Chelsea Mill Creek Salt Marsh Restoration: Promoting Community Engagement

An Interactive Qualifying Project
submitted to the faculty of

WORCESTER POLYTECHNIC INSTITUTE

in partial fulfillment of the requirements for the
Degree of Bachelor of Science

Date: October 13, 2023

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Relevant SDGs:
6. Clean Water and Sanitation
11. Sustainable Cities and Communities

Key words:
1. Salt marsh
2. Community engagement

Boston Project Center
Worcester Polytechnic Institute

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ABSTRACT

This project focuses on promoting community engagement in restoration efforts around Mill Creek, a tidal marsh in Chelsea, MA. The overall goal was to increase public awareness and engage Chelsea residents in restorative initiatives. Our methodology for the project was to identify public opinions through surveys, obtain knowledge through interviews with stakeholders, and then create a deliverable to help educate residents. Results showed that residents would benefit from more public spaces and environmental awareness. Residents can use the educational tool to educate themselves on the history and projects of Mill Creek, as well as facilitate further use of the survey for more community engagement.
ACKNOWLEDGEMENTS

Firstly, we would like to thank our faculty advisor, Professor Mathisen, for his efforts and guidance throughout our Interactive Qualifying Project (IQP). It was a very enriching experience to work on this project alongside industry professionals and subject matter experts.

Additionally, we express our deep gratitude to the stakeholders and changemakers in Chelsea, MA who volunteered their time, input, and knowledge to us in order to benefit our project. Namely, Emily Granoff and Alexander Train (our sponsors from Chelsea Housing and Community Development), Karl Allen of Chelsea Housing and Community Development, Catherine Pedemonti of the Mystic River Watershed Association, John Walkey of Green Roots Inc., and Emma Gildesgame of the Nature Conservancy.

Lastly, we recognize our project could not have reached the scope of Chelsea residents as it did without our translated Spanish outreach materials. Thank you to Professor Rivera of Worcester Polytechnic Institute for kindly translating our materials voluntarily.
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EXECUTIVE SUMMARY

Introduction

As a vital ecosystem, salt marshes are coastal grasslands that are regularly flooded with saltwater. However, due to years of unbridled land use and urban infrastructure projects, salt marshes all over have steadily deteriorated due to coastal erosion, the influx of pollutants from stormwater and drainage sites, and the inability to migrate under rising tidal pressures.

Mill Creek is a salt marsh located on the southeast side of Chelsea. Throughout the years, Mill Creek’s ecosystem had steadily declined due to polluted rainfall and coastal erosion along the shoreline, which rendered the area around the marsh unusable for neighboring residents. However, several organizations have been involved in restoring and preserving the marsh to benefit residential areas; these organizations are Chelsea Housing and Community Development, Mystic River Watershed Association, GreenRoots Incorporated, and the Nature Conservancy. Despite conservation efforts being instated, the engagement of residents getting involved with the restoration efforts in Mill Creek is crucial for further technical efforts to be implemented. This was where our team played a role in the engagement process.

The overall goal of the project was to engage and educate residents on the history and conservation efforts to preserve the creek. The primary objectives developed to accomplish this were to educate and connect with residents, to further knowledge of challenges and projects through stakeholder interviews, and to promote community involvement.
Methodology

As part of our role in increasing initiative among the Chelsea community, the team utilized interviews and surveys to gain a variety of perspectives for the project. To gather input from residents, the team developed a survey to gauge the knowledge of societal and environmental issues among Chelsea residents and garner a public perception of Mill Creek and its recreational uses. The intended audience for this survey was people who live around Mill Creek. The survey consisted of 10 questions that relate to accessibility, community engagement with the river and creek, water pollution and quality, and the current level of public interest. The overall goal of the survey was to understand the overall background and engagement regarding Mill Creek. While getting feedback on the survey, the team conducted interviews with local stakeholders involved in relevant organizations. The interviews were conducted with Karl Allan from Chelsea Housing, Catherine Pedemonti from Mystic River Watershed Association, and John Walkey from GreenRoots Incorporated. Through these interviews, the team covered topics relating to history, limitations and challenges, community perceptions of Mill Creek, and ongoing projects to preserve the area.

Results

From the survey, a number of findings were reported. First, the team found that residents generally were aware of the poor water quality problems; however, most were not fully aware of the environmental problems surrounding Mill Creek, and they had a generally negative perception of the river. Yet, they showed interest in preserving the creek and opening more public spaces. Secondly, among the most requested and desirable public spaces for residents
were boardwalks, parks, and gardens. Finally, the last key finding was that property damage occurs near adjacent neighborhoods from flooding, such as Spencer Avenue and Clinton Street.

In contrast, the interviews informed us of the history of Chelsea and Mill Creek, the challenges the organizations were facing, their views on the residents’ perceptions, and their projects. Using information from the survey and interviews, we developed an educational resource to help people find details regarding Mill Creek. An important point that the interviews provided the team with was that the pollution of the watershed as well as the diminishing ecological diversity prompts barriers in public access and addressing public health. Furthermore, the organizations engage in building parks, habitat restoration, monitoring the water quality and sediment levels, and engaging in community outreach initiatives.

Conclusion

Overall, the main conclusions were that residents would benefit most from community outreach involving better public access, education about the creek and its history, and through raising awareness about pollution and other environmental problems near the creek. By promoting public access through education efforts, more technical restoration teams will benefit from resident outreach. Some recommendations from the team are to expand the survey population to include a larger survey size, publicize the education tool and other sources for education for the community, and to continue to improve water quality and circulation.
CHAPTER 1 - INTRODUCTION

1.1 Introduction

Throughout history, salt marshes have been regarded as a crucial coastal ecosystem that bridges between land and bodies of saltwater. While the marsh is inhabited by an abundance of aquatic life and vegetation, people engage in recreational activities near the creek as well, such as fishing and boating activities. However, decades of urban infrastructure, sea level rise, and water contamination from stormwater and sewage have contributed to the steady declines of salt marsh ecosystems around the globe, drowning marshes and preventing them from migrating effectively. According to the National Oceanic and Atmospheric Administration (NOAA), the US lost up to 80,000 areas where coastal wetlands such as salt marshes were located. An example of a salt marsh encountering this issue is the Mill Creek salt marsh, which is located southwest of the city of Chelsea in Massachusetts. In contemporary times, it stands as a deteriorating ecosystem within the Mystic River watershed. Moreover, the waterway is now regarded as a polluted body of water.

1.2 Efforts to Restore the Marsh

To combat the deterioration of the salt marsh, several organizations such as the Department of Chelsea Housing and Community Development, GreenRoots, and the Mystic River Watershed Association (myRWA) collaborated to promote nature-based solutions to reduce the drainage of polluted rainfall and an overflow of nutrients into the creek. This was implemented by installing green roofs and structural BMPs and making improvements to the
drainage and sewage system in Chelsea to filter out pollutants in stormwater. These organizations also worked to create an open space for residents around the creek.

1.3 Overall Goal and Approach

Despite all of these conservation efforts being instated, the engagement of residents with the restoration of Mill Creek continues to be crucial for further technical efforts to be implemented. For this project, the team communicated with the organizations involved in these efforts as well as people around the city. The overall goal of the team for this project was to engage and educate residents on the history and conservation efforts to preserve the creek. The approach used surveys and interviews to assess public perspectives on the creek for next steps. Furthermore, the conclusions drawn from this project could be used to influence future technical restoration initiatives and to promote a broader understanding of the restoration methods around Chelsea.

Throughout the project, the team obtained a wider perspective on Mill Creek through social research, and crafting an education tool on the Mill Creek salt marsh to further inform residents as our final deliverable.
CHAPTER 2 - BACKGROUND

The purpose of this chapter is to summarize background information and past projects that are crucial to understanding the purpose of our team’s project as well as what has already been accomplished in the scope of conservation efforts around Mill Creek. The chapter describes the ecological and geographic significance of salt marshes, the geographical barriers around the Mill Creek Marsh, and relevant information regarding the sponsors' purpose and connections with other relevant environmental organizations. Next, the section addresses the prime causes of the marsh’s steady deterioration. This includes an impeded quality of water concerning differing sources of pollution, and how an impeded hydrology contributes to rising sea levels, which render the area around many vulnerable areas as flood zones. Additionally, this section discusses the past restoration efforts that sought to address both societal and environmental issues near the marsh. Wrapping up this section, we will discuss how the team will facilitate further engagement of restoration involvements in Mill Creek and spread awareness to residents around the Chelsea area about these persisting environmental concerns.

2.1 Geography

Before delving into the deterioration of Mill Creek, it is important to discuss the background regarding the city of Chelsea. Chelsea is a city in Suffolk County in Massachusetts, which lies near the Mystic River estuaries. The primary water bodies around Suffolk County are the Charles, Mystic, and Chelsea Rivers. In particular, this section focuses on a tributary of the Mystic River known as Mill Creek. As an introduction, Mill Creek is a tidally influenced region
that borders Chelsea and the Mystic River. Chelsea is a city in Suffolk County that spans 2.4 miles (Weston, 2022). It stands directly across from the Mystic River, which is a total of 76 square miles in length, making up around 1% of the land area in Massachusetts (Weston, 2022). The Lower Mystic Lake extends through several cities, such as Arlington, Somerville, Medford, Everett, Chelsea, Charlestown, and East Boston. All of the water from the mystic rivers is then emptied into the Boston Harbor (Britannica, 2017). There are several drainage areas where water is discharged into the Mystic River, including land around Chelsea. Water from Mill Creek is discharged to the Mystic River watershed. The ecological function of the creek is to act as a tributary biodiverse salt marsh. Furthermore, Mill Creek salt marsh is bordered by residents along the north and west areas, highways that disrupt the water flow, and commercial development along the south end of Chelsea (Castillo, 2000).
Residents from several demographics make up the population of Chelsea. According to the U.S. Census Bureau, Hispanic and white residents make up the majority of Chelsea’s current population. White residents constitute 38.4% of the population, while Hispanic and Latino individuals make up 66.1%. Furthermore, there is an active Spanish-speaking and Vietnamese population in Chelsea (Census, 2021).
Furthermore, to increase community involvement in promoting restoration projects around Mill Creek, several organizations collaborated with the City of Chelsea and were involved in advocacy for the marsh’s preservation.

2.2 Organizations Involved in Educational and Restorative Efforts

The rejuvenation of Mill Creek was made possible through the generous support and partnership of key stakeholders, namely Chelsea Housing and Urban Development, Mystic River Watershed Association, and GreenRoots. Our collaborative efforts were facilitated by scheduled consultations with representatives from the Chelsea Housing and Urban Development team. These consultations allowed us to comprehensively assess the project's impact while gaining valuable insights into their broader community-centric initiatives, such as the preservation of community spaces, the enhancement of public access to open areas, and the development of amenities along the forthcoming revitalized Mill Creek site. These amenities included the establishment of a waterfront playground and the creation of a linear park, further enriching the area's potential for recreational and environmental enhancement (Weston, 2022). The relevant organizations mentioned also sought to promote a better understanding of the environmental issues that plague the creek.

2.3 Pollutants and Pathogens from Natural and Urban Sources

Mill Creek's pollution level was tested to be well below standards for safe use. According to an annual water quality check from the U.S. Environmental Protection Agency (EPA) and Mystic River Watershed Association (MyRWA), Mill Creek received an "F" grade in nearly
every year from 2014 to 2022 as shown by Figure 2. This meant that the water quality, when averaged with two previous years, is lower than 40% of Massachusetts Department of Environmental Protection (MassDEP) standards for swimming and boating. Mill Creek was also identified as a category 5 impaired waterbody of the 303(d) list, meaning that the marsh waters harbored an excess of pollutants and pathogens (Weston, 2022). In the Final Massachusetts Integrated List of Waters for Clean Water 2018/2022, Mill Creek did not meet the water quality standards due to contamination and bacterial pathogens. Additionally, urban infrastructure projects such as bridges and dams blocked the hydrology of the creek, which disrupted the regulation of nutrients around the marsh. For instance, twelve outfalls that discharge to Mill Creek were monitored between the Broadway and MBTA bridge, to assess the levels of sediment accumulation around the area.

<table>
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Figure 2: 2022 Mystic River Watershed Report Card - https://www.epa.gov/mysticriver/mystic-river-watershed-report-cards

Mill Creek's history of being a heavily industrialized area was a major contribution to the water quality problems, but this was also due to nonpoint source pollution (Environmental Protection Agency, 2022). Nonpoint source pollution is contaminants picked up from rainfall, snowmelt, and other sources, and traveled into the waterbody without being treated. The
pollutants can include oils, harmful chemicals, fertilizers, pesticides, heavy metals, de-icing salts, animal wastes, and more (Weston, 2022). The natural landscape of large slopes and hills surrounding Mill Creek with heavy human activities and a poor drainage system resulted in a high flooding risk in the surrounding area and sediments carried from parking lots and roads into the river. As the runoff migrated, it carried man-made pollutants, which were then deposited into bodies of water (Environmental Protection Agency, 2022). Any source of pollution that does not qualify under section 502 (14) of the Clean Water Act is considered a nonpoint source pollution. Section 502(14) defines point source point as “any discernible, confined, or discrete conveyance” (Environmental Protection Agency, 2022). Under this definition, the major sources of point source pollution were drainage sites around urban areas and infrastructure located around Mill Creek. For instance, there were several outfalls discharging water to Mill Creek that harbored E. coli. To prevent these sources of pollution from carrying polluted water to the Mystic River tributary, various organizations helped with installing structural best management practices (BMP) to manage the influx of pollutants into the creek. Structures that store rainfall that would have otherwise been filtered into the creek are identified as structural BMPs (Weston, 2022). These BMPs include infiltration and retention basins, and artificial marshes (Weston, 2022).

2.4 Causes and Effects of Sea Level Imbalances in Mill Creek

In addition to the influx of pollutants contaminating the waters of Mill Creek, there was also a risk of flooding due to the sea level rise around the creek. Vegetation around the marsh was responsible for absorbing the waves and tidal flooding to manage the salt levels and sea
levels around the marsh. However, several urban infrastructure sites such as dams, highways, and the MBTA bridge all impeded the natural hydrology of the marsh (Chausson, 2020). This resulted in the introduction of invasive species such as *Phragmites* near the marsh areas and prevented tidal waves from being absorbed normally. Furthermore, it also resulted in the diminishing of ecological diversity and habitat loss, specifically through lower areas of the creek. Moreover, man-made restrictions prevented the salt marsh from migrating appropriately through vertical accretion, which is when the salt marsh builds up enough sediment to migrate under tidal pressures (Castillo, 2000). As a result, a lack of vegetation and migration from lower elevations meant that several marshes (such as Mill Creek) could barely sustain the rising sea levels induced by climate change. This is shown by Figure 3, which references potential flood zones existing around Mill Creek’s borders. A possible solution that was proposed to combat the rising sea levels and tidal imbalance is by removing the Mill Creek Earth Dam (Castillo, 2000).
Figure 3: Map of the flood zones and hazard areas around neighborhoods in Mill Creek.

The area along the Broadway Bridge, Wilson Street, and the Revere Beach Parkway was denoted as a flood zone with an annual 1% chance of flooding according to FEMA flood zone designations (Weston, 2022). Moreover, several places around these flood zones were signaled as priority habitats of rare vegetation species around the marsh. Both pieces of information signified how the quality of vegetation and sea level management had dwindled compared to the cutoff of water flow.
2.5 Restoration Initiatives

To educate and engage residents in the restoration of Mill Creek, there were several preservation and educational efforts hosted by organizations that sought to help residents get involved in the restoration process. For the Mill Creek Water Quality Enhancements Project, several prominent organizations collaborated to educate residents on practices to restore the habitat near the creek. These organizations included the Mystic River Watershed Association, GreenRoots, and the city of Chelsea. An example of these events includes an Earth Day cleanup hosted by GreenRoots to remove trash alongside the creek and educate residents on the utilization of stormwater management tools to reduce the amount of excess stormwater that was dispensed into the creek (Weston, 2022). Moreover, at 88 Clinton Street, a Mill Creek visioning open house was held. The relevance of this is that the neighborhood was used for the implementation of stormwater management, and the city planned to make the 88 Clinton Street site a public access point to Mill Creek (Weston, 2022).

These organizations were involved in the implementation of restoration methods that were implemented as a means of reducing the runoff of pollutants into the creek. Through the Department of Housing and Community Development, the city of Chelsea sought to identify the causes of excess pollutants near the creek. After determining the sources of pollution, the project teams drafted designs of BMPs (Best Management Practices) in areas where there were the highest concentrations of pollutants (Weston, 2022). The outfalls of Guam Road, Crescent Avenue, and Washburn Street were marked as high-priority sites for BMP installation, on account of the levels of pathogens and pollutants that were collected from those areas. For instance, near the Guam Road Outfall, the Chelsea Housing Department installed an infiltration
basin. Infiltration basins are man-made sumps that prevent flooding and stormwater runoff near an adjacent body of water (Weston, 2022). Installing these basins, as well as green roofs and other filtering areas, allowed the level of pollution to be appropriately managed near the creek. The main project to restore the creek as an accessible space for residents was to build a park on 88 Clinton Street, and to engage in the construction of a boardwalk near the creek for nearby residents. Despite the facilitation of these current efforts, resident participation and engagement were crucial to assessing how the creek can best serve their interests, as residents bordering the creek would benefit the most from its recreational and ecological value.

2.7 Summary

Overall, this section provided a substantial background into the geographical boundaries surrounding Mill Creek, environmental concerns surrounding pollution and the risk of flooding, and what relevant environmental organizations as well as the city of Chelsea embarked on to restore and spread awareness regarding the state of Mill Creek. Our team’s project efforts sought to facilitate resident engagement and education regarding the state of the marsh. In doing so, the team helped lay the groundwork for technical restoration efforts as well as future civic engagement planned by our main sponsor: The Department of Chelsea Housing and Community Development.
CHAPTER 3 - METHODOLOGY

Referring back to the introduction, the overall purpose of this project was to get involved in the engagement and education of the Chelsea community to promote a broader understanding of initiatives to restore a salt marsh in decline. Throughout the project, the team addressed these objectives through the preparation and implementation of social research methods. These included surveys for residents and people involved in Mill Creek preservation efforts, as well as interviews from experienced sources in relevant environmental issues. Additionally, the main objectives of the project were to determine public opinions surrounding Mill Creek, find supplementary information on societal and environmental issues through social research, and engage with the general public to educate them on conservation efforts on Mill Creek.

The team plans to accomplish these three major objectives:

1. Understanding the public opinions and experiences of residents in Chelsea surrounding Mill Creek through surveys.

2. Obtaining a broader understanding of relevant expertise, technical and social limitations, and current efforts from interviews with experts.

3. Creating an educational resource to promote the history and current projects.
3.1 Input from Chelsea Residents through Surveys

To gather input from residents, the team developed a survey to gauge the knowledge of societal and environmental issues among Chelsea residents and garner a public perception of Mill Creek and its recreational uses. The reason why the project team chose to put out a survey was because surveys allow us to obtain a large number of responses in a short time. After the surveys were distributed, we compiled and analyzed the responses to help the team make better recommendations on the final deliverable. The intended audience for this survey was people who live around Mill Creek. To increase community participation, we distributed the survey in both English and Spanish. Addressing the issue of human ethics with this mode of research, all responses were anonymous and no names or personally identifiable information of the subjects were disclosed in the research process unless there was informed consent given. No identifiable information was on the deliverable and final reports as well. The team distributed flyers with a link to the survey around the Chelsea area for responses. In summary, the survey itself consisted of 10 questions that relate to accessibility, community engagement with the creek, water quality, and the current level of public interest. All of this information helped to determine where the public’s knowledge and engagement was with the creek, so recommendations were given to move forward with the development of community engagement initiatives.
3.2 Using Interviews To Gather a Broader Understanding of Issues and Challenges

To obtain a broader understanding of the trials and tribulations of restoring Mill Creek, the project team conducted interviews with relevant stakeholders from prominent organizations that were heavily involved with the conservation and awareness efforts around Mill Creek. These organizations that we connected with include prominent staff from GreenRoots, Mystic River Watershed Association, and the Department of Chelsea Housing and Community Development.

For the interview conducted with Mystic River Watershed Association, the primary objective was to address social justice concerns and environmental management. The interview would also address how the Mystic River Watershed Association addressed these concerns through outreach and sustainability projects. The project manager of sustainability project Catherine Pedemonti from Mystic River Watershed Association was our focal point of contact for the interview, as she had expertise in managing environmental projects that involved working on salt marsh areas and the filtration of pollutants. The scope of these questions tackled the organization's partnership and collaborative efforts with the Department of Chelsea Housing and Urban Development, as well as societal aspects of the deterioration near residential areas.

Furthermore, an interview was set up with John Walkey, who was the director of Waterfront and Climate Justice Initiatives at GreenRoots Inc. For this interview, the purpose was to determine the role of GreenRoots in facilitating restoration and conservation efforts. Walkey exhibited extensive involvement in these community initiatives, so his insight would provide valuable information on the Mill Creek project. Moreover, the interview addressed how GreenRoots aided with environmental justice concerns. Afterward, the state of Greenroot’s future conservation plans were discussed. Similarly, the third interview that the team participated in was with Karl
Allan, who was the senior planner at the Department of Housing and Urban Development. With this interview, we focused on municipal and social justice constraints to shed light on how these constraints would affect the execution of our final project. Likewise, the team also discussed social problems that stemmed from issues regarding salt marsh depletion, sea-level rise, and excess pollutants. Each interview was 30 minutes long and at least two members from each team were present in the conduction of each interview.

Although the interviews provided more context to our project, there were several limitations when conducting social research. For instance, possible bias might have been introduced when reviewing survey responses. This issue is due to the time constraints of this project and how much time was provided to gather necessary input. Moreover, the project team also may encounter response bias from survey responses, since the validity of responses as well as what type of residents responded to the survey could not be confirmed. It also related to how accurate the answers might be, or how representative they might be of the situation around Mill Creek. Limitations to the process of conducting interviews included time constraints for each interview, inconsistent responses, and how the questions asked during the interview may be interpreted. The project team addressed these challenges for our methods by making sure that interview and survey questions were worded correctly. Moreover, the team scheduled interviews and distributed survey flyers beforehand. After the process of gathering information was completed, the information was then used to forward the creation of an educational tool on Mill Creek.
3.3 Creating an Educational Resource to Further Engagement Efforts

After the process of conducting social research concluded, the responses from both the survey and major stakeholders were reviewed and analyzed. The information from this analysis was considered to determine how our deliverable would be formatted and to identify the stakeholders' needs for this project. Once the primary components to address were identified, the team created the final product, which was a file detailing the history and restoration projects of Mill Creek. The file included the history of Chelsea, initiatives taken to restore Mill Creek, and a call to action for residents to facilitate community involvement in its restoration. The primary purpose of using a file as our deliverable was to have it open for public access on the City of Chelsea website. Thus, it was an effective tool to inform residents about projects to improve the creek’s overall quality and recreational value.
CHAPTER 4 - RESULTS

This project used surveys and interviews to gain inputs from residents and various stakeholders to help guide efforts to restore the Mill Creek Marsh. The interviews provided further insights into what needed to be properly addressed, as well as the organizations’ involvement in restoring the watershed. These results, which include survey responses and information gained from interviews and analysis, are discussed further in this chapter.

4.1 Survey

By analyzing the results from the survey responses, the team developed the following findings concerning the marsh’s restoration and what the city of Chelsea needs to focus on. There were a total of 20 responses to the English version of the survey and 2 responses to the Spanish translation of the survey.

To summarize these findings, the majority of residents who took the survey indicated that they often go near the creek or live alongside the creek’s boundaries. According to the responses, around 86% of residents indicated that they live near the vicinity of Mill Creek, or 2 miles or less away from it, and 11% lived more than 2 miles away. The next question referenced how many times residents visit the river every week. The most common response was that 9 people said they only visit once in a while. 48% of the participants go to the river weekly, and 30% said that they do more than 5 times a week. The majority believed that the river was relatively easy to access, even for people who lived at further distances. When asked about which public spaces they would like to see most, the most commonly requested public spaces near Mill Creek were
boardwalks and parks, but there were also significant votes for gardens, boat docks, and biking trails. To demonstrate, Figure 4 shows that 15 of the respondents desire Boardwalks, 13 desire parks to be built, and 11 respondents would like gardens to be instituted. Additionally, from Figure 5, 26% of residents would like Boardwalks, 22% of residents would like Parks, and 21% would prefer gardens.

![Bar Chart](chart.png)

**Figure 4:** Participants' Votes on Public Spaces out of 22 residents who filled out the survey. From the figure, 68% of respondents would like boardwalks.

Participants also answered one of the survey questions regarding whether they were aware of the environmental issues surrounding Mill Creek, more than half of the people taking the surveys indicated they were somewhat or not aware. When asked about the quality of the water, 70% said that the water quality was poor, and there were no respondents that put down “clean water” as their response to the survey question. Some of the participants reported
witnessing damage to properties, one due to heavy rainfall causing a flood on Spencer Avenue, and another flooding on Clinton Street.

![Pie chart with resident public space desires](image)

Figure 5: Analyzed Results from Survey Question on desired public spaces

### 4.2 Survey Analysis

From the responses, it was clear that most residents who lived near the creek would benefit from further efforts to improve its quality and usability. The survey results provided insight into the public's perspectives on what residents think about the water quality, general
awareness of environmental concerns, and what public places they would like to see instated near the creek.

Most residents who visited the creek when driving by or walking along reported that there was lots of waste and an irksome smell from the river. Improving water quality would provide a more usable space for residents and attract visitors. Additionally, 50% of residents were only somewhat or not aware of the overwhelming pollution in the creek; however, most residents were aware of the poor water quality in Mill Creek. This might be due to the bad connotation that Mill Creek had, being in the middle of the city with a long history of industrialization. On the topic of property damage, two responses on Clinton Street and Spencer Avenue have reported instances of flooding. These are potential sites for investigation for inadequate stormwater treatment. Based on these results, the overall public perception of Mill Creek from Chelsea residents was that the lower area is a polluted and deteriorating watershed. The results indicate that future awareness and restoration projects should focus on preserving the creek and changing public perception. Moreover, organizations should engage the public in the creation of open public spaces, such as boardwalks and parks for recreational use.

4.3 Interviews

Several environmental organizations exhibited community and municipal involvement in Chelsea. We as a team conducted interviews with members of staff involved with these organizations and their respective causes. The information from the interview was then juxtaposed with the results from the survey to obtain a broader understanding of the situation near Mill Creek. The team interviewed Karl Allan from the City of Chelsea, Cat Pedemonti from
the Mystic River Watershed Association, and John Walkey from Greenroots. Mr. Allan worked as a planner for the city of Chelsea. Ms. Pedemonti from Mystic River was the project manager of sustainability projects relating to the Mystic River Watershed Association. Mr. Walkey was the director of climate injustice for the environmental advocacy group GreenRoots. To summarize, the interviews provided the team with common challenges encountered, an overview of the community perceptions of the creek, and past and current project initiatives undertaken by our sponsor in conjunction with other organizations.

4.3.1 Limitations to be addressed in engagement initiatives across Mill Creek

An important point that the interviews provided the team with was that the pollution of the watershed and irregular flooding of the marsh impeded public access to the creek by creating barriers in public access and public health. When asked about the city’s key goals and objectives for Chelsea’s involvement, the main priority mentioned by Mr. Allan was public access for neighborhoods adjacent to the creek. Mill Creek was consistently the most polluted waterway segment in the Mystic River watershed for unknown reasons and they had been looking for solutions. Part of achieving equitable access to the creek was determining sources of pollutants and how to correct them through technical management methods. Furthermore, the irregular flooding of the marsh due to rising sea levels posed a similar barrier. An example of this is flooding near a housing complex where a berm removal is underway. The floods were in moderately high tides or when storms arose. Due to this consistent flooding, children and families sometimes encountered water filled with high levels of bacteria and sewage waste. From water reports conducted near Mill Creek, bacteria levels in the water were two orders of
magnitude above legal limits, which was the product of illicit connections to the stormwater system that should have been connected to the sewer system. The dispensing of pollutants around the creek during tidal flooding was a prominent issue. Additionally, due to the reduction in ecological diversity from irregular flooding, invasive species such as Phragmites appeared on the lower ends of the marsh. Moreover, because of the irregular tidal flushing and habitat degradation, there was a significant lack of green space around the creek’s areas. There was also an issue of how to increase advocacy for more public green spaces according to Mr. Walkey. The public access component related to how in the survey, residents indicated their interest in public spaces. Overall, interviews suggested that the main limitations that these organizations are trying to address include public access, water pollution, and how irregular tidal flooding impacts surrounding communities. Such limitations prompt a generally negative outlook of Mill Creek in nearby residential areas, which will be covered in the next section.

4.3.2 Observed Community Perceptions and Potential Benefits

Due to the pollution and diminishing of vegetation around the marsh, there was a negative social connotation between residential areas and Mill Creek. However, the upper side of the creek attracts residents more often, primarily because tidal flushing was more consistent within the upper areas of Mill Creek. Therefore, Mill Creek was generally a more pleasant recreational experience for residents upstream. From Ms. Pedemonti’s perspective, when going upstream from 88 Clinton Street, there was a riverwalk near the boardwalk that was extensively used by residents. In downstream areas of Mill Creek, there was a high population of phragmites along the marsh’s edges, as well as a more polluted watershed. Near 88 Clinton Street, there is
less engagement due to the lack of accessible public space for recreational usage and the formation of *Phragmites* along the creek’s borders. Relating the issue to the lack of green space, Chelsea residents tend to have a neutral negative connotation with Mill Creek due to the widespread effects of industrial land usage. However, the quality has improved since 1980, which is when Mr. Walkey described it as an industrial waste site at the time. Now, Mill Creek has improved in terms of its potential to benefit residents. This is mainly because many people who live along the creek in Chelsea are essential workers, oftentimes living paycheck to paycheck and focusing on providing the bare necessities for themselves and their families. However, a recreational site could benefit them by offering relaxation and opportunities. This primary reason is why the city of Chelsea has engaged with other relevant organizations to establish projects that relate to fulfilling this purpose through restoration and outreach initiatives.

**4.3.3 Projects related to Mill Creek advocacy and restoration**

Finally, the team then learned about how the organizations have engaged in interdisciplinary initiatives to not only undergo projects relating to combating issues near Mill Creek but to also advocate for further community involvement as well. To start the first interview with Karl Allan, the team asked Mr. Allan about his background and role in the City of Chelsea. Allan describes his background as a planner who started working full-time with Chelsea in 2017. During his time working in the position, Mr. Allan was responsible for developing a municipal harbor plan for Mill Creek. Moreover, the Department of Chelsea Housing and Community Development has worked closely with GreenRoots, which has been conducting dredging and salt marsh restorations on the upper side of Mill Creek. Furthermore, they later toured the area with a
group to observe the creek’s hydrodynamics and development near housing complexes and a boardwalk. Similarly, the Mystic River Watershed Association has been monitoring the water quality near the creek as well. Staff from Mystic River consistently monitor areas of the watershed to graph and map data regarding the level of pollution and enterobacteria. Furthermore, we found out from interview responses that the Mystic River Watershed Association has worked in tandem with GreenRoots to improve water flow to the creek, through diligent data analysis and sediment removal. The purpose of this is to monitor the intake of nutrients and sediment to the creek, since typically salt marshes require daily flooding to maintain a stable population of aquatic life and vegetation. Additionally, these organizations also engage in promoting nature-based solutions to reduce pollution and fix the impeded hydraulics that prevent salt water from reaching the lower ends of the creek. For example, Pedemonti informed the team that the water quality grade of “F” by the EPA, “comes from the sampling that we do throughout the watershed”. From this quote, Mystic River engages in technical restoration efforts to help the EPA develop a water quality grade for pollution. Furthermore GreenRoots has consistently addressed this issue through their advocacy for green spaces. Some examples of this are transit advocacy measures, plans for habitat restoration along Mill Creek, and creating a project to combat urban food injustice. Examples of specific projects that involved creating green space were relating to the development of Creekside Commons along the pathway of the creek. Although the main objective was to restore spaces around Mill Creek, GreenRoots has framed the issue in terms of climate justice. A significant part of this is combating environmental inequities caused by urban infrastructure projects and its impact on surrounding communities as well. Clearly, the current efforts to restore and conserve between these organizations encompass
three major aspects of the Mill Creek project; social efforts, technical efforts, and environmental justice outreach.

4.4 Summary of Results

Community perceptions of Mill Creek were shaped by pollution and the decreasing vegetation around the marsh. Those residing upstream generally held more positive views of the creek, attributed to consistent tidal flushing. To gain deeper insights, the team conducted interviews with key figures, including Karl Allan from Chelsea City Hall, Cat Pedemonti from the Mystic River Watershed Association, and John Walkey from Greenroots. These interviews provided valuable insights into common challenges, community perceptions, as well as past and ongoing initiatives.

The survey results underscored the significant potential for the improvement of the creek's quality and usability, particularly for residents in close proximity. In summary, this project encompassed a comprehensive survey, interviews with critical stakeholders, and meticulous analysis, all aimed at assessing the current state of Mill Creek and pinpointing areas necessitating attention and improvement. The combined efforts of organizations and the community embody a holistic approach towards revitalizing the watershed and gauging public perception.
CHAPTER 5 - CONCLUSIONS AND RECOMMENDATIONS

In conclusion, the team was able to gain information on public perspectives through surveys and interviews in order to create an educational tool to promote future engagement efforts. The survey results were adequate to gain insight and develop some conclusions regarding the public’s understanding of the current conditions and their interests related to the restoration of Mill Creek. Through interviewing, the team also gained experts' knowledge, thoughts, and their recommended solutions for the problem.

Overall, our team recommends that engagement initiatives should be geared towards educating the public about concerns relating to pollution, irregular tidal flooding, and habitat conservancy along the creek. Another aspect that engagement initiatives should focus on is tailoring to the more positive aspects of the creek to motivate residents to get involved. These include a well-rounded view and a good scenic space since it was an industrial waste site in the 1980s. Moreover, the survey gave an outlet for residents’ voices to be considered in the conservation process. Furthermore, promoting community outreach through surveys was another way to support the community by asking what spaces may benefit their lives and furthering future efforts for education on the creek. In addition to offering community support, our results conveyed that public access is a main issue with restoring the creek and engaging nearby residents in the conservation process. By promoting public access through education efforts and the team's educational tool, more technical restoration teams will benefit from resident outreach. Furthermore, future officials can work on educating residents on the restoration process itself as well. Moreover, residents will be more open to using the creek and benefiting from it if they are educated about the projects that are currently underway. Some further resources that can be consulted include the Environmental Protection Agency, other organizations in Chelsea to
facilitate these efforts, and the city offices to educate people on the subject matters. Moreover, the educational tool presented on the Chelsea City Hall website should be further utilized to engage residents in the future about possible opportunities to help Mill Creek within their community, and also to facilitate education about the creek and potential benefits. Overall, we as a team recommend expanding the survey size to include more residents' perspectives, publicizing the educational tool for further outreach, and encouraging organizations to continue to improve the water quality and circulation around Mill Creek. Through community involvement in tandem with stakeholders' efforts, Mill Creek can become a solid recreational resource that can improve residential areas around it.

REFERENCES

   https://www.chelseama.gov/departments/housing_and_community_development/climate_resilience_sustainability.php#collapse1890b1


5. Massachusetts Historical Commission (November, 1980) MHC Reconnaissance Survey Town Report: Chelsea (p2 - 4) cls.pdf (state.ma.us)


APPENDIX A: Survey

**Anonymous Survey:**

Description: Mill Creek is a part of the Mystic River separating Chelsea and Revere, adjacent to the Revere Beach Parkway. Due to the history of being an industrial area and the surrounding hills and slopes, Mill Creek has been facing water quality problems. The Housing and Community Development Department (H+CD) is working to improve water quality in the creek and create new parks and paths nearby for public use.

This survey will ask questions about Mill Creek and the ways people use and interact with it. It will be administered by a WPI student project team with H+CD. We want to gather information on how people utilize Mill Creek, understand the frequency of creek use and associated activities, and assess public opinion about the creek. The department will use this survey to help decide how to best use available spaces around the river to improve the well-being of residents in the community.

Comments can be put in the response lines after each question and are encouraged to provide us with more background and insight into the community’s relation to Mill Creek. The survey should take no more than 5 minutes. All responses will be anonymous.

1. How close do you live/work to Mill Creek?
   - [ ] < 1 mile
   - [ ] 1-2 miles
   - [ ] > 2 miles

2. How often do you go near the river (walking by the river, driving nearby, etc.)?
I don’t spend that much time near the creek at all

☐ I only go to the creek once in a while

☐ 1-2 times a week

☐ 3-5 times a week

☐ 5+ times

If you answered 1-2 times a week or more, where do you spend your time the most near Mill Creek?

______________________________________________________________________________

______________________________________________________________________________

3. Do you see people visiting Mill Creek often?

☐ Yes, in large groups

☐ Only a few people

☐ No

4. How easy is it to spend time near the river for people living close by?

☐ Very easy

☐ Moderately easy

☐ Somewhat hard

☐ Not available at all

5. Would you like to go to the river more often if it is more publicly available?

☐ Yes, I would

☐ No, I would not go near the river

If not, why? ________________________________

6. What would make you go to the river more often?
7. What kinds of public spaces would you like to see more?

- Parks
- Gardens
- Biking tracks
- Boat docks
- Boardwalks
- Others

8. Are you aware of any environmental problems (bad air quality, unclean water, erosion, etc.) near the Mill Creek River area?

- Yes
- Barely
- No

9. Do you think that the water quality has been mostly poor, normal, or clean?

- Poor water
- Normal water
- Clean water

Why do you think so? ________________________________
10. Has any house, road, or land that you know of been damaged near the river by natural causes (flooding, erosion, etc.)?

☐ Yes

☐ No

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________
APPENDIX B: Survey Results

### Chelsea Boston IOP Survey - Final Page 1

**Q. Recaptcha Score**

![Graph showing Recaptcha Score](chart)

**How close do you live/work to Mill Creek?**

<table>
<thead>
<tr>
<th>Distance</th>
<th>Percentage</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>At 1 mile</td>
<td>68%</td>
<td>13</td>
</tr>
<tr>
<td>1-2 miles</td>
<td>21%</td>
<td>4</td>
</tr>
<tr>
<td>&gt; 2 miles</td>
<td>11%</td>
<td>2</td>
</tr>
<tr>
<td>Sum</td>
<td>100%</td>
<td>19</td>
</tr>
</tbody>
</table>
How close do you live/work to Mill Creek?

<table>
<thead>
<tr>
<th>Distance</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Average</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>At, 1 mile</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>13</td>
</tr>
<tr>
<td>1-2 miles</td>
<td>2.00</td>
<td>2.00</td>
<td>2.00</td>
<td>4</td>
</tr>
<tr>
<td>&gt; 2 miles</td>
<td>3.00</td>
<td>3.00</td>
<td>1.00</td>
<td>2</td>
</tr>
</tbody>
</table>

How often do you go near the river (walking by the river, driving nearby, etc.)?

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percentage</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>I don’t spend that much time near the creek at all</td>
<td>11%</td>
<td>2</td>
</tr>
<tr>
<td>I only go to the creek once in a while</td>
<td>32%</td>
<td>6</td>
</tr>
<tr>
<td>1-2 times a week</td>
<td>16%</td>
<td>3</td>
</tr>
<tr>
<td>3-5 times a week</td>
<td>11%</td>
<td>2</td>
</tr>
<tr>
<td>5+ times</td>
<td>32%</td>
<td>6</td>
</tr>
<tr>
<td>Sum</td>
<td>100%</td>
<td>19</td>
</tr>
</tbody>
</table>

How often do you go near the river (walking by the river, driving nearby, etc.)?

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Average</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>I don’t spend that much time near the creek at all</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>2</td>
</tr>
<tr>
<td>I only go to the creek once in a while</td>
<td>2.00</td>
<td>2.00</td>
<td>1.00</td>
<td>6</td>
</tr>
<tr>
<td>1-2 times a week</td>
<td>3.00</td>
<td>3.00</td>
<td>1.00</td>
<td>3</td>
</tr>
<tr>
<td>How often do you go near the river (walking to the river, driving nearby, etc.)</td>
<td>Average</td>
<td>Minimum</td>
<td>Maximum</td>
<td>Count</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>3-5 times a week</td>
<td>4.00</td>
<td>4.00</td>
<td>4.00</td>
<td>2</td>
</tr>
<tr>
<td>5+ times</td>
<td>5.00</td>
<td>5.00</td>
<td>5.00</td>
<td>6</td>
</tr>
</tbody>
</table>

If you answered 1-2 times a week or more, where do you spend your time the most near Mill Creek? (put N/A if you don't spend that much time near the creek)

- Around the back of the hotel
- A new skatepark being built next door to the park on the Creekside Commons
- BDHC-Chelsea and Parkway Shopping Plaza
- Walk paths from around ice skating rink, behind hotel all the way to end, past park and out into home depot plaza
- My backyard
- Home
- I live on the riverfront
- Live on the creekside walk all around near the hotel, rink and on Lisa Ln - is a beautiful view
- I walk along the Mill Creek Riverwalk by the shopping complex / Michael Go etc...
- N/A
- Hotel trail
- N/A
- I live in front of it, walk by it and drive by it
**Do you see people visiting Mill Creek often?**

- **Yes, in large groups**: 5% (1)
- **Only a few people**: 74% (14)
- **No**: 21% (4)
- **Sum**: 100% (19)

**Do you see people visiting Mill Creek often?**

<table>
<thead>
<tr>
<th>Do you see people visiting Mill Creek often?</th>
<th>Average</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, in large groups</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1</td>
</tr>
<tr>
<td>Only a few people</td>
<td>2.00</td>
<td>2.00</td>
<td>2.00</td>
<td>14</td>
</tr>
<tr>
<td>No</td>
<td>3.00</td>
<td>3.00</td>
<td>3.00</td>
<td>4</td>
</tr>
</tbody>
</table>

**How easy do you think it is to spend time near the river for people living close by?**

- **Very easy**: 100% (19)
- **Moderately easy**: 100% (19)
- **Somewhat hard**: 100% (19)
- **Not available at all**: 0% (0)
How easy do you think it is to spend time near the river for people living close by?  

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very easy</td>
<td>42%</td>
</tr>
<tr>
<td>Moderately easy</td>
<td>42%</td>
</tr>
<tr>
<td>Somewhat hard</td>
<td>11%</td>
</tr>
<tr>
<td>Not available at all</td>
<td>5%</td>
</tr>
<tr>
<td>Sum</td>
<td>100%</td>
</tr>
</tbody>
</table>

How easy do you think it is to spend time near the river for people living close by?  

<table>
<thead>
<tr>
<th>Average</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very easy</td>
<td>1.00</td>
<td>1.00</td>
<td>8</td>
</tr>
<tr>
<td>Moderately easy</td>
<td>2.00</td>
<td>2.00</td>
<td>8</td>
</tr>
<tr>
<td>Somewhat hard</td>
<td>3.00</td>
<td>3.00</td>
<td>2</td>
</tr>
<tr>
<td>Not available at all</td>
<td>4.00</td>
<td>4.00</td>
<td>1</td>
</tr>
</tbody>
</table>

Would you go to the river more often if there are more public spaces?  

- Yes I would go
- No, I would not go near the river

Would you go to the river more often if there are more public spaces?  

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes I would go</td>
<td>95%</td>
</tr>
<tr>
<td>No, I would not go near the river</td>
<td>5%</td>
</tr>
<tr>
<td>Sum</td>
<td>100%</td>
</tr>
</tbody>
</table>
Would you go to the river more often if there are more public spaces? 19

<table>
<thead>
<tr>
<th></th>
<th>Average</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes I would go</td>
<td>100</td>
<td>1.00</td>
<td>100</td>
<td>18</td>
</tr>
<tr>
<td>No, I would not go near the river</td>
<td>2.00</td>
<td>2.00</td>
<td>2.00</td>
<td>1</td>
</tr>
</tbody>
</table>

Would you go to the river more often if there are more public spaces?: No, I would not go near the river

My house is on the river, so it wouldn't change much for me.

What would make you go to the river more often? 39

- More public space
- Clean surroundings
- Other

Other: Less homeless living in the shrubbery areas and all the alcohol bottles and needles.

Educational signs...and gatherings. I'm exploring a grant to host one.

Board walks, bike trails.
The area needs better cleaning and pruning while keeping its natural ecosystems in tact.

Restrooms

What kinds of public spaces would you like to see more? 19

- Parks
- Gardens
- Biking tracks
- Boat docks
- Boardwalks
- Others

What kinds of public spaces would you like to see more? 19

<table>
<thead>
<tr>
<th>QR: What kinds of public spaces would you like to see more?</th>
<th>Selected Choice</th>
<th>Percentage</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parks</td>
<td>100%</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Gardens</td>
<td>58%</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Biking tracks</td>
<td>47%</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Boat docks</td>
<td>37%</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Boardwalks</td>
<td>04%</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>21%</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Sum</td>
<td>316%</td>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>

What kinds of public spaces would you like to see more?: Others

- I think less biking and boating and more protection. We have caused enough human interference and cleaning and protecting it is the most important piece to safeguarding the important role it plays in our ecosystem.

- Wildlife education, animal pollinator stations, more walking and enjoying the scenery...not necessarily pats.

- Playgrounds

- Bird Sanctuary/Trail
Are you aware of any environmental problems (bad air quality, unclean water, erosion, etc.) near the Mill Creek river area?

- Yes: 53% (10)
- Somewhat: 26% (5)
- No: 21% (4)
- Sum: 100% (19)

**Unclear water, occasionally the air is stinky**

**It is industrial zoned, the government forces it down our throats**

**Erosion and water pollution**

**So much pollution, many items are in the river floating, because of all the litter nearby the water smells terrible.**

**Lead paint, chemicals, etc. SO much.**
Do you think that the water quality has been mostly poor, normal, or clean?

<table>
<thead>
<tr>
<th>Quality</th>
<th>Percentage</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor water</td>
<td>68%</td>
<td>13</td>
</tr>
<tr>
<td>Normal water</td>
<td>32%</td>
<td>6</td>
</tr>
<tr>
<td>Clean water</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td><strong>Sum</strong></td>
<td><strong>100%</strong></td>
<td><strong>19</strong></td>
</tr>
<tr>
<td>Water Quality</td>
<td>Average</td>
<td>Minimum</td>
</tr>
<tr>
<td>--------------------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>Poor water</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Normal water</td>
<td>2.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Clean water</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Why do you think so?**

- It looks ok.
- This is an urban city so poor quality open spaces is expected.
- All the trash and sewage thrown into the creek you can see it at low tide.
- I wanted to say its not that bad as we seen some improvements but the protecting efforts of local org and city has helped raise awareness. We still need to do more.
- There are still ducks and swans that live there so I guess its cant be that bad.
- All the petro products for the air pot the larger airport this part of the usa goes on that river.
- Have seen several shoe birds there
- Hoping it is.
- I see when driving by.
- All the garbage people leave.
- Off smells when walking around.
- Always looks dirty.
- Pollution, industrial dumping, shipping.
- There are still paint cars out there. The heron and other birds that eat the baby founds hatching there probably get sick.
- It's dirty and you can fin a sock out of there.
Has any road, house, or land that you know of been damaged near the river by natural causes (flooding, erosion, etc.)?  

<table>
<thead>
<tr>
<th></th>
<th>Percentage</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>79%</td>
<td>15</td>
</tr>
<tr>
<td>Yes</td>
<td>21%</td>
<td>4</td>
</tr>
<tr>
<td>Sum</td>
<td>100%</td>
<td>19</td>
</tr>
</tbody>
</table>

| Has any road, house, or land that you know of been damaged near the river by natural causes (flooding, erosion, etc.)?  
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average</td>
<td>Minimum</td>
<td>Maximum</td>
<td>Count</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>2.00</td>
<td>2.00</td>
<td>1.00</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

Has any road, house, or land that you know of been damaged near the river by natural causes (flooding, erosion, etc.)? Yes

Spencer Ave properties struggled with rain flooded basements.

But it will impact neighborhoods if it's not cared for. There should be less development around it to protect its natural flow and likewise community that can also be impacted.

My uncle's back yard on Clinton street (on the river) has flooded before.
¿Qué tan cerca vives/te trabajas de Mill Creek?

<table>
<thead>
<tr>
<th>Distancia</th>
<th>Porcentaje</th>
<th>Cuenta</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 milla</td>
<td>50%</td>
<td>1</td>
</tr>
<tr>
<td>1-2 millas</td>
<td>50%</td>
<td>1</td>
</tr>
<tr>
<td>&gt; 2 millas</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>2</td>
</tr>
<tr>
<td>¿Qué tan cerca vives/trabajas de Mill Creek?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Alt. 1 milla</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>1-2 millas</td>
<td>2.00</td>
<td>2.00</td>
</tr>
<tr>
<td>&gt; 2 millas</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>¿Con qué frecuencia te acercas al río (caminando por el río, conduciendo cerca, etc.)?</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Frecuencia</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>No paso tanto tiempo cerca del arroyo en absoluto</td>
<td>0</td>
</tr>
<tr>
<td>Sólo voy al arroyo de vez en cuando</td>
<td>2</td>
</tr>
<tr>
<td>1-2 veces a la semana</td>
<td>0</td>
</tr>
<tr>
<td>3-5 veces a la semana</td>
<td>0</td>
</tr>
<tr>
<td>5+ veces</td>
<td>0</td>
</tr>
<tr>
<td>Sum</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Con qué frecuencia te acercas al río (caminando por el río, conduciendo cerca, etc.)</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>No paso tanto tiempo cerca del arroyo en absoluto</td>
<td>0</td>
</tr>
<tr>
<td>Sólo voy al arroyo de vez en cuando</td>
<td>2</td>
</tr>
<tr>
<td>1-2 veces a la semana</td>
<td>2</td>
</tr>
<tr>
<td>3-5 veces a la semana</td>
<td>0</td>
</tr>
<tr>
<td>Sum</td>
<td>2</td>
</tr>
</tbody>
</table>
¿Con qué frecuencia te ejerces el río (caminando por el río, nadando en el río, saltando por el río...)?

<table>
<thead>
<tr>
<th>Frecuencia</th>
<th>Cont.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 x veces</td>
<td>0</td>
</tr>
</tbody>
</table>

Si respondió 1-2 veces a la semana o más, ¿dónde pasa más tiempo cerca de Mill Creek?

No data found - your filter may be too exclusive.

3. ¿Ves gente visitando Mill Creek a menudo?

<table>
<thead>
<tr>
<th>Opción</th>
<th>Cont.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sí en grupos grandes</td>
<td>0</td>
</tr>
<tr>
<td>Sólo unas pocas personas</td>
<td>1</td>
</tr>
<tr>
<td>No</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opción</th>
<th>%</th>
<th>Cont.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sí en grupos grandes</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>Sólo unas pocas personas</td>
<td>50%</td>
<td>1</td>
</tr>
<tr>
<td>No</td>
<td>50%</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>3</td>
</tr>
</tbody>
</table>
3. ¿Qué tan fácil es pasar tiempo cerca del río para las personas que viven cerca?

- Muy fácil: 50% (1)
- Moderadamente fácil: 0% (0)
- Algo difícil: 50% (1)
- No disponible en absoluto: 0% (0)
- Suma: 100% (2)

4. ¿Estás de acuerdo con la idea de solicitar una contribución para el mantenimiento del río y sus alrededores?

- Totalmente de acuerdo: 0% (0)
- De acuerdo: 0% (0)
- Duda: 0% (0)
- En general, no: 100% (1)
- Total: 100% (1)

5. ¿Cuál es tu opinión sobre la calidad del agua en el río?

- Muy mal: 0% (0)
- Mal: 0% (0)
- Adecuado: 0% (0)
- Buena: 0% (0)
- Muy buena: 0% (0)
- Total: 0% (0)

6. ¿Estás de acuerdo con la idea de establecer reglas para el uso del río?

- Totalmente de acuerdo: 0% (0)
- De acuerdo: 0% (0)
- Duda: 0% (0)
- En general, no: 100% (1)
- Total: 100% (1)
¿Le gustaría ir al río más a menudo si está más disponible públicamente?

<table>
<thead>
<tr>
<th>Opción</th>
<th>Porcentaje</th>
<th>Conteo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sí, lo haría</td>
<td>100%</td>
<td>2</td>
</tr>
<tr>
<td>No, no me acercaría al río</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>2</td>
</tr>
</tbody>
</table>
¿Le gustaría ir al río más a menudo si está más disponible públicamente?  

<table>
<thead>
<tr>
<th>Opción</th>
<th>Average</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sí, lo haría</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>2</td>
</tr>
<tr>
<td>No, no me acercaría al río</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
</tbody>
</table>

¿Le gustaría ir al río más a menudo si está más disponible públicamente? No, no me acercaría al río

No datos found - your filters may be too exclusive.

¿Qué te haría ir al río más a menudo?  

<table>
<thead>
<tr>
<th>Opción</th>
<th>Percentage</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Más espacio público</td>
<td>100%</td>
<td>2</td>
</tr>
<tr>
<td>Entorno limpio</td>
<td>50%</td>
<td>1</td>
</tr>
<tr>
<td>Otro</td>
<td>50%</td>
<td>1</td>
</tr>
<tr>
<td>Sum</td>
<td>200%</td>
<td>4</td>
</tr>
</tbody>
</table>
¿Qué te haría ir al río más a menudo?: Otros

¿Qué tipo de espacios públicos te gustaría ver más?

- Parques
- Jardines
- Pistas para ciclistas
- Muelles para barcos
- Paseos marítimos
- Otros

<table>
<thead>
<tr>
<th>Tipo de Espacio</th>
<th>Porcentaje</th>
<th>Cantidad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parques</td>
<td>50%</td>
<td>1</td>
</tr>
<tr>
<td>Jardines</td>
<td>100%</td>
<td>2</td>
</tr>
<tr>
<td>Pistas para ciclistas</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>Muelles para barcos</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>Paseos marítimos</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>Otros</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>150%</td>
<td>3</td>
</tr>
</tbody>
</table>
7. ¿Qué tipo de espacios públicos te gustaría ver más? Otros

8. ¿Estás al tanto de algún problema ambiental (mala calidad del aire, agua sucia, erosión, etc.) cerca del área del río Mill Creek?

<table>
<thead>
<tr>
<th></th>
<th>Percentage</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sí</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>Apenas</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>No</td>
<td>100%</td>
<td>2</td>
</tr>
<tr>
<td>Sum</td>
<td>100%</td>
<td>2</td>
</tr>
</tbody>
</table>

8. ¿Estás al tanto de algún problema ambiental (mala calidad del aire, agua sucia, erosión, etc.) cerca del área del río Mill Creek?

<table>
<thead>
<tr>
<th></th>
<th>Average</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sí</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Apenas</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>No</td>
<td>3.00</td>
<td>1.00</td>
<td>3.00</td>
<td>2</td>
</tr>
</tbody>
</table>
8. ¿Está al tanto de algún problema ambiental (mala calidad del aire, agua sucia, erosión, etc.) cerca del área del río Milk Creek? Sí ☑

6. ¿Crees que la calidad del agua ha sido en su mayoría mala, normal o limpia? ☑

<table>
<thead>
<tr>
<th>Opción</th>
<th>Percentage</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agua pobre</td>
<td>100%</td>
<td>2</td>
</tr>
<tr>
<td>Agua normal</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>Agua limpia</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>Sum</td>
<td>100%</td>
<td>2</td>
</tr>
</tbody>
</table>
¿Crees que la calidad del agua ha sido en su mayoría mala, normal o limpia?

<table>
<thead>
<tr>
<th></th>
<th>Average</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agua potable</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>2</td>
</tr>
<tr>
<td>Agua normal</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Agua limpia</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
</tbody>
</table>

¿Por qué crees eso?

Puedo verlo desde el puente que conecta Chelsea con Revere

Porque en verano se seca el agua y queda con mal olor

¿Sabe o conoce de alguna casa, carretera o terreno que haya sido dañado cerca del río por causas naturales (inundaciones, erosión, etc.)?

<table>
<thead>
<tr>
<th></th>
<th>Percentage</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>100%</td>
<td>2</td>
</tr>
<tr>
<td>Si</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>Sum</td>
<td>100%</td>
<td>2</td>
</tr>
<tr>
<td>Sabe si conoce de alguna casa, carretera o terreno que haya sido dañado cerca del río por causas naturales (inundaciones, erosión, etc.)?</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>No</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Sí</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

No dias found - your filters may be too exclusive!
APPENDIX C: Catherine Pedemonti of Mystic River Watershed Association Interview

Basically the purpose of this interview is to gain knowledge about the Mystic River Watershed Association, to understand your perspective on the social factors at play in the Mill Creek salt marsh situation and discuss potential solutions.

1. *Can you describe the Mystic River Watershed associations specific role in contributions to the restoration and conservation efforts of Mill Creek, including any past successes or ongoing projects?*

We have been involved with Mill Creek for the last couple of decades, mostly, in the beginning, it was mostly for the water quality. So Myra does a lot of water quality testing. And this isn't my particular role. So I can't speak too much in detail about it. But there, we have a number of sites throughout the watershed that we monitor on a regular basis and collect that data and map that data. And that's actually the data that informs as you know the EPA report card that you referenced before, and how Mill Creek makes an F, you know, that comes from the sampling that we do throughout the watershed. So again, we've been involved with Mill Creek for a while, I would say our involvement up to over the last decade I came on, probably five years ago. I'm a project manager. So Mill Creek became, you know, one of the projects that I was involved in, and I guess our role there, in addition to the water quality is I would say, you know, kind of, we collaborate closely with green roots in the city to push kind of a suite of projects forward. Right. So we meet with the city and green roots every two weeks, and it's kind of like go through like you guys saw 88 Clinton Street. Well, there's, you know, close to a dozen other projects along the mill creek that, you know, some of which are done,
some of them slowly moving forward. So sometimes we add, we add capacity with community engagement, right, like we'll help support green roots if they need help with community engagement.

We help with fundraising, so writing grants and securing funds to push some of these projects forward. So we're like, essentially one of the stakeholders there, and probably part of like the core project team, to help, you know, restoration and resilience work. And open space improvements happen there. So that makes sense.

2. *Have you embarked on any direct restoration projects in the Millcreek River?*

So in terms of actually getting things built I feel like that's one of the hard things.

Let me start over and answer that. So we have a number of projects that are moving forward.

One, I would highlight that we as my rep and particularly kind of taking the lead on a bit in terms, you know, it's hard, it's all a collaboration. So it's really hard to, to pull out like we did this, right, like everything's been in a group. But one thing we were actually just on a call on talking about was there is so when you went to 88 Clinton Street, I don't know if you looked across the creek from where you were, but there's an old mill building and a sort of I won't call it a dam because it's made out of like dirt and big rocks. But there's a berm that extends out in the middle of the creek. And one of the projects so we had this existing conditions analysis done and I think 2018 That basically went through got a bunch of data, you know, commented on again, what are the existing conditions? What are the challenges, what are the opportunities and here's our recommendation for restoration slash resilience work and one of
the top projects identified was removing this berm to restore the tidal flow. So the intention is if more saltwater gets up to the upper part of the system, then the salt marsh pockets that are up there will be healthier because there's more tidal flushing, making its way up there. Phragmites will be less healthy if you're getting more saltwater up there. In general, there'll be less erosion because it'll change velocity. You know, hopefully, there'll be a little bit more sediment transport, which is also positive for salt marsh. So this was identified as one of the big projects, we probably spent a few years trying to secure funding for it and having kind of a fairly hard time at it. But recently, over the last year, we've secured a good amount of funding from three different sources and are close to being fully funded. So we are kicking off at this point, kind of pre design work. So that over the next few years is one project that, you know, again, we're pretty much fully funded through construction that that will happen. So I would highlight that is one that we've been kind of particularly involved in, **but we've been a stakeholder supporting on 88 Clinton and the boardwalk and a number of other projects.**

3. *Please share your perspective on the social factors at play in the Millcreek salt marsh situation. For example, why do people hold biases or stigmas toward the creek or certain shoreline regions of the creek?*

I'm not a resident who lives there. So I feel like I can't speak on behalf of somebody who lives there. But my so a river walk you probably saw, I don't know if you went upstream from 88 Clinton. But if you cross Broadway, there is a river walk that goes along the creek and ends up at a Home Depot up there. **And my experience, to be honest, whenever I'm at Mill Creek is that that Riverwalk actually gets pretty extensively used and that people really do actually like**
it. My sense is that there's not a huge negative feeling towards Mill Creek. Do people swim in it? No. I don't think people see it as clean water that you would swim in. But I think that's probably true for most of Boston Harbor, and the river. Do people recognize how polluted it is? Like it is definitely like gets the you know that an ale and Brooke are the two segments that get the lowest grades within the whole watershed. I'm also not sure if people realize just how polluted it is.

I think in that lower area, like at Clinton, part of the intention, where there's a boardwalk project that's happening there, as well as the park project is to kind of help connect people to the marsh, right, to provide opportunities where you can actually see it and spend some time there.

4. *Can you provide us some details about Mystic River watershed association’s partnership with the Chelsea Housing and Community Development Department in the restoration efforts for Mill Creek?*

Every other Monday, we have these 11am calls with the city, which is, you know, the people you mentioned, Karl there, Alex is too busy and doesn't come anymore. But Emily is there. Oftentimes, somebody from DPW? GreenRoots is there. So they've been great partners and collaborators. And I feel like, you know, in my eyes, it's one of the stronger examples of pretty strong partnership between, nonprofits, community based organizations, and the city kind of all working together. So again, I feel like they're great partners.

5. *Do you recommend any potential solutions to address the social issues due to salt marsh depletion, water pollution, and stormwater runoff?*
Yeah, so I think everybody would agree that the water pollution and the stormwater runoff is a major issue. Was there and there is ongoing work. And again, this is the city's responsibility. So it's more of the city in trying to determine where that pollution is coming from. So it's clearly coming from piped infrastructure. And then it becomes that thing where how do you trace back? You know, is it one area where, you know, there was an Island, which is also in sort of Chelsea Everett was another stem that was really highly polluted. And basically, they were able to identify one illicit connection. So one place where the sewer system was hitting the stormwater, and sewage was making its way out, they fixed that and awesome, the grade got better. There has been testing going on with the Mill Creek, and I think it's become clear that there's probably not a single source of that pollution. But that it's a, you know, like, if you test different outfalls, if one has super high pollution, you could say, Okay, it's coming from there, but I think it's becoming clear that it's probably not a single problem causing that. So I think it becomes trying to figure out, you know, like tracing those pipes, it's all underground. So how do you trace up those pipes and find, is it you know, if you have a sewer line next to a storm water line, and they're both a little bit broken, and some sewage is making its way and like, there's probably a number of either at small illicit connections or broken pipes, where sewage is leaking into the water. So I think that needs to happen.

You know, there is opportunities for looking at green infrastructure to try to cleanse the water before it goes.

because I am not an expert on this. Like, I'm a project manager. I'm not an engineer. So I'm going to preface this with that. But there are ways to install green infrastructure, so rain gardens are bioswales are tree boxes so that when it rains, and there's sort of like overland water making its
way into the water that you can trap that water and cleanse it right, and there's a rain garden near 88 Clinton Street.

But I don't know that that would actually correct that F grade. We would catch a little bit of the pollution, but I think it's a bigger problem.
APPENDIX D: John Walkey of GreenRoots Interview

Team: We are WPI students in the interactive qualifying project regarding investigating solutions and restoration methods for salt marsh in Mill Creek and promoting community engagement. And it's an interdisciplinary project that most WPI students do in their junior and senior years. And my name is Akansha. I'm in bioinformatics. And I am Nguyen. I'm in chemical engineering.

Team: And through this interview, we seek to shed light on strategies, successes, and challenges that the community has had with engaging the community and addressing these environmental issues such as pollution, rising sea levels, erosion, and how to shape the future of Mill creek for the benefit of Chelsea residents, as well as the environment. And we heard about your extensive involvement in green roots and your expertise in environmental and community initiatives. And that makes you a valuable source of insight regarding the organization's contribution to the Mill Creek project, so we can better understand the scope of this issue for IQP.

John Walkey: So do you want to start other opening questions you have for me? Or do you want me to give a little background on myself? Or how do you want to go forward?

Team: Sure, can you give us a quick introduction and what you do in GreenRoots.

John Walkey: So my name is John Walkey. And I'm the director of climate justice and waterfront initiatives at Green roots. And so we're an environmental justice nonprofit organization. That's been around for almost 30 years now. And one of our, we have various areas that we work in, we
started out mainly focused on the issue in Chelsea is that there's a lack of green space. And many years ago, the city governance actually went into receivership. And one of the things in municipal government was in complete chaos from the police station to the housing authority to the school system. And one of the things they did was to coalesce all the elementary schools in one building, and they created a brand new elementary school complex, the Mary Burke. And when they built it, they built it on top of a large playground and athletic fields that were adjacent to one of the schools. So we're actually losing green space. So in response to that, our founder, Roseanne Vaughn Giovanni started up what was at the time, just a committee, like a working committee of the Chelsea Human Services collaborative, which was our parent nonprofit. That was in Chelsea at the time. They're now known as the collaborative diva, and they focus pretty intensely, as the name implies, on the Latino immigrant community. But the green roots started out advocating for parks. We were the Chelsea green space and Recreation Committee. And we quickly found out when advocating for parks that it wasn't just about ball fields and infrastructure and getting ownership of a property to make a park. It was also very much about the social setting of everything. A good example of that is the Mary O'Malley Park, which is a DCR state owned Park, down on Admirals Hill, right on the Mystic River next to the Tobin bridge. It's part of a former naval base that was there. And so this park has been there for a long time. And a lot of people were using the park for pickup soccer games. So it was mainly the Latino community going out and playing soccer. And the people who had moved into the very expensive condos that were part of the Admirals Hill redevelopment of the Navy Yard, sort of viewed that state park as their own backyard. And they really didn't like having all these people down there every afternoon on the weekends, you know, playing soccer so they asked the state to do something about it and said that all these people are bringing in crime and loud music and
prostitution and all these horrible things. And so they went out and they put these huge blocks and granite blocks and jersey barriers. They call them those things on the side, those cement things on the side of the road that divide lanes and things. They put those out spaced in the middle of the field. So nowhere could you actually have a full soccer pitch. So we rallied around against that. And so this is totally racist. This is like, this isn't their property, it's everyone's. And so they got the state to admit they had done wrong. And they removed that this was a real human civil rights violation. And they remove the barriers from the middle of the field, so people could go back to using it. And that was when we sort of realized that advocating for open space, park space, and that sort of thing doesn't is not removed from the sort of social issues of our day. And that's when we switched really from intentionally being an environmental justice organization, and not just an environmental advocacy organization. And since that time, in the intervening almost three decades, we've worked on park space, habitat restoration, we've done transit advocacy, we have a youth program, very early on, we put in some community gardens, we now have an urban farm, and are in the process of building a teaching kitchen, as all part of our food justice work. And in a growing area it has been real. It's sort of the same stuff we've always been doing on Mill Creek. But now it's reframed much more in the context of climate justice. So it's, it's in the same environmental work that we were doing. But now it has this perspective on it, that is, any environmental work you do is in the context of a changing climate, the environment itself is changing. And so there's new aspects of the work that are incorporated into that. And then we've also gotten into energy democracy. So looking at how energy is produced and distributed through our electrical system and how it's used in our homes and how we can better address the issue of greenhouse gasses through the energy sector, but then make the energy sector itself more responsive to people in sustainability concerns. So I guess that's my
background. I came into this as I worked at another nonprofit as a partner with green roots on some projects, about 10-12 years ago. And about seven years ago, I joined as the coordinator of the waterfront initiatives, and I live in East Boston. And when I came on, six years ago, six or seven, somewhere in there, when I came on, we expanded our reach from just Chelsea into East Boston, because there was one particular game campaign we were working on, that was not being addressed by the local organizations that were in East Boston at the time. So Greenway sort of expanded our reach into East Boston. So I manage most of our work in East Boston, and then a lot of the sort of the climate justice work that's going on in Chelsea as well. And I guess that's the context of sort of origin story of, of green roots, and then how I got involved with it. I'll pause there if you have any questions.

1. Can you tell us more about the projects you have done in Chelsea specifically? We tried to know more about the Mill Creek River and kind of its history and the projects that have been done around it.

John Walkey: Or what I can do is am I able to share screen because I actually have some?

Team: Yeah, I think you should be able to

John Walkey: let me just do this into slideshow mode.

Okay, so can you see now a map of the North? North Suffolk sort of area right now?

Team: Yeah.

John Walkey: Okay.

And so the Mill Creek is this, so the Mill Creek area is actually down here. This is Chelsea. It's its own municipality, you probably already know. The bothies Boston is over here. It's part of the
city of Boston. And then here's Rivere that's on this side. And there's something that the state has designated back in like it was in the 70s or early 80s. They designate areas of Critical Environmental Concern. And these were patches of habitat and ecological systems that were considered important and should be kind of preserved. It provides the eight ACC Program. Really what it does more than anything else is that if any federal or state money is being spent on a project in these areas, it needs to go through a certain kind of process. But in the end, it doesn't really provide that much protection. But it does highlight the fact that this thing is important. And one of the ones you see here is a non contiguous block of an ACC, which is the Romney Marsh. And the Romney Marsh consists of what's known as Romney Marsh up on the border of Revere, and Saugus and a little bit of Lynn. And then it also consists of the Belisle Marsh, which is the largest salt marsh in Boston, and that's in Boston and a chunk in Rivere in Winthrop as well. And what these when we think of these areas, they're, you know, salt marshes, they look like smaller versions of what you might see up in Ipswich or in the great Marsh. So these salt marshes are really highly productive ecosystems. They provide a lot of resources, and they provide a lot of ecosystem services and benefits like flood protection, things like that they act as a sponge. They act as a filter for contaminants, they act as habitat or rich resource beds you mentioned. And realistically, this whole area along the coastline was sort of a mosaic of different pockets of marsh and the Mill Creek was part of that mosaic. So zoom in here, and this is an older, hand drawn map of what Boston looked like at the time of European contact. So if we zoom in a little bit, East Boston itself, so the airport would be out here in the middle of the water. The airport was wholly built on landfill. This is one part of East Boston, the rest of East Boston that you see from downtown Boston is over here. All this down here was landfill like this section, going out this way is all landfill. And when a summit was the original indigenous name
of Chelsea, and you can see there's a lot of this sort of shading with all grasses sticking out of it. That's all the marsh symbology so this whole area was covered in March, the Romney Marsh is up here in a while Marsh down here and here you had Mill Creek. And so at the time of European contact with the indigenous people of this area, they would have been using these places as their whole foods. Basically, they went to the marsh and they got clams, they could catch birds. There were fish, there were grasses that they could use. There's other certain plant resources they would use. So the marshes really were a critical part of life. Back then. Europeans came in and basically the mindset was a marsh was fairly unproductive. They used to harvest salt marsh for cattle and whatnot. But over time, a lot of it was all filled in. So today, if you look at the mill creek, you get a sense of how much this whole area would have been Marsh at one time. But now it's all filled in with housing down here. And this is the Mill Hill neighborhood and Chelsea, this is Broadway running diagonally. This is Revere on this side. And over here is the Home Depot, the sort of shopping center that's down there. In terms of housing projects with Chelsea housing authority. They have the lock Street Apartments up here. And then down here is the mace development. And so the end mill creek runs from this is the interchange of route 16 and route one. And Mill Creek runs down and joins in with Chelsea creek down here and it's sort of Curves, Curves around takes a hard right and becomes a federal shipping channel. There's a lot of oil and salt and stuff that comes up the creek that's delivered bulk bulk products. But that empties out into the lower mystic and into Boston Harbor. And this other crossing here that's important to note is the commuter rail line that goes up to Salem and Gloucester and Newberry port. All this infrastructure really impacts the natural functioning of the system. And so green roots a number of years ago, probably about one a year or so, began a project where we were restoring some salt marsh up in this area right next to the lock Street Apartments. And we began
that process. This is just to show you. This is a design map from 1895 ish somewhere around there and it was, as I'm blanking on his name, but George Eliot who was a landscape architect designer, he's, you know, partially responsible for some of the designs that went into. He worked closely with the Olmsted brothers who were his contractors in Frederick Law. Olmstead was the guy with the emerald necklace and Elliot had the idea of carriageways around the city. And this was one of the carriageways, which is now route 16 of the Revere Beach Parkway. Shortly after this was designed, they declared Revere Beach, the first national Beach, public beach, for swimming, because it was just getting going. People swimming in the ocean became a recreational thing in the late 19th century. So this road got a lot of use. But you can see from today, to the beginning, like the late 19th century, there really hasn't been a lot of change here. It's still the same sort of setup. So the northern boundary of the mill creek was hemmed in by this road. And then now if we were to be in a helicopter looking above this interchange and looking down the Mill Creek, we'd see a view like this today. And you can see this is a glacial Drumlin. Hill over here that in Revere, there's a number of residential developments, the route 16 coming through here, the route one interchange, and then this is in culverts that come down through here, the Mill Creek actually ends up seeing the light of day inside this cloverleaf actually, there was a lot of engineering that went into that. And it still fills up with sediment quite regularly. Its serious sedimentation is one of our biggest issues on the Mill Creek in terms of the workings of it and the ecological workings. Now, if we go back in time, not as far as the 19th century, but 1958. This is what the area looked like. You can see the residential development is just getting going over here. They're just putting in the houses now the trees have grown yet. The road is still in construction mode here. This interchange was under construction, the Housing Authority properties that some on this side of Route one, and then there's lock street still hadn't been built
in August. That's a bit of a locked street right there. So it was still in construction. But you can see all the stuff where all this development over here of a mall and parking lots and such. That was all a sort of a jumbled mess. Basically, that area was used through most of the 20th century as a clay mine, and they were making bricks. So they would make the bricks and they would leave behind holes in the ground in the mud, which when the high tide came in, they would fill up with brackish water. It would smell bad if people threw trash in there, that's what you're seeing here. The smoke was burning trash down there. So it was a real public health nuisance. A lot of mosquitoes smell the contamination. So there was actually a project where they put in landfill and this whole whole area. They didn't do the actual Mill Creek, but they did right up to the edge of it. And then they built and so this is 58. So that landfill happened in the 60s. By the end of the 60s, they put it in a shopping center. But by that time, most everybody was doing their shopping out in the suburbs. So it sort of failed. And it remained a derelict shopping center, I think there was a liquor store and a pornographic movie theater for a number of years. And that was it. It was a place you didn't go. It was really nasty, until the 90s, when a developer came in, and actually the Chelsea green space was involved in trying to get the community organized around trying to improve their proposal to get more affordable housing. In the end, we didn't get the affordable housing, but we did get a number of things like a walking trail that goes along here, behind the Home Depot. It comes out to the parking lot, which was designed with a number of trees and additional parking areas for people to make use of this area. And the walkway continues on in this direction and takes you all the way over and brings you out to Broadway behind this is the Beth Israel over here, this is Walgreens and a hotel when and one of the things we make use of quite frequently in our projects is a piece of state law called chapter 91 which deals with filled tidelands and as I
described to you this area is all filled in tidelands. So they are under the purview of this chapter of state law. And what that says is that the title areas are common property to the people and originally in colonial times that meant you could go out there and what they called fishing and following you could go hunt for birds and for you know and go fishing And so today what that means is when this industrial property here got bought out by a hotel company and they wanted to put a hotel to get their chapter 91 license, they had to put in public amenities along the waterfront. And so what they put in was a nice walkway. They did some landscaping, they planted some native species and things, they put some interpretive signage that continues with the interpretive signage we had already put up when the development was over here when and so there's been sort of this long process of, of working to get public access to this. In terms of the ecology of it. What I might do is stop sharing here. I'm not sure if Yeah, well. This is what I wanted to show you. So let's go back to it. In terms of the ecology of it, this was a number of years ago. And it was our efforts to begin the Mill Creek Restoration. You can see this was when they were getting ready to build, they were in the process, he had some construction equipment out there, they were building the Home Depot that's there now. And so we were behind it and looking at what could be done in this area. And as the slide shows that, you know, our goals were to really create public access to this natural resource to improve the natural resource, its functioning and its ecological value. But then in the process of doing that, really engaging and educating the community that this isn't just a place to dump shopping carriages and you know trash and just drive over it and ignore it. But this is actually something you can go to and enjoy. At this point in time. People drove past and around and over this body of water, but no one ever considered it. And now today, people are walking along the banks of it taking pictures of the wildlife. So there's been a major shift. This is in 2000, that this is all Phragmites and invasive
species that will, over time choke out a salt marsh, it's usually indicative, it doesn't Thrive well in salt. So where you have it, that usually means your salt marshes are getting sedimentation. And as the level rises, less salt water can get in, and that allows these Phragmites to really proliferate. So a lot of our work went into dredging out sediment, removing the Phragmites allowing better saltwater flow into the space and, and then planting salt marsh grass Spartina. And we restored about a half an acre. And this was like I said back in 2001 or so. So quite some time ago. And this is just some pictures of what it looked like as we were doing the work. Heavy Equipment down there was one of the things about this project is we learned in terms of doing a project like this, the amount of permitting you have to do is just insane. And it's really expensive. So we learned that we had to work with not only the Department of Environmental Protection and the zoning board and staff of Chelsea, but we are in the UN the Conservation Commission in Chelsea. But we also had to work with the Army Corps of Engineers. We leveraged some funding from NOAA and their coastal restoration programs. So there were federal partners, there were philanthropic partners and there were municipal and state partners funding this and in getting it permitted. This just shows like you can see the the amount of drop so they dredged out this area removed the Phragmites from there and then this being lower allowed more saltwater to get up here at high tide and overtime so this is just giving an idea of the complexity in terms of at the time this was a lot of money. Nowadays this wouldn't even do your permitting really. But it definitely was a project of a lot of folks involved and then in the end we would have kayaking days on the creek and start introducing the idea of using the creek as an asset and not seeing it as a liability. And so moving a little further down in order to bring people down like we don't kayak in the put in the thing all the time and at low tide you can't because you'd be sitting in the mud. So one of the other things
we did was to create a park that's right alongside the creek pathway, Creekside Commons. We had the community involved in this design. This bluish building you see was a development that went in in that area that used to be the clay pits and everything was a trash dump. They built some condos on top of it, some of these were Portable, some of them are market rate. This big red brick building is senior housing. So the place is like a playground. But then we also have bocce courts and things for the seniors to use as well. And so this became a pretty heavily used playground and gets regular use, we do regular cleanup days on it and beautification, repaint things and have had to fix some of the playground equipment over the years, because it's been about 20 years since it was built, or maybe about closer to 15 years since it's been built. So that's another way we brought people down to the waterfront to start using it. Like I said, there were additional phases. This originally was like in 2000. And completed in 2005. And in 2012, we did some additional habitat restoration in this area. was just showing some of that. And here zooming in, I mentioned the hotel when in the Holiday Inn, this was 2014. So right up almost right before the pandemic. And that's worth noting, because this is looking from Broadway looking over to the, to the up the river and at the hotel, you can see the walkway along here. And the interpretive signage they put in. And one of the important things about this is that in 2020, when we got into the depths of COVID, this space ended up being really critical for people to get out of the house to go for a walk, you couldn't really mingle with people that much. So Chelsea was one of the hardest hit municipalities in Massachusetts. And when the COVID first started, we were one of the hardest hit in the country. In terms of the COVID rates. One of the issues was that so many people in Chelsea are considered essential workers. So they all had to go off and work. So the benefit of having open space like this, especially linear open space, where you walk and get somewhere, it meant that people could use this to go for a jog, to get outside, there's
benches to sit, and you have this nice view of this. This space, which in the 80s, this would have been covered in trash, it would have been something you rush past this would have been a actually, Body Shop garage was here originally. So it was a real industrial wasteland. And now you'll look at this and it looks like a place you wouldn't mind taking a walk or having a sit and watching you know egrets and herons land out in the marsh. So we've gone on to get more into the science of it. We've gone on, one of the things that we did was we did that restoration work up in this area. And it has filled in again, with sedimentation and the Phragmites are coming back. So one of the things that we're looking at is the hydrology of the system. And to look at the hydraulics, meaning how the water actually is moving through here, because for a marsh system, The regular daily two times a day flushing out of the system by the tide is really critical. It brings in sediment, it removes sediment, it brings in fresh nutrients, it circulates things. That deposition of sediment can be important for the health of a marsh. But as we said, if you get too much sediment that comes in from other places. It'll end up causing the kinds of issues that we've seen. So like sedimentation that chokes out the actual salt marsh. So we put in some tide monitors, there are just devices, data loggers at a number of locations along the creek to get an idea of the levels of the water and the periodicity. And exactly how much flow is going through. And where were their choke points. And we identified a few areas. There's an old dam down here near the mace housing project, there's Broadway, there's an access road that brings you out to the 16th to the parking lot. And then you have route one itself. And what we're seeing is that there's a lot of sediment coming off the roads and going through Stormwater drains and ending up in the creek. And that's it's not being flushed out by the tide because the tide does come in and go up a decent amount about 10 foot difference or so. But it's not coming in strong
enough to really wash out some of the sediments that are coming in from the land. And so you end up getting stuff getting choked.

And this is just showing really the normal you talk about a watershed with the urban settings. It's more of a sewer shed so this is the topography and the storm water system combined. And what you see is that the area that potentially drains into the Mill Creek includes stuff way down below here in Chelsea, but then also parts of Everett and revere a huge chunk of revere actually. So we can keep we're working with the city of Chelsea to improve a lot of their stormwater management their engineering designs to improve what's going into the creek for the water quality and the sedimentation, but we haven't had much luck really engaging with revere just yet and we feel like the poor water quality grades that we get in Mill Creek have a lot to do not only with Chelsea, but all. So with what's happening in Revere and ever, there will be some a need to chase down illicit sewer connections and things like that that are resulting in very high E. coli levels in the Mill Creek after heavy rains. And I think, yeah, just I'll stop, it's just in terms of the climate aspect of all this, I think there's two ways that we've looked at it. And that those ending slides get to the idea that salt marsh in an urban setting has a lot to do with water management, the city of Chelsea has invested a lot and the Department of Public Works on their stormwater system to better understand it. And the reason why they've done that is not just because, you know, it's necessary for the regular workings of the city. But we know with climate change, like what we just saw happen in New York City, we get these heavy, heavy downpours that are happening, they're really punctuated, they're intense, and you'll get like a month's worth of rain in one day. And the stormwater system is not designed for that. It's set up for these statistical analyses of what rain has been like throughout the past, while the climate is changing. So what happened in the past is not going to be what happens in the future. So we have to reengineer a lot
of our infrastructure to accommodate more water. One way you can do that, like a usual engineer's thought, is we have more water, just make your pipes bigger, so you have more volume. But that's intensely expensive and really overload. One of the other ways is using nature based solutions, as they call them, where you have more, you know, bioswales, these little like pits that can just grassy during dry times, but they can fill up with water that can take some of the stormwater runoff, different ways to make sure water is infiltrating into the ground and not just going into the storm drain system. Having more trees, Chelsea has very low canopy cover, having more trees slows down the speed which with with which water runs through a system, right now you drop if if you took two watersheds of a similar size, but one of them is covered an impervious surface, and one is like a natural treed state, a drop of water landing on either of those in one situation, it'll shoot through the system in a short period of time where your conveyor belt. And the other system that drops water may never actually make it to the ocean, it's going to get evapotranspiration. And never just because it gets slowed down by the trees in the natural environment. So one way of trying to improve the urban environment is to remove that impervious surface and try to recreate the natural systems and how they manage water. You can do that up to a point. I think one of the things that the last slide that showed like downtown Boston all flooded when it comes to sea level rise. There's only so much a tree or a bioswale or something can do These nature based solutions have their limits. So as we look at climate change over the long term, we'll have to start really grappling with some tough decisions like moving away from the coast. But in the meantime, what we know is these areas that had been marshes before that we saw in that old old map, hand drawn map, those are the areas that coat that coincide with all of our modeling of what are the areas that are going to flood? Well, it makes real intuitive sense. It's all the areas that used to flood. And so if we can return some of those
areas back to being floodable, that will in the near term, help us manage the floodwaters. So we're trying to do that in Mill Creek really. Previously, we wanted to restore the habitat because it's a good thing to do. And it's a benefit for the people. Now we're doing it because it's really critical because of climate change and what's coming.

The additional benefit was a little bit related to what I mentioned on COVID. Chelsea is huge and has a problem with the heat island effect. There's a lot of impervious surfaces, brick buildings, no trees. So in the summertime with these intense heat waves, which is another climate change impact, the whole surface of the city heats up and that heat is retained overnight. So the next day in a heatwave, the temperature isn't starting out really low. It's starting out already pretty high because like a pizza oven, the bricks of people's houses and things have retained the heat. So having these green spaces provides a cooling effect. It also allows people if they live in an area that's in a heat island, they can walk down to Mill Creek and spend some time in the park where it's cooler. Being near the coast, it's sort of a double edged sword, you get flooding risks, but also in terms of heat island effects. You do get ocean breezes and things like that, which helps mitigate a little bit of that more so than someplace like Chicago or someplace that's further inland. So I guess that's sort of the rundown on some of the climate aspects of the work that we're doing. We were still trying to continue to the Mill Creek walkway to bring it. There's a project right now to do a boardwalk that would go from Broadway, in the bed of a creek itself, and it would bring you out to a lot on Clinton Street, which is right next to the mace apartments. I got like a door two doors down or so. But that LOD is being converted into a park that would have a splash pad by the street to allow kids to go to the summertime and cool off. But then the lower part of it comes right out to the mill creek, the boardwalk will come up to the site, so people can then access back into the city. But the lower part is designed to be flooded, so
that over time as the Mill Creek levels rise, that we could actually see a migration of salt marsh into this park. That'll be, you know, a 57 year timeframe. But we're thinking that far in advance, we need to keep a buffer space here, we need to keep a space for nature to reclaim this property. And that will provide some protection against flooding and provide habitat and all the other benefits we've been talking about. And I guess the last part in terms of community engagement, it is really a question of this project. And Mill Creek projects sort of showed how over time, we've worked hard at trying to change people's perceptions of this river, that it was a dump before and a place you didn't want to go. Now it's become a place that is looking nicer, that you do want to go to because there's something to go to. And it's not dumpy looking. But all of that perception can be ruined by just having one day someone goes down there, and there's just crap everywhere.

And so we do have spent a lot of time on stewardship, of trying to get people engaged, to go down on cleanup days to clean the space up to make sure that the company that built the Home Depot and everything that they comply with a lot of their agreed upon things that they're going to do, and they were going to maintain a lot of the infrastructure down there. So we need to be watchdogging all the time, property owners who might not be doing what's right, just because it might be an expense. So there's a bit of that involved. And then you have programs and so on, in addition to just clean ups, you need to do something that'll bring people there. And that'll be fun, like they go there to have a good time, not just to pick up trash.

And they go down. And that's why we built the park. And then we occasionally do like we've done in the past. And recently, we haven't done as many in Millcreek. But we do regular kayaking and canoeing days. So programming events brings people down there, the more people
have contact with the space, the more they start to feel a sense of ownership to it. And the more they start to feel a sense of responsibility for the stewardship of that space. And so that's where we have that connection, we keep pushing on the property owners, we keep pushing on the city to maintain the space. And we're hoping that over time, we will have an engaged citizenship that will or engage residents who will take up the mantle of cleaning up some of this stuff on a daily basis, and really making use of the site and advocating for it to there's a lot of funding that's available through the state through something called the municipal vulnerability program. And that's all specifically for projects like things on mill creek where we're protecting against flooding and stuff like that. So we are continuing leverage, continually leveraging federal and state dollars to improve the Mill Creek and to enhance its ecological functions and to engage the community and benefit from those and support those functions.

And I think that that covers it.

2. What are some of the biggest challenges that green was facing when implementing like a nature based solution, opening up open spaces and engaging the community?

I think the

the biggest challenges we've had and doing some of the nature based solutions.

Just the

permitting, getting those things through getting the funding for them has been really challenging.

At one level, I think one of the biggest challenges of nature based solutions, and this is based more on my, my personal perceptions of it, then directly from all the experience that we have with green roots is,
is the scale at which you need to implement the nature based solution, I don't think people understand it, they think if we just do this one little pocket park, or if we just plant, you know, 100 trees, that there we go, we have a nature based solution, and now we won't have flooding or anything. No, it's, you need to do a whole lot and the scale at which you need to do it in a place, Chelsea is less than two square miles, it's very small. And a lot of it is covered in you know, a third of it is is industrial use. And the other two thirds are a mix of between residential and other sort of commercial uses. So there's not a lot of room in there to do the kind of scale that you need to prevent the bigger effects. So one of the things I'm the bigger effects of climate change.

One of the things I'm a little nervous about is we talk up natural bass solute nature based solutions quite a bit. And I think that what's going to happen is, we'll implement a few of them that might help with some of the sunny day flooding, as they call it, when we have the astronomical high tides and the water starts coming in or we have one of those summer heavy rains, that's just like a day, we'll be able to handle those better. And but I'm not sure people will notice that what they will notice is when we have a hurricane come really close our our nature based solution projects, we haven't implemented enough of them, that they're going to make much of a difference when we get something like what New York just had, or hurricane sandy or something like that. So and then people will say all this nature based solutions stuff was just crap. Because look, we we did that and nothing happened, you know, we still got flooded, it's it's not a magic bullet, it's not going to fix everything. So our challenge is really trying to get people to understand the benefit of implementing these things at a larger scale. So that property is a property that's up for grabs. And the city can either allow it to be developed for housing, maybe affordable housing, or they could allow it can be developed for a new Amazon distribution
facility, which brings in tax revenue and a few jobs. Or they could have it become a park, which is going to address flooding, but it's going to be something that's expensive, it's going to be something that they have to pay to maintain, and it won't bring in any money. But it's like paying for insurance, you pay for insurance, and you're not seeing a return on that. But at some point, something hits you and you're very glad that you were paying for the insurance because it bails you out. And that's what these parks and these nature based solutions are. They are insurance for the future. But I don't think people see that when they're having to pay for the permitting and everything else that goes into these projects. It's the capital expense, and then the maintenance of them. You're talking hundreds of millions of dollars over a period of time. But what that hundreds of millions of dollars of investment could do in addition to providing park space that's enjoyable and everything is actually prevent billions of dollars of damage when the storm actually comes.

3. What are the future plans? Are I kind of like the vision that Korean roots has for milkweed? And how can the residents take part in creating that vision.

I think our vision for Millcreek is really to continue the work and in a very physical sense is to continue the actual walkway week, we got all the way up from behind Home Depot. And you can walk all the way along the Mill Creek to the to Broadway. Now what we're going to be doing is putting in this boardwalk from Broadway down to 88 Clinton Street that gets you almost to the maze housing projects. Eventually we'll get all the way down to the Chelsea Creek.

We have some habitat restoration that's going on on one of the sleds mill dam. It's a historic mill dam that is really crumbled down and everything and at high tide it's completely submerged. However, we talked a little bit about sedimentation and flow and a salt marsh how important that
is. So we're going to try to remove some of that relic dam to allow better flow of water in and out which will affect the sedimentation hopefully benefiting the habitat. But we'll be monitoring that work. And as part of that there'll be a lot of work.

You go down and look at that dam, there's actually one part of it, where there's a tremendous amount of rock weed and different kinds of vegetation that's growing on it. And it's a, it's a tremendous amount of habitat, and probably the one of the most vital bits of habitat on all of Millcreek. So we're not going to remove all of the dam because it's actually start part of the ecological restoration now. So we're going to build upon that and see what we can do to improve in that area for the habitat, in terms of engaging people. And in particular, in terms of the Housing Authority, the mill, Mace development, which is in the on the Mill Creek, down by Ada Clinton Street,

they in the past, we put in a rain garden there, which is another one of those kinds of engineered nature based solutions. It wasn't very successful, the engineering of it wasn't that great. And then next to it, we put in some community gardens, which have sort of fallen into disrepair. And so as part of our food justice program, we manage a number of growing spaces around the city. And that's one of them that we're has needs some attention. So I think we're going to put some attention towards engaging the residents in the garden, which is something tangible, that sort of there's it's like right in their backyard, easy to get to, they can grow stuff and receive the benefits of growing tomatoes or whatever. But then in the process of doing that, that where the garden is, there's a wall, right on the other side of the wall is the Mill Creek. And so what we want to do is to engage them not only in creating their garden, but starting to look over the wall, starting to see the Mill Creek as potentially an asset, engaging them in some of the design of 88 Clinton Street, that park space, engaging them in some of the restoration work that's going on giving them
presentations, and what's happening, maybe, you know, teaching the kids how to identify
different types of birds and have them do like bird watching from their windows, to see what
birds they can see. Things like that to get them
turning around, because basically their back is to the mill creek. And we want to just turn them
around and have them look at the mill creek and say, you know, what do you see. And right now
they look at, they see a bunch of scrubby invasive trees, they see the dumpster in the parking lot,
and they see a bunch of old tires that somebody threw over the wall. And so we want to clean
that stuff up, maybe remove some of the invasives and get them starting to see the potential for
an asset there. So we're just working our way down Mill Creek. And over time, we hope that
people are more and more engaged in the process, and that they are seeing the benefits that they
can get from a healthy Millcreek.
Sure, so I'm a planner. I’ve been here while I started as an intern after grad school at the end of 2016, distributed full time in the spring of 2017. So I've been here about seven years at this point. And seen lots of efforts, participated in some and advised on others. Watch what's happening around Mill Creek with concern and with interest. **Mill Creek is consistently the most polluted waterway segment in the Mystic River watershed.** And we don't know why. So when I've been involved, I've tried to focus people's efforts on understanding why this is so polluted, and where do we go from here to understand what the causes are, and then to correct them, so that people can kind of reclaim this piece of their community. So one of the jobs over the past many years, is that I was in charge of developing the municipal harbor plan for Chelsea Creek. So Chelsea Creek starts at the mouth of Mill Creek, Mill Creek, the major tributary to Chelsea Creek. And so the base of Mill Creek is the head of Chelsea Creek. And that runs all the way down to the mystic. So we went through a couple of premises C's, in conjunction with the kind of great advocacy work that green roots had been doing in looking at Creek as a whole, Mill Creek as a whole and trying to understand the hydrodynamics of the creek. And why some previous efforts seem to succeed and then fail. So if it was long before I got here, sometime in the arts, I think it was that green roots did this project where they did dredging and salt marsh restoration on one of the upper stretches of mill creek behind the loc. St. Chelsea housing authority property. And if you have gotten a tour in that place
Team: Yeah. Last week. And we saw what was going to become like the park and then we went all the way to where all those like housing complexes are being built near the creek. And then we also got to the part where we saw what was being built off the boardwalk and then also some parts of the marsh that are like runoff to the rivers. So we just went further left to the marsh.

Karl Allan: Okay, so you didn't go all the way up behind home depot.
Team: No, we did not go there.
Karl Allan: I think. Yeah, so that's kind of lower Mill Creek. Um, we generally think of Mill Creek and kind of East I do. **Two segments: lower Mill Creek is from Broadway to Chelsea Creek and the upper stretches are from Broadway to in reality**, there were two headwaters that still exist. Almost everything's been a culvert and is under grant. But one of them can do, there's public walkways that go all the way behind the riverwalk or whatever formal branding of it. But if you walk along that you get to the lock street housing complex, and there's kind of a bass in there that has a couple of storm drains emptying into it, and a big wall, which is route one. And that's where the green roots, did some dredging, did some salt marsh restoration. If you go there now, you can look at it in aerial photos, it's hard to find any water. The entire basin, there is just sediment at the end, and is mostly a giant standard Phragmites. The other head water goes under the root one route 16 interstate. So there's kind of a big circle in that piece of the cloverleaf where the off ramp is. And there are culverts to it, there's an open segment upstream inside that circle. And then there are more culverts that go under route one, and end up at another public housing complex in Prattville. And behind it, and that one kind of forms the Chelsea repair border. And there are dozens of storm water drains that empty into that segment and all the
way down. And all of them are incredibly polluted. Okay. So have they given you background stuff to read?

Team: Yeah.

Karl Allan: So we had a pretty extensive booklet of what's happened and what is planning on happening and the projects that are currently underway.

2. Can you share some of the key goals and objectives of the department's involvement in the mill Creek project?

Like aside the broader thing I would say is to make it not be as bad as it is right now. Well, okay. So priority number one is public access. Yeah. There has never really been public access. And we're, there is potential for public access. There are public health problems. So that's priority number two, is to address all of the public health issues which are primarily a function of water quality. So if you looked at where the berm was, so you were down at the mace housing complex. So that parking lot floods monitor moderately high tides or storms, and mill creek water, you'll get at least a couple inches. And that's a family based public housing complex and kids love to play in these giant puddles that are full of bacteria and E. Coli. And no one should be going near. So it's very dangerous. Dangerous might be in over characterization. But, you know, it's, it shouldn't be a concern. Yeah. You know, there's certainly public health implications. And, you know, it's not like we have cholera infestations in Chelsea. And it's unlikely that anyone's going to die from an infection from either E. coli or interrupt. But you can get sick, and, you know, green roots, when I started complaining to them, that we need to actually address water quality issues. Yeah, a few years ago, when we were having our kayaking event in Mill Creek,
one of the kids capsized in his kayak, and was in the water and, you know, a day later, so he
came down with a bad eye infection. So, yeah, can't tie it directly to that. But
there's a reason to believe this, you know, Clean Water Act, promised all Americans, swimmable,
fishable waters. And those waters aren't swimmable, and they should be no reason other than
lack of will and, you know, basic, gross incompetence on the part of people building
infrastructure. So, in theory, we don't even have any combined sewers that dump into it. But if
you look in those reports, at the bacteria levels, that they're reporting from samples coming out
of outfalls, that should only contain stormwater. They are two orders of magnitude above legal
limits. That's not dog poop. That's someone flushing a toilet directly into it. So they're illicit
connections to our stormwater system that should be connected to our sewer system. And they
haven't been addressed.

3. What role does public engagement play in the department's approach to the Mill Creek
   project? And how are you involving residents in decision making processes?

Certainly education, which is letting people know they shouldn't be there. You know, I worry
about other things like they're really nice mud flaps out there. But you don't want to go clamming
in the mud flats and actually eat the clams that you would pull out of there. You know, we talked
about using oysters as part of a remediation effort, because they kind of build banks their coastal
resiliency measure and they filter water and clean out all kinds of bad stuff. But the flip side is
it's almost an attractive nuisance for people, that they'll see the oysters and walk down there and
think they should eat them. And so we need to balance things like that.
4. How can local residents and community members actively participate and contribute to the ongoing restoration and conservation efforts for mill Creek? In your opinion, like what can the average resident kind of do to help participate?

Be involved, be knowledgeable, talk to your neighbor, encourage. Enjoy it. It's actually pretty nice out there. Use it more. Yeah, the more people that use it, that walk along there, the more reasons and justification we have for expanding the amenities that exist around there. If you spend too much money and effort to build something that people aren't using, it's like, no one wants to take the next step.

5. Was there a time where the Millcreek was accessible? And was like, people don't actually enjoy it?

You know, if you. So when you get down to like 88, Clinton and start talking to somebody, the neighbors tell you stories. They've been living on it, it hasn't been publicly accessible, but it's been privately accessible. And so one of the neighbors they're, like, well into his 80s, we'd go down to swim every day. Okay, yeah. You know, so there were certainly people, you know, there were people who go out there and go fishing. Not clear, you really dont want to eat any of the fish you would catch there. But if people do, you know, and there needs to be a public reason for municipal officials to clean something up. Otherwise, it's not their priority. You know, on the Revere side, it's just as bad. No one in revere lives along Mill Creek, or is in a place where it's particularly accessible. So as a result there's no political will to spend money or effort to clean up their inputs into the creek. Even though they're in theory under a consent decree to
make them clean. Everything, they're focusing all of their efforts on parts of the marshland, particularly up in revenue Marsh that are adjacent to their residential neighborhoods, because that's where people live. And so the state actually owns most of the Revere solid middle Creek and residents can organize and put pressure on the state to actually fix things.

6. Do you believe that there are other very pressing issues that residents are facing in Chelsea? That's keeping them away from rallying their efforts for the Millcreek ability to pay rent, how to put food on their table. If you know, people you know in, in viral mental concerns are nice thing if you have everything else it's kind of a privilege to have that and you know they deserve it. But if you work and you know three part time jobs because that's all he can do in trying to juggle how you can do Child Care for a couple of kids between all of that. And you're making, you know, minimum wage. It's not your first concern. But there are still people who are doing okay. I think I just have to be careful, too. Don't let the voices of the people who are able to speak overwhelm the lack of voices for the people who can't speak.

So, part of, you know, we're trying really hard to do our decision making based on data. And so that it's not just people's perceptions. But because when you start addressing perceptions, you're often just kind of fixing the visible piece of the problem, and not addressing the underlying cause. So we don't want one to do that. Sometimes you have to. But so one of the first things that was done through Green roots and Mystic River Watershed was to look at the hydrology of the creek. Understand what the flow rates were, identify where the constrictions were. And our original hypothesis was that the reason we're getting these giant Phragmites stands in kind of the headwater areas was that we're not seeing enough salt water getting pushed up the creek, because
Phragmites will tolerate salt, but it won't clip in salt. Good, cheap project. And so we wanted to understand where the constraints were. And are there things we can do to increase the quantity of saltwater flow going up the creek to hopefully enable stable populations of salt marsh so you know, salt marshes need to be flooded at least once a day, ideally twice a day. So you have two times a year. So you really want the areas to get covered in both of the items. If we had portions that would only get covered it meant higher high tide, and not every day. And that was due to some constraints in the channels. So understanding that and trying to prioritize the different constraint systems in Mill Creek was something we tried to do. That's where berm removal came in that it was our thought that well, it was an artificial constraint on the flow. So you one, removing the berm, then modeling shows won't necessarily improve the amount of water that gets up stream, it will improve the velocity of the water going upstream. And we should see some better scouring. That will take away some of the places where we're seeing too much sedimentation. That in turn is constricting the channel for the rep to see. But modeling is fun.
Chelsea Mill Creek

ABOUT

Chelsea's Mill Creek faces several pressing issues that demand attention and concerted efforts for resolution. *Pollution* from various sources, including *stormwater runoff* and industrial discharges, threatens water quality and the health of aquatic life in the creek.

- *Urban development* in the surrounding area has led to habitat loss
- *Habitat loss* has diminished the creek's ecological diversity
- Erosion along the creek's banks is a significant concern
- *Erosion* has resulted in sedimentation and altered flow patterns
- These challenges require *community involvement* and coordinated action
- The goal is to *protect and restore* Chelsea's Mill Creek
Chelsea Mill Creek: Broadway Bridge

Chelsea Mill Creek: view from 101 Broadway facing East
**Contact Period**  
(1500-1620)

- **Transportation Routes**
  Terminus of routes to Mystic tidewater from interior highlands around coastal marshes. Primary trail appears as Washington-Park Streets around Mt. Washington, Powder Horn Hill, and Mt. Bellingham.

- **Settlement Patterns**
  No archeologically documented sites reported, but several sites known from literature. Probable period sites noted on Powderhorn Hill as well as on Mt. Washington.

- **Subsistence Routes**
  Diverse food resources, especially shellfish in tidal estuaries, and fish. Good horticultural land available. Likely a major location for trade between natives and Europeans.

- **Observations**
  Dense native settlement; one terminus of a seasonal axis along the Mystic/Malden rivers. Identity of the people is not clear but identified as "Aberginians" in 1628, probably part of the Pawtucket/Pequock group.

**First Settlement Period**  
(1620-1675)
Transportation Routes
Native trails improved as local highways with primary route from Lynn and Malden as Washington Street to early ferry landing (1831) as Winnisimmet Street from Park Street

Population
Earliest settlement by 1825, with four farms established by the end of the period.

Settlement Patterns
Early English trading post by Samuel Maverick on Mystic River tidelands by 1825. Winnisimmet ferry to Boston created landing site around Maverick Farm during the 1830s.

Economic Base
Establishment of the first ferry from Boston around 1830.

Colonial Period

Transportation Routes
Local highways remain from the 17th century to Winnisimmet ferry landing as Washington-Park Streets
Population
No identified population growth, likely remained at a relatively low level

Settlement Patterns
Bellingham estate farms remain along Washington Street axis, and tidemill established on Mill Creek (1734)

Economic Base
Economy likely limited to farming and some fishing

Transportation Routes
Continued improvement of Boston access across Mystic with steam ferry (1831) and omnibus service over Chelsea bridge to Ferry Village

Population
Population expanded rapidly with the establishment of the steam ferry to East Boston

Early Industrial Period
Settlement Patterns
Operation of steam ferry to Chelsea during the 1830s prompted subdivision of Bellingham estate. Secondary focus around Pratt Farm on Washington Avenue at the head of Mill Creek by the early 19th century.

Economic Base + Architecture
Growth of various industries, including rubber, paints, varnishes, linseed oil, etc.
Residential and institutional structures built during this period.

Late Industrial Period

Transportation Routes
Expansion of streetcar service and railroads.

Population
Significant demographic change with a rapid increase in population, driven by industrialization and immigration.
Settlement Patterns
Expansion of residential development, industrial areas, and commercial centers

Economic Base + Architecture
Expansion of various industries, including shoemaking, rubber, paints, varnishes, and more
Construction of residential, institutional, commercial, and industrial buildings

Timeline content credit: Massachusetts Historical Commission
Reconnaissance Survey Report
PROJECTS

Past Projects

- Restoration of Mill Creek began in the early 2000s
- Early studies for potential redevelopments initiated the project
- Chelsea Creek Water Plan in 2007 explored opportunities in Chelsea and Revere
- Goals included financial benefits for nearby communities, increased public access, and improved river quality
- Plan aimed to reduce non-industrial uses and create a network of public access and open spaces
- Restoration efforts involved removing invasive plant species
- Efforts to reduce stormwater runoff were part of the plan
- Increasing tidal flow was a strategy to improve water quality

*Mill Creek Riverwalk: image sourced from Google Maps*
Projects in Progress

**Project: Boardwalk**

- **Description:** The City is planning to build a boardwalk along a stretch of Mill Creek.
- **Timeline:** Currently in the design and permitting phase. Construction expected to start in 2025 and complete in 2026.

**Project: New park at 88 Clinton Street**

- **Description:** The City recently acquired a vacant lot and is transforming it into a park.
- **Timeline:** Finalizing design and permitting this fall, with construction to finish in June of the following year.

**Project: Berm Removal**

- **Description:** Investigating the removal of a berm in Mill Creek to improve tidal flow and water quality.
- **Timeline:** Design and permitting over the next 24 months, followed by construction concluding in the fall of 2026.

**Project: IDDE study (Illicit Discharge Detection and Elimination)**

- **Description:** A study to identify the causes of poor water quality in Mill Creek.
- **Timeline:** The study is commencing in September 2023

**Project: Vegetation management and shore stabilization**

- **Description:** Addressing invasive species encroachment and bank erosion along the riverbank.
- **Timeline:** Study period scheduled to end in the fall of 2024, with funding sought for implementing the preferred solution thereafter.
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RESIDENT RESPONSES

Survey Review

The intended audience for this survey was people who live around Mill Creek and the Mystic River, as well as those who are directly involved with current and past restoration and preservation efforts. To increase community participation, we distributed the survey in both English and Spanish. Addressing the issue of human ethics with this mode of research, all responses were anonymous and no names or personally identifiable information of the subjects were disclosed in the research process unless there was informed consent given. No identifiable information was on the deliverable and final reports as well. The team distributed flyers with a link to the survey around the Chelsea area for responses. In summary, the survey consisted of 10 questions that relate to accessibility, community engagement with the river and creek, water pollution and quality, and the current level of public interest.
Survey Findings

When asked “Would you go to the river more often if there are more public spaces?”

Would not go
5%

Would go
95%

Survey from September 2023
When asked “What would make you go to the river more often?”

- More Public Spaces
- Clean Surroundings
- Other

Survey from September 2023
When asked “Has any road, house, or land that you know of been damaged near the river by natural causes (flooding, erosion, etc.)?“

Survey from September 2023
Interactive Qualifying Project
Student Team

Project Overview

The overall goal of the team for this project was to engage and educate residents on the history and conservation efforts to preserve the creek. Furthermore, the conclusions drawn from this project were used to influence future technical restoration initiatives and to promote a broader understanding of the restoration methods around Chelsea.

Over the course of the project, the team researched and identified the geographical and ecological significance of Mill Creek, delineated its historical degradation, and delineated ongoing restoration endeavors aimed at rejuvenating its salt marsh ecosystem. The team also underscored the significance of community engagement and public education initiatives within Chelsea in their technical research paper.
Team Members

Tanya Khan
Worcester Polytechnic Institute ‘25
Computer Science and Interactive Media & Game Development (BS)

Sharon Rose John-Paul
Worcester Polytechnic Institute ‘25
Electrical and Computer Engineering
Minor in Computer Science

Akansha Pathak
Worcester Polytechnic Institute ‘25
Bioinformatics

Nguyen Nguyen
Worcester Polytechnic Institute ‘25
Chemical Engineering
When asked “Why do you think the water quality is so poor?”

“This is an urban city-so, poor quality open spaces is expected.”
-Anonymous

“All the trash and sewage thrown into the creek. You can see it at low tide.”
-Anonymous

“All the petrol products for the airport the largest airport this part of the USA goes on that river.”
-Anonymous

“There are still paint cans out there. The herons and other birds that eat the baby flounders hatching there probably get sick.”
-Anonymous

“It’s dirty and you can fish a sock out of there.”
-Anonymous
Advisors, Sponsors, Volunteers

Paul Mathisen
Worcester Polytechnic Institute
Director of Sustainability
- Professor of Civil and Environmental Engineering

Emily Granoff
Chelsea City Hall Housing and Community Development
Project Manager

Alexander Train
Chelsea City Hall Housing and Community Development
Director

Karl Allen
Chelsea City Hall Housing and Community Development
Economic Development Planner

Catherine Pedemonti
Mystic River Watershed Association
- Environmental Resiliency Manager

Emma Gildesgame
The Nature Conservancy
- Climate Adaption Scientist

John Walkey
Green Roots
- Director of Waterfront and Climate Justice Initiatives

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Worcester Polytechnic Institute
- Assistant Professor of Spanish
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