DESIGNING TRANFORMATIVE EXPERIENCES: REDEFINING THE HUMAN-NATURE RELATIONSHIP

by

KATHERINE ELIZABETH PERRY

(Under the Direction of Marianne Cramer)

ABSTRACT

While sustainable landscape designs help preserve and restore important ecological processes, this thesis proposes that designing a sustainable future is much larger than what can be accomplished with any site-level design. The key to environmentalism lies in the social realm and landscape designers have the opportunity to use the formal aspects of design to help the public connect the actions of humans to the less obvious patterns of the natural world. This thesis explores the idea that designed landscapes can potentially transform the way that humans relate to nature, and proposes a framework to guide the design of this type of transformative experience of nature. The framework, based on analysis of existing research then refined through case study analysis, is finally evaluated as a design tool through a projective design for a public greenway in Birmingham, Alabama.

INDEX WORDS: Eco-Revelatory Design, Environmentally Responsible Behavior, Environmental Stewardship, Landscape Aesthetics, Landscape Architecture, Landscape Perception, Landscape Preference, Public Landscapes, Sustainability

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DEDICATION

In loving memory of Cameron Josiah Miller, whose life and love changed my world forever.

And for my family. Your love and support have carried me through the tough times and made the good times that much sweeter.

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TABLE OF CONTENTS

Page

LIST OF TABLES

Page

LIST OF FIGURES

Page

CHAPTER 1

INTRODUCTION

Landscape design negotiates a delicate balance between serving human needs and preserving ecological health. This relationship between humans and nature is as old as mankind, and has been expressed in many different forms throughout human history. Ancient societies respected, feared, and depended upon nature for the fulfillment of every daily need. This relationship between humans and nature has been eclipsed as humans have become increasingly dependent on technology, society has become more urbanized, and daily life has grown further removed from the natural processes on which it still very much depends. As limitations on the planet's natural resources become more pressing, landscape architects have a unique opportunity to leverage ecological principals to create spaces that preserve or restore ecological function. While it is vital that landscape designers continue to minimize environmental impacts of new designs and mitigate detrimental decisions made in the past, the key to a more sustainable future is larger than what can be accomplished with any site-level design. Through landscape design, there is an opportunity to reacquaint humans with the importance and power of healthy natural ecosystems.

In 1998, a special issue of *Landscape Journal* was published as an accompanying piece to an exhibition; both were titled "Eco-Revelatory Design: Nature Constructed/ Nature Revealed." The editors defined eco-revelatory design as "landscape architecture intended to reveal and interpret ecological phenomena, processes, and relationships." The

significance of eco-revelatory design lies in the idea that raising the public's awareness of ecology can build a stronger appreciation for ecological processes, and ultimately inspire environmental stewardship (Brown, Harkness, and Johnston 1998). Featuring fifteen design works of various scales, contexts, and styles, as well as eight essays that assess the design works, the journal and exhibition sought to lay a groundwork for discussing, defining, and evaluating the profession's progress towards revealing ecology through design.

More current research often references the notion that understanding the ecological function of a landscape can affect one's perception of that place, or increase one's value of ecosystem services being provided (Green 2011; Gobster et al. 2007; Nassauer 2011). This concept is widely recognized as important and viable, yet there is little discussion of the strategies for most effectively engaging visitors and affecting change in the way that they see the natural world or behave. This thesis proposes to explore the notion that people's experience of a designed landscape can encourage environmentalism, and create a framework that can guide the design of such spaces. This thesis seeks to answer the research question: *How can designers most effectively create landscape experiences capable of transforming the way humans relate to nature?*

Purpose and Significance

The purpose of this research is to compile a guiding set of goals for designing transformative experiences of nature, which can be proactively applied in the profession. The significance of this research lies in the potential for landscape architecture to affect individual preferences and behaviors. A deeper understanding of ecology could inspire stronger appreciation for the natural world and encourage environmentally responsible

behavior and lifestyle choices, including the more sustainable design and management of residential landscapes.

There has been much research on the aggregate ecological impact of residential design choices, and also on the incremental benefits of preserving ecological function and biodiversity even at this small scale. Making smart ecological decisions in residential design can contribute incrementally to healthier ecological structure and function in a variety of ways: create habitat corridors in fragmented landscapes; regulate microclimates and pollination; cycle nutrients; conserve water supplies; manage stormwater; and improve air and water quality (Helfand, Park et al. 2006; Simmons, Venhaus et al. 2007; Nassauer, Wang et al. 2009; Cook, Hall et al. 2012; Smetana and Crittenden 2014).

In addition, increased biodiversity has been found to have a higher correlation with the positive psychological benefits of greenspace than the size of the greenspace (Fuller, Irvine et al. 2007) suggesting that the application of ecological restoration principles—even on a small scale—can have positive psychological impacts as well. Small actions can be contagious within neighborhoods and social networks, "aggregating across time and space to change values and institutions" that affect landscape choices (Nassauer 2011, 323). Given the collective impact of individual design decisions, it is important to consider the ways that the design of public spaces could influence individual values and choices.

Methodology & Overview of Chapters

This thesis will begin by exploring how landscape design can potentially affect the relationship between man and nature. This investigation will first look at the changes in the profession of landscape architecture that precipitated the 1998 exhibition and

special edition of *Landscape Journal* titled "Eco-Revelatory Design: Nature Constructed/ Nature Revealed." Analyzing the discourse inspired by the exhibition and more current literature and research, this thesis will evaluate the importance of humanistic and experiential considerations in ecological design and make a case that designing to enhance man's understanding of nature is key to designing a sustainable future. Classification—reviewing, categorizing, and describing existing research—will be the primary research method employed to support this assertion.

Chapter Three analyzes landscape preference research and the motivators of human behavior to compile a framework for designing potentially transformational landscape experiences. This framework will then be evaluated in Chapter Four through its application to three case study projects that can be considered successful in both their ecological and experiential performance. Analysis of these projects will highlight strengths, weaknesses, and potential omissions in the proposed design framework. The case studies will also produce examples of specific design techniques that can be used to apply each design goal laid out in the proposed framework.

The revised framework will then be tested through a projective design for a site in Birmingham, Alabama. This thesis will conclude with a design critique that evaluates the design and the design framework's ability to answer the research question: *How can designers most effectively create landscape experiences capable of transforming the way humans relate to nature?*

CHAPTER 2

DESIGNED LANDSCAPE AND THE HUMAN-NATURE RELATIONSHIP

The Human-Nature Relationship

The profession of landscape architecture is essentially a negotiation of the relationship between humans and nature. While the science of ecology has become more widely known and applied in the last century, landscape designers have always been conscious of the role that time and unpredictability play in their manipulations of nature. As the science has progressed, and quantitative evidence of the impact of human action has increased, ecology has become a primary consideration in the field of landscape architecture. This increasing emphasis on science in the 20th century, and particularly the publication of Ian McHarg's *Design with Nature* in 1969, instigated a shift away from aesthetic design traditions and to a certain degree eclipsed the artistic and humanistic ideals of landscape design (Phillips 1998). The environmental movement in landscape architecture in the latter half of the 20th Century leaned heavily on ecology as a way of making design decisions, believing that science and technology would provide clear solutions to mounting environmental concerns (Phillips 1998; Corner 1997).

Towards the turn of the century, likely recognizing that science could not be a true antidote to problems created by human behaviors, the dialectic shifted back towards man's relationship with nature. Professionals like James Corner lamented the lack of creativity in designs dictated by science—pointing out that nature itself is incredibly dynamic but that landscape architecture's response to these exciting processes was

sterile and stagnant. Corner encouraged landscape architects not to look to ecology for prescribed solutions but rather for inspiration, and not to discredit the "power that symbolic representation can have in forging cultural relationships" between man and man and man and nature (1997, 87). He argued that a purely scientific approach to fixing or managing nature perpetuates the idea that nature is something "out there" or separate from humans, rather than an integral part of human life. This mindset is a source of continued environmental decline (Corner 1997).

Eco-Revelatory Design

In the mid 1990s a group of landscape architects including Brenda Brown, Terry Harkness, and Doug Johnston noted that supporters of ecological design—in its many forms, scales, and contexts—often avoided transparency or interpretation that would benefit an observer. Forms of symbolism or abstraction associated with traditional garden design were trivialized as ornamentation, while ecology was prioritized. Conversely, designers promoting a more artistic approach to landscape architecture neglected ecological issues and impacts. This group of concerned professionals decided that the discipline of landscape architecture and the general public could both benefit from "more clearly articulated, comprehensive, and differentiated definitions and practices of ecological design" (Brown, Harkness, and Johnston 1998, x).

Brown, Harkness, and Johnston drafted a proposal for an exhibition and an accompanying catalog exploring a type of ecological design they termed "eco-revelatory design." Based on the assumption that if people are more aware of ecological processes they are more likely to appreciate these processes and make environmentally responsible choices, the authors of this proposal saw great need and potential for design

that would “reveal and interpret ecological phenomena, processes and relationships” (Brown, Harkness, and Johnston 1998, xii). In 1998, approximately four years after the initial proposal, a gallery exhibition and a special issue of *Landscape Journal* both entitled “Eco-Revelatory Design: Nature Constructed/Nature Revealed” were introduced. Featuring fifteen design works of various scales, contexts, and styles, as well as eight essays that assess the design works, the journal and exhibition sought to lay a groundwork for discussing, defining, and evaluating the profession’s progress towards revealing ecology through design.

In general, the essayists evaluated the exhibit as a positive step for the field of landscape architecture and noted areas for improvement towards the purpose of communicating ecological ideas to the public. Carolyn Merchant narrowed in on the core of eco-revelatory design, by describing it as a partnership between people and nature; “a partnership ethic, I believe, is required for the future welfare of both people and nature” (Merchant 1998). This partnership, Merchant states, must be based on the equity of human and nonhuman nature. Human needs cannot be sacrificed in the pursuit of ecological health and vice versa (Merchant 1998, 69). The importance of revealing ecology through design lies in the potential for positively impacting this intricate relationship between humans and nature.

Science can be a guiding perspective in landscape design, but human experience of the designed space should be equally valued. The emphasis on ecology in landscape architecture has in some cases caused the profession to be identified with the pragmatic concerns of planners and scientists. Barbara Matilskey described this as a distinction between ecological art and landscape architecture, explaining that “artworks transcend

their visual dimension and become....'philosophical spaces.' Not only intended as models for ecological rehabilitation, they are also places that catalyze an experience intended to stir the mind and spirit" (Howett 1998, 96). The eco-revelatory design exhibition reminded the field of landscape architecture that designed spaces can also serve as this type of catalyst. Robert Thayer actually points out that landscape architecture can move a step beyond art in its ability to not only comment on an undesirable or unsustainable condition, but also help remedy the situation (1998). The crux of eco-revelatory design is in the dichotomy of art and science, and the consideration of how to use the art of landscape design to connect humans to the ecology of nature (Galatowitsch 1998).

Adaptive Design and Productive Ecologies

"Eco-Revelatory Design: Nature Constructed/Nature Revealed" seemed to mark the return of a more humanistic approach to design in the field of landscape architecture, which is in keeping with a paradigm shift seen over the last quarter century in the field of ecology, "toward a more organic model of open-endedness, flexibility, resilience, and adaptation and away from a mechanistic model of stability and control" (Green 2011). The unpredictability of nature and the deeply integrated relationship between humans and the environment are the basis for a type of ecological design Nina-Marie Lister calls "adaptive design." Evolution and transition are not only built into ecosystems, some ecosystems are actually dependent upon such disturbance.

Adaptive design is based upon work in the field of applied ecology, which recognizes humans as participants in ecosystem evolution (Green 2011). These ideas are also prevalent in James Corner's writing, which treats both ecology and creativity as fluid, directional, and dynamic realities, representative of "propulsive life unfolding

in time" (1997, 81). Landscape architecture, in Corner's opinion, must move beyond environmental problem solving and aesthetic experience and focus instead on building relationships between people, place, and the cosmos—ecological landscape architecture should focus more on redefining form, function, and program and less on "fixing" (Corner 1997). To ground a design in ecological values it must be dynamic and evolutionary, like nature. There must be an element of experimentation and creative play with new materials and ideas (Howett 1998). Lister proposes that it is a potent act for a designer to be able to reveal how ecosystems function, so that the public can become participants, and not merely consumers (Green 2011).

The Shift to Stewardship

At the core of all this discussion is the idea that the key to lasting environmental health may be in transforming societal attitudes and values, and that one way to accomplish this task is by designing spaces that allow for transformative experiences with nature. Joan Nassauer's research proposes that people are more likely to appreciate and protect landscapes that are aesthetically pleasing over landscapes that are perceived as undistinguished, ugly, or messy; therefore landscape aesthetics serves as a vital link between humans and ecological processes (Gobster et al. 2007; Nassauer, Wang, and Dayrell 2009; Nassauer 2011; Nassauer 2012). Gobster and Nassauer offer two ways of aligning aesthetic experience and ecological function: intervention through design and intervention through knowledge. Their research shows that cognitive processes can actually change perception, and they suggest that a person could gain pleasure from an aesthetically unremarkable landscape if he or she were aware of the beneficial ecological function it provides. Perceptions change as people observe and interact with landscapes

(2007; Nassauer 2011). Aesthetic experience can directly influence the way humans change the landscape, but changes to the landscape can also affect aesthetic experiences. Nassauer stresses the importance of bridging the gap between individual ownership and stewardship. She suggests that policy, planning, and design could leverage the halo effect of landscape care to align patterns showing care with patterns indicative of environmental health. This linkage leads to important and unanswered questions about how, and to what extent, design interventions can or should try to influence human behavior (Gobster et al. 2007; Nassauer 2012; Cook, Hall, and Larson 2012).

The most important and influential realm of this debate occurs within what Gobster and Nassauer call the "perceptible" scale, which includes landscape patterns that can be immediately experienced and processed by humans (2007). Public landscapes such as parks and greenways function at this immediately perceivable scale, and seem like a reasonable subject on which to conduct the next phase of this research. Approaching urban green space design from an ecological perspective can positively contribute to local and regional biodiversity, provide habitat links in a fragmented environment, but maybe most importantly it can have an educational value. A park can be more than an aesthetic symbol of nature, it can provide direct and influential experience with nature (Gobster et al. 2007). This research raises a question about the extent to which the influence and education provided by public designed spaces could affect environmentally responsible design decisions made by individuals on their own private properties.

Susan Galatowitsch identifies regulation and incentives as the two primary catalysts for societal environmental action. The effectiveness of regulation has been questioned by scientists, planners, and designers (1998). On the other hand, incentives

have been suggested as a viable alternative—particularly incentives that either directly or indirectly, through experience or education, enhance the public's appreciation for the environment. The effects of such measures that seek to change the human relationship with the environment are thought to have more lasting impact than monetary incentives. Galatowitsch further explains that this model is dependent upon "people experiencing places, understanding their relevance, and wanting to have more places like them" (1998, 99).

This idea is supported by James Corner's writing, which places the success of the environmental movement in the sphere of culture. Corner's explanation of the theory of "social ecology" describes a "reinvigoration of the cultural imagination," rather than political or scientific means, as vital to environmental progress (Corner 1997). Society must see nature with wonderment and reverence in order to act as moral agents for change. This type of societal ecological consciousness depends on education or experiences that can connect the actions of people to the less obvious patterns of the natural world. This is the incredible opportunity afforded to designers of the built environment—to employ aesthetics and formal expression as a way "to construct meaning in the unfolding relationship of human expectations and ecological systems" (Phillips 1998, 117).

The Performance of Appearance

In studying the influences on man's relationship with nature and the drivers of human behavior, it becomes clear that design can guide a visitor's experience of a place. If the sensory human experience of a place is neglected in the pursuit of ecological performance, the designer is missing an opportunity to engage visitors with nature. Frederick Law Olmsted once said to the Prospect Park Scientific Association that "A park

is a work of art, designed to produce certain effects upon the mind of men" (Meyer 2008, 7). Appearance, form, circulation, sensory stimulation—these are the designer's tools for creating a space to have a desired effect upon the mind of men.

Elizabeth Meyer points to the fact that literature surrounding sustainable or ecological design often avoids, even shuns, the notion of beauty, instead focusing on the three pillars of ecology, social equity, and economy. Meyer, however, proposes that "immersive, aesthetic experience can lead to recognition, empathy, love, respect, and care for the environment" (2008, 7). Aesthetics can be more than ornamentation, aesthetics can actually perform. Performance, Meyer argues, must move beyond ecological function and include emotional or ethical revelation—Catherine Howett and Anne Whiston Spirn both propose that "the act of experiencing designed landscapes poly-sensually, over-time, through and with the body, is not simply an act of pleasure, but possibly, one of transformation" (Meyer 2008, 8). Therefore beauty and aesthetics are a vital part of sustainable design if it is to have any significant cultural impact. Meyer maintains that she does not believe that design can change society, but that designed landscapes do have the power to influence an individual's values, priorities, and actions (Meyer 2008).

Information, Perception, and Behavior

The question then becomes, what circumstances and factors can make an experience of a place transformational or revelatory? Many have maintained the idea that individual landscape preferences or perceptions can change as people are informed about the ecological benefits of a design, converting a "scenic aesthetic" into an informed "ecological aesthetic" (Hill and Daniel 2008). Evolution-based theories, however, propose that a preference for fairly open spaces with low ground cover and a water

source—reminiscent of the savannah landscape in which man evolved—is ingrained in human nature to the point that it is impenetrable to the influence of cognitive-knowledge (Parsons and Daniel 2002). At this time, these theories regarding the influence of information on aesthetic preference have not been widely tested.

A study conducted in 2008 testing 182 college students contributed some data to this debate. Students were divided into three groups and given a written/graphic message regarding the ecological benefits of protective cover and tree density (a woodland), a message regarding the ecological benefits of openness or open areas (a savannah), or no message. 1. The savannah scene was presented to members of the woodland group as a "disturbed woodland." 2. The woodland scene was presented to the savannah group as a "disturbed savannah." 3. The third group served as a control and the participants were given no additional message. The participants were then shown images of 45 landscape scenes and asked to rank their "scenic beauty" and "acceptability." The results did not significantly support the influence of information on aesthetic preference, but did find that the group given the positive information about woodlands had a higher level of "acceptability" for that landscape than the other two groups, even though "scenic beauty" ratings still supported a preference for the open savannah images (Hill and Daniel 2008).

This study seems to support the conclusion that information can influence landscape perception, even if it does not immediately alter aesthetic preference. The question still remains, however, if this shift of perception can translate into a shift in behavior. Additionally, how does the experience of a place change the influence of information? The participants of the study were sitting in a computer lab scrolling

through images; would the results have been different, or more conclusive, if the students were discovering the ecological information while immersed in those landscapes?

The behavioral sciences have long studied how to encourage or facilitate environmentally responsible behavior (ERB), and literature commonly focuses on the altruism-approach—essentially appealing to individuals' conscience or sense of compassion and selflessness (De Young 2000). This particular approach, however, has some unintended adverse consequences and can contribute to feelings of helplessness and guilt, as it stresses self-sacrifice over quality-of-life enhancing solutions (Kaplan 2000). Stephen Kaplan's research proposes an alternative to the altruism approach in the Reasonable Person Model, which is based upon "the relationship between how people approach new information, how information relates to motivation, and how information and motivation relate to behavior change" (Kaplan 2000, 492). Kaplan explains that people are obviously capable of acting reasonably and also capable of reacting in completely unreasonable ways, which points to the circumstances in which one finds him or herself to be a primary driver of behavior.

Just as landscape preferences can be traced back to man's evolution in the savannah, so can man's emotional reaction to changing circumstances. The field of cognitive science has uncovered man's incredible capacity for information-processing. Looking at evolution, survival of man's prehistoric ancestors was dependent on the ability to quickly and skillfully process vast amounts of information regarding the surrounding environment. It is reasonable to assume that humans will prefer situations that support their information-processing capability, and act quite differently in situations where this vital ability is inhibited. Based on this evolutionary theory, there are three aspects of

information-processing that would be expected to strongly motivate behavior: people want to understand their surroundings and hate being disoriented; people want to actively acquire, explore, or discover information and the answers to their questions; people want to participate in their surroundings and hate feeling incompetent or helpless (Kaplan 1992).

Even in spaces that are perfectly pleasant and not the least bit disorienting, it is reasonable to think that further engaging man's information-processing capabilities would only deepen his appreciation for a place. It has been found that the linkage between attitude and behavior is much more predictable when the attitudes are held with stronger conviction (Abelson 1988). A stronger connection to a place inspires a greater desire to protect what is special about that place and stronger feelings of stewardship for the environment in general (Nassauer 2011). Additionally taking advantage of any opportunity to engage people in understanding natural processes and the environment, could help combat feelings of helplessness as they relate to sustainable or environmentally responsible behaviors on an individual scale.

Conclusion

As humans have evolved, as technology has improved, and as people live more urban lifestyles, the relationship between humans and nature has become increasingly distant. Human life was once intimately intertwined with and dependent upon natural processes. Technology and industrialization have put humans in a position of power and enabled an attitude of ownership over nature. While environmental design can remediate or preserve natural resources on a small scale, the key to a more sustainable future must

move beyond site-level ecologies and address the way that the general public relates to nature.

Helping people to understand environmental processes and human benefits from and impacts on these processes can facilitate a shift in the human-nature relationship from ownership to stewardship—an appreciation of and desire to care for natural resources—or partnership—where environmental needs are valued as much as human needs. Based on the information presented in this chapter, the author believes that landscape architects can design experiences capable of influencing, or transforming, individuals' values, priorities, and actions.

CHAPTER 3

A FRAMEWORK FOR DESIGNING TRANSFORMATIVE EXPERIENCES

Defining Transformative Experiences

The research explored in Chapter Two supports the value of landscape design as a tool for influencing the way that people relate to nature. This thesis seeks to create a framework for designing public landscapes that provide a transformative experience of nature—an experience that can, over time, transform the way that people value natural resources. Ideally, sustainable landscapes can perform environmentally, and also aesthetically to "produce certain effects upon the mind of men" (Meyer 2008, 7). It is clear that enhancing a person's understanding of a place, situation, or concept is an important part of achieving the desired transformative effect on the man-nature relationship (Gobster et al. 2007; Kaplan 2000; Nassauer 2007), which presents the challenge of connecting human action and experience to the less obvious patterns of the natural world.

It is necessary to outline the types of environmental processes or concepts that would be beneficial for the public to understand more deeply. This thesis looks to the Landscape Architecture Foundation's (LAF) "Performance Series," a collection of case studies with quantifiable landscape benefits. LAF outlines five categories of environmental landscape performance that the organization recognizes as valuable and quantifiable (Table 3.1). These categories and benefits are considered in describing the environmental performance of the case studies evaluated in Chapter Four. These

environmental concepts, as categorized by a reputable industry source, are considered in this thesis to be important and worthy of interpreting for the public through the projective design in Chapter Five.

Table 3.1: LAF Categorization of Environmental Benefits

LAND Land efficiency/preservation; Soil creation, preservation & restoration; Shoreline protection	HABITAT Habitat creation, preservation & restoration; Habitat quality; Populations & species richness
WATER Stormwater management; Water conservation; Water quality; Flood protection; Other water	CARBON, ENERGY & AIR QUALITY Energy use; Air quality; Temperature & urban heat island; Carbon sequestration & avoidance
MATERIALS & WASTE Reused/recycled materials; Waste reduction	

A categorization and analysis of existing research has lead the author to six general goals that can guide the design of transformative landscape experiences. The framework presented here is not a guide to designing the most environmentally beneficial design solution, but rather a set of goals that can steer sustainable design towards the strongest possible impact on the people who spend time in designed landscapes. These six design goals are identified below, and compose a design framework that this thesis proposes could be used to design public spaces in order to encourage stewardship and environmentalism:

Environmental and Social Context

Ideally, designers should highlight ecological phenomena that are relevant both to the site and important in the surrounding region, so that visitors can associate what is experienced on a small scale to larger implications (Galatowitsch 1998). In addition to considering ecological context, it is important to acknowledge social and historical context. Incorporating elements of vernacular landscapes enables people to accept any new formal expressions, attitudes, or ideas that have been incorporated into a landscape design. Vernacular ideals can be nuanced to balance ecological and social values (Phillips 1998). Nassauer (1995) refers to these cultural evidences of human intention as "cues to care" and they vary by geographic and cultural context.

Table 3.2: Context

CONTEXT: Incorporating familiar elements enables people to accept new aesthetics, attitudes, or ideas.
Highlight an ecology important on-site and in the surrounding area. Acknowledge social and historical context. Incorporate elements of known landscapes.

Visibility and Evidence of Design

In order for ecological processes to be experienced, understood, and appreciated, they must first be noticed. Visibility is a particular challenge for landscape architecture, as designed landscapes—unlike architecture—are not always explicit. Since the act of revelation requires a participant or observer, Patricia Phillips advocates that those projects that bring people in the closest proximity to natural processes and offer multiple vantage points create the most intelligible and poignant images of nature (1998).

Nassauer points to the necessity of providing cues of human care and intention, stating that "where evidence of care is recognized as good resource stewardship, the halo effect may help to advance further stewardship by prompting curiosity or a sense of responsibility for ecosystem processes that may be only partly understood" (2011, 322). By giving the viewer an indication that there is human intention in a space, he or she is more likely to pay attention and search for meaning behind a design, and also more likely to recognize the space as one requiring continued care (Meyer 2008).

Michael Van Valkenburgh and his partners introduced the idea of hypernature in their Alleghany Riverfront Park in Pittsburgh, Pennsylvania—an idea which is also supported by Elizabeth Meyer. Users of urban landscapes are often distracted, and collage techniques such as "attenuation of forms, densification of elements, juxtaposition of materials, intentional discontinuities, [and] formal incongruities" can be used to symbolize nature and increase its visibility and impact (Meyer 2008, 17).

Table 3.3: Visibility

VISIBILITY: For ecological processes to be experienced, understood, and appreciated, they must first be noticed.
Bring people into close proximity with nature and offer multiple vantage points. Provide cues of human care and intention. Symbolize, exaggerate, densify, and juxtapose nature to draw attention to it.

Legibility

A focus on one or a few specific natural processes or phenomena ensures that the intended message to the observer is not confused or overwhelming (Galatowitsch 1998; Kaplan 2000). Additionally, ecological processes need to be simplified and symbolized in a way that promotes legibility—meaning that the process is not only seen, it is also

understood. Thayer explains that "sustainable landscapes need conspicuous expression and visible interpretation, and that is where the creative and artistic skills of the landscape architect are most critically needed" (France 2003). A designed landscape can tell the public a story, verbally or non-verbally, about the ecological processes at work in that place.

A primary critic of the 1998 eco-revelatory design exhibition, Robert France, agrees with Thayer that creating this type of landscape is possible. France writes, "Motivation will come from people's experiences of relatively undisturbed, protected green spaces far from cities, but also from educating and directly engaging people in the recognition and repair of damaged landscapes" (2003) He does not, however, think this type of legibility in design will be easily achieved. France fears that designers' desires to appeal to an artistic elite, will prevent the implementation of interpretive elements that the public is capable of noticing and understanding. Successful educational aspects of ecological designs should be conspicuous enough to be seen and digested by the common park visitor.

Table 3.4: Legibility

LEGIBILITY: Sustainable landscapes need conspicuous expression and visible interpretation.
Focus on one or a few specific natural processes. Simplify and interpret nature. Tell an ecological story. Make interpretive measures conspicuous and easy to understand.

Participation and Discovery

The Kaplans' research states that information is more effective in transforming behavior when the learner is actively engaged in discovering that information (1992,

2000), and Stephen Carr and Kevin Lynch maintain that the "best learning happens by surprise" or through acting experimentally and then observing a result (1968, 1277). James Corner also wrote that "bewilderment is simply a prerequisite for another form of seeing; it is an unsettled appearance that allows for the double presence of human and other" (1997, 100)—meaning that unexpected or unusual experiences lead to unexpected or different forms of thinking. Yet the Kaplans highlight the human aversion to confusion and helplessness, so effective learning and behavior-impacting experiences would likely be interactive and challenging, yet not overwhelmingly obscured.

Nina-Marie Lister uses the term "productive ecologies" to describe cultural-natural ecosystems that provide an ecosystem service like food, water, clean air, or raw materials. The more that a designer can expose the productive ecological processes and create participatory opportunities, the greater the general understanding of the services the environment provides and the value of those services. Participation can make ecology directly relevant to the public (Green 2011).

Table 3.5: Discovery

DISCOVERY: Information is more effective in transforming behavior when the learner is actively engaged in discovering that information.
Create opportunities for active engagement. Allow moments of disorientation and revelation. Bring people in direct contact with natural processes. Design surprising experiences.

Multi-Sensory Experience

Elizabeth Meyer, in her three-part manifesto entitled "Sustaining beauty. The performance of appearance," states that "immersive aesthetic experience can lead to recognition, empathy, love, respect and care for the environment" (2008, p. 7). She goes

on to explain that an "immersive aesthetic experience" is more than visual; it engages all five senses. Meyer summarizes research by Howett and Spirn to argue that "experiencing designed landscapes poly-sensually, over time, through and with the body, is not simply an act of pleasure, but possibly one of transformation" (2008, p. 8). The phrase "over time" alludes to the importance of memory in the transformative potential of experiences with nature.

An appreciation for nature often grows from positive associative memories; many environmentalists site early explorations of wilderness or countryside as the reason they became environmentalists (Meyer 2008). Emotional memories are strongly linked with all human senses. A study in 2010 showed that the same part of the human brain that processes senses also, at least partially, stores emotional memories (Rettner 2010). For this reason, appealing to multiple senses more effectively produces positive memories of nature.

Table 3.6: Sensuality

SENSUALITY: Appealing to multiple senses can enable a designed landscape to more effectively produce positive experiences and memories of nature.
Design immersive aesthetic experiences that appeal to all five senses: sight, smell, hearing, taste, and touch.

Flexibility

As natural processes are dynamic and flexible, an ecological design should be as well (Green 2011; Corner 1997; Howett 1998). Incorporating unexpected forms and sequences, while referencing known experiences, can lead to cognition and new understanding (Meyer 2008). Meyer phrases a concept that seems to be supported by

other researchers and practitioners, that "the intrinsic beauty of landscape resides in its change over time" (2008, 19). Spirn describes the type of design aesthetic that could inspire a transformational experience of nature as being timeless, in the sense that it celebrates both the passing of time and the singularity of each moment (Meyer 2008). Additionally, Lister promotes the design of landscapes that are "safe to fail;" adaptive designs consider the fundamental dynamism of ecosystems, and recognize that there must be some amount of uncertainty or flexibility in the way humans design around these systems (Green 2011). An effective revelatory design should in some way reflect or celebrate the ever-changing and unpredictable nature of nature.

Table 3.7: Flexibility

FLEXIBILITY: Ecological design should be dynamic and flexible, as are natural processes.
Accommodate and celebrate the dynamism of natural processes. Incorporate unexpected forms and sequences while referencing known experiences. Consider the effects of time, and the visitor's experience over time.

Table 3.8: Proposed Framework for Designing Transformative Experiences

DESIGN GOAL	DESIGN OBJECTIVES
CONTEXT: Incorporating familiar elements enables people to accept new aesthetics, attitudes, or ideas.	Highlight an ecology important on-site and in the surrounding area. Acknowledge social and historical context. Incorporate elements of known landscapes.
VISIBILITY: For ecological processes to be experienced, understood, and appreciated, they must first be noticed.	Bring people into close proximity with nature and offer multiple vantage points. Provide cues of human care and intention. Symbolize, exaggerate, densify, and juxtapose nature to draw attention to it.
LEGIBILITY: Sustainable landscapes need conspicuous expression and visible interpretation.	Focus on one or a few specific natural processes. Simplify and interpret nature. Tell an ecological story. Make interpretive measures conspicuous and easy to understand.
DISCOVERY: Information is more effective in transforming behavior when the learner is actively engaged in discovering that information.	Create opportunities for active engagement. Allow moments of disorientation and revelation. Bring people in direct contact with natural processes. Design surprising experiences.
SENSUALITY: Appealing to multiple senses can enable a designed landscape to more effectively produce positive experiences and memories of nature.	Design immersive aesthetic experiences that appeal to all five senses: sight, smell, hearing, taste, and touch.
FLEXIBILITY: Ecological design should be dynamic and flexible, as are natural processes.	Accommodate and celebrate the dynamism of natural processes. Incorporate unexpected forms and sequences while referencing known experiences. Consider the effects of time, and the visitor's experience over time.

CHAPTER 4

EVALUATING THE FRAMEWORK: CASE STUDY ANALYSIS

Case Study Selection Criteria

The design framework outlined in Chapter 3 will be evaluated through its application to three built works that are considered successful sustainable designs, and that the author believes to be successful transformative designs as well. Each case study will be analyzed according to the six design goals that comprise the framework proposed in this thesis. The purpose of this analysis is twofold: i) evaluate the proposed framework to identify its strengths, weaknesses, or omissions; ii) identify design techniques for applying each of the design goals. The following criteria were used to select Railroad Park in Birmingham, Alabama, Historic Fourth Ward Park in Atlanta, Georgia, and Renaissance Park in Chattanooga, Tennessee, for inclusion in this thesis:

Project type and size: The selected case studies are public green spaces ranging in size from 1 acre to 25 acres—so as to focus on projects that can be experienced, as a whole, at the human scale.

Location: As the final chapter of this thesis will involve applying the proposed design framework to a projective design in Birmingham, Alabama, this thesis specifically targeted case study projects in the southeastern United States. Observations and lessons learned from the case studies will be more directly applicable to the projective design, due to shared or similar cultural and ecological considerations.

Environmental Performance Benefits: Based on information from the design teams responsible for these parks, environmental performance was a foundational consideration for the design of each project. The environmental performance benefits of Railroad Park, Historic Fourth Ward Park - Phase I, and Renaissance Park will be outlined in detail in the following sections.

Experience: As this thesis is based on human experience—how experiences can change human mindsets, and how designers can create these experiences—it was essential that the case studies be projects that the author has experienced first-hand. Based upon observation of these three parks, the author believes each to have transformative potential. The author's intuitive belief based on experience of these spaces is confirmed by the communities served by these green spaces. Railroad Park, Historic Fourth Ward Park, and Renaissance Park have each been described as having been a cornerstone in local redevelopment (Cole 2016; Saporta 2013; Collett 2014). The local economic investment catalyzed by these parks proves that their value is understood and appreciated by the public, and that each can be considered an experiential incentive of the type that Susan Galatowitsch describes as the key to lasting environmental health: "people experiencing places, understanding their relevance, and wanting to have more places like them" (1998, 99).

Railroad Park, Birmingham, Alabama

Size: 19 acres

Completion Date: 2010

Budget: $20 million

Design Team: Tom Leader Studio (Lead Designer); Macknally Ross Land Design; Giattina Aycock Architecture Studio; HKW Associates; Radius Graphic Design; Kennedy & Violich Architecture, Ltd.; Brasfield & Gorrie (General Contractors)

Figure 4.1: Railroad Park in Birmingham, Alabama (Photo by author)

Project Overview:

While many cities are distinguished by a river, a mountain range, or another geographical feature, what residents of Birmingham, Alabama identify with most is their city's industrial heritage. In the early 2000s, looking for a way to breathe new life into the underutilized downtown area, a public/private partnership developed plans to turn an abandoned rail yard into an urban oasis. In 2010, 19-acre Railroad Park opened in the heart of Downtown Birmingham. The park celebrates the railroad as a symbol of Birmingham—from the city's gritty, industrial beginnings, through the painful years of

the Civil Rights movement, the rumble of passing trains has been a constant backdrop to the story of "The Magic City." Railroad Park was envisioned as part of a larger plan to revitalize Downtown Birmingham and the park's design was driven by some lofty goals: strengthen the sense of community in Birmingham, help develop the city's identity, spur economic development, connect people to nature, and encourage healthier lifestyles.

Figure 4.2: Railroad Park Layout (Image courtesy of Tom Leader Studio)

Landscape architect Tom Leader was hired to help Birmingham develop a plan for the park. The site chosen for the Railroad Park is situated on a marsh that had been filled and used for warehouses and rail sidings, and is adjacent to 11 active railroad tracks. Leader noticed that the constant rumble of the low-speed trains running through the site

almost mimicked the sound ambiance of a river, and decided to design a "train-front" park. The central theme of the design is "Rail + Community + Nature," a space intended to draw people together, provide a way to experience nature in the heart of the city, but also inform about the city's history and industrial roots. To best meet the needs and wants of the community, the plan was shaped by a series of intensive public workshops (Tom Leader Studio 2012).

The design of the park is mostly linear, occupying four square blocks between 1st Avenue South and the train tracks. The side of the park bordering 1st Avenue South is an important pedestrian walkway with five distinct entry plazas, one from each of the streets (14th-18th Streets) that runs into the park. Each plaza connects to a wooden boardwalk that runs out to the "Rail Trail" on the North side of the park. This essentially extends the downtown grid into the park, creating several sections that can be used separately or all in conjunction. The Rail Trail series of bridges and paths serves as a continuous elevated train-watching platform and exercise circuit. With several access ramps and stairwells along its route, the Rail Trail allows easy movement among different areas of the park.

The 17th Street or East Gate plaza serves as the primary meeting space and event venue in the park. It is partially covered with a series of boxcar-reminiscent structures that house a ranger station, restrooms, and a restaurant. The area was intentionally positioned to take advantage of cool breezes coming across the lake (Tom Leader Studio 2013). A grass amphitheater sits on the other side of the plaza, allowing for easy access to the park facilities during large shows or events.

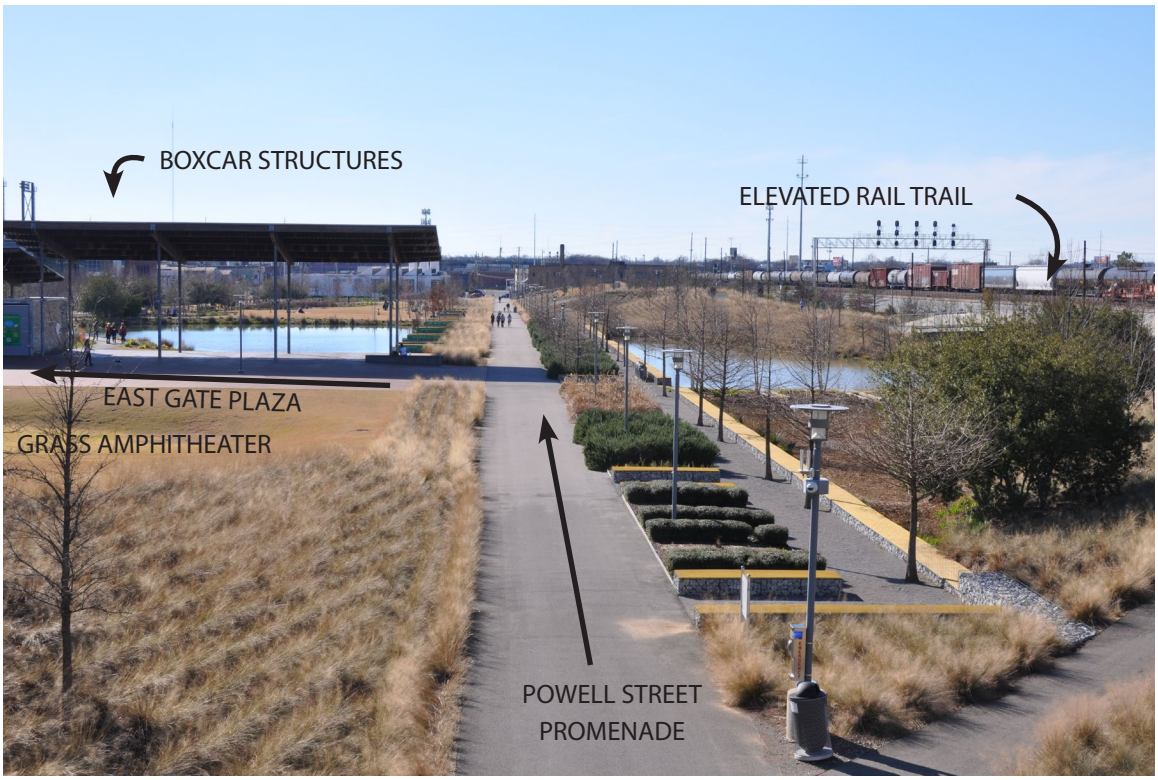


Figure 4.3: Looking west from the east end of Railroad Park (Photo by author)

Running parallel to 1st Avenue and bisecting the park from east to west, the Powell Street Promenade extends beyond the park in each direction and is intended to structure a future connection between the park and Sloss Furnace on the East and potentially Alyce Furnace to the west. The promenade is shaded by tree “islands” that project into the lake, and lined with display gardens planted with perennial herbs and seasonal crops.

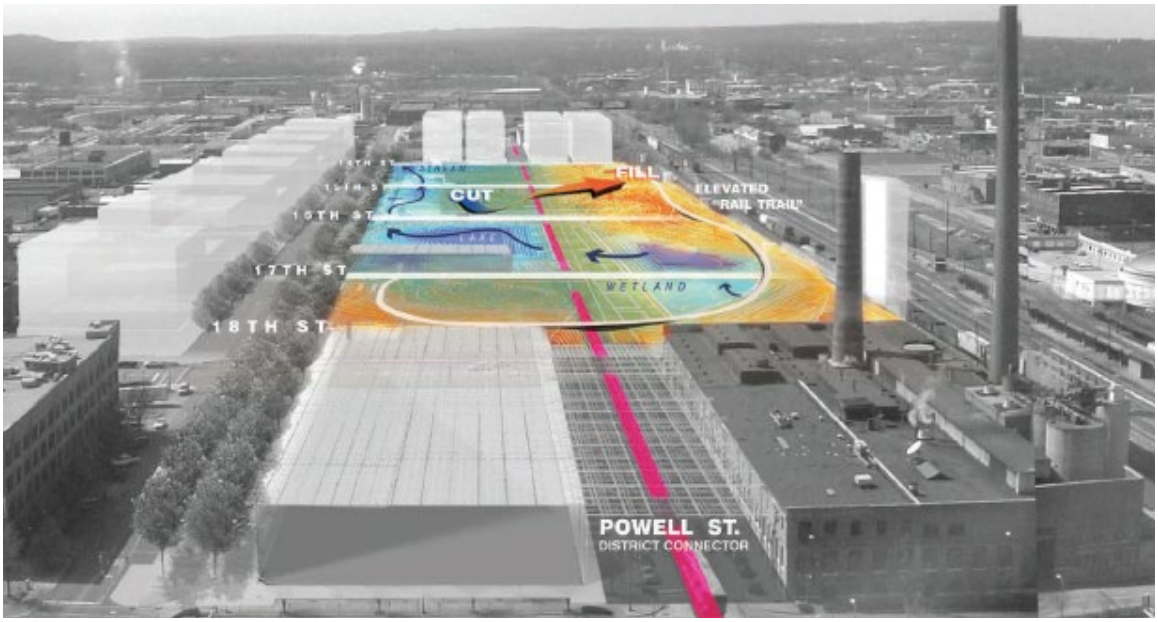


Figure 4.4: Tom Leader Studio's design concept for Railroad Park (Image courtesy of Tom Leader Studio)

Environmental Benefits:

Railroad Park's site is historically the lowest point in the city, so managing the flow and storage of stormwater became an important aspect of the design. Due to recession-related budget constraints, topography became the primary element used to organize the site and manipulate hydrology. The entire site tilts to the south so that water is collected and then flows west towards a flood storage pond. A large lake serves as an irrigation reservoir during the summer months and its banks are planted with biofilitration wetlands. 30% of the park is covered in water, and the connected lake and stream systems organize district stormwater drainage, retention, infiltration, and biofiltration (Tom Leader Studio 2013).

The park is planted with a mixture of more than 600 native hardwood, evergreen, and flowering trees, giving the park a cool and shady feel in the midst of the hot city (Railroad Park 2013). Knolls covered in tall grasses and soft vegetation provide a visual

contrast to the surrounding cityscape. The broad range of native plants creates habit for native species, aids in stormwater infiltration, and exposes Birmingham residents to the ornamental potential of native trees, shrubs, grasses, and perennials throughout the year.

Figure 4.5: The park incorporates a range of native plant species, appropriate for both dry and wet habitat. (Photo courtesy of Tom Leader Studio)

Context:

The essential concept for Railroad Park celebrates the project's cultural and historical context. Built adjacent to the railway, trains roll through the park as an inescapable part of the visitors' experience and an orienting reminder that this park is located in Birmingham, Alabama. A large historical banner at the 18th Street entrance outlines the city's industrial and rail history, and the park site's specific role in that story.

To work within the city's tight budget, the design repurposed building materials excavated from the site. Steel gabions were fashioned and filled with broken pieces of brick and limestone. The infill was arranged thematically according to source and time period (Tom Leader Studio 2013). Benches were created by covering the tops of

some gabions with molded safety-yellow fiberglass. Limestone and steel are important materials in the region and the broken re-used bricks were once hand-crafted by another generation of Birmingham residents. While the rectangular gabions and the bright yellow fiberglass create a more modern look than this traditional Southern city is accustomed to, the fill materials are a comfortable acknowledgment of the city and the site's history. Native plants are another context-grounding element surrounding the more modern design elements.

Figure 4.6: Contextual design elements in Railroad Park (Photo by author)

Visibility:

A visitor to Railroad Park has varied opportunities to observe the cycling of water through the site, as well as the natural plant communities functioning to filter the water. Primary circulation in the park continues the grid of the downtown city streets, by

interrupting this rectilinear pattern with alternative circulation routes and places to sit, the visitor's focus is directed towards the site's special features. The elevated Rail Trail provides unique observation points, and seating "islands" that extend into the main water body create opportunities to be surrounded by functioning wetland plant communities.

Figure 4.7: A parent and child playing in a seating "island" on the lake (Photo by author)

A flowing stream on the southeast side of the park recalls a wilderness aesthetic but its materials and form are exaggerated in a way that makes it obvious that this element of the design was created and is maintained by human care. The use of perfect and obviously man-made forms alerts the visitor to the human intention behind the design of the space and directs attention towards important features.

Legibility:

While Railroad Park provides valuable environmental benefits for the city of Birmingham, particularly in regards to strormwater management and filtration, there are few indicators on-site that explicitly relate this information to visitors. The most legible environmental element of the design is the movement of water across the entire site—

down the sculpted landforms, through the stream, and into the retention pond planted with wetland communities—symbolic of water flow across larger watersheds. While the educational value of this symbology is subtle, repeated exposure to this space over time could build an intrinsic understanding of the way that water moves through an ecosystem and interacts with plant communities.

Figure 4.8: Perfect forms and exaggerated natural forms serve as cues of human care. (Photo by author)

Participation/Discovery:

Elevation changes and winding circulation lead to moments of obscured visibility, then discovered views. Plants, particularly textural grasses, aid in creating these moments of revelation. Additionally, visitors are able to directly access and participate in functioning ecosystems on-site. In warm weather children play in the stream, jump across it, run alongside it, and likely begin to value this resource and its nature-like aesthetic. More formal play areas—a small climbing dome and a skate area—are subtlety folded into the design of the space and call to mind natural landforms. The result is that the entire park, rather than a singular defined area, feels like a space appropriate for play, participation, and discovery.

Figure 4.9: Children play on a climbing dome. (Photo by author)

Figure 4.10: Children play in the stream. (Photo courtesy of Tom Leader Studio)

Figure 4.11: People feed fish by the lake. (Photo by author)

Figure 4.12: Winding circulation, elevation changes, and vegetation create moments of discovery. (Photo by author)

There is also visible wildlife in the park. In addition to the birds, bugs, and pollinators that are hopefully attracted by the native plantings, a few ducks spend time in the retention pond and the larger water bodies are stocked with coy. While the presence of these species is more indicative of human action than healthy ecosystems, the public's interaction with the birds and fish can help people to associate wildlife with its habitat and build an appreciation for both.

Sensuality:

Railroad Park has a strong visual impact. Public appreciation for this project and the environmental benefits that it provides is largely because of the beauty that this green space brings to Downtown Birmingham. The wetland areas that retain and filter area stormwater, also reflect impressive views of the Birmingham skyline. The Rail Trail boardwalk provides far-reaching vistas of both the park and the city. The soft grasses and native plant communities provide a stark contrast to the surrounding development.

Figure 4.13: Sensory experiences in Railroad Park (Photo by author)

Grasses and large rosemary plants lining the walkways beg to be touched and smelled. Children play in the running stream, and the water curtain falling into the retention basin provides white noise and a perceptible mist. Perhaps most unique to this particular place is the multi-sensory experience of nature in conjunction with the sight, sound, and palpable vibration of the passing trains—simultaneously evoking memories of wilderness, but firmly grounding the visitor in the City of Birmingham.

Flexibility:

As one of the lowest points in the city, Railroad Park serves as valuable flood protection for surrounding development. The southern portion of the site was excavated for a stream system and small lake, and the cut soil was used to build up the north side of the park. Water rolls off the knolls on the north edge, and the stream carries the water west towards a flood storage pond. The pond, at the site's low point and therefore one of the lower points in the city, collects excess stormwater and prevents flooding during large storm events. The fluctuating water levels, particularly in the flowing stream, are indicative of the area's climate.

Table 4.1: Design Framework as Applied to Railroad Park

DESIGN GOAL	DESIGN OBJECTIVES	DESIGN TECHNIQUES
CONTEXT	Highlight an ecology important on-site and in the surrounding area. Acknowledge social and historical context. Incorporate elements of known landscapes.	Proximity to place-defining features Local and recognizable materials Native plant communities Signage
VISIBILITY	Bring people into close proximity with nature and offer multiple vantage points. Provide cues of human care and intention. Symbolize, exaggerate, densify, and juxtapose nature to draw attention to it.	Elevation changes and circulation Overlooks and seating "islands" Exaggeration of natural aesthetic Perfrect forms
LEGIBILITY	Focus on one or a few specific natural processes. Simplify and interpret nature. Tell an ecological story. Make interpretive measures conspicuous and easy to understand.	Symbology
DISCOVERY	Create opportunities for active engagement. Allow moments of disorientation and revelation. Bring people in direct contact with natural processes. Design surprising experiences.	Elevation changes and circulation Direct access to stream Wildlife to observe and feed Nature-inspired play forms
SENSUALITY	Design immersive aesthetic experiences that appeal to all five senses: sight, smell, hearing, taste, and touch.	Attractive views Contrasting textures Flowing water Fragrant plants
FLEXIBILITY	Accommodate and celebrate the dynamism of natural processes. Incorporate unexpected forms and sequences while referencing known experiences. Consider the effects of time, and the visitor's experience over time.	Flood control elements Fluctuating water level

Historic Fourth Ward Park - Phase I, Atlanta, Georgia

Size: 5 acres (of Historic Fourth Ward Park's 35 acres)

Completion Date: 2010

Budget: $15 million

Design Team: HDR, Inc. (Landscape Architecture, Site Civil and Structural Engineering); Willmer Engineering (Env. Testing); Womack & Associates (Electrical Engineering); PEQ (Public Involvement Services); Maria Artemis (Sculptural Artwork)

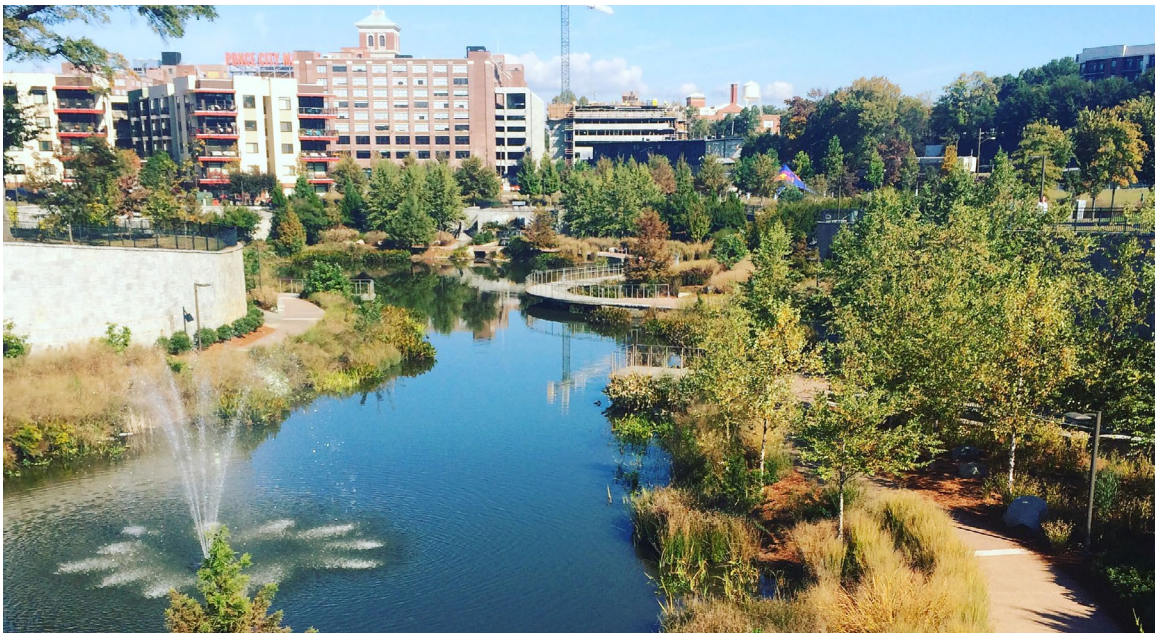


Figure 4.14: Historic Fourth Ward Park in Atlanta, Georgia (Photo by author)

Project Overview:

Historic Fourth Ward Park was conceived as a creative solution to both engineering and social problems in an historic neighborhood in Atlanta, Georgia. The Fourth Ward neighborhood was one of Atlanta's five original wards established in the mid-nineteenth century. Historic Fourth Ward Park is located in the Clear Creek Basin, a lowland area that was historically fed by springs (Saporta 2013). The area has perpetually

been one of the poorest neighborhoods in Atlanta, and in recent history has been highly susceptible to intermittent flooding and combined sewer overflows. Faced with a sewer overflow of this nature, the city would typically need to increase the capacity of the sewage system by extending underground tunnels—a costly and disruptive effort given dense development and the historic nature of the neighborhood. In 2003, community members proposed an attractive alternative to the tunnel extension, to design a park that would both address urban stormwater issues and provide a vital green space in one of Atlanta's most historic neighborhoods (HDR Inc. 2015).

The approximately five-acre Phase I of 35-acre Historic Fourth Ward Park, the primary focus of this case study, was the first constructed greenspace in the proposed "Emerald Necklace" component of the Atlanta BeltLine project. Entering this section of the park from the south, visitors encounter a snaking stone riverbed that symbolizes the "Ponce de Leon Springs," which first brought visitors to the area in the 1860s. The path functions as an ephemeral stream during storm events. Following the stream into the park brings the visitor to an overlook, offering the first full view of the two-acre retention basin below. The south end of the park is also anchored by an amphitheater, which steps down from street level to a stage that extends into the retention pond.

Walking paths give visitors the option to circle the site at street level or descend to water level, with several opportunities to move between the two elevations. The park is anchored on the west by a Sculpture Plaza, featuring artwork by Maria Artemis whose granite pieces are incorporated into several elements of the park's design. An entry plaza on the north end of the park is marked by a paving design reminiscent of flowing water, and overlooks a water feature designed by Artemis which actually disguises a tunnel that

contributes water to the pond. On the east side of the pond, the water-level walking path leads the visitor out onto the retention pond, offering views of a 40-foot long water wall over a 13-foot high retention wall (HDR, Inc. 2015).

Figure 4.15: Historic Fourth Ward Park Layout (Image courtesy of HDR, Inc.)

The entire park is filled with subtle, clever hardscape details and large swaths of native plantings. The design artfully transforms an engineering solution into an enjoyable and important opportunity to observe natural processes and plant communities. Additionally, the completion of the retention basin in the Fourth Ward neighborhood alleviated flooding problems, enabling previously impossible development—namely the sale of the Sears & Roebuck distribution center which was finalized right after the completion of Phase I in 2010. Historic Fourth Ward Park now connects the thriving Ponce City Market, the renovated Sears building, to the East Trail of the BeltLine.

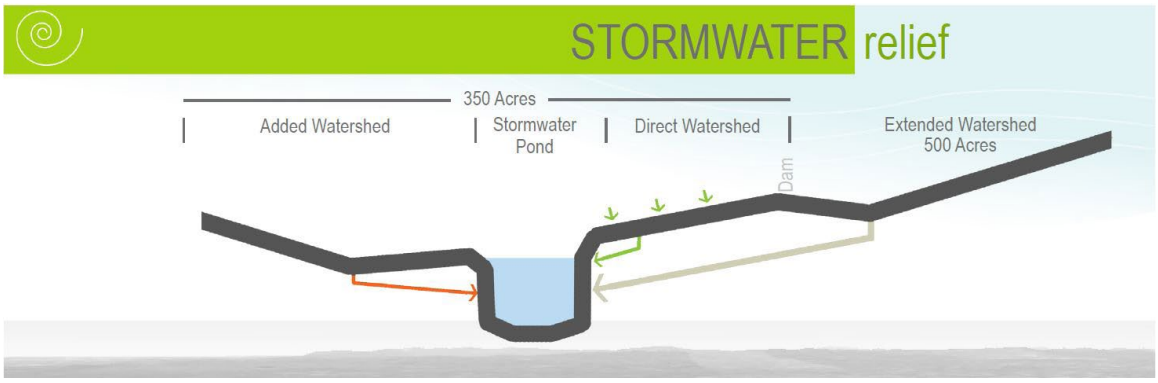


Figure 4.16: Stormwater relief model (Image courtesy of HDR, Inc.)

Environmental Benefits

Hydraulic modeling performed by the project's lead designer HDR, Inc. showed that some areas in the Clear Creek Basin experienced overflows during storms as small as the five-year event. The firm's analysis of the watershed showed the upstream watershed to contain roughly 850 acres of developed urban space. 350 acres were connected to the park site by surface drainage ways, and another 500 acres contributed water to the site through the sewer system. The two-acre detention pond built in Historic Fourth Ward Park represents 26 acre-feet of active storage potential and is built to generate a minimum

of 425 gallons a minute from the Clear Creek Basin (HDR, Inc. 2015). The pond is built below the water table to ensure a constant inflow of water, and outlet structures convey the water to irrigate the park's lawns. The detention pond safeguards the area against flooding, but also presents an opportunity for sediment to settle, and for plant communities to filter stormwater.

The planting design for Historic Fourth Ward park incorporates a range of native plants, intentionally arranged according to their water tolerance. As the project represents both upland and wetland habitats, visitors are exposed to the natural plant communities native to each of these environments. In addition to water and habitat benefits, the site excavation for Historic Fourth Ward led to remediation of industrial waste such as diesel fuel, lead soils, and asbestos and the removal of abandoned underground storage tanks (HDR, Inc.).

Figure 4.17: Planting concept (Image courtesy of HDR, Inc.)

Context:

One of the strongest contextual clues in Historic Fourth Ward park is the choice of materials. Much of the granite used in the public art and the retaining walls was salvaged from a local quarry. The stone, particularly the more natural shapes used in Maria Artemis' sculptures—which become seats, play elements, climbing areas, and water features—is reminiscent of Georgia's natural granite outcrops.

The serpentine paving patterns and the ephemeral stream on the South Plaza are another nod to the Fourth Ward's history, representing the "Ponce de Leon Springs" that once flowed through the area. Additionally, the plant choices and their arrangement in the design demonstrate the natural relationship between topography, moisture, and plant species. Due to the richness of the plantings and their placement on the terraces, standing near the water's edge feels somewhat like standing by a mountain pond.

Figure 4.18: Contextual references in Historic Fourth Ward Park (Photo by author)

Visibility:

Circulation around the retention pond artfully provides opportunities to see the water and the various features from many different levels. Observation areas and a winding boardwalk allow visitors to be out over the water, surrounded by the wetland plants and close to the water fowl that can sometimes be seen on the pond. The paths at street level provide views down into the wetland plant communities and the chance to observe the movement of water through the site.

The lush plantings of native perennials, grasses, shrubs, and trees produce an aesthetic unlike traditional southern gardens. The plant choices are typically less ornamental, and the plant groupings are guided by ecology rather than formal design. The clean, clear hardscape forms, however, make a potentially unfamiliar planting aesthetic feel comfortable and safe. The full, somewhat wild, plantings clearly evoke a feeling of being in nature, but the smooth curves, crisp corners, and orderly pavings "clean up" the naturalized pond edges and planting beds. The juxtaposition of textures actually draws attention to the functioning ecosystems.

Figure 4.19: Circulation and vantage points (Photo by author)

Legibility

The retention basin plays a vital role in collecting, containing, and filtering stormwater for a large area. The environmental performance of this park is conveyed to the public primarily through symbolic representations, and design measures that highlight the inflows of water to the retention pond. A sculptural feature cascades water over granite pieces and ledges to join the inflow from a large tunnel on the north end of the park. A series of terraces steps down alongside a pedestrian path on the southeast side of the park, conveying collected surface runoff down 35 vertical feet to the pond. These measures, along with the stream bed near the South Plaza, are so designed, so intentional, that they are clearly water-bearing mechanisms even when there is no water flowing. These elements go beyond visibility to legibility, because when observed as a whole they tell a story of where water comes from in an urban environment.

Figure 4.20: A water cascade carries surface runoff down to the retention pond. (Photo by author)

The planting plan could be viewed as another interpretive element of the design. The organization of the natural communities according to the moisture gradient could be considered a demonstration garden. Visitors paying close attention may notice the change in species, and might pay particular attention to the wetland plants they are likely less familiar with. Another subtle informative detail lies in the pattern of the retaining walls circling the pond. Two river rock bands break the granite pattern of the walls to mark the level of the 100 year and 500 year storm events. This detail is incredibly clever and the simple labels say just enough to convey meaning and spark a visitors interest, yet the labels are somewhat difficult to find.

Figure 4.21: Bands of river rock mark the level of the 100 and 500 year storm events. (Photo by author)

Participation/Discovery

The relationship between the walking path and the pond creates interesting moments of discovery in this park. Wetland plants of varying heights line the shores of the pond, sometimes tall grasses filter the visitor's view and other times the pond is right beneath his or her feet. Nearing the pond or walking along the edges, visitors can peer

through the vegetation and discover the wildlife that this constructed wetland attracts.

Many of the park's design details can become opportunities for play and engaged discovery. The sculpted granite on the Sculpture Plaza can be used as seating, but children also enjoy climbing over, hanging on, and dancing around the pieces. Similarly, the swirling paving patterns become trails to follow—particularly the blue paving accents that sparkle in the sunlight. The stream bed on the south side of the park is a favorite play area for the park's young visitors. While the design for this space is elegant, it is not without whimsy and even the artwork feels approachable and worthy of exploration.

Figure 4.22: Children play in the ephemeral streambed. (Photo by author)

Sensuality

The design of the park provides beautiful and varied views of water, wildlife, and plant communities, nestled seamlessly into strong hardscape forms and accented with fun, clever details. The visual impact of the space is obvious, but the experience of the park is very tactile as well. The sculptural elements beg to be touched and their incorporation into the design provides plenty of opportunities. Material changes in hardscape elements

also may cause visitors to reach out a hand. The soft, almost wild, plantings practically surround the visitor at times creating opportunities to touch or smell these native species. Falling water from the water curtain and the fountain feature provide a consistent white noise that permeates the experience of the park. The cascading water also perceptibly cools and dampens the surrounding air.

Figure 4.23: Visitors can see, hear, and feel water features throughout the park. (Photo by author)

Flexibility:

This park was designed with the unpredictable nature of nature in mind. Historic Fourth Ward Park was actually built as a response to the unpredictability of storm events and the sewer system's insufficiency to accommodate even a five year storm. The retention basin was designed to withstand a 100 year storm, and every surrounding element of the park was also designed to survive fluctuating water levels. Flexibility was an essential consideration in the design of Phase I of Historic Fourth Ward Park.

Visiting Historic Fourth Ward Park is a dynamic experience, changing in response to local climate. Sometimes there is water flowing down the terraces by the southeast staircase, sometimes there is water in the ephemeral stream by the South Plaza. Visitors

are able to observe changes in the level of the pond based on the amount of recent rain, and also see the way that the plant choices in the park respond to these changes. Spending time in this space repeatedly, over time, can help the public begin to understand the dynamic relationships between urban development, stormwater runoff, and natural ecosystems.

Figure 4.24: HDR, Inc.'s modeling of Historic Fourth Ward Park's storage capacity (Image courtesy of HDR, Inc.)

Table 4.2: Design Framework as Applied to Historic Fourth Ward Park, Phase I

DESIGN GOAL	DESIGN OBJECTIVES	DESIGN TECHNIQUES
CONTEXT	Highlight an ecology important on-site and in the surrounding area. Acknowledge social and historical context. Incorporate elements of known landscapes.	Symbolize historic features Local art Local and recognizable materials Native plant communities
VISIBILITY	Bring people into close proximity with nature and offer multiple vantage points. Provide cues of human care and intention. Symbolize, exaggerate, densify, and juxtapose nature to draw attention to it.	Elevation changes and circulation Overlooks and viewing platforms Perfect forms Juxtaposition
LEGIBILITY	Focus on one or a few specific natural processes. Simplify and interpret nature. Tell an ecological story. Make interpretive measures conspicuous and easy to understand.	Related design elements Repetition of symbols or ideas Paving details Demonstration plantings
DISCOVERY	Create opportunities for active engagement. Allow moments of disorientation and revelation. Bring people in direct contact with natural processes. Design surprising experiences.	Plant choices and placement Wildlife to observe Direct access to pond Unconventional play opportunities
SENSUALITY	Design immersive aesthetic experiences that appeal to all five senses: sight, smell, hearing, taste, and touch.	Attractive and interesting views Enclosure with plantings Approachable artwork Flowing water
FLEXIBILITY	Accommodate and celebrate the dynamism of natural processes. Incorporate unexpected forms and sequences while referencing known experiences. Consider the effects of time, and the visitor's experience over time.	Ephemeral elements Designed to flood

Renaissance Park, Chattanooga, Tennessee

Size: 22 acres

Completion Date: 2006

Budget: $8 million

Design Team: Hargreaves Associates (Lead Designer)

Figure 4.25: Renaissance Park in Chattanooga, Tennessee (Photo credit: John Grollings, Hargreaves Associates)

Project Overview:

Renaissance Park is a 23-acre public greenspace located on the Tennessee River in Downtown Chattanooga, Tennessee. Completed in 2006, the park celebrates the area's history and ecology, while remediating a contaminated landscape remnant of Chattanooga's industrial past. Situated directly across the river from Chattanooga's up-and-coming downtown, Renaissance Park has breathed new life into the area known as the North Shore.

Designed by Hargreaves Associates, Renaissance Park uses landforms, art, and symbolic representation to pay homage to Chattanooga's unique history and culture while creating a functional greenspace that is highly used by the city's modern residents. A visitors center with a greenroof and demonstration garden mark the entrance to the park, and two iconic sculpted landforms—one angular slope and one large knoll—are immediately visible. A walking trail leads visitors around a constructed wetland area, accented with linear gabions and plantings. An amphitheater steps down towards the wetland, providing a space for resting or playing while observing the wetland habitat.

Following the pedestrian trail across the wetland area and towards the river brings the visitor to a criss-crossing series of gravel paths that are representative of the paths taken by the Cherokee people during the Trail of Tears. A circular wall creates a symbolic council ring, another nod to Cherokee culture. Sculptural pieces are scattered throughout this section of the park, and the river-side path extends over the water periodically creating viewing platforms. This section of Renaissance Park is separated from the constructed wetland by a "Flooded Forest," a maintained natural section of the area's floodplain.

Of the three case studies examined in this thesis, Renaissance Park represents the least manicured aesthetic with floodplain forest comprising 53% of the 23 acres and meadow accounting for another 23%. Only 25% of the park is grass and the majority of this turf covers the sculpted landforms (Collett 2014). A survey conducted in 2014 by The University of Tennessee-Knoxville found that nearly 70% of park visitors visit Renaissance Park more than once a week, and that 80% of visitors' motivation for being in the park is to "enjoy nature and the outdoors" (Collett 2014). Hargreaves Associates'

design for Renaissance Park incorporates very little hardscape, but creatively weaves obvious man-made forms through, around, and over untouched or restored natural areas to immerse visitors in nature in a way that still feels safe and intentional.

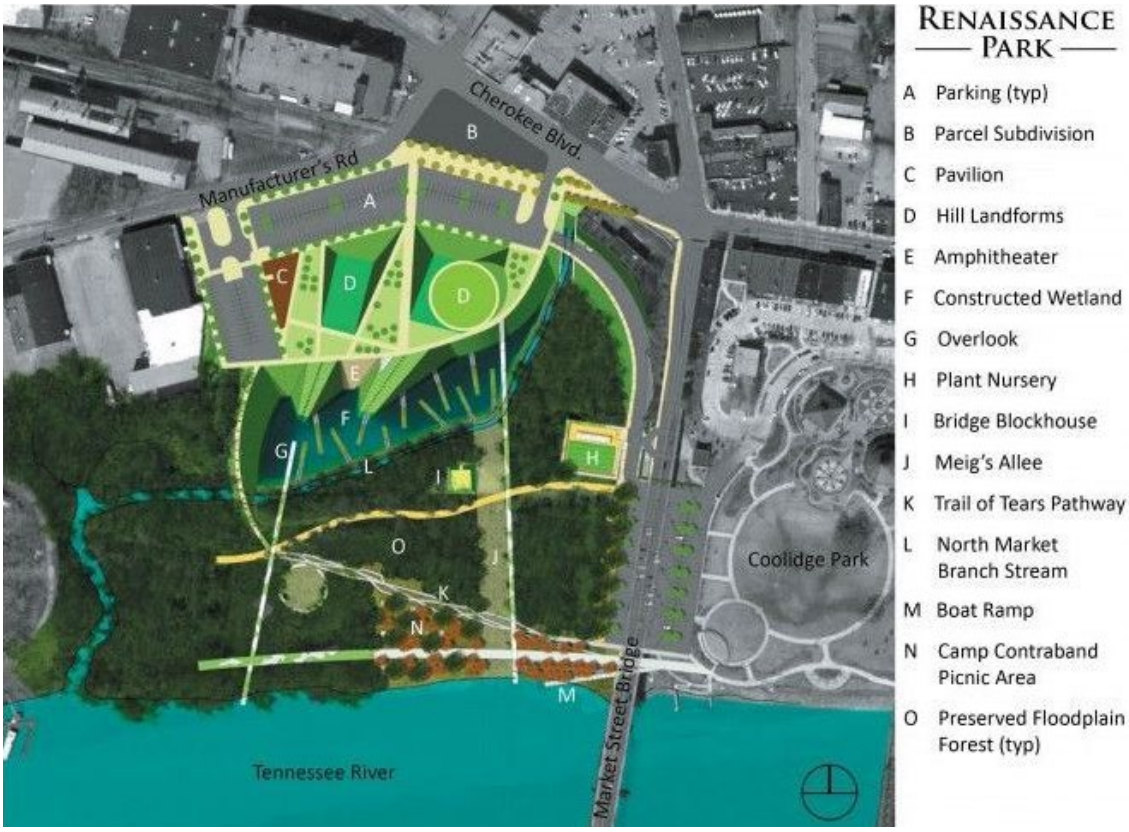


Figure 4.26: Renaissance Park Layout (Image courtesy of Hargreaves Associates)

Environmental Benefits:

Renaissance Park's iconic landforms provide unique views of the park, opportunities for play, and are even utilized by fitness trainers and their clients, but they also perform environmentally. Approximately 34,000 cubic yards of contaminated soil containing PCBs, heavy metals, cyanide, SVOCs, VOCs and enamel frit were removed from the 100-year floodplain and sealed in the park's two landforms. The burial areas were designed to be outside of the 100-year floodplain, and were sealed with geogrids,

warning tape and more than two feet of soil. Additionally, the excavation of contaminated soils increased floodplain storage by nearly 10 acre feet (Collett 2014).

As part of the design, some measures were taken to stabilize the bank of the North Market Branch stream that runs through the site. Erosion control measures and the planting of native riparian plant species caused the USEPA's assessment of the stream habitat to increase from 60 in 2002 to 122 in 2014 (Collett 2014). Planting choices throughout the site have restored or improved habitat conditions, attracting native wildlife. Nearly 80% of the park is non-irrigated, involving 39 native riparian and wetland aquatic plants, forbs, grasses, shrubs, and trees (Collett 2014).

Figure 4.27: Landscape type map of Renaissance Park compared to neighboring Coolidge Park (Image source: Collet 2014)

The constructed wetland also functions to filter contaminants out of the water that flows through the park and downstream to the Tennessee River. Stormwater runoff from the North Chattanooga urban watershed and water that builds up around the encapsulated contaminated soil enters the wetland and is directed through a series of stone-filled

gabions. Native wetland species planted behind the gabions filter the water and reduce pollutants. Solar-powered motors run pumps that maintain the water level in the wetland during times of drought or extreme rainfall (Renaissance Park 2016).

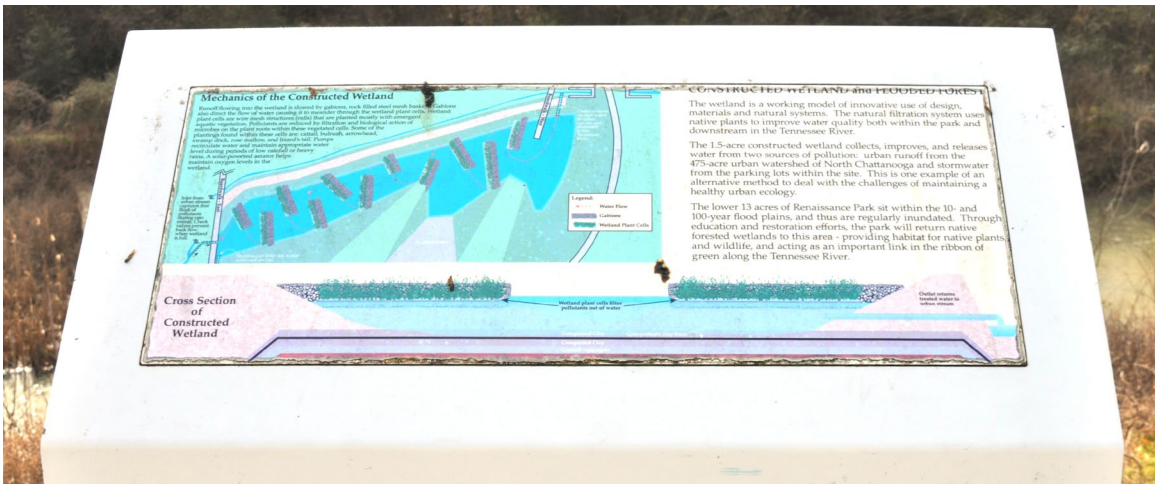


Figure 4.28: Signage informs park visitors about the constructed wetland. (Photo by author)

Context:

Situated on the north bank of the Tennessee River, Renaissance Parks uses overlooks and artwork to direct attention to the river and across it to Downtown Chattanooga. A sculpture entitled *The Ascending Path* frames the downtown view; the corten steel symbolic bridge shows bronze figures representing the Trail of Tears, the African American garrisons, and the crossing of freed refugees over to Camp Contraband. Selected by a panel of local artists from 80 national entries, the sculpture and the broken rocks below are a reminder of the area's past but are intended to also celebrate Chattanooga's growth and bright future (Renaissance Park 2016).

Informational signage throughout the park tells the story of the site's history, and symbolic gestures ground the design in the unique geography, culture, and history of Chattanooga, Tennessee. The criss-crossing arrangement of gravel trails represents the

various crossing points of the Cherokee people during the Trail of Tears, and a Council Ring celebrates Cherokee traditions. The natural aesthetic of the park, with some areas virtually untouched and most of the designed spaces requiring little maintenance, also provides geographic context through plant communities and the wildlife they attract.

Figure 4.29: *The Ascending Path* by Brad Bourgoyne and Aaron Hussey, 2006 (Photo by author)

Figure 4.30: Gravel paths and a council ring symbolize the area's Cherokee history. (Photo by author)

Visibility:

The pedestrian paths running through Renaissance Park provide opportunities to view the wetland and the Tennessee River from multiple vantage points. The amphitheater steps right down to the water of the wetland, and a boardwalk and bridge offer additional vantage points. Additionally, climbing the two landforms at the park's entrance provides far-reaching views of the full park as well as the surrounding city. Overlooks stretching out over the river are opportunities to be surrounded by the flowing water and observe the city to the south.

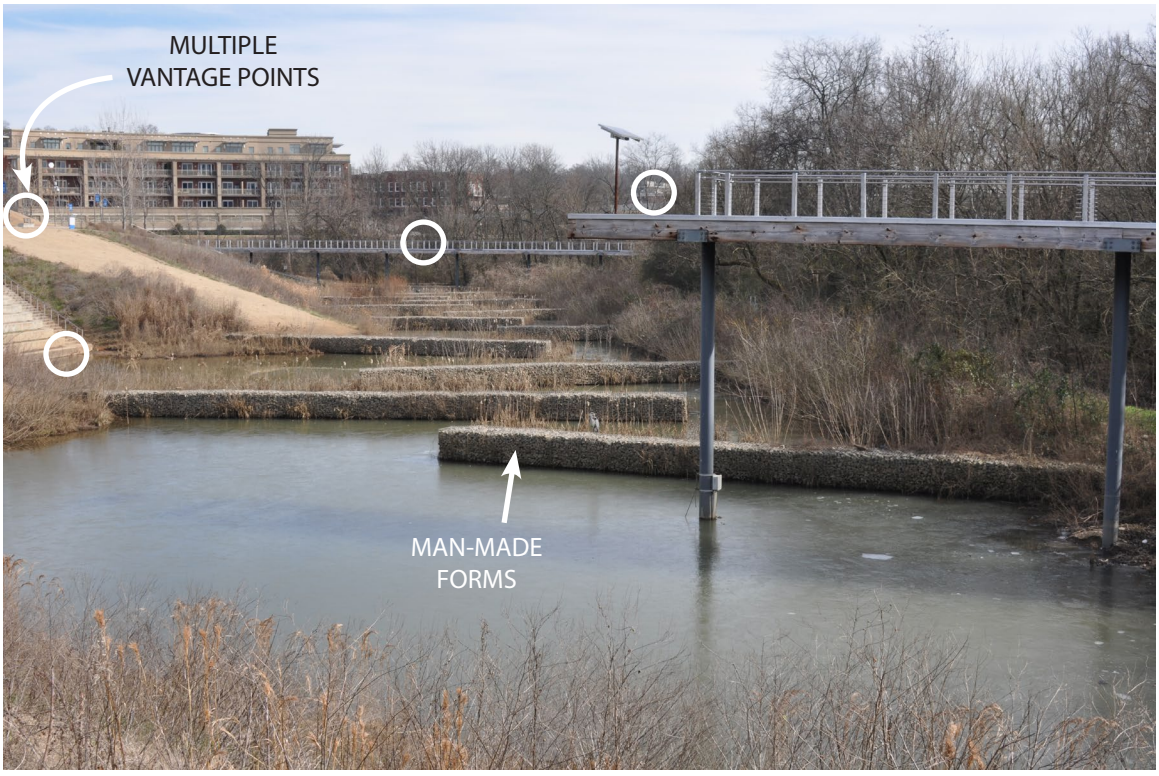


Figure 4.31: Examples of visibility in Renaissance Park (Photo by author)

Renaissance Park incorporates less hardscape than the other two built works studied in this thesis. The almost overgrown feeling of the vegetation in this park could easily make it an unwelcoming experience, but the presence of artwork, unnatural shapes and

forms, and signage ensures that the visitor knows the space was intentionally designed and is regularly maintained. The diagonal placement of the gabions in the wetland, for instance, does not necessarily aid in wetland function, but the design of this element makes it clear that the wetland was constructed and alerts the visitor that something interesting is happening here.

Legibility:

Because the design of this park is less formal, it goes the extra mile to make the environmental benefits of the park legible. Signage plays a significant role in conveying information to visitors. Some features have informational kiosks, but other signs simply direct the visitor to dial a phone number and enter a code to learn more about the adjacent park feature. By this means, the park explains the workings and the purpose of the constructed wetland, the significance of an environmental piece of artwork entitled *Tennessee Leaf* by Terry Allen, the importance of the "Flooded Forest," and other relevant information about the park's design. By conveying information about the habitat value of the natural areas of the park and drawing people's attention to the importance of wetlands and wetland plants, visitors are more likely to appreciate their surroundings even if they differ from a traditional image of beauty.

A demonstration garden near the outdoor center at the park's entrance is another interpretive element of the design. The structure houses a rooftop garden, which can be observed from atop the sculpted landforms nearby. A sign on the building explains how a greenroof is constructed and the general benefits of greenroofs. An irregular planter in front of the building serves as a demonstration garden, showing visitors the same species that can be found on the roof.

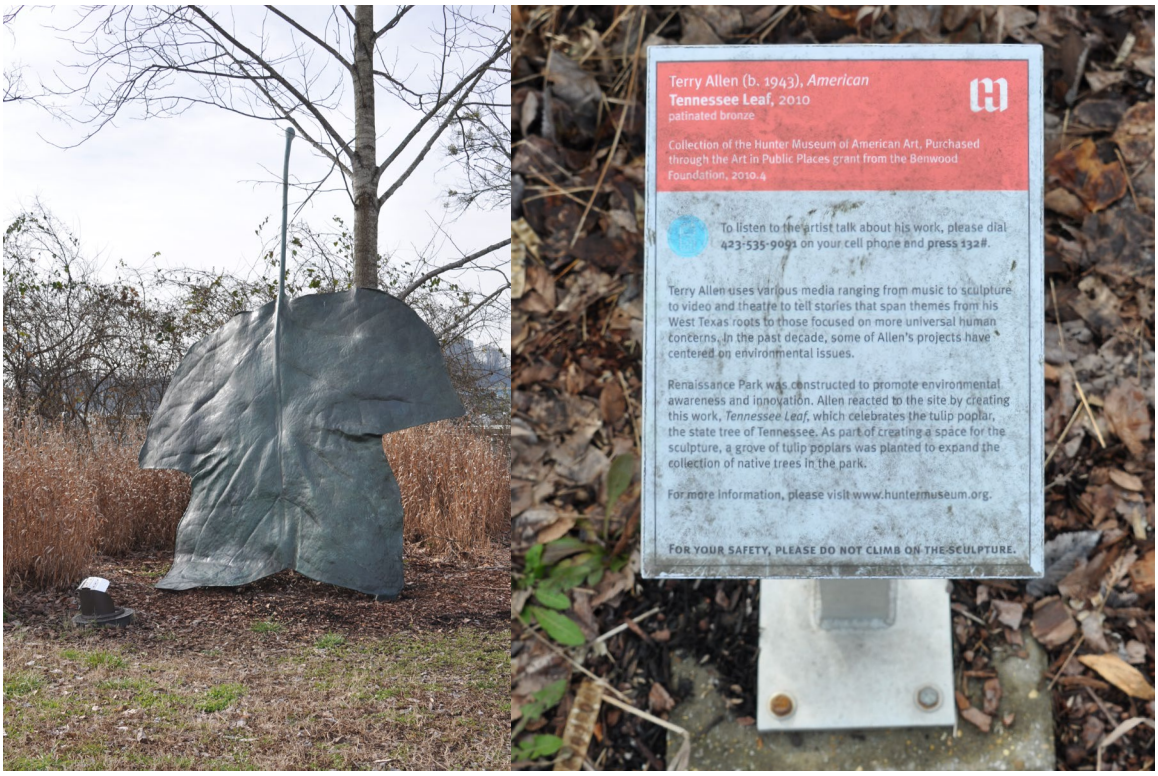


Figure 4.32: *Tennessee Leaf* by Terry Allen and adjacent interpretive signage (Photo by author)

Figure 4.33: A sign at the outdoor center explains the benefits of green roofs. (Photo by author)

Discovery:

Pedestrian paths wind through dense vegetation in Renaissance Park, creating moments of enclosure and revelation. One sculpture in particular is set off of the pedestrian path in the woods, leading visitors into the trees for an even more immersive experience of nature. The natural woods and the constructed wetland are valuable habitat for fauna, and circulation paths provide ample opportunities to look for and observe wildlife. Additionally, the same signage that provides legibility is a chance for visitor participation as well. By directing visitors to call a number for more information, the signs actively engage people in the discovery of new information about the park and natural processes.

Figure 4.34: A sculptural structure draws people away from the primary path. (Photo by author)

The large landforms also engage people in unexpected forms of play—fitness groups can often be seen running up and down the mounds—and reward them with the discovery of a new vantage point. Direct access to the river provides for an interactive experience with nature as well; a kayak launch on the river bank encourages park users to get out on the river.

Sensuality:

Varied and interesting views of the park and downtown Chattanooga engage visitors visually in Renaissance Park. The close proximity and largeness of nature in this park provide additional sensory experiences. The vegetation encloses the paths, encouraging visitors to touch the varied textures of the plants. Walking through the wooded areas one hears birds and the rustling of leaves in the wind. The sensual experience of this park is very much like strolling through the woods. Additionally, signage engages visitors both visually and audibly.

Figure 4.35: A platform extending over the river provides an immersive experience of nature. (Photo by author)


Figure 4.36: The sight, sound, and potential interaction with wildlife adds to the multi-sensory experience of Renaissance Park. (Photo by author)

Flexibility:

The design of Renaissance Park is flexible in its ability to accommodate excess rainwater. The park is also dynamic in its seasonality. Because woodland and wetland comprise a large portion of the park, the visitor feels seasonality even more strongly here than in the other two case study sites. With less hardscape and built elements, the overall experience of the park is strongly related to the appearance of the vegetation.

Figure 4.37: Renaissance Park 100 year flood plain before and after development (Image source: Collett 2014)

Table 4.3: Design Framework as Applied to Renaissance Park

DESIGN GOAL	DESIGN OBJECTIVES	DESIGN TECHNIQUES
CONTEXT	Highlight an ecology important on-site and in the surrounding area. Acknowledge social and historical context. Incorporate elements of known landscapes.	Framed views of downtown Art Signage Symbolic cultural references Local and recognizable materials Native plant communities
VISIBILITY	Bring people into close proximity with nature and offer multiple vantage points. Provide cues of human care and intention. Symbolize, exaggerate, densify, and juxtapose nature to draw attention to it.	Elevation changes and circulation Overlooks and viewing platforms Perfect forms Signage
LEGIBILITY	Focus on one or a few specific natural processes. Simplify and interpret nature. Tell an ecological story. Make interpretive measures conspicuous and easy to understand.	Signage Direction to more information Demonstration garden
DISCOVERY	Create opportunities for active engagement. Allow moments of disorientation and revelation. Bring people in direct contact with natural processes. Design surprising experiences.	Circulation Dense vegetation Wildlife to observe Signage Unconventional play opportunities Kayak launch
SENSUALITY	Design immersive aesthetic experiences that appeal to all five senses: sight, smell, hearing, taste, and touch.	Attractive and interesting views Enclosure with plantings Signage Wildlife
FLEXIBILITY	Accommodate and celebrate the dynamism of natural processes. Incorporate unexpected forms and sequences while referencing known experiences. Consider the effects of time, and the visitor's experience over time.	Increased flood capacity Seasonal changes

Evaluation of the Framework

Each of the case studies was found to exhibit every component of the proposed design framework to a certain extent. It is clear that each project excelled in certain areas and was weaker in others. Railroad Park's defining design principle could be considered context, while Historic Fourth Ward Park is a strong example of flexibility, and Renaissance Park excels in its legibility. The strength of each case study is logical considering the different goals that drove the designs: Historic Fourth Ward Park was designed to address a need for flood control; Railroad Park sought to build community and give Birmingham an iconic greenspace; Renaissance Park was designed to highlight Chattanooga's ecology and history. Each of these projects has been very successful in accomplishing its primary design objective.

Evaluating the applicability of the framework, there seems to be an opportunity to combine certain objectives that were difficult to distinguish. "Visibility" and "Legibility" are closely linked, and "Visibility" could actually be considered a component of "Legibility." The very visible design of water inflow elements in Historic Fourth Ward Park is part of what makes this landscape legible. In turn, the less visible hand of the designer in Renaissance Park requires more textual and audible interpretation to make the landscape legible. It seems appropriate to make "Visibility" a design objective for accomplishing the overarching design goal of "Legibility."

Additionally, it is difficult to separate "Participation/Discovery," from sensual experience. A participatory landscape will undoubtedly appeal to multiple senses as participation implies that one is doing more than simply viewing. It seems that the appropriate design goal here would be "Participation," and that creating opportunities

for discovery and appealing to all five senses would be design objectives related to that principle.

There were also components of each case study that seemed important, but did not have a logical place in the design framework. For example, would pre-construction community participation fall into the "Participation/Discovery" category? There may be a place for an additional category that accounts for park attendance, which could include community input as well as publicity and park programming. Getting people into the park to experience nature repeatedly and over time is an important part of transforming man's relationship with nature.

Based on the application of the proposed design framework to Railroad Park, Historic Fourth Ward Park, and Renaissance Park—each considered to be a successful example of a transformative experience of nature—this thesis makes the following revisions to the design framework:

Table 4.4: Revised Design Framework Based on Case Study Evaluation

DESIGN GOAL	DESIGN OBJECTIVES
CONTEXT	Highlight an ecology important on-site and in the surrounding area. Acknowledge social and historical context. Incorporate elements of known landscapes.
LEGIBILITY	Bring people into close vicinity with nature and offer multiple vantage points. Provide cues of human care and intention. Symbolize, exaggerate, and juxtapose nature to draw attention to it. Make interpretive measures conspicuous and easy to understand.
PARTICIPATION	Involve the community in the design and programming of the park. Create opportunities for experimentation. Allow moments of disorientation and revelation. Design immersive aesthetic experiences that appeal to all five senses: sight, smell, hearing, tastes, and touch.
FLEXIBILITY	Accommodate and celebrate the dynamism of natural processes. Incorporate unexpected forms and sequences while referencing known experiences. Consider the effects of time.

CHAPTER 5

APPLYING THE FRAMEWORK: A DESIGN FOR ROTARY TRAIL

Introduction to Rotary Trail

Rotary Trail is an approximately 25 ft.-wide area located between the eastbound and westbound lanes of 1st Avenue South in Birmingham, Alabama. The site, previously known as the "1st Avenue Cut," stretches nearly a half mile between 20th Street and 24th Street in Downtown Birmingham and is part of the city-owned railroad bed. The recessed concrete corridor, built roughly 100 years ago, is covered in graffiti, and often partially flooded—the Cut has been an eyesore and a target for redevelopment for over 25 years but a lack of funding has previously prevented any plans from moving forward (Ross 2016).

In 2014, the Rotary Club of Birmingham decided to fund the redesign and construction of the Cut into a public green space. The project is a gift to the City of Birmingham to mark the Rotary Club's centennial anniversary. Goodwyn, Mills and Cawood was signed on as the lead designer. Rotary Trail is currently under construction and will open to the public in April of 2016.

The redevelopment of Rotary Trail into a public green space is part of a broader movement to revitalize Downtown Birmingham. Rotary Trail is envisioned as a piece of a 750 mile network of multi-use, pedestrian, and biking trails in Jefferson County, Alabama. Rotary Trail is a piece of the Jones Valley Corridor, a nearly 29 mile trail that serves as the central spine of the greenway system (Red Rock Trail 2016). More

specifically, Rotary Trail is the first step in creating a greenway connection between Railroad Park and Sloss Furnace—an historic steel plant that is now a popular concert and event venue.

Figure 5.1: Context map of Rotary Trail in Downtown Birmingham

Site Inventory & Analysis

The Rotary Club did not request specific programmatic elements (Ross 2016), but wants the project to be big, meaningful, and long-lasting (Stein 2016). The project should celebrate Birmingham's history, while representing a bright new phase in the city's growth. Additionally, while the Rotary Club is funding and overseeing construction, the trail is still owned and will be maintained by the City of Birmingham and needs to be relatively inexpensive and simple to manage. An inventory and analysis of the project site reveal a number of additional considerations:

Safety:

Rotary Trail is a recessed site that moves under multiple overpasses. The depth of the site and limited visibility from street level present possible safety concerns—both real and perceived. Bringing the trail closer to street level could minimize feelings of discomfort. Designing the overpass areas to encourage movement and discourage loitering and adding lighting, could make these areas feel safe and prevent people from sleeping or living there.

Access:

Ideally, the site could be accessed from each cross street. At-grade access exists on each end of the trail, but an additional street-level access would be beneficial. Proximity to Railroad Park makes the west end the obvious primary entrance, and considering a future link to Sloss Furnace calls for a significant entry at 24th Street as well.

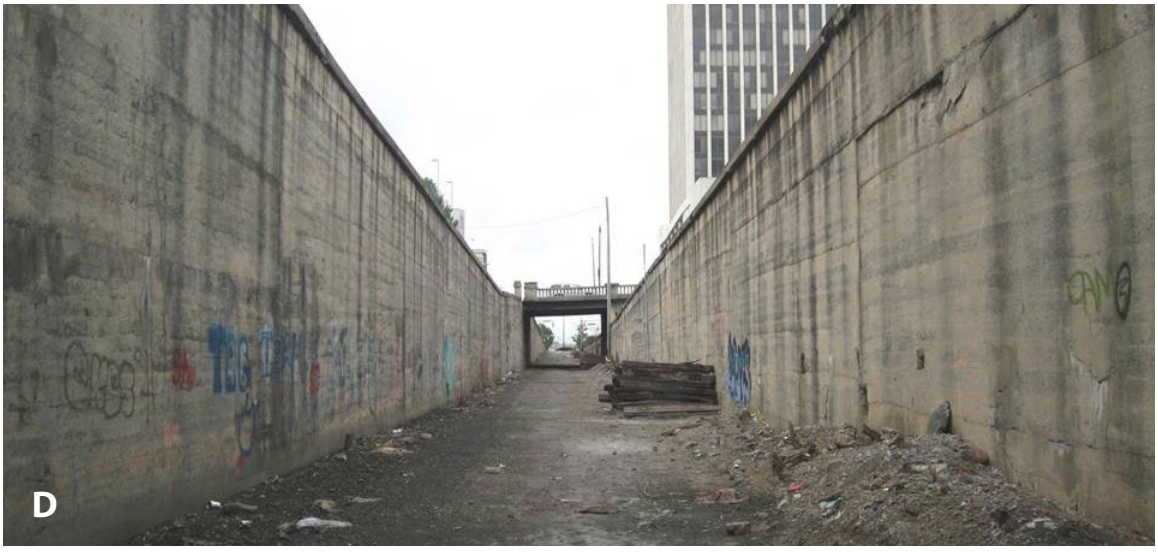
Soil:

The soil underneath the existing concrete floor is highly toxic. It is necessary to cap the contaminated soil, and the area cannot be used for biofiltration as it could leach toxins into the groundwater (Ross 2016).

Figure 5.2: Pre-construction photos of the "First Avenue Cut," walking west from 24th Street. **Letters relate to Figure 5.3: Site Inventory.** (Photos Courtesy of Jason Crunk)

B


C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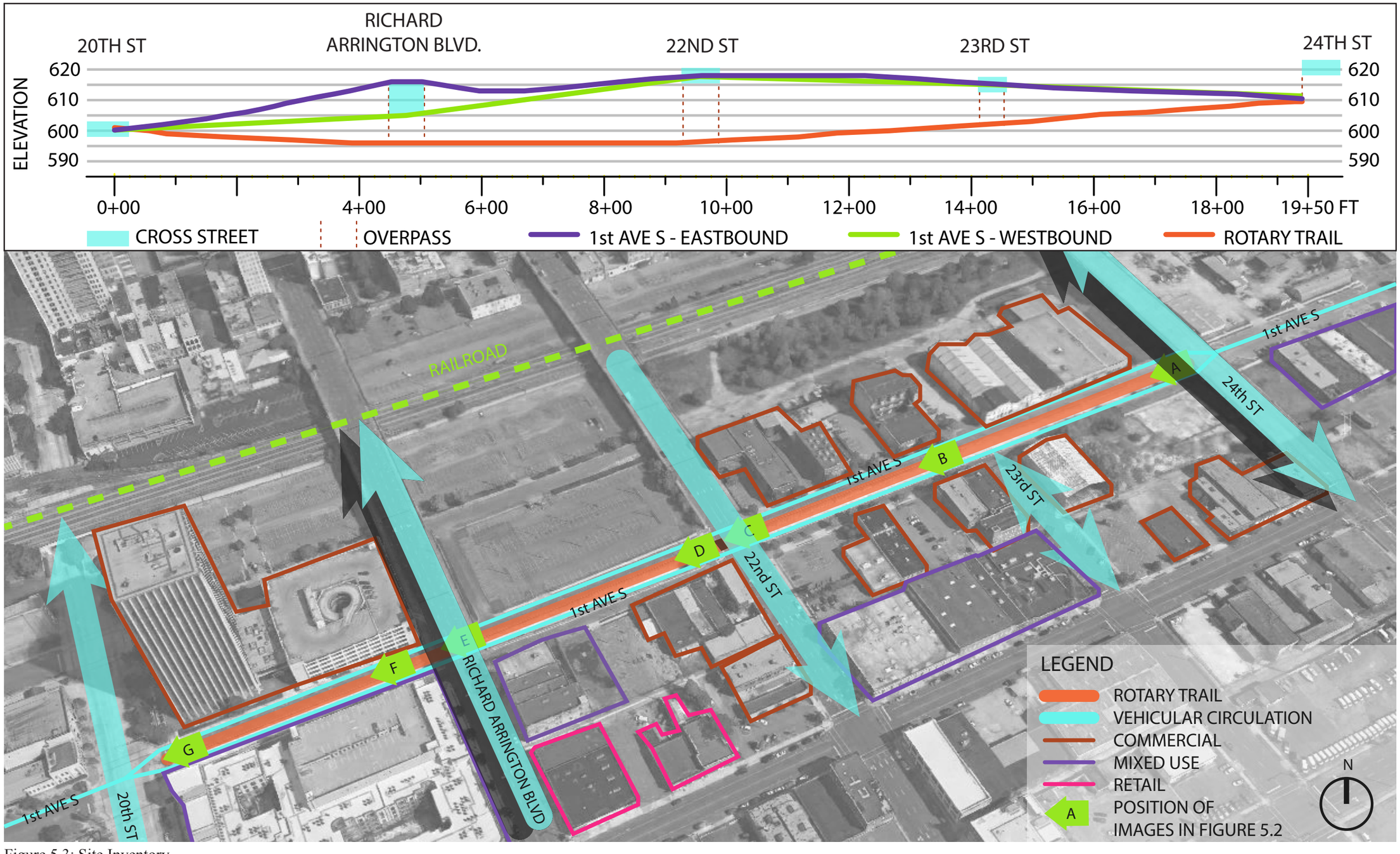


Figure 5.3: Site Inventory

ROTARY TRAIL

VEHICULAR CIRCULATION

CLOSE TO RAILROAD PARK
HIGH TRAFFIC AREA
PRIMARY TRAIL ENTRANCE

FUTURE CONNECTION
TOWARDS SLOSS FURNACE

OVERPASSES - NO VEGETATION
ADD LIGHTING
DISCOURAGE LOITERING

POTENTIAL AT-GRADE ACCESS POINTS

SITE IS > 10 FT BELOW 1ST AVE S
CONSIDER FILL FOR SAFETY

OPPORTUNITY FOR
LONG VIEWS

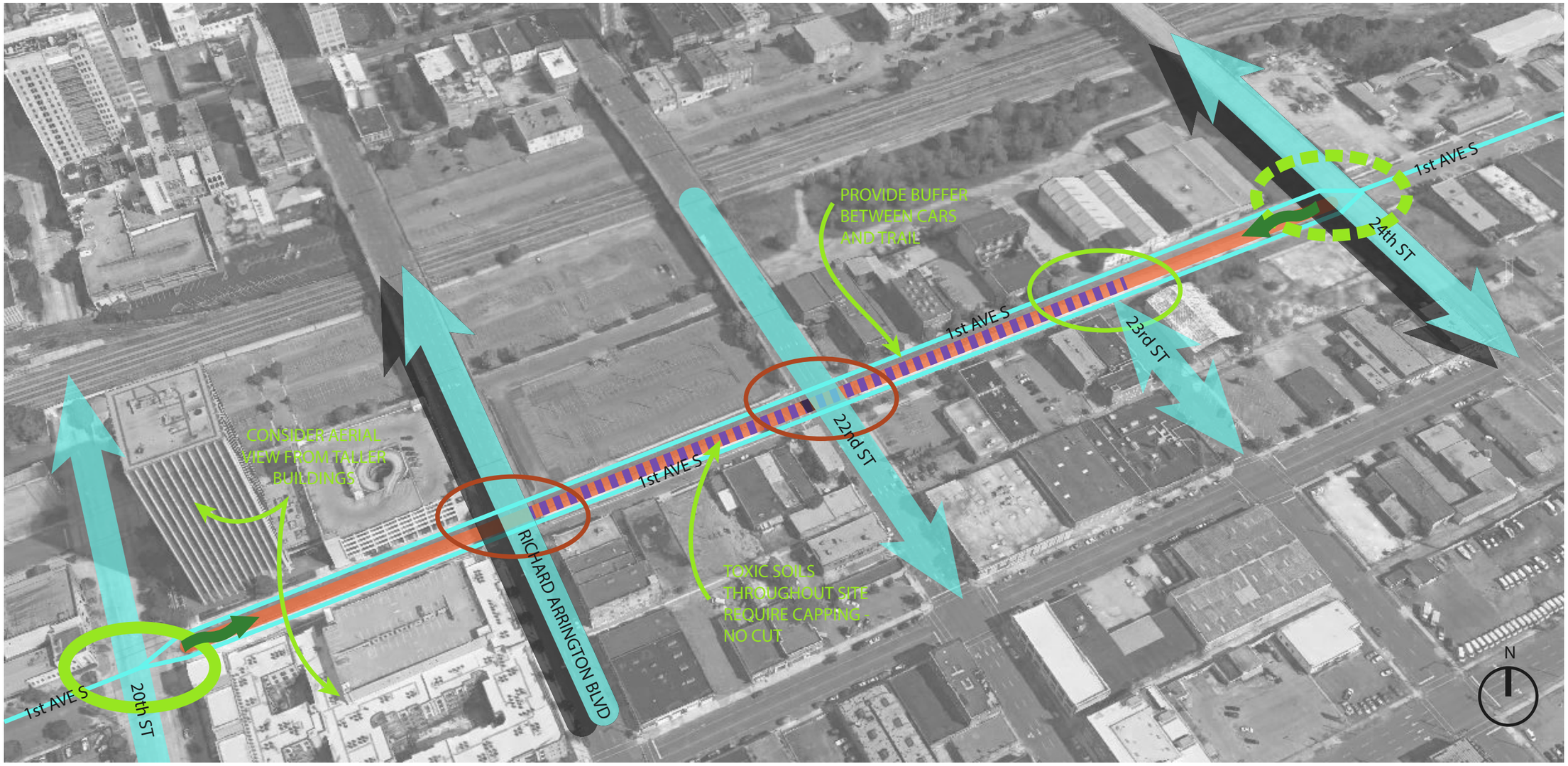


Figure 5.4: Site Analysis

Introduction to the Design Concepts

Three design concepts respond to the site inventory and analysis. Research suggests that focusing on one or a few specific natural processes ensures that the intended message to the observer is not confused or overwhelming (Galatowitsch 1998; Kaplan 2000), therefore each design concept is based on a different category of environmental benefit introduced in Chapter Two and outlined in Table 5.1 below. While each design concept may provide several types of environmental benefits, each concept will focus on interpreting a single category of benefits to the public. For this particular site, the author chose to focus on designing experiences that could transform the public's understanding of and appreciation for water; carbon, energy and air quality; and habitat.

Table 5.1: Environmental Benefits Interpreted Through Design Concepts

LAND Land efficiency/preservation; Soil creation, preservation & restoration; Shoreline protection	HABITAT Habitat creation, preservation & restoration; Habitat quality; Populations & species richness
WATER Stormwater management; Water conservation; Water quality; Flood protection; Other water	CARBON, ENERGY & AIR QUALITY Energy use; Air quality; Temperature & urban heat island; Carbon sequestration & avoidance
MATERIALS & WASTE Reused/recycled materials; Waste reduction	

As Rotary Trail is located in the heart of Downtown Birmingham, it seemed appropriate to focus on environmental processes or problems that are directly influenced by urbanization. The functioning of urban watersheds and the impacts of urbanization on air quality and ozone seemed appropriate narratives to introduce to the public through Rotary Trail's urban site. Habitat was chosen for the third design concept specifically because of Rotary Trail's broader impact as a piece of the Red Rock Ridge and Valley Trail Systems; the trail's proximity to larger green spaces presents an opportunity to introduce the public to the idea of habitat patches, corridors, and the value of native plant and animal species.

Three general design concepts will be explored, and one design concept that is found to be most appropriate for the Rotary Trail project will be further developed. Using the framework below to guide the final design will enable the author to evaluate the framework's feasibility, appropriateness, and clarity as a design tool.

Table 5.2: Revised Design Framework Based on Case Study Evaluation

DESIGN GOAL	DESIGN OBJECTIVES
CONTEXT	Highlight an ecology important on-site and in the surrounding area. Acknowledge social and historical context. Incorporate elements of known landscapes.
LEGIBILITY	Bring people into close vicinity with nature and offer multiple vantage points. Provide cues of human care and intention. Symbolize, exaggerate, and juxtapose nature to draw attention to it. Make interpretive measures conspicuous and easy to understand.
PARTICIPATION	Involve the community in the design and programming of the park. Create opportunities for experimentation. Allow moments of disorientation and revelation. Design immersive aesthetic experiences that appeal to all five senses: sight, smell, hearing, tastes, and touch.
FLEXIBILITY	Accommodate and celebrate the dynamism of natural processes. Incorporate unexpected forms and sequences while referencing known experiences. Consider the effects of time.

<u>Design Concept One: Water</u> (Figure 5.5)

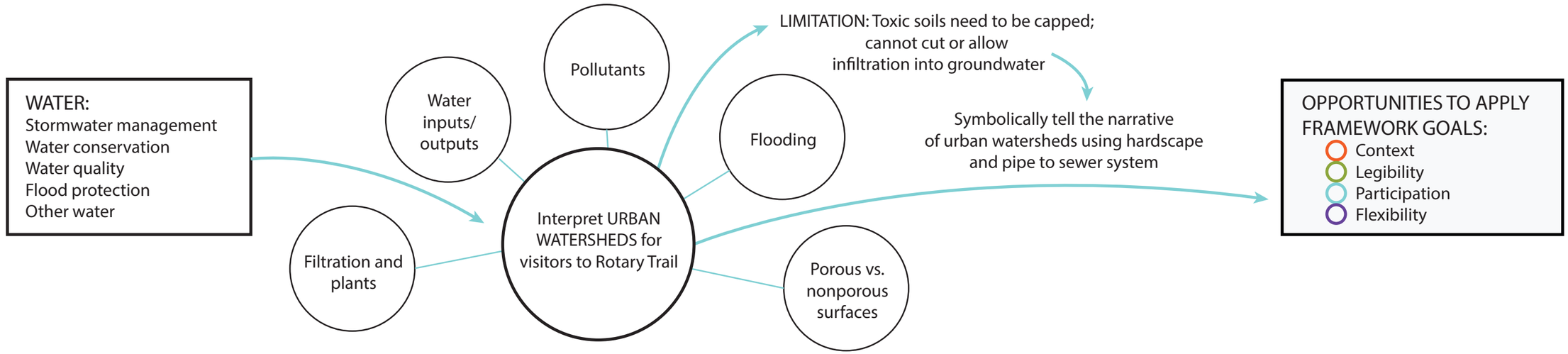
Design concept one strives to transform the way that visitors to Rotary Park think about water. The design seeks to inform visitors about urban watersheds and the ways that urban development affects water cycles, while creating a dynamic experience capable of changing public attitudes and behaviors over time.

Experiential Narrative:

Beginning on the west side of the site, visitors encounter a sculptural representation of Birmingham crafted by a local artist. Water runs from the site walls, over the impervious cityscape, and into a stream marked with interpretive text—while this feature can utilize stormwater during storm events, pumping water through the site continuously would promote legibility. Under the overpasses, the path narrows to encourage movement and discourage loitering. Stormwater coming through the overpass has been directed so that it falls in patterns from overhead, onto tile mosaics depicting local landmarks.

In the deepest part of the trail, water flows through a naturalized stream into a small constructed wetland pond—to emphasize the contrast between urban and rural watershed function. It will be necessary to build the soil up at this point and water will likely need to be collected in drains under the pond and piped to the sewer system. Boulders serve as seating and an interpretive mural behind the pond shows the water cycle and illustrates the value of wetland habitat.

After crossing under the 22nd Street overpass, the site steps up to reach street level at 23rd Street, forming a small amphitheater. An interactive water feature allows visitors to turn on different streams of water and watch water flow over different types



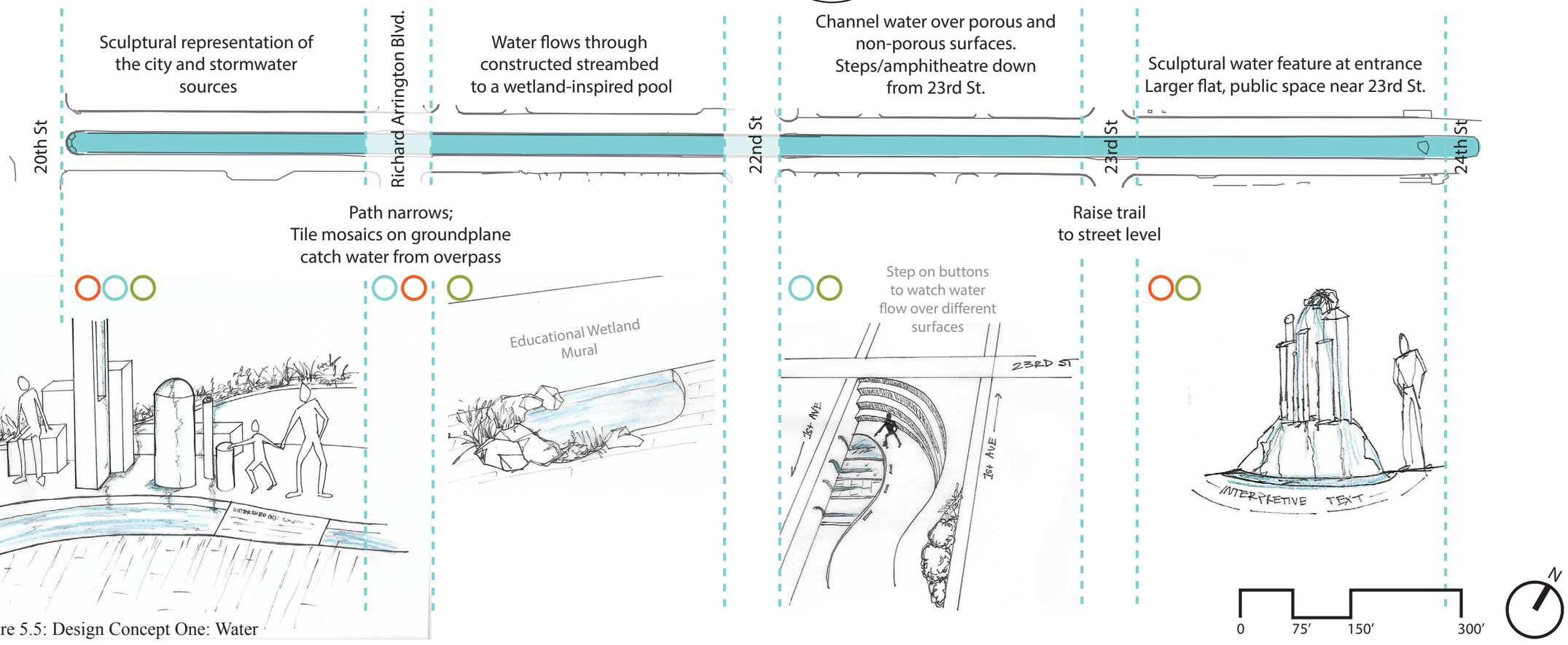


Figure 5.5: Design Concept One: Water

of permeable and impermeable surfaces. Crossing over 23rd St., visitors enter a larger public gathering space centered around a sculptural water feature symbolizing an urban watershed and surrounded by interpretive text.

Design Concept One Critique:

While Concept One could successfully inform and transform the way that people think about a valuable resource—water—it is limited in its ability to provide significant environmental benefits. The design successfully touches on many elements of the design framework, particularly context and legibility. Were this concept to be explored further, it would be important to focus on adding flexibility to the design and reconsidering its environmental impact. The site's location and the fact that it is already recessed would have made the trail a good candidate to serve as a biofiltration basin. Due to the toxicity of the soil, however, it is actually necessary to minimize stormwater from the site seeping into the groundwater. Concept One, as designed, is much more symbolic than environmentally beneficial. An ideal design for this site would perform both environmentally and experientially.

<u>Design Concept Two: Habitat</u> (Figure 5.6)

Design Concept Two seeks to restore habitat, while informing visitors about the value of native plant and animal communities and the ways that human development impacts natural habitats. Interpretive elements in the design attempt to relay the importance of habitat restoration at the site level, but also as a component of larger greenway systems and greenspace matrices.

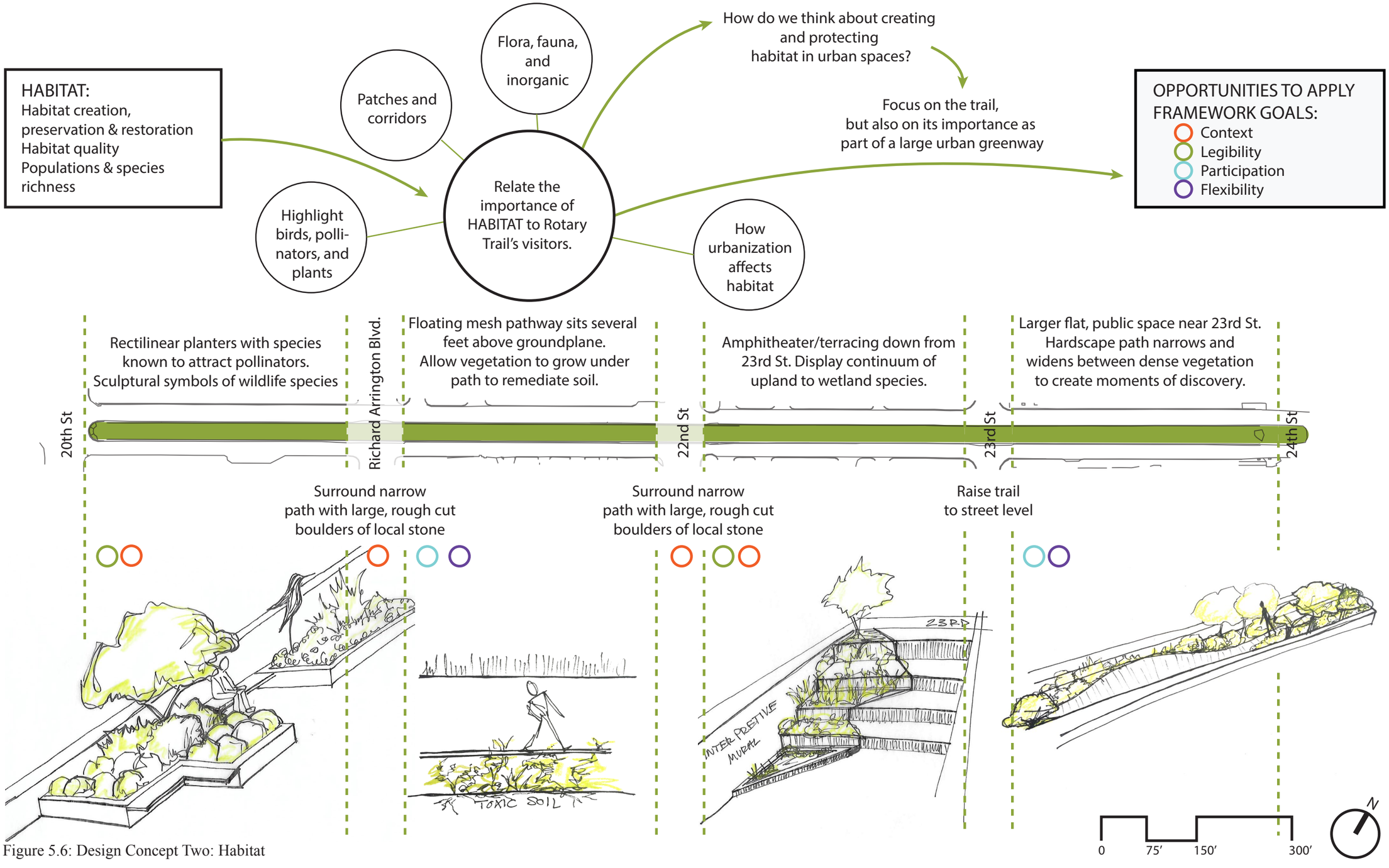


Figure 5.6: Design Concept Two: Habitat

Experiential Narrative:

Beginning on the west side of the site, visitors walk through a series of strong rectilinear forms filled with native plant species known to attract pollinators and birds. Sculptural pieces by local artists symbolize wildlife species that are dependent upon each habitat for food and shelter. Large rough-cut boulders symbolizing local mountains surround visitors as they pass under the Richard Arrington Blvd. overpass.

In the lowest part of the site, between Richard Arrington Blvd. and 22nd Street, a mesh walkway is set several feet above the ground. Vegetation is allowed to grow directly in the toxic soil, under and around the walking trail, to help remediate the soil. The space between 22nd and 23rd streets features an amphitheater, planted to demonstrate a continuum from upland to wetland plant species. An interpretive mural informs visitors about these different types of habitat.

The final stretch of trail, leading to the secondary entrance under the 24th Street overpass, includes a winding path that narrows and widens to a public gathering space. Dense vegetation on either side of the curving path allows moments of discovery and exploration as one moves through the site.

Design Concept Two Critique:

Design Concept Two has the potential to perform environmentally by creating habitat, remediating soil, and increasing species richness in Downtown Birmingham. Though the project's environmental impact is limited by the site's small size and narrow shape, it could actually serve as a small patch and a habitat corridor in this urban setting, particularly once the nearly 29 miles of the Jones Valley Corridor are completed.

CARBON/ENERGY/AIR
Energy use
Air quality
Temp. & urban heat island
Carbon sequestration

CO2 sources and sinks

Effects of surface and shade

Value of alternative transporta-tion

Value of vegetation in urban setting

Illustrate the CARBON CYCLE for visitors to Rotary Trail

Explain the urban heat island

OPPORTUNITIES TO APPLY FRAMEWORK GOALS:
- Context
- Legibility
- Participation
- Flexibility

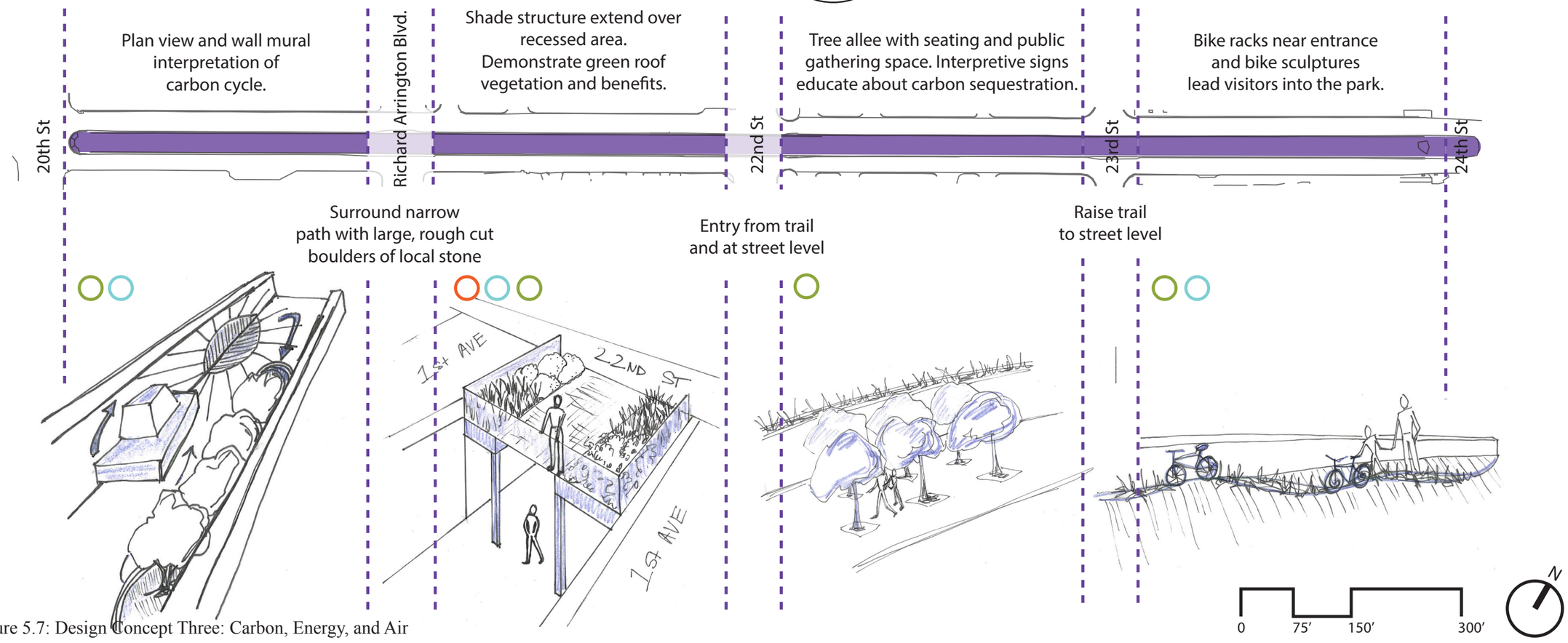


Figure 5.7: Design Concept Three: Carbon, Energy, and Air

A weakness of this design is that it could go further to interpret the effects of human development on habitat, particularly the impact of fragmentation, and the benefits of species richness. While this design concept would hopefully provide an enjoyable experience of healthy natural habitats, the likelihood of enhancing the public's value of and desire to protect habitat is higher if they understand how healthy wildlife habitats benefit human life.

Design Concept Three: Carbon, Energy, and Air (Figure 5.7)

Design Concept Three strives to communicate the carbon cycle to visitors, how the flow of carbon affects human life, and how human activity affects the flow of carbon.

Experiential Narrative:

Entering the site from 20th Street, visitors encounter a depiction of the carbon cycle that incorporates both the ground plane and the trail's walls. The 22nd Street overpass is extended west, over the trail, to form viewing platforms and a greenroof. Signage or interpretive elements will explain greenroofs, and how rooftop vegetation can help reduce urban heat islands. The corridor between 22nd Street and 23rd Street features a public gathering space and a long allee of trees. Text on the walls and groundplane describe the benefits of carbon sequestration. The last stretch of the trail towards the secondary entrance under 24th Street houses bike racks and sculptural bike pieces, to encourage the use of alternative forms of transportation.

Critique of Design Concept Three:

This concept tackles a more abstract, more difficult to materialize, environmental process than the previous two concepts. The size and shape of the site limit its ability to have a significant environmental benefit, but by symbolizing the carbon cycle and more explicitly laying out ideas through text and interpretive elements there is potential

to educate the public about topics they are probably unfamiliar with. It seems as though elements of this design could actually be incorporated into Design Concept Two, as nutrient cycles are an important part of healthy habitat and complete ecosystems.

Final Design Concept

Design Concept Two was chosen for further exploration in the final design. While the size and shape limit the opportunity for significant habitat creation or restoration on-site, the trail's inclusion in the larger Red Rock Ridge and Valley Trail System means that Rotary Trail could be a piece of a larger habitat restoration network. Rotary Trail's role as a part of this urban collection of greenways can be interpreted to the park's visitors. Additionally, as water and inorganic cycles are components of habitat, there is the opportunity to fold ideas from Concepts One and Three into the final habitat-inspired design. This final design proposed for Rotary Trail seeks to leverage the design framework constructed in this thesis, in order to create a landscape experience that has the potential, over time, to transform the way that people think about and value natural habitat. Expanding the public's appreciation for and understanding of the environmental benefits of healthy habitat can inspire stewardship and the desire to protect natural habitat.

The formal expression of the design references the Rotary Club's logo, a gear wheel that represents civilization and movement. Beginning on the west end of the trail, a curvilinear path cuts through raised planting beds. Spoke-like linear paths interrupt the plantings and create smaller spaces for sitting or exploring. The gear wheel shape becomes more abstracted in the sections of the trail between Richard Arrington Boulevard and 23rd Street. The shape becomes more clearly defined again near the east end of the trail, with sculptural corten steel columns forming spokes across arcs of dense vegetation.

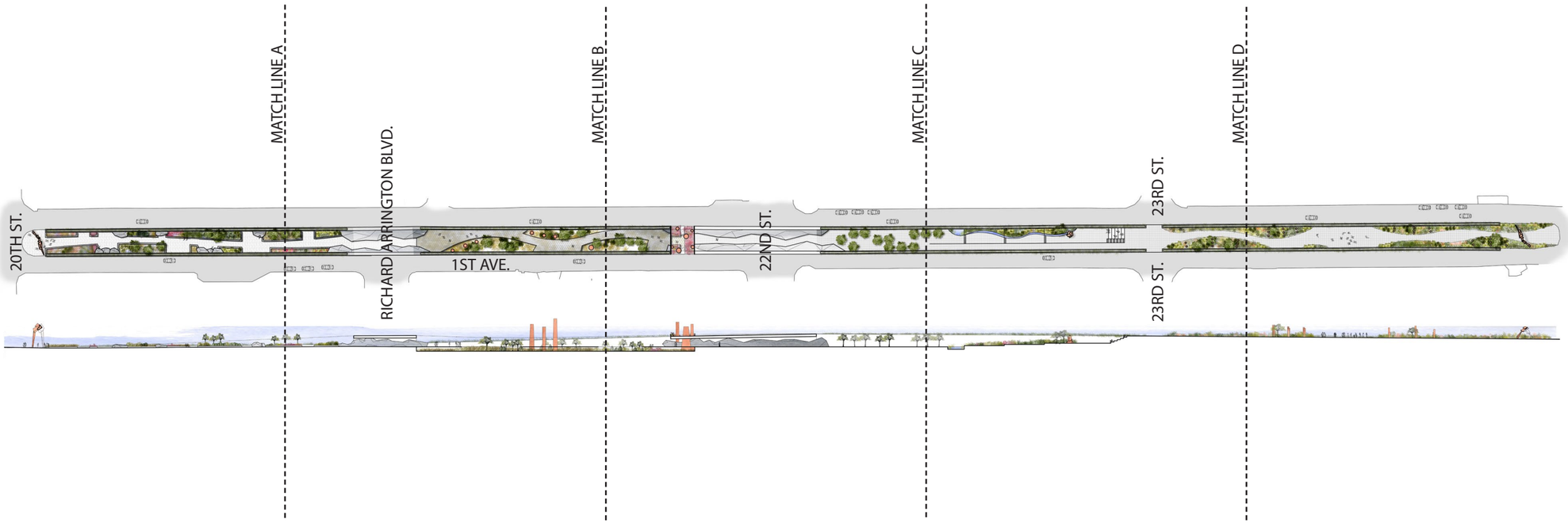


Figure 5.8: Rotary Trail Final Design Concept, 1” = 150’

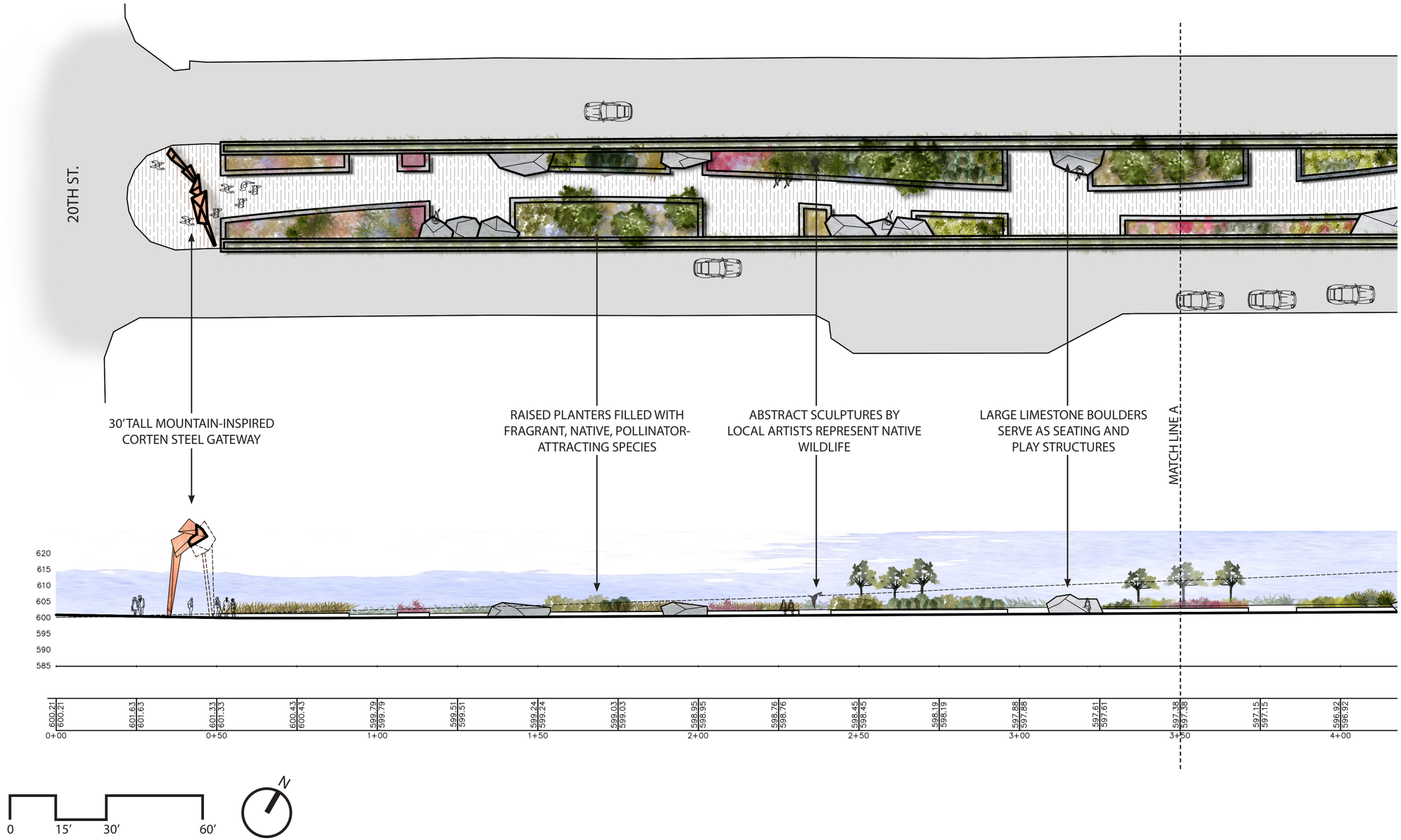


Figure 5.9: Rotary Trail Final Design Concept, 1” = 30’

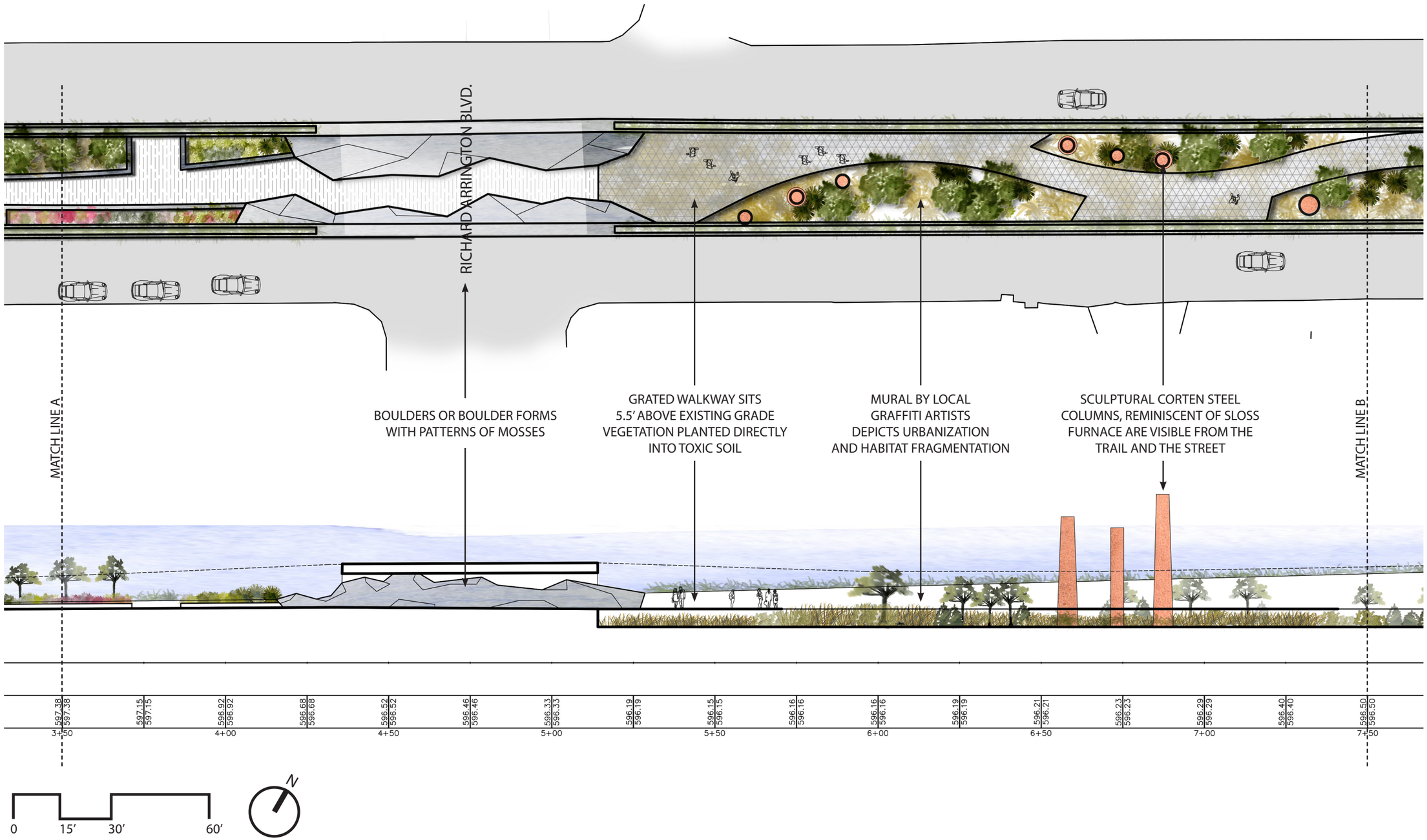


Figure 5.9: Rotary Trail Final Design Concept, 1" = 30'

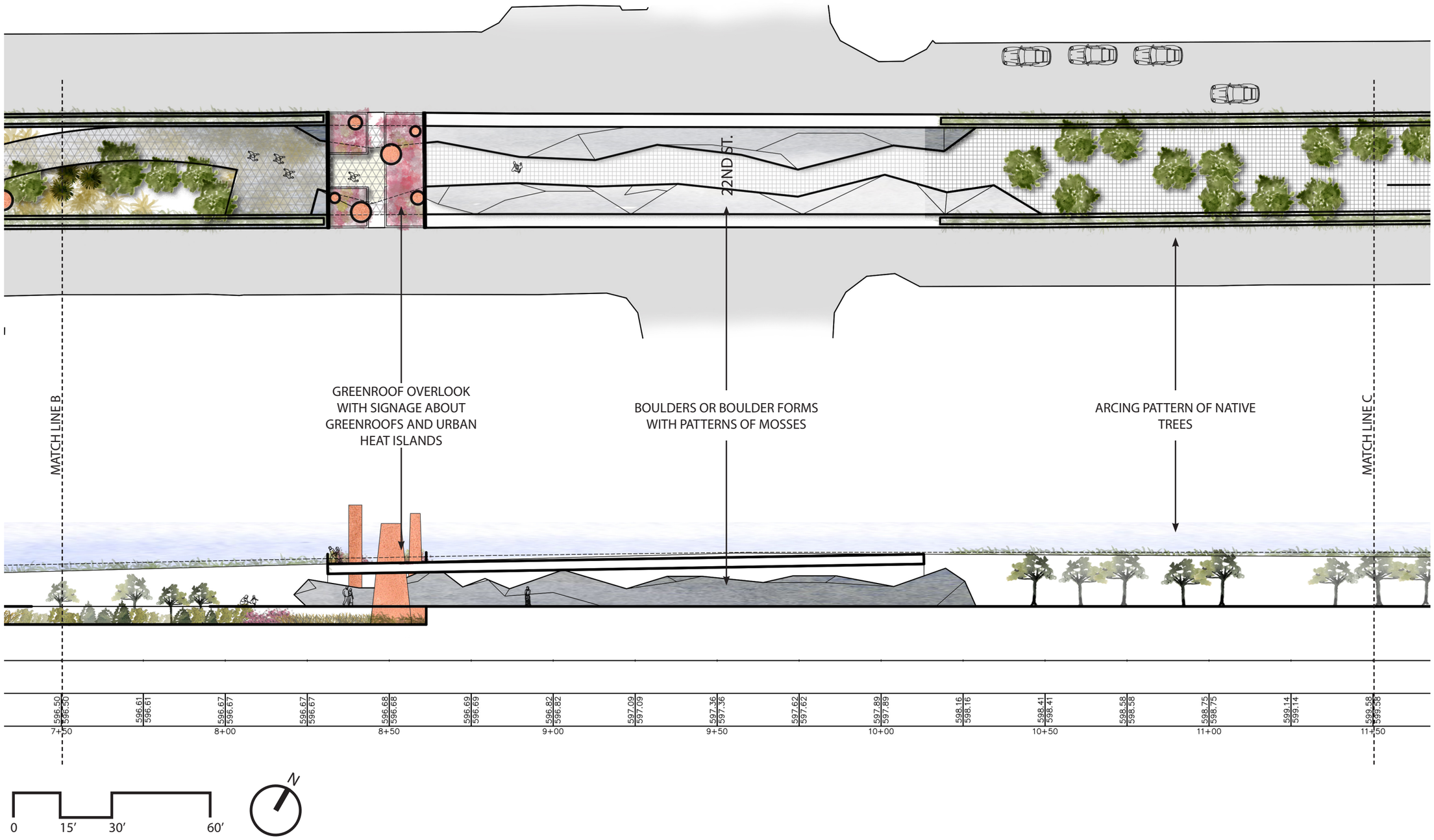


Figure 5.9: Rotary Trail Final Design Concept, 1” = 30’

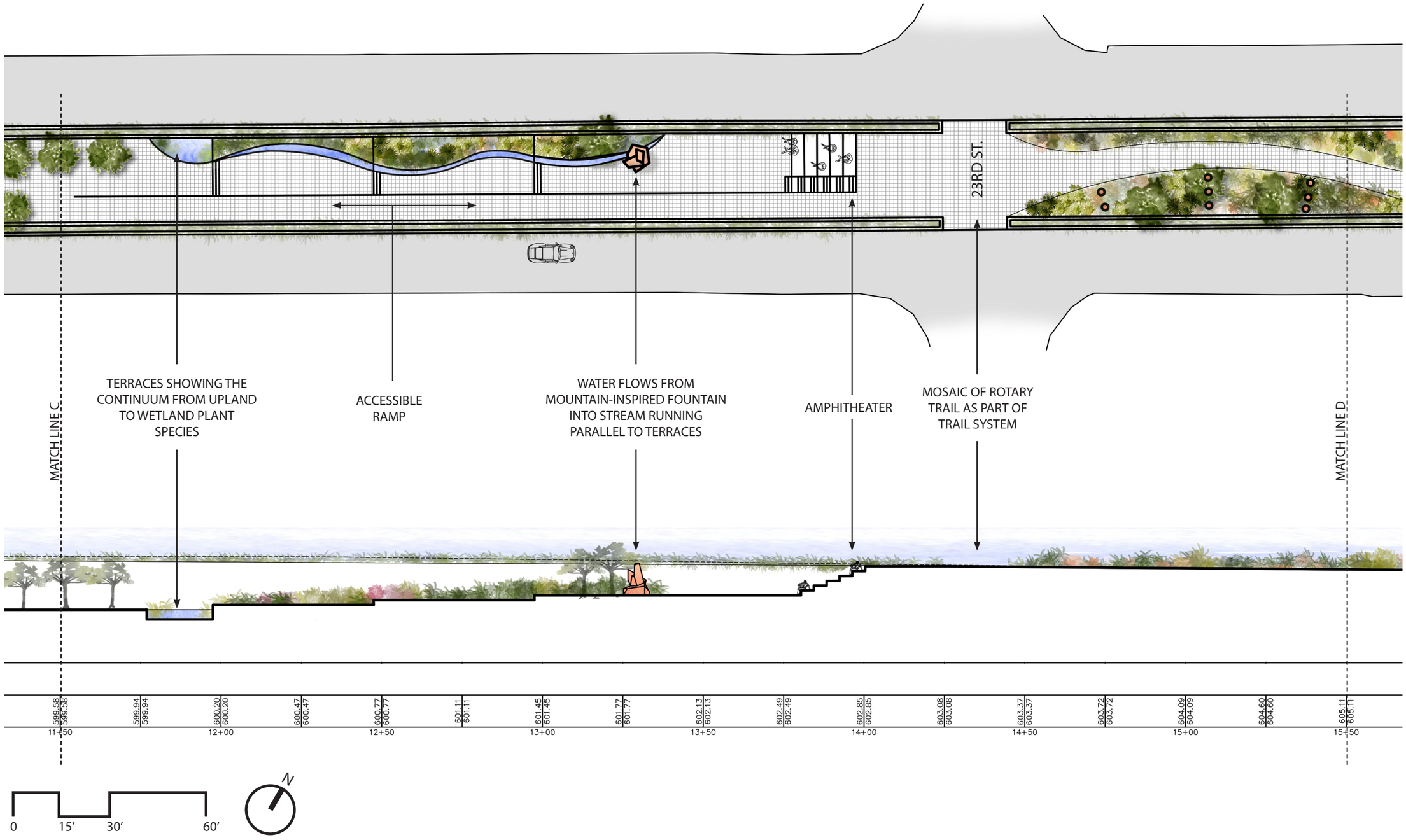


Figure 5.9: Rotary Trail Final Design Concept, 1” = 30’

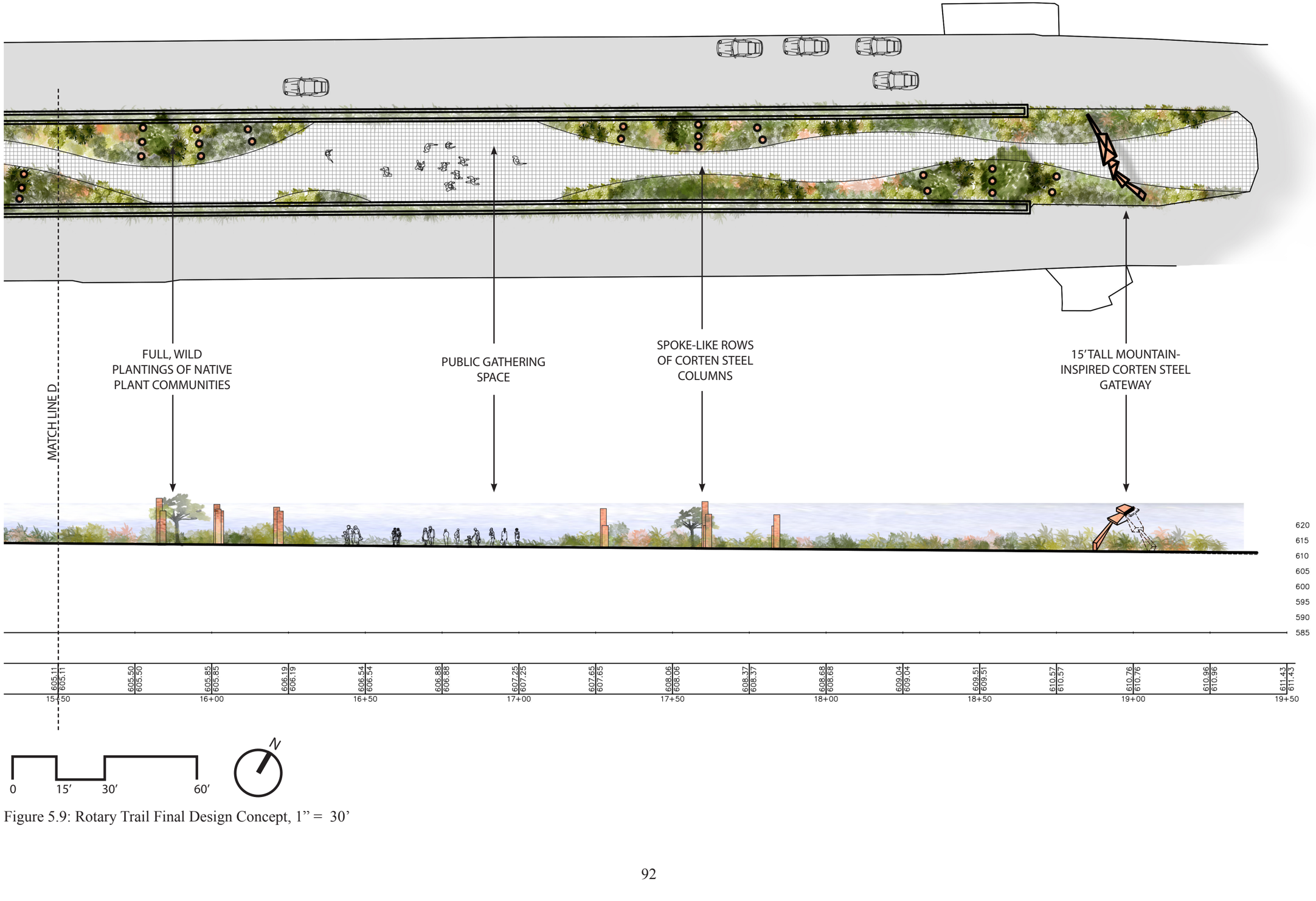


Figure 5.9: Rotary Trail Final Design Concept, 1” = 30’

Revisiting the Framework

Environmental Benefits:

The final design concept focuses on interpreting the concept of habitat creation and preservation to Rotary Trail's visitors, but the design has additional environmental benefits. The design creates habitat that will support important pollinator species. The intention is for the planted areas to be arranged in nature-inspired groupings and incorporate a wide range of species, improving biodiversity in this urban setting. Species diversity would be maximized as much as possible given the limited acreage of the trail.

In addition to habitat benefits, the design helps remediate the site's toxic soil. Exposed portions in the grated walkway area could eventually be used for stormwater biofiltration, once the toxicity in the soil has decreased. The final design will also help with carbon sequestration—due to the dense plantings. Additionally, the replacement of pavement with vegetation can help reduce reflectivity and absorb heat, decreasing the urban heat island effect.

Context:

The City of Birmingham's history is intimately tied to steel production. Birmingham's proximity to the rail networks and abundance of iron ore, coal, and limestone made the city an ideal steel-making hub. Rapid growth in the late 1800s—emerging as a leading steel producer seemingly overnight—earned Birmingham its nickname: The Magic City. Steel and limestone hold historical and cultural significance for Birmingham and both are incorporated throughout the design. Tall, corten steel sculptures mark each end of the trail and a coordinating water feature anchors the 23rd street amphitheater. The shape and color of these sculptures are reminiscent of the red

clay soil and local topography of the area—nearby Red Mountain overlooks Downtown Birmingham. Several tall corten steel columns, symbolic of Sloss Furnace's towers, rise up through the grated walkway and greenroof. These columns are repeated on a smaller scale near the east entrance of the park, forming spoke-like patterns in the rolling form of the planted areas. Limestone boulders in the west section of the trail and under the two overpasses serve as seating, play opportunities, and gateways.

Interpretive elements throughout the site reference important local symbols. Artwork in the pollinator garden that stretches between 20th Street and Richard Arrington Boulevard symbolizes local pollinator and bird species. The mural spanning the walls of the grated walkway area depicts an urban scene with Birmingham landmarks. The mosaic on the 23rd Street entrance plaza places Rotary Trail in the context of the city and the larger greenway system. Additionally, dense native vegetation provides context throughout the design.

Legibility:

The linear nature and narrowness of the trail somewhat limit circulation opportunities, but the design does provide opportunities to view vegetation from above, below, and beside, and from near and far. Natural forms, particularly mountain shapes, are exaggerated, stylized, and repeated throughout the design in sculptural elements. Loose, full plantings are contained by orderly and obvious lines. Even the spontaneous vegetation in the soil remediation area is framed by a defined metal grated walkway.

The final design for Rotary Trail uses a range of interpretive techniques to enhance visitors' understanding of habitat. The pollinator garden, terrace plantings, and green roof all function as demonstration gardens. Quotes about pollinators mark the

groundplane near the 20th Street entrance, and artwork symbolizes important species. An interactive mural visually interprets biodiversity, habitat fragmentation, and the impact of urbanization on the wall of the soil remediation area. Buttons along the wall allow visitors to access additional audio information. Signage, a mosaic, and additional artwork further seek to interpret the concepts represented in the design to the trail's visitors.

Participation:

The widening and narrowing of the trail and dense vegetation create opportunities for discovery. Changes in elevation and the groundplane allow for many different types of feelings and experiences; standing on a grate six feet above the ground feels very different from winding through a narrow path surrounded by boulders. These drastic changes engage the entire body.

Vegetation provides a range of textures in contrast to the crisp hardscape edges, and the density of the plantings makes them a dynamic element of the design—lending smells, sounds, and movement to the experience of Rotary Trail. Many aspects of the design can become opportunities for play and experimentation. The boulders can be perches or climbing apparatuses. Planters are the ideal height on which to sit, or walk, or lay. The amphitheater, terraces, and water element can become interactive experiences as well. The sculptures, murals, and mosaics can be climbed upon, touched, and walked over.

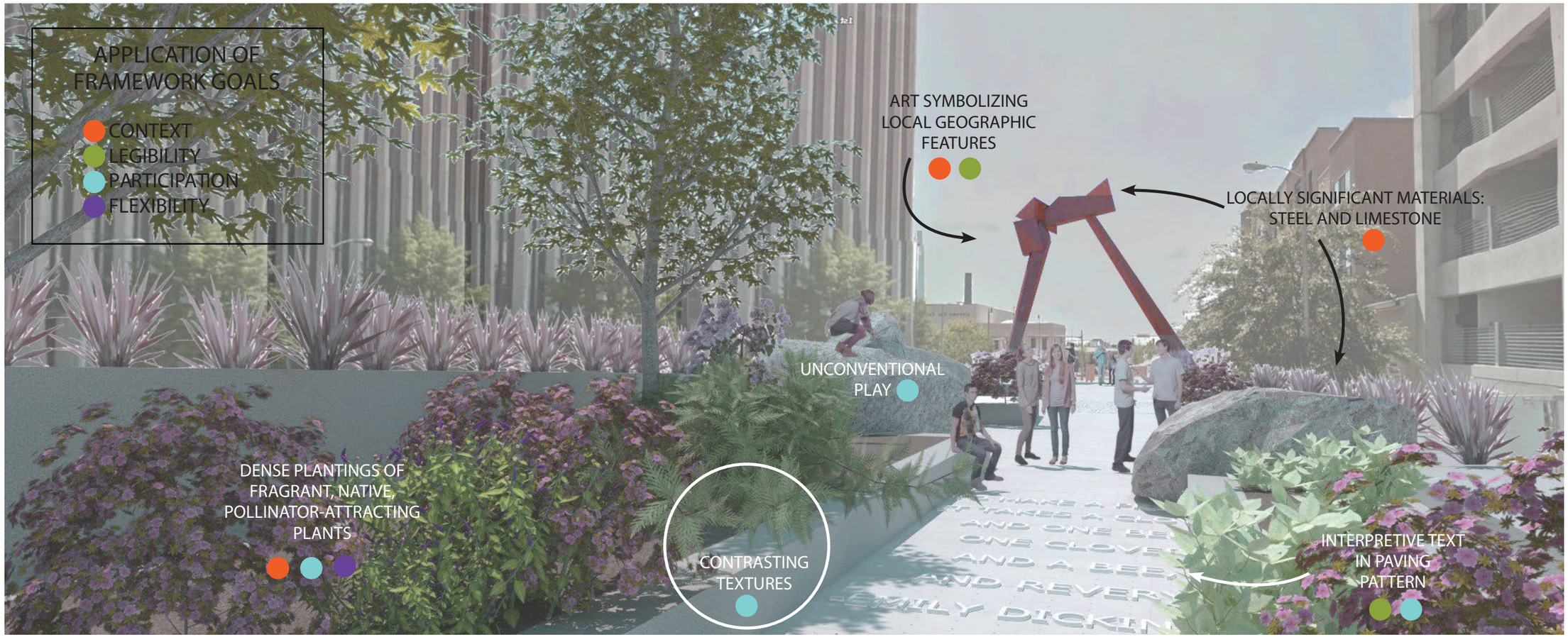
Flexibility:

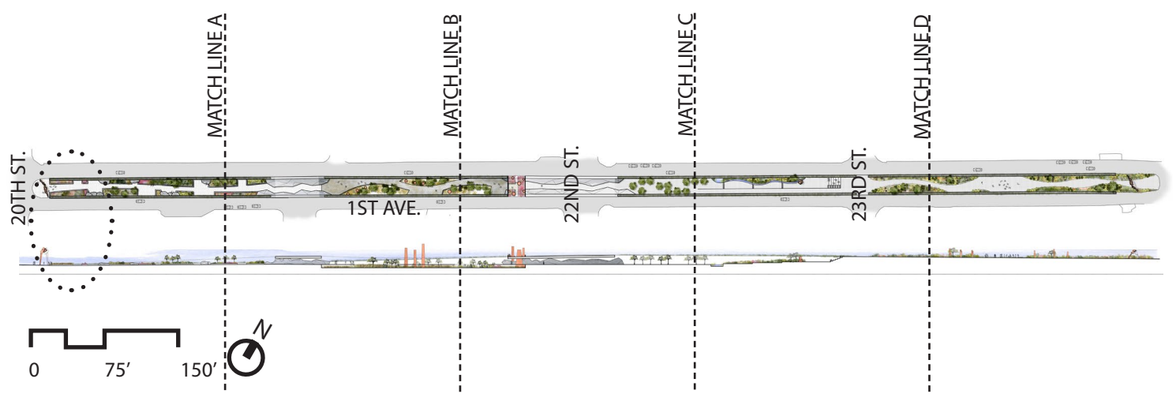
As vegetation is highlighted in this design, the experience of the trail will be very seasonal. Walking through Rotary Trail in the summer after a thunderstorm will be a different experience than strolling the trail on a chilly winter day. Additionally,

the experience of the site will shift as the vegetation grows, particularly in the soil remediation area with the grated walkway. As the plants reach up towards the path, and grow through the holes in the walkway, the feeling of this space will subtly shift. There is also an opportunity to alter the design as time passes—once the soil's toxicity has decreased, a section of the soil remediation area could be turned into a stormwater retention pond.

Table 5.3: Revised Design Framework as Applied to Final Design of Rotary Trail

DESIGN GOAL	DESIGN OBJECTIVES	DESIGN TECHNIQUES
CONTEXT	Highlight an ecology important on-site and in the surrounding area. Acknowledge social and historical context. Incorporate elements of known landscapes.	Locally significant materials Art incorporating local historical, cultural, and environmental symbology Native plant communities
LEGIBILITY	Bring people into close vicinity with nature and offer multiple vantage points. Provide cues of human care and intention. Symbolize, exaggerate, and juxtapose nature to draw attention to it. Make interpretive measures conspicuous and easy to understand.	Varied vantage points Exaggerated and symbolic natural forms Juxtaposition of textures Repetition of symbols Demonstration plantings Signage Interpretive murals, mosaics, and sculpture
PARTICIPATION	Involve the community in the design and programming of the park. Create opportunities for experimentation. Allow moments of disorientation and revelation. Design immersive aesthetic experiences that appeal to all five senses: sight, smell, hearing, tastes, and touch.	Moments of discovery created by circulation and vegetation Unconventional play opportunities Interactive elements Fragrant plants Water sounds Contrasting textures
FLEXIBILITY	Accommodate and celebrate the dynamism of natural processes. Incorporate unexpected forms and sequences while referencing known experiences. Consider the effects of time.	Seasonal changes Experience changes as plants grow Reflects climate changes





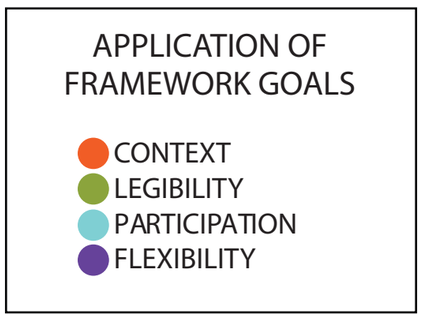
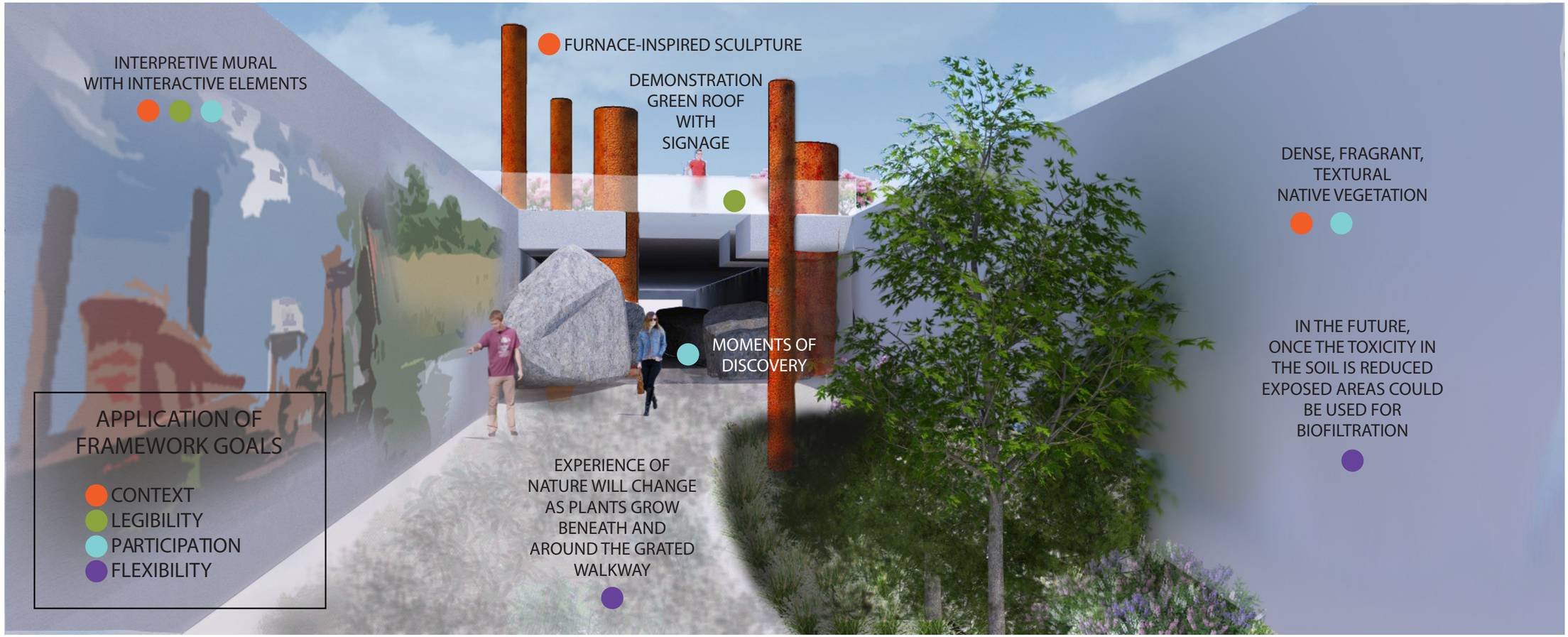


Figure 5.10: Walking through the pollinator garden towards the 20th Street entrance.



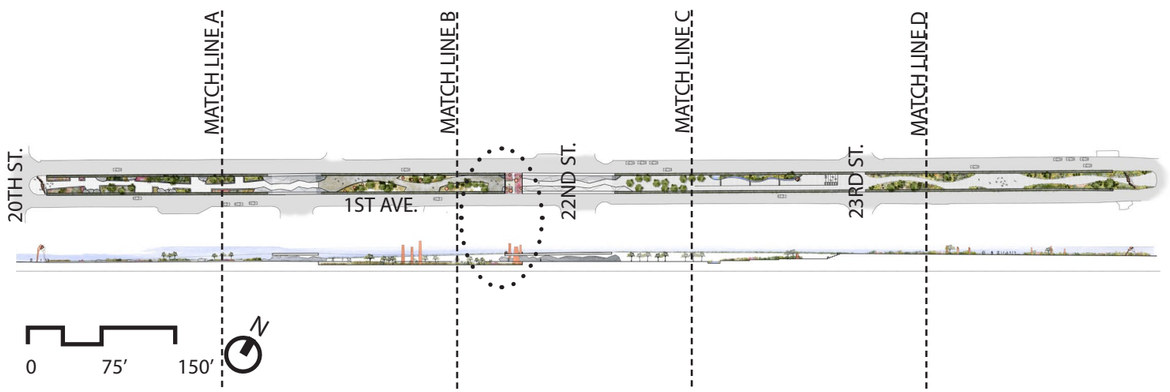


Figure 5.11: Walking through the soil remediation area, looking at the 22nd Street overpass

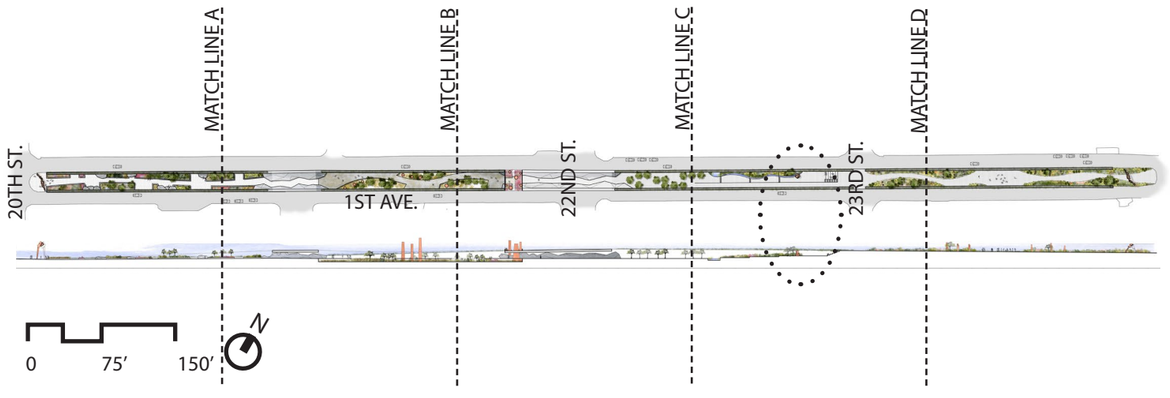


Figure 5.12: Climbing the demonstration terraces towards the 23rd Street entrance

CHAPTER 6

CONCLUSION

Critique and Future Directions

The proposed design for Rotary Trail represents an engaging experience of nature that the author believes could have transformative potential. Each aspect of the research-based framework was considered and incorporated into multiple elements of the design. The author believes the final design concept to be most successful in accomplishing the goals of context and legibility. There are also many opportunities for actively engaging experiences on-site, but the design could have gone further to incorporate community input.

Given the time and labor constraints on this thesis research, the author was not able to conduct meetings or charrettes to collect suggestions, concerns, and priorities from Birmingham's citizens. It would have been valuable to speak with the surrounding communities to gain a clearer sense of how people would like to use this space. It would also have been helpful to see how community members respond to different elements of the proposed design concept. Additionally, long-term participation and input from the community could be key to the lasting success of this public space. Involving the community in the programming of the space would incubate stronger feelings of attachment to Rotary Trail and a stronger desire to protect and maintain it.

Meetings with the community and Birmingham leadership could also have helped inform more specific design elements for the surrounding streetscapes. Currently, the

path from Rotary Trail to Sloss Furnace is not pedestrian-friendly. It is likely that most people will enter Rotary Trail from Railroad Park on the west, walk the length of the trail then turn around and walk back. The hope is that the completion of the broader trail system and continued development in Downtown Birmingham will eventually provide desitinations on the east side of the trail. With a better sense of the intended timeline and direction for the completion of the trail system and downtown development, the final design could incorporate elements that would help better connect Rotary Trail with its surroundings. Sculptures, plant choices, and paving patterns could be extended beyond Rotary Trail to help lead people to and along the trail system.

The purpose of applying the framework to a proposed design was to evaluate the framework's feasibility, appropriateness, and clarity as a design tool; is this framework an effective response to the research question, *How can designers most effectively create landscape experiences capable of transforming the way humans relate to nature?*

The format of the framework seems to be appropriate. During the conceptual design phase, the author tried to focus on the more general Design Goals. In refining the concept, it was helpful to reference the more specific Design Objectives. If only the Design Goals were included the framework would be much too general, but without them the Design Objectives would be overwhelmingly specific in application. The author found the organization useful in shifting between the general and specific as a designer must during the design process.

While the author attempted to have strong expressions of each element of the design framework, it was found—as was evident in the case study analysis—that there will inevitably be some categories that are more or less successfully accomplished.

However, strengths in one area can compensate for weaknesses in another. The author struggled with how to maximize the realization of the design objectives, while maintaining an elegance and cleanliness in the design. This may be an example of Robert France's fear that the ego or artistic sensibility of the landscape designer will prevent the explicit type of interpretation that the public requires (2003).

The author believes that this framework is a clear and applicable design tool. Based on the foundational research presented in Chapters Two and Three and the study of three successful built projects in Chapter Four, it is a logical conclusion that this framework would be an effective tool for designing landscape experiences capable of transforming the way that the public relates to nature.

The next phase of this research would be to test the framework through surveys of park visitors. This projective design research is an academic exercise. There are many questions about the effectiveness of the framework that cannot be deduced from existing research. Are certain aspects of the framework more important than others (e.g., is legibility more impactful than flexibility)? What is the time frame needed to accomplish such a transformation of human values? Are certain demographics, like children, more receptive to this type of landscape experience or more likely to change their behaviors? Much could be discovered through on-site surveying of successful projects over an extended period of time.

Reflecting on the Process

This research is based on the primary idea that brought me into the field of landscape architecture—an intuitive knowledge that spending time in nature can have profound beneficial effects on the human psyche. This belief was not something that I

could prove, rather something I could feel and see, and the desire to design spaces that could have this beneficial impact on people's lives led me to this field and to this thesis. It has been gratifying to research, question, test, and ultimately build a defensible case that designed public landscapes can beneficially influence the way that humans relate to nature.

The effectiveness of the framework proposed in this design can be logically deduced, but has not been scientifically tested; this projective design research is an academic exercise. Nonetheless, based on existing research, I believe that the framework is an effective tool for designing transformative landscapes and that the projective design for Rotary Trail has transformative potential. A landscape that is grounded in local context, that enhances the public's understanding of nature, and that is actively engaging can, over time, strengthen people's connection to and appreciation for the environment. Helping an individual understand why he or she should value the environment, can hopefully shift that individual's relationship with nature from ownership to stewardship or partnership. If the success of environmentalism lies in the sphere of culture, what James Corner describes as a "reinvigoration of the cultural imagination," the human experience of designed landscapes and the framework proposed in this thesis are worth considering as a component of sustainable landscape design (Corner 1997).

REFERENCES

Abelson, Robert P. 1988. 'Conviction', *American Psychologist*, 43: 267-75.
Bratman, G. N., J. P. Hamilton, and G. C. Daily. 2012. 'The impacts of nature experience on human cognitive function and mental health', Year in Ecology and Conservation Biology, 1249: 118-36.

Brown, Brenda, Terry Harkness, and Doug Johnston. 1998. 'Eco-revelatory design: nature constructed/nature revealed: guest editor's introduction', *Landscape Journal*: ix-xv.

Bryant, Robby. 2015. "Interview with Robby Bryant of HDR Inc." Edited by Katherine Perry.

Brzuszek, R. F., and J. Clark. 2007. 'Are they getting it? Visitors respond to the Crosby Arboretum's ecological aesthetic', *Landscape Architecture*, 97: 78-+.

Brzuszek, R. F., R. L. Harkess, and S. J. Mulley. 2007. 'Landscape architects' use of native plants in the southeastern United States', *Horttechnology*, 17: 78-81.

Carr, Stephen, and Kevin Lynch. 1968. 'Where Learning Happens', *Daedalus*, 97: 1277-91.

Cole, Jennifer V. 2016. 'The Magic City's Next Act.' *Garden and Gun.* February/March 2016.

Collett, Brad. 2014. 'Renaissance Park: Methodology for Landscape Performance Benefits, Case Study Investigation.' *LAF Performance Series*. Accessed January 2016. http://landscapeperformance.org/sites/default/files/Renaissance%20Park%20Methodology_0.pdf.

Cook, E. M., S. J. Hall, and K. L. Larson. 2012. 'Residential landscapes as social-ecological systems: a synthesis of multi-scalar interactions between people and their home environment', *Urban Ecosystems*, 15: 19-52.

Corner, J. 1997. *Ecology and landscape as agents of creativity* (John Wiley & Sons Inc: New York).

Daniel, Terry C. 2001. 'Whither scenic beauty? Visual landscape quality assessment in the 21st century', *Landscape and Urban Planning*, 54: 267-81.

De Young, Raymond. 2000. 'Expanding and Evaluating Motives for Environmentally Responsible Behavior', *Journal of Social Issues*, 56: 509-26.

Deming, M. Elen, and Simon R. Swaffield. 2011. *Landscape architecture research: inquiry, strategy, design* (Hoboken, N.J. : Wiley, c2011.).

Echols, Stuart, and Eliza Pennypacker. 2008. 'From Stormwater Management to Artful Rainwater Design', *Landscape Journal*, 27: 268.

France, Robert. "Green World, Gray Heart?: The Promise and Reality of Landscape Architecture in Sustaining Nature." *Harvard Design Magazine*. (2003): 30-36.

Fuller, R. A., K. N. Irvine, P. Devine-Wright, P. H. Warren, and K. J. Gaston. 2007. 'Psychological benefits of greenspace increase with biodiversity', *Biology Letters*, 3: 390-94.

Galatowitsch, Susan M. 1998. 'Ecological design for environmental problem solving', *Landscape Journal*: 99-107.

Gobster, P. H. 2001. 'Visions of nature: conflict and compatibility in urban park restoration', *Landscape and Urban Planning*, 56: 35-51.

Gobster, P. H., J. I. Nassauer, T. C. Daniel, and G. Fry. 2007. 'The shared landscape: what does aesthetics have to do with ecology?', *Landscape Ecology*, 22: 959-72.

Green, Jared. "Interview with Nina-Marie Lister on Ecological Urbanism." ASLA's The Dirt, June 7, 2011, accessed September, 23 2015, http://dirt.asla.org/2011/06/07/interview-with-nina-marie-lister/

Haag, Richard. 1998. 'Eco-revelatory design: the challenge of the exhibit', *Landscape Journal*: 72-79.

HDR, Inc. 'Award Application.' Provided May 2015.

Hedge, A., L. Miller, and J. A. Dorsey. 2014. 'Occupant comfort and health in green and conventional university buildings', *Work-a Journal of Prevention Assessment & Rehabilitation*, 49: 363-72.

Helfand, G. E., J. S. Park, J. I. Nassauer, and S. Kosek. 2006. 'The economics of native plants in residential landscape designs', *Landscape and Urban Planning*, 78: 229-40.

Hill, D., and T. C. Daniel. 2008. 'Foundations for an ecological aesthetic: Can information alter landscape preferences?', *Society & Natural Resources*, 21: 34-49.

Howett, Catherine. 1998. 'Ecological values in twentieth-century landscape design: a history and hermeneutics', *Landscape Journal*: 80-98.

Jorgensen, A., J. Hitchmough, and T. Calvert. 2002. 'Woodland spaces and edges: their impact on perception of safety and preference', *Landscape and Urban Planning*, 60: 135-50.

Jungels, Jeremy, Donald A. Rakow, Shorna Broussard Allred, and Sonja M. Skelly. 2013. 'Attitudes and aesthetic reactions toward green roofs in the Northeastern United States', *Landscape and Urban Planning*, 117: 13-21.

Kaplan, Stephen. 1992. 'Environmental preference in a knowledge-seeking, knowledge-using organism.' in Jerome H. Barkow, Leda Cosmides and John Tooby (eds.), *The adapted mind: Evolutionary psychology and the generation of culture*. (Oxford University Press: New York, NY, US).
———. 2000. 'Human Nature and Environmentally Responsible Behavior', *Journal of Social Issues*, 56: 491-508.

Landscape Architecture Foundation. "Landscape Performance Series: Case Study Briefs." Accessed January, 20, 2016. http://landscapeperformance.org/case-study-briefs.

Larson, K. L., E. Cook, C. Strawhacker, and S. J. Hall. 2010. 'The Influence of Diverse Values, Ecological Structure, and Geographic Context on Residents' Multifaceted Landscaping Decisions', *Human Ecology*, 38: 747-61.

Liverman, Benjamin. 2007. *An evaluation of eco-revelatory design.* (The University of Georgia, Master of Landscape Architecture Thesis).

McCoy, Emily. 2015. "Interview with Emily McCoy of Andropogon Associates, Ltd." Edited by Katherine Perry.

Merchant, Carolyn. 1998. 'Partnership with nature', *Landscape Journal*: 69-71.

Meyer, Elizabeth K. 2008. 'Sustaining beauty - the performance of appearance: can landscape architects insert aesthetics into our discussions of sustainability?', *Landscape Architecture*, 98: 92-131.
———. 2009. 'Slow landscapes: a new erotics of sustainability', *Harvard Design Magazine*: 22.

Nassauer, Joan Iverson. 1988. 'THE AESTHETICS OF HORTICULTURE - NEATNESS AS A FORM OF CARE', Hortscience, 23: 973-77.
———. 1992. 'THE APPEARANCE OF ECOLOGICAL-SYSTEMS AS A MATTER OF POLICY', Landscape Ecology, 6: 239-50.
———. 1995. 'CULTURE AND CHANGING LANDSCAPE STRUCTURE', Landscape Ecology, 10: 229-37.
———. 2011. 'Care and stewardship: From home to planet', Landscape and Urban Planning, 100: 321-23.
———. 2012. 'Landscape as medium and method for synthesis in urban ecological design', Landscape and Urban Planning, 106: 221-29.

Nassauer, J. I., Z. F. Wang, and E. Dayrell. 2009. 'What will the neighbors think? Cultural norms and ecological design', *Landscape and Urban Planning*, 92: 282-92.

Parsons, Russ, and Terry C. Daniel. 2002. 'Good looking: in defense of scenic landscape aesthetics', *Landscape and Urban Planning*, 60: 43-56.

Phillips, Patricia. 1998. 'Intelligible images: the dynamics of disclosure', *Landscape Journal*: 108-17.

Pimentel, D., L. Lach, R. Zuniga, and D. Morrison. 2000. 'Environmental and economic costs of nonindigenous species in the United States', *Bioscience*, 50: 53-65.

Railroad Park. "About." Birmingham's Railroad Park. Accessed November 27, 2013. http://www.railroadpark.org/about.html.

Red Rock Trail. 2016. "Red Rock Ridge and Valley Trail System." Accessed February 15, 2016. http://redrocktrail.org.

Renaissance Park. Audio information listed on signage and accessed via cell phone. Accessed January 26, 2016.

Rettner, Rachael. 2010. 'Brain's Link Between Sounds, Smells and Memory Revealed." *Live Science.* Accessed January 30, 2016. http://www.livescience.com/8426-brain-link-sounds-smells-memory-revealed.html.

Ross, Jane Reed. 2016. Site visit and interview. Edited by Katherine Perry. February 9, 2016.

Saporta, Maria. 2013. 'Historic Fourth Ward Park - Mixing Green and Blue - Parks and Storm Water - A Model for Greater Atlanta.' *Maria's Metro*. Accessed January 10, 2016. http://saportareport.com/historic-fourth-ward-park-mixing-green-and-blue-parks-and-storm-water-a-model-for-a-greater-atlanta/.

Simmons, M. T., H. C. Venhaus, and S. Windhager. 2007. 'Exploiting the attributes of regional ecosystems for landscape design: The role of ecological restoration in ecological engineering', *Ecological Engineering*, 30: 201-05.

Smetana, S. M., and J. C. Crittenden. 2014. 'Sustainable plants in urban parks: a life cycle analysis of traditional and alternative lawns in Georgia, USA', *Landscape and Urban Planning*, 122: 140-51.

Stein, Kelsey. 2016. 'Lighting of Iconic 'Magic City' Sign Will Herald Opening of Birmingham's Rotary Trail.' Accessed February 20, 2016. http://www.al.com/news/birmingham/index.ssf/2016/02/lighting_of_iconic_magic_city.html.

Thayer, Robert L. 1998. 'Landscape as an ecologically revealing language', *Landscape Journal*: 118-29.

Thompson, K., K. C. Austin, R. M. Smith, P. H. Warren, P. G. Angold, and K. J. Gaston. 2003. 'Urban domestic gardens (I): Putting small-scale plant diversity in context', *Journal of Vegetation Science*, 14: 71-78.

Tom Leader Studio. 2012. 'Application for Rudy Bruner Award.' Provided by Railroad Park on November 12, 2013.

———. 2013."Railroad Park Booklet." Accessed November 10, 2013. http://www.tomleader.com/studio/press/Railroad_Park_booklet_TOM_LEADER_STUDIO.pdf.

Turner, Frederick. 1998. 'A cracked case', *Landscape Journal*: 130-38.

van Marwijk, R. B. M., B. H. M. Elands, J. K. Kampen, S. Terlouw, D. G. Pitt, and P. Opdam. 2012. 'Public Perceptions of the Attractiveness of Restored Nature', *Restoration Ecology*, 20: 773-80.

Zheng, B., Y. Q. Zhang, and J. Q. Chen. 2011. 'Preference to home landscape: wildness or neatness?', *Landscape and Urban Planning*, 99: 1-8.