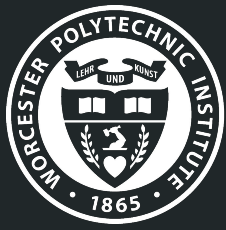


Community Science Project Options for Monitoring Coastal Change Effects on the Boston Harbor Islands

Dana Maloy, Sam Vinson, Issy Rhodes



WPI



Overview

Climate and coastal change

Our purpose

Community science

Our recommendations

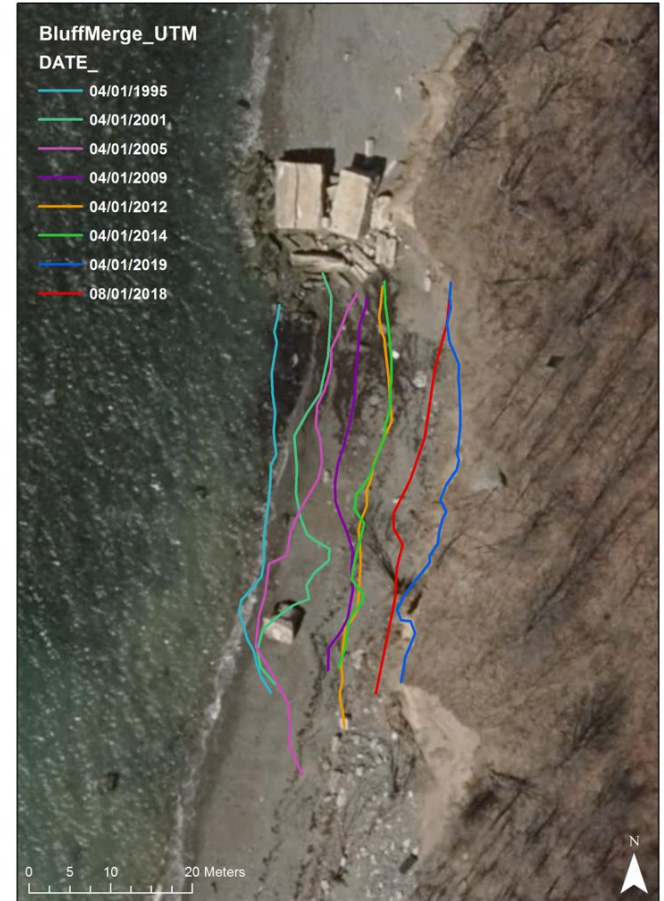


Photo: Boston Discovery Guide

Introducing the Issue

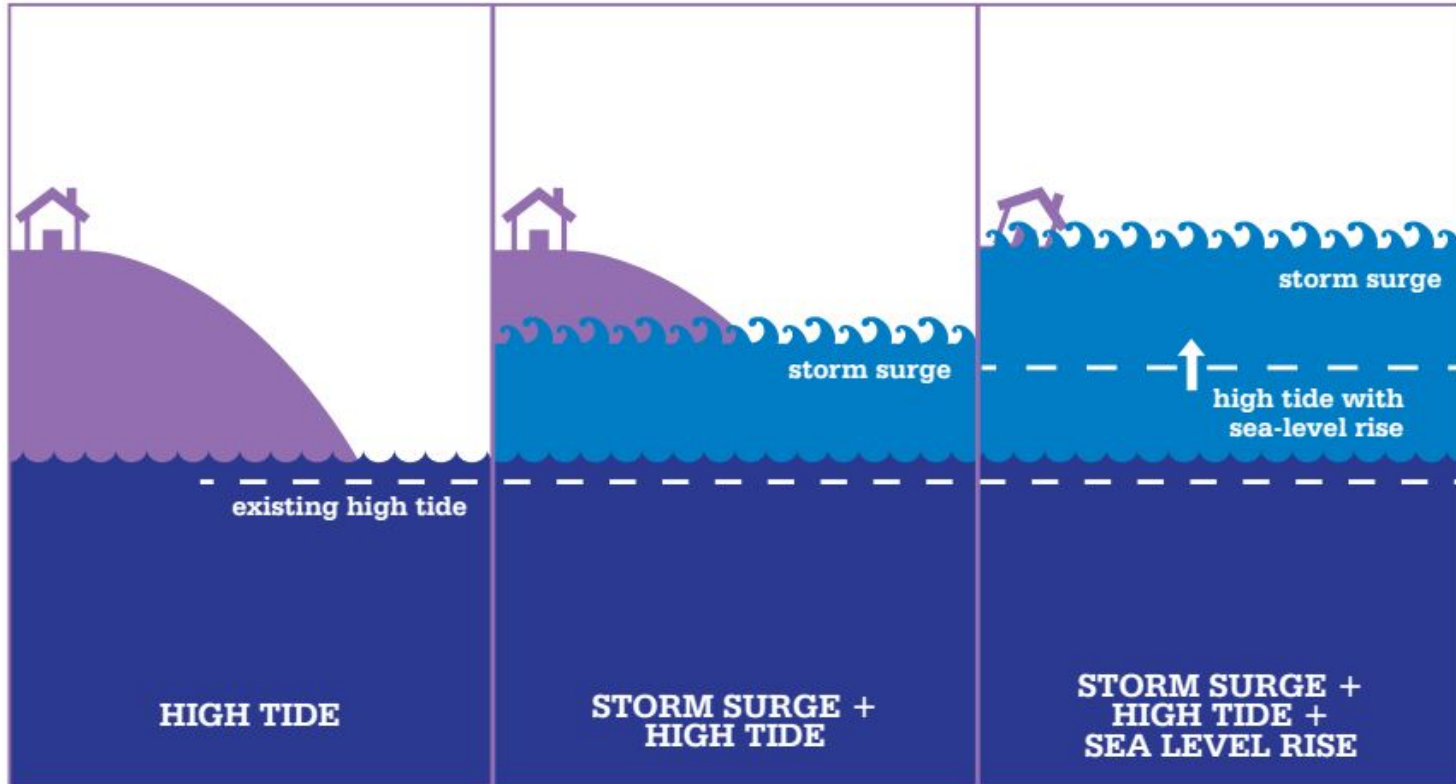
Coastal and Climate Change

- Erosion/accretion
- Storm surge
 - Hurricanes
 - Nor'easters
- Sea level rise



Photograph courtesy of Zoe Hughes

Storm Surge, Tides, and Sea Level Rise



From ClimateCouncil.org

2004



Photograph courtesy of Zoe Hughes

2008



Photograph courtesy of Zoe Hughes

2012



Photograph courtesy of Zoe Hughes

Our Goal

The goal of our project was to recommend community science programs focused on monitoring coastal change in the Boston Harbor Islands.

Community Science

- Public participation in the collection and analysis of scientific data
- Citizen science vs community science
- Current programs in BOHA



Photo: UNH Sea Grant

Why community science

- Increased engagement and education for participants
- Comparable accuracy of data



NPS Photo

Park Goals

- Scientific validity
 - Useful for park management decision making
 - Educational and engaging experience for participants
-

Road to Recommendations

- Literature review
 - Interviews
 - Compile Key Design Aspects of Community Science (KDACS)
 - Develop program recommendations
-

Categories		Definition	1	2	3
Scientific Quality		<i>The quality of scientific data that results in a citizen science activity.</i>	The activity was scientifically faulty, and data cannot be trusted or used in the future.	Activity produces quality scientific data but not reliable enough for scientific papers.	Scientific papers and further research can use data produced during the citizen science activity. Data is trustworthy and could be duplicated.
		<i>The amount of time citizens participated in scientific research.</i>	Participants can only participate in a single stage of the activity once.	Participants have the ability to participate in activity more than once, but in only one stage.	Participants have the opportunity to participate in multiple stages of the activity and can participate multiple times.
		<i>The participants have access to the final results of the project and the ability to understand the outcome.</i>	They have no greater knowledge of the outcome of the project.	Access is available to the outcome of the research, but the outcome is not intelligible to all learning levels.	Access is available for the outcome of the research, and the impact the research had inside and outside the park. The outcome is made accessible to diverse audiences. Participants are acknowledged in results and publications.
Management Relevance	Long Term	<i>Long term management is when results from the research require additional park management for longer than one season.</i>	There is no long term management decision.	There are possibilities for relevant long term management decision if the correct personnel is contacted and if finances are available.	There are possibilities for a specific long term management decision for the park along with needed personnel and finances. i.e. Adaptive Management Plan
	Short Term	<i>Short term management is when results from the research require additional park management for less than one season.</i>	There is no short term management decision.	There are possibilities for relevant short term management decision if the correct personnel is contacted and if finances are available.	There are possibilities for a specific short term management decision for the park along with needed personnel and finances. i.e. Adaptive Management Plan
Participant Experience	Number of People	<i>Amount of people who participated in the activity.</i>	4 or less	5-9	10 or more
		<i>The amount of enjoyment citizens express during and after the activity.</i>	Participants disliked the activity and the subject of the activity.	Participants enjoyed parts of the activity. They found the subject of the activity semi enjoyable.	Participants enjoyed the activity and found the work rewarding. They would be willing to continue the activity alone or with others in the future. They wish to gain a better understanding of the subject, the park, or the National Park Service.
	Quality	<i>The level of understanding of the Boston Harbor Islands National and State Park, and the National Park Service</i>	They left with no new knowledge of the Boston Harbor Islands National and State Park, and the National Park Service and are unlikely to visit again.	They understand that Boston Harbor Islands is a National and State Park but does not fully understand the purpose and goals of the National Park Service. They might revisit Boston Harbor Island.	They have a better understanding of the park service and are likely to tell friends and family about the Boston Harbor Islands National and State Park and the National Park Service. They are very interested in revisiting the Boston Harbor Islands National and State Park.
		<i>Understanding of resources and stories of the Boston Harbor Islands and the park generally.</i>	They left with no new knowledge or understanding of the Boston Harbor Islands National and State Park.	They have a general understanding of the resources and stories of the Boston Harbor Islands.	They have a strong understanding of the resources and stories of the Boston Harbor Islands.
		<i>The amount of knowledge and understanding the citizens express during and after the experiment.</i>	They would not be able to do the activity alone or lead others. Did not retain any information about the activity.	The participant can generalize what the activity was about and its purpose other. The participant has some new knowledge and understanding of the activities subject.	Participants can lead and communicate the activity to a diverse audience. The participant has new knowledge and understanding of the activities subject and wishes to learn more outside of this activity.

Categories	Definition
Scientific Quality	<i>The quality of scientific data that results in a citizen science activity.</i>
	<i>The amount of time citizens participated in scientific research.</i>
	<i>The participants have access to the final results of the project and the ability to understand the outcome.</i>

3
Scientific papers and further research can use data produced during the citizen science activity. Data is trustworthy and could be duplicated.
Participants have the opportunity to participate in multiple stages of the activity and can participate multiple times.
Access is available for the outcome of the research, and the impact the research had inside and outside the park. The outcome is made accessible to diverse audiences. Participants are acknowledged in results and publications.

Categories		Definition
Management Relevance	Long Term	<i>Long term management is when results from the research require additional park management for longer than one season.</i>
	Short Term	<i>Short term management is when results from the research require additional park management for less than one season.</i>

3
There are possibilities for a specific long term management decision for the park along with needed personnel and finances. i.e. Adaptive Management Plan
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Categories		Definition
Participant Experience	Number of People	<i>Amount of people who participated in the activity.</i>
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		<i>Understanding of resources and stories of the Boston Harbor Islands and the park generally.</i>
		<i>The amount of knowledge and understanding the citizens express during and after the experiment.</i>

3
10 or more
Participants enjoyed the activity and found the work rewarding. They would be willing to continue the activity alone or with others in the future. They wish to gain a better understanding of the subject, the park, or the National Park Service.
They have a better understanding of the park service and are likely to tell friends and family about the Boston Harbor Islands National and State Park and the National Park Service. They are very interested in revisiting the Boston Harbor Islands National and State Park.
They have a strong understanding of the resources and stories of the Boston Harbor Islands.
Participants can lead and communicate the activity to a diverse audience. The participant has new knowledge and understanding of the activities subject and wishes to learn more outside of this activity.

Conversations with Professionals

- Joe Bagley, City of Boston Archeologist & Elizabeth Solomon, member of Massachusetts Tribe
 - How can archeology be integrated into a community science program?
- Dr. Zoe Hughes, Boston University
 - Measuring erosion, the Boston Harbor Islands
- Dr. Colleen Hitchcock, Brandeis University
 - Community science as a whole
- Emily Greene, Maine SeaGrant
 - Beach profiling, participant experience
- Carol Trocki, Coastal Breeding Bird Monitoring
 - Local considerations
- Matthew Liebman, Environmental Protection Agency
 - Data quality, organization of community science programs

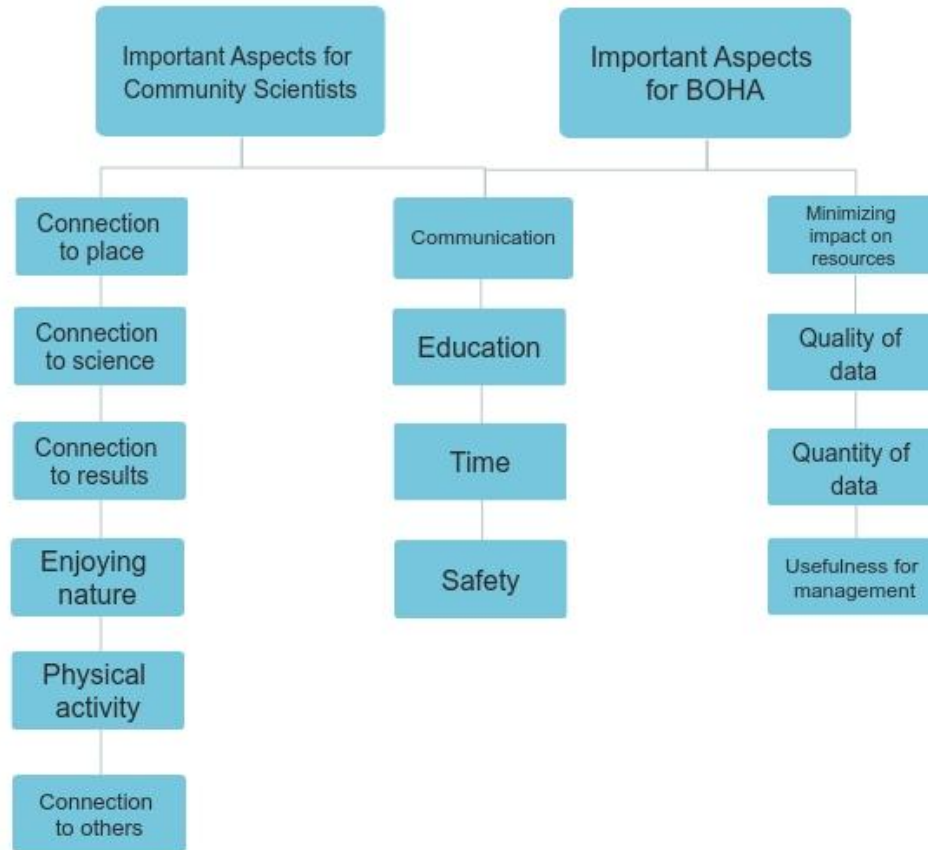
Interviews with Community Scientists

- George, Betsy, Judy, Southern Maine Sea Grant
- Draw to participate, things they liked and disliked



Photo: Maine Sea Grant

Key Design Aspects of Community Science (KDACS)



Our Recommendations

Community science programs to reveal coastal change effects on the Boston Harbor Islands that can allow for action and engage park participants.

Recommendation 1	Coastal Change Photo Hunt
Goal	To document effects of coastal change on important park features
Scientific Objectives	Obtain visual data of the impact of coastal change in specific areas of the islands
Management Objectives	Track the impact of coastal change on resources and landmarks across BOHA
Education/engagement objectives	Take visitors on an educational journey, learning about landmarks on the islands as well as coastal change

Procedure

- Self led tour vs. guided tour



NPS Photo

Feasibility Concerns

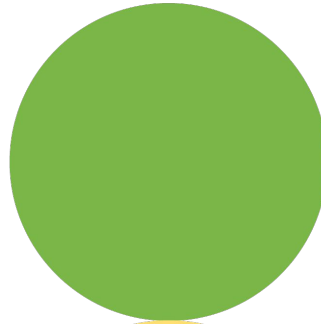
- Maintenance of post and promotional material
- Tour guide



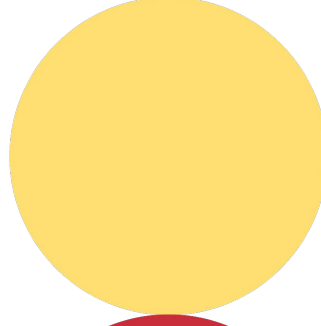
NPS Photo

Recommendation 2	Mapping Island Change Risk
Goal	To generate a detailed and dynamic map of the parts of the islands that are at highest risk of damage due to coastal change
Scientific Objectives	Establish a regular and reliable process for tracking coastal change across vulnerable park lands
Management Objectives	Identify which resources and landmarks on the islands need greater attention due to vulnerability
Education/engagement objectives	Educate participants in how to spot erosion/accretion & its effects Can also include helping people understand the human history of interaction with the islands

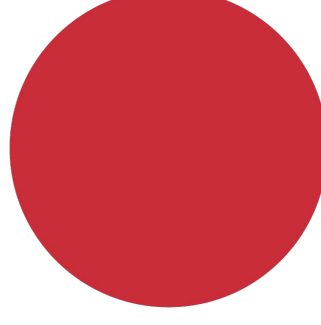
Procedure



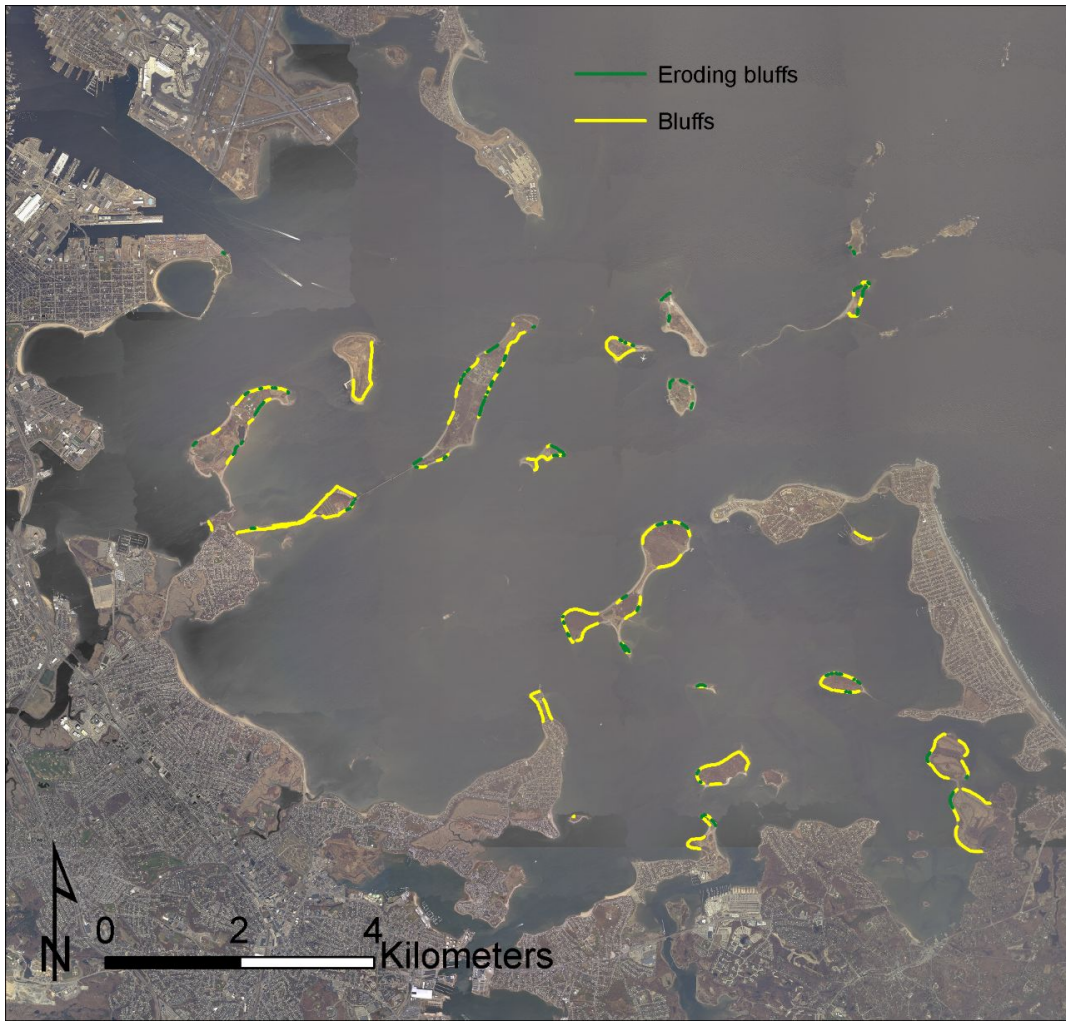
Areas that are not eroding or have a low risk of eroding



Areas at risk of eroding



Areas with significant signs of eroding



Photograph courtesy of
Zoe Hughes

Feasibility Concerns

- Boat availability
- Poor weather

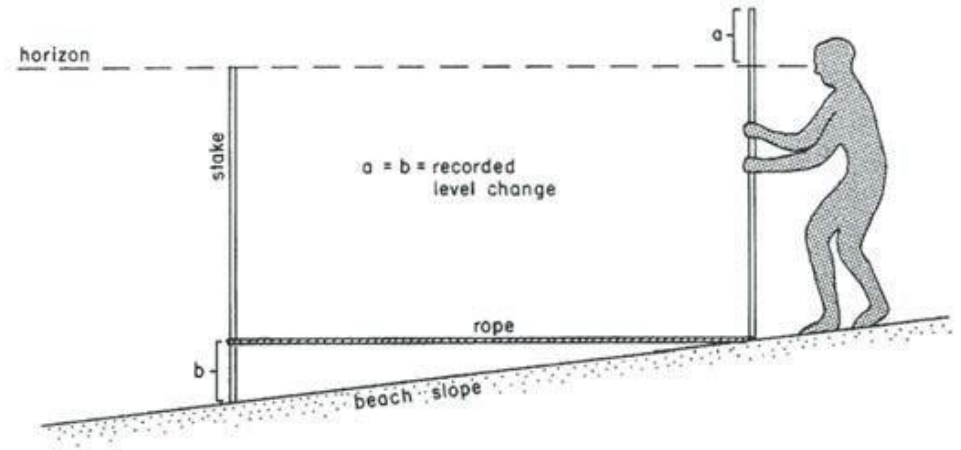


NPS Photo

Recommendation 3	Revealing Island Profiles
Goal	To reveal the cyclical and seasonal patterns of change in the profile of shorelines
Scientific Objectives	To observe and monitor the changes in shoreline profiles due to coastal change
Management Objectives	To characterize change in coastal areas of islands accessible by public ferry
Education/engagement objectives	Providing participants with experience engaging in a common scientific field sampling protocol

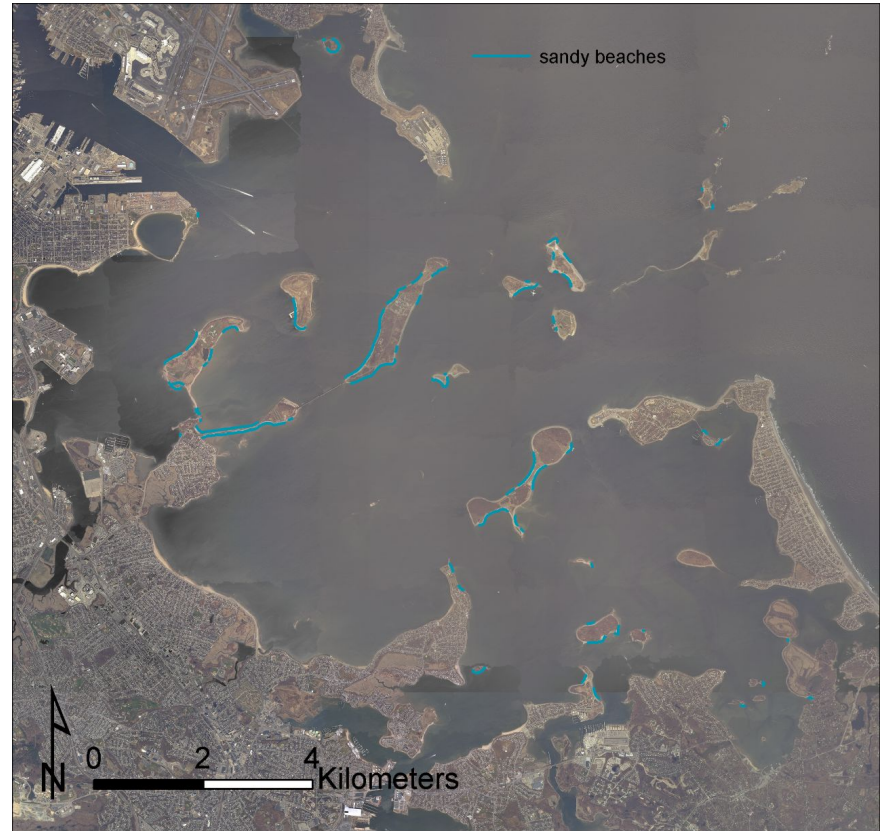
Procedure

- Emery Method for beach profiling
- Beaches and lower bluffs



Feasibility Concerns

- Public ferry schedule matching low tides
- Ferry not operating in winter
- Limited to beaches and lower bluffs
- Finding suitable fixed points



Photograph courtesy of Zoe Hughes

Final Recommendations

- Mapping Island Change Risk
- Locations for Photo Hunt
- Collaboration with other beach profiling programs

Acknowledgements

Marc Albert
National Parks of Boston

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Brandeis University

Dr. Zoe Hughes
Boston University

Joe Bagley
City of Boston Archaeologist

Elizabeth Solomon
Member of Massachusetts Tribe

The community scientists we interviewed

Professors Seth Tuler and Qingshuo Song
Worcester Polytechnic Institute

Questions?

Sources

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