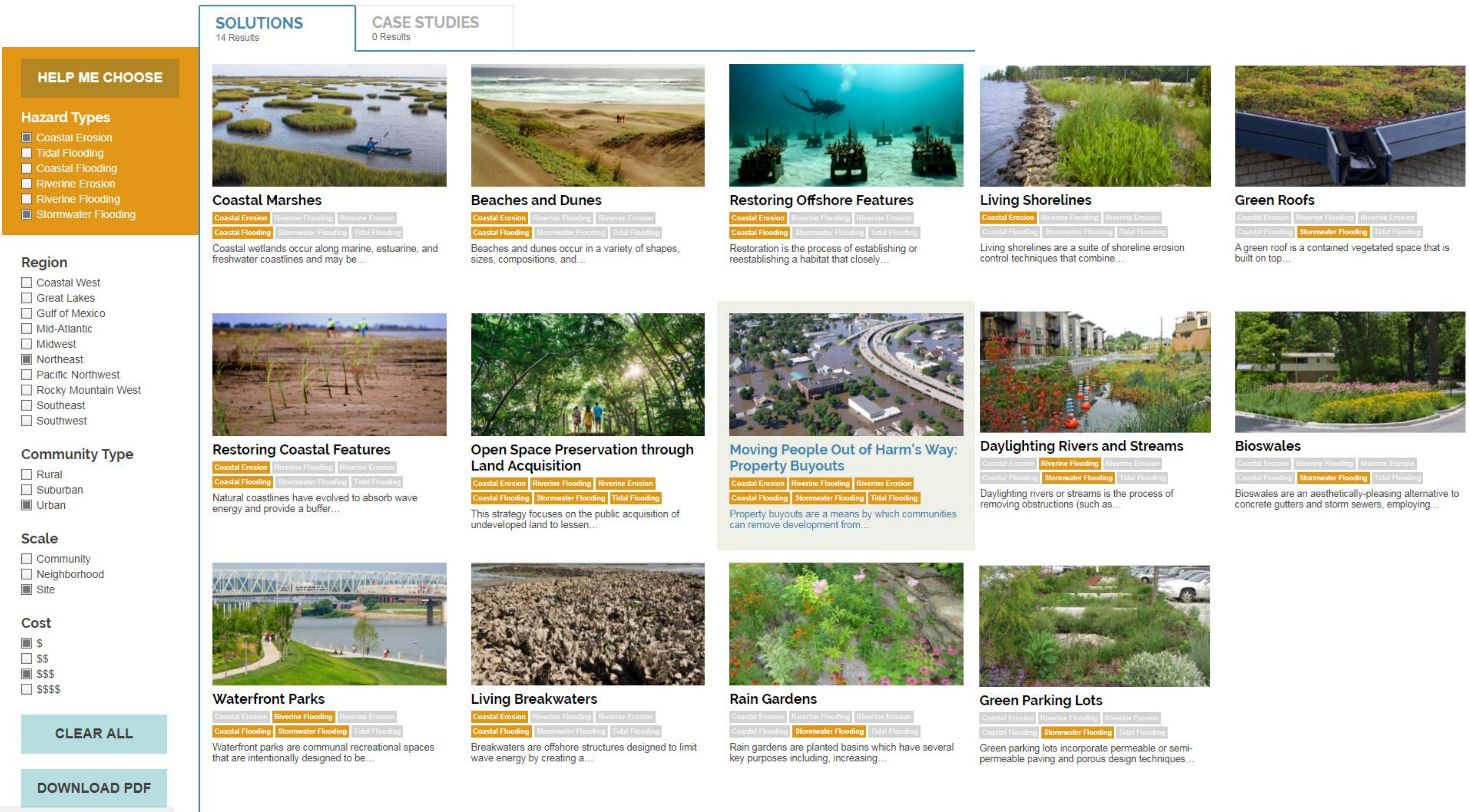
- EPA's Green Infrastructure cost/cost-benefit/tools Database of tools for comparing solution costs
- Massachusetts Division of Ecological Restoration's economic benefits of aquatic restoration based on MA case studies

Bylaws/Ordinances

- EEA's Smart Growth Toolkit access to information on planning, zoning, subdivision, site design, and building construction techniques
- Guide for Supporting LID in Local Land Use Regulations provides a framework for communities to review their zoning, rules, and regulations for a number of factors.

Naturally RESILIENT Communities

http://nrcsolutions.org/

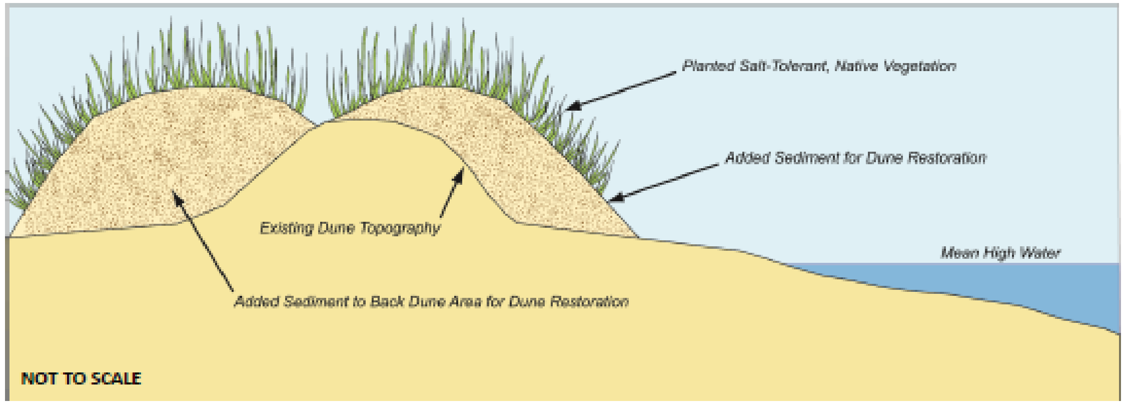


Dune - Natural

Dune building projects involve the placement of compatible sediment on an existing dune, or creation of an artificial dune by building up a mound of sediment at the back of the beach.[1] This may be a component of a beach nourishment effort or a stand alone project.

Objectives: erosion control; shoreline protection; dissipate wave energy; enhanced wildlife and shorebird habitat.

Design Schematics



Case Study

Ferry Beach, Saco, Maine

Relatively high beach and dune erosion (approximately 3 feet per year) prompted the FBPA to undertake a dune restoration project to help protect roads and homes from flooding and erosion. Given the relatively high erosion rate, it was decided that placing sediment for restoration seaward of the existing dune would be short-lived. A secondary frontal dune ridge landward of the existing dune crest was constructed instead, allowing native vegetation to establish.

Ferry Beach, Saco, ME
Photo courtesy of Peter Slovinsky

Project Proponent	Ferry Beach Park Association (FBPA)
Status	Completed 2009
Permitting Insights	Permit-by-Rule needed from Maine DEP
Construction Notes	An 800 foot long secondary dune was built to 1 foot above the effective FEMA 100-year BFE. A secondary dune was built because erosion of the front dune was considered too high (>3 feet per year) to have a successful project. 1,800 cy of dune-compatible sediment was delivered via truck from a local gravel pit. Construction and planting occurred in early spring. Volunteers planted native American Beach grass.
Maintenance Issues	Sand fencing was used to help trap sediment in the constructed dune, and to help maintain the seaward edge of the original dune. However, shoreline erosion has continued; as of May 2017 the restored dune has started to erode.
Final Cost	$29,000 and volunteer hours
Challenges	Trucking 90 dump-truck loads of sediment through the community. Construction and planting timing windows associated with piping plover nesting. Continued erosion.

Overview of Technique

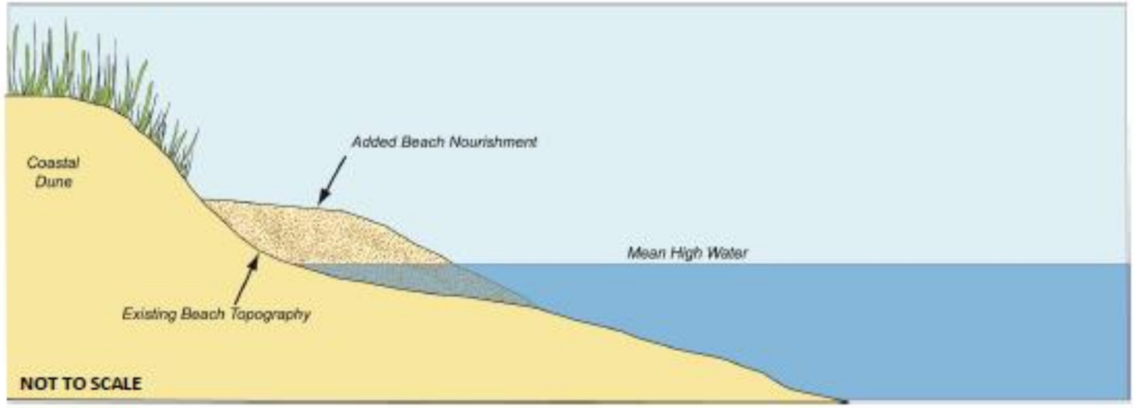
Materials	Sediment is brought in from an offsite source, such as a sand and gravel pit or coastal dredging project.[1] Planting the dune with native, salt-tolerant, erosion-control vegetation (e.g., beach grass *Ammophilia breviligulata*) with extensive root systems is highly recommended to help hold the sediments in place.[1,11] Sand fencing can also be installed to trap windblown sand to help maintain and build the volume of a dune.[1,11]
Habitat Components	Dunes planted with native beach grass can provide significant wildlife habitat.[9]
Durability and Maintenance	The height, length, and width of a dune relative to the size of the predicted storm waves and storm surge determines the level of protection the dune can provide.[1] To maintain an effective dune, sediment may need to be added regularly to keep dune's height, width, and volume at appropriate levels.[1] The seaward slope of the dune should typically be less steep than 3:1 (base:height).[1,9] Dunes with vegetation perform more efficiently, ensuring stability, greater energy dissipation, and resistance to erosion.[10] If plantings were included, plants should be replaced if they are removed by storm or die.[1]
Design Life	Dunes typically erode during storm events. In areas with no beach at high tide, dune projects will be short lived as sediments are rapidly eroded and redistributed to the nearshore.[1] Designs should consider techniques that enhance or maintain the dune (e.g. sand fencing and/or vegetation to trap wind blown sand).
Ecological Services Provided	The added sediment from dune projects supports the protective capacity of the entire beach system (i.e., dune, beach, and nearshore area). Any sand eroded from the dune during a storm, supplies a reservoir of sand to the fronting beach and nearshore area.[1,9] Dunes dissipate rather than reflect wave energy, as is the case with hard structures.[1] Dunes also act as a barrier to storm surges and flooding, protecting landward coastal resources,[9] and reducing overwash events.[10] Sand dunes provide a unique wildlife habitat.[9]
Unique Adaptations to NE Challenges (e.g. ice, winter storms, cold temps)	Shorter planting and construction window due to shorter growing season. Utilization of irrigation to establish plants quickly. Presence of sensitive species may require design (e.g. slope, plant density) and timing adjustments.

Beach Nourishment

Beach nourishment is the placement of sediment along the shoreline of an eroding beach from outside source. It widens and/or elevates the beach and usually moves the shoreline seaward, increasing the natural protection that a beach can provide against wave energy and storms. This may be a component of a dune restoration/creation effort or a stand alone project.

Objectives: erosion control; shoreline protection; enhance recreation; increased access; dissipate wave energy; enhanced wildlife and shorebird habitat.

Design Schematics



Case Study

Winthrop, MA Beach Nourishment

Applied Coastal Research & Engineering, Inc. designed the Winthrop Beach Nourishment Program to provide storm protection to an upland urban area fronted by a seawall originally constructed in 1899. The project utilized 460,000 cy of compatible sediment to nourish approximately 4,200 linear feet and to create the equilibrated designed berm width of 100 feet. Once the beach nourishment was completed in late 2014, the high tide shoreline was pushed more than 150 feet from the seawall, with a gradual slope extending approximately 350 feet offshore.

Winthrop Shores, Winthrop, MA
Photo courtesy of Applied Coastal Research & Engineering

Project Proponent	Massachusetts Division of Conservation and Recreation (DCR)
Status	Phase 1: 2013; Phase 2: 2014
Permitting Insights	Offshore sediment source was denied by Army Corps after a 12-year permitting process. Conservation Permit required from NHESP to address potential impacts to Piping Plovers.
Construction Notes	Upland derived mix of sand, gravel and cobble to match the existing beach sediments was required, where the nourishment was provided from two sources: sand borrow (80%) and naturally rounded cobble & gravel (20%).
Maintenance Issues	Cobble berms have begun forming along the beach, which conflicts with community recreation goals, requiring additional sand for aestheitcs.
Final Cost	Permitting: $2,000,000 (including attempt to permit offshore borrow site. Construction: $22,000,000 (included work on coastal engineering structures).
Challenges	Trucking through the community: urban community with two roads in and out, as well as roadway damage and air quality impacts associated with 16,000+ truck trips. Public perception of compatible sediment.

Design Overview

Materials	Sediment is brought in from an offsite source, such as a sand and gravel pit or coastal dredging project.[1]
Habitat Components	Beaches nourished with compatible sediments can provide significant wildlife habitat.[5,6]
Durability and Maintenance	A coarser sand may erode more slowly than a finer sand.[6] To maintain an effective beach berm, sediment may need to be added regularly maintain the desired beach profile.[6,11] The need to replenish the beach depends upon the rate of erosion at the particular site, but is typically once every 1-5 years.[6]
Design Life	To increase erosion and flooding protection, nourished beaches are frequently built higher and wider than would occur naturally.[11] Grain size (e.g. sand, gravel, cobble) drives appropriate design slopes; gentler slopes generally perform better than steep areas. However, coarser grain sizes allow for steeper project slopes.
Ecological Services Provided	A nourishment beach can provide additional beach habitat area. Added sediment used for the nourishment can also provide a sand source for surrounding areas. The increased width and height of the beach berm can help attenuate wave energy.[10]
Unique Adaptations to NE Challenges (e.g. ice, winter storms, cold temps)	Beach nourishment sites subject to ice impacts are generally most successfully stabilized with gentler slopes (e.g., 6:1-10:1).[13] Presence of sensitive species may require design (e.g. slope, plant density) and timing adjustments.

Revere Beach, MA
Photo courtesy of MA CZM

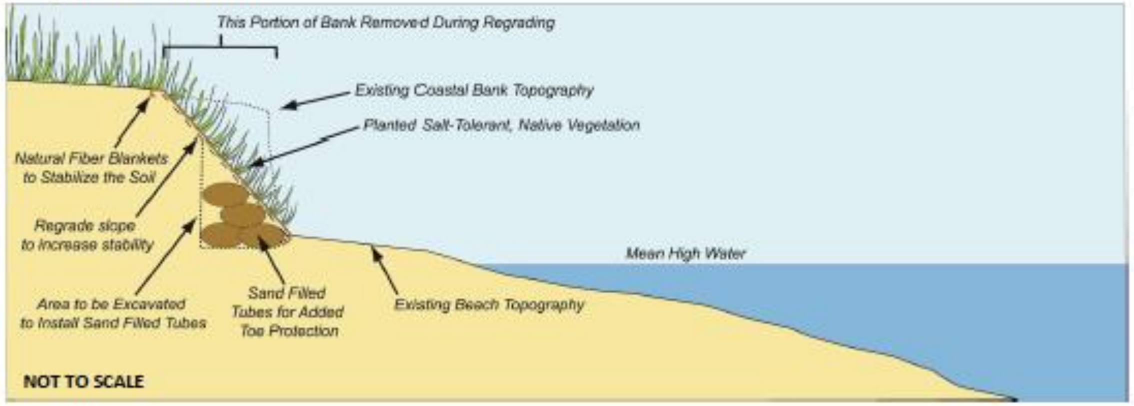
Long Beach, Barnstable, MA
Photo courtesy of MA CZM

Coastal Bank – Engineered Core

Coastal bank protection, including slope grading, terracing, and toe protection and vegetation planting will reduce the steepness and protect the toe of the bank from further erosion. Engineered cores, of sand filled tubes, provide added protection from future bank erosion.

Objectives: erosion control; shoreline protection; dissipate wave energy; enhanced wildlife habitat.

Design Schematics



Design Overview

Materials	An engineered core could be constructed using coir envelopes, which are coir fabric filled with sand. Cutback/excavated material should be used to fill the coir envelopes but supplemental offsite material may be required. Anchors are necessary to secure the envelopes. Native vegetation with extensive root systems are often used in conjunction with coir envelopes to help stabilize the site. Also, natural fiber blankets can also be used to stabilize the ground surface while plants become established. (Blankets should be run up and down the slope rather than horizontally across it.)
Habitat Components	Because they are made with natural fibers and planted with vegetation, natural fiber blankets also help preserve the natural character and habitat value of the coastal environment.
Durability and Maintenance	A veneer of sand/sediment should be maintained over the sand filled tubes to prolong their lifetime. Regular maintenance, such as resetting, anchoring, replacement, or recovering, can increase the effectiveness of the project.[6] Invasive species management should be incorporated into the project. Runoff management and groundwater will also be crucial to project success.[6]
Design Life	As the sand tube material and natural fiber blankets disintegrate, typically over 5-10 years, the plants take over the job of site stabilization.
Ecological Services Provided	Upland plantings stabilize bluffs and reduce rainwater runoff.[11]
Unique Adaptations to NE Challenges (e.g. ice, winter storms, cold temps)	Shorter planting and construction window due to shorter growing season. Utilization of irrigation to establish plants quickly. Freeze and thaw processes can damage this design. Consideration should be given to the slope aspect and the implications on plant growth and microbiome from shading and sun exposure.

Case Study

Stillhouse Cove, Cranston, RI

Stillhouse Cove is the site of a public park and a previous salt marsh restoration project that was completed in 2007. Restoration of the coastal bank was initiated after Superstorm Sandy caused extensive erosion which over-steepened the bank and washed fill and soil into the adjacent marsh. Save The Bay and EWPA, working closely with the USDA Natural Resources Conservation Service, developed a design to reinforce and protect the eroding bank by reconfiguring the slope and using natural materials and vegetation.

Construction at Stillhouse Cove, RI
Photos courtesy of Janet Freedman

Project Proponent	City of Cranston, RI, Edgewood Waterfront Preservation Association (EWPA), Save The Bay, Natural Resources Conservation Service (NRCS).
Status	Completed in 2013. Maintained in 2014 (added coir logs and plantings).
Permitting Insights	The project had several iterations but was finally permitted as a Sandy Emergency Assent. An extension was required due to challenges of securing funding within the permit time frame.
Construction Notes	A key component of this project was regrading the bank from a vertical cut to create a more gradual slope. Once the slope was regraded, sand filled coir envelopes were installed, covered with soil and planted with salt tolerant vegetation.
Maintenance Issues	3 coir logs were installed at the southern end of project and planted with warm season grasses as part of the Dept. of Interior Hurricane Sandy Relief Grant Program. The base of the bank will be more frequently inundated as sea levels rise.
Final Cost	Permitting: No permit fee for municipalities Construction: $59,006 plus volunteer labor.
Challenges	Funding and coordination with partners and volunteers.

Completed Stillhouse Cove Project (RI)
Photo courtesy of Janet Freedman

Construction at Allin's Cove, Barrington, RI
Photo courtesy of Janet Freedman

HELP ME CHOOSE

Hazard Types

- [ ] Coastal Erosion
- [ ] Tidal Flooding
- [ ] Coastal Flooding
- [ ] Riverine Erosion
- [ ] Riverine Flooding
- [x] Stormwater Flooding

Region

- [ ] Coastal West
- [ ] Great Lakes
- [ ] Gulf of Mexico
- [ ] Mid-Atlantic
- [ ] Midwest
- [x] Northeast
- [ ] Pacific Northwest
- [ ] Rocky Mountain West
- [ ] Southeast
- [ ] Southwest

Community Type

- [ ] Rural
- [ ] Suburban
- [x] Urban

Scale

- [x] Community
- [x] Neighborhood
- [x] Site

Cost

- [x] $
- [ ] $$
- [ ] $$$
- [ ] $$$$

CLEAR ALL

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SOLUTIONS 10 Results | **CASE STUDIES** 0 Results

Regulatory and Policy Approaches to Address Hazards

Coastal Erosion | Riverine Flooding | Riverine Erosion | Coastal Flooding | Stormwater Flooding | Tidal Flooding

Flooding is a natural process that, in the absence of human settlements,...

Planning Approaches to Reduce Natural Hazards

Coastal Erosion | Riverine Flooding | Riverine Erosion | Coastal Flooding | Stormwater Flooding | Tidal Flooding

Flooding is a natural process that, in the absence of human settlements,...

Enhanced Floodplain Mapping

Coastal Erosion | Riverine Flooding | Riverine Erosion | Coastal Flooding | Stormwater Flooding | Tidal Flooding

Flooding is a natural process that, in the absence of human settlements,...

Bioswales

Coastal Erosion | Riverine Flooding | Riverine Erosion | Coastal Flooding | Stormwater Flooding | Tidal Flooding

Bioswales are an aesthetically-pleasing alternative to concrete gutters and storm sewers, employing...

Open Space Preservation through Land Acquisition

Coastal Erosion | Riverine Flooding | Riverine Erosion | Coastal Flooding | Stormwater Flooding | Tidal Flooding

This strategy focuses on the public acquisition of undeveloped land to lessen...

Urban Trees + Forests

Coastal Erosion | Riverine Flooding | Riverine Erosion | Coastal Flooding | Stormwater Flooding | Tidal Flooding

Urban forestry is the planned installation and management of trees within an...

Rain Gardens

Coastal Erosion | Riverine Flooding | Riverine Erosion | Coastal Flooding | Stormwater Flooding | Tidal Flooding

Rain gardens are planted basins which have several key purposes including, increasing...

Green Roofs

Coastal Erosion | Riverine Flooding | Riverine Erosion | Coastal Flooding | Stormwater Flooding | Tidal Flooding

A green roof is a contained vegetated space that is built on top...

Green Parking Lots

Coastal Erosion | Riverine Flooding | Riverine Erosion | Coastal Flooding | Stormwater Flooding | Tidal Flooding

Green parking lots incorporate permeable or semi-permeable paving and porous design techniques...

Daylighting Rivers and Streams

Coastal Erosion | Riverine Flooding | Riverine Erosion | Coastal Flooding | Stormwater Flooding | Tidal Flooding

Daylighting rivers or streams is the process of removing obstructions (such as...

MVP Example: identified intersection that floods?

Bioretention bump outs & street trees can help to…

- capture & filter excess water – alleviate pressure on MS4
- improved pedestrian safety – better visibility, shorter walkway
- enhance aesthetics to encourage visitors & walking

without altering existing parking or bus stops

Environmental Services

Enhanced Safety

Funding

Certified MVP Communities Receive Priority Ranking

- MA Clean Water State Revolving Fund Program (CWSRF)
- MA Office of Coastal Zone Management (CZM)
- MA Department of Agricultural Resources (MDAR)
- MA Executive Office of Energy and Environmental Affairs (EEA)
- MA Department of Environmental Protection (DEP)
- Mass Environmental Trust (MET)

Ten things local homeowners & citizens can do

1. Divert your downspouts

2. Plant a rain garden

3. Replace impervious surfaces

4. Adopt a drain – and encourage others to

5. Don't wash your car in the driveway

6. Pick up pet waste

7. Reduce fertilizer and pesticide use

8. Replace lawn with native plants

9. Reduce lawn watering and mowing

10. Pick up leaf litter (compost/dispose of properly)

The Nature Conservancy
Protecting nature. Preserving life.

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&CURRAN

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COMMITMENT & INTEGRITY DRIVE RESULTS