



An Assessment of the Preferences of Urban Residents for Green Space

In collaboration with the Massachusetts Executive Office of Energy and
Environmental Affairs



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Abstract

The Massachusetts Executive Office of Energy and Environmental Affairs (EEA) is developing a Statewide Land Conservation Plan. A focus of the new plan is to increase climate change resilience by developing green space in urban areas. The goal of our project was to identify types of green space that urban residents prefer in their communities and how their preferences can promote climate change resiliency. This was accomplished by developing eight case studies on existing urban green spaces and distributing surveys to and conducting interviews with urban residents. The top preferences were parks, community gardens, and walking paths. We recommended that the EEA consider the availability of parking when developing green space, utilize connections with NGOs, and conduct more data collection.

Executive Summary

As climate change becomes a more pressing issue, urban areas are experiencing the brunt of the problem (Massachusetts Executive Office of Energy and Environmental Affairs, 2017). The impervious surfaces largely present in cities put residents at risk for experiencing increased temperatures leading to the Urban Heat Island effect and more frequent flooding. If action is not taken to address climate change, the world will face irreparable consequences (Climate Change Clearinghouse for the Commonwealth, 2018).

The Massachusetts Executive Office of Energy and Environmental Affairs (EEA) is a prominent leader in promoting initiatives that mitigate the effects of climate change. A major initiative they are pursuing is the conservation of green space in urban areas with a focus on the input from community members. Land conservation is a legal agreement between a landowner and a land trust or government agency that permanently limits the use of land in order to protect its conservation values (Land Trust Alliance, 2019). Land conservation has been identified by the EEA to decrease the amount of greenhouse gasses, as well as lessen the other effects of climate change urban areas experience. Land conservation can also provide a place for the community to recreate. The EEA releases a Statewide Land Conservation Plan approximately every twenty years to increase the amount of protected green space. In their next plan, they are emphasizing the necessity of the input from urban community members and increasing urban climate change resilience through land conservation.

The goal of our project was to identify types of green space that residents in urban areas prefer in their communities and how their preferences can promote climate change resiliency. This information will help inform the Massachusetts Executive Office of Energy and Environmental Affairs as they develop a Statewide Land Conservation Plan. To achieve this goal, we:

1. Assessed how prior land conservation initiatives in urban areas in Massachusetts have addressed climate change resiliency and incorporated community feedback.
2. Identified preferences for green space among residents in urban areas.
3. Identified types of green space that incorporate the community's preferences and promote climate change resiliency.
4. Presented a final summary of the results of the community feedback with suggestions for implementing climate change resiliency.

Research Methods:

The first objective was accomplished by conducting a thorough analysis of existing MVP and OSRP plans for urban areas in Massachusetts. The team also worked with land trusts in urban areas to learn about what land conservation initiatives they have completed and how they contribute to climate change resiliency. The team conducted case studies of these initiatives and took pictures of the green space encountered.

The second objective was accomplished by conducting surveys and interviews of urban community members. The team utilized its connections with land trusts and other organizations to distribute the surveys. Organizations such as Groundwork Lawrence and The Greater Worcester Land Trust suggested venues to potentially conduct interviews. These venues included three farmer's markets and various parks within our sampling frame. The team also created social media pages to gain a visual understanding of the types of green space urban community members enjoy.

The third objective was accomplished by identifying what the top preferences for green space are among urban community members. Then the team made connections between the top preferences of community members and climate change resilience contributions, such as tree canopies and permeable surfaces. The main climate change issues that were addressed were urban heat island effect and urban flooding.

The fourth objective was accomplished by creating a summary of the results obtained throughout the project. The deliverables were the potential types of green space that incorporates the community's preferences and climate change resiliency, the set of case studies, the report of results from the surveys, interviews, and focus groups, the questions and procedures used in the surveys and interviews, and the image database.

Findings:

Our survey was emailed to the cities of Attleboro, Chelsea, Chicopee, Everett, Fall River, Fitchburg, Haverhill, Holyoke, Leominster, Lynn, Quincy, Revere, Salem, and Taunton. Our survey was also sent to the Buzzards Bay Coalition, the Greater Worcester Land Trust, Groundwork Lawrence, the Lowell Parks and Conservation Trust, the Massachusetts Audubon Society, and the Wildlands Trust. The number of individual residents who received our survey is unclear. Of all the people who received our survey, 508 people clicked on the survey, and 60 submitted a response. We traveled to a farmer's market at Campagnone Park in Lawrence, two farmer's markets in Worcester, and Elm Park in Worcester to use as venues for conducting interviews. Additionally, we distributed approximately 50 flyers with QR codes for the survey while conducting interviews at these venues. We estimate that we attempted to interview approximately 20-30 residents. Of all the residents we attempted to interview, 5 agreed to be interviewed.

Community members reported that green space is not easily accessible.

The team determined that community members are not utilizing their city's green space because it is not accessible to them. 62% of respondents indicated that they do not have time to go to their local green spaces. 29% of respondents indicated that it is inconvenient to travel there. 17% of respondents specifically indicated that parking was an issue for them. Four of the five interview participants indicated that parking was an issue for them as well. 14% of respondents said it is too far from where they live. Survey respondents also indicated how far of a walk it is to their nearest green space; 27% said it was more than 20 minutes.

The majority of survey respondents indicated that they wanted to see more community gardens, flower gardens, parks, and walking paths.

65% of respondents indicated that they want to see more community gardens, approximately 62% indicated they want to see more flower gardens, and 60% indicated they want to see more walking paths. Other common preferences in the responses are trees, bike paths, and hiking trails. Some examples of the types of green space that received the least responses were frisbee golf courses, swimming locations, and outdoor entertainment venues.

There are many specific locations and types of locations respondents would like to see green space created.

The team was not able to identify a clear consensus amongst survey respondents for specific locations for green space. 27% of respondents indicated that they would like to see the vacant lots or abandoned building lots in their neighborhoods be converted to green space. Some responses stated specific locations in their neighborhood where green space is preferred. For example, one respondent from Northampton identified “the former Honda dealer property at King Street and Finn St” as a specific location in their neighborhood they would like to see green space. Another respondent from Worcester responded, “there's an abandoned lot on Raymond Street that is usually a dumping ground for trash”.

Recommendations:

The EEA should consider the availability of parking lots and street parking when selecting green spaces to protect.

As discussed in the first finding, survey and interview respondents stated that green space is inaccessible to them. If more residents are able to drive to their local green spaces, travel times can be significantly decreased. Additionally, the option to drive can appeal to residents who feel unsafe traveling to their local green spaces by walking. This option can also appeal to residents who feel that their local green spaces are too far from where they live. Overall, the team concluded that prioritizing the conservation of green spaces in areas with available parking can make those green spaces more accessible to urban residents.

The EEA and NGOs should work together to emphasize that green spaces be equitably dispersed throughout cities.

When writing their Statewide Land Conservation Plan, the EEA should emphasize that green space be equitably dispersed throughout cities. This could be achieved by partnering with land trusts and other NGOs in cities and selecting areas for green space based on how much other green space is around. The EEA and land trusts should focus on creating numerous smaller green spaces that are dispersed throughout the city, rather than a few central parks. This will make parks more accessible to community members that do not have cars or cannot afford public transportation. It will also make all areas of the city have an increase in climate change resilience, rather than just a few areas. This may also address the disparity between poor and wealthy neighborhoods in terms of green space accessibility. If the EEA is able to work closely

with groups and organizations with the same mission as them, the success of all parties could be increased tremendously.

The EEA should collect more data from urban community members.

Before finalizing their Statewide Land Conservation Plan, the EEA should perform more surveys, interviews, and focus groups with urban community members. Due to the challenges we encountered during data collection, we did not gather enough responses from urban residents to feel confident in truly identifying the overall preferences and ideas for green space from urban communities.

We recommend that the EEA utilize incentives to obtain more responses. The team received feedback on our survey from The GWLT and other individuals with experience in survey distribution and interviews, including farmer's market coordinators and community engagement specialists. The feedback suggested that we should use incentives as a means to encourage more people to respond to the survey and/or agree to be interviewed.

While the team did obtain useful data on the preferences of urban community members on green space, there was a lack of diversity from respondents. The Portuguese, Spanish, and Cape Verdean Creole surveys were not utilized. The team recommends to the EEA that in any future rounds of data collection with our surveys, they focus on connecting with these under-represented groups.

Conclusion:

The EEA's upcoming Statewide Land Conservation Plan will be focusing on integrating the urban community's preferences on green space and increasing climate change resilience. The voice of urban community members is something that has been lacking in previous land conservation initiatives. Based on our survey results, the EEA should focus on increasing accessibility through location and parking, incorporating walking trails, parks, and community gardens into urban areas, and harnessing connections with other like-minded organizations and groups to achieve optimal success. If the EEA focuses on these aspects, we believe their Statewide Land Conservation Plan will be successful.

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Authorship

Rachael Mair, Nicholas Alescio, and Isaiah Aridou all contributed to the research and writing of this report. The following is a breakdown of the authorship of each section.

Rachael Mair contributed to this report by writing the abstract, the executive summary, sections of the introduction, sections of the literature review chapter, half of the research methods chapter, findings 1-3, the entirety of the deliverables chapter, recommendations 1-3, and the conclusion. Ms. Mair also created table 3. Additionally, Ms. Mair developed the following case studies: Aerosol Art Gallery, Buzzard's Bay Sawmill, Campagnone Common, Concord River Greenway, Elm Park, Moakley Park, and Winslow Park.

Nicholas Alescio contributed to this report by creating the table of contents, list of tables, and list of figures. Mr. Alescio wrote sections of the executive summary, introduction, sections of the literature review chapter, half of the research methods chapter, the introduction to the findings, adding sections to findings 1-3, and adding sections to recommendations 1 and 3. Mr. Alescio created tables 1-2. Additionally, Mr. Alescio developed the community outreach flyer and the Institute Park case study.

Isaiah Aridou contributed to this report by writing sections of the literature review chapter.

In addition to writing individual sections of the report, Rachael Mair, Nicholas Alescio, and Isaiah Aridou all edited the report for content, grammar, and flow.

Chapter 1: Introduction

Urban areas are currently experiencing the harmful effects of climate change. Urban areas are especially vulnerable to the urban heat island (UHI) effect, a phenomenon whereby temperature levels in urban areas are higher than in surrounding rural settings (Leal, 2018). Additionally, urban areas are vulnerable to flooding from high-precipitation weather events. These risks are present primarily due to the high amounts of impervious surfaces and heat-trapping materials used in cities. Coastal cities are especially vulnerable to urban flooding because the sea level has been rising; for example, in Boston, sea levels have increased 11 inches since 1922 (Climate Change Clearinghouse for the Commonwealth, 2018).

One major focus currently in urban areas is to combat these issues by increasing climate change resilience. Climate change resilience supports the ability of a socio-ecological system to maintain its function while facing stresses caused by climate change (Folke, 2006).

Green spaces can promote climate change resilience within urban communities in multiple ways. First, green space in urban areas can reduce the risk of the urban heat island effect. Green spaces can lower temperatures on hot days because they are able to absorb heat (Leal, 2018). Green spaces also provide natural outlets for excess water during storms and other high-intensity weather events (Climate Change Clearinghouse for the Commonwealth, 2018).

In addition to promoting climate change resilience, green spaces promote physical activity, and the general public health of urban residents (Wolch, Byrne & Newell, 2014). Specifically, the conservation of green spaces in urban areas has been linked to many physiological and psychological benefits for urban residents, including lowered diastolic blood pressure and heart rate, and improved mood (Tsunetsugu et al., 2013).

In Massachusetts, many public and private organizations have recognized the benefits of conserving green space and are working towards increasing the amount of green space in urban areas. The Massachusetts Executive Office of Energy and Environmental Affairs' (EEA) Statewide Land Conservation Plan completed in 2003 identified undeveloped lands representing the most significant water supply, biodiversity, urban open spaces, working farms, forests, and future recreational sites (Massachusetts Executive Office of Energy and Environmental Affairs, 2003). However, there are two key points that were not emphasized in the plan: 1) how the EEA can make land conservation more relevant to community climate change resilience and 2) what kinds of green space urban communities want to see in their cities. The EEA is currently developing their new Statewide Land Conservation Plan and will address these two points. The EEA's desired outcome for the new plan is to increase climate change resilience through the implementation of land conservation with direct input from the community (Massachusetts Executive Office of Energy and Environmental Affairs, 2019).

The goal of our project was to identify types of green space that residents in urban areas prefer in their communities and how their preferences can promote climate change resiliency. This information will help inform the statewide land conservation plan that The Massachusetts Executive Office of Energy and Environmental Affairs is developing. To achieve this goal, we:

1. Assessed how prior land conservation initiatives in urban areas in Massachusetts have addressed climate change resiliency and incorporated community feedback
2. Identified preferences for green space among residents in urban areas
3. Identified types of green space that incorporate the community's preferences and promote climate change resiliency
4. Presented a final summary of the results of the community feedback with suggestions for implementing climate change resiliency

The team made recommendations on how to implement urban land conservation to improve resilience to climate change while addressing the community's preferences.

Chapter 2: Literature Review

The main topics informing our research are urban climate change, urban land conservation, and the voice of urban communities. First, we summarize how climate change affects urban areas. Second, we introduce how green space can help reduce the effects of climate change. Finally, we will discuss the organizations in Massachusetts at the forefront of this movement and their role in engaging communities. The Massachusetts Executive Office of Energy and Environmental Affairs (EEA) is a major contributor to this movement as they develop a new Statewide Land Conservation Plan.

2.1 Climate Change in Urban Areas

In this section, we discuss the negative consequences of climate change in urban environments. Carbon dioxide is one of many known contributors to climate change. Carbon dioxide emissions have been observed to cause increases in mean temperature (Callendar, 1938). Increases in temperature have been observed to cause greater evaporation and thus surface drying, thereby increasing the intensity and duration of drought. Additionally, the water holding capacity of air increases by about 7% per 1°C warming, which leads to increased water vapor in the atmosphere (Trenberth, 2011). Hence, storms, whether individual thunderstorms, extratropical rain or snowstorms, or tropical cyclones, supplied with increased moisture, produce more intense precipitation events (Trenberth, 2011).

Urban areas are sensitive to climate change because they are more susceptible to higher concentrations of greenhouse gasses, such as carbon dioxide (Hunt, 2010). Urban areas are a major source of anthropogenic carbon dioxide emissions from the burning of fossil fuels for heating and cooling, industrial processes, and transportation of goods and people. 90% of anthropogenic carbon emissions are generated in cities (Grimmond, 2007). As the amounts of greenhouse gasses present in urban areas increases, urban residents become more vulnerable to the effects of climate change (IPCC, 2014).

As a result of increased temperatures, urban areas are put at a higher risk for experiencing the urban heat island effect. Increased precipitation also puts urban areas at a higher risk for experiencing flooding and other precipitation-related hazards. These two topics are discussed in the following subsections.

2.1.2 The Urban Heat Island

Urban areas tend to be warmer than surrounding rural areas by an average of 1-3 degrees Celsius higher than surrounding rural environments. Under some conditions, they may reach as high as 10 degrees Celsius higher (Grimmond, 2007). This difference in temperatures is referred to as the urban heat island effect (UHI). Sunlight is absorbed into materials such as asphalt, concrete and brick and is then released as heat. This phenomenon increases the temperature significantly, as depicted in Figure 1. UHIs have become a matter of increasing concern as a

result of an increasing occurrence of heat-related illness that may even lead to higher levels of mortality (Leal, 2018).

An example of causes contributing to UHIs can be seen in the city of Everett, MA. The use of dark color materials, such as asphalt pavement, absorbs all wavelengths of light energy and converts them into heat. The surface becomes warmer and can even be hot to the touch; the issue of waste heat which is defined as heat released from buildings, mechanical systems, idling vehicles, construction equipment and other infrastructure and is the major contributor to the UHI effect in the city of Everett (St. Louis, 2019). Due to the involvement of waste heat and hotter surfaces, the city of Everett's projected increase in amount of days over 90 degrees is 9.1 to 19 increase in and also a .2 to .9 increase in days over 100 degrees by the year 2030 (St. Louis, 2019). These issues are not only limited to Everett but indicate issues that are across Massachusetts and its urban cities as the UHI phenomenon will continue to persist in areas similar to Everett.

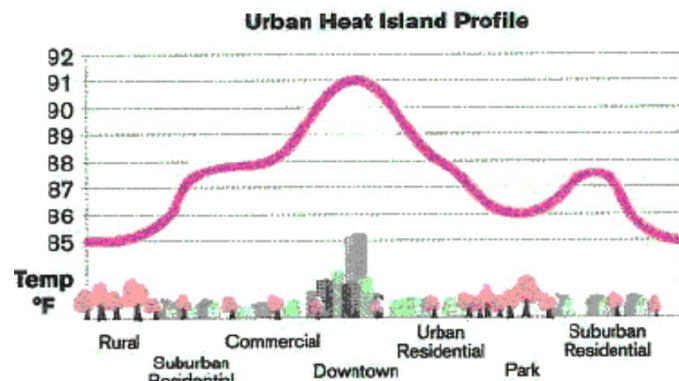


Figure 1: Urban Heat Island Effect

Additionally, the effects of this phenomenon are not equitably distributed in urban areas and show a growing problem for certain communities. Research conducted in Phoenix, Arizona reported higher temperatures correlated with lower income neighborhoods and that wealthier neighborhoods experienced the lowest surface temperature because of the density of vegetation in the area, which had a cooling effect (Larsen, 2015). The lack of green space in these areas and the correlation to lower income neighborhoods gives insight on the urban residents who experience the fullest effects of this phenomenon. Follow-up investigations were conducted that involved the measuring of neighborhood air temperatures along with metrics calibrated to replicate human thermal comfort confirmed this socioeconomic pattern further highlighting elevated temperatures as an environmental injustice in urban areas (Larsen, 2015).

2.1.3 Flooding in Urban Areas

Risks to public health and infrastructure due to heavy precipitation are being directly exacerbated by climate change (Lane et. al, 2013). In urban areas, the probability that flash floods and other precipitation-related hazards to public health will occur is significantly higher due to the lack of permeable surfaces available for storm drainage. Annual increases in rainfall due to climate change highlight the flooding and storm drainage issues that cities are naturally prone to (Guo, 2013). Specifically, in Boston, heavy precipitation has increased by 55% since 1958 (Climate Change Clearinghouse for the Commonwealth, 2018). Stormwater drainage systems were developed in urban areas to aid in removing flood water from streets as quickly as possible. These drains are becoming insufficient as climate change causes precipitation to increase. Furthermore, as urbanization continues, the presence of impervious surfaces increases

Urban populations are at risk of experiencing many precipitation-related hazards as a result of flooding. For example, increased visits to emergency rooms in Massachusetts for symptoms of acute gastrointestinal illness was observed up to 14 days after flooding had occurred (Wade et. al, 2014). In New York City, carbon monoxide poisoning from improper use of portable generators and other fuel-burning equipment was observed as a major health hazard following widespread power outages caused by flash flooding (Lane et. al, 2013).

2.2 Using Land Conservation to Address the Effects of Climate Change in Urban Areas

Land conservation efforts offer an approach to mitigate the effects of climate change in urban areas (Climate Change Clearinghouse for the Commonwealth, 2018). Land conservation is a legal agreement between a landowner and a land trust or government agency that permanently limits the use of land in order to protect its conservation values (Land Trust Alliance, 2019). Land conservation can be an effective way to address the effects of climate change in urban areas by promoting the protection and creation of green space (Ay, 2013).

A greater presence of green spaces in urban and suburban areas mitigates the effects of climate change, such as the effects of flooding and urban heat islands (Francis, 1984). Primarily, the presence of green space makes urban areas more resilient to climate change through the direct reduction of pollution outputs (Maciejewski, 2016). In other words, green space can be responsible for resolving climate change-related threats present in urban areas.

The effects of the urban heat island are directly reduced by the presence of green spaces (Leal, 2018). The natural process of tree transpiration lowers the temperature, and the green cover of vegetation reduces the intensity of direct solar exposure. These areas help to transfer the received solar radiation into latent heat. Additionally, naturally occurring waterways or bodies of water present in green spaces can cool the surrounding area and support local vegetation during droughts, or other extreme heat events.

Flooding in urban areas can also be mitigated by land conservation (Guo, 2013). Green space acts as a permeable surface for water to be absorbed into. As the amount of green spaces decreases, there are fewer opportunities for the excess and ground water to be absorbed into the ground. In addition, land conservation in urban areas can significantly lower the likelihood of urban flooding by providing natural outlets for excess water to drain.

In addition to supporting resilience to the effects of climate change, green spaces in urban areas offer many other benefits. Green space such as parks often serve as sites of physical activity, which is associated with enhanced health and reduced risk for all-cause mortality and many chronic diseases (Wolch, Byrne & Newell, 2014).

Despite the many benefits of green space, their promotion and conservation can have unintended negative consequences for urban communities. For example, an analysis of property sales in the vicinity of Pennypack Park in Philadelphia indicated a statistically significant rise in land value with closeness to park, when allowance is made for effect of type of house, year of sale, and special characteristics such as location (Hammer et. al, 1974). This rise in land value

can force out low-income residents and families in favor of the middle to upper class by promoting gentrification of the surrounding area. Other types of green space such as recreational areas can exacerbate the urban heat island effect if they are primarily composed of impervious or dark-colored surfaces. Additionally, increased impervious surfaces can take away natural outlets for excess precipitation in urban areas. Table 1 contains four common types of urban green space, and their pros and cons.

Table 1: Pros and Cons of Different Types of Green Space in Urban Areas

Type of Green Space	Pros	Cons	Mitigates UHI Effect?	Mitigates Urban Flooding?
Park	<ul style="list-style-type: none"> Promotes community wellness Multi-purpose Can contain other types of green space 	<ul style="list-style-type: none"> Expensive to maintain Can cause gentrification of surrounding area 	Yes ¹	Yes ¹
Community Garden	<ul style="list-style-type: none"> Providing fresh and affordable produce to community Fosters a welcoming, safe environment Offers employment opportunities 	<ul style="list-style-type: none"> Prone to droughts, extreme weather events Expensive to maintain Difficult to implement due to soil contamination and limited space 	Yes ²	Yes ²
Wetlands and Waterways	<ul style="list-style-type: none"> Fishing opportunities Fosters a diverse ecosystem Cools surrounding area significantly 	<ul style="list-style-type: none"> Implementation requires a naturally occurring body of water 	Yes ³	Yes ⁴
Recreational Areas	<ul style="list-style-type: none"> Promotes community wellness Increased social interaction More recreational opportunities 	<ul style="list-style-type: none"> Can exacerbate UHI effect (more impervious surfaces) 	Depends	Depends

¹ Campbell et. al, 2016, page 42

² Okvat et. al, 2011, page 382

³ Godschalk, 2003, page 138

⁴ Phelan et. al, 2015, page 300

2.3 Land Conservation Efforts in Massachusetts

Land conservation efforts have been increasing rapidly across the country with the help of governmental agencies and nonprofit organizations. Massachusetts has been at the front of this movement because of the numerous organizations contributing to land conservation. These groups have been driving the efforts to protect the environment, especially in urban areas (Wolch, 2014). An example of Massachusetts urban land conservation is shown in Figure 2.



Figure 2: Campagnone Park, Lawrence MA

2.3.1 Governmental Agencies and Land Conservation

Massachusetts has implemented policies in previous years to aid in the effort of land conservation, such as the EEA's 2003 Statewide Land Conservation plan. The goal of the plan was to protect one million acres of land by 2023. This was going to be accomplished by state bond funding, federal grants, land trusts, and fundraising in communities. However, there seemed to be a lack of participation and awareness of the EEA's goal (Massachusetts Executive Office of Energy and Environmental Affairs, 2005). This ultimately resulted in the proposed plan not being as successful as it was hoped to be. The EEA is now working on a new Statewide Land Conservation Plan. This plan will focus on the implementation of land conservation in urban areas and creating land conservation initiatives that urban communities want.

Another example of a governmental organization implementing land conservation policies is the EEA's 2017 Statewide Comprehensive Outdoor Recreation Plan (SCORP). This plan served to guide the distribution of federal money from the Land and Water Conservation Fund to state agencies and municipalities for acquisition of open space, renovation of parks, development of new parks, and trail construction (Massachusetts Executive Office of Energy and Environmental Affairs, 2017). This conservation plan ties in greatly in relation to selecting areas to protect and determining the distribution of money for these areas while also understanding the many communities involved in these areas. While there are many governmental organizations working to increase the presence of green space, there are other players as well.

2.3.2 Nongovernmental Organizations and Land Conservation

Nongovernmental organizations (NGOs) are independent organizations that work to improve their communities. NGOs can work independently in communities, or work with state agencies. NGOs are another frequent player in developing green space in communities (Foo, 2017). Land trusts are a key example of an NGO that focuses on this. Land trusts have proven to be an integral player in the development of land conservation and green space, especially in urban areas.

One major environmental initiative that NGOs have achieved in urban areas is the planting of trees to reduce widespread exposure to harsh sun rays (Foo, 2017). This initiative was successful because the NGO made the opportunity for community participation easily accessible.

The community was excited about this initiative, and thus it has become common in other towns and cities. The tree canopies provide a natural cover to protect hot areas from direct sunlight, rather than an artificial solution, as well as engaged the community in making their neighborhoods greener.

NGOs are also a key networking point for urban community members to participate in environmental initiatives, such as the previously mentioned tree planting (Foo, 2017). Because they are nonprofit organizations, community members are able to volunteer in projects in their areas. Governmental agencies, although effective in implementing policies, don't often provide the opportunity for community members to directly engage in their initiatives or voice their opinions on the matter. The EEA frequently utilizes their connections with NGOs to connect with urban community members. The EEA will work with many of these land trusts during the next stages of their Statewide Land Conservation Plan to ensure that all community's voices are being heard to create a plan that is relevant to urban community members.

2.4 Importance of Community Voice in Land Conservation Initiatives

The EEA is focusing on urban communities' preferences in their upcoming Statewide Land Conservation Plan. For example, community members may prefer parks, walking trails, tennis courts, or somewhere to participate in events as seen in Figure 3. Motivating urban communities to participate in land conservation initiatives is a crucial step in land conservation efforts (Wilhelmi, 2010). However, The EEA is having difficulty connecting with urban community members. There are many social factors that make it difficult to connect with urban community members: not all people will think attending meetings and focus groups will be worth their time, not all people believe in climate change, and many people have the mentality of "someone else will do it" (Warren, 2011). When there is community participation, there is often under representation of marginalized groups, especially in urban areas.



Figure 3: Community Farmer's Market, Lawrence MA

The EEA will utilize surveys and interviews as a means to connect with urban community members for their opinions on land conservation. The goal of the surveys and interviews is to obtain information about what kinds of green space urban community members enjoy, what kinds of green space they want to see more of, if there are any problems they have with their existing green space, and if there are any improvements or suggestions they would make. The EEA will focus on connecting with marginalized groups as well.

2.4.1 Lack of Green Space for Marginalized Groups in Urban Areas

Within cities, green space is not always equitably distributed. Often times, access and availability of environmentally friendly green space is based on income, ethno-racial characteristics, gender, and other factors (Byrne, 2012). Uneven accessibility of urban green

space has become recognized as an environmental justice issue to public health and in these urban areas, it is extremely important to have easy access to urban green space, primarily parks (Byrne, 2012).

Green space is unevenly distributed within the urban landscape, and there are several reasons why that is, such as histories of class and ethno-racial inequality and state oppression. A study conducted in 2005 reveals that in the state of Massachusetts those living in a white community have a 1.8 percent chance of living in the most environmentally hazardous communities in the state while those living in communities of color have a 70.6 percent chance (Dooling, 2017). In the US, minorities and low-income earners typically occupy the urban part of low-income inner ring suburbs where green space is scarce or poorly maintained. However, upper-class households often reside on better maintained property where the green space is abundant and well serviced. This has become an environmental injustice and has also become a planning priority. This has led to parkland acquisition programs and diverse strategies to deploy conserved urban land for additional green space (Wolch, 2014). The Buzzard's Bay Coalition converted an abandoned sawmill into a beautiful park next to a low-income neighborhood, as seen in Figure 4. This is a step in the right direction in terms of evenly distributing urban green space.



Figure 4: Buzzard's Bay Sawmill, New Bedford MA

2.5 Summary

The effects of climate change on human populations continues to put more communities in danger. Increases in global temperature, precipitation, and extreme weather events are dangerous - whether they are caused by humans or nature. Urban areas are disproportionately affected by these effects because of their low concentrations of open, green space, and their high concentrations of impervious surfaces. Of those affected in urban areas in the state of Massachusetts by climate change, there is a higher chance as a person of color to live in an environmentally hazardous area compared to an area populated by non-people of color (Dooling, 2017). The Massachusetts Executive Office of Energy and Environmental Affairs is working to strengthen urban resilience to climate change through urban land conservation. More green space in urban areas can foster more resilient cities by reducing the urban heat island effect and by reducing urban flooding. In order for the EEA's plan to be successful, the plan must prioritize the needs of urban residents by ensuring that all involved communities are fairly represented when taking into consideration their needs, especially communities that reside in environmental justice areas.

Chapter 3: Research Methods

The goal of our project was to identify types of green space that residents in urban areas prefer in their communities and how their preferences can promote climate change resiliency. To achieve this goal, we pursued the following objectives:

1. Assessed how prior land conservation initiatives in urban areas in Massachusetts have addressed climate change resiliency and incorporated community feedback
2. Identified preferences for green space among residents in urban areas
3. Identified types of green space that incorporate the community's preferences and promote climate change resiliency
4. Presented a final summary of the results of the community feedback with suggestions for implementing climate change resiliency

The sampling frame for the project was urban community members in Worcester, Boston, Lawrence, Lowell, Everett, and New Bedford. The EEA had existing connections with organizations in these cities that the team connected with to help distribute surveys, inquire about focus groups and interviews, and learn about land conservation initiatives. The qualitative data obtained from the survey results and information on existing land conservation initiatives will help to inform The EEA on what types of green space urban community members prefer, and what types of land conservation initiatives have been successful.

3.1: Objective 1: Assessed how prior land conservation initiatives in urban areas have addressed climate change resiliency and incorporated community feedback

The team identified towns and cities in Massachusetts that have implemented land conservation initiatives to address the wants and needs of stakeholders within their communities, while also addressing urban climate change resiliency. The team obtained background information about current and previous land conservation initiatives through existing Open Space Recreation Plans (OSRP) and Municipal Vulnerability Plans (MVP). During the preliminary research, the team came across unique and/or successful instances of land conservation implemented in urban communities through online research or outreach into urban communities. The team selected those initiatives for use as case studies. The case studies provide insight into the initiative's contributions to climate change resilience, unique history, and overall success. Case studies included the location of the initiative, date of establishment, type of land conservation, images, a short history of the space, and the initiative's contributions to climate change resilience.

The team worked with different non-profit organizations in urban areas of Massachusetts to obtain additional information regarding their land conservation initiatives. The organizations include the EEA (Boston), The Greater Worcester Land Trust (Worcester), Groundwork Lawrence (Lawrence), the Buzzard's Bay Coalition (New Bedford), and Groundwork Lowell (Lowell). The team reached out to organizations and request a meeting with the contact. If they were willing and available for a meeting, the team determined a time that worked for both parties. During the meeting, depending on how much time was available, the team interviewed

the contact to see what land conservation initiatives they have completed, and how they contribute to climate change resiliency. This information was utilized to complete case studies for the city. If there was enough time, the team received a tour from the contact of some of their land conservation initiatives. The team collected pictures to build a file of images for the EEA. The team met with Robert O'Connor from the EEA, Eddie Rosa from Groundwork Lawrence, Jane Calvin from Groundwork Lowell, Brendan Annett from the Buzzard's Bay Coalition, and Colin Novick from The Greater Worcester Land Trust. Ms. Calvin, Mr. Annett, and Mr. Novick gave us tours of their most notable land conservation initiatives in their cities. After the tours, we had completed case studies about the city's land conservation initiatives, as well as images of any land conservation observed during the visit. The case studies are available in Appendix 1, and examples of the images are available in Appendix 6.

3.2: Objective 2: Identified preferences for green space among residents in urban areas

In order to identify preferences for green space among residents in urban areas, the team collected data from urban communities through the use of surveys, interviews, and social media. The sampling frame was community members in Boston, Worcester, Lowell, Lawrence, Everett, and New Bedford. Groundwork Lawrence connected us with the Campagnone Common Farmer's Market to perform interviews with Spanish speakers in the Lawrence community. The Greater Worcester Land Trust suggested to us multiple farmer's markets in Worcester to connect with Worcester community members. The EEA (Boston), The Greater Worcester Land Trust (Worcester), Groundwork Lawrence (Lawrence), the Buzzard's Bay Coalition (New Bedford), and Groundwork Lowell (Lowell) all distributed our survey electronically. The following methods describe the in-depth procedures for surveys, interviews, and social media outreach.

Surveys:

Surveys were the key method for collecting data pertaining to community opinions because they can be delivered to a wide range of people electronically. The EEA (Boston), The Greater Worcester Land Trust (Worcester), Groundwork Lawrence (Lawrence), the Buzzard's Bay Coalition (New Bedford), and Groundwork Lowell (Lowell) all distributed our survey electronically. The process that the team used for setting up the surveys is as follows:

1. Created a list of possible survey topics to determine what the team wanted to learn
2. Developed the survey questions
3. Translated the survey into Spanish, Portuguese, and Cape Verdean Creole
4. Created the survey using an online survey host
5. Distributed the survey through the contacts in the previously mentioned cities (primarily email lists and community outreach events)

The team distributed the survey through email and by handing out flyers with the links to the surveys. The flyer is available in Appendix 5. The survey questions are available in Appendix 3.

Interviews:

Interviews were another useful method for gathering qualitative data for this study. The team attended two Worcester farmer's markets, Elm Park, Institute Park, and the Lawrence farmer's market in the hope of conducting interviews. The team asked urban community members that were passing by if they would be willing to take a short five-minute interview. If the residents agreed to be interviewed, the team introduced the purpose of the interview and explained to the interviewee that they were free to stop the interview at any time, and that the interviewee did not have to answer all of the questions asked. If the interviewee understood and agreed to the conditions of the interview, the team would begin asking the predetermined set of questions. The team recorded the interviewee's responses by hand. After the interview concluded, the team thanked the interviewee for their participation.

Social Media:

Another method of data collection that the team utilized for gauging the community's opinions is social media. The team created an Instagram and Facebook page relevant to all urban areas in Massachusetts. Once the pages were established, the team posted images of urban green space to inspire followers about what kinds of green space they could potentially see created in their neighborhoods. The captions of the posts encouraged followers to utilize hashtags or send posts to the account to demonstrate what green space they like, or where they would like to see green space. The hashtags "#greenspaceilike and #greenspaceiwant" will be used. Followers were obtained by following the pages of community members. Community members of the city were found through exploring other local pages. The EEA, The GWLT, Groundwork Lowell, and Groundwork Lawrence were willing to advertise the social media pages. The team reached out to these organizations with the social media information as well as a short explanation of the project goal that was sent to the organizations' followers.

3.3: Identified methods that incorporate the community's preferences and promote climate change resiliency

After the surveys and interviews were conducted, the team performed an analysis of the data to draw conclusions about the community's top preferences for green space in their neighborhood. The team began by analyzing the survey and interview results for the top preferences among community members.

After identifying the top preferences, the team connected these types of green space to increasing climate change resilience. The main climate change aspects the team was looking to mitigate were UHIs and urban flooding. Finally, the team connected these features to the top preferences of the respondents and created a recommendation for a green space.

3.4: Objective 4: Presented a final summary of the results of the community feedback with suggestions for implementing climate change resiliency

The team presented the EEA and The GWLT with a summary of the results obtained throughout the project. The first deliverable was the types of urban green space that increase

climate change resilience. The second deliverable was the collection of case studies that the team completes throughout the project. The third deliverable was the report of results from the surveys and interviews. A graphical analysis of the data was provided as well. This summary will be critical for the EEA during the next steps of their Statewide Land Conservation Plan, as it will provide them with insight into the community's opinions and preferences on green space in their community. The fourth deliverable was the team's set of survey and interview questions that The EEA may utilize in future community outreach initiatives. The fifth deliverable was the image database. The team combined all the information and presented it to the EEA.

Chapter 4: Findings

The team's findings are based on the data gathered via the surveys and interviews. These findings address what the urban community's preferences and struggles are with green space in their neighborhoods.

We distributed our survey electronically to several organizations and cities in Massachusetts. Specifically, our survey was emailed to the cities of Attleboro, Chelsea, Chicopee, Everett, Fall River, Fitchburg, Haverhill, Holyoke, Leominster, Lynn, Quincy, Revere, Salem, and Taunton. Our survey was also sent to the Buzzards Bay Coalition, the Greater Worcester Land Trust, Groundwork Lawrence, the Lowell Parks and Conservation Trust, the Massachusetts Audubon Society, and the Wildlands Trust. The number of individual residents who received our survey is unclear. Of all the people who received our survey, 508 people clicked on the survey, and 60 submitted a response.

We also gathered data by interviewing Massachusetts residents. We traveled to a farmer's market at Campagnone Park in Lawrence, two farmer's markets in Worcester, and Elm Park in Worcester to use as venues for conducting interviews. Additionally, we distributed approximately 50 flyers with QR codes for the survey while conducting interviews at these venues (see Appendix 4). We estimate that we attempted to interview approximately 20-30 residents. Of all the residents we attempted to interview, 5 agreed to be interviewed.

We encountered many challenges in achieving our objectives, specifically with data collection. One of the main difficulties the team encountered was that many organizations did not distribute our survey due to time constraint or conflict with surveys they were already sending. One organization responded, "Unfortunately we have a few other surveys going on right now and we don't want to confuse people, so we won't have the capacity to engage in this." This sentiment was expressed by other organizations the team interacted with.

Another challenge the team encountered was the lack of interest residents showed in participating in interviews. Many residents we attempted to interview expressed to us that they did not have time or were uninterested in agreeing to our interview. In addition, residents expressed that they were unaware of the topics being discussed. We speculate that the lack of participation in interviews was due to the lack of incentive we provided to potential interviewees. We also speculate that if we had more resources to conduct interviews such as tables, chairs, or posters, we would have gained more attention from residents.

Additionally, our heavy reliance on outside organizations made it difficult to collect data. Given our very short timeline of three weeks to gather data, we found it difficult to find meeting times with outside organizations that were within our timeline. One organization we communicated with said they would be happy to help organize focus groups and interviews, but the only available dates were past our timeline. Many other organizations simply did not respond to the team's emails, even if they were sent from our sponsors. We also encountered difficulties in coordinating activities with organizations. In one case, we reached out to a prominent non-profit organization and spoke with them in person. The organization agreed to help us conduct

interviews in a primarily Spanish-speaking community. We determined a time and a venue to conduct interviews. We were also told that a translator from the organization would be present. When we arrived at the venue, the representative from the organization that we spoke with did not show up, nor did the translator. We speculate that, from examples like this, our heavy reliance on outside organizations to help achieve the team's objectives directly conflicted with our three-week timeline to gather data.

Finding 1: Community members reported that green space is not easily accessible.

The team determined that community members are not utilizing their city's green space because it is not accessible to them. 62% of respondents indicated that they do not have time to go to their local green spaces. 29% of respondents indicated that it is inconvenient to travel there. 17% of respondents specifically indicated that parking was an issue for them. Four of the five interview participants indicated that parking was an issue for them as well. 14% of respondents said it is too far from where they live. The team concluded that residents were less likely to spend time in their community's green spaces if they lived far away from them. The survey respondents also indicated how far of a walk it is to their nearest green space; 27% said it was more than 20 minutes.

Finding 2: The majority of survey respondents indicated that they wanted to see more community gardens, flower gardens, parks, and walking paths.

65% of respondents indicated that they want to see more community gardens, approximately 62% indicated they want to see more flower gardens, and 60% indicated they want to see more walking paths. One interviewee stated that she would like to see "more hiking and walking trails that are dog friendly." Other common preferences in the responses are trees, bike paths, and hiking trails. Some examples of lower-rated types of green space were frisbee golf courses, swimming locations, and outdoor entertainment venues. The full breakdown of the data is shown in Table 2.

Table 2: Responses to “What would you like to see added to your community?”

Choices	Response Percent	Response count
Community gardens	65.00%	39
Flower gardens	61.67%	37
Parks	60.00%	36
Walking paths	60.00%	36
Trees for shade	55.00%	33
Bike paths	50.00%	30
Hiking trails	48.33%	29
Outdoor seating	46.67%	28
Picnic areas	43.33%	26
Waterways	40.00%	24
Dog parks	31.67%	19
Playgrounds	28.33%	17
Playing fields	21.67%	13
Running tracks	20.00%	12
Courts	18.33%	11
Ice rinks	16.67%	10
Fishing ponds	15.00%	9
Other (please specify) *	10.00%	6
Frisbee golf courses	5.00%	3

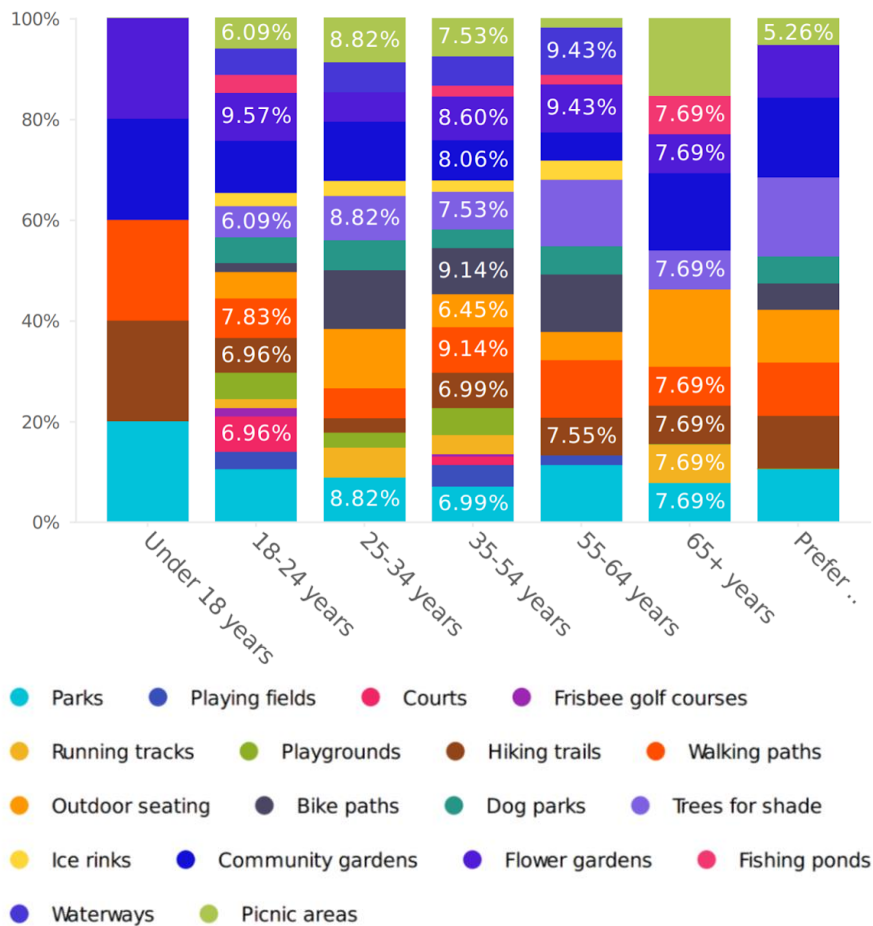
*responses included exercise stations (2), murals (1), bike repair stations (1), trees (1), bike sharing stations (1), outdoor entertainment venues (1), and swimming (1).

The team speculated that our respondents’ preferred types of green spaces could be connected to their age group. Feedback from the Greater Worcester Land Trust suggested that different age groups are more likely to prefer certain types of green spaces in their neighborhood. For example, in previous green space-related surveys distributed by the GWLT, elderly people indicated that they would like to see more walking trails, and park benches in their neighborhoods. In order to investigate this relationship, the team investigated the distribution of respondents in each age group. The team then created a graph mapping the age group of the respondent to what type of green space they prefer. These graphs are shown below.

Table 3: Age Distribution of Respondents

Response	Response Count
Under 18 Years	1
18-24 Years	20
25-34 Years	7
35-54 Years	25
55-64 Years	8
65+ Years	2
Prefer not to answer	4

Figure 5: Preferred Type of Green Space versus Age Group



Based on the data obtained, we did not identify any connections between age group and preferred green space.

Finding 3: There are many specific locations and types of locations respondents would like to see more green space.

The team was not able to identify a clear consensus amongst survey respondents for specific locations for green space. 27% of respondents indicated that they would like to see the vacant lots or abandoned building lots in their neighborhoods be converted to green space. Some responses stated specific locations in their neighborhood where green space is preferred. For example, one respondent from Northampton identified “the former Honda dealer property at King Street and Finn St” as a specific location in their neighborhood they would like to see green space. Another respondent from Worcester responded, “there's an abandoned lot on Raymond Street that is usually a dumping ground for trash”. The full summary of responses to this question is available in Appendix 5.

Chapter 5: Deliverables

The deliverables for this project are case studies, the image database, a summary of data from interviews and surveys, the survey and interview materials used, and potential types of green space based on community preferences and climate change resilience. Please see Chapter 4: Findings for an analysis of the survey and interview results, and the appendices for survey questions, interview questions, and community outreach materials.

Case Studies

The team created a series of case studies about green spaces in Worcester, Lowell, Lawrence, New Bedford, and Boston. These case studies are based on the green spaces' histories and contributions to climate change resiliency. The case studies are available in Appendix 1. The case studies helped us discover what kinds of green space exist in urban areas in Massachusetts, and what types of green spaces were successful in increasing climate change resilience. The case studies exhibit a wide variety of types of green space that urban communities have created, such as the Buzzards Bay Sawmill, the Lowell Concord River Greenway, and Worcester's Community Gardens. These case studies exhibit examples of storm drainage and tree canopies to increase climate change resilience. A brief summary of each case study is available below.

Aerosol Art Gallery:

The Aerosol Art Gallery is located in Lowell, Massachusetts, and will promote the work of local artists as well as reduce the pollution created by community members who commute to work. This walking trail is predicted to reduce carbon emissions by over one million kg per year.

Buzzard's Bay Sawmill:

The Buzzard's Bay Sawmill is a hiking trail located in New Bedford, Massachusetts. The site was originally home to an abandoned sawmill but has since been recreated to increase New Bedford's climate change resilience through the restoration of green space, permeable surfaces for flooding, and expansive amounts of forest to mitigate the urban heat island effect.

Campagnone Common:

Campagnone Common is located in Lawrence, Massachusetts, and is a park that reduces urban flooding and mitigates the urban heat island effect. The park contains playgrounds, tennis and basketball courts, and walking paths. The park is also used for many community events.

Concord River Greenway:

The Concord River Greenway is a walking path located in Lowell, Massachusetts, that reduces the effects of urban flooding. The waterway and the permeable surfaces allow for storm water drainage to occur, rather than flood the streets of the city. The walkway is frequently used by community members to escape their urban confines and enjoy nature.

Elm Park:

Elm Park is located in Worcester, Massachusetts, and provides a place for urban community members to spend time outdoors. The park has permeable surfaces and a pond to absorb

flooding, and a tree canopy to combat the urban heat island. The park contains playgrounds, walking trails, hiking trails, and a pond.

Moakley Park:

Moakley Park is a waterfront park located in Boston, Massachusetts. The park is currently undergoing a redesign that will manage stormwater more effectively through the use of basins, berms, and elevations. The park will serve to protect Boston from the rising sea levels and flooding from storms.

Winslow Park:

Winslow Park is a peace park located in Worcester, Massachusetts, and provides a place for urban community members to spend time outdoors and garden. The park was originally home to a burned-down school building but was given new life by the group Women Together in 2007. The park has permeable surfaces to absorb flooding, and a tree canopy to combat the urban heat island. The park also has a community garden to engage the community in outdoor activities.

Image Database

The EEA expressed interest in having access to a file of images of urban green space for their future projects. The team created a file of images from traveling to urban green space sites. The images are from Worcester, Boston, New Bedford, Lowell, and Lawrence. Some examples of the images captured are in Appendix 6, and throughout the report.

Potential Types of Urban Green Space

Based on the top survey results, the team concluded that the preferred green spaces among community members are parks, walking paths, and community/flower gardens (see Finding 3). These types of green space can promote urban resilience to climate change in many ways, as seen in the case studies.

Parks

Parks naturally mitigate the effects of flooding because they provide a permeable surface for storm water to drain into. Parks should also incorporate trees into their layouts; based on the survey responses, 55% of respondents indicated they would like to have more trees in their communities. The trees can combat the urban heat island effect as well as absorb carbon dioxide (Leal, 2018). The shade that is present can help to mitigate the effects of urban heat islands significantly, while also reducing the amount of carbon dioxide present (St. Louis, 2019). The shade can also draw community members out of their apartments on hot days. This will reduce the amount of electricity used to cool apartments, as community members will be spending time outdoors. These features were observed in The Capangone Park Case Study (Figure 6).



Figure 6: Campagnone Common, Lawrence MA

Walking Paths

Walking paths have similar climate change resiliency aspects to parks. A path can be created with a permeable surface for storm drainage, as observed in the Buzzard's Bay Sawmill Case Study (Figure 7) (Guo, 2013). Ideally, these paths would be located downhill from homes and streets so that the flood water can drain there. Walking paths can also be covered with tree canopy. Not only can this make them more desirable on hot days, but it can also lessen the effects of the urban heat islands and carbon dioxide emissions.



Figure 7: Buzzard's Bay Sawmill Path

Community Gardens

Community gardens are another method to implement permeable storm drainage surfaces and plants to absorb carbon dioxide (Okvat, 2011). The presence of dirt, as opposed to concrete, will provide an area for storm drainage. Community gardens can also directly reduce the waste produced from purchasing produce in packaging at grocery stores. Worcester has implemented successful community gardens, as seen in Figure 8.



Figure 8: Worcester Community Garden

Chapter 6: Recommendations and Conclusion

The overall goal of our recommendations is to increase climate change resilience in urban areas, address community preferences and struggles, and ultimately increase the success of the EEA's Statewide Land Conservation Plan.

Recommendation 1: The EEA should consider the availability of parking lots and street parking when selecting green spaces to protect.

As discussed in Finding 2, survey and interview respondents stated that green space is inaccessible to them. The team concluded that urban residents would be more likely to spend time in their local green spaces if the green spaces were more easily accessible to them.

If more residents are able to drive to their local green spaces, travel times can be significantly decreased. Additionally, the option to drive can appeal to residents who feel unsafe traveling to their local green spaces by walking. This option can also appeal to residents who feel that their local green spaces are too far from where they live. Overall, the team concluded that prioritizing the conservation of green spaces in areas with available parking can make those green spaces more accessible to urban residents.

Another way that local green spaces can be made more accessible to residents is by mapping public transportation routes to existing urban green spaces. A map could be created on every bus or train that identifies the green spaces in the city. Maps can provide an easy and cheap solution for community members to travel to their green space. This can serve people without cars, or elderly people who are unable to drive. Encouraging people to utilize public transportation to travel to their local green spaces can solve the issue of parking, while also promoting existing green spaces.

Recommendation 2: The EEA and NGOs should work together to emphasize that green spaces be equitably dispersed throughout cities.

When writing their Statewide Land Conservation Plan, the EEA should emphasize that green space be equitably dispersed throughout cities. This could be achieved by partnering with land trusts and other NGOs in cities and selecting areas for green space based on how much other green space is around.

The EEA and land trusts should focus on creating numerous smaller green spaces that are dispersed throughout the city, rather than a few central parks. This will make parks more accessible to community members that do not have cars or cannot afford public transportation. It will also make all areas of the city have an increase in climate change resilience, rather than just a few areas. This may also address the disparity between poor and wealthy neighborhoods in terms of green space accessibility.

If the EEA is able to work closely with groups and organizations with the same mission as them, the success of all parties could be increased tremendously. Some organizations that could be positive connections are Groundwork Lawrence, Groundwork Lowell, and the Buzzards Bay Coalition. If these groups unite to combat urban climate change, the results will be significantly better than if each organization tackles it alone. The EEA should also partner with local groups that are interested in greening their community. While local groups may not have useful resources for the EEA, the EEA will be able to utilize having community members that are promoting their cause.

The EEA should also consider allocating small amounts of funding to these smaller groups to achieve their goals. For example, The Greater Worcester Land Trust may not have enough funding to create a new park. If the Greater Worcester Land Trust were to work closely with The EEA on these projects, the EEA may be able to grant funding so that these projects may be completed.

Additionally, the EEA should utilize its existing programs when creating new green space; for example, the tree planting initiative. In the last five years, the EEA's tree planting initiative has planted over 25,000 trees. If the tree planting department can work with the department that creates the actual green space, the quality of the green space will be enhanced. Utilizing existing projects when creating green space will increase both projects' success.

Recommendation 3: The EEA should collect more data from urban community members.

Before finalizing their Statewide Land Conservation Plan, the EEA should perform more surveys, interviews, and focus groups with urban community members. Due to the challenges we encountered during data collection, we did not gather enough responses from urban residents to feel confident in truly identifying the overall preferences and ideas for green space from urban communities.

We recommend that the EEA utilize incentives to obtain more responses. The team received feedback on our survey from The GWLT and other individuals with experience in survey distribution and interviews, including farmer's market coordinators and community engagement specialists. The feedback suggested that we should use incentives as a means to encourage more people to respond to the survey and/or agree to be interviewed. Examples of some incentives would be reusable shopping bags, goodie bags, and dollar bills.

While the team did obtain useful data on the preferences of urban community members on green space, there was a lack of diversity from respondents. The Portuguese, Spanish, and Cape Verdean Creole surveys were not utilized. The team recommends to the EEA that in any future rounds of data collection with our surveys, they focus on connecting with these under-represented groups.

Conclusion:

The EEA's upcoming Statewide Land Conservation plan will be focusing on integrating the urban community's preferences on green space and increasing climate change resilience. The voice of urban community members is something that has been lacking in previous land conservation initiatives. Based on our survey results, the EEA should focus on increasing accessibility through location and parking, incorporating walking trails, parks, and community gardens into urban areas, and harnessing connections with other like-minded organizations and groups to achieve optimal success. If the EEA focuses on these aspects, we believe their Statewide Land Conservation plan will be successful.

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Appendices

Appendix 1: Case Studies

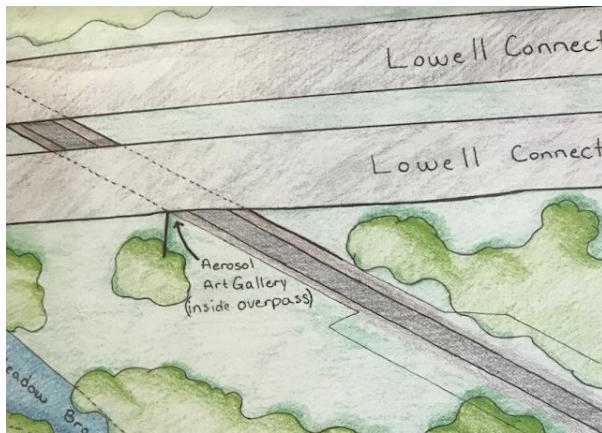
Below are the case studies completed during the project.

CASE STUDY: Aerosol Art Gallery

TYPE OF GREEN SPACE: Outdoor Art Exhibit/Walking Trail

LOCATION: Inside overpass tunnel under Route 3 in Lowell

YEAR OF ESTABLISHMENT: 2019



HISTORY:

The Aerosol Art Gallery is a green space that is currently being developed in Lowell, MA. This tunnel is frequently vandalized by graffiti artists. The Lowell Land Trust identified this tunnel as an addition to the current Concord River Greenway walking path. They also believe that the graffiti is a work of art, rather than a work of vandalism. Thus, graffiti will become legal in this tunnel to promote local artistry and create an outdoor art gallery. The path will serve as a venue for nearly 30,000 people to walk for recreation, walk to work, and observe local artists' work.

CLIMATE CHANGE RESILIENCE:

The Aerosol Art Gallery contributes to climate change resilience because it directly reduces carbon emissions. It is predicted to reduce carbon emissions by 1,036,389 kg per year. This is equivalent to emissions from 222 cars in one year and 112 homes' energy in one year. This green space will reduce carbon emissions greatly because it will serve as a walking path for commuters to get to work, rather than drive their cars or take public transportation.

CASE STUDY: Buzzard's Bay Sawmill

TYPE OF GREEN SPACE: Hiking/walking trails, nature reserve

LOCATION: New Bedford, MA

YEAR OF ESTABLISHMENT: 2014



HISTORY:

Buzzard's Bay Sawmill was previously the home of an expansive lumber yard. This establishment was owned by the Acushnet Saw Mills Company. However, after numerous fires in the 1980s, the sawmill permanently closed. The owners of the land eventually sold it to Buzzard's Bay Coalition to restore to its natural glory. Buzzard's Bay Coalition removed the many buildings to recreate the previously existing ecosystem. Local trade school students worked on this project to get real-world experience, while also benefiting a good cause. The park now protects clean water and is home to many wildlife species. It also provides .5 miles of walking trails, stillwater for fishing, and classes for children. The park is largely ADA accessible as well.

CLIMATE CHANGE RESILIENCE:

The Sawmill now protects many wildlife and plant species as it is a fully restored and protected ecosystem. The large presence of trees works to prevent the urban heat island phenomenon present in the urban New Bedford Community. The waterways present in the park provide an area to absorb stormwater and ocean water to prevent urban flooding. The material used on the walkways, although it appears to be normal gravel, is actually a permeable surface that aids in stormwater drainage.

CASE STUDY: Campagnone Common

TYPE OF GREEN SPACE: Park, play space, playing fields, walking paths

LOCATION: 200 Common Street, Lawrence, MA

YEAR OF ESTABLISHMENT: Renovated in 2012



HISTORY:

Campagnone Common was originally created to be a memorial for the three Campagnone brothers who lost their lives fighting for the Union during The Civil War. The park has now grown into a focal point for the city of Lawrence. In 2012, the park was renovated to include playing fields, playgrounds, and walking paths. The walking paths expand throughout the park, as well as around the perimeter. The park is used for many community events, such as The Bread and Roses Festival, and the weekly Farmer's Markets in the Fall.

CLIMATE CHANGE RESILIENCE:

Campagnone Common has many features that promote climate change resiliency. The copious amounts of trees present mitigate the effects of the urban heat island, which Lawrence feels the effects of significantly. The shade provided by the tree canopy is crucial for this aspect. The permeable surface present throughout the park is also useful for storm drainage. The city of Lawrence is predominantly concrete, or other non-permeable surfaces, so the park aids in providing drainage.

CASE STUDY: Concord River Greenway

TYPE OF GREEN SPACE: Walking trail/waterway

LOCATION: 51 Davidson Street, Lowell, MA

YEAR OF ESTABLISHMENT: 2006



HISTORY:

The Concord River was constructed in 1793 to allow for the transportation of goods between communities in Massachusetts. However, as time went on, the edge of the river became developed by urban areas. In what is now the Concord River Greenway Park, there was a large concrete parking lot. This area was prone to flooding due to the lack of permeable surfaces. In 2006, the Lowell Land Trust converted this area into a beautiful park and walking trail. The park features greenery, outdoor seating, a walkway, and the work of local artists. There is also the opportunity to go white water rafting on the Concord River (class 3 and 4 rapids). What was once a flood-prone concrete lot is now a beautiful example of urban green space.

CLIMATE CHANGE RESILIENCE:

The main aspect of this park that contributes to climate change resilience is the prevention of urban flooding. The waterway and the permeable surfaces allow for stormwater drainage to occur, rather than flooding the streets of the city. Prior to the establishment of the park, the lot was at times 6 feet underwater. The presence of tree canopy also combats the urban heat island effect present in Lowell.

CASE STUDY: Elm Park

TYPE OF GREEN SPACE: Park and Walkways

LOCATION: 121 Russell Street, Worcester, MA

YEAR OF ESTABLISHMENT: 1854



HISTORY:

Elm Park was created in 1854 when the city of Worcester purchased 27 acres for its community members to have an outdoor recreational spot to enjoy. This was one of the first attempts any city made to preserve open space by spending public funds. Elm Park eventually grew to 58 acres, most of which are undeveloped. The park is split into two pieces by Park Avenue.

The main site of the park features a pond, trees, walking paths, and a playground for children. The community often uses this space for events, such as concerts and food trucks. The second site of the park is not as developed. It features extensive hiking trails and even disk golf.

CLIMATE CHANGE RESILIENCE:

Although there was no direct effort to foster climate change resilience through the construction of Elm Park, there are a few qualities of the park that do increase climate change resilience. First, the copious amounts of trees provide shade for community members. This tree canopy can combat the impending urban heat island effect present in many urban areas. Second, the permeable surface allows for water drainage during storms. This decreases the amount of water present in roadways during storms. Third, the park provides an outdoor recreation area for people to go to on hot days. This directly decreases the amount of energy consumption from air conditioners and fans. Finally, the park is legally protected open space, so there will never be any development on it. The protection of open space is a key method to combating climate change, especially in urban areas.

CASE STUDY: Institute Park

TYPE OF GREEN SPACE: Park

LOCATION: 82 Salisbury Street, Worcester, MA

DATE OF ESTABLISHMENT: 1887



HISTORY:

Originally a farm field and pasture, Institute Park was donated to the city by Stephen Salisbury III in 1887. His goal was to make the park an area that could serve as an adjunct to students of the Worcester Free Institute of Industrial Science (today known as WPI). Institute Park's pond used to be a mill pond supplying power to a local factory. The City of Worcester's parks commission took over maintenance and upkeep when Mr. Salisbury passed away in 1905. In 1970, work began to try and clean up Salisbury Pond. In 1972, a group of WPI students created the Salisbury Pond Task Force. The group removed 5000 cubic yards of sediments, but the pond eventually reverted back to its polluted condition, because not enough of the pollution was properly disposed of.

CLIMATE CHANGE RESILIENCE:

Primarily, the park's tree cover and local body of water address the Urban Heat Island effect by cooling the surrounding area. Additionally, flooding from increased precipitation due to climate change can be mitigated by the park's 44.9 acres of open, green space. The park's local pond can also support the surrounding vegetation during droughts. The park also promotes general community wellness by providing walking/jogging trails, and space for recreation, as well as outdoor concerts.

CASE STUDY: Moakley Park

TYPE OF GREEN SPACE: Waterfront Park

LOCATION: 1005 Columbia Road, Boston, MA

YEAR OF REDESIGN: 2019 - present



Vision for Moakley Park - 2019

HISTORY:

Moakley Park is one of the most visited parks in Boston, as it borders nearly 2000 condominium units. However, the park is prone to flooding during storms because of its design and location. The park has even become dangerous after storms, as some children are getting stuck in the mud. In 2019, Mayor Marty Walsh promised that 10% of spending would be allocated towards increasing climate change resilience in Boston. Moakley Park was chosen as one of the sites to be redesigned to incorporate climate change resilience aspects.

CLIMATE CHANGE RESILIENCE:

The redesign of the park will allow for the influx of stormwater to be managed through the use of berms, elevations, and basins. Not only will this allow the park to be usable after a storm, but it will also protect the city from flooding as well. These features will also prove to be vital as the sea levels are rising, and the park is located on the waterfront.

CASE STUDY: Winslow Park

TYPE OF GREEN SPACE: Park and Community Garden

LOCATION: 374 Pleasant Street, Worcester, MA

YEAR OF ESTABLISHMENT: 2007



HISTORY:

Winslow Park is a great example of the community coming together to create green space in their neighborhood. The group Women Together created this initiative because they wanted to see a burned-down school lot turned into something beautiful for their community to enjoy. It is also considered a peace park. The group of women fought tirelessly for years for this cause. This initiative serves as an inspiration for other community members with similar dreams.

The park is .56 acres, and features a few trees, community garden plots, grassy areas, and picnic tables. The community frequently uses this park as an area to cool down on hot days. The patients of the rehabilitation center across the street also receive healing benefits from looking at greenery, instead of unappealing concrete.

CLIMATE CHANGE RESILIENCE:

Although Winslow Park was not constructed with any climate change resilience features in mind, it has a few naturally occurring ones. First, the permeable ground serves as drainage for stormwater. This prevents the water from flooding the street. Second, the community members frequently visit this park on hot days, rather than increase energy consumption by using their air conditioning and fans. Finally, the protection of open space in urban areas naturally increases climate change resilience, because it prevents the construction of concrete-dominate areas.

Appendix 2: Survey Questions

- 1) In your town/city, what do you consider to be green space?
- 2) Which of those green spaces do you like to visit?
- 3) What are the top reasons you like to visit them?
- 4) How important is spending time outside to your quality of life?
 - a) Choose number from 1 to 10, 1 being not important and 10 being very important
- 5) How much time do you spend in your community green space per week?
 - a) 0 hours
 - b) 1-5 hours
 - c) 5-10 hours
 - d) 10+ hours
- 6) How long of a walk is it to your favorite green space?
 - a) 0-5 minutes
 - b) 5-10 minutes
 - c) 10-15 minutes
 - d) 15-20 minutes
 - e) More than 20 minutes
- 7) What are the challenges for spending time there? Select all that apply.
 - a) Convenience of traveling there
 - b) Safety of traveling there
 - c) Poorly maintained
 - d) Unsafe
 - e) Not ADA accessible
 - f) I don't have time
 - g) Too far
 - h) Nothing to do there
 - i) I don't know
 - j) Other (please specify)
- 8) Overall, how satisfied are you with your green space?
 - a) Choose number from 1 to 10, 1 being very unsatisfied and 10 being very satisfied
- 9) Can you do the things you want at your existing green space?
 - a) Yes
 - b) No
 - c) I don't know
- 10) Are there any improvements you would make to your existing green space? If so, what are they?
- 11) I would like to see more green space in my community.
 - a) Choose number from 1 to 10, 1 being strongly disagree and 10 being strongly agree

- 12) What would you like to see added to your community? Select all that apply.
- a) Parks
 - b) Playing fields
 - c) Courts
 - d) Frisbee golf courses
 - e) Running tracks
 - f) Playgrounds
 - g) Hiking trails
 - h) Walking paths
 - i) Outdoor seating
 - j) Bike paths
 - k) Dog parks
 - l) Trees for shade
 - m) Ice rinks
 - n) Community gardens
 - o) Flower gardens
 - p) Fishing ponds
 - q) Waterways
 - r) Picnic areas
 - s) Other (please specify)
- 13) What is the coolest place in your neighborhood on a hot summer day?
- 14) Do you think green space could improve your family's health? If so, how?
- 15) Are there any specific lots you would like to see green space? (i.e. any vacant lots, abandoned building lots, overgrown lots, etc.)
- 16) What is the primary language spoken in your home?
- 17) What is your race/ethnicity?
- a) White
 - b) Black or African American
 - c) American Indian or Alaska Native
 - d) Asian
 - e) Native Hawaiian or other Pacific Islander
 - f) Hispanic or Latino
 - g) Prefer not to answer
 - h) Other (please specify)
- 18) What city are you located in, and what is the nearest street intersection to your home?
- 19) Do you have any children?
- a) 0
 - b) 1
 - c) 2
 - d) 3

- e) 4
- f) 5+
- g) Prefer not to answer

20) Do you have any dogs?

- a) 0
- b) 1
- c) 2
- d) 3
- e) 4
- f) 5+
- g) Prefer not to answer

21) What is your age?

- a) Under 18 years
- b) 18-24 years
- c) 25-34 years
- d) 35-54 years
- e) 55-64 years
- f) 65+ years
- g) Prefer not to answer

Spanish Survey:

1. En tu ciudad, ¿qué consideras que es un espacio verde?
2. ¿Cuál de esos espacios verdes te gusta visitar?
3. ¿Cuáles son las principales razones por las que te gusta visitarlos?
4. ¿Qué tan importante es pasar tiempo al aire libre a su calidad de vida?
5. ¿Cuánto tiempo pasas en tu espacio verde comunitario por semana?
6. ¿Cuánto tiempo de paseo es a su espacio verde favorito?
7. ¿Cuáles son los desafíos para pasar más tiempo allí? Seleccione todas las que correspondan.
8. En general, ¿qué tan satisfecho estás con tu espacio verde actual?
9. ¿Puedes hacer las cosas que desea hacer en su espacio verde existente?
10. ¿Hay alguna mejora que haría en su espacio verde existente? Si es así, ¿qué son?
11. Me gustaría ver más espacio verde en mi complejo.

12. ¿Qué le gustaría ver añadido a su comunidad? Seleccione todas las que correspondan.
13. ¿Cuál es el lugar más fresco de su vecindario en un caluroso día de verano?
14. ¿Crees que el espacio verde podría mejorar la salud de tu familia? Si es así, ¿cómo?
15. ¿Hay alguna ubicación específica que le gustaría ver el espacio verde? es decir, cualquier lote vacío, lotes de edificios abandonados, lotes cubiertos, etc.
16. ¿Cuál es el idioma principal que se habla en su hogar?
17. ¿Cuál es su raza/etnicidad?
18. ¿En qué ciudad se encuentra y cuál es la intersección de la calle más cercana a su hogar?
19. ¿Tienes hijos?
20. ¿Tienes perros?
21. ¿Cuántos años tienes?

Portuguese Survey:

1. Na sua cidade, o que você considera que seja espaço verde?
2. Quais desses espaços você gosta de visitar?
3. Quais são as principais razões pelas quais você gosta de visitá-los?
4. Quão importante é passar tempo ao ar livre para a qualidade da sua vida?
5. Quanto tempo na semana você passa no seu espaço verde?
6. Quanto tempo é a caminhada até o seu espaço verde favorito?
7. Quais são os desafios que te impedem de passar mais tempo nesse espaço? Seleccione todos que se aplicam.
8. No geral, quão satisfeito você está com o seu espaço verde?
9. Você pode fazer as coisas que você quer fazer no seu espaço verde?
10. Há alguma melhoria que você gostaria de fazer no seu espaço verde? Se sim, quais?
11. Eu gostaria de ver mais espaços verdes na minha comunidade.

12. O que você gostaria que fosse adicionado a sua comunidade?
13. Qual é o lugar mais legal no seu bairro em um dia quente de verão?
14. Você acha que espaços verdes poderiam melhorar a saúde da sua família? Se sim, como?
15. Existem localizações específicas nas quais você gostaria de ver espaço verde? ex. lotes vagos, lotes de construção abandonada, etc.
16. Qual é a língua primária falada na sua casa?
17. Qual é a sua raça/etnia?
18. Em que cidade você está localizado, qual é o cruzamento de rua mais próximo de sua casa?
19. Você tem filhos?
20. Você tem cachorro?
21. Qual é a sua idade?

Cape Verdean Creole Survey:

1. Na bu cidade kuze qui bu ta considera un espaco verde?
2. Qual des espacos verde qui bu gosta di visita?
3. Qual es motivos principal qui bu gosta di visita quel lugar?
4. Cuando important e passer tempo ao livre pa sua qualidade di vida 1-10?
5. Cuando tempo bu ta leba pa esse espaco verde favorito?
6. Qual sao desafios pa passa mas tempo la? Selecione tudo qui ta applica.
7. In geral qual e nivel di satisfacao cu esse espacio verde atual?
8. Bu pode faze tudo cuza qui bu deseja fazer na quell espaco verde?
9. Gostaria di fazer algum cuza melhor du espaco verde qui ka ta existi? Si sin que es?
10. Min ta gosta di odja mas espacio verde nab u comunidade.
11. Selecione tudo qui ta applica.

12. Qual es lugar mas legal di bu bairro na um verao quenti?
13. Bu ta acha cumo un espacio verde pode melhorar a saude di bu familia?
14. Qual lugar qui bu ta gosta di odja un espao verde? Exemplo: lotes vagos, lotes di predios abandonado, lotes cubertos
15. Qual e lingua principal faladu na bu casa?
16. Bu ten un cachor?
17. Qual e sua idade?
18. Qual e sua raca/etnia?
19. Nhos them filhos?
20. Ki cidade ki bus ta localizado. Qual e u cruzamento di bu rua mas proximo di bu casa?

Appendix 3: Interview Questions

1. What do you think of when you hear “green space”?
2. How satisfied are you with your existing green space?
3. What types of green space do you like to use? Why?
4. What are your top reasons for visiting them?
5. What types of green space do you want to see more of? Why?
6. Are there any areas where you would prefer to see these implemented?
7. Are there any suggestions you have for improving your green space?

Appendix 4: Community Outreach Flyer

Tell us what you think!



Take our survey and tell the Massachusetts Executive Office of Energy and Environmental Affairs how you feel about urban green space!

English



Español



Português



Your feedback will directly contribute to the protection and promotion of green spaces in Massachusetts cities!

Appendix 5: Notable Survey Results

5.1: Are there any specific locations you would like to see green space? i.e. any vacant lots, abandoned building lots, overgrown lots, etc. Answered: 45 Skipped: 15

Location	Number of Responses
Vacant lots	9
Abandoned Buildings	6
Overgrown Lots	3
Street trees/sidewalk gardens	3

Other specific responses:

- “Along Kings Highway & north of the airport”
- “By water street and the 141 bridge, between the canal and the river. That would be amazing parkland instead of underused industrial land.”
- “Brown fields”
- “The former Honda dealer property at King Street and Finn St!”
- “Brock Ave. New Bedford, Acushnet Ave. North End New Bedford”
- “Property near the current recreation center”
- “Empty neglected baseball field at the Parthum School. Hasn’t been used in years and there’s no PH baseball league.”
- “Yes near the Partham School in Lawrence there is a large parcel of land that belongs to the city that is an eyesore and would be a good location for green space”
- “There’s an abandoned lot on Raymond Street that is usually a dumping ground for trash.”
- “There is a vacant building across the street from my job (Hangar Pub & Grill, Amherst MA) which used to be a restaurant, but is now an overgrown building/parking lot”
- “I would love to see Worcester link to really BIG forests through a trail link to the MidState Trail”
- “It would be nice if prior to the development of the HCID, that some thought to green space along the canals had been planned --rather than a 5 story garage.”
- “Yes indoor hoops for the kids to play basketball. There is a abandon building by water street. The government should consider that”

The full survey responses are available to the EEA online.

Appendix 6: Image Examples



These images were captured when conducting case studies.

Top left: Acushnet River, New Bedford MA

Top right: Boston MA

Bottom left: Campagnone Park, Lawrence MA

Bottom right: Concord River Greenway, Lowell MA