



Stone Living Lab

Quarterly Summary

Research, Monitoring & Education Projects



Spring 2024

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About the Stone Living Lab

The Stone Living Lab (SLL) partnership is an innovative and collaborative initiative focused on testing and scaling up nature-based approaches to climate adaptation in Boston Harbor and beyond. We are a unique partnership between government agencies and nonprofits: UMass Boston School for the Environment, Boston Harbor Now, the City of Boston, the Massachusetts Department of Conservation and Recreation, the Massachusetts Executive Office of Energy & Environmental Affairs, and the National Park Service.

As a “Living Lab,” we bring research into the real world by engaging scientists and the community in collaborative design and exploration. Our work brings us not only along the coastline of Boston Harbor, but into the water itself and out among the Boston Harbor Islands and other locations. Our areas of focus are research and monitoring, education and engagement, policy innovation, and climate preparedness.

Letter from the Directors

The Lab has had a busy start to spring, hosting and joining many programs and events in collaboration with our wonderful group of partners.

We have hosted colleagues from Hohonu for a tour of the Lab's project sites, and joined a panel at the JFK Library and Museum Foundation to discuss climate resilience in Boston. Our team members have presented at the National Science Teachers Association annual conference with the National Park Service, and at the Museum of Science for their Rise Up: A Climate Event weekend. We have held two workshops on cobble berms with Woods Hole Group and the Duxbury Beach Reservation, and prototyped new project ideas with partners like the National Park Service, Massachusetts Department of Conservation & Recreation, City of Boston, Boston Children's Museum, and Camp Harbor View.

We are so thankful to be able to collaborate with such a wonderful group of partners, only some of whom are mentioned here, on addressing climate change through nature-based approaches. Please read more about some of this work in this Quarterly Summary, and always let us know if you have any new ideas for collaboration!

Sincerely,

Joe Christo, Managing Director

Paul Kirshen, Research Director

Contributors and editors for this quarterly summary: *Kirk Bosma, Mark Borrelli, Jarrett Byrnes, Bob Chen, Joe Christo, Paul Kirshen, Brittany Knotts, Katie Lavalley, Daniel Lopez, Curtis Morris, Allison Novelly, and Rebecca Shoer*

For feedback and recommendations for this quarterly summary, please reach us at info@stonelivinglab.org, jchristo@bostonharbornow.org, or paul.kirshen@umb.edu.

Featured Project

Living Seawalls



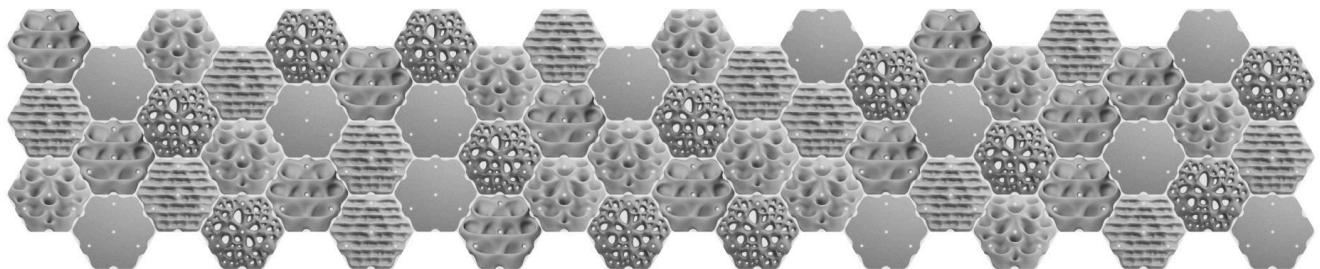
In January, UMass Boston graduate student Daniel Lopez visited our *Living Seawalls* colleagues in Sydney, Australia to see their installations, learn detailed protocols, and review comparisons between the system in Sydney harbor and our own.

He also shared Stone Living Lab (SLL) designs for fish sampling in environments with large tidal ranges – something that is not as much of an issue at the Australian installations. Lopez continued to build valuable connections as part of the knowledge and expertise transfer between our organizations.

UMass Boston undergraduate students working as part of the Living Seawalls team continue to process videos of fish visits to seawalls around Boston, finding such surprising species as small Alewives, eels, tomcod, and more.

The SLL Education & Engagement team is working with our partners at Boston Children’s Museum to pilot new programming centered on the Living Seawalls project. Programs will be hosted at the museum, as well as on-site at the installations as they come online. Programs and eventual signage will support both SLL and BCM efforts to increase programming centered on climate change and our relationship with the coast.

The SLL Living Seawalls team is preparing a finalized panel arrangement for installation.



Mockup of one possible randomized arrangement of tiles. Note this will not be the arrangement actually installed at the research sites, but it gives a sense of what a finished design could look like.

Core Research and Monitoring Projects

Cobble Berms

The Lab and partners hosted the three professional development courses in 2024. The first course took place at Duxbury Beach Reservation, and highlighted monitoring techniques used there, including aerial drone imagery and saltmarsh monitoring. Local experts joined municipal staff to explore the site and discuss how scientific monitoring can support nature-based approaches regionally. The second course, which was held virtually, presented permitting requirements and approaches associated with cobble berms, including using a couple of case study examples of the overall permitting process. This second course also covered design considerations and appropriate locations for consideration of cobble berms. The third course was held at a new site where a cobble berm is being considered for construction in Hull, MA. This site has already received a grant to design and permit a cobble berm approach.

The education team also began filming for two educational videos highlighting cobble berms and a site-specific case study at Duxbury Beach, featuring interviews with SLL and partner staff. These videos, along with informational factsheets, will be released by July 2024.

SLL PhD student Curtis Morris presented results from summer 2023 on how the richness and abundance of many species is higher on berms than adjacent beaches at the Benthic Ecological Society meeting in early April in Charleston, SC.



The CZM funded grant portion of this project is coming to an end in June of 2024. Deliverables from this work will include, but not be limited to:

- FAQ and Fact Sheets, example of Top Ten Factors shown herein
- Online summary and educational videos
- Technical report on monitoring results and performance

Top Ten Factors

when considering a cobble berm

Cobble berms are an effective and resilient nature-based approach for coastline protection. What factors should you keep in mind when considering a cobble berm?

Initial Considerations

- 1 Define the resiliency goals at your site**
Identify community goals for your project (like reducing erosion) and the physical processes threatening your site (like water levels, wave action, and strong currents).
- 2 Assess site compatibility for a cobble berm**
Confirm that the project area naturally has cobbles, either at the site or directly adjacent to it. Be sure that the physical footprint of your project is large enough for the cobble berm to shift over time.
- 3 Identify partnerships and funding opportunities**
Seek out information and expertise that may be relevant to your project. Reach out to local or state environmental agencies that can help guide you along this process and identify funding sources.

Approach Benefits

- 7 Mimic the natural environment**
Cobble berms imitate naturally-occurring coastlines, and dynamically respond to stressors such as erosion and storms.
- 8 Preserve and protect community spaces**
Enhance coastal resilience by safeguarding community areas such as public parks and coastal access routes, ensuring shoreline access for recreation.
- 9 Support coastal ecosystems over time**
Nature-based coastal protection introduces habitats for local plants and wildlife, supporting biodiversity while aligning with coastal stabilization goals.

Engineering Criteria

- 4 Partner with professionals to evaluate design options**
Seek out expert guidance to help confirm that the existing physical processes and site conditions are appropriate for a cobble berm project.
- 5 Design a suitably sized cobble berm**
Collaborate with experts to design a cobble berm with a suitable project footprint, slope, and cobble size specific to your site and resilience goals.
- 6 Identify a source of cobbles**
Look for an offsite upland source for cobbles matching the existing sediment at your site (typically 3 – 10 inches in size). Be sure to select rounded, not crushed, stone to allow the cobbles to move freely.

Guiding Principles for Success

- 10 There is no "one size fits all" solution for coastal resilience.** Each project is unique and presents its own opportunities and challenges. Careful planning, engineering, and regular monitoring and maintenance are essential for the success of any project. Unlike "traditional" gray infrastructure, cobble berms are adaptable to coastal climate challenges and provide numerous co-benefits to local communities and ecosystems.

To ensure success, projects should:
 - Consult with engineering experts or other qualified professionals.
 - Actively engage with local and state regulatory agencies.
 - Minimize impacts while maximizing ecosystem benefits.
 - Develop a tailored monitoring and maintenance plan.



Salt marsh, rocky intertidal, and geomorphic surveying are all being conducted for the Spring 2024 survey. After this round of surveying, the first complete analysis of the sites will be conducted to assess performance and impacts associated with the cobble berm sites being monitored. Some early indications are:

- Cobble movement landward at most sites
- Reduced erosion exhibited at all sites
- No change in salt marsh extent or density in vicinity of cobble berms
- Positive impact on total species richness to date
- Does not appear to negatively change ecological conditions

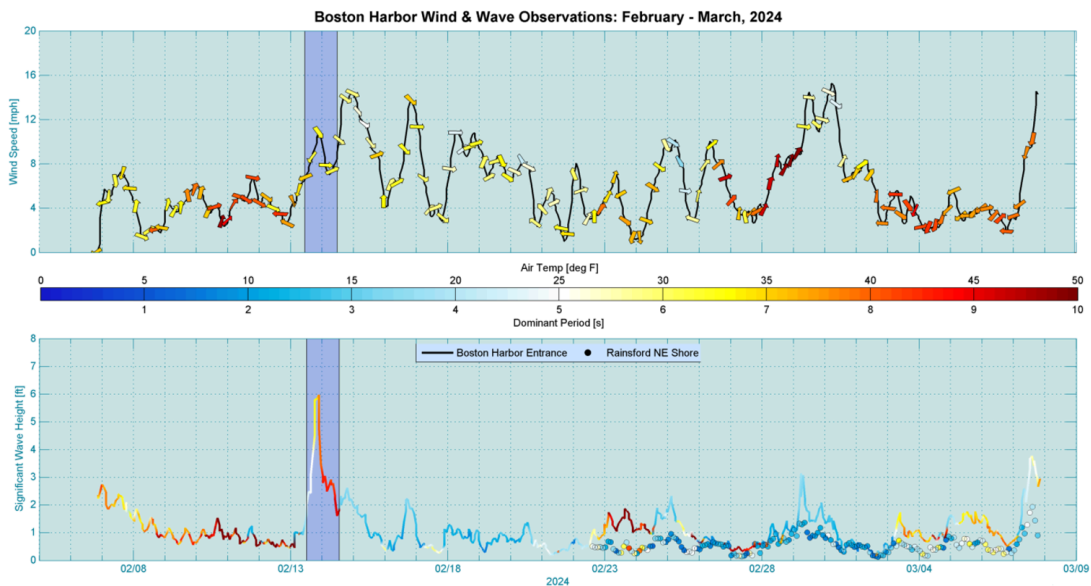
This project, through the series of educational courses and workshops, as well as the ongoing monitoring results, has resulted in grant funded projects at other new locations.

Core Research and Monitoring Projects

Real-Time Monitoring in Boston Harbor

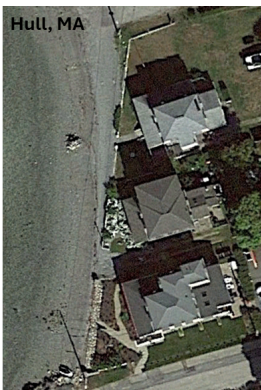
SLL, with partners Woods Hole Group and the City of Boston, continues to collect real-time wave, tide, meteorological, and flood data at eight locations throughout Boston Harbor and along the Harborwalk. The network includes: [two wave buoys](#) (one at the Harbor Entrance equipped with wind speed sensor and one off the northeast shore of Rainsford Island), one [tide station](#) installed on Gallops Island, one [meteorological station on Rainsford Island](#) equipped with wind speed, air temperature and pressure, precipitation, and four overland flood sensors.

All data are available in real-time across three online data platforms, and the Lab now releases *Field Observations* using data from our Real-Time Monitoring in Boston Harbor project. These mini reports will be posted to the [SLL blog](#) after coastal flooding or storm events. Read the most recent [Field Observation here](#).



Boston Harbor Metocean Monitoring

- The Rainsford Island nearshore wave buoy was recovered for annual maintenance on January 15th, and redeployed on February 22nd.
- Waves up to 6.5 feet in height were observed at the Harbor Entrance Wave Buoy during the February 13th Nor'easter winter storm.



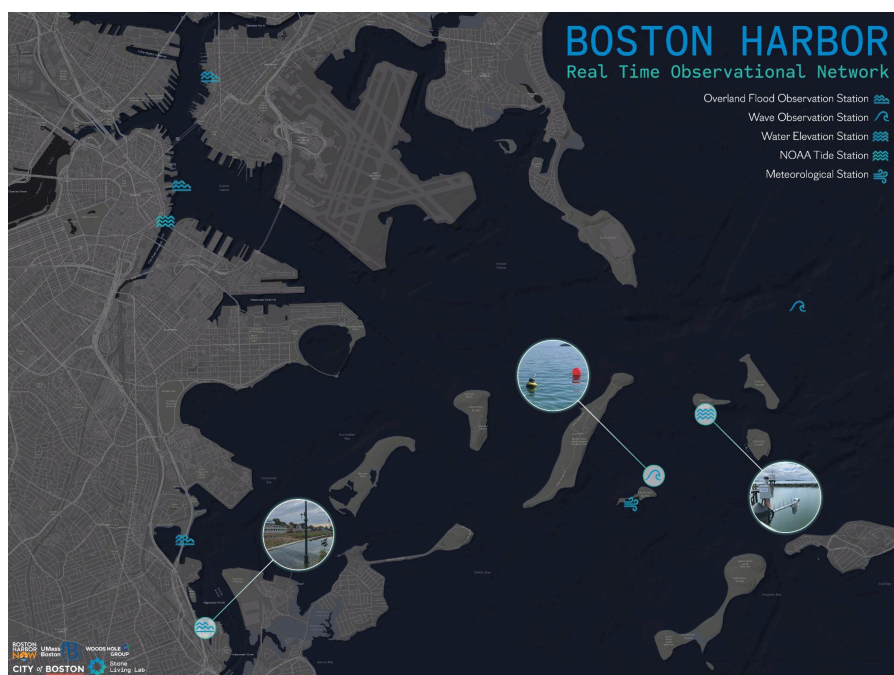
Overland Flood Stations

- This quarter, four major flood events were recorded at SLL stations installed around the city. High, spring tide events (January 10-13, February 10-13, March 8-10) resulted in overland flooding. Several of these events were exacerbated by strong onshore winds.

	January 10	January 13	February 13	March 10
Peak Event High Tide Recorded at Boston Harbor NOAA Tide Gauge (feet, MLLW)				
<u>Boston NOAA Station</u>	14.03	14.41	13.32	13.45
Peak Event Overland Flood Depth (feet)				
<u>Long Wharf</u>	2.2	2.6	1.5	1.5
<u>Tenean Beach</u>	2.8	3.4	2.5	2.4
<u>Border Street</u>	1.9	2.2	0.6	0.7
<u>Morrissey Boulevard*</u>	NA	0.8	NA	NA

**Note: The Morrissey Boulevard overland flood station is installed near Moore's Landing*

The team is collaborating with the City of Boston to fund and install three more stations across the city. Lewis Mall in East Boston is a top target, given the known recurring sunny day and storm flooding observed along East Pier Drive and Lewis Street.



The SLL Education & Engagement team also continues to find opportunities to host Wicked High Tide programming in conjunction with the Real-Time Monitoring in Boston Harbor project.

Core Research and Monitoring Projects

Camp Harbor View Partnership

The data collection and analysis that will document current conditions both onshore and offshore of Camp Harbor View on Long Island in Boston Harbor that started in the summer of 2023 continues.

Data collected include a intertidal biological survey at control and potential impact sites, a wetlands delineation conducted by a certified wetlands surveyor, onshore and offshore mapping surveys conducted via drones and sonar surveys respectively (*Figure X A-D*), and data collected on waves, tides and currents immediately offshore (*Figure XE*).

A second set of onshore and offshore surveys will be conducted in the Spring of 2024 that will allow for both seasonal signatures to be documented as well as quantifying change seen during that time by comparing them to the fall 2023 surveys.

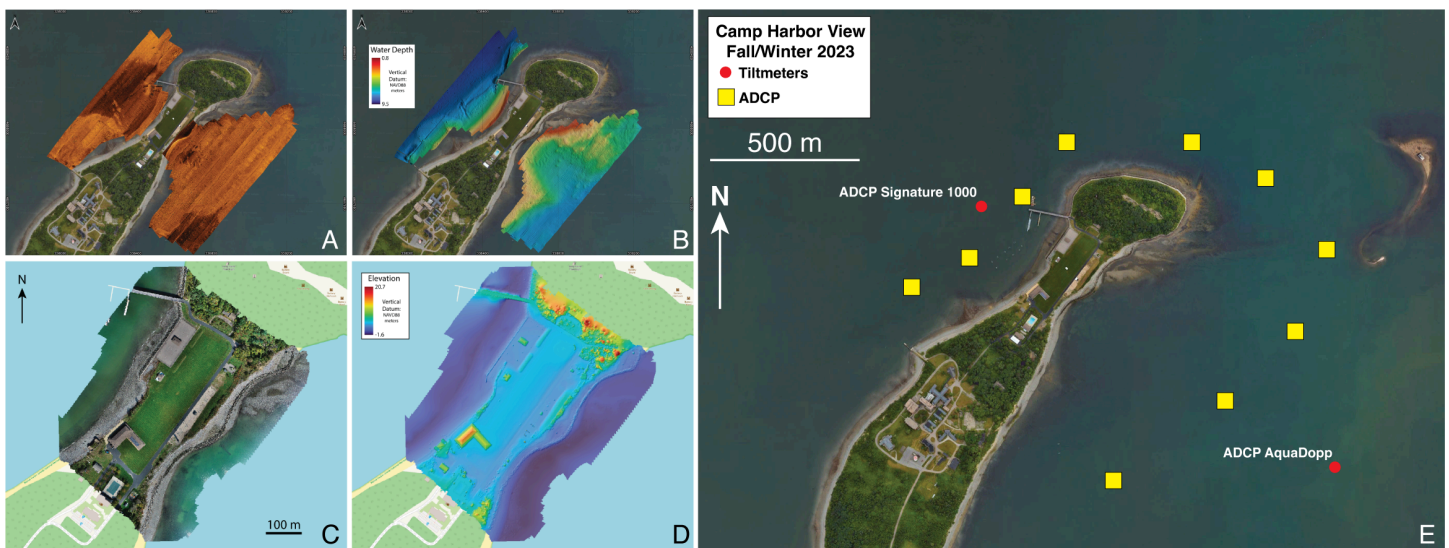


Figure X: Offshore sidescan imagery and bathymetry (A and B). Orthophoto mosaic and digital elevation model of the onshore area (C and D). Locations of Acoustic Doppler Current Profilers (ADCPs) and tiltmeters offshore.

Education and Engagement Projects

Summer Teacher Institute

The Lab hosted its first mid-winter gathering for Institute alumni this past February. Participants from our 2022 and 2023 sessions joined us at Dorchester Brewing for an evening of sharing and reconnecting.

In March the Institute team presented at the 2024 National Science Teaching Association conference in Denver, CO. Staff presented on the program itself, and led a workshop that helped classroom teachers begin framing and creating their own place-based programming using participatory science protocols. Staff also connected with other organizations doing similar work throughout the country, and met with the Education team of Rocky Mountain National Park.



Left to Right: Rebecca Shoer, Stone Living Lab Senior Manager of Education & Engagement Programs, National Parks of Boston's Elizabeth Colby, and Boston Public Schools teacher Holly Rosa attend the 2024 National Science Teaching Association conference in Denver

Preparations for our third Summer Teacher Institute are well underway. After receiving applications from teachers and schools throughout the Boston area, we have formally accepted 15 middle and high school teachers into this year's cohort! The Institute will run from July 22 - 26 this summer.

In February and March, we hosted our third [Boston Harbor Environmental Educators Workshop](#). More than 70 local educators joined us on Zoom for our lightning talk presentations, which featured programs from dozens of partner organizations around the area. Our in-person collaboration workshop (postponed due to weather) highlighted 8 local organizations running hands-on education programming, and included time for discussion amongst peers. Our growing network of informal educators will continue to support organizations that work in local communities.

Education and Engagement Projects

Climate Cart & Youth Engagement

Lab staff joined several outreach and programming events this spring, including the Boston Harbor Islands National & State Park Winter Wildlife Cruise & Winter Wander on Peddocks Island, Engineering Week at Boston Children's Museum, the High School Marine Science Symposium, and the City of Boston STEM Fair.

Planning is underway for late spring and summer programming, including the pilot of the NPS/SLL self-guided High Tide Trail as well as a *new* Climate Cart activity!



Left: Stone Living Lab Communications Manager Brittany Knotts explains a Climate Cart activity to a young visitor at BCM's Engineering Week in February. Right: SLL Senior Manager of Education & Engagement Programs Rebecca Shoer introduces youth participants to the Lab's "Making Waves at the Beach" Climate Cart activity during the City of Boston's STEM Fair in March.