ABSTRACT

Title of Thesis:	DESIGNING FOR INTERPRETIVE SIGNAGE: BEST PRACTICES FOR INCREASING ATTRACTION POWER
Name of degree candidate:	Emilie Carroll Carter
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Thesis directed by:	Christopher D. Ellis, PhD, ASLA, PLA Associate Professor, Department of Plant Science and Landscape Architecture

Interpretive signage, murals, and art installations are an important element of passive outdoor education for those who do not have formal education or knowledge about how landscapes work. The inclusion of passive education in projects has become increasingly necessary as new types of green infrastructures such as rain gardens, bioswales, and floating wetlands, are introduced to the landscape. Landscape architects can contribute to educational efforts by including interpretive signage on a site. While this practice is being implemented among many sites around the United States, it is unclear how effective these installations are in educating the public - specifically adults. This thesis project takes an in-depth look at the effectiveness of interpretive signage located around low-impact design elements and proposes a set of best practices for designing sites with interpretive signage. To support the best practices, data is being collected at two sites with methods that include surveying site occupants, field observation of occupant interactions with signage, and interviews with project designers. Initial data analysis from the pilot study shows that interpretive signage does positively affect people's views on environmentally sensitive design, but a variety of factors such as signage location and visibility of installation can affect the percentage of people who read signage.

DESIGNING FOR INTERPRETIVE SIGNAGE: BEST PRACTICES FOR INCREASING ATTRACTION POWER

By

Emilie Carroll Carter

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Advisory Committee:

Dr. Christopher D. Ellis, PhD, PLA, ASLA, Chair

Dr. David Myers, PhD, ASLA

Dr. Victoria Chanse, PhD

DEDICATION

to Ted for all of his love, support, and patience

to my mother for her inspiration and encouragement

and to my classmates and professors who have supported me throughout this journey.

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- Freeman Tilden, one of his six principles of Interpretation, 1957

"The object is to teach the student to see the land, to understand what he sees, and enjoy what he understands."

- Aldo Leopold

|| Chapter One ||

Introduction

Green infrastructure has gained a significant amount of attention in the past few years as a way to mitigate increasing amounts of stormwater runoff, create habitat for native plants and animals, and provide new scenic amenities to communities. These types of low-impact designs such as rain gardens, bioswales, bioretention, rain barrels, permeable pavements, and constructed wetlands provide basic ecosystem services to local environments and can assist in decreasing long-term project costs and maintenance. In the future, green infrastructure, along with environmental restoration, could be the key to creating more resilient sites as climate change increases the intensity of weather events.

As engineers, planners, and designers look to increase the presence of these elements within projects, it is important that the public understands the functions and long-term goals of green infrastructure. Educating the public – from citizens to policy makers – about the importance of these projects is critical to achieving broad, bipartisan support for them. Landscape architects can participate in the education process in a variety of ways. While educating clients can be necessary to ensure their inclusion in a project, landscape architects can reach larger audiences by including educational components in final site designs. Designing for passive education - such as interpretive signage, murals, and art installations - is an important element of landscape education for those who do not have

formal education or knowledge about how landscapes work – specifically ones utilizing green infrastructure to manage stormwater and enhance site processes.

Not only have regulatory requirements from the EPA and state and local governments promoted rigorous outdoor and environmental education, but so do green building and design programs such as LEED ND and Sustainable Sites. While this practice is being implemented among many sites around the United States, it is unclear how effective interpretive signage can be. Considering the profound negative impact that neglected signs can have on an educational landscape, there is very little evidence available through research, nor are there comprehensive guidelines describing passive education design practices that are proven to be effective. It is important to note though, while little-to-no resources on site design currently exist, there is a plethora of information and recommendations for the graphic design of signage. A sign can be designed impeccably, but if the site design doesn't create an attraction to the educational opportunity, it remains less effective overall.

The goal of this thesis project is to take an in-depth look at how sites can be designed effectively to increase attraction power and holding power for interpretive signage. The end result of this effort will be a list of best practices for interpretive site design that incorporates information from the literature, interviews with practitioners in the field, and field observations and surveying. For the field work, sites around Baltimore, MD and Annapolis, MD that focus

educational efforts on green infrastructure have been selected for study and observation.

In addition to creating a list of best practices, these recommendations will be applied to an interpretive signage project in Patterson Park, located in Baltimore, MD. This park currently has several locations with small interpretive signs near green infrastructure installations. The signs in the park and their location off the pathways calls for new designs to further enhance their impact on park visitors and educate the public about the importance of stormwater management in the Chesapeake Bay watershed.

|| Chapter Two ||

Green Infrastructure Education and Interpretive Signage

It has been documented in recent years that stormwater professionals and landscape architects are finding it increasingly necessary to include educational plans and public participation components when designing stormwater management systems (Neiswender, 2010). Much of this is due to regulatory requirements from the EPA and state or local governments, but it is also clear that education on stormwater issues is necessary for local decision makers (elected or not), homeowners, and citizens in order for those entities to make informed decisions regarding stormwater design and policies (Neiswender, 2010).

Since the idea of green infrastructure design that incorporates educational components is a relatively new approach in the last twenty years, there is no critical mass of data that demonstrates proven approaches to stormwater education in the landscape. Several studies are occurring around the United States that look at different forms of engagement and education throughout the design process, but few actually investigate the role of education in sites designed for stormwater management optimization. The majority of studies that focus education on reducing stormwater pollution in commercial areas utilize participatory methods to engage local citizens instead of passive educational strategies (Taylor *et al*, 2007).

While some studies measure a stormwater design's effect on people's understanding of the installation's goals and processes, there is a gap in the literature describing the effectiveness of passive stormwater education opportunities, such as interpretive signage focused on rain gardens, bioswales, rain barrels, permeable pavement, and other green infrastructure technologies.

Formal versus non-formal education

When considering environmental education, there are generally two avenues through which learning can occur. Active education involves a subject or idea being taught by another person, with human interaction being a key element of the learning experience (Ham et al, 1993). Examples of active education would be classes, seminars and organized/publicized events that aim to educate citizens on regional stormwater initiatives. This type of education requires participation from two parties – the educator and the student.

Adversely, passive education is one sided in the sense that the student learns by themself, in passive opportunities where they might not have been actively looking for the educational opportunity (Ham et al, 1993). Examples of passive education in the landscape would be educational signage on low-impact development designs such as rain gardens or signage and news articles on the floating wetlands near the National Aquarium in Baltimore. It is more likely that this type of education would be occurring in parks, considering the time and financial requirements that would be necessary to plan the events and educational experience. Without an organization whose mission incorporates

education in the landscape (such as the National Park Service) it would be difficult to maintain such a program.

Passive outdoor education techniques

Passive education can be incorporated into landscapes using different techniques that include artistic representations such as murals, words and images designed into paving patterns, artistic installations, and interpretive signage. Murals can be found in many urban areas, but one of the most frequently encountered are those painted onto storm drains (Figure 1). These murals are basic images and words that try to increase awareness of the connection between street pollution and its direct effect on large bodies of water. Many examples of this can be found in Baltimore, MD. Larger, more artistic murals can also be found on the sides of buildings. One example of the use of educational stormwater murals can be found in Philadelphia where the Philadelphia Water Department is working with the Mural Arts Program to combine city beautification with education (Green City, Clean Waters 2012). Many schools have installed murals to assist in educating school children about water use in the city.

Figure 1: Storm drain stencils [Carter]

Similar to murals, artistic installations can also educate site visitors by making statements about the historical past of a place or by highlighting processes that occur on site. Several cities have highlighted buried rivers and streams by painting pavement or including sculpture that insinuates the historical past of the site. One example of this is the Blue Road by Dutch artist Henk Hofstra. In 2007, Henk Hofstra painted a road that covered up a stream channel (Henkhofstra.nl, 2012). In addition to painting the road bright blue, Henk installed cars that looked as if they were falling into the stream channel. By painting the site, he tried to highlight the historical past of the space.

Artful rainwater design, defined as an “an amenity understood as a feature focused on the experience of stormwater in a way that increases the landscape’s attractiveness or value” (Pennypacker and Echols, 2008), is another design technique that can passively educate the public about stormwater issues and

uses. One example in Pennypacker and Echols' paper describes an ornate scupper with stainless steel salmon that highlights the use of rainwater and gutters on the building. By incorporating artistic details into these designs, landscape architects and artists are able to draw attention to processes that are otherwise invisible. These types of installations are also known as eco-revelatory design (Lovell and Johnston, 2009). Paving patterns and hardscapes that incorporate words can also educate people. One example of this tactic can be found at Pearce's Park in Baltimore, MD. The theme of this park focuses on sound and incorporates gramophones into the pavement (Figure 2).

Figure 2: Gramophones in pavement at Pierce's Park [Carter]

Many of these described strategies also incorporate interpretive signage. At times, designs need augmentation from signage to assist in explaining site functions and importance (Pennypacker and Echols, 2008). Interpretive signage is able to directly and concisely explain themes and processes on site and tends to focus on historical and environmental education. They can be found in many different places in the landscape – from urban areas to national parks.

Interpretation and signage

Interpretation, specifically for environmental education, has been utilized for many years in both formal and non-formal education settings. There are many different definitions of interpretation, all building off of the common idea set forth by Freeman Tilden in 1957. Tilden described interpretation as “an educational activity which aims to reveal meanings and relationship through the use of original objects by firsthand experience and by illustrative media rather than simply to communicate factual information” (Tilden, 1957). More recently, Ham provided more depth to this definition, stating “… its goal is not simply to teach audiences factual material about the environment but, rather, to impact their point of view, and sometimes behavior, with respect to managed resources or protected values.” (Ham, 1996)

There are two main types of passive interpretation messaging – behavior modification and salient interpretation that is more focused on positive educational aspects of the site (Ham, 1996). Behavior modifying interpretive signage signals the negative impacts that humans can have on a landscape and aims to curb those habits. An example of behavior modification signage would be one that tells people the negative effects of leaving trash on a site. Salient interpretation focuses on the positive side of a message, such as the benefits of a site and how it impacts the environment.

Interpretive signage can be multi-purpose and used in a many different places in the landscape. They can be the main purpose of a site or they can be an

additional amenity to a site. Many educational landscapes such as zoos, arboretum, and nature centers, utilize interpretive signage to educate site visitors. On sites like these, many organize interpretive signage on trails. Nature trails featuring signage are commonly found around the United State as a form of environmental recreation (Wamsley, 2005). In other, non-educational landscapes, interpretive signage tends to be an amenity which can lead to its placement on-site as an after though.

Two other programs, LEED ND and Sustainable Sites, promote the inclusion of interpretive signage through their programs that encourage site greening. Sustainable Sites offers points for signage that promotes sustainability awareness and education in credit 6.3, with the goal to “interpret on-site features and processes to promote understanding of sustainability in ways that positively influence site behavior on site and beyond.” (Sustainable Sites Initiative, 2009) Similarly, LEED ND also incorporates points for educational signage in its point system for the construction of new retail and commercial spaces. LEED ND recommends: “a comprehensive signage program built into the building's spaces to educate the occupants and visitors of the benefits of green buildings. This program may include windows to view energy saving mechanical equipment or signs to call attention to water-conserving landscape features.” (Sustainable Sites Initiative, 2009) Both of these programs recognize the importance of interpretive signage and its role in educating the public on green infrastructure projects, but neither of them provides site design recommendations.

Pitfalls of interpretive signage

When considering educational design elements for sites, some landscape architects shy away from utilizing interpretive signage. While it can be the most effective way to directly communicate a message to a site visitor, there is also a perception by some landscape architects that signage can inhibit the goals of the design and distract visitors from experiencing the site. This opinion has been supported by some of the significant problems that can be found on sites designed poorly for interpretive signage.

It appears that the field has been experiencing a period of stagnation in the evolution and creativity of interpretive signage design (Wamsley, 2005). Not only have the basic principles for visuals and materials not changed significantly, but one of the most commonly recurring criticisms of interpretive trails and signage is that it fails to meet either educational or behavior-change related goals for trail visitors (Knapp and Barrie, 1999, Cable et al 1987, Keyes and Hammitt, 1984). A recent study at a National Forest Site, Knapp and Poff (2001) found that fourth graders did not demonstrate an increased knowledge or behavioral changes toward the environment.

For a tactic that has been implemented in so many places, many ask why is this occurring and why hasn't it been addressed? One of the identified reasons is likely because designers don't study who their audience is and don't tailor messages to different audience groups (Ham, 1992). The lack of effectiveness could also be due to the lack of large scale planning of sites and creating a strong theme for signage. Another challenge lies inherently in non-student or

educationally driven visitors – one of the main problems with informal education – these types of audiences aren't necessarily captive audiences and don't suffer any consequences if they do not become involved in the interpretive experience (Ham, 1992).

Maintenance issues and aesthetic challenges can also be problematic and a cause for the decrease in effectiveness. In order to be legible to site visitors, the object of the interpretive signage needs to be obvious and aesthetically engaging (Bitgood, 2000). For green infrastructure, it is even more critical that installations such as rain gardens, bioswales, native plantings, etc are clear. If it is unclear what the visitor is looking at because it is overgrown or not maintained, it is likely that the lack of visual impact will affect the how memorable the site is (Nassauer, 2004). This can also be a common problem with restored landscapes which are supposed to look natural and not inhabited by humans (Nassauer, 2004). Signage provides a cultural clue that people are supposed to occupy the space, but it needs to be clear as to what they are observing and learning about.

Finally, vandalism and weathering is an occurring problem for many interpretive signs. Depending on their location, signs in urban areas can be subject to graffiti and demolition. In rural areas, maintenance of the signage can be an issue, specifically if it is exposed to extreme elements. In these situations, weathering can occur quickly, fading the attention-grabbing colors on the sign and making the area look not-well cared for. All of these pitfalls of interpretive signage can contribute to a decrease in the effectiveness of the sign and the perception in the

industry that interpretive signage can detract significantly from the experience of the site.

Metrics of success

One of the first steps in answering this question is defining what would make an interpretive sign and experience effective. According to Bitgood (2000), there are four different areas within signage design that could be used as metrics of success. These are attracting power, holding power, collateral behavior, and communication power. Attracting power is most frequently calculated by determining the percentage of visitors who stop at the interpretive sign to look at its information.

Based on these different measurements, when considering how the design of the space enhances effectiveness or detracts from it, the attracting power is one of the most important measurements to consider. In the context of this study, it is also important to consider the holding power and the communication power, since these elements can indicate the amount of information retained by the site users.

Design principles for interpretive signage

According to the literature, there are a variety site design techniques to consider that could increase the effectiveness of interpretive signage. While there isn't significant literature on site design for interpretive signage, several articles have been written that focus on the use of interpretive signage in museums and how label design and placement can increase or decrease the effectiveness and

attraction power of the sign. Other authors focus on the graphic components of the communications. Finally, another section of the literature focuses on more large-scale, planning efforts to consider when designing for interpretive signage. For the purposes of this section, the literature will be discussed based on scale – from large-scale and planning, to site-specific design, and finally focusing on some graphic recommendations for signage.

Large scale planning

From a planning perspective, several considerations need to be made as interpretive signage is considered on a site. These include the relevance of the educational experience to the site, the creation of a clear messaging theme, and analysis of the potential audience.

According to Asbaugh and Kordish (1971), sites should be selected for interpretive signage based on the educational experience that it possible. To ensure that the signage is relevant, designers should determine the importance of the interpretive experience that is being designed. It is also necessary to determine if the educational experience is a primary experience (the main reason for visiting the site) or a secondary experience (provides additional information but supplementary) (Asbaugh and Kordish, 1971).

Having a clear messaging theme is also important to creating a successful educational site – specifically one that contains multiple signs. Signs with logical, relevant information steps from one sign to another assist the site user in creating an information network on the subject and ensure a more

comprehensive experience (Kaplan, 1998, and Bitgood, 2000). Understanding the potential audience is also critical in designing a successful and effective interpretive education experience. This will inform not only the site design but the communications and graphics. While many sites need to accommodate multiple audiences, if possible incorporate elements that target specific audiences such as children, elderly, and disabled (Ham, 1992).

Site specific design

While large scale planning is important in shaping a project and determining goals, specific site design elements can significantly enhance a visitors experience with the interpretive signage and can be more effective in attracting a user to the space in the first place.

Capturing the attention of the site visitor is important to increase the effectiveness of the interpretive experience (Bitgood, 2000). It is important to orient a person in a direction that is away from significant distraction. If a proposed site is near a large road or public plaza, the educational component and the interpretive space should be positioned away from that distraction, so the user can focus its attention and fully experience the site. In addition to focusing attention on the object, it is important to make sure that the object that is being explained and interpreted is located within the immediate area of the sign and is clearly legible (Bitgood, Benefield and Patterson, 1990). This adds dimension to the educational experience and allows the visitor to observe. Accessibility is also important so visitors can not only see the sign but also easily access it (Pennypacker and Echols, 2008). Signs that are off the defined path are often not

as effective because it is less likely that they are seen (Bitgood, Benefield and Patterson, 1990).

As mentioned earlier, one type of interpretive project focuses on the use of trails. If the experience is being shaped by a trail, circular trails are generally preferred and should be between 1/8 mile and 1 mile to ensure the visitors remain engaged and don't suffer from attention fatigue (Ham, 1992, and Asbaugh and Kordish, 1971). Another way to combat attention and signage fatigue is to distribute the signage throughout the site and not concentrate it in one small area (Miller, 1956 and Bitgood, 2000). It has also been observed that humans have a right turn bias (Melton, 1935), thus when shaping an interpretive experience, understanding the circulation of the site can provide valuable clues as to where to locate signage.

Designs that incorporate additional cultural cues could increase the attraction power of signage by providing other stopping points. For pedestrians, this could include benches, lighting, or trash receptacles. For other modes of transportation, such as bicycling, indicate that there is a stopping point but introducing places to store their transportation, such as bicycle racks. These cues should also incorporate climate factors – if the site is windy or receives significant sun, consider incorporating shade structures to provide more protection (Bitgood, 2000). If the site has a significant amount of habitat restoration, such as a restored wetland, make sure to clearly define areas that are for humans, such as purposeful and aesthetically pleasing planting, defined bed edges, and lawn (Nassauer, 2004). Lighting is another important cultural clue that not only provides

safety but it also increases visibility and helps the user identify a stopping point. Lighting can be beneficial if the space is open in the evenings and will increase the ability to use the site (Ham, 1992 and Bitgood, 2000). Finally, changing hardscapes can and bringing site visitors into previously inaccessible spaces attracts users. It has been shown that trails that encounter the water's edge, those with softer surfaces, and boardwalks rate higher with users (Kaplan et al 1998).

Graphic recommendations

As mentioned earlier, there is significant information in the literature regarding best practices for interpretive signage design. Considering the main focus of this project is on the site design as opposed to the signage design, this section will briefly cover some general best practices that can be applied to the graphics.

In order to be visually distinct from the surrounding site, creating contrast on a sign will help it stick out. This can be accomplished using contrasting colors and graphics. Creating contrast on the signage can provide a key focal point and assist in capturing the attention of passersby (Alt and Shaw, 1984 and Bitgood, 2000). Illustrative graphics that assist in explaining processes and functionality on the site should also be included to connect the text with the visual aesthetics of the site. These graphics can also explain processes that are not visible to the human eye such as infiltration (Ham, 1992).

The content of the signage can also affect the holding power and comprehension of an interpretive experience. Briefly, the following recommendations can be made:

- Engage the visitor by asking questions on the sign – it is likely that this method can entice readers to continue reading the sign to determine the answer to the question. These questions can be simple but can also be challenging depending on the expected audience (Sustainable Sites 2009).
- Ease the cognitive experience by breaking up information and keeping it to a basic level. This can be accomplished by using bullet lists instead of paragraphs. If paragraphs are chosen, keep them short with 3-4 sentences maximum (Ham, 1992, Sustainable Sites 2009).
- Incorporate interactive elements if possible. This could include pointing out specific things the visitor can use additional senses for, such as touch, smell, hearing, or sight (Sustainable Sites, 2009).
- Include instructions on what to look for or what to do (Bitgood, 2000).
- Minimize mental effort for those visiting the site (Bitgood, 2000).

|| Chapter Three ||

Methodology

To answer the questions asked by this project, three methods were selected to provide a broad base of data and information: a survey, field observations and interviews. The first method selected was to conduct a survey of random site visitors. This survey asked selected site visitors fifteen (15) short questions about what they learned from the sign and whether it increased their understanding on the subject. In addition to surveying, general field observations occurred to determine how site visitors interacted with the signage and to calculate the number of site users who engaged with the signage versus the number who did not. Together, these two methods will provide a larger picture as to what is occurring on site and how effective the signage is in reaching the site's audience (Fetterman, 1998).

While the site observations and surveying is important to understand the human behavior component of this project, it is also important to learn more about the role that signage plays in shaping the design of a space. To address the question of how design can influence the effectiveness of interpretive signage it was important to ask questions of the designers of the selected sites and others to determine what role design played in the decision to implement signage.

Fieldwork

The initial site criteria for this project were the following:

- Interpretive signage: In order to accurately address this question, the site must have interpretive signage focused on green infrastructure.
- Non-education destination: Since this project is focusing on truly passive education experiences, it was important to find a site that did not have a widely-known educational mission. Places that are known for their education missions include museums, arboretums, botanic gardens, and aquariums among others.
- Site visitor requirements: To gather statistically significant data, it is important to have a large sample population.
- Location: To facilitate surveying without significant travel, sites around Baltimore, MD and Annapolis, MD were targeted.
- Maintenance: The site elements needed to have received some maintenance to be obvious to an untrained eye.

Selected Site One: Ellen O. Moyer Back Creek Nature Park, Annapolis, MD

After the initial site criteria were selected, several sites were researched in the area. The first site that was selected to conduct a pilot study was the Ellen O. Moyer Back Creek Nature Park in Annapolis, MD (Figure 3). The park is one of the premier education sites within the collection of Waypoints. A repurposed public-works building on the site now functions as a Nature Center that is open during the summer months and for special occasions. While active education programming exists on site, there is also a significant amount of signage on site. The majority of the signage focuses on low-impact development techniques, environmentally friendly design, and the natural ecological processes of the Bay.

One of the main reasons that this site features the educational experience is because it is located on waterfront property and there is significant linear footage of shoreline.

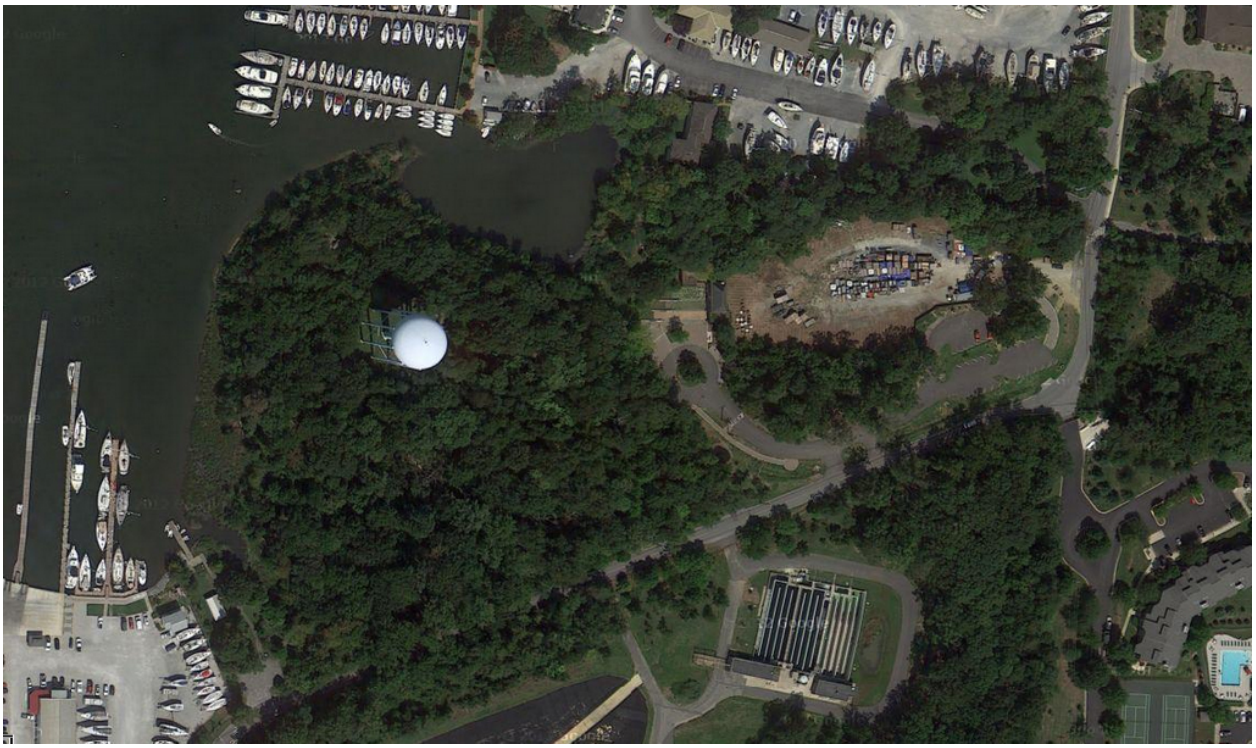


Figure 3: Back Creek Park, Annapolis, MD [Google Maps]

This park is part of the Annapolis Environmental Waypoints program – a program that focuses on different eco-technologies that can be used to make a site more environmentally friendly. Specifically these sites focus on stormwater eco-technologies since Annapolis is located on the banks of the Chesapeake Bay. There are 16 different waypoint sites that feature a variety of eco-technologies including green roofs, bioretention areas, bioswales, rain gardens, living shorelines, living walls, rain barrels and Storm-Ceptors. Each of the sites has

signage that educates visitors of the specific eco-technology – how it functions and how it decreases impacts on the Bay.

This site contains many different interpretive signs with the general theme of the Chesapeake Bay. The information featured in the signage focuses predominately on the health of the Chesapeake Bay, the ecology of the Bay, and how eco-technologies on the site can treat overland runoff before entering the bay and assist in stormwater management. Specifically, the technologies featured in the Eco-Technology Walk (Figures 4-10) are bioswales, green roofs, living shorelines, living walls, rain gardens, and step pools.

The design of the Eco-Technology walk is distinct. The signage area is located in the north-east side of the site and contains seven signs focused on the different elements. One of the unique aspects of this interpretive signage area is that the subjects of each sign are generally not located near the sign. The signs reference a number and location that the visitor can go to on the site where they can find that specific landscape element.

Figure 4: Approaching the Eco-Technology Walk [Carter]

Figure 5: Sign in the Eco-Technology Walk [Carter]

Figure 6: Sign in the Eco-Technology Walk [Carter]

Figure 7: Sign in the Eco-Technology Walk [Carter]

Figure 8: Sign in the Eco-Technology Walk [Carter]

Figure 9: Sign in the Eco-Technology Walk [Carter]

Figure 10: Sign in the Eco-Technology Walk [Carter]

In addition to the specific interpretive signage on each LID technique, there is a separate Stormwater Education Experience (SEE) that features a completely different set of elements that educate visitors on stormwater issues and design opportunities. Elements featured in the SEE include permeable pavers, rain barrels, a lawn demonstration area, a solar lighting area, a beaver dam and natural step pool, manmade step pools, vegetated swales, and recycled paving.

There is supplementary signage in other locations spread throughout the site as well. Signage focusing on ecosystem information like the food chain in the Chesapeake Bay (Figure 12) and oyster restoration efforts (Figure 13) can also be found on site. Overall, it is very clear to visitors that this park's main goal is to

provide a passive experience that educates users on a variety of ecological and stormwater issues within the Chesapeake Bay watershed.

Figure 11: Interpretive signage at Back Creek Nature Park [Carter]

Figure 12: Interpretive signage at Back Creek Nature Park [Carter]

Figure 13: Interpretive signage at Back Creek Nature Park [Carter]

Selected Site Two: Floating Wetland Signage, Baltimore City Inner Harbor, MD

The second site chosen for this study was a sign located near the floating wetlands in Baltimore City's Inner Harbor area (Figure 17). The floating wetlands that are located on the south side of the World Trade Center have an accompanying sign to educate passers-by about their importance and their function (Figure 18). Unlike the site at Back Creek Park, this site was selected predominately due to its location along a significant pedestrian traffic route.

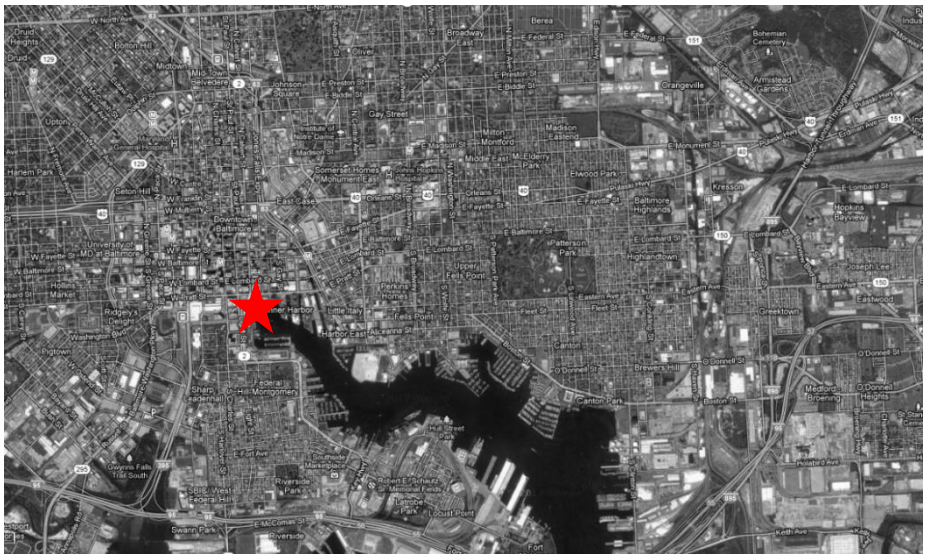


Figure 14: Location of the Inner Harbor, Baltimore, MD [Google Maps]

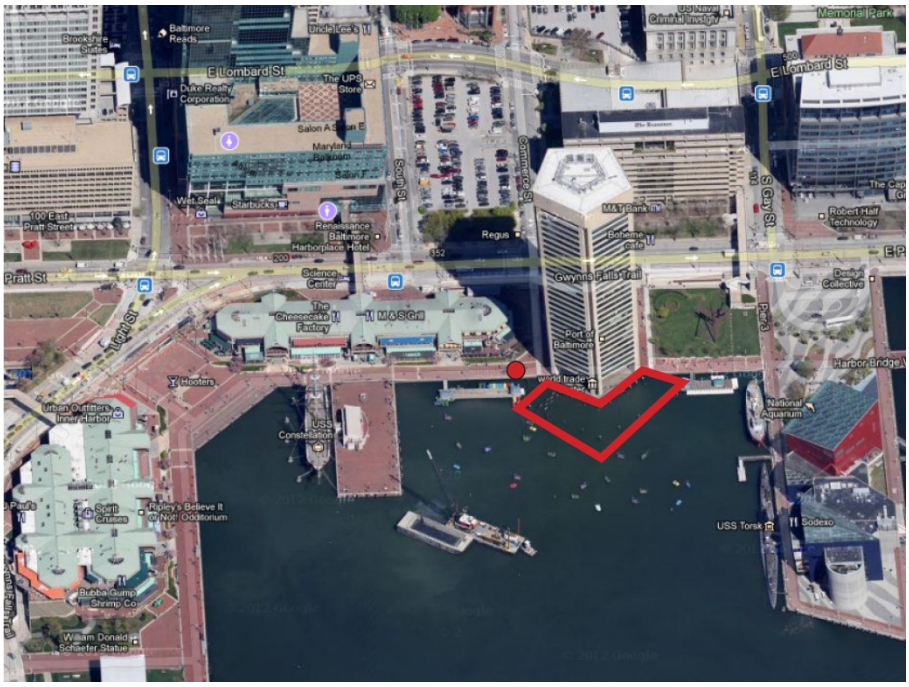


Figure 15: Location of floating wetlands and sign [Google Maps and Carter]

There is only one sign at this site and it sits on the edge of the promenade where the walkway meets the water. The sign (Figure 16) focuses on the functionality of the floating wetlands and the benefits that the structures provide the waterfront and harbor ecology. From the area next to the sign, visitors can observe the feature (Figure 17) from a short distance. While this site is near the National Aquarium, due to its location on the west-side of the World Trade Center, it is distinct from the plaza surrounding the Aquarium (Figure 18).

Figure 16: Interpretive signage next to floating wetlands [Carter]

Figure 17: Floating wetlands [Carter]

Figure 18: Site looking to the west of the Trade Center [Carter]

Contrasted with Back Creek Park, this site is much simpler and its large volume of traffic provides many opportunities to interact with site visitors who engage with the signage. In addition, since it isn't located within an education park, this education experience can be considered truly passive.

Observation

The methods selected were a field survey of subjects who had interacted with signage at selected sites. Field observations would also occur at these locations to enable a better understanding of volume of visitors, movement patterns, and human behavior trends on the site. The number of people walking past the signage was counted during 30-minute intervals of time. This number was divided into two groups - the number of people that moved through the site

without interacting with the signage and the number of site visitors that did stop and interact with the signage. Other observations included mode of transportation, weather, and spoken language (if available).

This particular set of field observations was conducted more easily in Baltimore's Inner Harbor near the floating wetlands signage due to the large number of site visitors. It was more time consuming to acquire this information at Back Creek Nature Park, where the volume of visitors was much lower and nearly 100% of the people on site had interacted with the signage.

Site Survey

In addition to field observations, surveys were conducted on each site. Selection criteria for the survey included site visitors who had visibly engaged with the signage being monitored. After the primary researcher observed a subject reading signage on each site, she would approach the person asking them if they would be interested in participating in a study. Participants were limited to those who were clearly over 18 years of age.

For the survey, I monitored the signage and after people had read the sign and were leaving, I approached them and asked them to participate in the study. Results were recorded on an iPad using a password protected Survey Monkey account. Identifying information was not collected and prior to beginning the survey, all participants verbally provided their consent. The entire survey can be found in Appendix A.

Interviews with Designers

The third method I used for this project was to interview practitioners in the field who currently work on educational and interpretive projects. To help create the best practices and understand the opinions from practitioners, I found it necessary to interview landscape architects, designers, and graphic communications experts. The goal of these interviews was to understand how landscape architects approach educational projects that incorporate interpretive signage and how graphic communicators and landscape architects work together. In addition to asking them basic questions regarding their process, I also asked the interviewees questions about best practices and design techniques they abide by, what types of materials they prefer to use, and creative examples of interpretive signage that they have designed or have encountered in their careers. Other elements of interpretive signage design were also informally discussed like how to discourage vandalism, how technology can support passive education, and graphic design principles for the signs. Using contacts of professors and from my personal research, I identified several firms or people to talk to. The synthesis of these conversations is included in the next chapter.

|| Chapter Four ||

Survey, Field Observation, and Interview Results

Ellen O. Moyer Nature Park at Back Creek

Surveying and field observations at the Ellen O. Moyer Nature Park at Back Creek occurred on two Saturdays in October and November, 2012. Conditions during these two Saturdays were mild, in the mid-50s with sun. The total number of survey participants for this pilot study was eleven (11). The volume of visitors on this site was much smaller compared to the other survey site at the Inner Harbor.

Field Observations

Field observations occurred simultaneously with the surveying work. All of the people I interacted with had at one point read one of several of the many signs in this park. Many of the people in the park were actively engaged in either reading the signage or participating in leisure activities such as walking or picnicking.

Due to the time of the year, there were no active education programs occurring in the park during site visits. In addition, most of the site's active installations (such as the stormwater runnel simulators and permeable paving sprinklers) were not working. I anticipate this site would be more active during spring and summer months when it is significantly warmer out and the nature center on-site is open.

Maintenance of the different eco-technologies seems to be an issue in this park. Several of the highlighted eco-technologies, like the step pools and bioswales, were significantly overgrown and showed signs of erosion. This lack of

maintenance made them harder to find and they weren't as apparent – even though their locations had been specifically defined on the site's maps.

Finally, one interesting design technique was the separation of several of the low-impact design installations and their corresponding interpretive signage. As described earlier, there is one section of the park that has a high concentration of signage – in the "Eco-Technology Walk". While there are seven signs in this location, only two of the actual installations discussed in the signage are within the range of sight. This lead several of the site visitors to ask me where some of the site installments were.

While conducting field observation and the surveys, I collected the following quotes from survey participants:

"I have visited this park many times and whenever I am here, I always read the signs. They are very informative."

"I think the signs are a great idea. People can learn about these systems whenever they want and don't need someone to explain it to them."

"I've learned so much in this park!"

Survey Results

Below are the results of each of the survey questions. These results are presented in the order that they were asked to the survey participants and two questions at the beginning of each survey have been omitted. The first is the informal consent question, to which everyone answered "Yes" and the question

asking the survey participants if they had read the signage. Considering this was part of the selection criteria, all survey participants also answered “Yes” to this question.

Table 1: Back Creek Park, Question #1

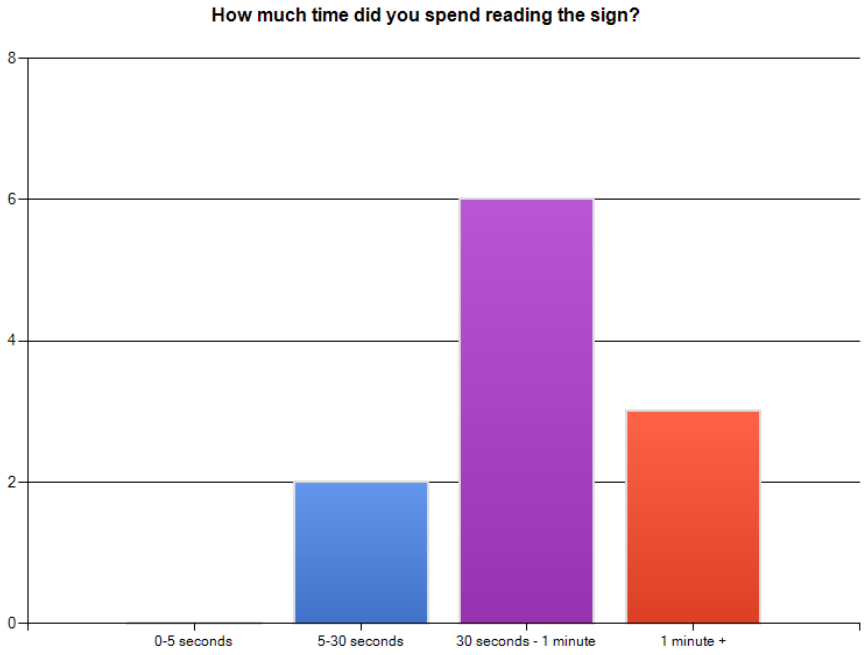


Table 2: Back Creek Park, Question #2

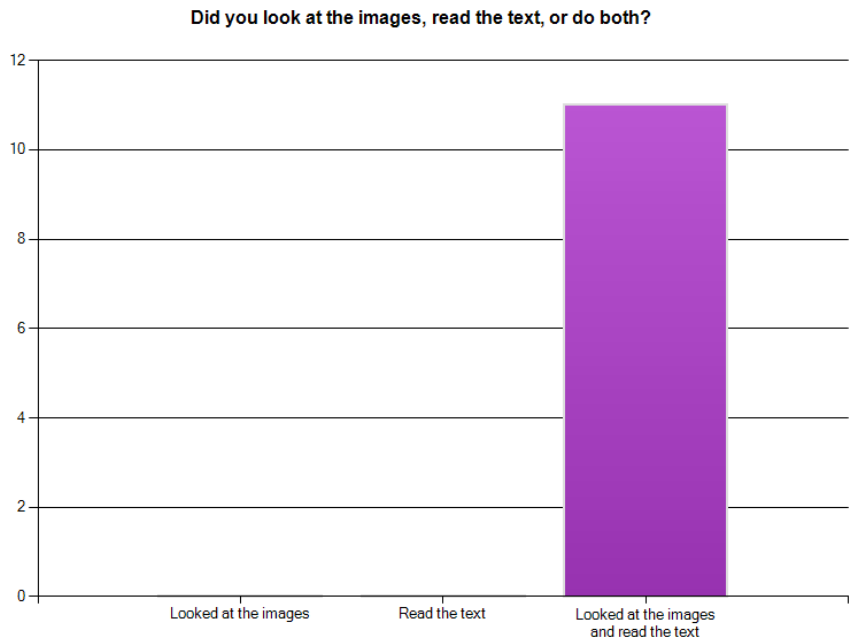


Table 3: Back Creek Park, Question #3

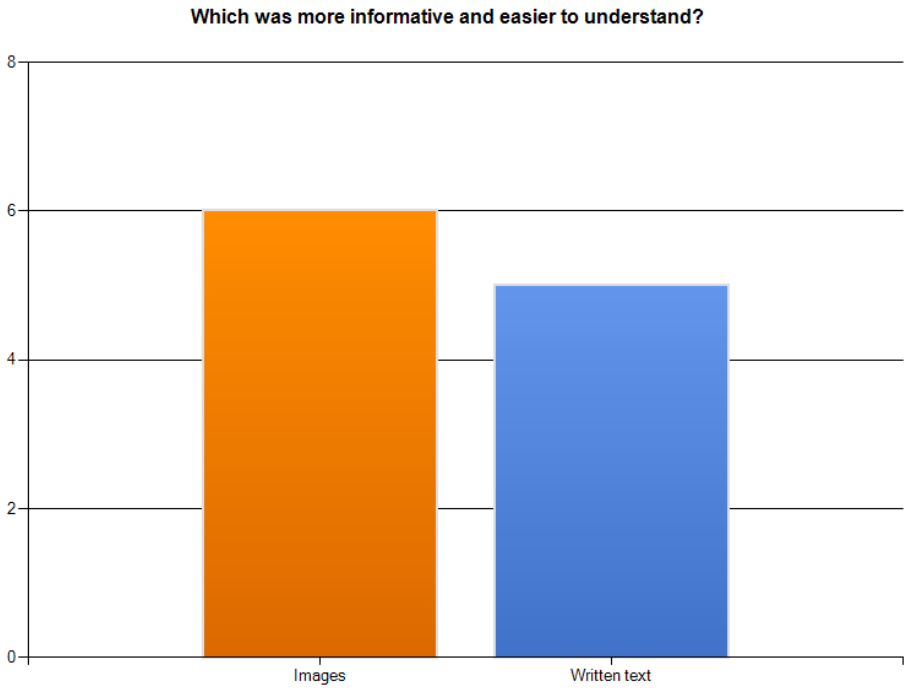


Table 4: Back Creek Park, Question #4

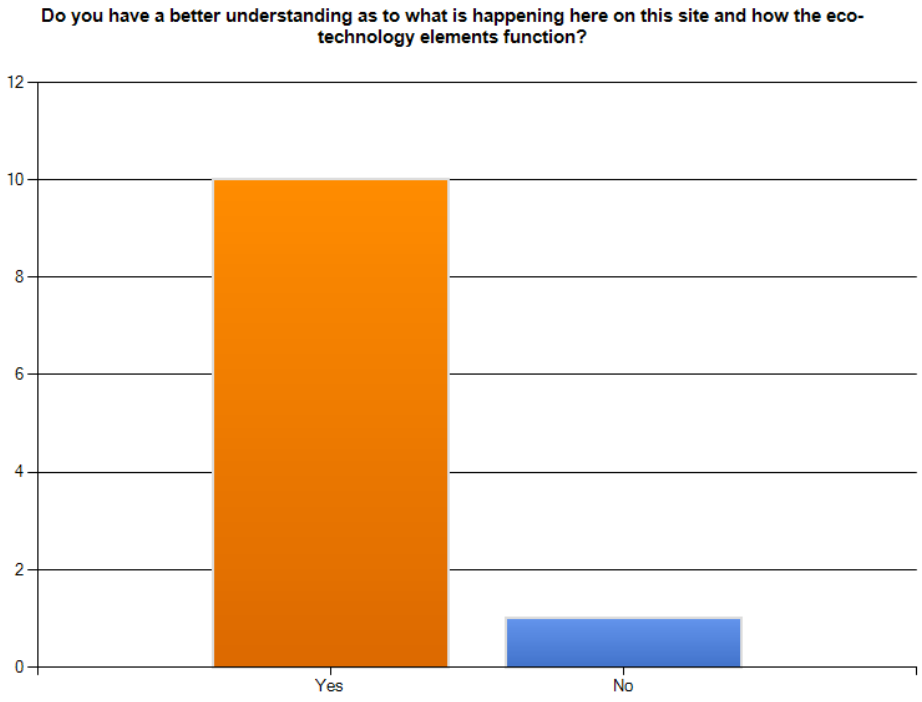


Table 5: Back Creek Park, Question #5

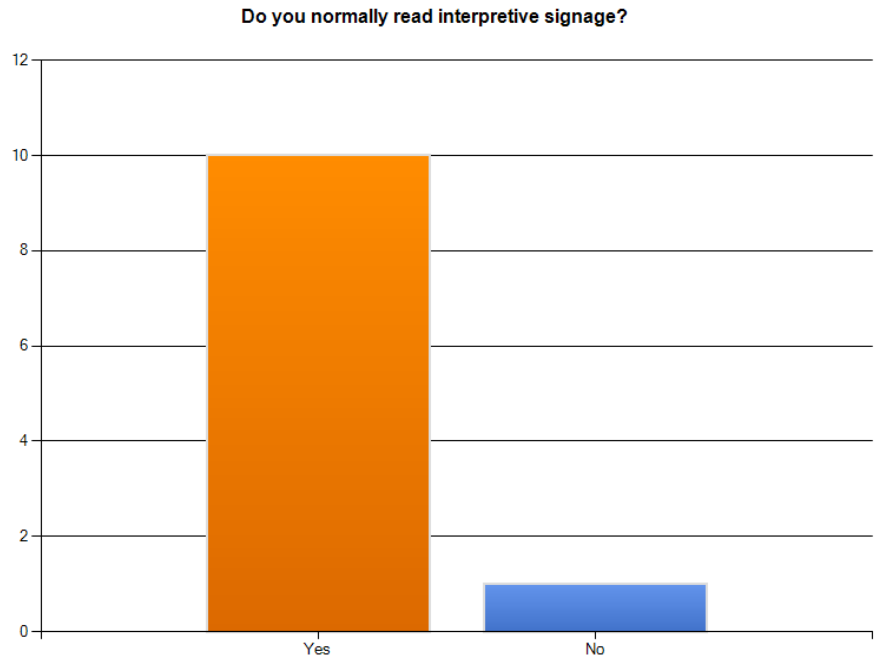


Table 6: Back Creek Park, Question #6

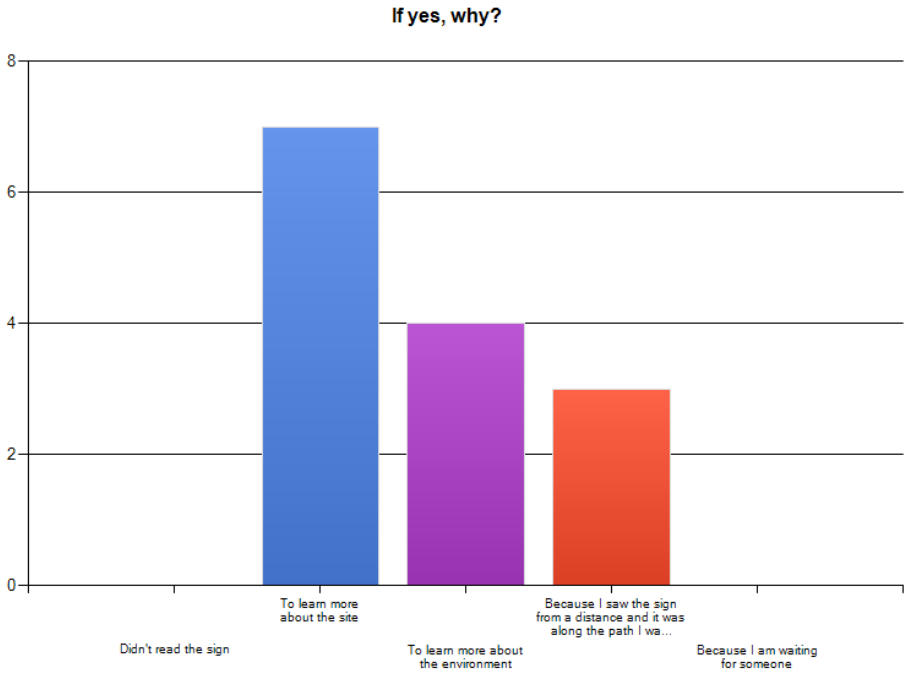


Table 7: Back Creek Park, Question #7

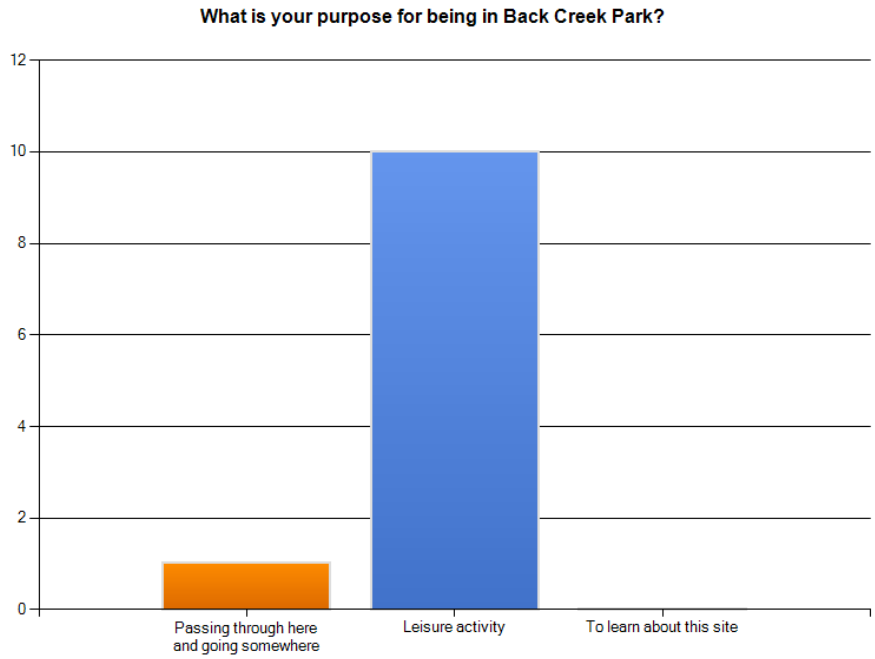


Table 8: Back Creek Park, Question #8

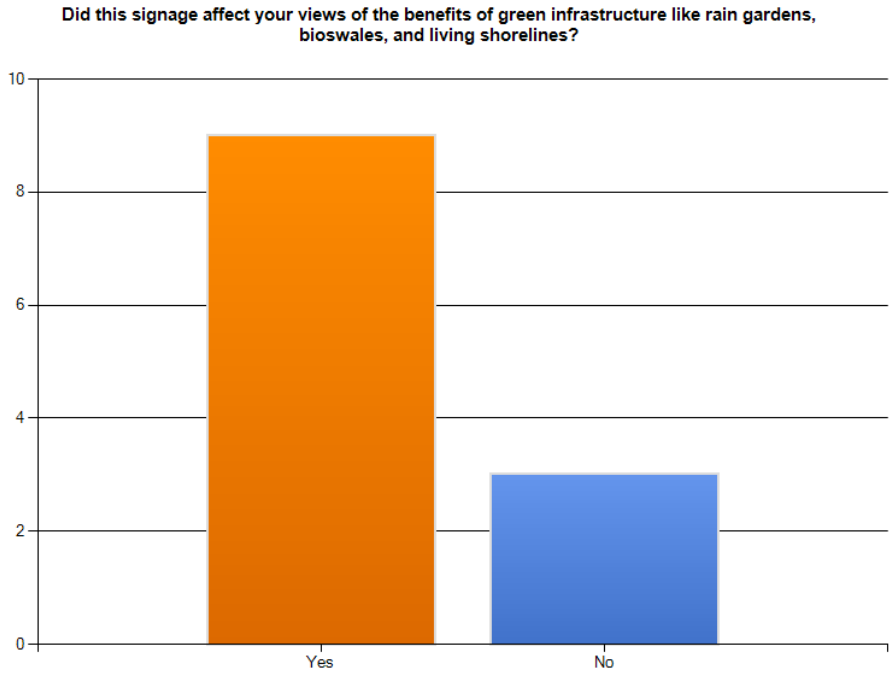


Table 9: Back Creek Park, Question #9

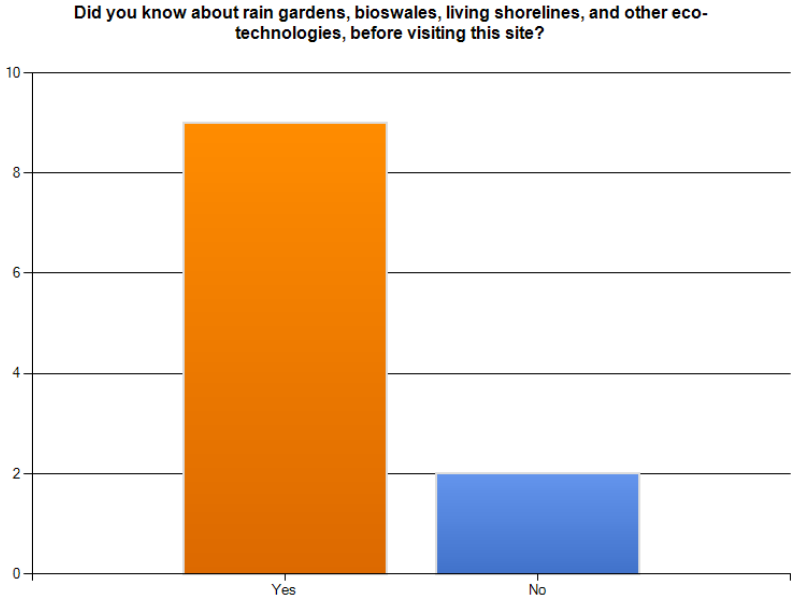
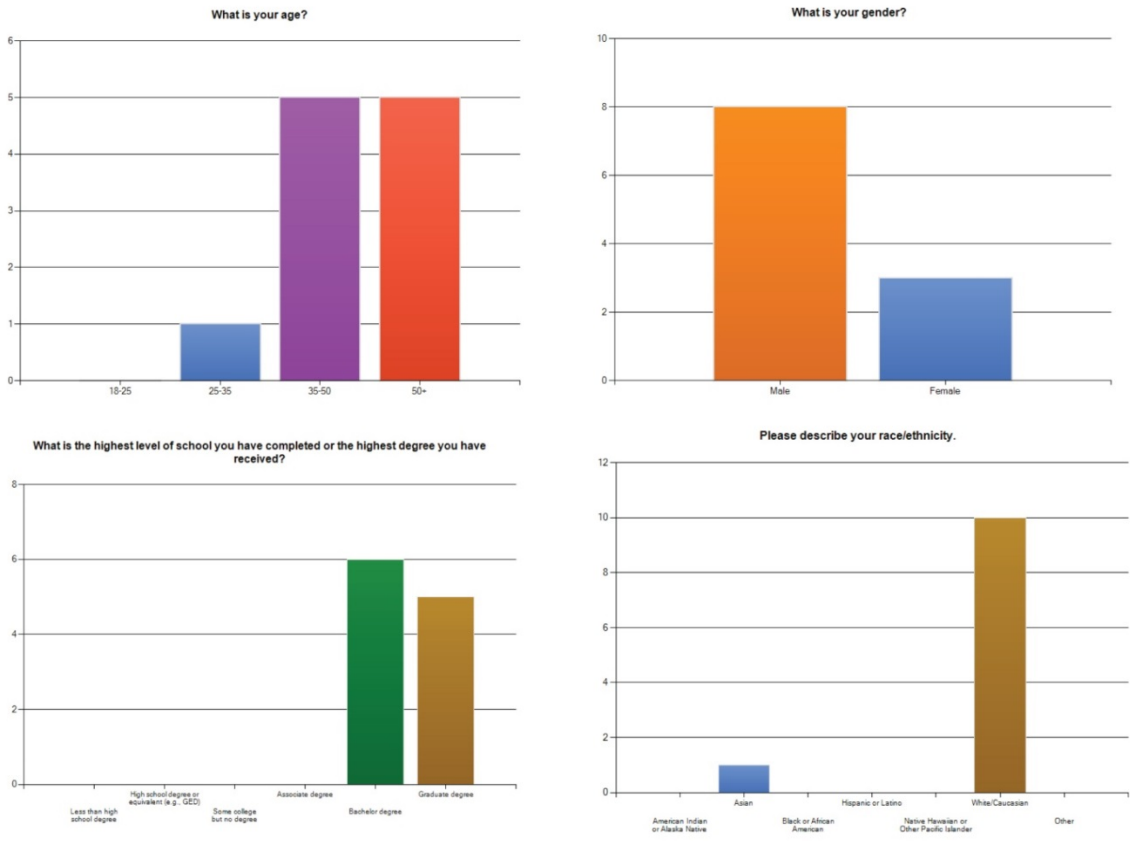


Table 10: Back Creek Park, Demographics Questions #10-14



While there were more than eleven people on the site during the survey times, site visitors were generally in groups. Thus when approached to participate in the survey, only one member of the group would participate instead of the others. Additionally, there were a significant number of children on the site and since they are not considered to be part of the target audience, they were not approached.

While I only interviewed several people with the questions about proximity to the park, most people who participated in the survey were local residents of Annapolis, lived within a few miles, and walked or drove to the park.

Results Discussion

Most survey participants read the sign for a relatively short period of time – 30 seconds to one minute (Table 1). This result shows how quickly people read the signage on average in Back Creek Park, making it important to include pertinent information on the signs.

As seen in Tables 2 and 3, site visitors looked at both the images and read the text. When asked which was more informative and easier to understand, there results were not significant with six people answering the images and five answering the text. This demonstrates the importance of integrating graphics and text, since learning styles can differ between people. This result also follows the findings from the literature review, which recommends including both graphics and written text (Bitgood, 2000).

When asked if they had a better understanding of what was happening on the site, the majority of the survey participants answered “Yes”. While this shows that there was learning, it doesn’t measure the level of comprehension of the material on the interpretive signs. This result does assist though in answering our initial question regarding the effectiveness of interpretive signage. If site visitors leave the educational experience with a basic understanding of the site’s functions that shows that the signage has been effective in communicating its educational message.

Question number five demonstrated that most people who were engaging in the signage tended to read signage on a regular basis. As mentioned in Bitgood

(2000) and Ham (1992), this tends to be one of the largest challenges with interpretive signage: the fact that it is a self-selected audience that reads signage. This could decrease the effectiveness of interpretive signage, especially when trying to reach larger audiences. This finding could also support the idea of diverse educational campaigns, with interpretive signage playing a role in educational efforts. When asked why they read interpretive signage, the majority of respondents answered “To learn more about the site” or “To learn more about the environment”. It is clear the main objective in reading the signage is to learn. A handful of survey participants also answered “Because I saw the sign from a distance and it was along the path I was following” demonstrating that there was some attraction power. For future surveying work, it might help to simplify this question with basic actions such as “To learn”. Additionally, several survey participants insisted on choosing more than one answer for this question, thus altering the results.

The eighth question in this survey asked survey participants if the signage affected their views of the benefits of green infrastructure. The majority of participants answered “Yes” to this question, demonstrating that these types of interpretive displays can positively impact perception. A final finding from this surveying was that the majority of the survey audience was aware of the existence of green infrastructure and eco-technologies prior to visiting the site and reading the signage.

This pilot study at Back Creek lead us to ask several site-specific additional questions that could assist in determining if the signs on this site are effective.

While the literature demonstrates that it is ideal to locate the interpretive signage near the installation, this practice doesn't happen in Back Creek Park. This leads us to ask if this affects learning and comprehension - since the installations aren't near many of the signs, does that affect the amount of information retained? For additional surveying, one way to determine this answer would be to test basic comprehension and ask a short answer questions. It could be challenging to directly correlate this signage with that outcome though, since many site visitors were previously aware of these types of technologies (Table 9).

There are several reasons that this survey population is well educated on low-impact design. The first is due to the level of education that the participants had completed (Table 10). It is also possibly the result of large scale education efforts that have occurred from organizations and the media regarding the health of the Chesapeake Bay (Chesapeake Bay Foundation, 2012). To clarify the reasons behind this educated audience, a follow up question asking the survey participant where they originally learned about these technologies might provide a better understanding of additional education efforts that are reaching the public. Finally, to determine whether or not education and awareness leads to support of these technologies another question that could be asked is "do you support increasing these types of technologies in the landscape?"

Inner Harbor

Surveying at the Baltimore City Inner Harbor occurred over one Saturday in mid-November, 2012. The conditions were mild, temperatures varied between 54 and

58 degrees, and it was sunny out. The total number of participants for this pilot survey was ten (10).

Field Observations

Field observations occurred before surveying took place. The first field observation was to count people who passed or stopped at the interpretive sign. During a 30 minute interval, 829 people passed the sign and of that sample population, 19 stopped to read the signage – approximately 2.3% of the people who walked by. This percentage seems low when compared with the studies completed by Knapp and Barrie (1999) and Cable et al (1987).

One of the significant trends noticed during observations was that groups of people would stop to read the signage when there were several people already reading the signage. Thus, if people already occupied the site, more people were attracted to it. Once people had left the signage, it was less likely that people would stop and read the signage unless they saw the wetlands and then realized there was a sign next to it.

There were other noticeable reasons why some of the passersby were not stopping at the sign. The first reason that people did not stop was their method of transportation. This included people who were running or bicycling through the site. Another factor was the visibility of the signage. The sign is located on the side of one of the main paths along the Inner Harbor (Figure 20). Unless people were already standing there and reading the sign, it appeared that it was less

likely that others would see it unless they were reading other signs along the waterfront or had seen the floating wetlands which sparked interest.

An additional observation that could have caused people to pass the signage was a possible language barrier. During observations, I overheard several groups of people who were not speaking English. This sign is entirely in English, so a lack of understanding could be a cause. And finally, when there were others reading the sign, there tended to be limited room. While the fact that people were standing around the signage attracted others, it also caused others to turn away since the signage wasn't large enough to accommodate everyone.

Finally, considering this site is located on a large, urban waterfront, distractions also likely play a large role. There are a number of destinations in the immediate surroundings of this site including numerous restaurants, the National Aquarium, and historic naval ships. As discussed in the literature, distraction plays a large role in the number of people that stop and engage with interpretive signage. It is clear that the many distractions on near this site likely contribute to the low visitor numbers.

From informal conversations with the participants I surveyed, I gathered the following quotes:

"I was attracted to the signage because I am a fisherman and there are perch in the photo. I was wondering if Perch lived here in the Inner Harbor."

"I had no idea what those floating plants were. I thought that was an island in the Inner Harbor"

“I’m glad to see the city is doing something to improve the Inner Harbor’s water quality. I wouldn’t have known about it if I hadn’t read that sign.”

Survey Results

Below are the results of each of the survey questions. Similar to the surveying from the Ellen O. Moyer Nature Park at Back Creek, these results are presented in the order that they were asked to the survey participants. The two questions at the beginning of each survey have been omitted. The first is the informal consent question, to which everyone answered “Yes” and the question asking the survey participants if they had read the signage. Considering this was part of the selection criteria, all survey participants also answered “Yes” to this question.

Table 11: Inner Harbor, Question #1

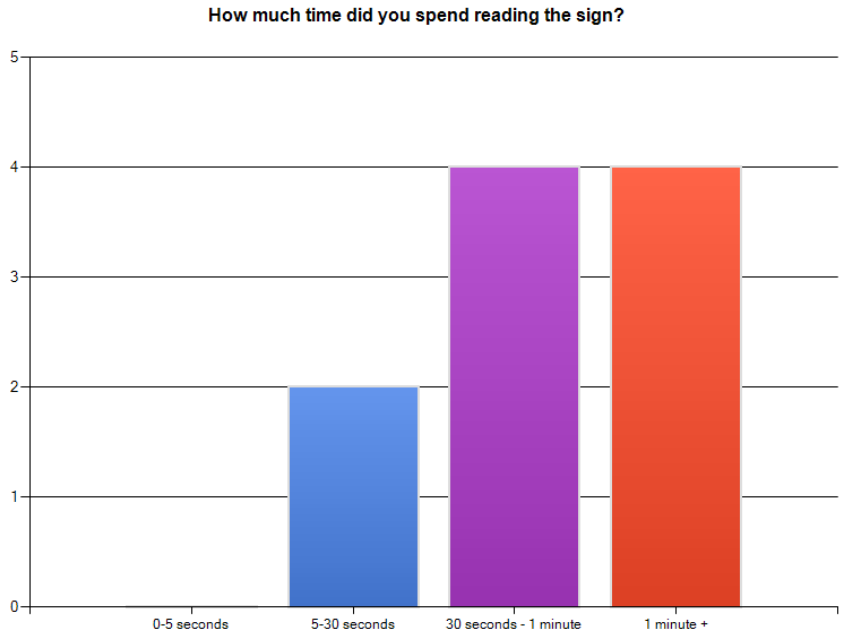


Table 12: Inner Harbor, Question #2

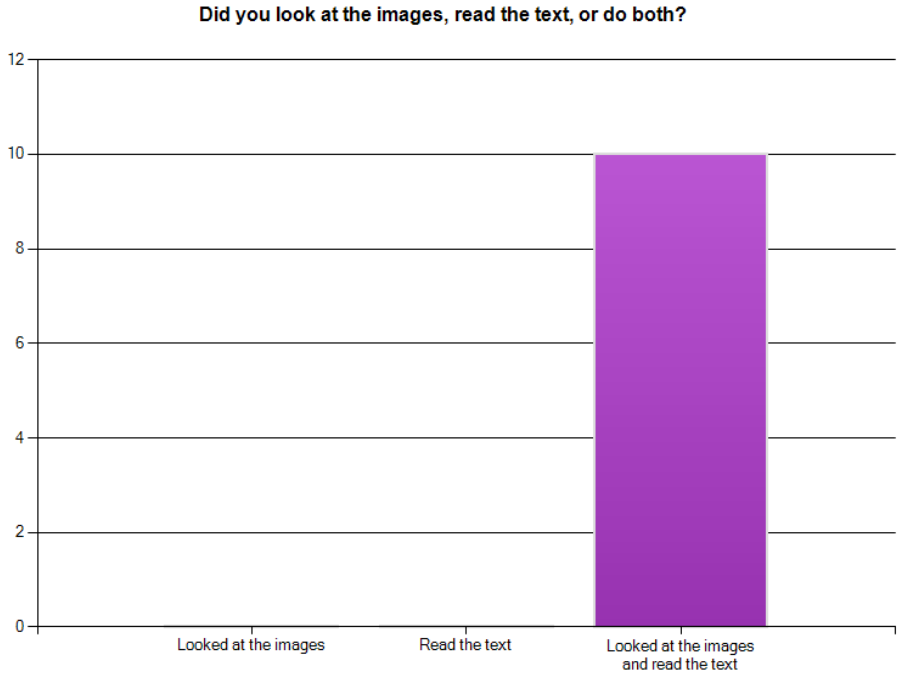


Table 13: Inner Harbor, Question #3

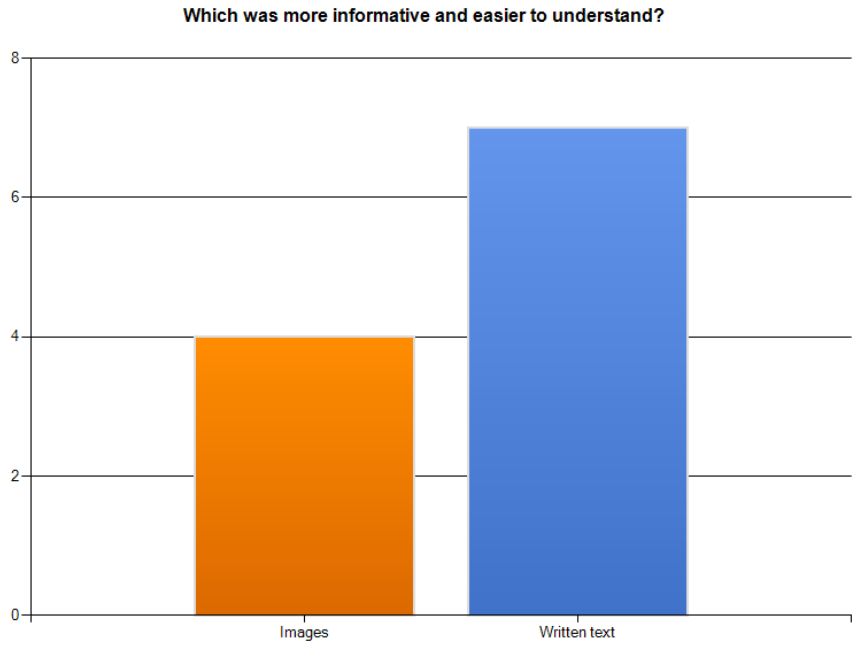


Table 14: Inner Harbor, Question #4

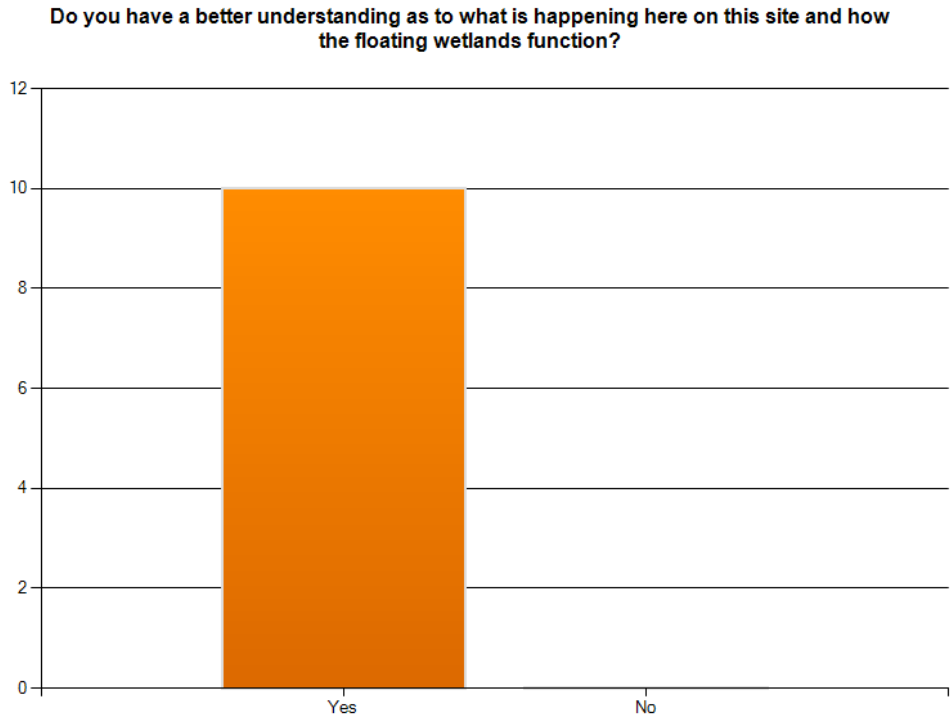


Table 15: Inner Harbor, Question #5

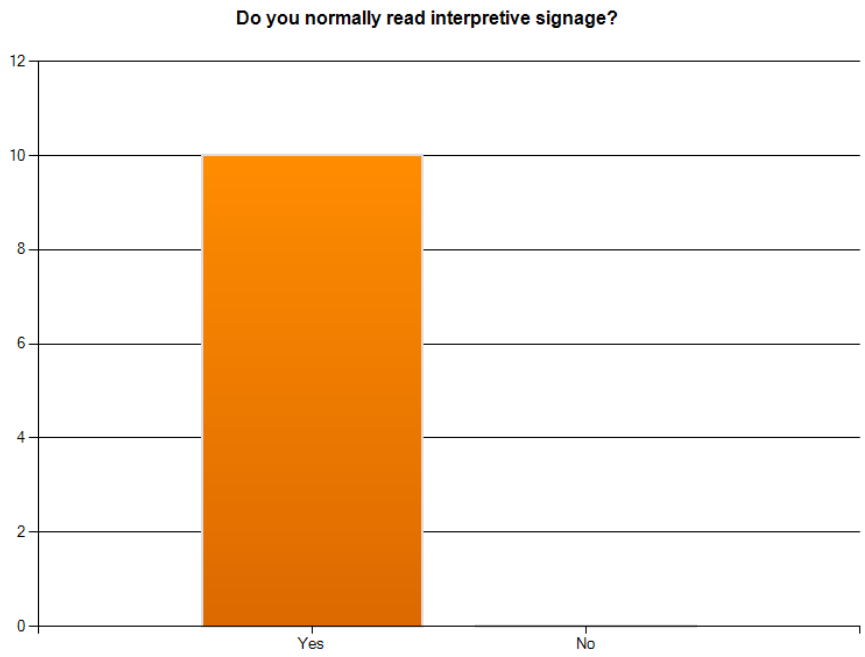


Table 16: Inner Harbor, Question #6

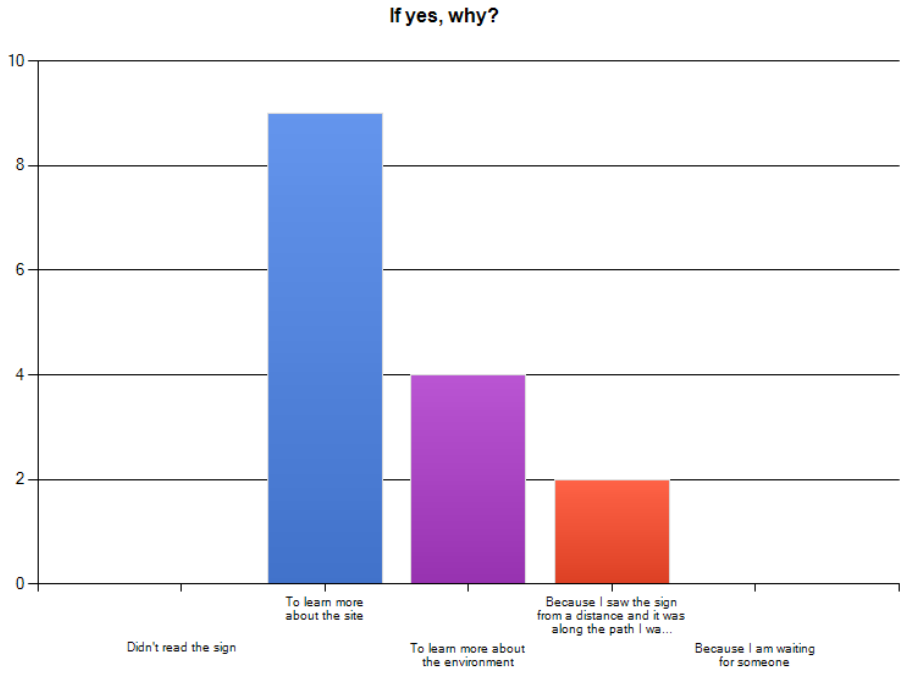


Table 17: Inner Harbor, Question #7

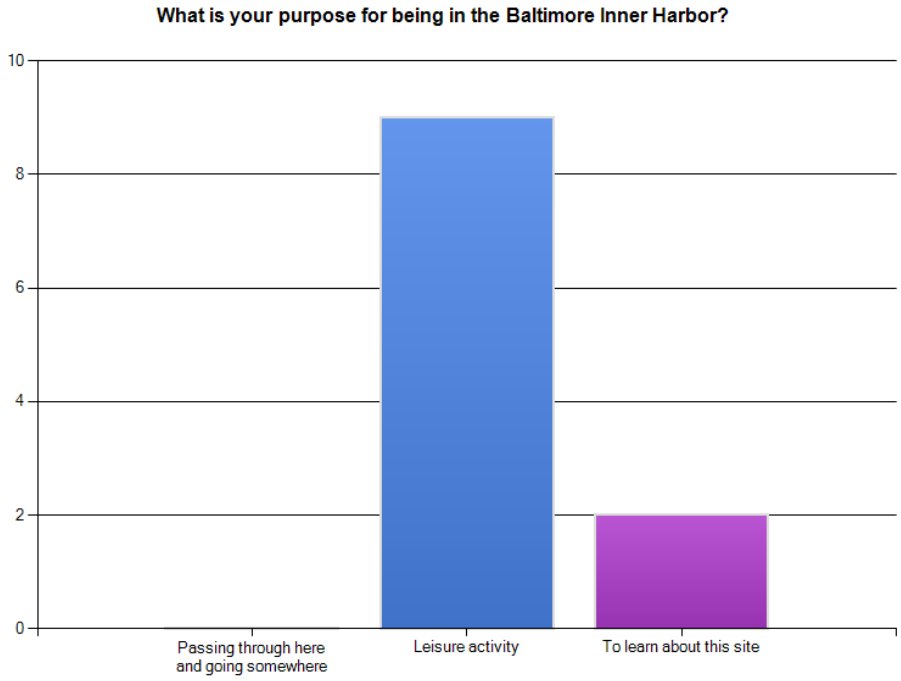


Table 18: Inner Harbor, Question #8

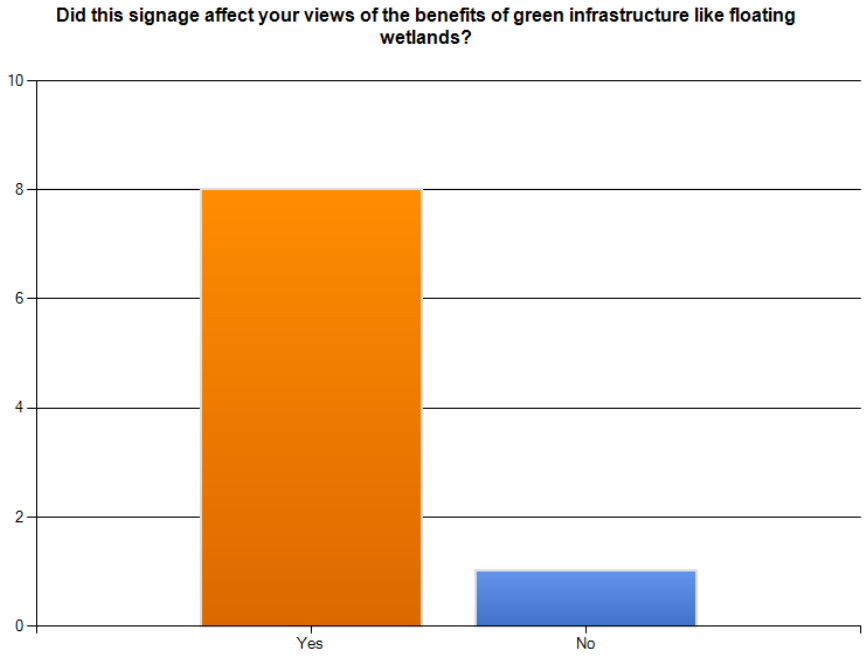


Table 19: Inner Harbor, Question #9

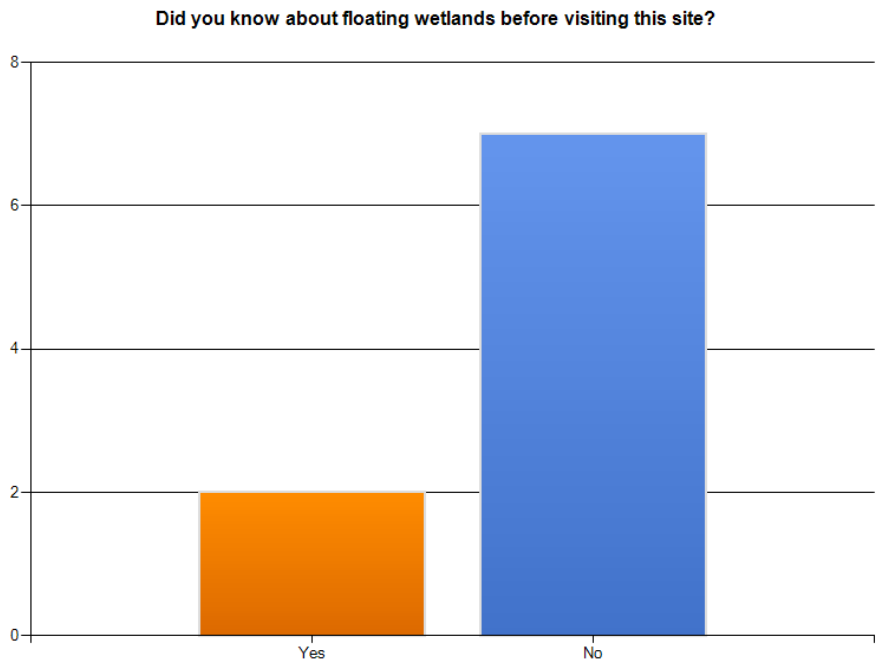


Table 20: Inner Harbor, Question #10

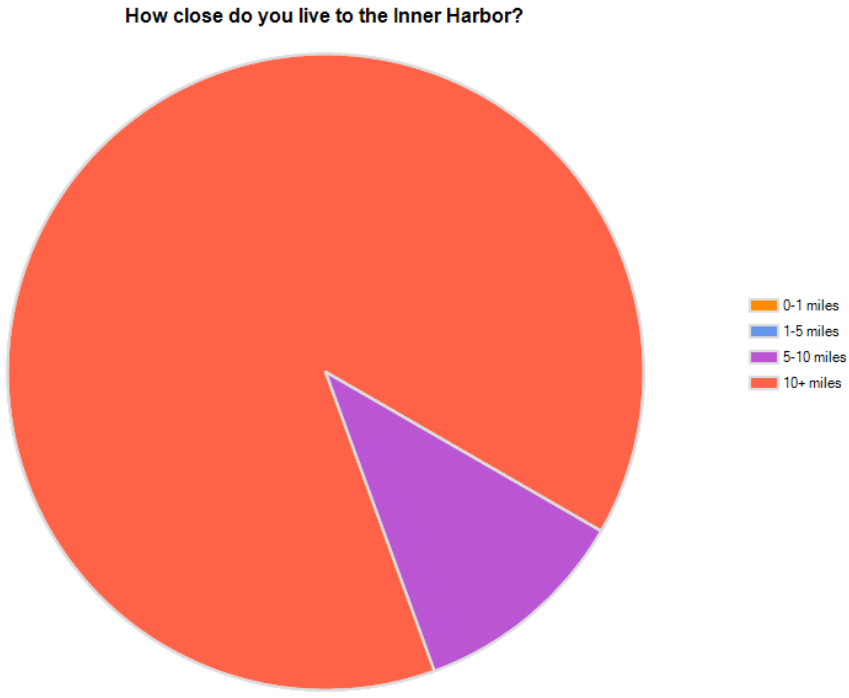


Table 21: Inner Harbor, Question #11

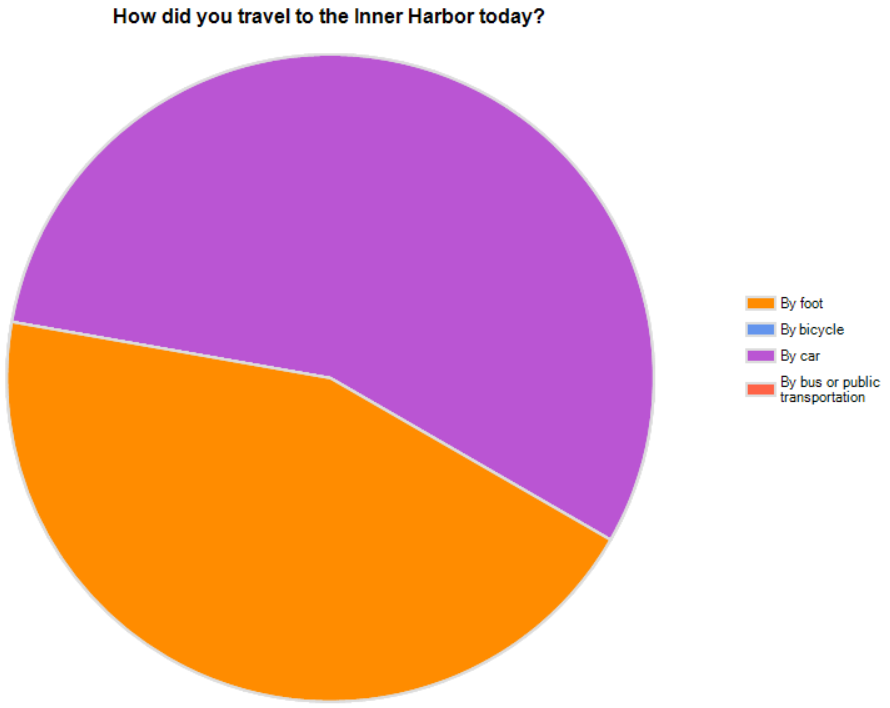
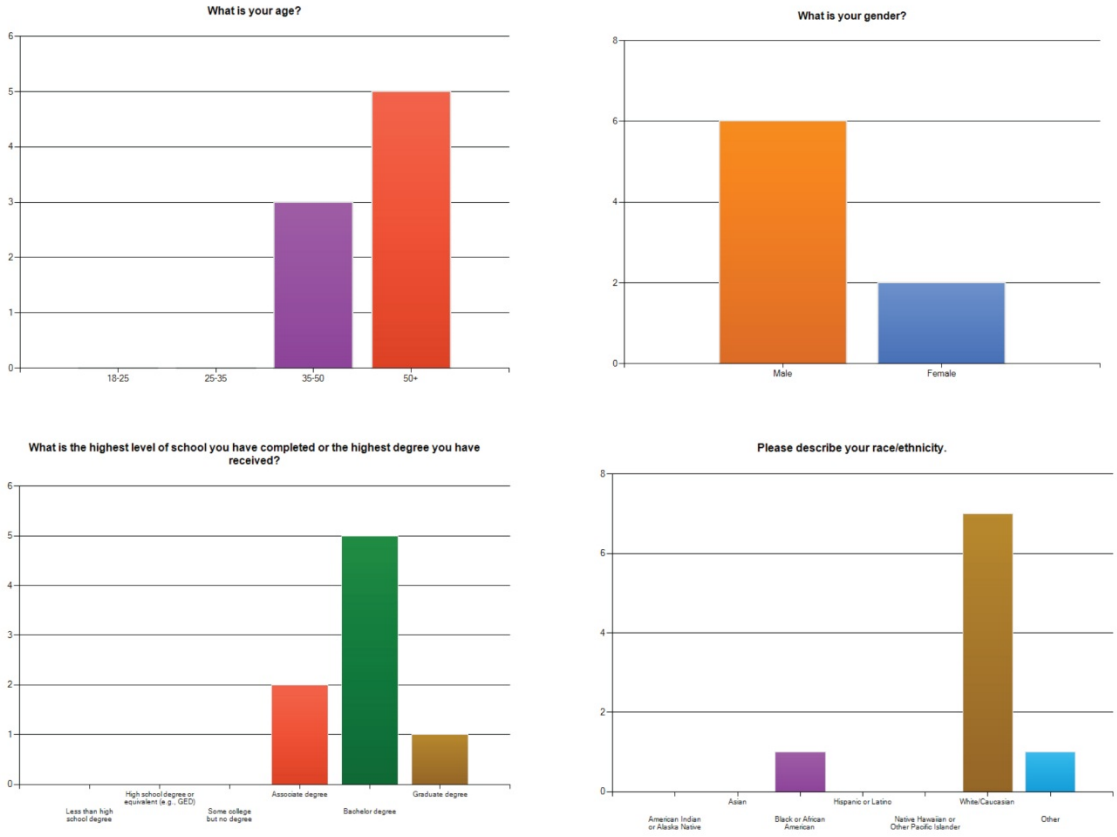


Table 22: Inner Harbor, Demographics Questions #12-15



Results Discussion

The first question in the survey shows an equal number of people who read the sign for 30 seconds – one minute and more than one minute (Table 11). The sign on this site has a significant amount of information - likely causing the increase in the time spent reading the sign. Additionally, it was observed that many of the survey participants spent time looking back and forth between the floating wetlands and the sign.

As seen with the surveying at the Ellen O. Moyer Nature Park at Back Creek, all of the survey participants read the text and looked at the image (Table 12). On this site though, more respondents claimed that the text was more informative

and easier to understand (Table 13). While additional research needs to be conducted to determine why, these two questions support the need to include written text and images on interpretive signage since the learning needs of site visitors can differ.

Another result similar to the results from Back Creek Park was that all the survey participants answered that they had a better understanding of what was occurring on the site (Table 14). This demonstrates that the sign was effectively communicating the processes that were occurring on site although long-term comprehension is uncertain. Additionally, all the survey participants at the Inner Harbor were a self-selected audience, as they normally read interpretive signage (Table 15). The majority of this population also read signs “To learn more about the site” and “To learn more about the environment”. As mentioned earlier, this question might benefit from simplification to assist in determining why people read interpretive signage.

Compared to the signage at Back Creek Park, it could be argued that this sign in the Inner Harbor is more effective. Questions 8 and 9 show that not only did the sign positively affect the participant’s views on floating wetlands (Table 18), but that fewer people were previously aware of the existence of floating wetlands prior to visiting this site (Table 19). As seen in the demographics questions (Table 22), the audience at the Inner Harbor is more diverse than the audience at Back Creek Park. This, coupled with the fact that many site visitors are not local (Table 20), provides a significant reason as to why this educational signage is important and has the ability to reach a larger audience. There is a large

opportunity to educate a variety of people at this site, thus potentially increasing the relative effectiveness of this specific educational sign.

There are several additional questions that have arisen from the field observations and surveying. These include:

- Would more cultural cues near the signage increase the number of people who come over to the sign?
- The wetlands are easier to see when approaching the sign from the west – do more people who come from this direction stop and look at the signage versus those approaching from the north or east?
- What do people who read this signage see first, the sign or the floating wetland?

Conclusions

From the field observations and surveys, several best practices can be established:

Signage design: As demonstrated by the survey results, it is important to include both images and text on interpretive signs.

Size of panels: The field observations demonstrated that smaller panels might deter others from reading the sign if others are in front of it. For this reason, it is important to understand the demand and size of the audience on site and size the panels accordingly.

Additional questions mentioned in the discussion should be included in future surveying efforts to determine how the site design can affect attraction power, holding power, and comprehension levels.

Interviews

To help create the best practices and understand the opinions from practitioners, I found it necessary to interview landscape architects, designers, and graphic communications experts. The goal of these interviews was to understand how landscape architects approach educational landscape projects that incorporate interpretive signage and how graphic communicators and landscape architects work together. In addition to asking them basic questions regarding their process, I also asked the interviewees questions about their best practices and design techniques they abide by, what types of materials they prefer to use, and creative examples of interpretive signage that they have designed or have encountered in their careers. Other elements of interpretive signage design were also informally discussed like how to discourage vandalism, how technology can support passive education, and graphic design principles for the signs. In this following section are some highlights and findings from these conversations.

Interviewee #1, Chesapeake Ecology Center and Rainscapes.org

During my field observations and initial research regarding signage programs in the Baltimore/Annapolis/Washington, D.C. area, I discovered two local programs focused on the design and installation of educational signage – Rainscapes.org (Figure 19) and Chesapeake Ecology Center. While each of their man focuses isn't specifically on signage, it is promoted as a tool to increase awareness of

how low-impact design can affect the health of the Bay. Rainscapes.org began from a US Fish and Wildlife Grant and its primary goal is to promote the construction of low-impact design elements and educate people on how to reduce water pollution entering the Bay (Rainscaping.org, 2012). Similar to Rainscaping.org, the Chesapeake Ecology Center's main mission is educating the public about conservation landscaping and community greening and how these practices can impact the Bay (Chesapeake Ecology Center, 2012).

Figure 19: Rainscaping.org sign at the Ellen O. Moyer Nature Park at Back Creek, [Carter]

As a part of their educational mission, each of these organizations promotes the use and installation of interpretive signage with rainscaping and low-impact design projects. Following a conversation with Interviewee #1 who works with these organizations, I learned more about their mission, why they have incorporated signage.

Interviewee #1 did speak to her knowledge of graphic design principles and what they have tried to achieve in the design of the sign templates for both Rainscaping.org and the Chesapeake Ecology Center. One of her goals for creating the signage templates was to take the burden off other organizations

who are interested in installing educational signage. The goal of providing templates is to help smaller organizations and groups save time and resources since the design and implementation of signage can be a time-consuming and expensive process.

She and I also discussed the idea of incorporating technology into passive education since many site visitors now have instant access to websites via their cell phones. While this is the goal of the Rainscaping.org website and campaign, she discussed how maintaining websites with dynamic and important information can be a very time consuming process. Her thoughts were that while it could be a strong educational tool, if not maintained correctly, these can actually hinder the education opportunity. Interviewee #1 tries to create content and materials that are more general and not as site specific so it can be more broadly implemented for a larger impact (Figure 23).

Some of her graphic design recommendations included:

- Pay attention to graphic versus text ratios. This is an important part of the visual element and it is important to have an equal amount or more images than text.
- Due to short attention spans, make sure the keep sentences short and preferably in bulleted format. This gives the reader the topline information but doesn't divulge too much which might lead to a decrease in interest.

Figure 20: Rainscaping.org green roof and rain barrel installation, Quiet Waters Park, [Carter]

Interviewees #2 and #3, Biohabitats

Biohabitats is a firm in Baltimore, MD that focuses on environmental restoration projects and master planning. Many of their projects include educational components such as interpretive signage, to help teach site visitors about the importance of restoration and using low-impact design.

I discussed their signage projects with two employees at Biohabitats. During our conversation we discussed three sites: the sign of study location #2 at the Inner Harbor's floating wetlands, Washington Avenue Green, and Leonardtown Wharf. While the sign at the Inner Harbor was added later, the interpretive signage at Leonardtown Wharf and Washington Avenue Green was incorporated into the original design of the site and the graphics were designed in-house.

From our conversation, there were two major ideas that transcended our conversation: the first was the importance of including cultural cues on the site to entice a visitor to stop, and the second was the idea of signage fatigue. Other topics also were discussed, similar to other interviews conducted, such as vandalism, best materials, basic design principles, and post-occupancy evaluations.

The first theme that was discussed was how including additional cultural cues such as benches and bicycle racks can assist in the attraction power of signage. One example that was provided was from Washington Avenue Green. The site that is bisected by a bike path so many visitors who arrive on site are passing through on bicycles and not necessarily arriving for educational purposes. For this reason, it was important to include cultural cues like bicycle racks (Figure 24) at each entry point on site to signal visitors to stop. Other furniture like benches and picnic tables also provide cues to stop and spend time in the park.

An additional topic of conversation was how to provide enough information to provoke curiosity from the reader but not over do the interpretive experience. There are two ways to saturate the experience, the first is through a design that incorporates too much signage and the second is by designing panels that contain too much information. It is important to strike a balance when designing an interpretive experience, which can be hard for professionals who are very knowledgeable about these topics. It is ideal then to have a very firm understanding as to who the audience is because with this information, it is easier to understand the most effective way to communicate with them.

The final significant point of conversation was making sure that additional senses outside of sight can also be engaged in the educational experience. One of the design techniques that Biohabitats used for both Washington Avenue Green and Leonardtown was including boardwalks across some of the restoration sites that allowed visitors closer access to the educational subjects. This assists in engaging additional senses and enhancing the educational experience. It also creates a more poignant destination on the site that provides intrigue and gives the visitor a sense that they are in a distinct space within the site.

We briefly discussed how vandalism can be a big deterrent for interpretive design. Many interpretive panels are subjected to vandalism in large urban areas, so in some cases organizations avoid installing educational stations to avoid maintenance and replacement costs. We also discussed the fact that firms rarely complete in-depth post-occupancy evaluations of sites that include surveying and field observations. While this is recommended for outdoor education (Medlin and Ham, 1992), very few clients chose to incorporate these studies into the scope of their contracts. Post-occupancy evaluations are important because they provide user feedback that can assist in site adjustments to make the experience more engaging and effective.

Finally, the interviewees shared some of their guiding graphic design principles for interpretive signage. They recommended that panels include high contrast colors, large panels that can draw people in from a distance, and engaging graphics that balance the text (see example in Figure 26).

Figure 21: Interpretive sign designed by Biohabitats, [Carter]

Interviewee #4, Wetlands Research Associates

Wetlands Research Associates, an environmental consulting firm, has several offices located throughout California. While the main focus of their work is environmental restoration, they also have several Landscape Architects in their Renovo Studio. Similar to the work that Biohabitats does, WRA has designed many restoration sites that incorporate passive education and interpretive signage. I spoke with a landscape architect on staff who has worked on several signage projects WRA has completed.

According to Interviewee #4, restoration sites can pose certain challenges for outdoor passive education mainly due to accessibility restrictions and complex scientific processes that interpretive experiences tend to discuss. One of the first things mentioned was that universal accessibility to comply with ADA standards

can be challenging for restoration sites. Since these sites are trying to return to pre-developed goals, there is a balance that needs to be stuck between the needs of the user and the needs of the natural site. Since the goals of restoration should not be compromised for the user, this can be a difficult barrier to overcome. Another challenge with wetland restoration sites is that many times the educational messages focus on "invisible" processes such as water cleansing and general ecosystem health. Some of these topics can be complicated and difficult to break down into a simple message. When faced with these challenges, it is important to understand your audience as that can affect how you craft your message and design the site.

Also mentioned was the lack of thorough post-occupancy evaluations in the projects she has worked on. She said that the implementation of these practices could make interpretive signage programs more effective. Similar with other interviews, these types of evaluations would assist in determining a sites positive and negative attributes and could help make a site more effective in its ability to achieve educational goals.

Interviewee #5, Mayer/Reed

Mayer/Reed, a firm located in Portland, OR, is a combination of two studios – a graphic design studio and a landscape architecture studio (www.mayerreed.com, 2013). This unique combination of talents provides their designers a unique perspective into each profession and allows them to take an integrated approach towards educational projects that incorporate graphics and site design in the early stages.

Due to their significant work in educational site design, I contacted a Landscape Architect at Mayer Reed, to discuss design best practices and how Mayer/Reed integrates the two studios in its projects that incorporate interpretive signage and educational landscapes. Interviewee #5 mentioned similar best practices to the other interviewees (e.g. providing additional cultural cues and basic graphic design principles) but he focused some of his comments on designing to prevent vandalism. He has worked with the Portland Police and through this collaboration he learned that people who tend to vandalize signs prefer panel signs that seem like a canvas. From his experience and work with the Police Department, he recommends designing interpretive signs with curved surfaces (such as interpretive signs curved around a pole). These tend to receive less vandalism because of the lack of a flat surface.

Interviewee #5 also spoke to his experience working with a communications team that is integrated with his work and specific projects. He said that it is very helpful to have a communications and graphic design team working with you because they understand the projects from a deeper level and are able to create interpretive elements that not only reach the educational goals of the site but also support the design goals of the site. One example of the importance of incorporating graphic artists into the planning and design of the site early on is because it is important for the graphics team to understand how the design of the site might affect how people view the interpretive signs. He used his earlier example of the story telling poles and said that if either the landscape architect or the signage designer didn't understand how the interpretive experience

interacted with the site, part of the sign itself might not have been visible to viewers. This partnership is also important so the signage designer understands what elements are most apparent in the site design and how the graphics can assist the visual connection between the sign and the site element.

Similar to other interviewees, Interviewee #5 stressed the importance of post-occupancy evaluations. While he too has not had many clients formally request post-ocs, he always makes a point of visiting his sites after they have been constructed and interacting with site visitors, asking them about their experiences and how they like the site. He said that not only does this help him identify things that work well and others that might not, but it demonstrates to his clients a level of care for his projects.

Interview Analysis

From these interviews, several themes emerged that generally support the findings of the literature review.

Integrated teams: One of the most important findings from these interviews was to understand the importance of integrating the design of the interpretive signage with the design of the site. According to each of these interviewees, the design of the site is critical to directing the attention to interpretive signage and achieving educational goals. If these interactions happen to late in the design of the site, it could provide less-effective signage and lead to the need for site retrofits after completion.

Cultural cues: Including additional cultural cues outside of the signage itself is important to help attract visitors to the education experience by signaling a stopping point on the site. Basic cultural cues that should be incorporated into site design include: benches, picnic tables, bicycle racks, shade structures, lighting, well maintained plantings, and trash cans. Other large scale cultural cues could include: food vendors and significant views and look outs.

Vandalism: A major issue, especially in large urban areas. While there are some thoughts as to how to avoid it, few studies can provide significant findings as to how to design to deter vandalism. This alone can be the sole determining factor for organizations that have limited budgets and resources to care for and replace damaged signage.

Accessibility: Universal accessibility is an important component of designing successful interpretive and passive education sites. Ensuring that interpretive signage is ADA compliant enhances the user experience for all site visitors and allows all to participate.

Understanding the audience: The content of interpretive panels should depend on the targeted audience. Specifically, the age of the target audience can determine the content of the interpretive panels, the size and height of interpretive panels, and the number of educational experiences in a space. Without understanding the target audience, it is difficult to design effective passive education.

Post-occupancy evaluations: One of the rarer occurrences, but arguably one of the most important, is the completion of a post-occupancy evaluation to determine how users perceive the site and if it is achieving educational and design goals. This allows site designers to implement updates that may significantly affect the user experience.

|| Chapter Five ||

Best Practices

Using the findings from the literature review, surveys, field observations and interviews, a list of design best practices for green infrastructure interpretive signage has been established. These best practices will be presented based on the scale that they apply to, moving from a large, planning- based scale to site-specific scale and ending with graphic recommendations.

As discussed in the literature review, these best practices specifically target the attraction power of the signage with recommendations for site design. Basic recommendations for graphics have also been included, based on significant information found in the literature and from conversations with the interviewees.

Conceptual and Master Plan Development

The first step in designing for interpretive signage is at the conceptual and master planning level. The following best practices should be incorporated from the starting point of the project to ensure a successful interpretive education experience

Integrated teams: If possible, engage all members of the design team from the beginning of the project. Emphasized in the interviews, many designers recommended this because it allows the landscape architect, graphic designer, and other team members to participate in determining goals for the project, establishing clear educational messages, and design detailed sites. This also

allows for more creativity in the design process if all parties are actively participating and understand the goals of the project. (Interviews, 2013)

Relevance: Select sites for interpretive signage based on the educational experience that it possible. To ensure that the signage is relevant, determine the importance of the interpretive experience that is being designed. Also, determine if the educational experience is a primary experience (the main reason for visiting the site) or a secondary experience (provides additional information but supplementary) (Asbaugh and Kordish, 1971).

Clear theme: Make sure that the interpretive experience has a clear theme. This recommendation is most important if designing for multiple signs. Signs with logical, relevant information steps from one sign to another assist the site user in creating an information network on the subject and ensure a more comprehensive experience (Kaplan, 1998, and Bitgood, 2000).

Audience analysis: Understanding the site visitors and readers is critical in designing a successful and effective interpretive education experience. This will inform not only the site design but the communications and graphics. While many sites need to accommodate multiple audiences, if possible incorporate elements that target specific audiences such as children, elderly, and disabled (Interviews, 2013).

Site specific design

Distribution of educational elements: If including signage on more than one specific element, make sure they are distributed throughout the site and not

concentrated in one small area – this could lead to signage fatigue and sensory overload (Bitgood, 2000).

Trail shape: If the interpretive signage and educational experience is being shaped by a trail, circular trails are generally preferred and should be between 1/8 mile and 1 mile to ensure the visitors remain engaged and don't suffer from attention fatigue (Ham, 1992, and Asbaugh and Kordish, 1971).

Visibility of object and line of sight: It is important to make sure that the object that is being explained and interpreted is located within the immediate area of the sign and is clearly legible (Bitgood, Benefield and Patterson, 1990). This adds dimension to the educational experience and allows the visitor to observe the functionality of the site.

Accessibility: Make sure that the sign is on the accessible path. Signs that are off the defined path are often not as effective because it is less likely that they are seen (Bitgood, Benefield and Patterson, 1990).

Circulation: In addition to placing the sign along the path, it is also ideal to position the sign in a destination (Figure 22), drawing the site visitor in not only to the interpretive experience but also to the significant space on site (Field observations).

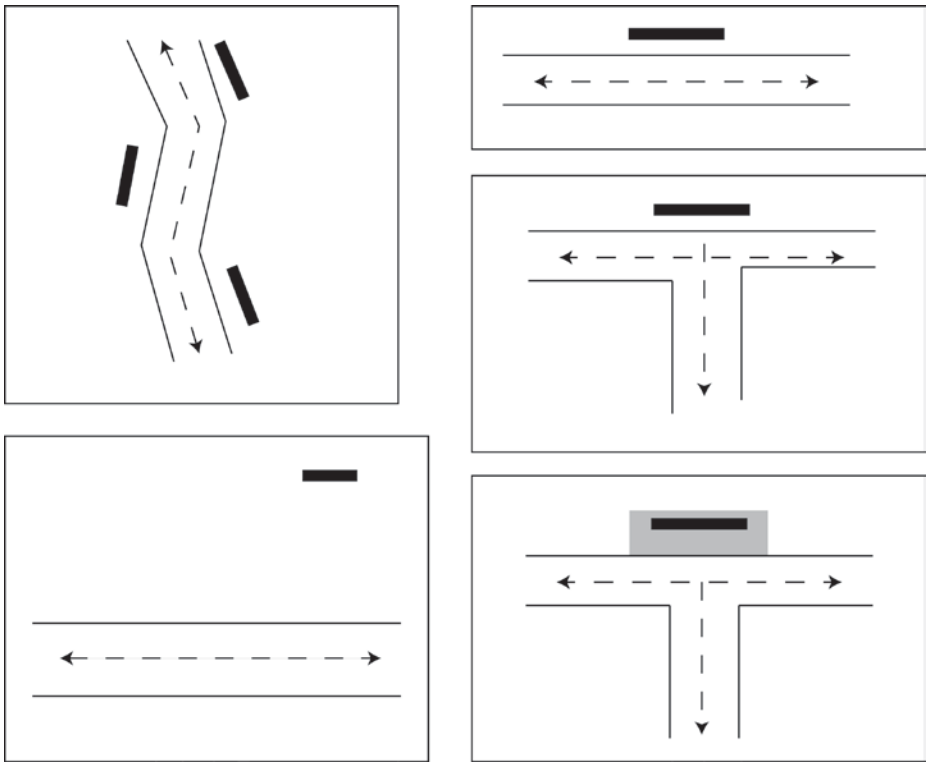


Figure 22: Circulation patterns related to sign location [Carter]

Cultural cues: Provide clues to the site visitor that this is a place to stop, in addition to the signage. For pedestrians, this could include benches, lighting, or trash receptacles. For other modes of transportation, such as bicycling, indicate that there is a stopping point but introducing places to store their transportation, such as bicycle racks. These cues should also incorporate climate factors – if the site is windy or receives significant sun, consider incorporating shade structures to provide more protection (Interviews, 2013).

If the site has a significant amount of habitat restoration, such as a restored wetland, make sure to clearly define areas that are for humans, such as purposeful and aesthetically pleasing planting, defined bed edges, and lawn (Nassauer, 2004).

Lighting: Lighting in an educational space is also important not only to provide safety but it also increases visibility and helps identify a stopping point. Lighting can also be beneficial if the space is open in the evenings and will increase the ability to use the site (Ham, 1992 and Bitgood, 2000).

Surfaces: It has been shown that trails that encounter the water's edge, those with softer surfaces, and boardwalks rate higher with users (Kaplan et al 1998).

Direct attention to avoid distraction: If there are other distractions on or near the site, such as a busy road or a large public plaza, make sure to shift the visitor's focus away from that space so they are able to focus on the interpretive sign and educational experience at hand. Sensory distractions (such as sounds and active sights) from outside of the interpretive area can take away from the experience (Bitgood, 2000).

Right turn bias: It has been observed that humans tend to have a right-turn bias, so this could be used to assist in capturing the attention on a space (Melton, 1935).

Space requirements: Depending on the volume of the site, make sure there is enough space to provide access for multiple people and groups. This can also assist in providing an area for social interaction and make the learning process more effective (Field observations, 2013).

Graphics and signage design

Contrast: Create contrasts on the sign that help it stick out from the surrounding environment. This can be accomplished using contrasting colors and graphics.

This can provide a key focal point and assist in capturing the attention of passersby.

Images: Include illustrative graphics that assist in explaining processes and functionality on the site (Surveys, 2012).

Content recommendations:

- Engage the visitor by asking questions on the sign – it is likely that this method can entice readers to continue reading the sign to determine the answer to the question. These questions can be simple but can also be challenging (Sustainable Sites 2009, Interviews, 2013).
- Ease the cognitive experience by breaking up information and keeping it to a basic level. This can be accomplished by using bullet lists instead of paragraphs. If paragraphs are chosen, keep them short with 3-4 sentences maximum (Ham, 1992, Sustainable Sites 2009).
- Incorporate interactive elements if possible. This could include pointing out specific things the visitor can use additional senses for, such as touch, smell, hearing, or sight.
- Include instructions on what to look for or what to do (Bitgood, 2000).
- Minimize mental effort for those visiting the site (Bitgood, 2000).
- If applicable, incorporate other resources via technology such as scanned codes and websites. Only do so if able to maintain those resources.

Additional Recommendations

Vandalism: A major issue, especially in large urban areas. While there are some thoughts as to how to avoid it, few studies can provide significant findings as to how to design to deter vandalism. This alone can be the sole determining factor for organizations that have limited budgets and resources to care for and replace damaged signage (Interviews, 2013). If possible, consult with a local police force before installing signage. These agencies may have insights as to what deters graffiti and vandalism.

Post-occupancy evaluations: If possible, schedule and complete a post-occupancy evaluation. This analysis can help determine how users perceive the site and if it is achieving educational and design goals. This allows site designers to implement updates that may significantly affect the user experience (Interviews, 2013, Medlin and Ham, 1992).

Best Practices Applied to Inner Harbor

To demonstrate some of these recommendations, I will briefly apply a few to the study site at the Inner Harbor. One of the things that I believe this space is lacking is a strong destination and separation from the rest of the waterfront promenade (Figure 23). Since this site is located on the water and the educational experience is about the harbor's ecological processes, it would be ideal to draw people to the sign by moving them into the space.

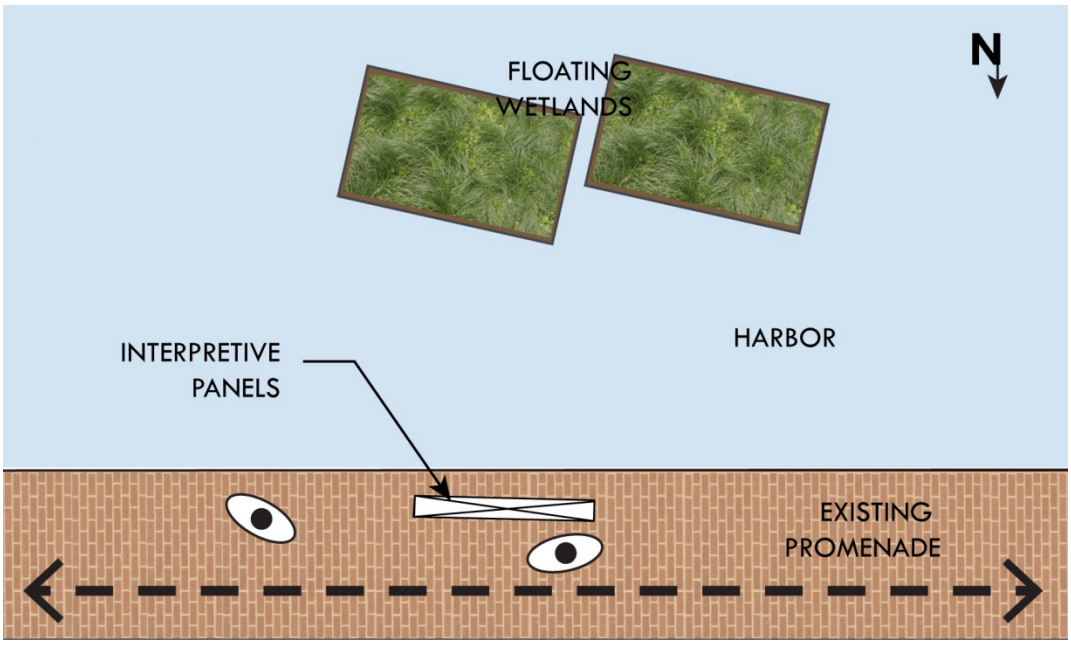


Figure 23: Existing site plan for Inner Harbor interpretive signage [Carter]

One basic site retrofit would be to create an overlook (Figures 24 and 25) that is distinct from the promenade, allowing the educational experience to be separate from the rest of the larger site. This proposed space would also incorporate seating and other cultural cues like enhanced lighting and trash receptacles. By creating the overlook, site visitors would also be brought closer to the floating wetlands which would create a new hardscape surface and would shorten the line of sight to the object that is being interpreted. This new overlook would also be out of the way of the main circulation on site, providing more space for site occupants to read the signage. These proposed changes would also maintain the existing accessibility on the site.

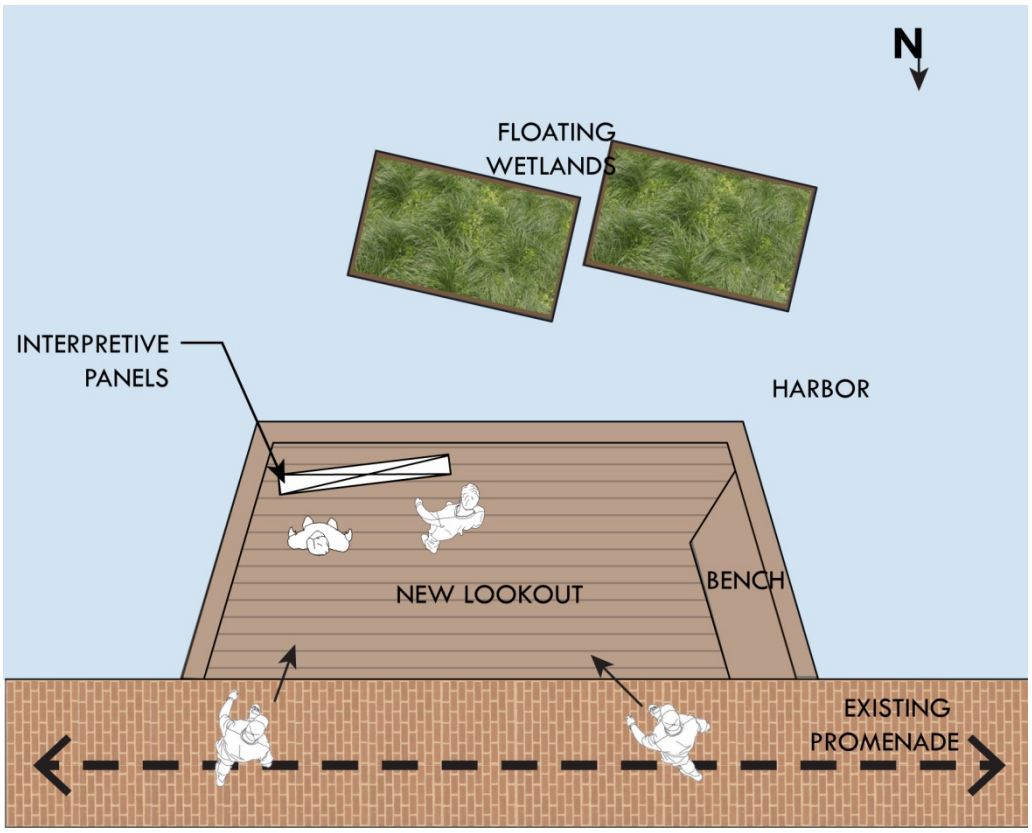


Figure 24: Proposed floating wetlands overlook, Inner Harbor [Carter]

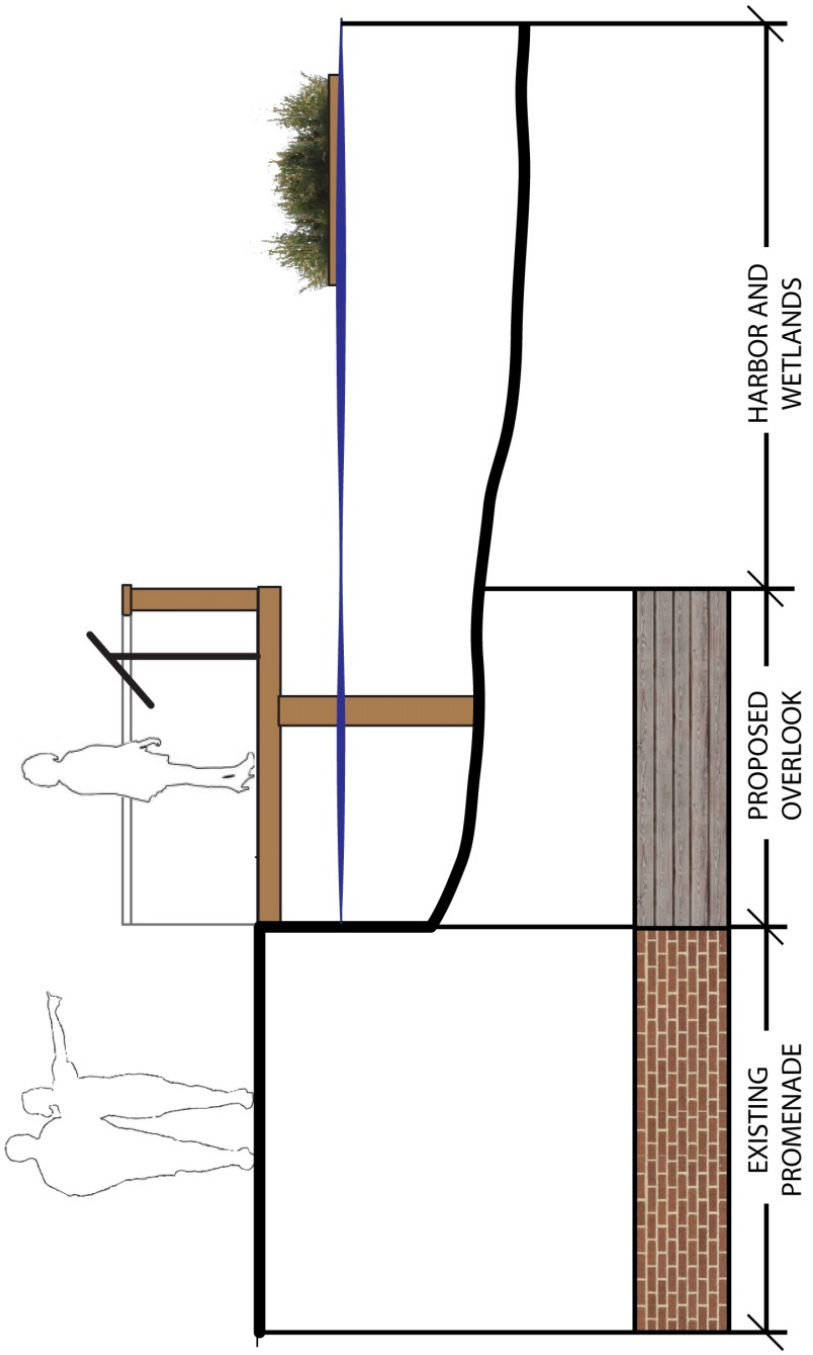


Figure 25: Section through proposed overlook [Carter]

|| Chapter Six ||

Site Inventory and Analysis

Introduction

To explain many of the best practices outlined in this project, it is necessary to look at an existing site and determine how these guidelines could be implemented to create effective interpretive signage. For this part of the project, I chose to propose two interpretive spaces and green infrastructure elements for Baltimore City's Patterson Park. This 155- acre urban park is located several miles east of the Inner Harbor. One of the most heavily used parks in the Baltimore City Park System, Patterson Park already has existing signage that was developed and installed by Audubon.

Figure 26: Map of Baltimore and Patterson Park [Google Maps]

There are several opportunities that I saw in Patterson Park which is why I selected this site. First, I have visited this park many times and am familiar with the existing signage that is already on the site. According to these best practices, the signage is not utilized effectively and could use some significant changes to be more effective. There is also an opportunity to expand the signage to educate visitors on how Patterson Park can help clean the Chesapeake Bay.

Patterson Park is a heavily used park and has a significant number of visitors that could benefit from passive education opportunities. Several organizations, including Audubon and the Friends of Patterson Park, already coordinate a significant number of active education programs in the park. Covered in more detail later in this chapter, these programs aim to educate a broad spectrum of people in the Baltimore region. The organizations involved in the park recognize the unique opportunity that Patterson Park has to educate on ecological issues, Chesapeake Bay health, and stormwater issues.

There are some significant stormwater issues that exist currently in the park. Due to its hydrologic history, Patterson Park is prone to water problems as Harris Creek used to run through the site and into the Bay (Almaguer, 2006). Additionally, due to steep slopes and clay soils, stormwater tends to run across the surface and enter into the City's stormwater system without any natural treatment. Since Baltimore City has a separated stormwater and sewer system, stormwater isn't treated before it goes into the Bay (City of Baltimore, 2012). This has had significant ecological impacts on the health of the Chesapeake Bay which has led to declining water quality and ecosystems. By updating the Park

with new low-impact design infrastructure, water pollution could be treated in the park before entering the Bay.

For these reasons, I saw an opportunity to propose updates to the existing signage in Patterson Park and design new low-impact infrastructure in the park. Prior to the conceptual design, it was important to complete a brief site inventory and analysis of Patterson Park. This chapter outlines the findings.

Patterson Park History

Patterson Park is a 155-acre park located to the east of downtown Baltimore City. Originally established in 1827 as one of the earliest public walks in the United States (Almaguer, 2006), it was expanded several times through 1910, to its current size today. The Park and its surrounding land has played an important role in the history of Baltimore, housing troops and military activities during both the War of 1812 and the Civil War. There have been three stages in the development of the Park: the public walk, the country park, and the recreation park.

In the early 1900s, formalized outdoor recreation became a new trend in the United States (Almaguer, 2006). This movement towards recreation required more designated spaces in urban parks. By 1925, Baltimore's athletic facilities outnumbered those in any other city and the most were located in Patterson Park. In addition to playfields and a track, the larger lake in the park hosted a number of swimming and diving events. Recreation was a predominant use of the park through the 1950s and 60s.

The more recent history of the park, from the 1950s until present day, encapsulates a period of decline and regeneration in the park. Following World War II and the movement to the suburbs, the City of Baltimore experienced a significant population shift to its suburbs. With this shift in the population to the county came a loss of revenue, ultimately leading to a shrinking budget for the park system. Maintenance of the park decreased which lead to the closure of buildings in the Park. Fires and vandalism also became significant problems in the 1970s and 80s. Several of the original buildings to the park, including the Bath Houses, were destroyed and never rebuilt.

As park staffing and maintenance continued to decrease, other buildings became unsafe and crime increased in the park. Following significant complaints from the community, Baltimore City Parks and Recreation completed a master planning process in 1996 which lead to the creation of the Friends of Patterson Park – a nonprofit charged with following up on the plans for the park and making sure the improvements outlined in the plan were completed. The Friends continues to work with the City on park improvements and advocates for the Park's needs.

Harris Creek

Patterson Park has experienced significant changes to its hydrology and watershed during its existence. Originally, Harris Creek and Harford run converged in the northeast corner of the park and continued south towards the harbor (Figure 27). This river system created a series of marshes and inundated soils along its banks. In 1894, an extensive sewer system was planned in the

City and both Harris Creek and Harford Run were put underground in large tunnels, which still exist today.

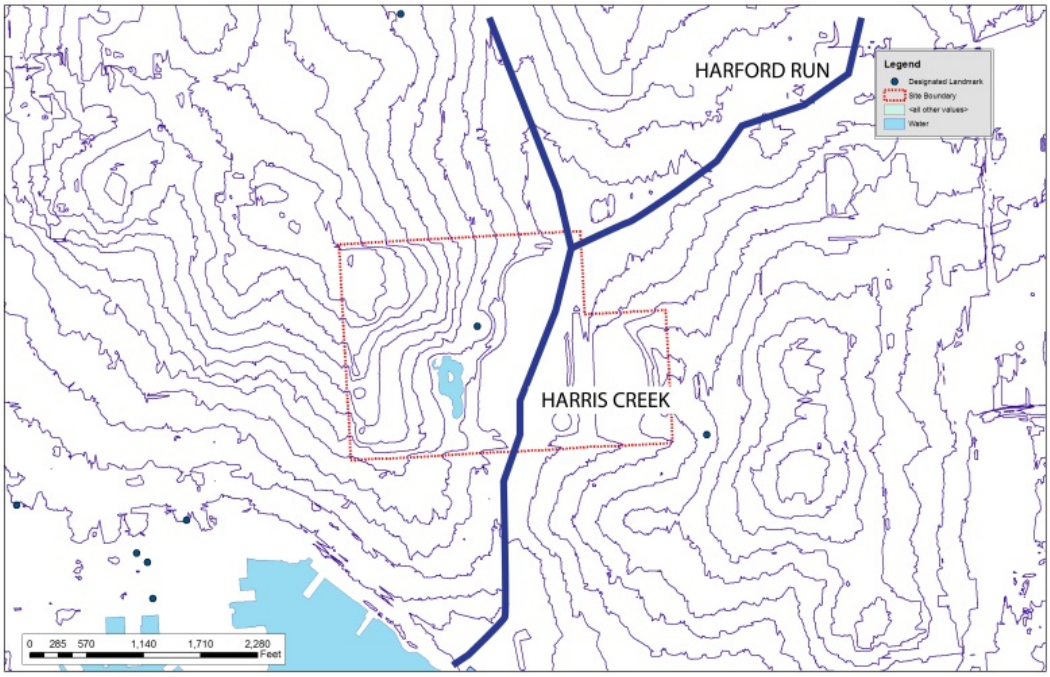


Figure 27: Historic Harris Creek and Harford Run [Carter, ESRI 2013]

Even without the presence of these two streams, water continued to occupy the lower part of the park. To provide a more scenic addition to the park, in 1899 a lake was constructed in this lower part of the park where Harris Creek once lived. Eventually, this lake was also filled in the 1950s to provide more space for recreation in the Park (Harris Creek Watershed, 2012). This complex hydrologic history is the main reason why water continues to be problematic in the eastern portion of the park, where the main recreation facilities live today.

Topography

There are substantial topography changes within Patterson Park (Figure 28). The northeast corner of the Park is one of the highest points in the region and the

eastern portion of the park contains an old drainage basin that head towards the harbor. From the northwest corner of the park to the southeast corner the change in elevation is approximately 120 feet. The slope varies from gradual slopes to significant slopes higher than 25%.

Figure 28: Two-Foot Contour Map of Patterson Park [Open Data, Baltimore, 2012 and ESRI, 2013]

Water, Soils and Hydrology

The soils and geology of Patterson Park create a complex hydrology that has been substantially altered over the last 200 years. The high point of the park in the northwest corner is predominately sandy loam soils that sit above a layer of clay. The clay intersects with the surface as the topography decreases, creating

a perched water table. This was the cause of many of the active springs in the park in the 1800s. Due to the dramatic change in elevation that causes runoff and erosion, extensive subgrade drainage was installed in the park in the 1800s to assist in drainage and direct water to the boat lake, which was inadvertently built during a grading operation in the 1870s (Friends of Patterson Park, 2013).

The central and eastern parts of the park are also predominately clay soils. Harris Creek and Harford Run once converged in the northeast corner of the park with a wide floodplain flanking its edges. Due to seasonal inundation and the impermeable clay soils, marshes were the predominant ecosystem. The eastern annex of the park was also home to a clay pit. In the mid-1800s, Harris and Harford creeks were buried into a pipe and a lake was created in their place. This lake was a central feature to the recreation expansion in the early 1900s. Eventually, as the demand for recreation facilities increased, the lake was filled in with urban debris, fill, and ash, and the Mimi DiPietro Ice Rink and Football Turf Field were constructed in the 1960s. This additional construction and fill has caused significant drainage issues in the eastern part of the park due to its hydrological significance as the original drainage basin for the surrounding Harris Creek Watershed. Due to these drainage problems, the Chesapeake Bay Trust is working with community members to create the Harris Creek Watershed Action Plan/Community and Stormwater Project, aiming to alleviate stormwater and ecosystem problems created by burying Harris Creek (Chesapeake Bay Trust, 2013).

Vegetation and Wildlife

Patterson Park is known for its tree diversity which has changed during its existence. Currently, there are more than 50 different tree species in the park, including natives like *Acer rubrum* and *Quercus alba* and non-natives like *Philodendron amurense*. The tree species in the park has been well documented since the late 1880s through current day and it shows how the predominant species in the park have shifted due to disease and availability. In 1887, the 15% were Silver Maples, 11% were Norway Maples and 9% were Box Elders (Friends of Patterson Park, 2013). Maples have continued to be a large percent of the canopy and in 1915, 39% were Maples (species unknown), 25% were American Lindens, 7% were American Elms, and 6% were Hickory. With the introduction of pests and diseases such as the Asian Long-horned Beetle (feeds on Norway Maples) and Dutch Elm's Disease, predominant species of the park shifted significantly in the last century. By 1995, 29% were American Lindens, 10% were Red Oaks, 6% were Red Maples, and 5% were White Ash. Today, there is also significantly less canopy than what was in the park in the early 1900s. Many organizations involved in the Park's maintenance and long-term planning have prioritized tree plantings to recreate the historic canopy in the Park.

The diverse tree population creates a natural hub in the city that supports a variety of animals and birds in the park. Over 180 bird species (Audubon Patterson Park, 2013) have been recorded in the park including the Bald Eagle, Red-Tailed Hawk, Baltimore Oriole and Great Blue Heron. This diverse bird population is supported by the different ecosystems in the park like the boat lake.

While there are no mega-fauna in the park, it is home to micro fauna like squirrels, mice, voles, amphibians, and turtles.

Cultural Site Elements

Zoning, Land Use, and Demographics, Buildings

The zoning and land uses surrounding Patterson Park consists of predominately medium-density residential (Figure 29). There are areas of industrial a few miles to the east and dense commercial to the west.

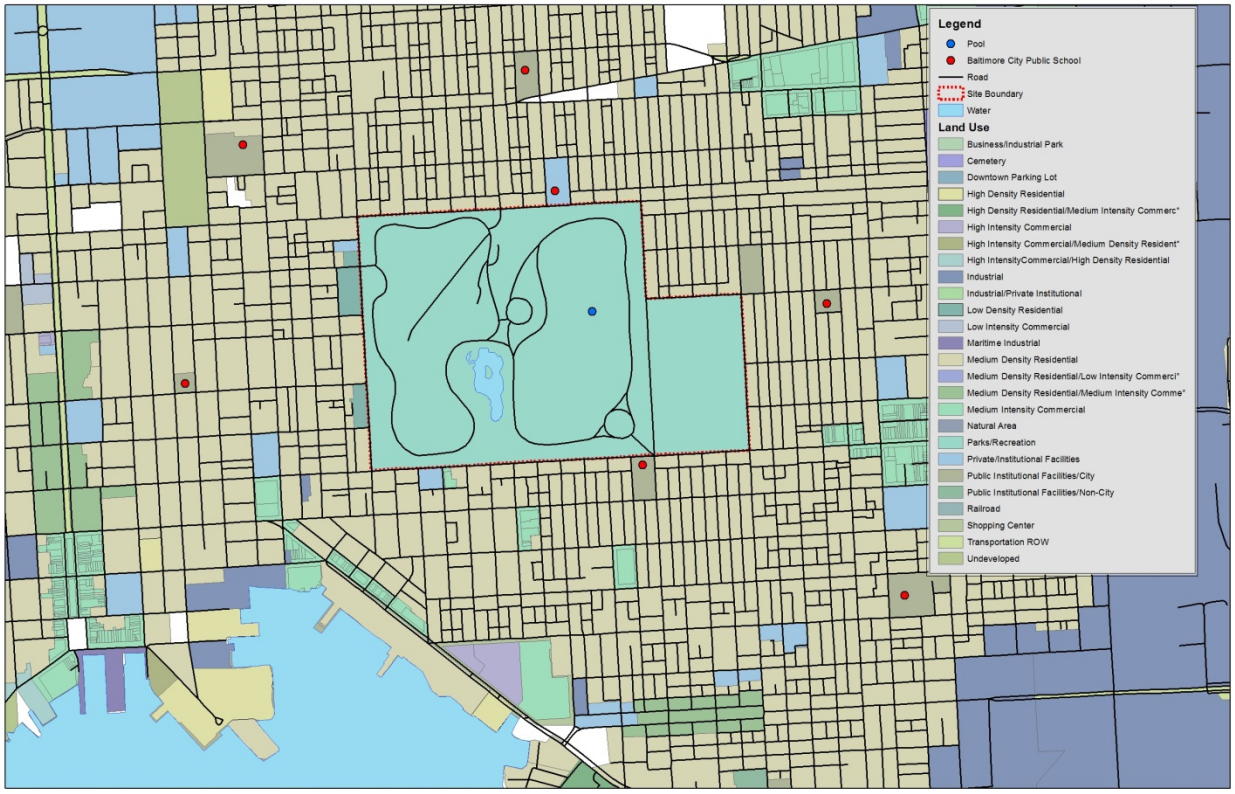


Figure 29: Zoning Map [Open Data, Baltimore, 2012 and ESRI, 2013]

From the 2010 census, it was determined that different ethnic communities surround the edges of the park – African American to the north, Hispanic and

Latino to the east, Caucasian to the south and southwest , and Asian to the west. Since the park sits at the center of these communities, it has become a strong gathering place for all neighborhoods.

Architect George Aloysius Frederick constructed several key buildings in the park including the marble fountain, the Gate House and the Lombard Street Gate (Almaguer, 2006). From the original buildings constructed in the park, several still exist. The buildings in the park host a variety of uses for community members and City officials as offices, gathering areas and for recreation. Buildings in the park include:

- Mimi DiPietro Ice Skating Rink
- Patterson Park Pool and Pool Field House
- Bandstand
- The Pagoda (1891, Latrobe)
- The Casino (1892)
- Virginia Baker Recreation Center
- Facilities Management
- The White House (Home to the Friends of Patterson Park)

Park Users and Visitor Numbers

Patterson Park is one of the most intensely used parks in Baltimore City. According to the Master Plan Study (Rhodeside Harwell, 1998) completed in 1998 by the firm Rhodeside Harwell, approximately 2,500 people used the park each day. It is likely that that number has increased significantly due to the increase in

homeowners and housing prices around the park and community regeneration that has occurred over the last 15 years. It was noticed that the park tended to be more active on the weekends and in warmer months. Activity peaked in the afternoons and early evening and the weekend use tended to be five times the weekday use.

To breakdown the demographics of the different user groups, it was estimated that 60-70% of the users were adults and the presence of men tended to outnumber women. The majority of users interviewed mentioned that they walked to the park, making the visitors likely to be from the surrounding neighborhood. Additionally, many people walk due to the limited street parking that is on the exterior of the park. Once in the park, there are a variety of activities that occur including (but not limited to):

Active	Passive
Walking, running or bicycling	Picnicking
Swimming	Bird watching
Child's play at playground	Sitting
Dog walking	Lying/sleeping
Tennis	
Community gardening	
Basketball, baseball, kickball	
Soccer and football	
Ice-skating	
Fishing	
Concerts	
Parades and festivals	

Schools and Education Programs

Patterson Park is located in a unique part of the city that has a high concentration of schools. All of the following schools are located within a ½ mile radius around the park (Figure 30).

Figure 30: Schools located in 1/2-mile radius around the Park [Carter]

- Baltimore City Schools
- Highlandtown Elementary School
- Hampstead Hill Elementary School
- Private/Charter Schools
- St. Elizabeth of Hungary Elementary School (Patterson Park Public Charter School)

- Christo Rey Jesuit High School
- Archbishop Borders Elementary School
- Baltimore Freedom Academy (6-12)
- Friendship Academy of Math, Science and Technology (6-12)
- Kennedy Krieger School (Special Education)

There are already a significant number of organizations that are involved in the Park's day-to-day activities and active education programs. The organizations involved in the Park include: the Friends of Patterson Park, Audubon Patterson Park, Parks and People, Baltimore City Parks and Recreation, and Tree Baltimore. Many of these groups have active education programs like bird walks and nature walks in the park, community gardening, tree planting, and maintenance volunteering. In addition to the active programs organized by the different groups in the park, many of the surrounding Baltimore City schools have partnered with these organizations to provide environmental education to their students. This has become a large part of the active education in the park mainly due to Maryland State Education requirements which have increased the amount of environmental education required in school curriculums.

Existing Interpretive Signage

While it is limited, there is existing interpretive signage in several areas of Patterson Park. One of the more prevalent areas with interpretive signage is on Hampstead Hill near the Pagoda. This is one of the more programmed parts of the western edge of the Park and historical signage is located along several

pathways. The signage focuses on discussing the Park's role during the War of 1812 and the Civil War. There are only 3 signs which are close to one another.

Figure 31: Wetland Garden Signage in the Park [Carter]

Figure 32: Locations of the two existing signs in the Park [Carter and Baltimore Open Data]

Audubon of Patterson Park has also recently installed two additional signage areas (Figure 32) that focus on a habitat gardens. The first sign (Figure 31) is located to the northwest of the Boat Lake. This sign focuses on the new wetland garden that has been installed in a natural drainage swale. Audubon installed this garden several years ago to take advantage of the year-round wet soils and provide more habitat for birds in the Park. The wetland garden is approximately 400 square feet and is surrounded by a fence. One this fence is the small interpretive sign which is in both English and Spanish. It is brief and explains what the plantings are and how the wetland garden positively affects birds.

The second sign (Figure 33) that was installed by Audubon is located next to a garden on the edge of the boat lake. Similar to the wetland garden sign, this sign focuses on how the plantings in the specific area along the boat lake are beneficial to birds in the park. This sign is also translated into Spanish.

Figure 33: Bird Garden Signage next to the Boat Lake [Carter]

Both of these signs are attached to the fencing surrounding the wetland garden and bird habitat garden. I learned that one of the biggest problems Audubon faces with these signs is vandalism. Due to the construction of the two fences, it is easy for people to knock them over to access the installations. In addition, they have had problems with graffiti in the past. These challenges, coupled with the maintenance of the two gardens and the high cost of producing the signs, has been problematic for the organization. With the potential construction of the new nature center in the Park, Audubon hopes to be able to expand passive education in the park and find new ways to make it more effective.

Opportunities and Constraints

From this analysis, it is clear that there are many opportunities and some constraints in identifying an area for an interpretive signage program that works to fulfill the stormwater needs in the park and with Audubon's proposed Nature Center in Patterson Park.

Due to the substantial development around the park and impervious pavement, there is a stormwater issue in the park. The topography and hydrology of the site exacerbate this situation in concert with human alterations that have destroyed the natural drainage basin of Harris Creek into the harbor. Since the park has a substantial amount of open space, this provides an opportunity to deal with some of the stormwater management and water quality issues on the surface (such as excessive fertilizer and pesticides), before the water enters the storm drains in the Park which send water directly into the harbor without treatment. This also provides an opportunity to educate site visitors about low-impact design and how elements like rain gardens and bioswales assist in mitigating stormwater and treating it naturally before it enters the Bay. This educational theme can also be linked to ecosystem functions and the relationship that the park has with the Bay.

Another opportunity is the fact that there are many different active organizations working in the park with educational goals. While many of the current educational activities in the park are active, there is a presence of signage that is already educating people on water quality issues and ecosystem services. These signs are small though and have been subjects of vandalism which could constrain further development of a signage program. Organizations like Audubon though are committed to increasing the educational opportunities in the park and would become stewards of a passive program if one was to exist. Additionally, the signage itself presents an opportunity for the organizations to spread awareness of their work in the park and solicit volunteering.

Proposal

I am proposing to design a series of connected interpretive spaces in Patterson Park. The framework for these interpretive spaces will focus on low-impact design and how these eco-technologies help manage stormwater issues in the park. The interpretive program will incorporate larger themes of environmental sustainability and ecosystem functionality to provide an information network that connects the signage to the place. This will also provide a connection to Audubon's work in the park and its mission. Each individual interpretive sign will be connected to a larger educational system that will aim to draw people from the exterior of the park to the interior. Finally, this master plan will be informed by the best practices set forth from the surveying, field observations, interviews, and literature.

Program Goals

The following program goals have been established for this design proposal:

1. Educate visitors about the natural processes and ecologies that exist in the Park and why they are important to the larger Chesapeake Bay ecosystem. This theme can be broken down into the following categories:
    a. Stormwater problems and low-impact design practices in the Park and how they can help mitigate stormwater issues
    b. General and historical natural ecology and relationship to the Chesapeake Bay
    c. Presence of bird habitat and the role that Patterson Park plays with local bird populations and migratory birds on the East Coast

2. Incorporate stormwater mitigation strategies into the master plan and small site specific plans that can enhance educational opportunities. This will include:
    a. Rain garden and wetland meadow
    b. Bioswales
    c. Curb cuts for roads in park and pervious paving on hardscapes
    d. Rain barrels around building
    e. Green roof and green walls on building
3. Implement best practices in signage design
    a. Select two small sites that could demonstrate best practices
    b. Consider material selections and how that might impact effectiveness
4. Determine effective ways to include higher traffic areas into the signage of the park and draw people into the interpretive trail.

|| Chapter Seven ||

Master Plan and Design Proposals

In order to identify ideal places to install green infrastructure in the park in addition to creating a larger network of educational stops, it was necessary to create a broad master plan that provides a framework for these sites. For this site, there were several goals of this master plan as mentioned in the previous chapter: These goals include:

1. Create a larger network of interpretive spaces that move throughout the park, focusing on educating on stormwater issues, green infrastructure, and the connection of surface water and the Chesapeake Bay.
2. Determine effective ways to integrate high traffic areas in the park with interpretive spaces and draw people in from the main entrances using interpretive signage.

The proposed interpretive and green infrastructure master plan for Patterson Park focuses on identifying places to accomplish these goals and mitigate stormwater. The locations, highlighted in Figure 34 in purple, also create a larger network of spaces that connect the northwest corner of the park to the southeast corner of the park and across to the annex. By locating these sites close to one another, it will create more relevance between each stop and will allow site visitors to build an information network focusing on green infrastructure.

As discussed in Chapter Six, these installations will be located at critical points to capture and manage stormwater in the Park. Considering the majority of the park

is covered in lawn or impervious surface, with less permeable clay soils, there is little infiltration in many places in the park. The impervious roads and paths that run through the park are also a source of petrochemicals and trash. With an active storm drain system in the park the drains into the Boat Lake and then into the Chesapeake Bay, it is critical to capture these pollutants on site.

In addition to locating the mitigation sites in these critical areas, there are also opportunities to utilize the native plantings in rain gardens to enhance and expand bird habitat in the park, accomplishing one of the largest goals of the Patterson Park Audubon Center. Considering Audubon's involvement in the current signage in the park, this would be an ideal way to connect the two larger programmatic goals for the Park and enhance the educational and habitat spaces as well.

From this master plan, two focus areas were chosen to design smaller interpretive stops and apply the best practices established earlier in this document. The first site chosen is located at the base of Hampstead Hill, where the soils transition from sandy loam to clay (Figure 33). The second site is located at the southeast corner of the Park, along the historic floodplain of Harris Creek.

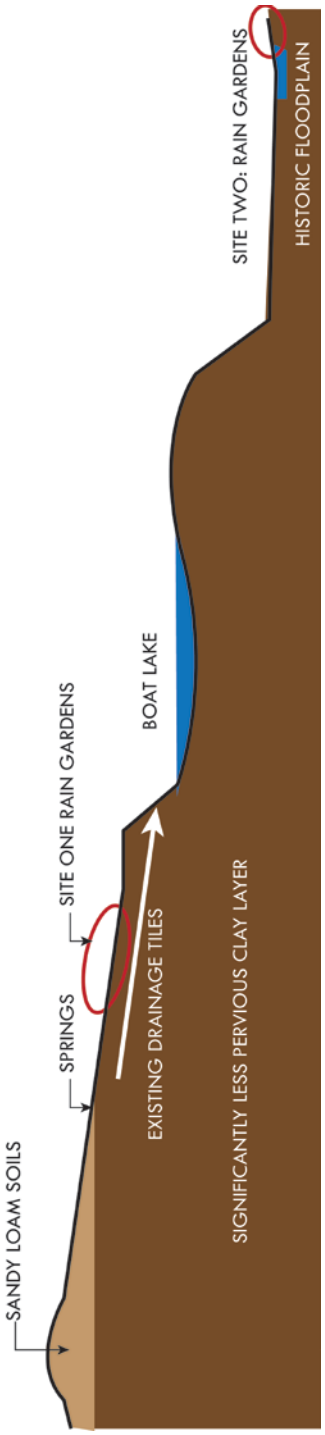


Figure 34: Section across site [Carter]

Figure 35: Proposed Master Plan [Carter]

Site One Design Proposal

The first site that was chosen for detailed design is the current site of the wetland garden, to the northwest of the Boat Lake (Figure 36).

Figure 36: Location of Site One [Carter and Google Maps]

Site selection and analysis

This site was chosen for several reasons including the current interpretive signage on site, the hydrology of the site, its location, and lack of significant vegetation. First, this site is currently the home to Audubon's Wetland Garden – a small, 350 sq. ft. garden planted with water tolerant plants. This site was chosen by Audubon due to its constantly wet soils, caused by the geology and topography of this space. It is situated below the change in soils from sandy loam to clay. At this point, the perched water table surfaces in the form of springs as it encounters the less permeable clay soils. These springs cause constant

drainage into this ravine and apart from the small garden, the predominant vegetation of trees and lawn (Figure 36). To assist the current drainage problems, there is a large storm drain that is located on the road that runs through this space (Figure 38). This storm drain empties directly into the Boat Lake.

Figure 37: Visual analysis of site [Carter]

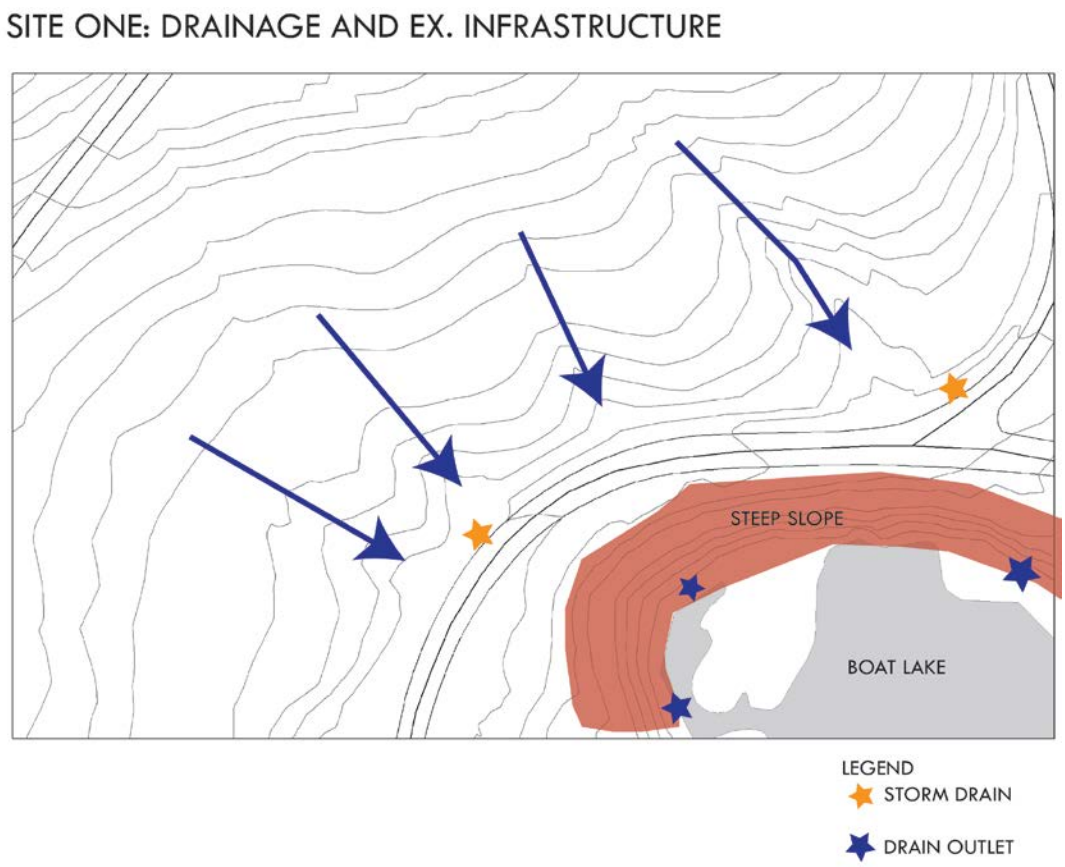


Figure 38: Site drainage [Carter]

The location of this site is also ideal for an interpretive stop because of the large loop road that runs through the site. Not only is this road heavily traversed by many users in the park, it also provides universal accessibility. This point on the road provides important views to the southeast corner of the park and over the Boat Lake.

Proposed design

The proposed design (Figure 39 and 40) for the first site focuses on three elements: the expansion of the current rain garden to fully capture and manage the runoff that is currently directed to this space, using the opportunity to create three interpretive spaces to educate visitors on the site's functions, and utilizing the topography to create a lookout across the boat lake and the south-east portion of the park.

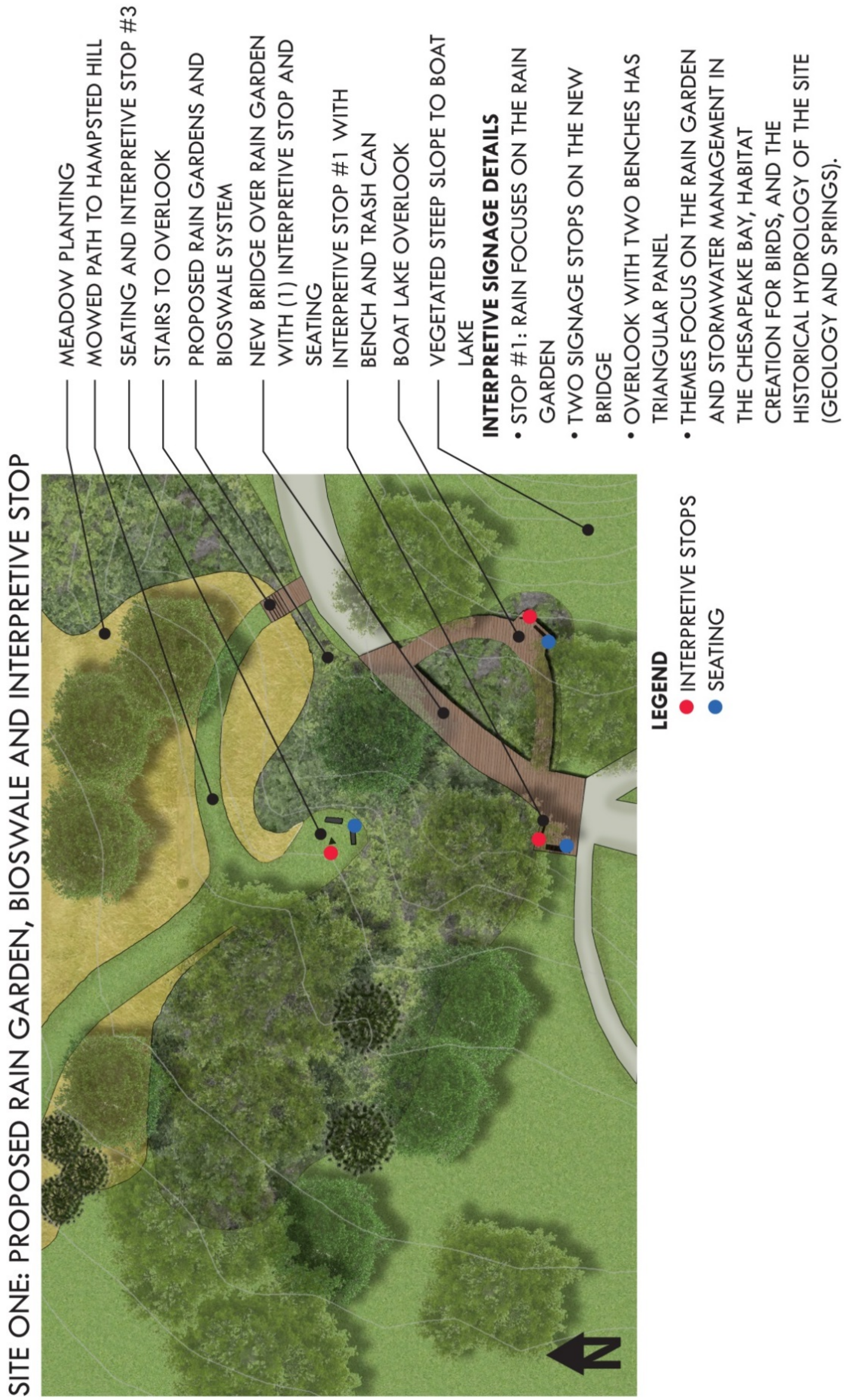


Figure 39: Proposed plan for Site One [Carter]

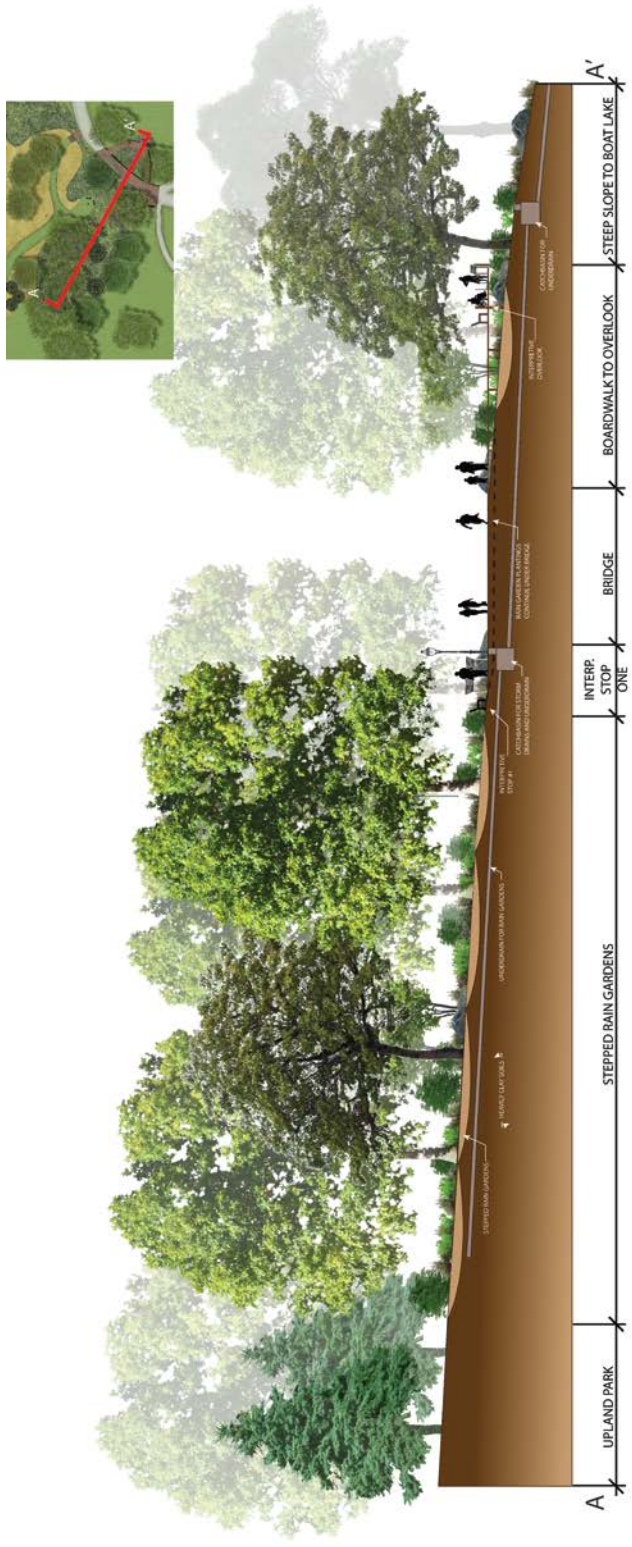


Figure 40: Section through Site One [Carter]

Rain gardens

Due to the topography, several stepped rain gardens are proposed for this site (Figure 40), to help mitigate stormwater and capture runoff that would otherwise be directed to the storm drains.

The size was chosen for these gardens based on several factors. First, establishing the general drainage area was necessary (Figure 41). The less-permeable clay soils and existing surface of the drainage area was also important in determining the overall size of this site. Based on the topography and observations on this site, the drainage area was determined to be approximately 96,500 sq. ft. In order to decrease runoff and enhance infiltration, the rain gardens have been designed to step with the topography. To accommodate this large drainage area, the proposed rain garden will be approximately 24,000 sq. ft.

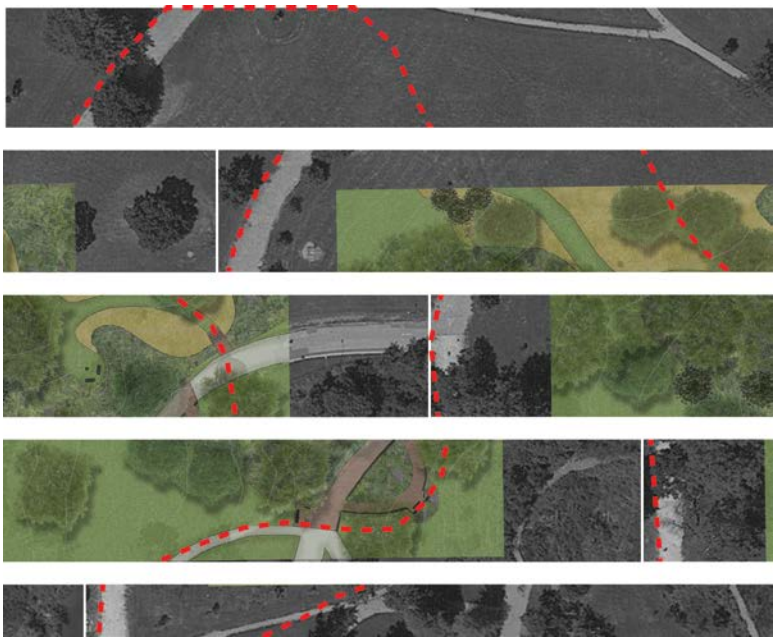


Figure 41: Proposed drainage area [Carter]

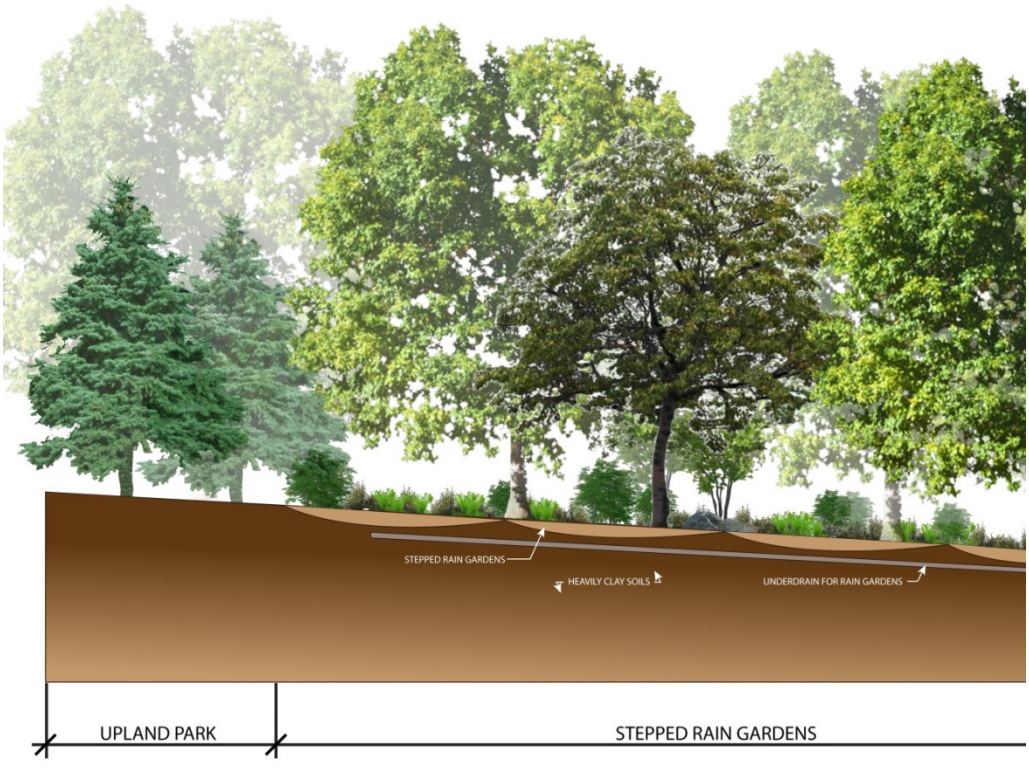


Figure 42: Section through rain gardens, [Carter]

Finally, due to the clay soils and low permeability, under drains have been added to the rain gardens to facilitate infiltration and expand on the subgrade drainage that currently empties in the boat lake (Figure 42). By filtering this water, instead of allowing it to runoff directly into the storm drains, the treated water will now enter the lake instead of previous untreated water laden with lawn fertilizers and pesticides.

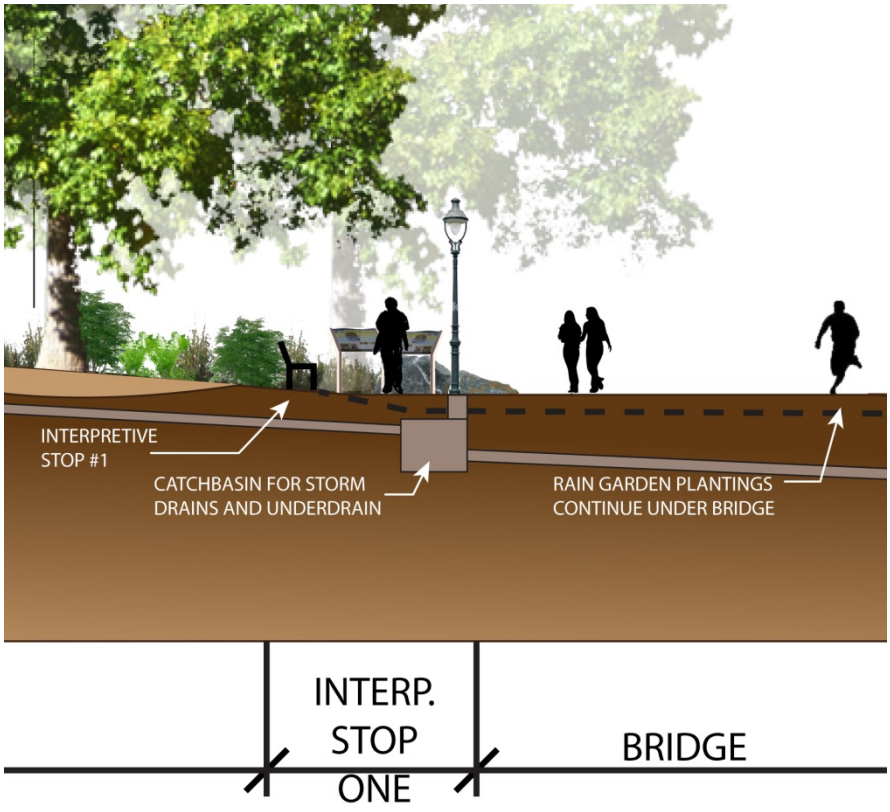


Figure 43: Section through interpretive stop, [Carter]

Boardwalk and interpretive stops

The first interpretive stop (Figure 43 and 45) is located along the main path that brings people into the site from the western portion of the park. This path has

been shifted slightly to provide more space for the interpretive stop. The existing park light will remain and a bench and trashcan will be installed for site visitors. This interpretive stop will be more visible to those passing by the site from both directions.

To facilitate drainage, decrease impervious pavement, and enhance the experience for site visitors, the existing road that runs through this space is to be replaced with a elevate bridge. A smaller circular boardwalk (Figure 44) allows visitors to access a lookout over the boat lake and draws them into one of the three proposed interpretive stops in this space. Along with the lookout and interpretive panel, this stop also contains two benches that allow visitors to enjoy the view. Due to elevation changes, this stop requires a railing while the rest of the boardwalk is lined with low guard boards.

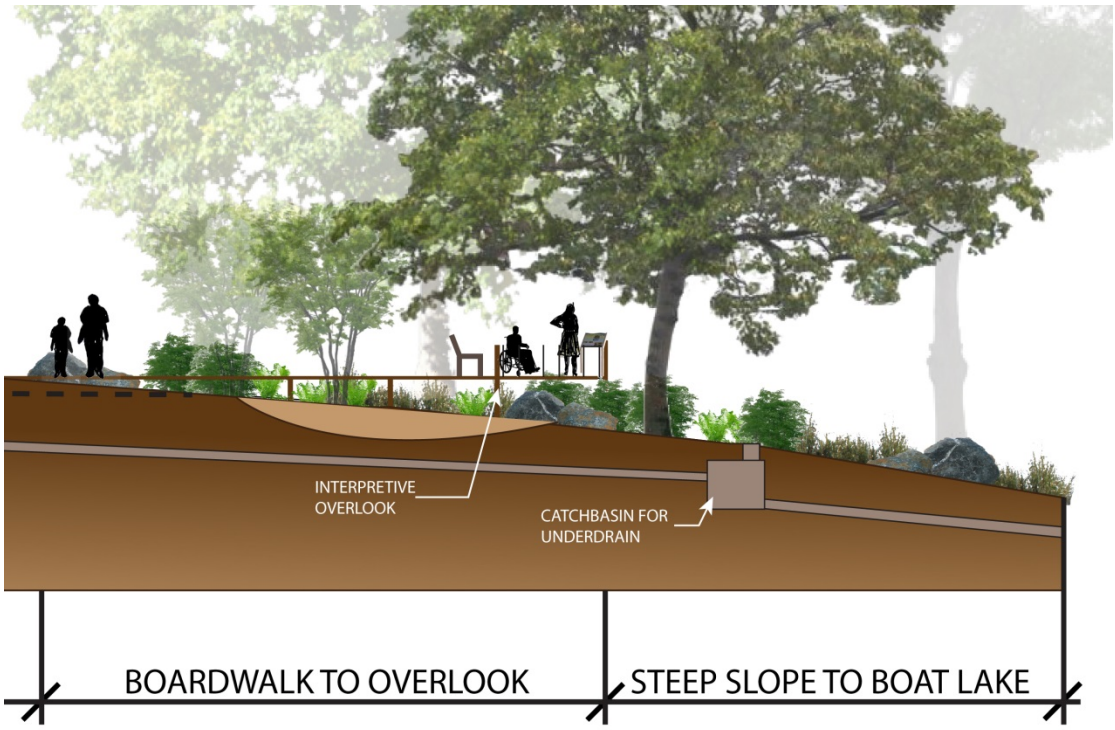


Figure 44: Section through boardwalk overlook [Carter]

Figure 45: Perspective image standing on bridge, looking at stop #1

[Carter]

Finally, a third interpretive stop is located on one of the small ridges that intersect the rain garden. This stop is accessible by a small stair case from the main road and a mown, grass path. At this top there are two benches that allow site visitors to rest and enjoy the views. While the other two interpretive stops are universally accessible, this third stop is not. Due to this challenge, the panel located at this site will be the same as one of the others.

Best practices applied

The proposed design incorporates the following principles from the best practices, outlined earlier in this document:

Audience analysis: Utilizing data from the Rhodeside Harwell Master Plan and from observations in the park, these interpretive spaces aims to capture the attention of adults, but incorporates easy to understand graphics for children as well.

Clear theme: This interpretive space has a clear theme, focused on water quality issues in the park and how rain gardens and the like can improve the current situation. This also connects with current messaging in the park regarding the wetland garden in this area.

Distribution of signs: Three signs are located on this site, two with similar material and the third, located at the overlook, focusing on larger processes within Patterson Park. Additionally, these three spaces are evenly spaced, to decrease attention fatigue.

Visibility and line of sight is captured at this space by making all three spaces easily visible to those traveling on the main circulation routes. The overlook space captures significant views towards the southeast corner of the park.

Accessibility: Two of the three signs are universally accessible to all site visitors.

Circulation: These three spaces are located next to major circulation routes in the park. Also, the proposed overlook boardwalk is circular so site visitors wouldn't have to move through repeating spaces. Finally, the meadow path provides a connection to the main circulation road to the northwest of site.

Cultural cues and lighting: These three spaces provide many additional cultural cues to indicate to site visitors that it is a place to stop. Cultural cues include lighting, benches, and trash cans in addition to the interpretive signs. Low lights along the guard boards are included on the boardwalk to provide safety to those on the boardwalk during the evening time.

Surfaces: This design proposes to remove the existing pavement on the main circulation route and replace it with a large bridge and a boardwalk. This allows the rain garden to continue below the surface as well as capture the attention of site visitors as they are entering a different space.

Space requirements: Two of the panels will be the same, providing more space for site visitors. Each stop can host many people and the panels will be large enough for several people to read at once.

Planting and maintenance: Plant specifics are described further in detail towards the end of this chapter, but plants have been selected on seasonality, to ensure interest and structure all year round. Maintenance will need to occur throughout the year, but this site can be naturalized to require minimal maintenance.

Site Two Design Proposal

The second site chosen for this design proposal is located in the southeast corner of the park (Figure 46), near the main entrance at S. Linwood and Eastern Avenues. This site was chosen for several reasons including its topography and historic hydrology, location, and strong ability to help manage a significant amount of stormwater runoff from S. Linwood and the surrounding area in the Park.

Figure 46: Location of Site Two [Carter]

Located near the main entrance on the southeast corner of the park, this site is close to some of the most populated recreation fields in the park. Users who enter the park through the main entrance pass right by this visible site.

The topography of this site and surrounding impervious surfaces create an opportunity to capture and treat runoff from roads and sidewalks (Figure 47). Currently, the curbs on the west side of South Linwood capture and direct stormwater to the many storm drains located on the road. The space has a moderate decreasing slope from the east part of the site along S. Linwood to the road inside the park (see Figure 47). This negative change in elevation provides an opportunity to direct stormwater on S. Linwood into this space for treatment prior to entering the storm drain system**.** By installing pipes and curb cuts, stormwater could travel into the park to be naturally treated. Additionally, this site is located within the historic floodplains of Harris Creek which once ran through the park. Similar to the other site, the predominant vegetation on site is grass and large shade trees (Figure 48).

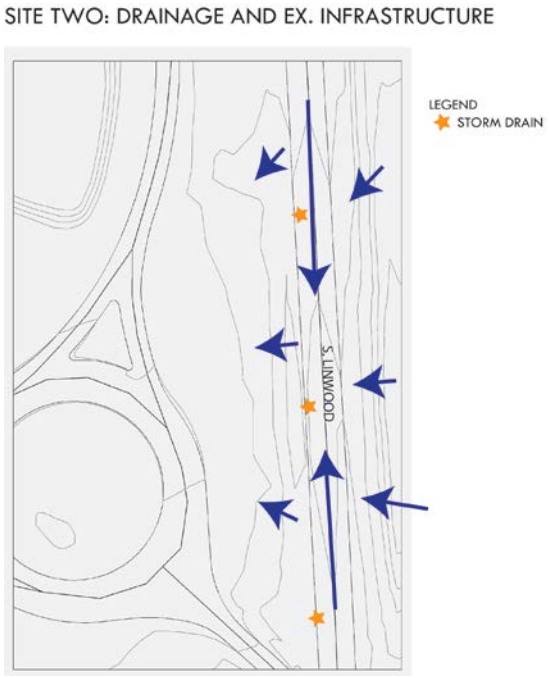


Figure 47: Topography and drainage of site two [Carter]

Figure 48: Existing site conditions [Carter]

Proposed design

The proposed design for this space (Figure 49) focuses on several elements: the ability for this space to capture and treat stormwater from surrounding impervious surfaces, opportunities to educate park visitors about the importance of green infrastructure like rain gardens, and accessibility. Overall, this site utilizes curb cuts and pipes to direct water into a large rain garden system and a boardwalk with interpretive signs enhances the educational experience.

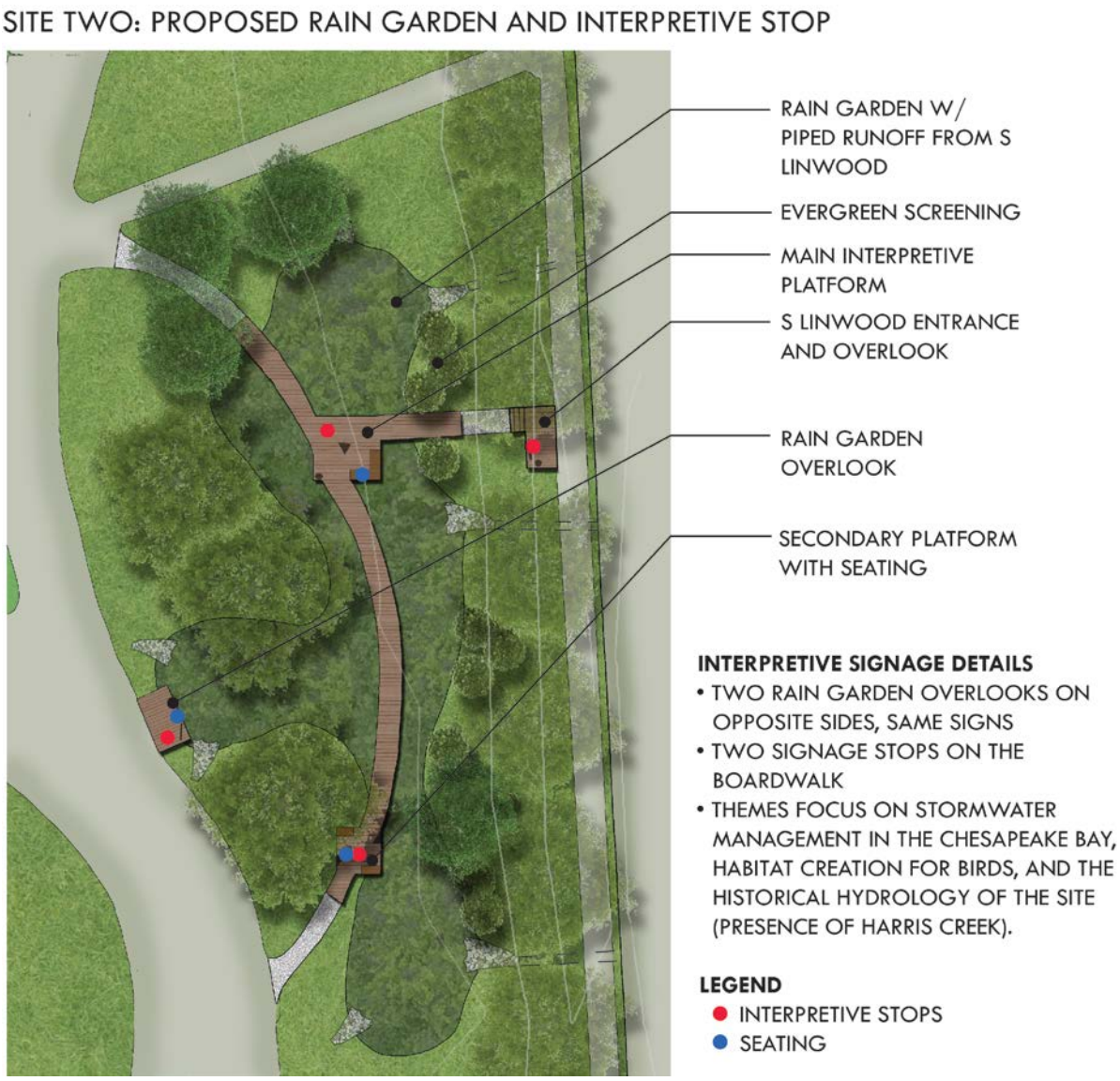


Figure 49: Proposed plan for site two [Carter]

Rain gardens

To capture and treat the water from S. Linwood and the steep slopes in the Patterson Park Annex, several rain gardens are proposed for this site. The source of water for this site will predominately be from South Linwood and the annex to the east (Figure 50). To accurately size this rain garden, the drainage area was calculated to be approximately 92,250 sq. ft. To treat stormwater from

this area, the proposed rain garden will be approximately 15,750 sq. ft. Sub-grade pipes (Figure 49) at several intervals will direct water into the rain gardens, encountering rip rap to decrease the erosion impact where the pipes daylight into the space.

Figure 50: Site Two drainage area [Carter]

These rain gardens will also step slightly (Figure 51) to take advantage of the grade and also create positive flow from the large roadway inside the park. By doing so, this space will be able to treat even more runoff that would traditionally go into the storm drains. Once water has infiltrated into soil media, it will be

captured by a perforated under-drain to facilitate drainage into the storm drains as much of the soil is clay with low permeability rates.

Figure 51: Section through Site Two [Carter]

Boardwalk and interpretive stops

There are three interpretive stops at this site. The first is located at an overlook along South Linwood. Positioned on a platform off of the sidewalk, this stop is clearly visible for those walking along the main sidewalk and provides a lookout stop over the rain garden system. A bench is also located at this point to signal a stopping point and allow visitors to sit. From this stop, visitors can access the first of three entrances to the main boardwalk over the rain garden (Figure 52). Several stairs connect this entrance to a short gravel path and then ultimately the boardwalk. Prior to entering the boardwalk though, one will pass through several evergreen screening trees that try to block some of the noise and distraction from the road.

Figure 52: Perspective image looking into the site from South Linwood [Carter]

In the center of the space is an interpretive platform, with two different signs and benches along two of the edges. This can be considered the nucleus of the site as it is surrounded by the rain gardens (Figure 53). From here, site visitors can easily see many aspects of the rain garden such as the plantings, the inlets from

South Linwood, and the changes in topography that create the smaller rain gardens within the system. Visitors can exit this space heading to the northern portion of the board walk or to the south. Each of these exits will connect visitors to one of the main circulation routes through the park. If the visitor follows the boardwalk heading south, they will encounter a third interpretive space that educates visitors on the habitat functions of the rain gardens in the park. This circular part of the boardwalk is universally accessible (Figure 54), allowing all visitors to access this space.

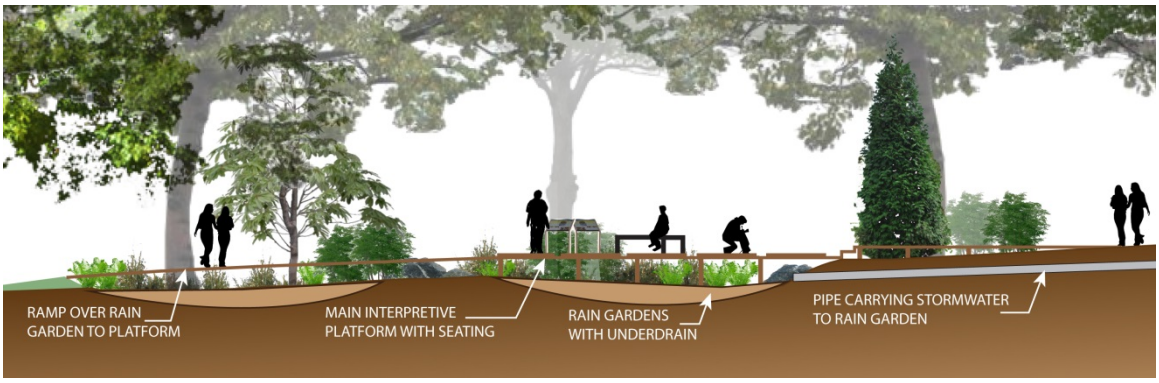


Figure 53: Focus section through boardwalk and platform [Carter]

This site was also designed to be clearly visible and legible to those who are accessing this space from within the park. The two entrances along the road in the park are easily to see and the change in the surfaces, from asphalt to boardwalk, would likely draw people into the space.

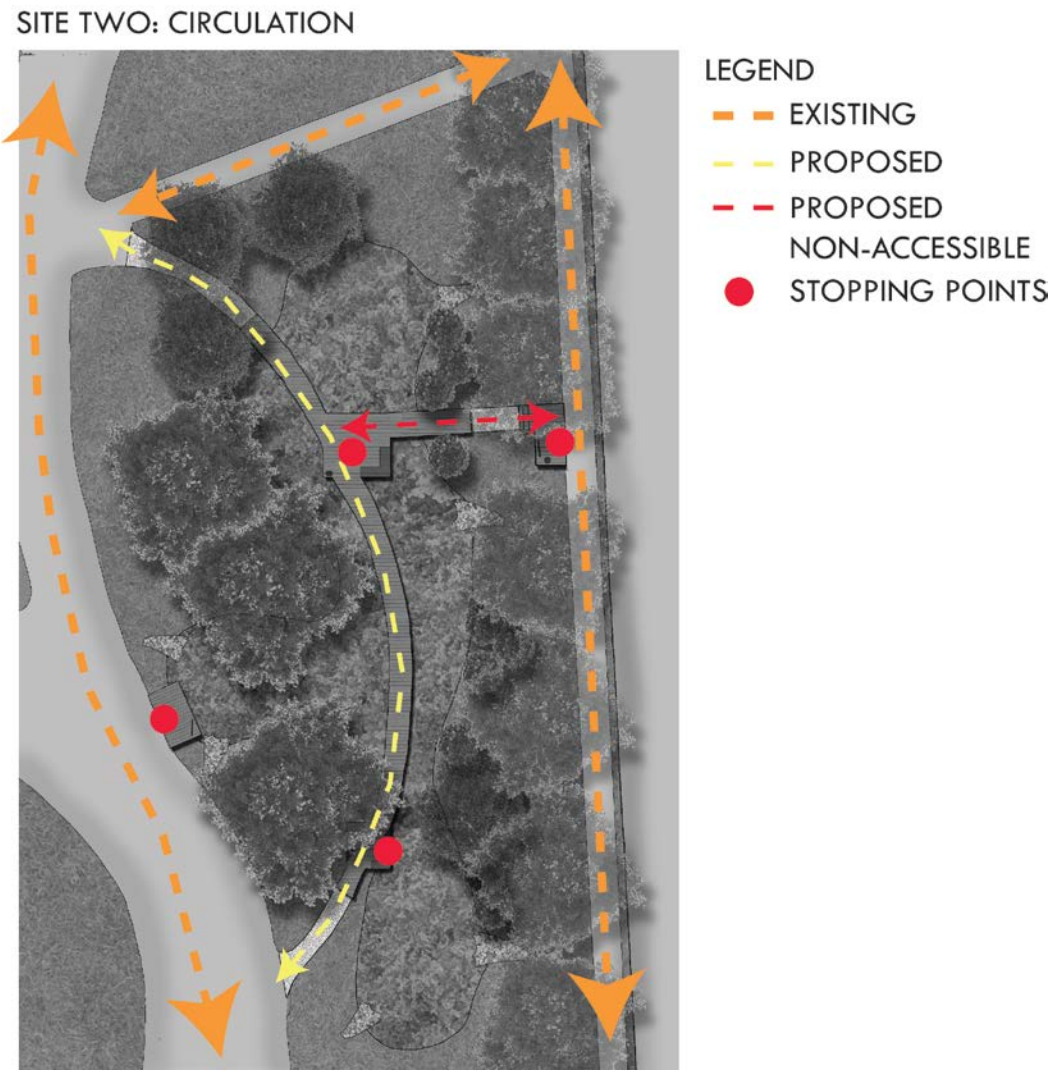


Figure 54: Accessibility for proposed site [Carter]

Best practices applied

The proposed design for this site incorporates the following best practices:

Audience analysis: Similar to the first space, this interpretive experience targets adults but incorporates illustrative images that are easy for younger children to understand.

Clear theme and relevance: Building on the other proposed rain garden system in the Park, this site will similarly have a clear theme focusing on the importance

of rain gardens and their role in managing stormwater. With the addition of another rain garden and interpretive space, this will build larger connections for site visitors and increase their information networks on the subject.

Accessibility and circulation: This space is easily accessible from several main circulation routes inside and outside the park. Not only does each of the three entrances connect to highly trafficked spaces, but they are all universally accessible.

Distribution of signs: Similar to the first site, there are three interpretive stops in this proposed design that focus on different elements or rain garden and stormwater education. This will assist in building broader connections regarding issues within the park. By limiting the number of stops and signs, there will likely be less signage fatigue.

Visibility and line of sight: The surrounding area of this site is broad and open, making it easily visible to passersby. Once a visitor has entered the boardwalks, the rain gardens are easy to see and experience firsthand.

Directed attention: Due to the activity on South Linwood, evergreen screening has been included to direct the attention away from the road, allowing site visitors to focus on the rain gardens.

Surfaces: Utilizing the boardwalk structure entices people to enter the space and indicates a distinct area, separate from the main roads and sidewalks in the park.

Cultural cues: Benches, lighting, trashcans, and bicycle racks have been included in the design of this site to provide additional cues for people to stop. These elements can also increase comfort levels for those interacting with the space.

Rain garden plantings

As described in the best practices, legibility is an important element of a successful interpretive space. This can be challenging for green infrastructure projects like rain gardens due to maintenance issues and seasonal changes in plant material. To ensure the garden is noticeable and engaging throughout all seasons, it is important to select plants for their specific seasonal interest qualities. For this purpose, the following plant palette (Table 23) has been proposed for each of these rain gardens.

Table 23: Proposed plantings [Carter]

Ferns	Grasses	Herbaceous Perennials	Shrubs
Onoclea sensibilis (Sensitive Fern)	*Calamagrostis canadensis* (Bluejoint)	*Arisaema triphyllum* (Jack in the Pulpit)	*Clethra alnifolia* (Summersweet)
Osmunda cinamomema (Cinnamon Fern)	*Carex glaucodea* (Blue Wood Sedge)	*Baptisia australis* (Wild Blue Indigo)	*Cornus racemosa* (Gray Dogwood)
Osmunda regalis (Royal Fern)	*Panicum virgatum* (Switchgrass)	*Chelone glabra* (White Turtlehead)	*Hamamelis virginiana* (Witchhazel)
		Dicentra eximia (Wild Bleeding Heart)	*Ilex verticillata* (Winterberry)
		Erythronium americanum (Trout Lily)	*Kalmia latifolia* (Mountain Laurel)
		Eupatorium dubium (Joe Pye Weed)	*Lindera benzoin* (Spicebush)
		Lobelia cardinalis (Cardinal Flower)	*Myrica pensylvanica* (Northern Bayberry)
		Mertensia virginica (Virginia Bluebells)	*Rhododendron maximum* (Great Laurel)
		Monarda didyma (Beebalm)	*Viburnum dentatum* (Arrowwood)
		Viola cucullata (Marsh Blue Violet)	
		Iris versicolor (Blue Flag)	

Each of these plants (Fish and Wildlife Service, 2012) was chosen for its ability to adapt to wet or dry conditions and for shade, due to the shade canopy that is over each site. Additionally, plants were chosen for specific features, whether flower schedule or prolific berry production, to maintain aesthetic qualities during

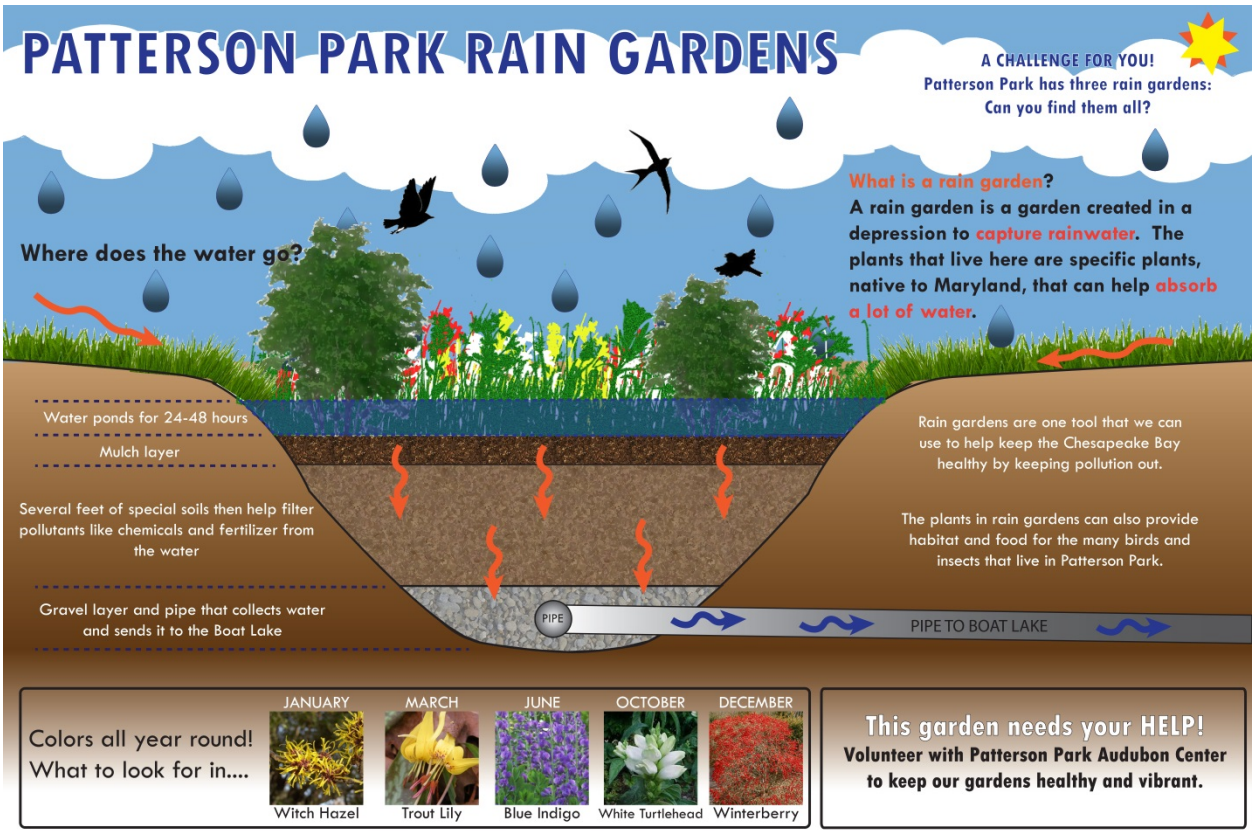
the entire year. As seen below in Figure 55, the shrubs and grasses provide a structural interest and background throughout much of the year. The herbaceous perennials then produce flowers throughout the spring, summer, and fall months, creating more color and interest on the site.

Figure 55: Seasonal bloom calendar [Carter]

Figure 55, above, demonstrates the qualities of many of the selected plants during each month of the year. As seen in the first set of shrubs and grasses, these elements will provide color and structure during the fall and winter months. During the summer months, they will create a green backdrop for the other blooming plants. As the year progresses, different colors appear in the garden as plants begin to bloom. During the fall, changing leaves on several species such as the *Hamamelis virginiana* and *Lindera benzoin* will provide more interest by adding color to the site. In the winter months, when most rain gardens struggle to maintain their presence, ornamental grasses like *Calamagrostis* and *Carex* will persist (albeit dried out) and the *Ilex verticillata* will produce brilliant red fruits. Finally, several understory trees and evergreens, such as Arborvitae and Sweetbay Magnolia, have been selected to provide additional seasonal interest and to assist in creating views into the site and providing some screening from exterior distractions.

Proposed interpretive sign

To explain the basic functions of the rain garden and how it is connected to the broader infrastructure in the Park, the following interpretive sign was designed for two stops at Site One.



This sign assists in graphically explaining how water filters through the different layers in a rain garden and ultimately, how this water goes to the Boat Lake. It also highlights different plant material that is present and blooming at different times of the year. This sign incorporates the following best practices:

Contrasting colors: Using primary colors that contrast with one another, this tactic emphasizes important information and captures the initial attention of the site visitor.

Images and illustrative graphics: A large illustrative cross section of the rain garden is able to easily display how water filtrates through the soil and then is captured by an under-drain with its final destination in the Boat Lake.

Content: The sign also focuses on some of the basic content suggestions as recommended in Chapter Five: Best Practices:

- There are several questions on the sign, pointing out specific connections that can be made between this site and others in Patterson Park.
- Information is broken up into short sentences and bullet points. Short paragraphs are no more than 2-3 sentences.
- The sign includes instructions and tells the site visitor to look for certain plants during different seasons.
- Basic information is presented on this panel. While there are many more details that could be included, this sign captures the most important information that presents the concept in a straightforward manner to the visitor.

|| Chapter Eight ||

Summary and Conclusions

Interpretive signage can be an effective way to educate the public on important issues, like green infrastructure. As this thesis explores though, it is important to consider interpretive signs early in the design stage and select sites that are appropriate for the possible educational experience. Landscape architects play an important role in these educational sites by designing spaces that increase the attraction power and holding power of signs. Based on surveys, field observations, and interviews with landscape architects, a list of best practices was established to be considered at the conceptual design stage, the site design stage, and the graphic design stage. For this project, these best practices were applied to the design of two sites in Patterson Park, Baltimore, Maryland.

While this thesis explores best practices for designing for signage, it doesn't address financial aspects of interpretive signage, nor include a discussion of every precise situation to utilize signage. These decisions are site and programmatic specific and should be determined by those looking to implement signage. In these instances, factors such as visitor volume at the site and availability of maintenance should be considered in the initial decisions on whether or not to incorporate signage. If the site visitation is too low or the likelihood, it should be advised to not utilize interpretive signage as it will most likely not be noticed or effective. Additionally, the opportunity for vandalism can play a large role in determining whether or not to include signs in a design. Interpretive signs may not be the best option for all green infrastructure sites but

if they are, the previously described best practices are a starting point for those designing the spaces.

This thesis answers the general question about how to design for effective interpretive signage, but it raises more questions about interpretive signs in the landscape. One of the more frequently asked questions of this thesis was how to design to deter vandalism. Another question that it raises is how effective is each one of the cultural cues that could be included in site design – are there specific elements, like benches, that are most effective in attracting site visitors? Finally, more questions about the graphic design of the sign can also be asked, focusing on how people perceive the different layers of text and what level of comprehension is typical for short site visits.

Interpretive signs can communicate important messages to site visitors who might be unaware of processes that are happening in the landscape. By increasing awareness about green infrastructure, hopefully these types of projects will be increasingly utilized in small and large infrastructure projects.

Appendix A: Survey Questions

Survey Introduction Script

Hi, my name is Emilie and I am a student at the University of Maryland who is doing research on the effectiveness of interpretive signage. Do you have a moment to take a short, 15-question survey? All answers are "select a choice", there is no writing involved.

Survey Questions

1. This research is being conducted by Emilie Carter at the University of Maryland, College Park. No identity information will be collected. Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time.

If you consent to participate in this survey, please check the box below. By checking the box, you are confirming that you are 18 years of age or older:

☐ I Consent.

2. Did you read or look at the signage?
    a. Yes
    b. No
3. How much time did you spend reading the sign?
    a. 0-5 seconds
    b. 5-30 seconds
    c. 30 sec. – 1 minute
    d. 1 minute +
4. Did you look at the images, read the text, or do both?
    a. Looked at the images
    b. Read the text
    c. Looked at the images and read the text
5. Which was more informative and easier to understand?
    a. Images
    b. Written text
6. Do you have a better understanding as to what is happening here on this site and what the function of the (A – Back Creek Park) eco-technologies (or B – Inner Harbor) floating wetlands *(fill in information depending on site with rain garden, bioswale, green infrastructure, or other site specific installation)* that you were reading about?

a. Yes
b. No

7. Do you normally read interpretive signage?
   a. Yes
   b. No
   i. If yes, why?
      1. To learn more about the site
      2. To learn more about the environment
      3. Because I saw the sign from a distance and it was along the path I was following
      4. Because I am waiting for someone

8. What is your purpose for being (A) at Back Creek Park (B) at the Inner Harbor *(fill in site name)*?
   a. Passing through here and going somewhere
   b. Leisure activity
   c. To learn about this site

9. Did this signage affect your views of the benefits of green infrastructure or (B-Inner Harbor) the floating wetlands *(rain gardens, bioswales, green stormwater management, etc depending on site)*?
   a. Yes
   b. No

10. Did you know about rain gardens, bioswales, bioretention, before visiting this site?
   a. Yes
   b. No

11. Age
   a. 18-25
   b. 25-35
   c. 35-50
   d. 50+

12. Gender
   a. Male
   b. Female

13. Degree of education
   a. Some high school
   b. High school diploma
   c. College
   d. Graduate education

14. Please specify your race:

a. American Indian or Alaska Native
b. Asian
c. Black or African American
d. Native Hawaiian or Other Pacific Islander
e. White
f. Other

Appendix B: Resources Cited

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