ABSTRACT

Title of Thesis:	BOARDWALK NATURE TRAILS: A STRATEGY TO MITIGATE THE NEGATIVE IMPACT OF HUMAN ACTIVITY ON THE LANDSCAPE
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Urban natural areas provide critical opportunities for recreation, education, and human-nature connection, but their high usage also presents major challenges to ecological sustainability. This thesis explores the need to establish a balance between recreational use and environmental conservation. It focuses on the design and implementation of sustainable trails that preserve ecological integrity while enhancing accessibility. Using Lake Roland's Field Loop Path in Ruxton Maryland, this design thesis proposes a boardwalk trail that will minimize soil compaction, erosion, and prevent the spread of invasive species, all of which are common consequences of unmanaged trail use and off-trail trampling. The literature review examines trail-induced ecological disturbance, the spread of invasive species, the impacts of weather and soil types on trial durability, and best practices for sustainable trail design. The central research question investigates how landscape architects can create accessible nature trails that support community use while effectively mitigating environmental degradation. Findings support the boardwalk as a viable solution that offers both ecological protection and inclusive access, representing a practical balance between human use and the conservation of our natural environments.

BOARDWALK NATURE TRAILS: A STRATEGY TO MITIGATE THE NEGATIVE IMPACT OF HUMAN ACTIVITY ON THE LANDSCAPE

by

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Preface

As a child, I was always in awe of the world around me. Nature was my best teacher, a place fully absent of letters and numbers, a place where the dyslexic child in me thrived and always felt fully capable. To give you an idea about the severity of my dyslexia, I will leave you with this fact. I was in the fifth grade, unable to spell and write my name, unable to say or write the alphabet, and could only match a total of five letters to their sound. I spent a lot of my childhood playing in the woods, hiking in the mountains, and soaking in everything I possibly could about our world. I may not have been able to read, but I could tell you most of the things you would want to know about our native species and environment. As I grew older, I quickly realized that nature, as I have always suspected, was under attack due to human induced climate change. In college, I studied Environmental Studies and Biology and had the opportunity to study for a semester in Australia learning about their sustainable practices. It was during my time in Australia that I truly began to understand the severity of climate change. My time in Tasmania was cut short due to the fires. I will never forget driving the roads fully surrounded by scorched woods still smoking after the wildfires had been extinguished. We as humans are nature's greatest threat. This realization is what led me to pursue my master’s in landscape architecture. Now more than ever, our world's natural areas are under attack and the need for a balance between recreation and conservation is critical.

Dedication

This thesis is dedicated to my family—my unwavering foundation and constant source of strength. Your love, sacrifices, and belief in me have shaped who I am today. I would not be who I am today without you. Thank you for everything.

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Chapter 1: Introduction

One of the most significant challenges park managers are faced with today is how to best conserve the environment while still letting humans use it. Herein lies the struggle as park managers must follow policies directing them to balance recreational use and protecting natural resources (Jeffrey, 2016). Hiking, walking, biking, and running trails in urban settings are essential because they provide direct access to experience learning from our natural world, which has been found to have many benefits for humans. "Benefits include reduced anxiety, reduced stress, shorter hospital stays, lower heart rate, and increased directed attention (Franco, Shanahan, & Fuller, 2017, p. 3)." Therefore, natural areas in urban environments tend to be heavily trafficked and well-loved by the surrounding community. Although it is always a good sign when people are out interacting with nature, it also means that due to high use, urban trails tend to become highly eroded, compacted, and trampled by humans. Soil compaction and erosion over time results in gradual species changes along the trail, in many cases, irreversible soil damage and disturbance (Tessier, J. T. , 2022).

This thesis aims to explain why boardwalks could be one of the most effective tools for both trail and nature restoration and conservation at the site-specific conditions on Lake Roland's Field Loop Path, located at the bend in L'Hirondelle Club Road. The goal is to create a design for the Ruxton neighborhood's old rugby field that puts the health of this land and its nature first. The design implements the use of a boardwalk that keeps people off of the vegetation and soil while still

allowing visitors to be immersed in the natural beauty of nature in the area. The trail is short and rather flat with a total elevation gain of 16’ meaning that even with the current terrain it is possible for people using mobility aids to access the trail. However, with the current conditions and lack of a defined trail this experience may not be pleasant.

The research question I am asking is, how can landscape architects design accessible nature trails that serve community needs, mitigate the negative impacts of human activity on the landscape, and effectively revitalize the natural environment? In short, my design aims to balance recreation with conservation.

Chapter 2: Literature Review

Section1 : Trail Overview

As of 2014 the United States had over 78,293 miles of formally recognized recreational trails built by our park agencies, enough to circumvent the globe three times (Ballantyne & Pickering, 2015). In all actuality this number is even higher when we take into account all the formal and informal recreational trails that are not managed by the National Park services. This statistic alone demonstrates how important recreational trails are to people in the United States. No two trails are alike; they all have different uses, widths, soils, and surrounding plant communities.

One thing all trails do have in common, however, is human-caused disturbance. In this sense, disturbance is "the reduction in biomass in an ecosystem (Tessier, J.T, 2022, p. 1)." Taking this definition into account leads us to the fact that

"trails, essentially, are linear corridors of disturbance which cause negative impacts through their construction and maintenance and change abiotic conditions on and adjacent to the trial affecting local biota (Ballantyne & Pickering, 2015, p. 54)." Disturbance on many trails continues once construction of the trail ends; in fact, for most of the older trails in the US, the trail construction was just the beginning. Over time and with use trails change, and soil becomes compacted on the trail as people use it, leading to poor drainage, increased water runoff, muddiness, rutting that exposes tree roots and rocks leading to uneven surface trails, erosion, trail widening, and overall, more disturbance (Ballantyne & Pickering, 2015). Trail widening results from all the elements above as people try to find alternative ways around the tree roots, rocks, and mud that have come from excessive trail use (Tomczyk, Ewertowski, White, & Kasprzak, 2017). When trail width increases, it often leads to daylighting along the trail, which changes the composition of the understory plant communities as the sun now reaches the once fully shaded forest floor, forcing the plant community around the trail to transition from a full shade to a full sun/part sun environment. This means that the plants that were there die, and with that comes the invasives that mature and colonies before native species have a chance to fill in (Wimpey & Marion, 2010) (Tomczyk et al., 2017).

Section 2: Sustainable Trails

Trails are an essential way for humans to connect with nature while positively impacting physical, emotional, mental, and spiritual health. We, as landscape architects, trail designers, and users, must focus our time on designing and

implementing sustainable trails that minimize our resource impact on the earth by concentrating traffic in hardened treads that are sustainably designed with the environment in mind to further avoid degradation. "A sustainable trail is one that is designed, constructed, and managed to accommodate its intended type, amount, and season of use to provide high-quality visitor experience while protecting the trails infrastructure and adjacent natural resources (Marion, 2022, p. 1)." For a trail to be sustainable, its infrastructure must be site specifically designed to ensure utmost protection of the natural environment and "there should be an equilibrium or harmony between human uses and long-term protection and maintenance of the trail network's infrastructure, its environment and cultural resource conditions, and broader social, health, and economic benefits the surrounding community (Marion, 2022, p.1)." When looking at walking and hiking trails “from a conservation perspective, the loss of soil is perhaps the most significant form of environmental impact because it is long-term or irreversible without substantial management action (Marion & Wimpey, 2017, p. 46)”. The constant use of a natural surface trail over time, with weather, is a recipe for soil erosion which in turn exposes roots and rocks which as a result makes the trail wider as people try to avoid the obstructions.

A sustainable trail starts with the grade of the trail. Soil erosion rates have been found to be significantly greater on trails with grades above 10% and are due to the increased momentum that comes with both water and foot traffic associated with higher grades (Marion & Wimpey, 2017).

Section 3: Invasives Take Over

Invasive plants are non-native species that spread rapidly, disrupting ecosystems, outcompeting native flora, and posing significant challenges to biodiversity and land management. Most invasive plants reproduce rapidly, they tend to be better competitors than native species and also tend to be able to adapt quickly to different environments such as, drought tolerance or the ability to thrive in sun or shady environments. Invasive plants often do their best with disturbance and are the first to colonize open areas where an ecosystem change has occurred. The invasion of invasive species often represents a new and strong selective agent for native plant species that are able to persist in the presence of invasives. For many native species, these interactions lead to competitive exclusion, yet some native species manage to persist and coexist alongside invaders. "Native species that still stand in highly invaded areas, are called 'remnant natives,' and may persist for different reasons. First, they may be in the process of going locally extinct, just more slowly than species already displaced. Secondly, persistence of remnant natives may be promoted by ecological factors. For example, the inability of an invader to disperse to all available habitats, habitat heterogeneity, or effects of enemies/herbivores may promote coexistence between native species and highly invasive ones. Finally, the presence of remnant populations may be the result of a change in gene frequencies since the introduction of the invader. Remaining natives may be either better competitors or more tolerant of the impacts of invasive species than the population average at the time of the invasive species introduction, representing evolutionary change in remnant native populations in response to invasive species. This type of

evolutionary change within remnant populations is contingent upon native species having the demographic and genetic resources necessary to evolve in response to the exotic invader before going locally extinct (Leger & Espeland, 2010, p. 169)." This relationship has been demonstrated in the flowchart below (Figure 1) and is important to consider when designing in an area that has a highly invasive plant present.

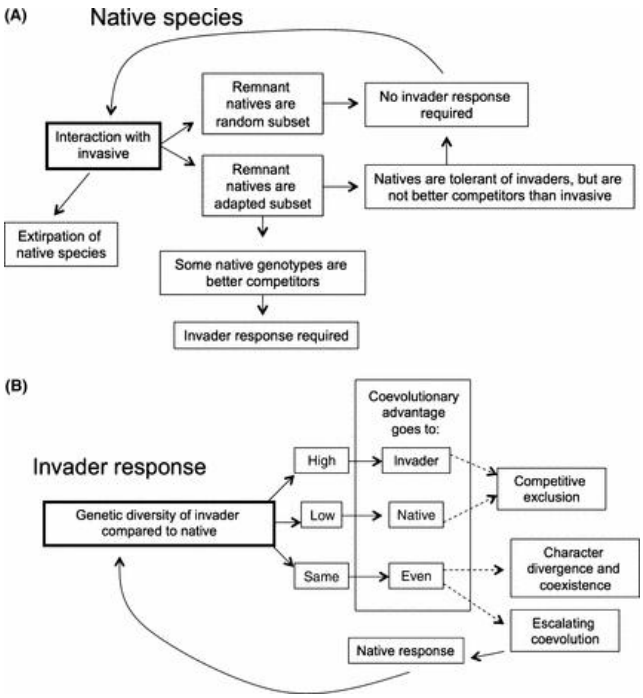


Figure 1: Flow chart showing how native species and invasive species compete and react to the presents of one another (Leger & Espeland, 2010, p. 170).

Community ecology theory suggests that an invasive species is less likely to establish if a species with similar traits is already present in the resident community or if the available niches are occupied. As a result, effective restoration efforts should focus on selecting native species with traits that resemble potential invaders and

ensure a variety of functional traits are represented (Funk, Cleland, Suding, & Zavaleta, 2008). One of the most significant problems, however, is that not much research has been done on specific native species and their ability to compete with natives. One species that is native to North America but considered invasive in other areas is Asclepias syriaca L., common milkweed. It is a broad-leaf perennial with many benefits here in the United States but has become an invasive problem species in other countries such as Hungary (Meinhardt et al., 2024). Here in the United States, it is a common native that tends to do a sufficient job competing with invasives before they grow out of control. The large leaves of the milkweed are good for photosynthesizing. The seeds are dispersed in the fall primarily by wind and lateral rhizomes, making it a fantastic native species to use in restoration work and invasive control.

Section 4: Trampling

Trails are a form of disturbance, and with disturbance comes invasives in most cases. Formal trails are designed to concentrate and direct visitors' use and foot traffic to the desired locations, while protecting the rest of the environment from human disturbance. Another form of human-caused disturbance is caused by off-trail trampling. Trampling is the reduction of biomass that is a result of constant traffic. Most trails, whether in a forest or an open field, are surrounded by ground vegetation, and this vegetation is neither resistant nor resilient when it comes to trampling. The threshold of trampling pressure that vegetation can resist is so low that even “meadow vegetation with resistant grasses and sedges cannot sustain more than 1 or 2 weeks of

camping (Marion, 2016, p. 342)". Once the vegetation is no longer in place, the impacts of humans' continued pressure in the area are seen rapidly, as the organic material and leaf litter disappear from the trail, leaving exposed soil that quickly loses its organic matter and becomes compacted and less fertile.

Trampling occurs for a variety of different reasons. Wimpey and Marion identify six behaviors that lead to off trail trampling; they include "1) passing other trail users, 2) side-by-side travel, 3) avoidance of tread problems (e.g., muddiness, erosion, roughness), 4) inability to remain on the intended tread due to poorly marked trails or ambiguous tread borders, 5) roaming associated with picking the easiest route when traversing steep grades, and 6) attraction and avoidance behaviors (e.g., gaining a view or staying away from a drop-off) (Wimpey & Marion 2010, p. 2030)." Anyone who has spent time hiking in the wilderness knows all six of these reasons all too well; I know that I do. As discussed earlier, this trampling is also the leading cause of trail widening as people try to avoid or get to areas they cannot reach on the designated formal trail.

With trail widening comes an understory compositional change as the trailside vegetation is no match for the constant trampling as people walk along. Suppose invasives somehow miss this opportunity to grow in the bare soil surrounded by the continuous disturbance that helps them to spread and thrive. In that case, you often will find short-growing trample-tolerant graminoids and prostate herbs (Marion, 2022). This trail-side compositional change from shrubs and tall herbs to grasses is common on many trails in Maryland, as the edges of the trail are bare dirt. The Torrey

C. Brown Rail Trail, known by most Marylanders as the "NCR Trail," is a perfect example. In most cases, this compositional change is only seen a few yards from the trail's edge, where disturbance is a constant (Marion, 2022).

Section 5: Weather

It is no secret that the weather has an impact on outdoor activities. Most of the time, when it is raining, people decide to stay dry inside. Additionally, we should note that some outdoor activities are limited to specific weather events; for example, country skiing can only happen when there is snow. In contrast, people can always walk in the rain, although it may not be enjoyable. Typically, weather plays a role in trail use frequency, for example, a review of literature was done in 2021 by Turrisi et al, which determined that recreational trails are more heavily trafficked in the summer than in the winter. The study also found that the length of time that people spent on the trail had a positive correlation with temperature and a negative correlation with precipitation. Other research that was done in the Knoxville Wilderness area of Tennessee found that urban mixed-use trails had higher usage rates in the spring and fall months, with usage decreasing in the cool months of January and February, along with the warmest months of July and August. The research noted that the trails were used the most prior to 3 pm then usage dropped. Wind was not found to affect trail use, but temperature does as trail use increased before slowing down when the outside temperature was 88 degrees Fahrenheit before leveling off (Gregory et al., 2022). This study is essential as it demonstrates that weather conditions clearly influence the frequency and duration of outdoor activities, with temperature and precipitation being

key factors in determining trail use patterns, demonstrating the importance of weather in shaping recreational habits and guiding the management of outdoor spaces.

Section 6: Soils and Use Impact

Soil type also has a significant impact on how well the land stands up to persistent use, resulting in soil compaction. The Soil Science Society of America, established in 1996, defines soil compaction as "the process by which the soil grains are rearranged to decrease void space and bring them into closer contact with one another, thereby increasing the bulk density". In other words, soil is about 25% air, and when soil is compacted, the particles that are separated by air are pressed together, resulting in less pore space in the soil. I find this to be a nice definition of the fundamental physical process. However, Yuejin et al. took this a step farther with the affects of soil compaction on the environment by including, "soil compaction leads to an increase in soil bulk density and a decrease in soil porosity, changing the water and temperature regime and altering the soil nutrient composition (Yuejin et al., 2022, p. 2)." For example, depending on their makeup, soils with high sandy particles tend to show shallow compaction, whereas clay soils have been known to compact up to two feet deep (Restoration Techniques, Chapter 5, n.d.).

Soil compaction happens for various reasons; as noted before, not all compaction is the same. Examples of how soil can become compacted include heavy foot traffic, heavy equipment or livestock movement, and even just the natural process of soil settling after periods of dryness or extreme wetness can compact soil. Soil texture, pH, cation-exchange capacity, clay particle thickness, water content,

roots, and vegetation influence the extent of soil compaction (Kozlowski, 1999). Soil compaction generally impacts soil structure and water movement by increasing bulk density, breaking down soil aggregates, reducing porosity, aeration, and infiltration, while boosting soil strength, water runoff, and erosion. Plant physiological issues often cause reduced water absorption and water stress in leaves. Moreover, it affects plant growth hormones, such as abscisic acid levels (Kozlowski, 1999). Abscisic acids are an essential plant hormone that controls seed and bud dormancy and stomatal closure, directly affecting water gain and loss in the plant's leaves. Changes in this hormone often cause the plant to suffer from reduced water absorption and water stress in leaves. The photosynthesis rate of plants in highly compacted soils is hindered because of stomatal and non-stomatal factors, and total photosynthesis decreases due to smaller leaf sizes. As soil compaction intensifies, root respiration shifts to an anaerobic state. Severe compaction can hinder forest regeneration by preventing seed germination, stunting seedling growth, and increasing mortality. Additionally, it drastically reduces the growth of mature woody plants and harvest yields due to the combined effects of high soil strength, poor water infiltration, and limited aeration, which restricts essential growth factors at the meristematic sites (Kozlowski, 1999), (Ballantyne & Pickering, 2015), (Martin & Butler, 2017). The effects of compaction on soil structure function, hydrology, and productivity are well documented. Yet, it is not a problem that is often discussed, even though it has had highly detrimental impacts on the Earth and our economy. In 1971, it was estimated that the United States alone was losing one billion two hundred million dollars

annually in crop revenue due to compacted soils (Kozlowski, 1999). That number has drastically increased now.

When formal trails with access points to desired locations do not exist, people take it upon themselves to create informal trails. Informal trails are trails that are not sustainably designed. Instead, they are formed by foot traffic and are rarely, if ever, maintained, resulting in further land degradation (Marion, 2022). For example, in 1996, Marion and Cole conducted a study along the Delaware River investigating the canoe campsites along the river, which found that "the majority of detrimental impacts occurred during the first year of use. However, recovery took six years, despite this area being characterized by long growing seasons and fertile soils (Tomczyk, Ewertowski, White, & Kasprzak, 2017, p. 2)." This study demonstrates that nature's recovery process cannot keep up with the rate of human trampling.

Section 7: Management

Management is a critical element of sustainable trail success and longevity and, therefore, is something that always needs to be considered before any trial is implemented (Marion, 2022) (Tessier, 2022), (Ballantyne and Pickering, 2015), (Tomczyk et al. 2017). In the future, all trails should be designed sustainably so that we minimize human impact by concentrating traffic on trails with hardened surfaces.

Management actions are the only way that we as humans will keep ourselves from destroying our environment, in today's world, we need them now more than ever. This year alone, the National Park Service has had to lay off 1,000 employees,

and the budget for protecting our national parks under the Wilderness Act has suffered tremendous cutbacks. The good news is that nature is something most people value and want to protect. Therefore, sustainable trails and access to nature are important when moving forward.

Most of the trails in urban environments are short; they are in fragmented forested areas and often have the community right outside of them. Most are natural surface trails and lack a clearly defined path that concentrates foot traffic, and as a result, the creation of desired paths is extremely common as people explore the area. Having a defined hard surface path that concentrates people into one area along the trail is a much more effective management strategy. It does a better job of directing people than a natural surface trail. Think, for example, about the last time you went on a hike and there was a bridge that crossed over the water. Most people use the bridge instead of finding their own more complicated way across the water. Bridges are an excellent everyday example of how trail infrastructure can protect humans from harming the environment. Formal trails with infrastructure like bridges or a defined path work well. However, their effectiveness quickly diminishes when people decide to meander away from the formal trail, creating their own informal trails (Hockett, Marion, & Leung, 2017).

In 2017, a study on the hiking trails of Bear Island, located in Potomac, Montgomery County, Maryland, was conducted to evaluate the effectiveness of combining educational interventions with site management strategies to reduce off-trail hiking in an urban-adjacent protected area. The park is situated between the

Potomac River and the Chesapeake and Ohio Canal and is managed by the National Park Service as part of the Chesapeake and Ohio Canal National Historical Park. It is also co-owned by The Nature Conservancy. In the study, four intervention treatments were used, the first being signs that asked visitors to stay on the trail, the second being physical barriers created by piling brush in front of the desired trails to create a blockade. The third treatment left the signs and brushing in place and added symbolic restoration sites along the trail that were marked with no trampling signs. Then the last treatment consisted of personal contact when a person stood at the informal trail entrances, directing and educating people. A control treatment was also implemented where nothing was done to the trails, including no signage. It is important to note that all treatments were on different trails, not all on the same foot trail (Hockett et al., 2017).

Two other methods were used as well, including a visitor survey and then direct observation of trampling behaviors on the trail. A total of 1,205 surveys were filled out by visitors and asked about age, gender identity, educational background, demographics, self-reported off-trail hiking behaviors, awareness of trampling impacts on rare plants, and opinions about the management practices. The results of the survey found that 70% of the trail users were between the ages of twenty-five and forty-nine, and many respondents, 41.2% had hiked the trail more than three times before. The urban location of the trails lent to the fact that more than half of the trail users, 76.7%, were locals in the area (Hockett et al., 2017).

On the control trail where observations were made by park stewards, an average of 25.9% of the hikers on the 90m trail walked off the formal trail. When signage was present on the trail this rate was reduced by only 6%. It should be noted that part of the reason the number of people who strayed from the trail in this group was so small was likely due to the presence of park managers. Interestingly, the self-reported trail use surveys found that 70.3% of the trail visitors reported leaving the main trail for various reasons. The surveys showed that signage had no impact on visitors' behavior. This finding is notable as it demonstrates that the presence of an authoritative human plays a significant role in protecting trails from trampling. "The brushing and restoration & fencing treatments significantly reduced off-trail hiking to 60.2% and 58.6%, respectively. The final and most comprehensive treatment, which used personal contact to convey the covered trailhead educational sign message, was the most effective, reducing self-reported off-trail hiking to 43.0% (Hockett et al., 2017, p. 22)." The signage method alone was not very successful, primarily because it relies on people actually reading the signs instead of walking right past them.

The results of this study are important because they demonstrate that physical obstruction is the most effective anti-trampling management strategy, whether or not a park steward is present. The survey results alone indicate that the treatments applied to reduce off-trail trampling were relatively effective, as the percentage of intentional trampling on the trails went from 70.3% to 43% after the treatments were applied (Hockett et al., 2017).

It should be noted that although this study was successful, park managers played a significant role as their presence kept people honest and off of the areas they should not walk on in most cases, as the visitors would rather stay on the trail than be reprimanded by authority. Although it would be nice to have every trail equipped with a steward, this is not a possibility in most cases, as funding and staffing are an issue. The positive impact that physical barriers have on deterring people from areas is a much more logical and implementable strategy that can be incorporated into current and future trail designs. Going forward, it is crucial that trail designers take management into account, as humans cannot always be present and most of the time are not on small or short community-used urban trails. The key is going to be balancing conservation and recreation in a way that protects our landscapes from human destruction.

Chapter 3: Lake Roland History

Section 1: Large Scale History

The land that is now Lake Roland has a rich history of mixed-use dating back to the 18th century when it was gifted as a land grant to a handful of families from Lord Baltimore. In 1853, Baltimore City announced that it would purchase six properties in the area to build Baltimore City's water source. The Bellona Gunpowder Mill and The Eagle Factory, a textile mill at the time, were both acquired by the Baltimore Mayor and the City Council so that the artificial lake could be completed. From 1804 to 1854 a privately owned water company had the entire city of Baltimore depending on them for water. As the need for water increased so did the land the

company had to acquire upstream from existing mills. This pattern of individual control over a public water source was put to an end in 1854 when the city of Baltimore bought the entirety of the Baltimore Water Company for $1,350,000 (Historic Dates, 2015). The construction of the new Baltimore water source began in 1854, and in 1862, the reservoir began supplying water to the city with a conduit running from Lake Roland to Hampden Reservoir. However, after two years, it became clear that more water would be needed than Lake Roland could supply (McGrain, 1979). Not having enough water was not the only problem Lake Roland encountered after construction, as sedimentation and siltation were also extreme problems as the slopes around Lake Roland drained the water directly into the reservoir. Although the Lake Roland water supply project failed to provide the water needed to the city, its construction is highly significant as it was "the first municipal water supply system to be built in the City of Baltimore, as well as one of the first municipal waterworks constructed in the State of Maryland (Lake Roland Damn Hear No. MD-81)." In addition, the lake was one of the first sites in the United States to implement large-scale water purification testing using liquid chlorine (Lake Roland Damn Hear No. MD-81). Due to Lake Roland's historical significance, the land was designated as the Lake Roland Historic District in 1992 under the National Register of Historic Places (The Cultural Landscape Foundation).

The naming history of what is now Lake Roland is complex and has been changed multiple times. When first constructed, the lake was named Swan Lake in remembrance of Mayor Thomas Swann, who was in office when the construction of the lake began. Then in 1945, the park was renamed the Robert E. Lee Memorial Park

to honor General Robert E. Lee, who was the commander of the Confederate Army in Northern Virginia during the Civil War. This name lasted for many years until it was recently changed in 2015 to become Lake Roland officially. The name originates from the Roland Run Stream that runs through the area still to this day, and has been mentioned in past literature dating back to 1694 (History -Dam -and -Water -Supply -Chronology.pdf. 2020).

Today, Lake Roland is managed by Baltimore County, which has a one-hundred-year lease on the land from Baltimore City's landform. The public park consists of 503 acres and is home to wetlands, meadows, mature hardwood forest, and the ecologically rare serpentine barrens of Bare Hills (Hoffman, 2022). Other amenities the park has to offer include areas of paved walking trails, a nature center, a dog park, picnic areas and pavilions, playgrounds, a canoe and kayak launch, the dam, a COVID-19 Memorial public art project walk, and piers that people can fish using the catch and release method. The park is open daily from sunrise to sunset. The park's main entrance is located at 1000 Lakeside Drive, Baltimore, Maryland 21210, but the trails within the park have many other access points.

The Field Loop Path, which will be the focus area of my research, is located on the far northeastern side of the park and is only about 2,059 ft in total. Perhaps one of the shortest and most secluded trails owned by Lake Roland, it is situated and only accessible from the bend in L'Hirondelle Club Road. It is a short out-and-back trail with great potential.

Section 2: Land History and Current Land Use

The land that now makes up Ruxton was historically farmland that Lord Baltimore's Land Office granted to six second or third generation settlers in sizes ranging from 100 to 500 acres per person. Many people who lived in Ruxton owned slaves, as is reported in the first federal census of 1790, which showed the population here was a total of 236 people, with 34 free white males over 16 years of age, 35 free white males under 16 years of age, 61 free females and 106 slaves. The introduction of the railroad to Ruxton, coupled with the opening of Lake Roland, led to the rising land prices in the area, which in turn caused the shift from agricultural lands to suburban homes. The first subdivision happened in 1854, and parcel division followed soon after. People were drawn to Ruxton as it was just outside the city limits, making it a perfect commuter neighborhood for people who worked in the city (Ruxton, Riderwood, Lake Roland Area Improvement Association, Historical overview 2025). Today, the Ruxton area is primarily residential housing with Lake Roland to the South (Figure 2).

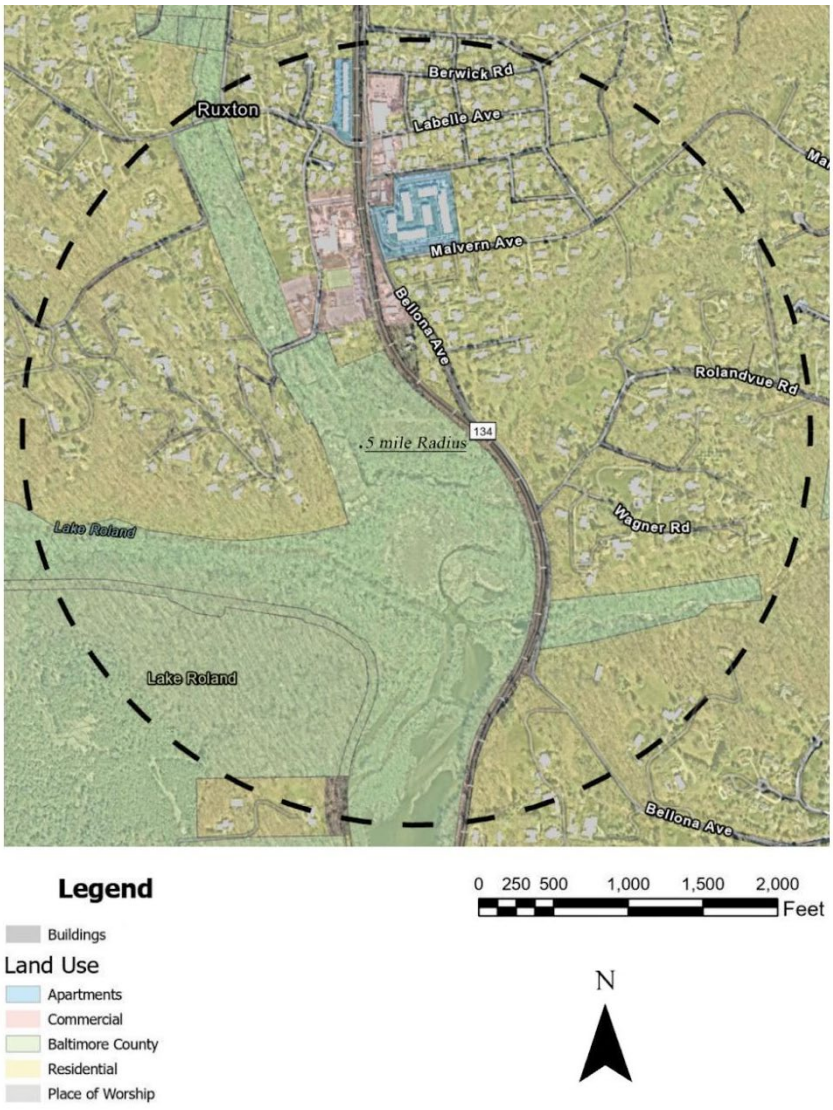


Figure 2: Current Land Use Within a ½ mile radius of the Field Loop Path Trail. Graphic by author.

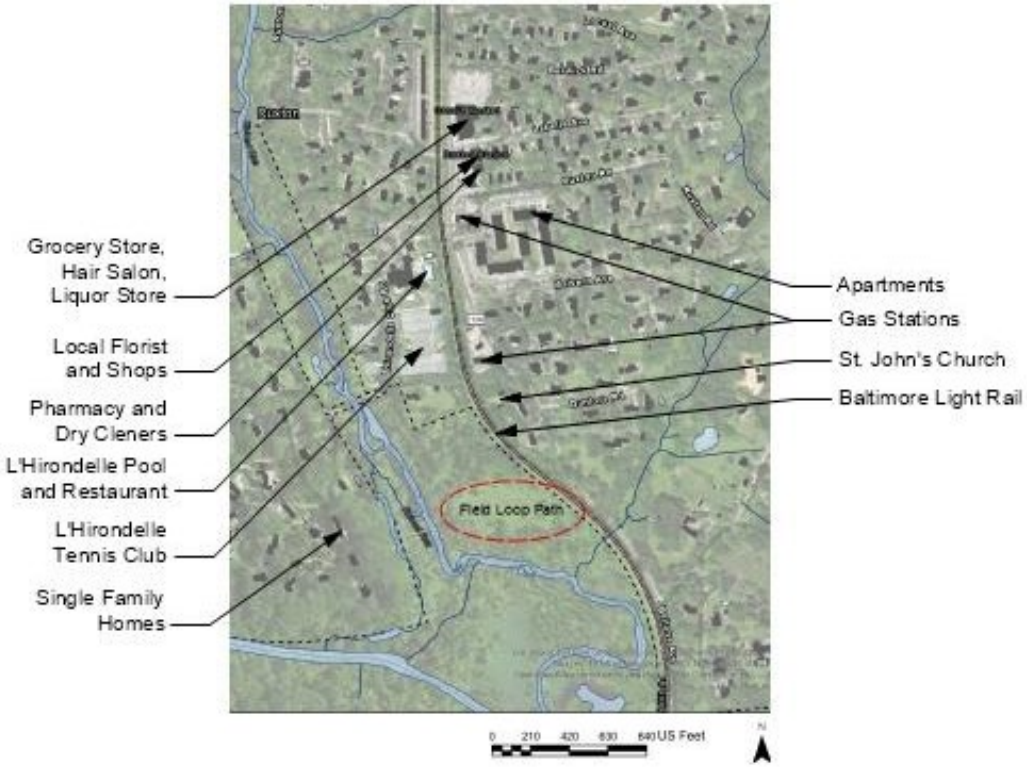
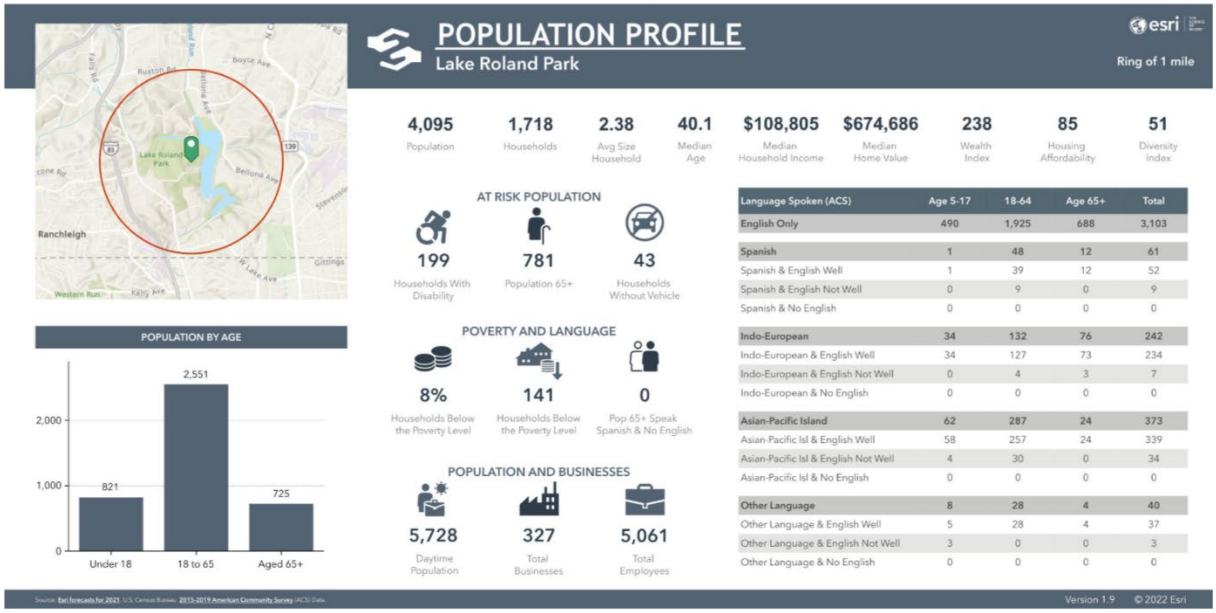


Figure 3: Industries Proximity to Field Loop Path. Graphic by author.

Section 3: Demographics

When assessing the population of people that live within a 1-mile radius of Lake Roland it was found that the total population was relatively small at 4,095 people. This is due to the fact that within a one-mile radius of the park, when done from the center, the public park takes up the most land space. The number of households sits at 1,718, with the average age being around 40. It is important to note that the number of households with a disability is 199 in total, so there is a need for accessible parks. Most people in the area speak English, although there is a small number who speak Spanish as well. Within a one-mile radius, there are only 327 businesses, although again, this statistic is a bit skewed due to the fact that Lake Roland takes up most of the land mass. The median household income is high; most

people make over 100,000 dollars a year and the housing affordability index is 85. (Hoffman, 2022), (U.S. Census Bureau.).



Language Spoken (ACS)	Age 5-17	18-64	Age 65+	Total
English Only	490	1,925	688	3,103
Spanish	1	48	12	61
Spanish & English Well	1	39	12	52
Spanish & English Not Well	0	9	0	9
Spanish & No English	0	0	0	0
Indo-European	34	132	76	242
Indo-European & English Well	34	127	73	234
Indo-European & English Not Well	0	4	3	7
Indo-European & No English	0	0	0	0
Asian-Pacific Island	62	287	24	373
Asian-Pacific Isl & English Well	58	257	24	339
Asian-Pacific Isl & English Not Well	4	30	0	34
Asian-Pacific Isl & No English	0	0	0	0
Other Language	8	28	4	40
Other Language & English Well	5	28	4	37
Other Language & English Not Well	3	0	0	3
Other Language & No English	0	0	0	0

Figure 4: Population Profile within a 1-mile radius of Lake Roland Park. Graphic from Hoffman, S. (2022, May 10).

A three-mile radius was also considered to get a less skewed demographic profile due to the large size of the park. Within a 3-mile radius, the population jumps to 109,557 people, and the number of households jumps to 42,440. The average age of people is also younger, at 38.7 years old. Perhaps the most significant jump is that the number of households with people who have disabilities has risen to 7,356. Even within a three-mile radius, English is the primary language spoken. The number of businesses in the radius also jumps to 5,661, much higher than the one-mile radius.

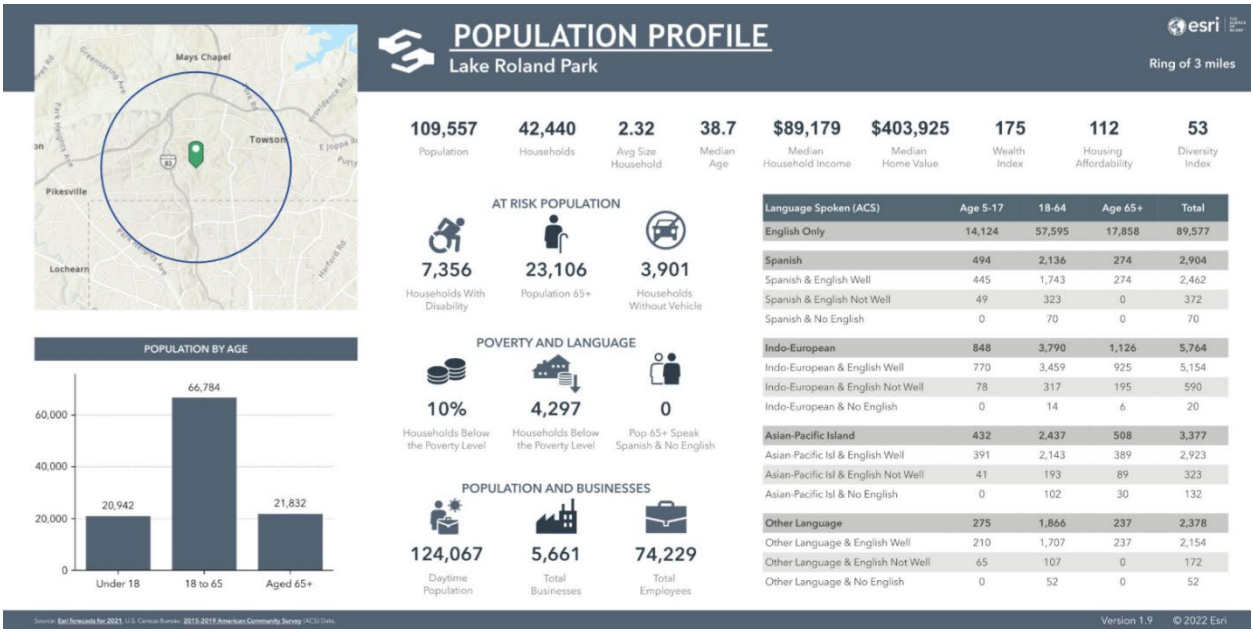


Figure 5: Population Profile within a 3-mile radius of Lake Roland Park. Graphic from Hoffman, S. (2022, May 10).

Section 4: Environmental

The thesis site and the greater Ruxton, Lake Roland, and Riderwood neighborhoods are located within Baltimore County located in the USDA ecoregion 64c, the Piedmont Uplands, which is a subdivision of the Northern Piedmont. “The Piedmont Uplands ecoregion is characterized by rounded hills, low ridges, relatively high relief, and narrow valleys and is underlain by metamorphic rock. Irregular plains and narrow valleys typically have elevations that often range from about 450 feet to 1,000 feet (Woods, Omernik, & Brown, 1999, p. 21).” The climate is characterized as humid continental with hot summers and cold winters. On average, the growing season or days without a killing freeze is between 170 and 210 days. The vegetation in this ecoregion is typically Appalachian Oak Forest, which is dominated by white and red oaks, and the land use and cover is mainly a mix of smaller farms, residential,

commercial, and industrial development with woodlands mixed throughout (Woods et al., 1999).

The thesis site is located within the Jones Falls watershed, one of the four sub-watersheds situated in Baltimore. It is located between the Herring Run and Gwynn's Falls sub watersheds. The reservoir at Lake Roland is the direct drainage point for all of the northeastern Jones Falls, meaning that the streams of Roland Run, Ruxton Run, and Towson Run all directly spill into Lake Roland (Baltimore County Department of Environmental Protection and Sustainability, 2013).

Figure 6: Map of Jones Falls Watershed. Graphic taken from www.Blue-Growth.org

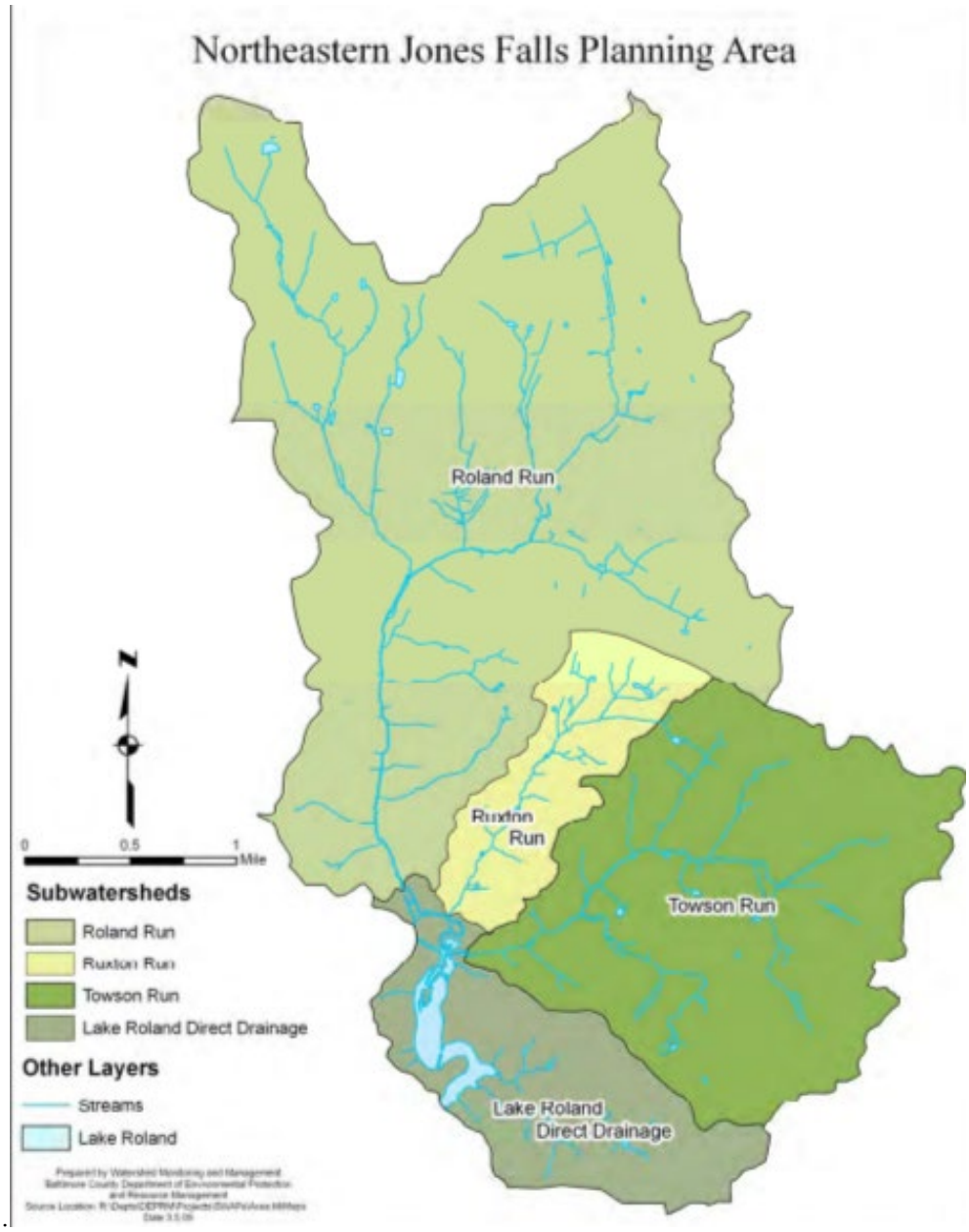


Figure 7: Map of Northeastern Section of Jones Falls. Graphic taken from (Baltimore County Department of Environmental Protection and Sustainability, 2013).

Chapter 4: Field Loop Path Introduction

Field Loop Path is located along L'Hirondelle Club Road in Ruxton, MD (Figure 1). It is situated directly across from the L'Hirondelle Club's tennis courts in a well-off residential neighborhood.

The name given to the trail reflects the trail's nature, as the main loop of the trail takes you around a large open field that gets mowed once a year. According to locals, this field used to be a rugby field in the 1970s, and it is well-documented in the Ruxton - Riderwood - Lake Roland Area Improvement Association neighborhood newsletter, which has been going out every season since 1953. The field used to be an area where the community would hold events, such as bonfires in the winter. Now the field has reverted to a grassy meadow with more invasive species than native or beneficial varieties.

This trail differs from most other trails owned by Lake Roland due to its remote and almost hidden location in the neighborhood. Currently, there is no way to access the trail from the main park, making it one of the less traveled and degraded trails, as people must drive and park in the neighborhood to walk on it. Consequently, the trail's main users tend to be people in the neighborhood who can walk from their house to the trail for a quick walk, watching the light rail go by with kids or birdwatchers. Wild Birds Unlimited in Timonium has posted on Instagram about birdwatching meetups at the trail, and Lake Roland has also organized a few bird walks. The Baltimore light rail runs along the eastern side of the trail about every 30

minutes, bringing people back and forth from the city to the county. Bellona Avenue is located on the other side of the light rail tracks.

When you arrive at the trailhead, located at the bend in L'Hirondelle Club Road, you are greeted by a red pasture gate so that people do not drive down the trail. Although not beautiful, it does its job and blends into the natural woodland environment well. You enter the trail facing south, and to your right is Roland Run stream flowing southwards as it feeds into Lake Roland and eventually leads to the Inner Harbor of Baltimore.

Chapter 5: Vision and Goals

Section 1: Vision

My vision for the future of Field Loop Path is rooted in restoration, revitalization, and stewardship. I envision a landscape where nature is protected from human impact, not merely managed for it, where the integrity of ecosystems is preserved and allowed to flourish by prioritizing the needs of the natural world. This is a place where ecological health comes first, and where human presence is guided by respect, education, and deep reverence for the land. Through this approach, I envision a space where both community and ecology can thrive together, in harmony, while being protected from one another. I envision elevated boardwalks throughout the site guiding visitors through the once degraded and decimated by invasive species landscape that is Field Loop Path. The boardwalks will have railings to keep people on them offering a low-impact, immersive experience while protecting the delicate landscape around them.

Another goal of the Field Loop Path revitalization is accessibility for all. To do this, I picture 10' wide boardwalks so that wheelchairs, strollers, and any other mobility aids can be used with ease. I would like people to be present mentally when walking the trail instead of having to worry about maneuvering around or between people or objects. Every person deserves access to nature. Tragically we live in a world that prioritizes able-bodied people and so often forgets or brushes off those with disabilities. I picture this site as a safe place for all people, a place where parents can let children run ahead and experience the world around them without worrying that they may wander off or get lost, a place where elderly people can easily walk and explore the way they were able to when younger, a place where teenagers can hang out together outside instead of in a basement with their eyes glued to the television, and most of all a place that protects this small area of urban wilderness from humans and destruction.

I intend to primarily use native species to rehabilitate the land and bring it back to its natural state. Each species used will be carefully selected to suit the sites' soil types, moisture levels, sun exposure, and microclimates. In turn, over time the hope is that local pollinators, birds, insects, and mammals will come back to the site in more significant numbers than currently exist as the seasonal bloom cycle will be restored. With time, as plants establish and take root, we should see better soil stability along with the slowing of runoff and enhanced water infiltration as the ecosystem recovers from years of invasive plants smothering the site.

Section 2: Design Goals

Goal #1: Environmental health and resilience: The primary goal of my thesis redesign of Field Loop Path is to prioritize environmental health and resilience, placing ecological priorities above human convenience in an effort to reframe how humans can coexist with nature rather than dominate its natural systems. My design will use boardwalks to guide visitors through the site, allowing humans to have a presence in nature without doing damage. I will do this by actively avoiding any earthworks on the site so that the grade and slopes are not altered, which in turn allows for existing healthy trees and species to remain on site while removing those that are detrimental or invasive.

Goal #2: Design With the Environment in Mind: Currently, whether we would like to admit it or not, we are living in a world where all nature, as we know it is under attack. Lands that have been protected under The Wilderness Act of 1964 are now being logged because humans have destroyed all other significant areas of nature. Keeping this fact in mind, it is vital that going forward we, as landscape architects, design with the environment in mind. Humans must come second in the design process and think about the Australian Aboriginal proverb, "We are all visitors to this time, to this place. We are just passing through. Our purpose here is to observe, to learn, to grow, to love, …. and then we return home." To help control people's impact on the Field Loop Path this design will implement a boardwalk.

Goal #3: Accessible Design: For this thesis, accessible nature design is defined as creating outdoor spaces where everyone, regardless of age, ability, or background, can access nature. My goal is to create a space in which everyone will be

able to experience the same beauty of nature. To guarantee accessibility, the boardwalk must be wide, and the slope should always be under 5%.

Chapter 6: Relevant Case Studies

Accessible, earth-friendly nature trails that utilize boardwalks to protect the environment currently seem few and far between. This is probably due to the fact that they have a significantly higher upfront build cost compared to most natural surface trails. Although this is true, protecting nature from humans while also allowing access to nature is worth it. The benefits of boardwalks extend farther than just protecting the environment, as it also means accessibility to nature for all is possible.

Section 1: The Naval Cemetery Landscape

The first public park to open along the 26-mile Brooklyn Waterfront Greenway was The Naval Cemetery Landscape, designed by Nelson Byrd Woltz Landscape Architects for The Brooklyn Greenway Initiative. Although Brookland has a long history of different land uses, this site sits on a parcel of land that was home to a naval hospital with its cemetery between 1831 and 1910. It is estimated that approximately 2,000 men were buried there. Woltz was tasked with designing a landscape that fostered mindful reflection, restored mental health, and strengthened communities while also honoring those who had been buried there. In regard to this thesis, this project is significant as the walking surface of the entire trail is an elevated boardwalk (Naval Cemetery Landscape | ASLA 2020 Professional Awards. n.d.), (Naval Cemetery Landscape | Nelson Byrd Woltz. n.d.). The site's design features include a memorial meadow and a sacred grove that are surrounded by a boardwalk.

The planning palette used prioritized natives to aid in the return of pollinators from the once degraded, exploited land. The park is located in an urban setting, and you can literally see the skyscrapers in the distance towering over the trees and other vegetation now thriving on the ground below. The boardwalk is made from black locust (*Robinia pseudoacacia*) wood. It encompasses a 1.7-mile site which doubles as a space to hold community events such as yoga and beekeeping classes.

Figure 8: Site plan for The Naval Cemetery Landscape. Designed by Nelson Byrd Woltz

Figure 9: Black Locust tree (Robinia pseudoacacia) boardwalk at The Naval Cemetery Landscape. Photo Credits to Max Touhey.

Section 2: Red Ribbon Park

Red Ribbon Park is located in Qinhuangdao, Hebei, China, and was designed by Turenscape for The Landscape Bureau, Qinghuangdao City, Hebei Province, China. The project is a minimum intervention approach to creating an urban greenway along the Tanghe River. The design takes its name from the red ribbon that runs along the boardwalk, serving multiple purposes, including lighting, seating, environmental interpretation, and wayfinding. The red ribbon boardwalk follows the river corridor. It spans over five hundred meters in length, allowing people to travel along the river and be immersed in nature without trampling the sensitive landscape around them. Prior to becoming part of the now greenway, this site functioned as a dumping site that was scattered with old water towers and random irrigation facilities

from back when the area was farmed. Like most current designs, the most significant challenge with this site was successfully preserving the natural habitats and river while also creating opportunities for recreation. By utilizing a boardwalk as a central design feature, the surrounding environment was able to be protected while also offering an accessible area for all people to enjoy. The experience one has in the park is controlled by using the boardwalk as well so that people know how to stay on the path. The design features crossings for small animals, along with plenty of opportunities to get out of the harsh sun, have social gatherings, and environmental interpretation plaques are placed strategically throughout the site. The now-abandoned farm fields have been turned into pollinator-friendly perennial gardens. This design has won numerous awards, including the 2010 Annual Honor Award for Excellence on the Waterfront, the 2008 International Architectural Award, and the 2007 ASLA Design Honor Award (Turenscape - Qinhuangdao Red Ribbon Park, n.d.),(Red Ribbon Park / Turenscape, 2013). The winning of these awards is a testament to the brilliant design of the site, which allows for the perfect balance between conservation and recreation, which our world so desperately needs.

Figure 10: Qinhuangdao Red Ribbon Park site plan. Designed by Turenscape. Photo Credits Turnscape

Figure 11: Qinhuangdao Red Ribbon Park. Designed by Turenscape. Photo Credits Turenscape.

Section 3: Strandskogen Arninge Ullna

Located in the new urbanized district of Täby in Stockholm, Sweden, is the Arninge-Ullna Riparian Forest Park. The park was designed by Topia landskapsarkitekter for the Täby Municipality and was constructed between 2013 and 2015. The land is classified as a swamp alder forest, commonly referred to as a flooded forest. This type of ecosystem is typically found in floodplains, where the area experiences periodic flooding from nearby bodies of water. The flooding is often seasonal, and its duration can vary significantly. Consequently, the vegetation growing in them must be adaptable and be able to withstand periods of water inundation along with periods of dryness.

Due to frequent flooding and to preserve the ecology of the site Arninge-Ullna Riparian Forest Park features an accessible boardwalk that branches out into various areas, allowing visitors to explore the entire park. The bends in the boardwalk are made from recessed ochre gratings, which allow native plants to reach through the design. This project is an excellent example of how landscape architects are striving to prioritize nature while still allowing people to immerse themselves within it. The boardwalk protects the species on the forest floor from humans yet still allows for recreational activities (Strandskogen Arninge Ullna by Topia, n.d.).

Figure 12: Strandskogen Arninge Ullna site plan overview of boardwalk and footbridge paths. Graphic taken from Strandskogen Arninge Ullna by Topia. (n.d.). Landezine.

Figure 13: Strandskogen Arninge Ullna boardwalk. Photo credits to Oskar Segerström.

Chapter 7: Site Inventory

The first section of the trail into the meadow is wide with a crushed CR6 path that gets narrower as you proceed. The walk into the field is short, only about 655 feet, which is equivalent to about 0.124 miles with the path around the field being only 0.25 miles. The topography change is gentle with the total change across the field being only 6' over the 500' long open field. Walking in on both sides of the path are struggling as the forest floor is covered in invasives and the Japanese kudzu vines and ivy climbing the trees while also blanketing the forest floor. As a result of this some of the older trees have died and are left with only the trunks standing.

With the invasives it is clear as you walk into the trail that the canopy is thinning which in turn allows for more invasives to thrive even in the little or dappled sun they receive. Along the trail you will find invasives blanketing the ground, including Japanese Barberry (*Berberis thunbergii*), Multiflora Rose (*Rosa multiflora),* Wineberry (*Rubus phoenicolasius*)*,* English Ivy (*Hedera helix*)*,* Kudzu (*Pueraria montana var. lobata*), Mile-A-Minute (*Persicaria perfoliata*), and Porcelain Berry (*Ampelopsis grandulosa*), just to name a few that have been identified (figure). Many of the same invasive species are present even in the open field and its woodland edges however others such as Bradford/Callery Pear (*Pyrus calleryana*), Chinese Pennisetum (*Cenchrus alopecuroides)* and many other invasive grasses are also present. The invasive plant takeover that is happening on this land is taking its toll on the natural ecosystem quickly and the invasives are quickly replacing the natives as they are better suited to colonize areas after a disturbance. The number of invasive

grasses in the open field it should be noted is not actually surprising as “grasses and sedges (graminoids) are substantially more resistant than broad-leafed herbs/forbs, largely due to the toughness and flexibility of their narrow stems and leaves, low stature, and higher growth rates throughout the growing season (Marion, 2022).” This finding is demonstrated on the field loop path as its trail is only defined by a mowed path currently and in most cases is lined with Chinese Pennisetum and other invasive grasses.

The native and non-invasive species present along the trail and open field are less apparent on the site yet still present. If you look closely, you will see Arrowleaf Violet *(Viola sagittata),* Christmas Fern *(Polystichum acrostichoides),* and Blue Phlox (*Phlox divaricata)* on your walk to the meadow. Once in the meadow area there is a larger variety of natives including Common Milkweed (*Asclepias syriaca*) ,Cutleaf Coneflower (*Rudbeckia laciniata*), Allegheny Blackberry (*Rubus allegheniensis*), Giant Goldenrod (*Solidago gigantea*), and White Yarrow (*Achillea millefolium*) just to name a few.

Figure 14: Site Photos Taken at Field Loop Path through the seasons. Graphic by author.

Figure 15: Site photos continued with site plan linework layer over the site's topography. Graphic by author.

Chapter 8: Site Analysis

Section 1: Soils

The main loop of Field Loop Path is located on UuB, which represents a complex of Urban Land and Udorthents soils, both of which are typically found in areas that have been significantly modified by human activity over the years. Udorthent soils are characterized by human disturbances such as excavation or grading. The Urban Land component of the soil means that the natural soil in the area has been significantly altered over the years and could lack a defined soil profile as a result. The typical soil profile consists of 0-3" of silt loam, 3-65" of gravelly silt

loam, with bedrock located 65-80” below that. The soil on my site is D in the hydrologic soil group, and in the well-drained drainage class and medium run off class. (Web Soil Survey Area: Baltimore County, Maryland, Version 19, Sep 6, 2024).

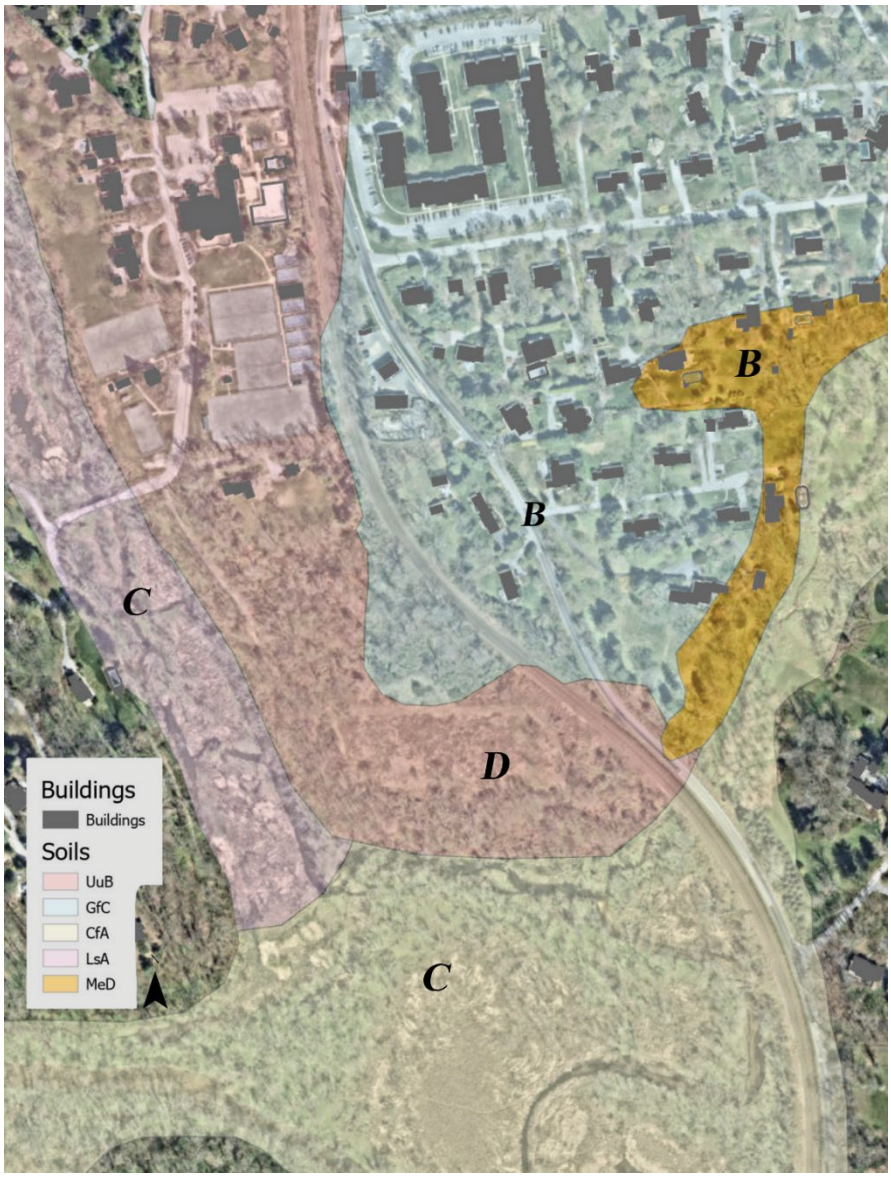


Figure 16: Field Loop Path and Surrounding Areas, Hydraulic Soil Groups and Soil Types. Graphic by author.

Section 2: Geology

The geological formation of my thesis site is Baltimore Gneiss, which is one of the oldest rock formations in the eastern United States. Its formation dates to the Precambrian era and was formed deep in the Earth's crust as igneous and sedimentary rocks metamorphosed under intense heat and pressure. Gneiss is a high-grade metamorphic rock, and Baltimore Gneiss typically is banded with quartz, feldspar, mica, and other minerals. This type of rock serves as the base for soils like the Urban land–Udorthents (UuB).

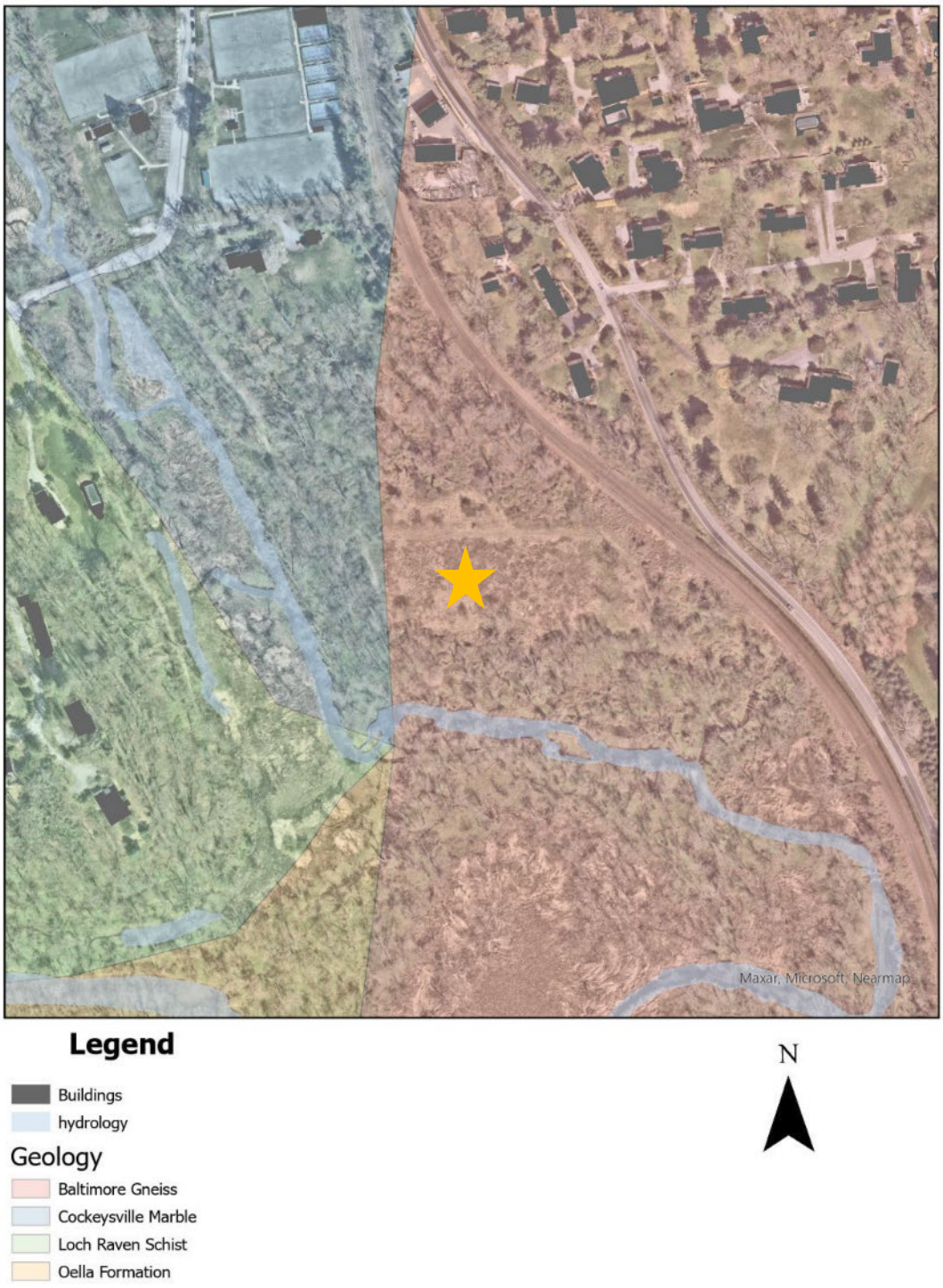


Figure 17: Field Loop Path and Surrounding Sites Geology. Graphic by author.

Figure 18: Outcropping of Baltimore Gneiss, in Maryland. Photograph by "JStuby" (Wikimedia Commons; Creative Commons CC0 1.0 Universal Public Domain Dedication).

Section 3: Field Loop Path Site Analysis

Field Loop Path is in an area that receives full sun throughout the year, as it is a clearing in the surrounding forest. However, it does experience filtered light along the southern edge of the trail during winter, due to the sun setting lower in the sky. The prevailing summer winds come from the southwest, while the winter winds originate from the northwest. Due to the tall trees and dense vegetation surrounding the site, it is generally well protected from strong winds. However, a slight breeze can still be felt on the trail, and the wind is most noticeable through the rustling of the tree leaves. The highest point on the site is located along the light rail tracks north of the main path and the lowest point is in the southwest corner of the site where the land

meets the Roland Run stream. The Topography of the site is a gentle slope, and all water runs off the site and into Roland Run.

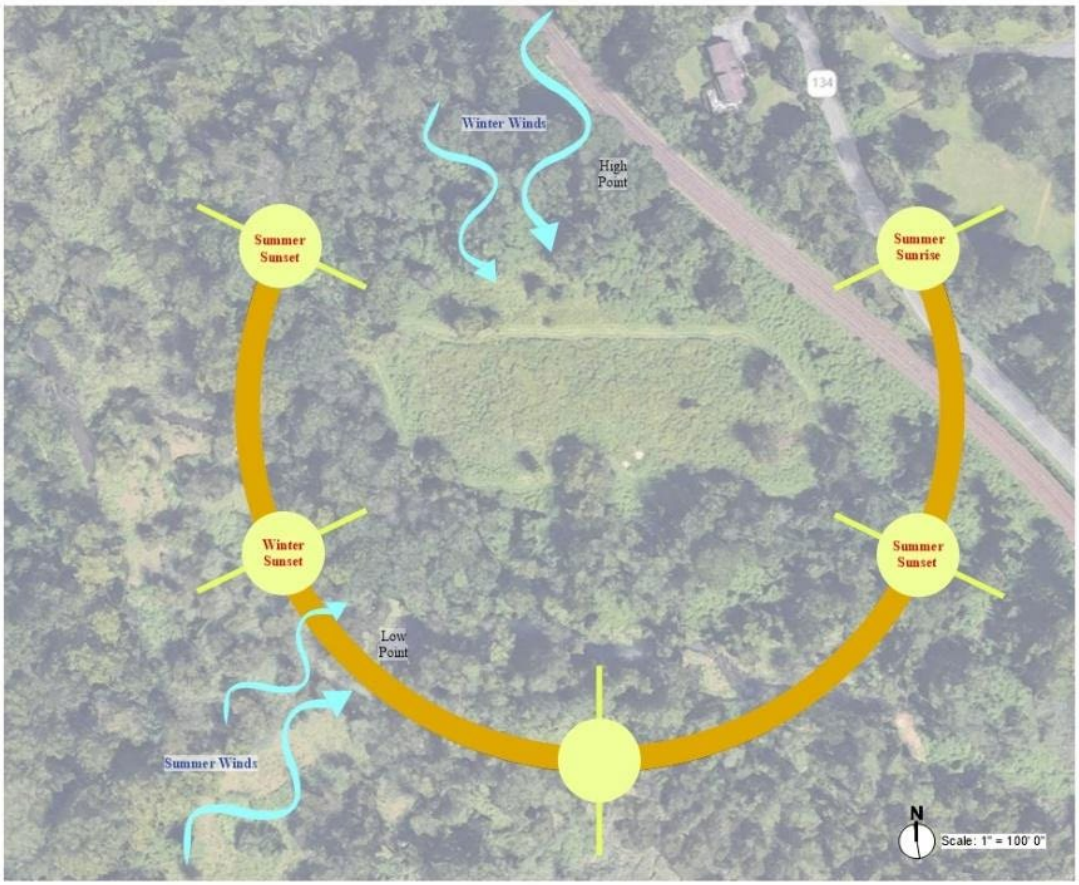


Figure 19: Field Loop Path Site Analysis. Graphic by author.

Chapter 9: Site Design

Section 1: SWOT Analysis

The site of Field Loop Path is located within the 503-acre area of Lake Roland. Field Loop path accounts for only about 11 acres, with the open field accounting for only about 3 of those acres. For this thesis, I have focused on designing only the main field loop which is shown in the figure below.

Figure 20: Field Loop Path, Lake Roland. (Google Earth)

The primary goal of my site design from the beginning has been to help bridge the gap between conservation and recreation in this area so that restoration can be successful, and humans will be able to immerse themselves in nature without injuring nature. In order to determine how I would achieve this, I conducted a SWAT analysis for the site, calling out the Strengths, Weaknesses, Opportunities, and Threats present on the site (Figure 21).

Figure 21: SWAT Analysis for Field Loop Path. Graphic by author.

Based on the results of the SWAT Analysis for the thesis site, I plan to design with the goals laid out in Chapter Five; the first being to minimize human footprints on the land, second being to design with the environment at the forefront, and the third being the use of accessible design in my final site plan.

Section 2: Site Plan

Once the goals for my design had been laid out, I used the SWAT analysis to think more about the programming that would happen through the site. The design process started with conceptual diagrams in which I laid out my boardwalk along with my main features that I knew I wanted to include such as the train watching platform, bird watching platform, shade platform, boulder crossing, and the yoga and event space. Each element was placed where you see it in the site plan for specific reasons, which I will address below.

Figure 22: Site Plan for Field Loop Path. Graphic by author.

Section 3: The Shade Platform

One of the biggest challenges that comes with designing an open field for human use is creating shade in a habitat that is naturally an open meadow and grassland. One of the foremost goals of my site design was to honor the natural state of the landscape. I chose to lean into what the site inherently wants to be by keeping the area open and preserving clear views across the field. This is why very few trees have been added in my site plan. That said, it's still important that the design creates a comfortable space where people can immerse themselves in nature, which means providing shade in at least a few key areas. With this in mind, I chose to create a central shade platform in the center of the site that is almost equidistant from all other design elements. The boardwalk in this area features White Oak trees that grow through the decking, each surrounded by a circular bench. Additional seating is built into the deck railings, allowing visitors to relax under the oak canopy while also enjoying clear views into the meadow. While the benches around the tree trunks will likely be used most often as they provide the best shade. I anticipate that, as the trees mature, people will gravitate more toward the path-side benches, where the best views of the meadow can be found.

The White Oak (Quercus alba) was chosen for this area of the site for a variety of reasons, both environmental and aesthetic. I selected this tree for the site as oaks are native to woodlands all over the eastern United States, and they will thrive in the deep, damp well-drained soils we have on Field Loop Path. White Oaks are a keystone plant as they are the host to over 200 species of insects. With insects come

birds, and in the fall, the acorns that fall are a vital food source to many animals. Most people do not know that oak trees can actually help control invasive species such as Japanese stilt grass. This is because White Oak leaves decompose at a much slower rate than other species, meaning that when the leaves fall and if they are left, they will shield out the sunlight from the Japanese stilt grass seedlings which germinate very early in the spring (Burghardt, Karin & Tallamy, Douglas & Shriver, Greg, 2008). Oaks are also known to be one of the trees with the longest life span, meaning that each one planted on this site will be able to mature and grow into the surrounding environment fully and will hopefully be there for the next 200 years. From a more aesthetic perspective, I chose White Oaks due to their large size and beautiful architectural branching habits.

Figure 23: Section A-A1 on-site plan. Graphic by author.

Figure 24: Perspective 1 of the shade tree platform. Graphic by author.

Figure 25: Perspective 2 of the shade tree platform. Graphic by author.

Section 4: The Birdwatching Platform

As noted earlier, many of the users of Field Loop Path are currently birdwatchers. Many species of birds have been recorded on iNaturalist, ranging from hawks and other birds of prey to songbirds and water-dwelling birds. With this new design, I expect the number of birdwatchers to increase, and I anticipate more community birdwatching meetups. Keeping this in mind, it was important for me to create a space specifically for bird watchers. Located on the southern side of the site, in the woods and off the main boardwalk loop, I have designated a birdwatching platform. Its location was chosen for two reasons. The first is its proximity to the Roland Run stream, a place where birds tend to gather, as they are protected in the understory and have access to a water source. Currently, there is a desired path that has formed in this area by people wanting a closer look at the stream, so naturally, I thought this would be the best location for the platform.

The area was also chosen for its topography. It has the gentlest slope, making it the easiest spot to build a level boardwalk. Because of this, the platform is elevated, allowing visitors to look down at the stream and immerse themselves in the surrounding tree canopy.

Figure 26: Perspective 1 of the birdwatching platform. Graphic by author.

Figure 27: Perspective 2 of the birdwatching platform. Graphic by author.

Section 5: The Yoga Platform

Just west of the shade platform sits the yoga and event space platform. This area features built-in seating around the deck's bend, allowing it to function as a stage. With more trail users expected to visit the site after the design is completed, a multi-purpose area that could be used for large community events is needed. I envision this space hosting yoga classes, pollinator and bird talks, and a variety of other community meetups that will now be possible here.

Figure 28: Section C-C1 on site plan. Graphic by author.

Figure 29: Perspective of the yoga platform. Graphic by author.

Section 6: The Light Rail Watching Platform

At the far eastern part of the site lie the Baltimore Light Rail tracks, which are already perfectly visible due to a large flat area that was likely graded when the tracks were installed. The light rail passes every half hour and can be seen from the far side of the field. Although the light rail is not natural, it is part of many people's day-to-day lives, and I embraced its existence as an opportunity to enhance the experience. I've designed a large platform here with built-in benches, positioned far enough from the

railing so that people using mobility aids or strollers can easily move between them. The forest to the left and right of the clearing has been cleared of invasive species, now revealing a forest canopy that once didn't exist. The light rail itself is wrapped in the Maryland flag, making it a vibrant and eye-catching sight as it goes by. I imagine families bringing their children here for a picnic or just to let them burn off energy while watching the train. I can almost hear parents saying, "Hey, do you want to go to Field Loop Path and watch for the train to go by?" I picture excited children running across the boardwalk to the platform, anxiously waiting for the huge, colorful train to zoom by. The vegetation between the platform and the light rail tracks has been restored to a native grass and wildflower meadow, and the surrounding forest edges are now blanketed with ferns and other native edge species.

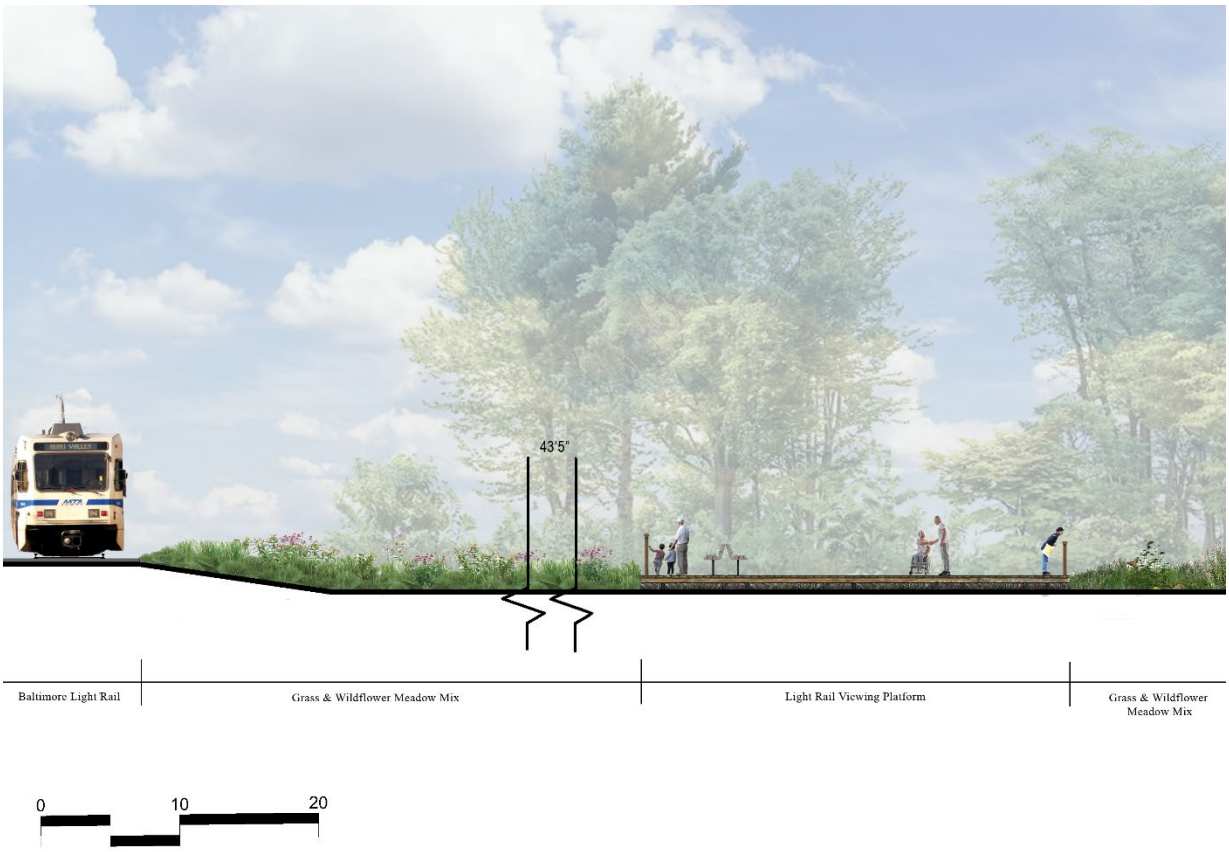


Figure 30: Train section B-B1. Graphic by author.

Figure 31: Train 1 section perspective. Graphic by author.

Figure 32: Train 2 section perspective. Graphic by author.

Section 7: The Boulder Crossing

The last main design feature on this site is the boulder crossing, which is the only area on the boardwalk that has a break in the railing. This element of the design was inspired by the boulder crossing used at the Navel Cemetery Landscape, designed by Nelson Byrd Woltz, also one of the case studies discussed earlier in this paper. The large boulder crossing is an element in this design that allows visitors to get up close to the meadow and even touch it as they cross from one area of the boardwalk to the other. This is an area I originally designed with children in mind as an opportunity for them to take healthy risks. However, I also imagine people sitting on the boulders and reading in the sun when others are not using them. The boulders

will also create a warm spot for snakes and other creatures to sunbathe, meaning that they serve both human and environmental purposes. In a perfect world, the boulders would be Baltimore Gneiss stone as a tribute to the unseen geology of the site and ecosystem.

Figure 33: Perspective 1 of the boulder crossing. Graphic by author.

Figure 34: Perspective 2 of the boulder crossing. Graphic by author.

Section 8: Planting Palette

To aid in restoration and to benefit the ecosystem, a native plant palette was chosen for this site in both the woodland edge and the open grass and wildflower meadow. One of my greatest inspirations for the planting palettes in this thesis came from Claudia West and Thomas Rainers Book, Planting in a Post Wild World. The way they use plants that work together and all benefit from each other in symbiosis has inspired me to use this idea as the basis for my plant palettes. Due to the fact that the open field and the woodland edges are both different archetypes, one being a grassland and the other being a woodland and shrubland, two planting palettes were made. Each palette was carefully selected so that they not only have a large environmental impact but also fit the site's sun and soil conditions.

Figure 35: Planting Palette for the Meadow. Graphic by author.

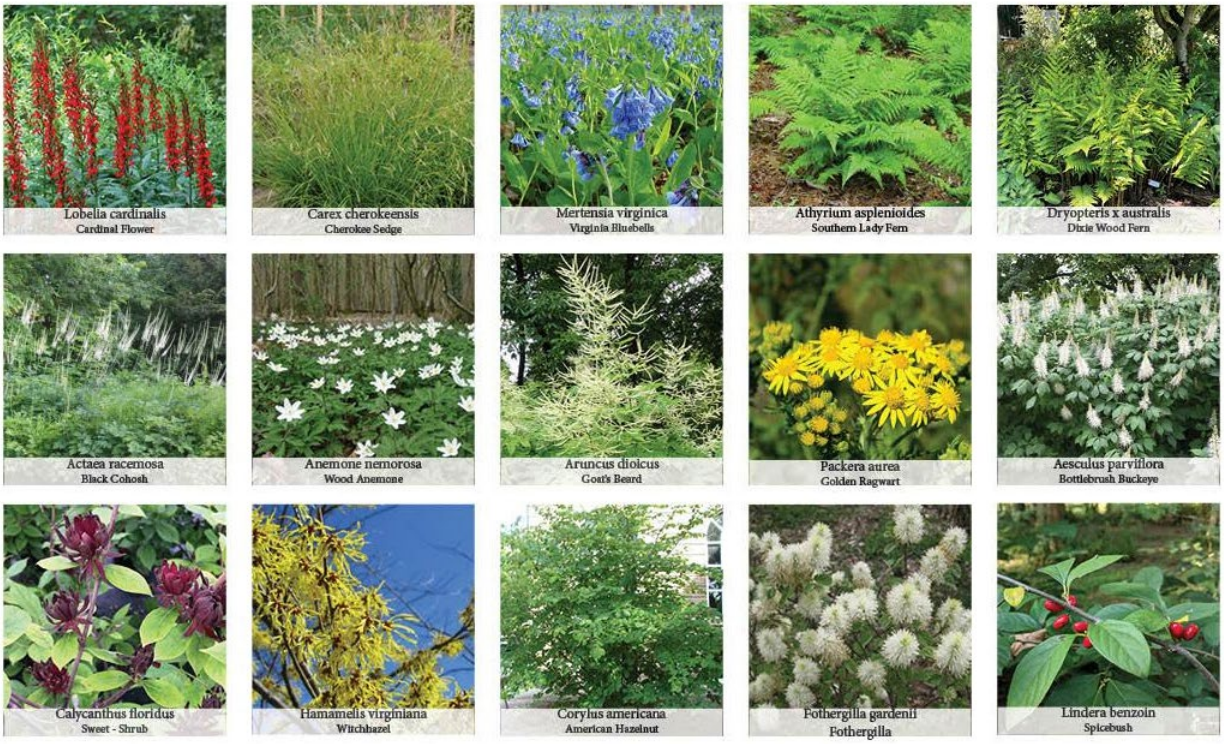


Figure 36: Planting Palette for the Woodland edge. Graphic by author.

Chapter 10: Conclusion

In reimagining Field Loop Path, my vision is not simply about creating a boardwalk trail but about redefining the relationship between people and nature. This project is a commitment to restoration, accessibility, and ecological respect. This is a space where native ecosystems are revived, where human impact is carefully managed, and where every person, regardless of ability, can experience the serenity and beauty of the natural world. Through thoughtful design strategies such as elevated boardwalks, the use of native plantings, and a deep-rooted environmental ethic, Field Loop Path has become more than just a place that I would have loved to

visit as a child, it becomes a model for how we can tread gently, inclusively and reverently through the landscapes we cherish.

Bibliography

Ballantyne, Mark, and Catherine Marina Pickering. “The Impacts of Trail Infrastructure on Vegetation and Soils: Current Literature and Future Directions.” Journal of Environmental Management 164 (December 1, 2015): 53–64. https://doi.org/10.1016/j.jenvman.2015.08.032.

Ballantyne, Mark, and Catherine Marina Pickering. “The Impacts of Trail Infrastructure on Vegetation and Soils: Current Literature and Future Directions.” Journal of Environmental Management 164 (December 1, 2015): 53–64. https://doi.org/10.1016/j.jenvman.2015.08.032.

Baltimore County Department of Environmental Protection and Sustainability**.** (2013, January). *Northeastern Jones Falls small watershed action plan: Volume 2: Appendices D & E* (Final). In consultation with Northeastern Jones Falls SWAP Steering Committee.

Burghardt, Karin & Tallamy, Douglas & Shriver, Greg. (2008). Impact of Native Plants on Bird and Butterfly Biodiversity in Suburban Landscapes. Conservation biology : the journal of the Society for Conservation Biology. 23. 219-24. 10.1111/j.1523-1739.2008.01076.x.

Follak, S., Bakacsy, L., Essl, F., Hochfellner, L., Lapin, K., Schwarz, M., … Wołkowyki, D. (2021). Monograph of invasive plants in Europe N°6: Asclepias syriaca L. Botany Letters, 168(3), 422–451. https://doi.org/10.1080/23818107.2021.1886984

Franco, L. S., Shanahan, D. F., & Fuller, R. A. (2017). A Review of the Benefits of Nature Experiences: More Than Meets the Eye. International journal of environmental research and public health, 14(8), 864. https://doi.org/10.3390/ijerph14080864

Funk, J. L., Cleland, E. E., Suding, K. N., & Zavaleta, E. S. (2008). Restoration through reassembly: plant traits and invasion resistance. *Trends in ecology & evolution*, *23*(12), 695–703. https://doi.org/10.1016/j.tree.2008.07.013

Gregory, D., Kintziger, K., Crouter, S., Sims, C., Kellogg, M., & Fitzhugh, E. (2024). Weather effects on natural surface trail use in an urban wilderness multi-use trail system. *Journal of Outdoor Recreation and Tourism*, *46*, 100757. https://doi.org/10.1016/j.jort.2024.100757

Historic Dates. (2015, December 28). Baltimore City Department of Public Works. https://publicworks.baltimorecity.gov/pw-bureaus/water-wastewater/water/history/dates

History-Dam-and-Water-Supply-Chronology (n.d.). Retrieved April 6, 2025, from https://www.lakeroland.org/wp-content/uploads/2020/01/History-Dam-and-Water-Supply-Chronology.pdf

Hockett, K.S., Marion, J.L., & Leung, Y. (2017). The efficacy of combined educational and site management actions in reducing off-trail hiking in an urban-proximate protected area. Journal of environmental management, 203 Pt 1, 17-28 .

Hoffman, S. (2022, May 10). *A geographic assessment of Baltimore's Lake Roland Park*. ArcGIS StoryMaps. https://storymaps.arcgis.com/stories/eb5c30d1aec54ebaa03e1ae64129eb43

Hoffman, S. (2022, May 24). *A geographic assessment of Baltimore's Lake Roland Park*. ArcGIS StoryMaps. https://storymaps.arcgis.com/stories/eb5c30d1aec54ebaa03e1ae64129eb43

Jeffrey L. Marion, A Review and Synthesis of Recreation Ecology Research Supporting Carrying Capacity and Visitor Use Management Decisionmaking, Journal of Forestry, Volume 114, Issue 3, May 2016, Pages 339–351, https://doi.org/10.5849/jof.15-062

Kozlowski, T. T. (1999). Soil Compaction and Growth of Woody Plants. Scandinavian Journal of Forest Research, 14(6), 596–619. https://doi.org/10.1080/02827589908540825

Leger, E. A., & Espeland, E. K. (2010). Coevolution between native and invasive plant competitors: Implications for invasive species management. *Evolutionary Applications*, *3*(2), 169–178. https://doi.org/10.1111/j.1752-4571.2009.00105.x

Marion, J. L., & Wimpey, J. (2017). Assessing the influence of sustainable trail design and maintenance on soil loss. Journal of Environmental Management, 189, 46–57. https://doi.org/10.1016/j.jenvman.2016.11.074

Marion, Jeffrey L., and Jeremy Wimpey. “Assessing the Influence of Sustainable Trail Design and Maintenance on Soil Loss.” Journal of Environmental Management 189 (March 15, 2017): 46–57. https://doi.org/10.1016/j.jenvman.2016.11.074.

Marion, Jeffrey. Trail Sustainability: A State-of-Knowledge Review of Trail Impacts, Influential Factors, Sustainability Ratings, and Planning and Management Guidance, 2022. https://doi.org/10.13140/RG.2.2.23996.31364.

Martin, R., & Butler, D. R. (2017). A Framework for Understanding Off-trail Trampling Impacts in Mountain Environments. *The George Wright Forum*, *34*(3), 354–367.

McGrain, J.W., September 1979. Historical Aspects of Lake Roland. Maryland Historical Magazine. Vol. 72, No. 3. Pg. 253- 273.

Meinhardt, S., Saláta, D., Tormáné Kovács, E., Ábrám, Ö., Morvai, E., Szirmai, O., & Czóbel, S. (2024). The Multifaceted Botanical Impact of the Invasive Common Milkweed (Asclepias syriaca L.) in a Protected Sandy Grassland in Central Europe. Land, 13(10), 1594. https://doi.org/10.3390/land13101594

Naval Cemetery Landscape | ASLA 2020 Professional Awards. (n.d.). Retrieved April 17, 2025, from https://www.asla.org/2020awards/485.html

Naval Cemetery Landscape | Nelson Byrd Woltz. (n.d.). Retrieved April 17, 2025, from https://www.nbwla.com/projects/park/naval-cemetery-landscape#

Red Ribbon Park / Turenscape. (2013, November 7). ArchDaily. https://www.archdaily.com/445661/red-ribbon-park-turenscape

Restoration Techniques CHAPTER 5 Restoration Techniques. (n.d.). https://www.fs.usda.gov/t-d/pubs/pdf/riparian_restoration/lo_res/04231201LChap5.pdf

Ruxton-Riderwood-Lake Roland Area Improvement Association. (2025, February 12). *Historical overview*. Ruxton-Riderwood-Lake Roland Area Improvement Association. https://rrlraia.org/neighborhood/overview/

Strandskogen Arninge Ullna by Topia. (n.d.). Landezine. Retrieved April 22, 2025, from https://landezine.com/strandskogen-arninge-ullna-by-topia/

Tessier, J. T. (2022). Minimal Impact of a Long-Distance Hiking Trail on the Plant Community in the Adirondack Park, New York State, U.S.A. Rhodora, 123(993), 31–49. https://doi.org /10.3119/21-07

Tessier, Jack T. "Minimal Impact of a Long-Distance Hiking Trail on the Plant Community in the Adirondack Park, New York State, U.S.A." Rhodora 123, no. 993 (September 2022): 31–49. https://doi.org/10.3119/21-07.

The Cultural Landscape Foundation. (n.d.). *Lake Roland Park*. TCLF. https://www.tclf.org/lake-roland-park

Tomczyk, Aleksandra M., Marek W. Ewertowski, Piran C. L. White, and Leszek Kasprzak. "A New Framework for Prioritising Decisions on Recreational Trail

Management." Landscape and Urban Planning 167 (November 1, 2017): 1–13. https://doi.org/10.1016/j.landurbplan.2017.05.009.

Turenscape—Qinhuangdao Red Ribbon Park. (n.d.). Retrieved April 21, 2025, from https://www.turenscape.com/en/project/detail/336.html

Turrisi, T. B., Bittel, K. M., West, A. B., Hojjatinia, S., Hojjatinia, S., Mama, S. K., Lagoa, C. M., & Conroy, D. E. (2021). Seasons, weather, and device-measured movement behaviors: A scoping review from 2006 to 2020. *International Journal of Behavioral Nutrition and Physical Activity*, *18*(1), 24. https://doi.org/10.1186/s12966-021-01091-1

Wimpey, Jeremy F., and Jeffrey L. Marion. "The Influence of Use, Environmental and Managerial Factors on the Width of Recreational Trails." Journal of Environmental Management 91, no. 10 (October 1, 2010): 2028–37. https://doi.org/10.1016/j.jenvman.2010.05.017

Woods, A. J., Omernik, J. M., & Brown, D. D. (1999, July). *Level III and IV ecoregions of Delaware, Maryland, Pennsylvania, Virginia, and West Virginia*. U.S. Environmental Protection Agency, National Health and Environmental Effects Research Laboratory.

Yuejin, L., Kelong, C., Zhifeng, L., & Guangchao, C. (2022). Short-term impacts of trampling on selected soil and vegetation properties of alpine grassland in Qilian Mountain National Park,China. *Global Ecology and Conservation*, *36*, e02148.