CONSTRUCTING AN ATTRACTIVE, INVITING AND AWARENESS AWAKING SUSTAINABLE DESIGN

by

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(Under the Direction of Jon Calabria)

ABSTRACT

Under increasing climate crisis, sustainability has been a popular term in the field of landscape architecture. In the current discussion of sustainable landscape, more emphasis is placed on the technical challenges that are directly related to ecological improvements; the appearance of sustainability is seldom mentioned. This thesis examines the meanings and forms in landscape architecture, and explores what meanings and appearance a sustainable landscape should possess.

The meaning of sustainability should not be limited within the range of ecology; socially sustainability is equally important in landscape architecture, which requires continuous awareness from users. In this thesis, a model illustrates how forms and meanings in sustainable landscape lead to an increased environmental awareness. A design application would apply the theories in a stream enhancement project.

INDEX WORDS: Sustainability, Environmental Art, Environmental Awareness, Environmental Psychology, Hyper Nature, Stream Restoration, Campus Planning, Water Quality

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CHAPTER 1

INTRODUCTION

Though sustainability is mentioned often in the field of landscape architecture, the term remains elusive concerning its meaning and usage as it relates to design. The definition of sustainable landscape changes through time. In Oxford Dictionary, sustainability is defined as an ability to be maintained at a certain rate or level. In landscape architecture, a general perception of sustainable landscape is acknowledged as an enjoyable environment that is in balance with the local climate and requires minimal resource inputs through efforts of functional, cost efficient, environmental friendly and maintainable design (J.Bousselot, K.Badertscher et al. 2005). Landscape architecture is the product of designer's creative process, ideas are presented through forms to influence and affect users. However, how form and appearance in sustainable landscape can be influential in terms of promoting sustainability are seldom discussed among the field; applications on such topics are even rare. Among the present discussions and applications of sustainable landscape, construction techniques and managing methods are the predominant concerns. The notion of sustainability should not be limited to ecology, social and cultural component are equally important, which are directly related to the people influenced by landscape. This thesis explores the meaning and forms of sustainable design and how they relate to sustainability. The form and appearance of a sustainable

landscape could impact visitors by attracting, inviting and inspiring them; an increased environmental awareness is reached during the process of such influences. In this thesis, certain types of forms are defined and explored in terms of how they will direct to an increased environmental awareness and promote sustainability.

At the emergence of sustainability in the field of landscape architecture right after the convention of United Nation's Brundtland Commission, the United States government used to demonstrate that sustainability is perceived to be outside the mainstream and at odds with American conceptions of capitalism. Though some understood the application of sustainability through Ian McHarg's *Design with Nature*, some perceived it as a threat to their practice of doing whatever a developer wanted on a site by using the Ian McHarg's method as a tool for maximizing a site's capacity. However, with the rising awareness of global climate crisis, the concern for our environment has been an urgent issue put in front of policy makers, urban planners and landscape architects. Sustainable landscaping is perceived as an increasingly prevail practice since the Declaration on 1992 UN Conference on the Environment and Development. In the declaration, 4 out of 27 principles that intended to guide sustainable development tied directly to the activities of landscape architects. Then the American Society of Landscape Architects Board of Trustees adopted its own version of Declaration on Environment and Development. These values are embedded in works and text from numerous famous landscape architects, from

Olmsted, Ian McHarg and Lawrence Halprin to Hargreaves, Van Valkenburgh and James Corner, some of which are highlighted in the later chapters.

Given the growing consensus about the impact from human actions on the environment, it seems imperative to include environmental concern in landscape design—a work tightly bond to soil, water and plants. Among the prevalence of sustainability in landscape architecture, there are many of those who tried to integrate artistic innovation in the context of sustainable development. This renewed celebration of creative agency is welcome from a landscape architecture perspective since every design action is also a landscaping gesture with environmental implications (Reimer 2010). However, the discussion of aesthetic value is not prevalently incorporated in the context of sustainable landscape. In her article Sustaining Beauty: the Performance of Appearance in Journal of Landscape Architecture 2008, Elizabeth Meyer's proposed the question: "Can landscape architects insert aesthetics into our discussions of sustainability (Meyer 2008)?" She suggested that beauty is rarely discussed in the discourse of landscape sustainability, and when mentioned, it is dismissed as a superficial concern. She claimed that it is necessary to reinsert the aesthetic values into the discussion of sustainability and considered the appearance of the designed landscape as more than a visual, stylistic, or ornamental issue. By listing 11 principles in her manifesto, she explained how immersive, aesthetic experience can lead to "recognition, empathy, love, respect, and care" for the environment (Meyer 2008).

In this thesis, the appearance of sustainable landscape is the core of the discussion bolstered by several arguments. A thesis scheme model illustrates the structure of the thesis (Figure 1.1). In next chapter after introduction, definitions and a brief history of sustainability are introduced, followed with an overview of current sustainable landscape design. Concluded from Meyer's article, the problem of limited discussion on sustainable design is brought up after analyzing different attitudes towards sustainability in this profession. The importance of the aesthetic values of a sustainable landscape is discussed at the end of the second chapter, which leads to a deeper discussion on the appearance and forms in landscape architecture in chapter three.

In any kinds of field related with design, forms are tightly bond with meanings. Chapter three starts with how forms convey meanings and affect users in the general landscape architecture category and then narrow to sustainable landscape. The meanings in sustainable landscape are defined according to one of its main cultural influences—to increase public environmental awareness. Three meanings—a sense of connection with nature, a puling of attention, an enticement of ecological curiosity—are defined and illustrated in an awareness model showing their collaborative efforts towards an increased environmental awareness. To convey those meanings, three types of forms that should be incorporated into sustainable landscape are concluded at the end of chapter three, which are an aesthetically metaphoric natural form, a recognizable inviting form, and a legible illustrative ecological form.

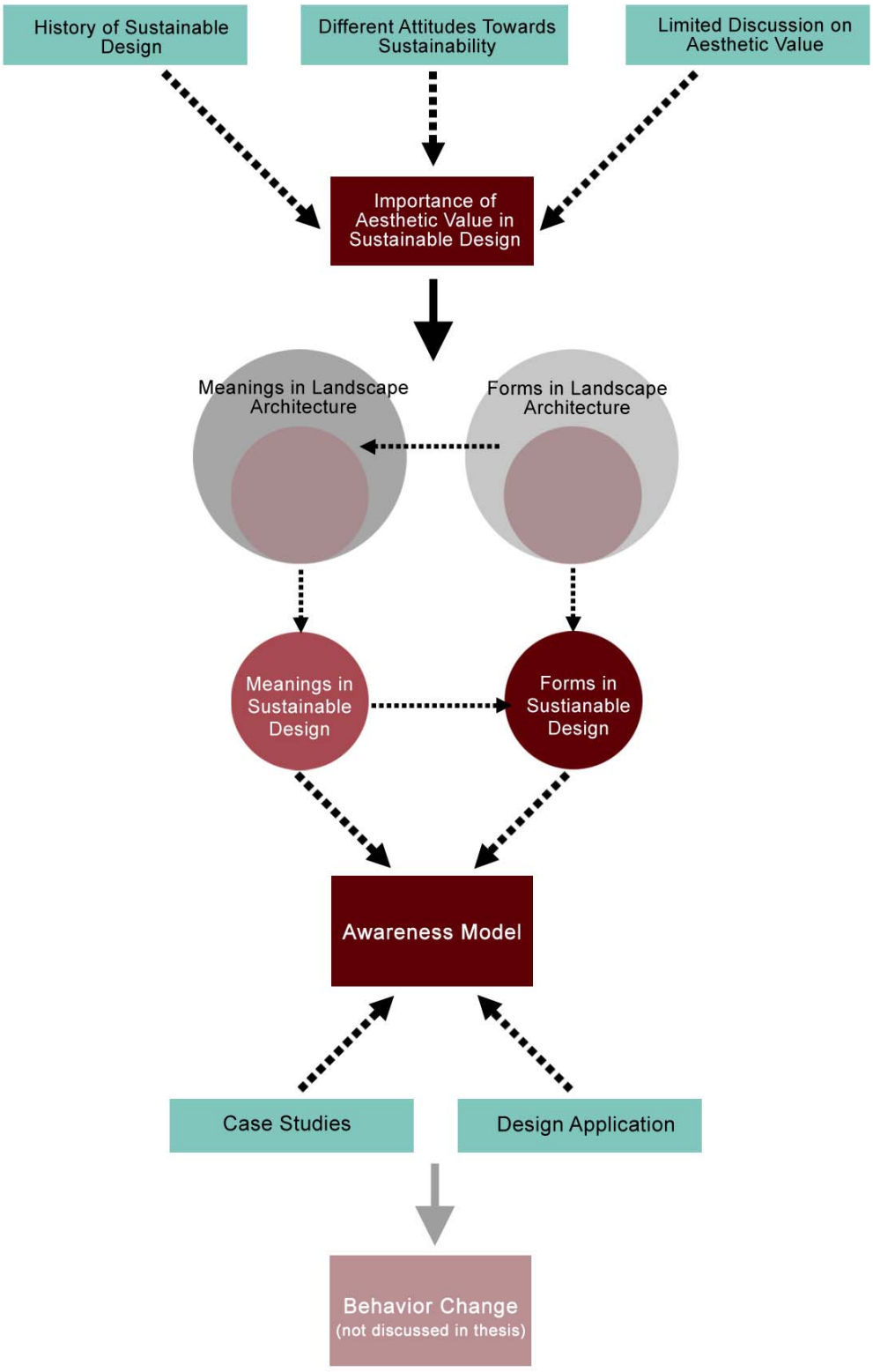

Figure 1.1 Thesis scheme model

Chapter four includes relevant case studies. Four projects were selected to exemplify how the three forms are achieved and convey the meanings to the users. Each project addresses a certain type of environmental issue, presented with the intelligently designed forms, the messages are delivered to the users whose environmental awareness are enhanced through the experience of these landscapes. Constraints in those projects are also examined to propose an improved alternative design.

Chapter five is a design application chapter. The site is Lily Branch Creek, Athens, Georgia—a tributary of the North Oconee River. It runs across the east campus of University of Georgia. For years, the creek had been regarded as a nuisance. Two thirds of the stream is encased in concrete culverts, the down stream part before the confluence with Oconee River is left unculverted, which is located in UGA east campus, right next to the new school of art building. The design focuses on this section of the stream. Radical runoff from the high percentages of impervious surface in the watershed keeps cutting the bank soil in storm events, leaving a heavily eroded streambed. The incised streambank is disconnected from the terrace and creates a new floodplain covered with invasive exotics (Doll, Grabow et al. 2003). Excess nutrients and pollutants in the down stream ecosystem, along with the increased stream temperature caused by urbanization and decreased tree cover, form a profound impact on living organisms in the stream, transforming a once viable riparian ecosystem into an unhealthy stream (Figure 1.2, Figure 1.3, Figure 1.4).

Figure 1.2 Stream bank erosion

Figure 1.3 Overland flow

Figure 1.4 Lily Branch Creek existing condition panorama

Several serious efforts has improved the health of Lily Branch since 2002, the restoration of Lily Branch has been concerned by different departments in University of Georgia，which include UGA River Basin Center, UGA Office of Sustainability, Environmental Practicum, College of Environmental Design, College of Agricultural and Environmental Sciences, Odum School of Ecology, The UGA Office of University Architects, Warnell School of Forestry and Upper Oconee Watershed Network. The former works include water quality sampling, pollution chemical identification, storm water management improvement around the new Lamar Dodd School of Art, invasive species removal, underground leaking storage tank removal and stream monitoring, all of them form a strong

base for the enhancement of Lily Branch, yet no aesthetic values are discussed in the former efforts. Class of LAND 6030 is a studio course in the graduate school of College of Environment and Design (CED), the course focuses on projects related with sustainable designs. According to the portfolio of class LAND 6030, most plans developed by CED landscape architecture students place more emphasis on ecological concerns, but the aesthetic appearance of the restored Lily Branch watershed area is limitedly addressed. In the Lily Branch Watershed Plan and Implementation Grant Proposal, one of the project objectives is to conduct educational and outreach activities at the site, it aimed at five audiences—University students, K-12 students who visit campus from around the state, the Athens-Clarke County community, watershed professionals that come to campus for continuing education, and those members of the Bulldog Nation who come to campus for football games and other sporting events or to visit children or friends at UGA and can learn something to take back to their communities. However, the existing plans proposed are mostly about stream rechanneled patterns, placement of sandbars and vanes, floodplain reinforcement to keep the stream in shape and raingardens or bioswales, re-vegetation, plunge pools, roof run-off capture and other treatments to address surface water run off and associated sedimentation and pollutant loads, they are all ecologically targeted at restoration efforts in the daylighted portions of Lily Branch Creek. Despite the success of their environmental treatments proposals, they placed little concerns on the educational role of the restored stream. In this

thesis, the educational role would be emphasized in the new design would be aligned with efforts to increase public environmental awareness.

A new design application would be proposed not only to address the environmental issues in the restoration of Lily Branch, but also transform the area into a public natural space where people find themselves attracted to, connected with and enticed to explore more ecological knowledge. The design process would be guided both by the stream restoration principles and the awareness model proposed in chapter three.

CHAPTER 2

AESTHETIC VALUE IN SUSTAINABLE DESIGN

2.1 Brief history of sustainability

A wave of sustainability development in U.S. was rekindled in the 1960's and 1970's. Growing public concern for environment had been awakened by Rachel Carson's book Silent Spring, published in 1962, highlighting the danger of pesticides to both ecosystems and humankind (Carson 1962). In 1969, the establishment of a national policy for environmental sustainability came with the passage of the National Environmental Policy Act (NEPA) whose purpose was "to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony and fulfill the social, economic and other requirements of present and future generations (National Environmental Policy Act, 1969)." A year later, President Nixon submitted to Congress a reorganization plan proposing the establishment of a U.S. Environmental Protection Agency (EPA) as an independent agency in the executive branch of the federal government. In 1972, the United Nations Environmental Program (UNEP) was formed during the United Nations Conference on the Human Environment (known as the Stockholm Conference), which marked first worldwide meeting on environmental and development issues. In December 1983, a special independent commission was formed, the World Commission on Environment and Development know as the WCED, in1987 the

commission's work concluded with the publication of the famous Brundtland Report, which served a key role in bringing sustainability into the public eye world-wide. An additional outcome of the report was the UN Conference on Environment and Development, also known as the Earth Summit, in Rio de Janeiro, which marked the second meeting of world leaders to discuss environmental and sustainable development issues. Over 100 heads of state and government attended the Earth Summit and 170 nations sent delegations. Throughout the 80's and 90's, the idea of sustainable design developed under the efforts of several scientist, designers and thinkers. In 1993, United State Green Building Council (USGBC) was formed, it is a non-profit organization dedicated to sustainable building design and construction. In 2000, Leadership in Energy & Environmental Design (LEED) rating system was introduced; it prompts global adoption of sustainable green building through the creation and implementation of a series of standard, tools and performance criteria.

2.2 Sustainability in landscape architecture

The Earth Summit is a turning point where the landscape architecture professions began to integrate with the worldwide dimension on the sustainable issues. In the Declaration on the Environment and Development, there were 27 principles that intended to guide sustainable development, among which were several principles that were tied directly to the activities of landscape architects (Meyer 2008).

PRINCIPLE 1: Human beings are at the center of concerns for sustainable development. They are entitled to healthy and productive life in harmony with nature.

PRINCIPLE 3: The right to development must be fulfilled so as to equitable meet the developmental and environmental needs of the present and future generations.

PRINCIPLE 4: In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it.

PRINCIPLE 7: States shall cooperate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth's ecosystem. In view of the different contributions to global environmental degradation, States have common but differentiated responsibilities. The developed countries acknowledge the responsibility that they bear in the international pursuit of sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command.

(Declaration on the Environment and Development, 1992)

The following year, the American Society of Landscape Architects Board of Trustees adopted its own version of a *Declaration on the Environment and Development.* The first article about sustainability in Landscape Architecture journal was published in 1994, 11 years after the United Nation's Brundtland

Commission convened. During the 11 years, the evolution of the sustainable idea in landscape architecture profession was some how impeded by ambivalence. United States government's resistance to environmental initiatives adopted by most of the developed world (and increasingly the developing world) demonstrated that sustainability was perceived to be outside the mainstream and at odds with predominant American conceptions of capitalism (Meyer 2008). In the nearer decades, the impacts of human action on global environment are revealed through many serious environmental problems, such as global warming, air pollution, natural resource shortage and species extinction. Being gradually aware of the growing global climate crisis, public starts to be increasingly concerned of our environmental health. The term of sustainability has become prevailing in the field, more attention has been placed on the ecological issues for every landscape architects.

2.3 Different attitude toward sustainability in landscape architecture

Despite having evolved over two decades, the sustainability's current meaning and usage are still relatively new, it remains incongruent for the attitudes towards sustainability in landscape architecture. In Elizabeth K. Meyer's article *Sustaining Beauty: the Performance of Appearance;* she gave her own perception of the categories of current American attitudes toward sustainability (Meyer 2008).

The first group believes that sustainable design is what landscape architects do and is considered nothing new. These people see sustainability as

a new name for an enduring existing value and practice in landscape architecture. Meyer included ASLA declaration into this category and showed examples of how the value of sustainability were existed and embedded in some of the famous precedent projects: Olmsted's Emerald Necklace in Boston in1880, works and texts by Lawrence Halprin and Ian McHarg during 1950s and 1960s, followed by two of McHarg's student who continued the concern for environmental issues and had it expanded into the realm of urban landscape design. Meyer assumed this group has a long acknowledgement of sustainability and would continue to go on (Meyer 2008).

The second group, in Meyer's opinion, is the largest group who believe sustainability is a technical challenge. They are concerned about how to correctly restore a stream using proper vegetation, what is the best way to harvest water for irrigation, which material can be made the perfect paving that could increase rainwater percolation and infiltration. Though there are admirable practices and invaluable research outcomes, Meyer argued that this type of work is still not enough as a landscape designer who should make our contribution visible and legible (Meyer 2008).

The third group is those who believe sustainability equals "no design", and they consider that form and appearance are more important than ecological performance. Thanks for the efforts by generations of designers and educators who sought to bridge the gap between art and science, the size of this group is much smaller than it was 25 years ago (Meyer 2008).

The last group is labeled “disdainers” by Meyer. They consciously include ecological process in their design and apply powerful form on it, but seldom relate their works with sustainability. Unlike those who advocate sustainability only as a technical challenge, the disdainers speak of performances and processes with the ecological concerns as background. Meyer took the 2005 Groundswell exhibition for example; it was a contemporary Landscape exhibition at the Museum of Modern Art (MOMA). In a critical essay discribing this exhibition written by Curator of Architecture and Design Peter Reed, words are replete with ecology, process and temporality without mentioning “sustainability” directly (Meyer 2008).

2.4 Limited discussion on aesthetic appearance in sustainability

Looking at the present attitudes toward sustainability Meyer concluded, it is apparent that the first two groups are the ones who promote the development of sustainability the most. However, looking closely at these two categories, one important value is seldom mentioned in the discussion of sustainable issues. In the ASLA declaration (defined as the first group by Meyer), none of the five objectives and five strategies address form or appearance of a designed landscape. In John Benson and Maggie Roe’s introduction to *Landscape and Sustainability*, they noticed that there were few books published that tells more than technical issues in sustainable design between 1992 and 2000 (Benson and Roe 2000). In the second group, beauty is even more ignored in the discourse of sustainable landscape design, and if it is, it is dismissed as a superficial concern.

At present, sustainability has three legs: ecology, social equity, and economy. The ecological implementation operates correlatively with social justice and capitalist profit but not aesthetics (Meyer 2008). The prevailing literatures promoting rain gardens, green roofs, stream restorations and explaining how to construct them in detailed technical instructions show little regard for the performance of appearance. As for those approaches that addressed both ecological and aesthetical issues are not recognized as a contribution to the sustainable solution, an acknowledgement to include them as an effort towards sustainable landscape is needed.

2.5 Importance of aesthetic value in sustainable landscape

"A park is a work of art, designed to produce certain effects upon the mind of men."

—Frederick Law Olmsted

2.5.1 Aesthetics in landscape architecture

In Oxford English Dictionary, beauty is defined as "that quality or combination of qualities which affords keen pleasure to the other senses (e.g., hearing) or which charms the intellectual or moral faculties, through inherent grace, or fitness to a desired end (Oxford English Dictionary, 2008)." "Beauty itself is a sensuous perception that could charm, influence or persuade one's intellectual and moral position. Beauty invites replication, it is life saving. Beauty quickens. It adrenalized. It makes the heart beat faster. It makes life more vivid, animated, living, worth living. At the moment we see something beautiful, we

undergo a radical decentering, it changes our relationship to that object or scene or person (Scarry 2001)."

Meyer argued that this experience of aesthetics that made us "decentered, restore, renewed, and reconnected to the biophysical world" could inculcate environmental values (Meyer 2008, p18). She believed that beauty in landscape is an immersive, aesthetic experience that can lead to recognition, empathy, love, respect, and care for the environment. She articulated that the experience of certain kinds of beauty is a necessary component of fostering a sustainable community and that beauty is a key component in developing an environmental ethics. If a landscape is designed to have a significant cultural impact, the concern for beauty and aesthetics is necessary (Meyer 2008).

Design is a cultural act which produces new forms through innovative arrangement of existing materials. In landscape architecture, designs are evolved using materials of nature and principles of ecology, but as Meyer emphasized, it does more than that. Other than merely a brain child from the designer, it serves as a media that translate cultural values into memorable landscapes, such spaces often challenges, expands, and alters our conceptions while we are using it. It is essential to realize that the performance of the landscape appearance is a main access by which our mind can be affected. In Arnold Berleant's book about how human is being influenced by designed landscape, he writes, "…both art and environment share our vivid perceptual interest. At the same time, the qualitative experience they generate has not only immediate value but also effects that extend beyond the perceptual present. Experiencing

an environment as sacred may change our sense of the world and affect how we live and act. To regard the world as sacred and everything that is part of it as inherently valuable can change our decision and alter our actions (Berleant 1997)."

Tracing the history of landscape architecture, the aesthetic value in a designed landscape is being mentioned and emphasized by those famous precedents decades ago. During the late half of 19th century, cities in America underwent tremendous changes. More people were moving to the cities than before and it became evident that cities needed to be transformed into more hospitable places. Olmsted was the leading landscape architect of that post-Civil War generation and has long been acknowledged as the father of American landscape architecture. For Olmsted, parks performed to address three different aspects: community, ecology and delight.

Community: Urban parks, promenades and boulevards, public gardens, parkways, and suburban residential enclaves are spaces that would provide opportunity for community partnership and possibilities for sharing and joint ownership.

Ecology: Olmsted believed that parks were environmental cleaning machines, it would provide open spaces of healthy sunlight, well-drained soils, and shady groves of trees reducing temperatures, absorbing carbon dioxide, and releasing oxygen (Meyer 2008).

Delight: Olmsted estimated that the environmental and social functions were equaled, if not exceeded, by the third function—the appearance of the designed landscape.

In addition to how the landscape worked, Olmsted also cared about what those landscapes looked like. He believed that the experience of that appearance—the combination of its physical characteristics and sensory qualities—altered one's mental and psychological state. According to Charles Beveridge, Honorary ASLA, the historian most closely associated with Olmsted's archives, Olmsted developed his theories on the psychological effects of landscapes before he had started to design, and applied those theories during his career as a landscape architect (Charles and Rocheleau 1995).

2.5.2 Aesthetic performance of sustainable landscape

Sustainable landscape performs in two ways: First, they are designed based on the ecological principals; it includes acknowledging of local conditions such as, climate, soil, hydrology, and indigenous plant species, which would lead to an environmental friendly design that may need minimal inputs. Functionally they are self sustained, cost efficient and visually pleasing. This environmental function is equaled, if not exceeded, by the second function—to introduce visitors the idea of sustainability. Now we are all living in an era replete with information comes from various type of media, urban residents are much more focus on their own daily concerns of work and family than the performance of a designed environment. One of sustainable landscape's main purposes is often ignored in

the discussion, which is to draw the attention of visitors who are often distracted by chores or overstimulation of the digital world, and provide interpretations of environmental knowledge to them. An increased environmental awareness is another essential outcome of a sustainable landscape. And such psychological change experience could be achieved through providing a form-full, evident and palpable design.

Aesthetic value in sustainable landscape should address more than representation of ecosystem; it should involve the design of experience that connects visitors with nature and encourages stewardship of environment. Such particular environmental experience not only breaks down the barriers between human and nature; they changes us, and at times, has the capacity to challenge us and prod us to act (Berleant 1991).

Such experience that connects human with nature provides people with opportunities to explore the wildness in nature, and close access to the trees, insects, birds and animals. However, it is not to say that sustainable landscape should look as wild as nature and be intact without human's attendance. When talking about the appearance of sustainable landscape, most would recall the natural-looking landscapes which is often the very opposite of tamed gardens, however, neither is it the only genre that performs ecologically, especially in an urban condition where limited space and scale don't allow the site to be restored to its very original natural trajectory, nor is it the only form that provides an experience that could stimulate the sense of connection between human and nature. Meyer argued that appearance of the designed landscape is more than a

visual, stylistic, or ornamental issue; it is connected to the “body and polysensual experience” (Meyer 2008). Art critic and philosopher Arthur Danto argues that beauty is not found or discovered immediately, it is discovered through a process of mediation between the mind and body, between seeing and touching, smelling and hearing, between reason and the senses, between what is known through past experiences and what is expected in the here and now (Danto 1999). “Any form constructed under the keen understanding of ecology system, aim to draw attention and bring experience of discovering through deployment of design tactics such as exaggeration, amplification, distillation, condensation, juxtaposition, or transposition/displacement, can be introduced into sustainable landscape design (Meyer 2008).”

The discussion of the importance of aesthetic value in sustainable design would push this thesis towards the discussion of forms and appearance of sustainability. Although the landscape today still retains its strong pictorial connotation, it is more than a place that serves as ornamental role providing pleasurable and evident view. A changed standard in landscape appearance is taking place when a lot more similar projects around the world are addressing environmental issues. In China, the world first eco-city Dongtan —situated near Shanghai — was initiated a few years ago, followed by the riverside greenbelt project Shanghai Houtan Park, representing peak performance of sustainable landscape designed by Turenscape. In London, the development of the Olympic landscape is heading towards a parkland that promotes sustainable and active living. The climate crisis has pushed the issue of sustainability into frontal lobe of

every planner and designers (Reimer 2010). As a result, the emerging sustainable culture offers new perspectives on special creativeness and a new comprehensive landscape imaginary has emerged. Every design action serves as a landscaping gesture with environmental implication; they would not only ease the many previously disregarded environmental issues but also make them conspicuous and call for more dutiful attention.

The emerging new fashion in the appearance of landscape that would meet the requirements of our agitated environmental crisis has renewed the celebration of creativity. Under the context of sustainable design, designers begin to bring creativity into the biosphere and start to explore how green can human's imagination and inventiveness be. Although the appearance of sustainable landscape projects often appear similar according to their similar environmental functions, forms constitute those landscape works are numerous and identical in each project. How do forms lead to a spatial manifestation that would raise visitor's environmental awareness? In the following chapter, forms and meaning in landscape architecture would be introduced to lead the discussion on what meaning and forms should be contained in a successful sustainable landscape.

CHAPTER 3

MEANING AND FORMS IN SUSTAINABLE LANDSCAPE

3.1 Where forms in landscape architecture come from

"Everything that exists has form and forms come from forms"

—Laurie Olin

Landscape architecture is just like any subfield of art: music, literature, film photography, sculpture or painting, it is the product of deliberately arranging symbolic elements in a way that influences and affects one or more of the senses, emotions, and intellect (Davies 1991). Richard Long and Andy Goldsorthy often proposed: the "art" consists of reformulating in the simplest way the given organic or inorganic materials of the site—a line of stones, a ring of leaves (Hunt 1999). For landscape architects, most work with the similar palette which includes earth, plant, stone, water, and arrange them in a form that could transfer their own conception of beauty in landscape to the visitor, here the designed landscape serves as a media that translates the designers' personal perception about aesthetics into a form that could be read and understood by others.

Though landscape designers are using the similar palettes, the works they create are never the same. It can be easily observed when we look at designed landscapes at different parts of the world, which always show strong local characters. Take imperial gardens built for the royalties in western and oriental world for example, we can clearly tell the difference of how the landscape

element were arranged to create views that are distinct enough to record the uniqueness of a culture in time and place. Examples can be found between Chinese garden, Persian paradise garden, Japanese tea garden, English landscape garden, and other great gardens that represent a cultural distillation of man's relationship with nature.

The reason why the same words construct different sentences that tell distinct stories lies in the difference of designers' personal perception of beauty, those perceptions are largely influenced by designers' own experience and somehow also reflect his or her cultural background. As Laurie Olin mentioned in his article *Form, Meaning and Expression,* Lancelot Brown, one of the greatest landscape designers, in whose works meadows, clumps, and belts of trees, lakes, dams, classical pavilions, even the positioning strategies were all existed in landscape gardens of his contemporaries and immediate predecessors (Kent, Bridgemen, Wise e.g.), the pastoral compositions in his works came from contemporary literatures and graphic art, and a large portion of his audience would understand and appreciate his works as an emblematic representations of agrarian societal views. Le Nôtre, another great landscape architect Olin mentioned, used shapes and forms from seventeenth-century pattern books, and some of his work implied patterns that could be found in the sixteenth-century Italian and French gardens which he knew as a young adult. He was influenced by Roman literature, archaeology and Renaissance masterworks. Neither of the landscape designers invented the elements that comprised their greatest compositions. "Through inventions by recombination and transformation, or a

jump in scale with the simplest of elements and unexpected juxtaposition, they produced unique, startling fresh and profoundly influential designs (Olin 1988)."

Although the two designers were generations apart, both men produced works that reflect a particular moment in the economy and social structure of their society, that could not be sustained beyond their own time (Olin 1988). As Harkness argued that landscape is a container and reflector of diverse, diffuse, and often ambiguous cultural meanings (Harkness 1990), a designer's own experience during a particular period under a certain type of culture is one of the main sources where they would find original ingredients to comprise their designs. Just as Terry Harkness mentioned in the beginning of Garden from Region, "by sifting through and selecting from regional cultural history and physical landscape, a vocabulary of design—a wellspring of familiar physical elements—might be found to create places of strong visual presence and shared experience (Harkness 1990)."

Designers often find inspirations from predecessors' masterworks, contemporary literatures or other forms of art, but the works they created are never exactly the same as being copied from those masterworks or literatures. Forms in landscape are all processed products that have been through a series of transformations, such as changes in scales, distortion, simplification and exaggeration, and then those elements are assembled into cohesive new compositions that support the design. Although their works in some way resembled the beauty in nature, neither Le Nôtre nor Lancelot Brown ever designed a composition that "visually or formally imitated nature, they both

abstracted their forms from nature, farming, and art. Each of them expanded or drowned the work of a predecessor with an uncanny sense of organic logic (Olin 1988).”

Designed landscapes are generated based on designers’ own interpretations of the world; they are created upon designers’ stimulated thoughts and emotions. Through the different arrangements of similar elements and thoughtful placement of different-sized space for certain private or public use, the designed landscapes serve as mediums that represent ideas from the designers to the users. Thus each form comes from an experience-based recognition and a bunch of considerations from the designer, consequently those ideas embedded in the forms are relayed to the users who experience the landscapes, such sequence of idea’s conveyance leads the users to the meanings of landscapes.

3.2 Landscape forms possess internal power and convey meanings

In his essay “Works of Art as Mere Real things,” Arthur Danto claims that the central activity of art is to transform ordinary (or extraordinary) real things into things that are art, i.e., no longer ordinary or mere real things (Danto 1983).” How to make old things new, how to see something common and banal in a new and fresh way is the central topic the art field continuously addresses. “Meaning” becomes the essential word in this discussion; common things that communicate new meanings could be endowed new values. Gardens, an original type of designed landscape could be an example to show the existence of meanings. In the study of garden history, we see gardenss gradually evolved from formative

utilitarian agricultural function of food production into settings of expanded possibilities: places of leisure, pleasure, delight, and artistry (Helphand 1984). The gardens have long served as a media to represent nature, culture and how they influence each other. It represented safety from the threat of wild nature or an escape from barbarian outsiders, it had been considered as a nature under control, also an idealization of what society believed that nature should be and should look like. In a spiritual level, the gardens expressed ideas of paradise, harmony and faith. In expressing personal and political powers, gardens could define the power of religious heritage (Francis and Randoph T. Hester 1990). A garden might restructure people's perception of and response to the contemporary social values, it's not surprising that historians often examine gardens in a history period in order to expose its uses of power and its social ideals.

Looking at the contemporary landscape, the influence still exists in an apparent way. Cosgrove, in his book *Social Formation and Symbolic Landscape* argued that cultural products such as works of landscape architecture can change human consciousness as well as modes of production such as the neoliberal capitalism that characterizes late 20th-century and early 21st-century American society, and that is so at odds with human, regional and global health (Cosgrove 1998). Drawn on Cosgrove's words, Meyer expressed her doubt in the possibility that design can change society, but she does believe that it can alter an individual's consciousness and perhaps assist in restructuring his or her priorities and values (Meyer 2008).

The importance of meanings in designed landscapes could also be implied by the great appeal of Land Art to contemporary landscape architecture. Land Art is an art form that is created using natural materials. John Dixon Hunt gave his reasons for the widening of Land Art in the field lf landscape architecture, other than their own privilege of artistry character and the emphasized creative purpose, the lack of a sense of coherence and the failure to attend to conceptual concerns in the field of landscape architecture is another reason why Land Art emerged as an important role. Land Art seems to restore some of the meanings landscape architecture may be lost, such as ideas of how to respond to land, ideas of art and nature and the interrelation between them. Taking abstract forms, signaling a wholly cultural reformation of natural material, Land Art draws us closer to the recognition of our relation with nature by inserting meanings into the design (Dixon 1999).

Peter Walker and Cathy Deino Blake identified three important features (gesture; hardening and flattening of the surface; and seriality) that could create internal strength in landscape that engages the mind (Walker and Blake 1990). Although they defined them all as gardens without walls, some of the examples they referred to are similar to a Land Art. In defining gesture—a linear statement in the landscape and an organizing element for understanding the whole, they brought one of the boldest gesture makers in modern art Christo and his spectacular piece Running Fence as an example (Figure 3.1).

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Figure 3.1 Running Fence by Christo (Walker and Blake 1990)

“The shimmering fence interacted with both the fixed, heavy morphology and the total scale of the existing landscape while disappearing over the horizon. It was so powerful and rich that you had to see it to understand it and you had to actually move to the landscape in order to really see it. Not merely objective, it made you perceive the landscape differently (Walker and Blake 1990).”

Another example is Carl Andre’s *Secant*, expressing the dimension of a field with a line of timbers. “He imposes a kind of geometry on the field that makes you not only look at the object but also become acutely aware of the place it is in (Walker and Blake 1990).” Another example that encourages one to look at the landscape in a new way by innovative placement of objects is Robert

Smithson's The Spiral Jetty, and Elyn Zimmerman's Marabar, in which she suggests water cutting through the rocks (Figure 3.2).

Figure 3.2 Marabar by Elyn Zimmerman (Walker and Blake 1990)

"In a setting of a rather ordinary building, garden ,and stones, the space becomes more powerful than the objects and holds them together in a way that makes the entire setting remarkable(Walker and Blake 1990). "

In explaining "hardening and flattening of the surface", Peter and Cathy referred to *Aluminum-Steel Plain* by Carl Andre, which illustrated that a surface only a quarter of an inch high can define the space above and around it (Figure 3.3). To explain "seriality", they returned back to the work of Carl Andre on his *Stone Field Sculpture*, where he used repetition in order to draw people's attention away from the buildings and the active streets (Figure 3.4). Another

example for repetition to draw eye into landscape is Martha Schwartz's Bagel Garden and Tanner Fountain at Harvard University.

Figure 3.3 Aluminum-Steel Plain by Carl Andre (Walker and Blake 1990)

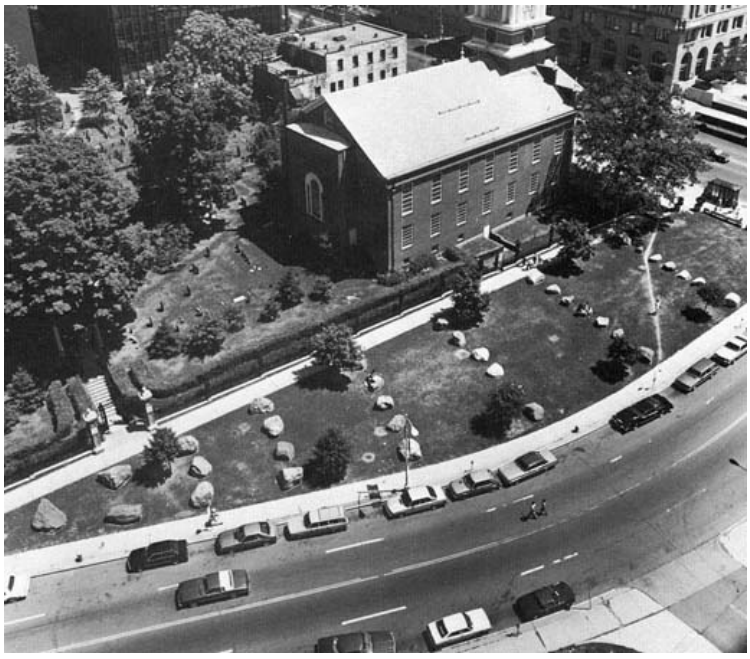


Figure 3.4 Stone Field Sculpture by Carl Andre (Walker and Blake 1990)

3.3 What meaning should a sustainable landscape possess?

"We make sense of the world around us and our role in it by developing a world view through which we systematically arrange everything—people, events, the environment, values—into an order. Ordering is the way we get the various aspects of our lives into their right places or at lease into places that we can comprehend and accept and upon which we can act. There are an infinite number of ways to create an order and we can create our own personal order based on experience and dreams (Francis and Randoph T. Hester 1990)."

Like literatures, films, music, sculptures and paintings, landscape architectures provide experience that could alter individuals' consciousness through space, sequence and form. This alteration of conciseness restructures individuals' priorities and values, changes the way they "arrange everything into an order (Francis and Randoph T. Hester 1990)." A new order of arrangement of people, environment, and value of nature could form a conception that we normally defined as individual obligation to the environment, and a sustainable landscape can play an important role in providing such value changing experience.

Such personal internal changes including emotion, attitude and values intrigued by external influences are one of the revolutions sustainable design brings to the public. Other than ecological improvement, sustainable design also has the responsibility to awaken public environmental awareness and to encourage individual obligations. The cause and effect of such awareness changes are particularly studied by anthropologists. The phases of people's

changing mind set, the process of how it is altered to a new personal norm and how it leads to beneficial behaviors are illustrated with various behavior models. Those behavior models suggest how attitude, norms and values control motivation, intention, willingness to act and ultimately behavior. Three behavior models are described below as they are instructive to define the meanings in sustainable landscape.

In the Model of Conservation Behavior, the author used a linear model to illustrate the mind process in encouraging water conservation (Figure 3.5). As the diagram shows, the whole process starts with noticing the problem, interpreting the problem correctly, assuming responsibility and then through knowing “how to respond” to the final acts. The linearity of the model is reached through the continuity between each step. Whenever there’s option of not proceed to the next step, a feed back loop is offered to redirect the mind process to its original course (Smith, Gordon et al. 1982).

In the Value-Belief-Norm (VBN) Theory proposed by Paul C. Stern (Figure 3.6), the model starts with “Altruistic values”, “Egoistic values”, “Traditional values” and “Openness to Change Values”, and then through “New Ecological Paradigm” forms the “Awareness of Consequences” which in the next step leads to “Ascription of Responsibility”. The last stage of the VBN model relies on the former inputs to produce a “Pro-environmental Personal Norm”, which would enable the last four pro-environmental attitude and behaviors. Implicit in the model is the “Norm Activation Theory”, which suggests that action will occur when individuals “believe the environmental conditions pose threats to other

people, other species, or the biosphere and that actions they initiate could avert those consequences (Stern, Dietz et al. 1999).”

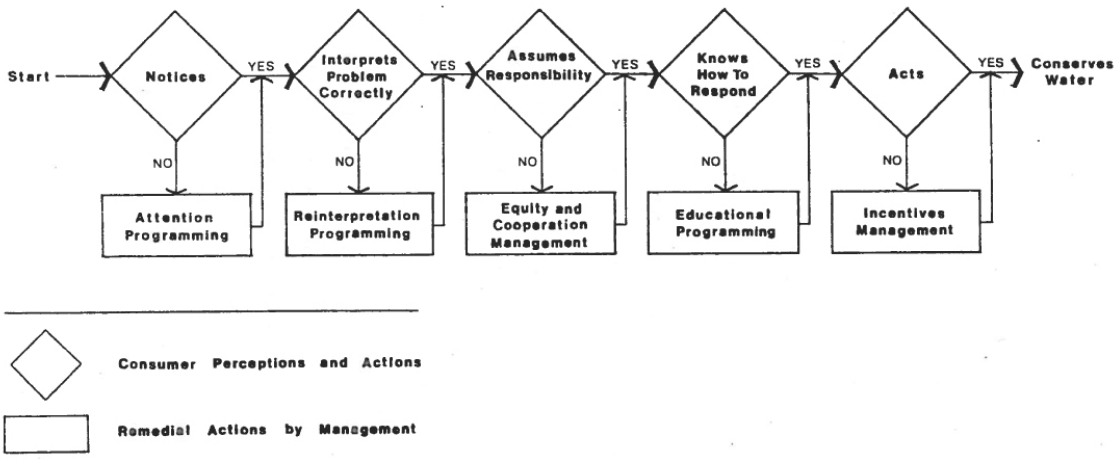


Figure 3.5 Model of conservation behavior (Smith, Gordon et al. 1982)

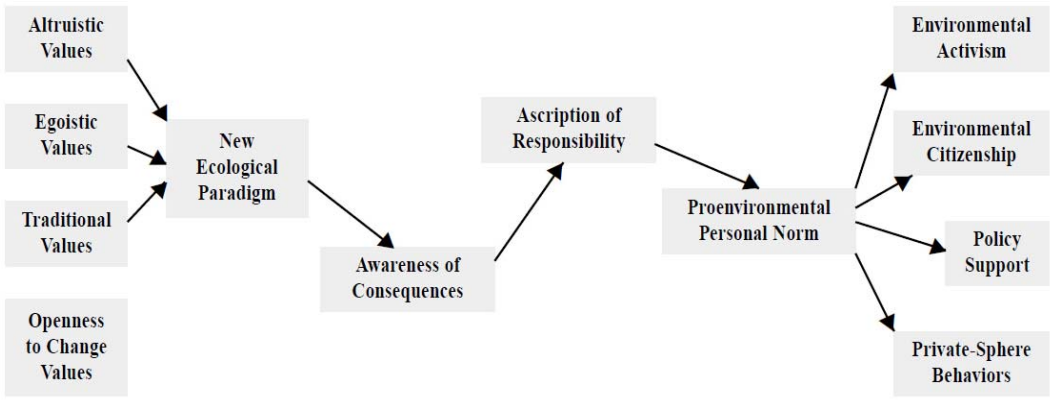


Figure 3.6 Schematic model of variables in the Value-Belief-Norm theory (Stern, Dietz et al. 1999)

In the Model of Pro-Environmental Behavior proposed by Kollmus and Agyeman (Figure 3.7), internal and external factors are the main components that interactively lead to pro-environmental behaviors. In internal factors, environmental consciousness is considered the essential component which is composed of “Knowledge”, “Values / Attitudes”, and “Feelings”. Those factors and sub-factors are enhanced and leads to the final pro-environmental behavior through interconnections between each of them. Impediment that would inhibit such interconnections are listed in black squares, they are the barriers for internal and external factors to reach for pro-environmental behaviors (Kollmuss and Agyeman 2002).

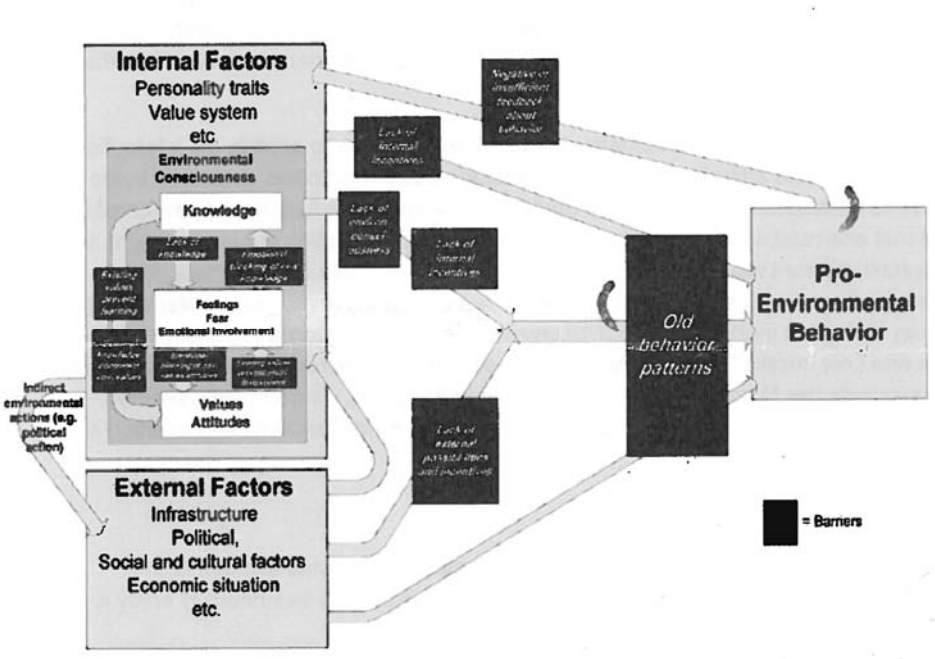


Figure 3.7 Model of Pro-Environmental Behavior (Kollmuss and Agyeman 2002)

Extracting the essence from the listed models, several components are instructive and can be borrowed to describe the formation of changed attitude and increased awareness in sustainable landscape. In the first model which described the whole process from the start to the end of a conservation behavior, the initiating stage “Notice” served as a vital part in the whole model, and also anchored the other two models which are developed assuming there are existing attentions. In the second model, “New Ecological Paradigm” is a turning point that transformed the former inputs into awareness and responsibilities and consequent behaviors, such ecological paradigm could be a policy, a film or a sustainable landscape. In the third model, the factors and sub-factors lead to environmental consciousness resonance with the purpose of sustainable landscape. Knowledge, feelings, values and attitudes are essential elements a sustainable landscape would address in increasing visitors’ environmental awareness.

In other words, a successful sustainable design could fit into phases of the behavior models to encourage any pro-environmental behaviors. This thesis would focus on the formation of increased environmental awareness or enhanced environmental consciousness, which could fit into the initial stage of those behavior models. Borrowing ideas from the three behavior models, a new model that illustrates the process of awareness increasing in sustainable design would be created.

As stated in the earlier part of this chapter, designed landscapes are composed of forms that relay meanings and affect visitors. Since the thesis

focuses on the vital important impacts of sustainable landscapes — to increase public environmental awareness, the discussion on the meanings in sustainable landscape is indispensable. The following part of this chapter would introduce three important meanings identified by the author a sustainable landscape should posses, and then the new model would illustrate how three factors lead to an increased environmental awareness. Those meanings are: “A sense of connection with nature”, “A pulling of attention” and “An enticement of ecological curiosity”. Before introducing the model, the three factors are described and reasoned with their substance role in sustainable landscape.

3.3.1 A sense of connection with nature

Buell suggested in his book *Writing for an Endangered World,* American environmental policy is missing *“a coherent vision of the common environmental good that is sufficiently compelling to generate sustained public support,”* he argued that what is needed is not more policies or technologies but more “attitudes, feelings, images, narratives (Buell 2001).” Public awareness of the environmental issue becomes an increasing concern in the discussion of sustainability.

Environment ethics, a sub discipline of philosophy, began in 1970s. There were several articles and books published on the subject on environmental values. Interest in the field grew and more publications appeared after the initiation of the journal *“Environmental Ethics”* in 1979. Environmental ethics

extended the traditional boundaries of ethics from solely humans to the non-human world (Leopold 1949).

Lynn White Jr. in her article “The Historical Roots of Our Ecologic Crisis” expressed criticisms to Western culture that separates humans from nature. She mentioned the directional conception of time, a Christian idea absorbed from the Hebraic tradition that saw creation as a beginning of history. White suggested that this linear conception of time, which differs from the Greek conception of nature as cyclical, with no beginning or ending, has instilled in Western consciousness a directionality and a sense of purpose, and also a form of unjustified optimism that treats all technological changes as progress (White 2005). The image in Western Christianity that humans are creation of God is an implication that separate human from nature, and is responsible for leading the Western culture “anthropocentric”. Westerners tend to believe that the development with the entire emergence of new technologies is optimistic by default.

Constructed landscapes serve as connections between man and nature, they are orchestrated by a set of moral, aesthetic, and philosophical principles. It is the ability of every man to lose himself in the contemplation of the scenery of nature. A sense of connection with nature is one essential notion that sustainable landscape should convey. The meaning communicated by a sustainable landscape should encourage us to stand in a different relationship to the world than we were the moment before, and prompt an impulse to give up our imaginary position as a separated part from nature.

3.3.2 A pulling of attention

Bryan G. Norton in his book “Sustainability” mentioned that “sustainability is about the future, our concern toward it and our acceptance of responsibility for our actions that affect future people.” Some commentaries refer sustainability as a new type of equity and fairness, what ever else it means, sustainability has to do with our intertemporal moral relations (Norton 2005). Given the rapid development of technology, new media such as television and internet have helped in forming a growing consensus about the impact of human action on global environment. Polls shows that there are overwhelming majorities of people in modern democratic societies believe we have obligations to the future (Norton 2005), which means that the environmental crisis has been publicized and the sustainability has been perceived as a public goal. Then what are the imperatives that urge the discussion of meanings in sustainable design?

Just as Meyer’s description for some of the “yawners” in sustainable design, there are a number of both designers and users think that “sustainable design is what a designed landscape should do, what is the big deal? (Meyer 2008)” In an urban context, designed landscapes are everywhere in our lives. From private front yards to municipal plazas, from community gardens to city parks, designed landscapes are often experienced but at the same time overlooked. Most of the time, people use a landscape without noticing the meaning in it and the function of it or are too busy to bother extrapolating those obscurities consciously. An awareness awakening sustainable landscape should draw people’s attention away from other distractions such as daily concerns of

work and family or overstimulation of the digital world, and initiate a conversation between the user and the designed landscape. Sustainable landscape design includes constructing experience, other than the design of form and the design of ecosystems, it also involves the design of experiences that make us to notice, to care and to deliberate about our place in the world (Meyer 2008).

3.3.3 An enticement of ecological curiosity

Our ability to act is limited by our knowledge; greater ecological knowledge will promote cultural change. Gorhan, Eaton, and Meine—as Joan Nassauer recalled—all have described how understanding of nature will not only change the landscape but enrich human experience. Joan Nassauer described in her book *Placing Nature: Culture and Landscape Ecology* that the landscape itself can be a "means of environmental education, exemplifying aspects of more pristine places or portraying the ecological functions of even the most densely settled landscapes" (Nassauer 1997).

The importance of revealing ecological process in landscape has been discussed for a long time in an area that is termed with "eco-revelatory design", which means "landscape architecture that reveals and interprets ecological phenomena, processes and relationships" (Helphand and Melnick 1998). Eco-revelatory design has been labeled and increasingly used since 1997, when a group of landscape architects who were interested in such type of landscape design complied and organized a body of such work into an exhibition. In the proposal of the 1998 issue of Landscape Journal, which particularly discussed on

this eco-revelatory design exhibition, the editor said "If one is more aware of environmental phenomena and processes—if one is able to see and comprehend them—one is better able to appreciate, evaluate, and make wise decisions concerning them (Helphand 1998)."

Eco-revelatory design is the type of design that particularly addresses the educational role of designed landscape, the range of its ideas, principles and methods overlap with some of it in sustainable design. A force to sensitize people to what is known about the interlocking complexities of environmental system and engage people to explore more environmental knowledge can be another influential aspect of sustainable landscape.

3.3.4 Coactions of the three meanings in sustainable landscape

In the behavior models, the authors all tried to propose a linear, one direction model that lead multifactor values to a predicted behavior. In the case of sustainable landscape design, a linear one-way model is not sufficient in reaching an increased environmental awareness—a gradual psychological change obtained by continuous influences. The meaning of sustainability should not be limited in the ecological context; factors that lead to environmental consciousness are also required to be sustained over time. The next model illustrates the inter relationship between the sense of being connected to nature, the tendency to notice and the curiosity of environmental knowledge, and shows how they act interactively to sustain each other and synergistically to reinforce an increased environmental awareness (Figure 3.8).

In the awareness model, a gradual enhancing process of environmental awareness is showed in stacked abstractive layers; they represent different levels of experience in sustainable landscape. In each level the three factors work simultaneously to promote the experience to the next level. The different level of experience in a sustainable landscape is aligned with visitors' different environmental awareness, which are initiated, sustained and enhanced throughout the experience.

When visiting a sustainable landscape, the users should be enticed to initiate following experience. At the same time, a sense of connection with nature would create a bonding between the users and the landscape, which leads to an enhanced level of experience. Ecological curiosity would also help to sustain the effect of the other two. As Eaton describes, ecological knowledge will help to sustain aesthetic attention to landscapes over time, such continuous attention would help to bring a sense of strong connection with nature, which would motivate a desire for more ecological knowledge (Nassauer 1997). Ecological knowledge will further lead to more discerning human experiences, in which ecologically destructive phenomena are not mistaken for beautiful nature. A correctly structured scientific background would encourage a more environmentally just appreciation while a visitor is drawn to noticing, caring and deliberating in a sustainable landscape.

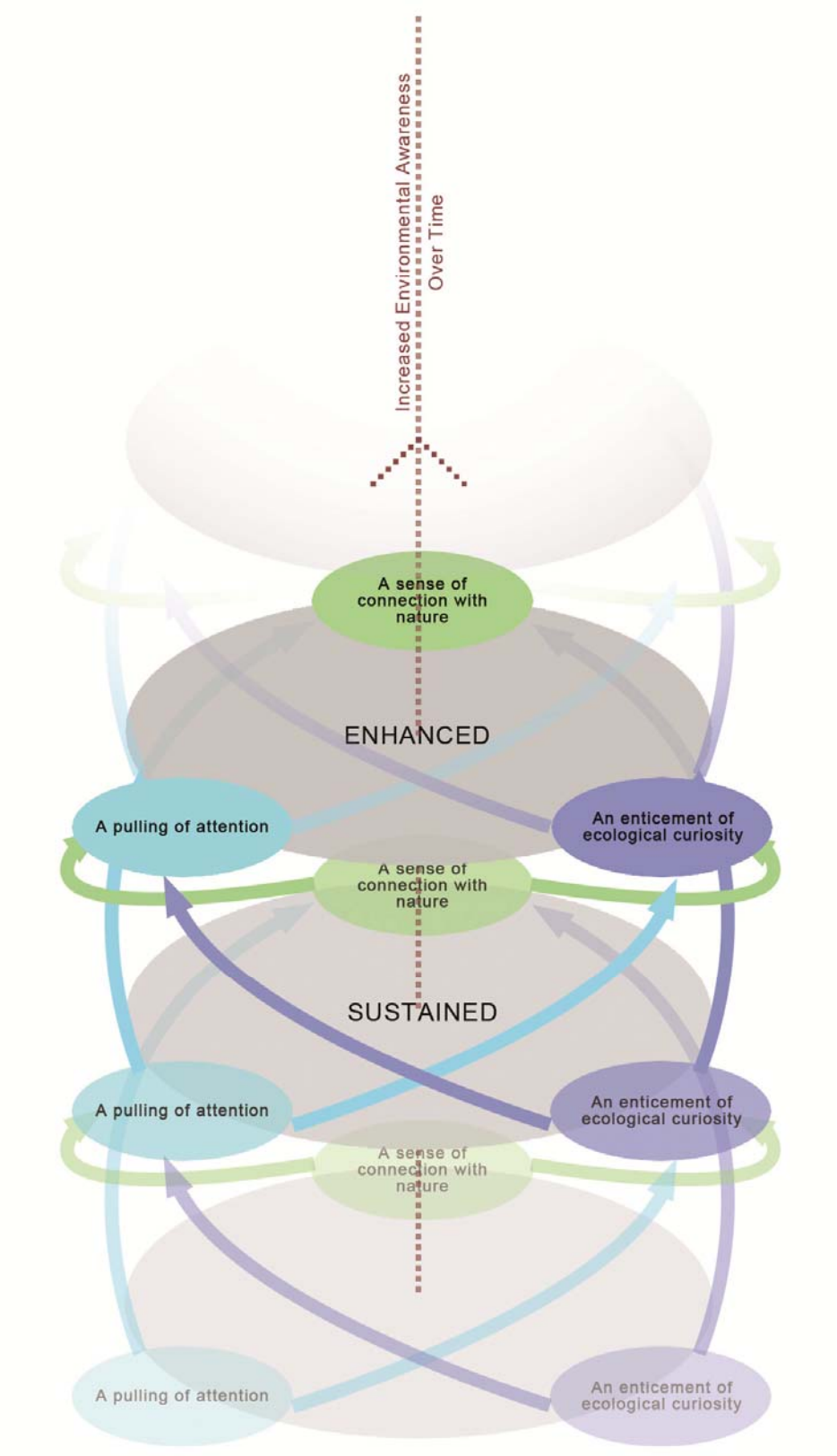


Figure 3.8 Awareness model in sustainable landscape

In this model, the three factors share the same significance in the same level, each factor pushes the other two up to a higher level over time. In a continuous sequence of such circulation, the experience of sustainable landscape would be enriched and an increased environmental awareness could be gradually achieved.

3.4 What form is required to define sustainability?

Understanding of the three essential meanings in sustainable landscape guides the following discussion of forms and appearance in sustainable landscape. What forms would transfer those physiological effects to users in order to promote environmental awareness? The following part of this chapter answers this question with another model (Figure 3.9). This model shows a plan view of the awareness model, illustrating how three kinds of forms lead to the three essential meanings in sustainable landscape.

3.4.1 An aesthetically metaphoric natural form

As stated in chapter two, an aesthetic experience can result in the appreciation of new forms of beauties that are discovered, a beautiful landscape has the capacity to challenge our mind and prod us to think. Aesthetic satisfaction can help to overcome problems of perception that obstruct understandings of landscape ecological knowledge. Aesthetic tradition could be seen as the “basis for a language that can be used to provoke change and sustain ecological quality (Nassauer 1997).”

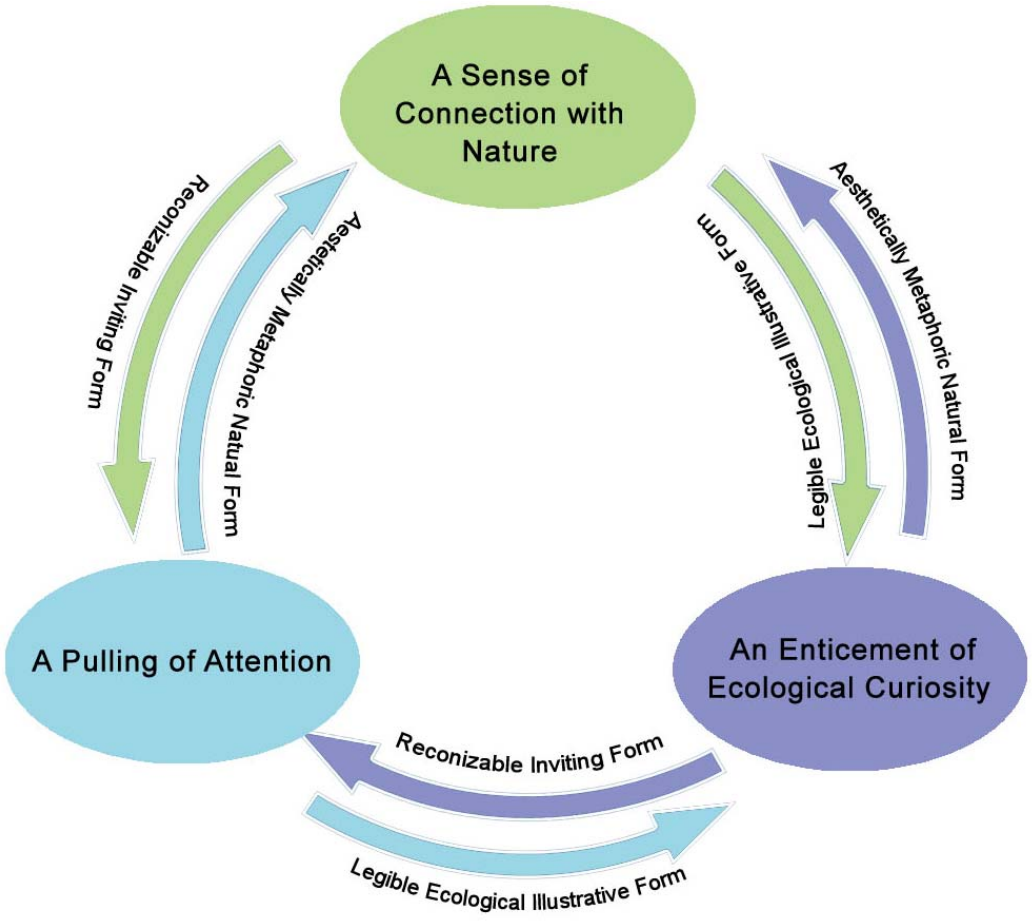


Figure 3.9 Three forms lead to three meanings

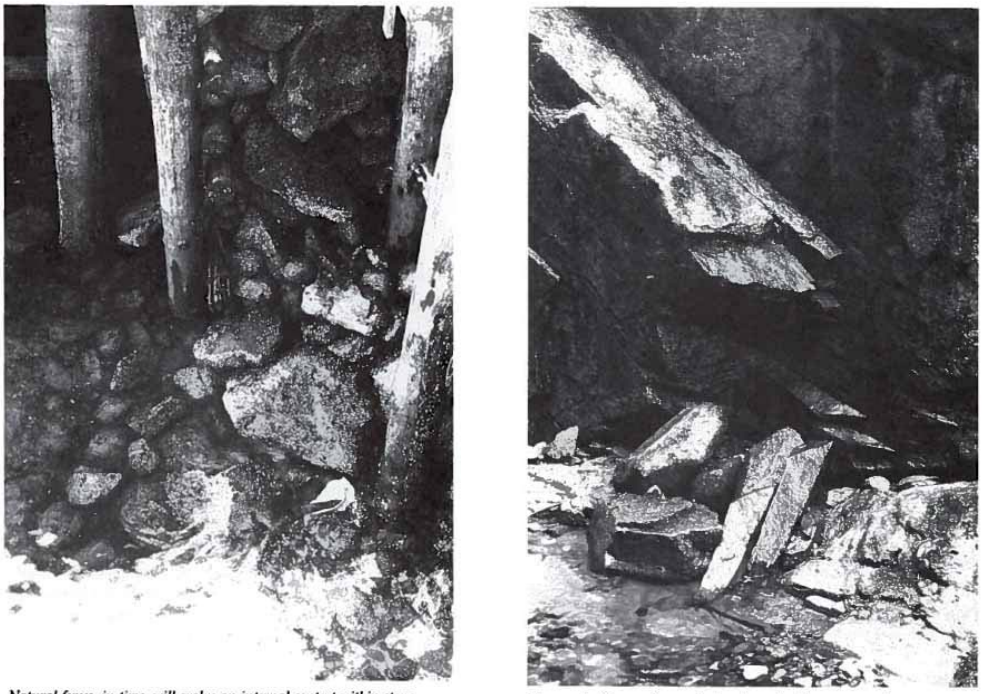
Joan Nassauer argued that aesthetics is explicitly about nature. In ancient Roman or the wealthy in 18-century England, representations of natural landscapes were often used as decorations. Other than representations of landscapes, poetry, painting and environmental art all showed the fact that landscape viewing was a popular pastime. Since then, the power of nature began to be seen as beautiful, as long as it was controlled. The eighteenth-century picturesque promoted the appreciation of scenic landscape aesthetics. The

picturesque was a cultural idea about how nature looks, which designated recognizable features of natures, such as rocky peaks, steep bluffs, crashing water, gnarled trees and the ruins of ancient buildings, and then arranged these features for human enjoyment (Nassauer 1997). However the aesthetically pleasant form in sustainable landscape is more than pictorial, pleasant, idealized pastoral scenes. The beauty here refers to “somatic, sensual experiences of places that lead to new awareness of the rhythms and cycles necessary to sustain and regenerate life (Meyer 2008).”

Such beauty exists in every piece of nature, whether it's the grand vista in a national park, or droplet falling from a leaf within pool of water, we can be inspired and filled with awe of the natural sublime set before us. When we are asked to describe the experience, there is usually a loss for word. The emotional responses are indeed personal and subjective, and these feelings and emotions triggered by natural beauty are a cross cultural phenomenon. There have been strong forces during the last few centuries emphasizing the need to design with a sense of returning to nature, and the growing trend during the 1990s toward naturalistic design implies a urgent need to reembrace the aesthetics of the natural world (Dubé 1997). However, to represents nature and express a sense of wild and pristine doesn’t necessarily mean we need to copy the exactly same scenes in nature into the design. The best way to do is through “applying the lessons we learn from nature to our own personal landscapes (Dubé 1997).” It is the metaphor in natural forms that we need to borrow into our design.

In his book Natural Pattern Forms, Richard L. Dubé found that the beauty in nature is largely ignored in the tradition of Western landscape design, although there are exceptions such as Frederick Law Olmsted, due to the influence from the rectilinear form of Ancient Egypt and Babylon, there is still a rule of tendency to have the landscape be formally balanced with either rectilinear or circular as the basis of the design, which shows little regards to the innate character of true nature. On the contrary, Dubé gave Asian gardens (in particular, Chinese and Japanese) the testimonial for giving a feel of peace inside and evoke a true feeling of serenity. He explained that those Asian gardens are generally based upon an informal balance and themes that are related to the natural world. He gave examples of the design of *tsukubai* (Japanese stone washbasin), which is designed by following the same frame based on a simple pattern, the connection of such pattern with natural forms was later found in a photo he had taken on an obscure river in the Pemigewasset Wilderness (Figure 3.10). The image shows the combination of water and stones that are borrowed as a framework or template in the design of *tsukubai*. The ability to capture the serenity inherent in certain nature is more important than simply copying natural elements or patterns into our design. By applying these patterns we would create a metaphor in our design, and what we infuse into the contrived space is not only the pattern and form inherited in nature but also the underlying tone or emotions of the original natural scene (Dubé 1997) (Figure 3.11).

Figure 3.10 Water wearing on this rock in the Pemigewasset Wilderness Area has formed something akin to a Japanese Washbasin (Dubé 1997)



Natural forces, in time, will evolve an internal context within stone.

Strong repetitive angles can bring stones together as a group.

Figure 3.11 Metaphoric natural forms (Dubé 1997)

3.4.2 A recognizable inviting form

More than being ecologically sound, landscapes should attract more attentions from human beings and evoke enjoyment and approval from them, so that it can be appreciated and appropriately cared over time. Cultural sustainability, a term brought up by Joan Nassauer, means the survival that depends on human attentions, it makes human attentions an indispensable role in stewarding ecological health (Nassauer 1997).

Joan Nassauer argued that cultural conventions of aesthetics affect our appreciation of landscapes. She said that landscapes are judged and enjoyed according to the degree that they clearly exhibit care. A wild landscape with absence of trash or signs of human occupation, cultivated field with straight rows and no weeds, or a neat and tidy lawn that is properly mowed, they are all settled landscapes show neatness and are more likely to be appreciated by people. This appreciation of neatness is laden with good intentions and social meanings: stewardship, a work ethic, personal pride, contributing to community. Such law like aesthetic conventions can be instructive when addressing ecological awareness in sustainable landscape. "…we can critically analyze those features and selectively use them because we recognize the power of overall aesthetic experience (Nassauer 1997)."

Although some environmentalism might criticize that human interventions would result in unintended and unexamined harm, they suggest leaving the landscapes in minimal care and have it sustained on its own wild conditions. Considering the educational role of sustainable landscape, which not only

functions in a healthy ecological system but also popularizes ideas of sustainability to the public, attention drawing should be an important objective. “Natural-looking designed landscapes quickly become invisible landscapes and neglected landscapes (Meyer 2008). ” Natural-looking landscapes may not be sustainable in the long term, as they are often overlooked in metropolitan areas. A successful sustainable landscape should be assumed to be found, to be learned and to be cared.

According to the aesthetic conventions Nassauer mentioned, peoples’ interests and appreciation are more likely to be raised through the appearance of human’s attendance, which can be shown by signs and forms that imply efforts of design or marks of human’s ideas. Through design tactics such as “exaggeration, amplification, distillation, condensation, juxtaposition, transposition or displacement to form a form-full, evident, and palpable landscape” is one of the main goals sustainable landscapes should attain (Meyer 2008).

The importance of forms that imply human’s creativity is shown with a frequently used term these days—Hypernature, a form that describes the exaggerated version of constructed nature. It is an example showing how designers transform the elements in nature to emphasize the beauty within. The deployment of hypernature can be found often recently, works from Van Valkenburgh, Laura Solano and Matthew Urbanski all expressed their interests in it (Meyer 2008). In an conversation with Jane Amidon, the editor of series books *Source Books in Landscape Architecture*, Michael Van Valkenburgh said “If we ever replicate nature, its with a winkle in our eye…I see what our office did as not

copying nature but rather borrowing pieces. When we use something natural in our design, it is a strategy, it is a collage of parts…Landscape architects spend too much time worrying about 'real nature' versus 'constructed nature' when both are alive and are part of the same ecological essence (Valkenburgh 2005). " The Teardrop Park in Lower Manhattan, New York, designed by Michael Van Valkenburgh Associate, epitomizes the effectiveness of "hypernature." The eye-catching structure of more than eight-meter-high, 51-meter-long stone wall challenges and shifts visitor's attentions to the unseen, underground natural world (Figure 3.12).

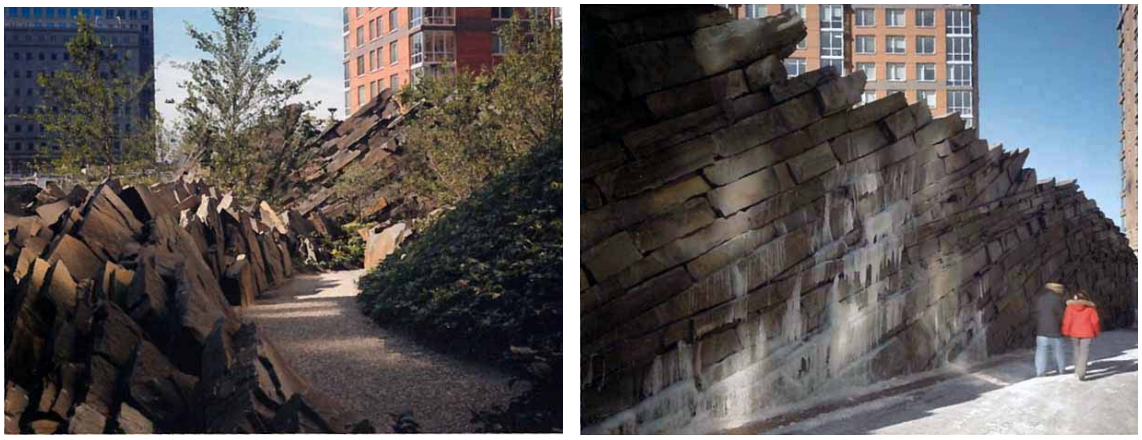


Figure 3.12 Teardrop park (Michael Van Valkenburgh Associates, 2005)

Meyer also expressed her doubt of the language in landscape architecture which only includes limited genres such as formal and informal, cultural and natural, man-made and natural, which hamper our profession. She questioned "How does such language allow us to capture the strange beauty and

horror of a forest polluted by acid-mine drainage caused by coal mining that has been transformed through bioremediation into a park (Meyer 2008)."

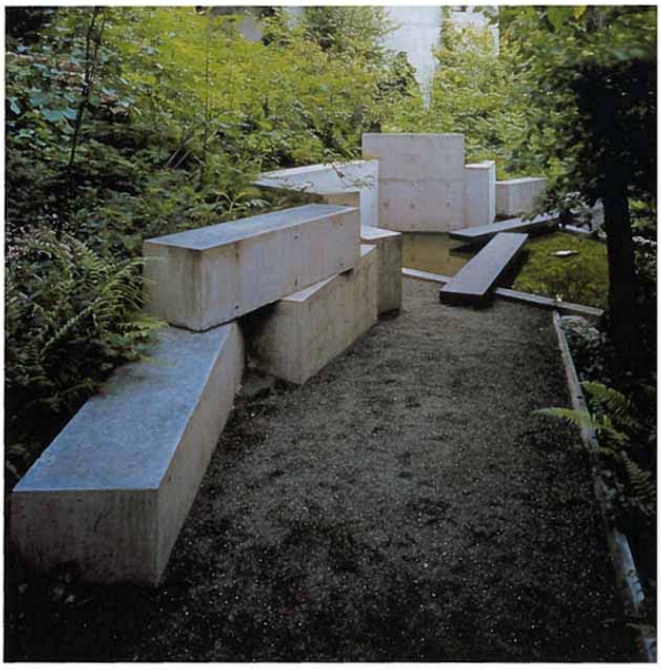


Figure 3.13 Hybrid forms that include both nature power and human intelligence (Michael Van Valkenburgh Associates, 2005)

Hybrid forms that include both nature power and human intelligence would serve as a magnifying glass, increasing our ability to see and appreciate the context (Figure 3.13). In Meyer's words, such sustainable beauty should be particular rather than generic. She believes there will be as many forms of sustainability as there are places cities and regions. "It will be recognized as site-specific design emerging out of its context but differentiated from it (Meyer 2008)."

In short, a recognizable form that is a blend of human intelligence and powerful nature would lead us to observe, to learn, to deliberate, to appreciate and to care.

3.4.3 A legible ecological illustrative form

Part of the function in sustainable landscape is to enable, repair and regenerate ecological processes, in order to allow the landscape perform ecologically, designs are based on local climate, soil and hydro conditions. Referencing the local natural condition pushes the appearance of sustainable landscape to be similar to a real nature. However, natural-looking landscapes are not the only type that performs ecologically. A mimicry of natural processes is more important than the mimicry of natural forms (Meyer 2008). While Kevin Lynch, Christopher Alexander, Kenneth Frampton, Richard Forman, Anne Spring had discussed “pattern language,” Kristina Hill expressed her opinion on the importance of process language in our current era of priorities in her article “a process language for urban design.” “Pattern languages give us terms for form, process language give us terms for function, form and function together help to produce both cultural meanings and the biophysical effects of a design.“ She proposed a process language that could provide us with terms to name design strategies that intent for particular functions, and those functions are obtained by a designed landscape that change over time to achieve their goals (e.g. a street act as a filter for stormwater runoff before it hits the salmon in urban waterways). Using such process language would allow us to “articulate both the implications

of systems for site and the strategies designers can use and improve upon for expressing dynamic systems as part of a design aesthetic (Hill and Maupin 2003).” The appearance of sustainable landscape should consist of forms that could translate such process language into shapes of trees, rings of stones and sounds of water.

Eco-revelatory, the type of design that particularly addresses the revelation of natural system, has been discussed in sustainable landscape for a long time. The merit of it is that it can educate and illumine. Design is always a revelatory activity; it has the capacity to make the invisible visible. In a sustainable design, landscape architecture is often guided by ecological principles, which is for most time unseen from the appearance of the designed landscape; it is our task to create patterns, endow meanings, and promote understandings in a sustainable landscape. The actions of drawing, mapping, modeling, marking, and making are methods and modes of visualizing and externalizing those understandings (Helphand and Melnick 1998).

The 1998 exhibition *Eco-Revelatory Design: Nature Constructed/Nature Revealed* and its subsequent publication in *Landscape Journal* had drawn many attentions from the public; a lot of related comments were published afterwards. Among the various opinions appeared in the comments, some praise eco-revelatory design for creating a more visible aesthetic that would “illuminate process and highlight issues so that the public can be a critical participant in particular settings (Phillips). ” In contrast, some environmentalism questioned eco-revelatory design’s significant impact on the greater ecological good. Robert

France, in his article “Green World, Gray Heart” questioned the ability of not only eco-revelatory design, but also ecological design in general to help with mediating ecological problems (France 2003). Making claims and assumptions not adequately supported by scientific data lead to limited ecological functions, and the lack of clarity prohibits effective communication that eco-revelatory design could provide. Some criticism accused eco-revelatory of revealing only a tip of the ice burg of nature, little is done beyond revealing designer’s own perspectives and prejudices. Instead of increasing public awareness and encouraging partnership between people and nature, eco-revelatory design leaves nature’s subtleties opaque and unclear. On the 1998 exhibition, France said “contrary to the large claims that accompany them, most of these eco-revelatory projects reveal little beyond the sensibility of their designers. In these works, too often the result of the images and words is not clarity but obfuscation (France 2003).” To flesh out the promise of eco-revelatory design, some recommendations were given which include: improving the scientific quality of design, increasing legibility and understanding, expanding the scope of eco-revelatory design’s subject (Liverman 2007).

In constructing of the ecological explanation part in sustainable landscape, a lot can be borrowed from the advice for eco-revelatory design. A form that is based on scientific principles supported by high standard ecological assessment data from continued professional research and monitoring is recommended for sustainable landscape. Often, such ecological revealed forms are just like the real ecological system in the wild nature, they should be temporal and dynamic.

The scientific lessons are learned when visitors experience the landscape over the course of the seasons. And a real ecologically revealed landscape does not count on interpretive signs to tell stories of the eco system. A changing landscape could be the narrator that explains ecological process in sustainable landscape. In his article Ecological Design, Urban Places, and the Culture of Sustainability, William Eisenstein argued that non-verbal communication is an important way of relaying messages, through which people derive meaning from their built environment (Eisenstein 2001). A clear and legible form that could intimately instruct people to the understanding of environmental process and ecological function is required in promising the educational role of sustainable landscape.

CHAPTER 4

CASE STUDIES

Sustainable landscape design flourishes when fixed categories are transgressed and their limits and overlaps are explored. People often found themselves exposed to different notions about environment when they experience landscapes designed by environmentalists or artists. As stated at the beginning of last chapter, designers try to create forms according to their own experience influenced by different culture and educational background, and relay their understanding of nature through their works of landscape. How does a sustainable landscape that embodies the idea and knowledge from a multi professional field that include art, ecology and psychology transfer its meaning into a recognizable, legible metaphoric natural form? In this chapter, four case studies are introduced and examined to extract the language they used when translating sustainable techniques, each of them addresses a certain environmental issue and contains one or two of the meanings concluded in last chapter, the constrains in the four cases are also included in the discussion.

4.1 10th@Hoyt Courtyard—Translating the water conveyance

This project is located in a dense urban context—the heart of Portland, Oregon, it is designed by landscape architect Steve Koch, ASLA. Pearl District is a recently gentrified area in Portland, where new residential housing is springing

up all over the place. The 10th@Hoyt apartment was completed in March 2003. It is a six story building with an 8,500 square feet courtyard in the center. The courtyard is the roof of a sub-grade parking, it is surrounded by the residential building with apartments on the top five floors and retail on the ground floor (Figure 4.1). The project is featuring a semi public green space that creatively display the capturing, conveying and utilizing of the on site stormwater run-off, it would also provide a space for residents to relax and enjoy the experience of tracing the route of water.

Figure 4.1 Location of 10th@Hoyt Courtyard (From Google Earth)

The entrance of the courtyard is to the west of the whole block. Once entering the courtyard, one can easily tell the composition of the space is simple and orthogonal, a vertical copper line running down the face of the building

marked the axis of the space, around which symmetrically placed some stylish benches serve as a seating place. Some oversized black pots planted with shrubs surround the seating area and defines the central space within the courtyard (Figure 4.2). The copper line up on the face of the building revealed the special story about rainwater implied by this courtyard. Functioning as a downspout from the roof of the building, the copper line on the axis lead the water to a ziggurat like concrete structure, which in turn steps down to a cantilever over a raised concrete basin filled with round river rocks. Rainwater is also pumped over two sculptural Cor-Ten fountains studded with button glass and lit from within (Echols and Pennypacker 2006) (Figure 4.3).

Figure 4.2 Central space in courtyard (Landscape Architecture, September 2006)

Figure 4.3 Sculptural Cor-Ten fountains (Landscape Architecture, September 2006)

Other two down spouts are placed in the corner of the courtyard with the similar rainwater discharging aqueducts, expect that the concrete cantilever zig zag both horizontally and vertically to talk to the shape of the building, before entering the concrete basin also filled with river rock, the rainwater wash over a Cor-Ten steel level spreader which is studded with colored glass dots and is lit from below (Figure 4.4). Planting in the courtyard were spared and arranged in different hue and texture, complementing the hardscape that carried the rain water (Figure 4.5). Trees, shrubs and ground covers are all planted in a 10-30 inch growing medium supported by drain mats with 6” of drain rock and a conventional irrigation system (Rodes 2007).

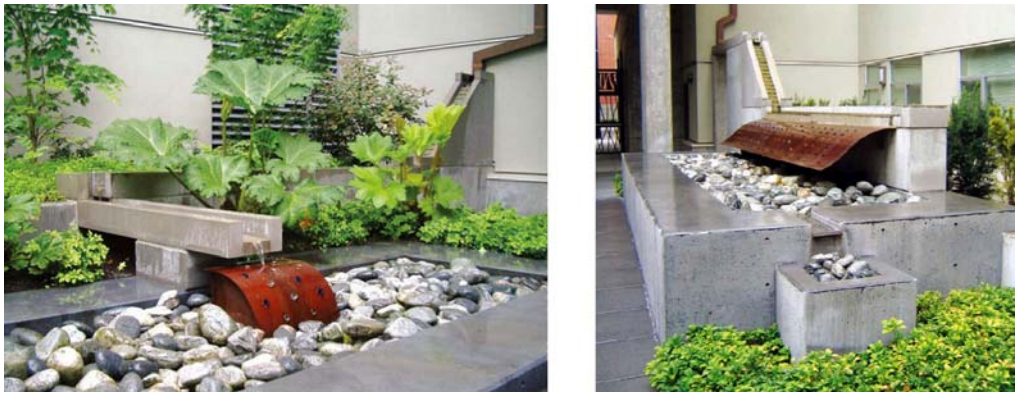


Figure 4.4 Cor-Ten steel spreader (Landscape Architecture, September 2006)

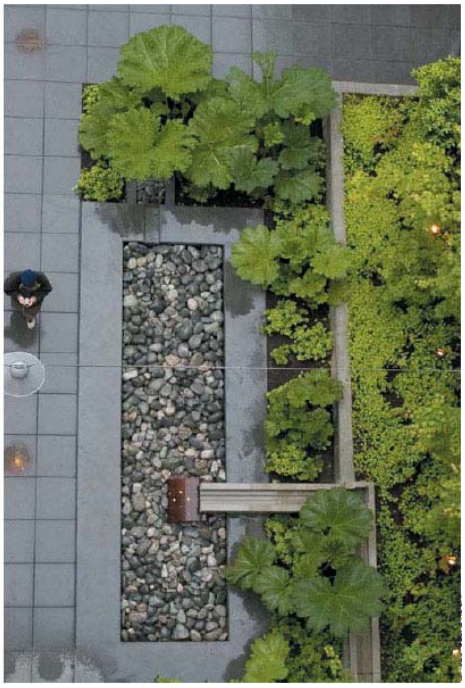


Figure 4.5 Plantings compliment the courtyard (Rodes 2007)

The designer Steven Koch found inspiration in Persian Garden, most of the form existed in the courtyard such as runnels, chutes and ladders can be found similar to a typical Persian Garden. The designer stated in an interview that “Persian gardens excel in their ability to maximize the aesthetic affects of

water given the traditional oasis gardens that have very little water to work with," (Rodes 2007). Portland has an average of over 36 inches of annual rainfall per year, any project that is over 500 square feet are required to manage and treat stormwater on site (Rodes 2007). By maximizing the aesthetic value of water learned from Persian garden, the designer proved that there could be something interesting and innovative done despite of the plumbing codes set by the City of Portland. While artfully directing the running of rainwater, the courtyard also properly managed and treated the rain water collected from roof before it reaches the city stormwater system.

After the rainwater is collected and conveyed through the series of fountains in the courtyard, it is stored in a 4,000 gallons cistern below grade. This cistern has the capacity to hold all of the roof rainwater for a 1/8" storm event and detain it for approximately 30 hours after the storm (Rodes 2007) and finally release it to the city stormwater system through a small valve that can be adjusted by hand. The rainwater detained in the cistern can be recirculated and pumped up for the use of the Cor-Ten steel fountains, and then drained back to the cistern to create a closed loop water circulation (Figure 4.6). This system serves as an detention facility that allow the settlement of sediment in the water before it reach the city stormwater system (Echols and Pennypacker 2006).

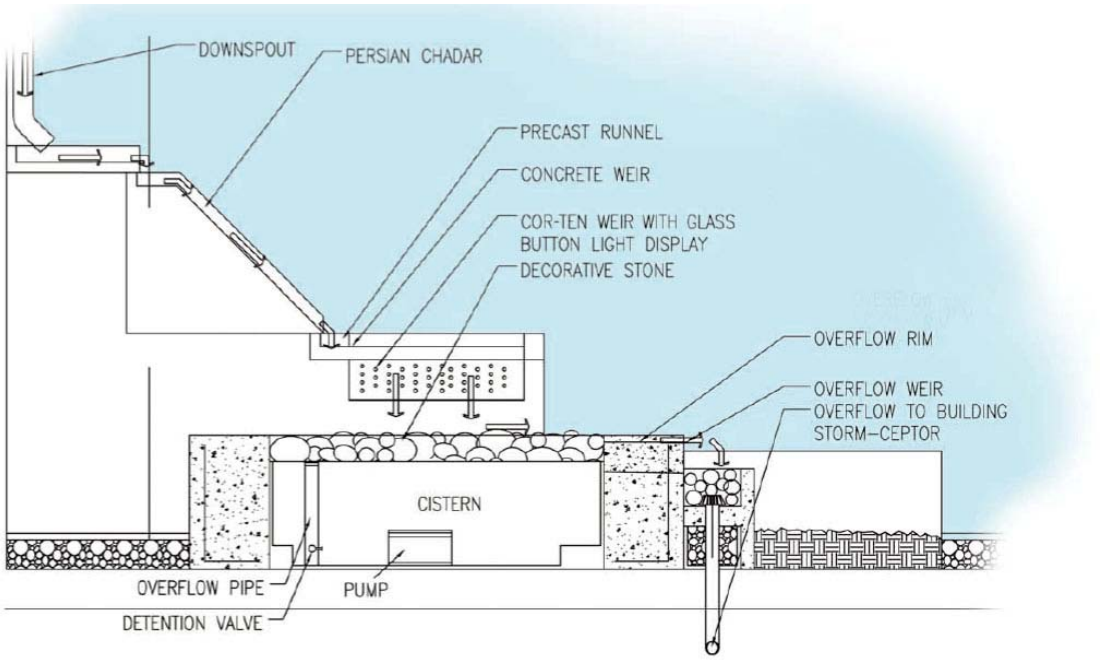


Figure 4.6 Illustration of rainwater trail sequence
(Landscape Architecture, September 2006)

While addressing the stormwater quality through conveying retaining and recirculation, the unique, playful and sculptural forms that structured the channels, cascades and fountains captivate the visitors' attention to this artfully displayed water conveyance system. One can easily deduce that rainwater movement is the focus of this courtyard. Intrigued by the different shapes and materials that form the conduit, the visitors' curiosities are engaged to follow the water trail from one structure to another. The site also provide a quite, inward oriented and oasis-like space in the high density urban area, and arose inspiration to the community by giving them ideas on how to incorporate these sustainable practices at their own homes.

There are also some feedbacks from other landscape practitioners pointed out that the courtyard addresses the utility of rainwater management less

extensively than it could. The final chapter of the rainwater stories—retention of excessive water in the subgraded cistern and the recirculation of the water for fountain use—seems to be missing at 10th@Hoyt. After its elaborate journey down and into the space, rainwater simply disappears without a trace into the river rock-filled basins, leaving the following part of water treatment invisible. Also, in spite of the effort in reducing the amount of excess runoff and improving the runoff quality, 10th@Hoyt courtyard could address the rainwater management more comprehensively by simply reusing it for irrigating the onsite plants, so that the residents and visitors could see rainwater being used to sustain the plantings. In addition to these treatment opportunities, some diagrammatic signage or visibility into the cistern would allow curious visitors to comprehend the rainwater story from start to finish (Echols and Pennypacker 2006).

In project of 10th@Hoyt, various hardscape elements such as paving, outdoor furniture, planting beds and the stormwater conveyance structures all together implies the context of the space—an central urban area. The limited space of 10th@Hoyt defined by the architectural footprint of the residential building make it infeasible to develop a naturalistic ecosystem that treats the rain water before it being discharged to the municipal stormwater system, however the square still provides a oasis-like space in the middle of a high density city through applying the design with metaphorical nature pattern. Rain water collected from the roof being directed within various shapes of conduits is more than a formal imitation of Persian Garden, it also borrow the attitude of celebration and appreciation for water from the Iranian culture. Respect and

reverence for water have been institutionalized in ancient Iranian societies due to their socio-cultural value (Ansari, Taghvaee et al. 2008). Additionally, with the help of subtle arranged vegetations, the running water plays hide-and-seek with the plantings, whether in picture or in sound, the particular conveyance system can finds similarities with a natural stream that exist in the wild nature. Such metaphorical mimicry of natural pattern takes urban dwellers an imagination of natural scene, away from suppressive buildings and congested traffic.

More importantly, the conveyance process is exaggerated and rephrased in various ways. From the explicit rust-colored copper line to the water steps that shaped in skinny ziggurat, from the zigzag aqueduct to the Cor-Ten steel level spreaders which are perforated by colored glass dots that can be lit from below, the shape of the water is altered when flow through these structures and create forms of water falls and fountains which are familiar to the urban dwellers. Representation of such connection between rainwater to usual landscape water feature would arouse visitors' thinking of how natural source could be collected and reused in different beneficial ways. The particular conveyance system also serves as a piece of art when there's dry season, the illustrative path of water reminds visitors the diversity of climate and the changing of time.

Similar projects are Growing Vines Street at Seattle, Washington, designed by Carlson Architects, Peggy Gaynor, Buster Simpson and Greg Waddell (Figure 4.7); and Steven Epler Hall at Portland State University, designed by Mithūn Partners (Figure 4.8).

Figure 4.7 Growing Vines Street, Seattle (Photograph by Eliza Pennypacker, 2006)

Figure 4.8 Steven Epler Hall, Portland State University
(Photograph by Stuart P. Echols, 2005)

4.2 Shop Creek—Translating the Manipulation of Nature's Power

This project is at Denver, Colorado. Suburban development in the Shop Creek drainage basin had cause severe pollution and channel erosion, the bank of Shop Creek had been degraded by increased runoff (Figure 4.9), making it into a lifeless canyon with no ecological or recreational benefits, and also the source of pollution to its downstream area—Cherry Creek Reservoir, a major

recreation area in Aurora, Colorado, where sedimentation and phosphorous pollution had become a significant problem. The pollutant was collected by rains and ran through the Creek, feeding algal blooms in the reservoir, killing fish and causing havoc for the whole water body (WenkAssociates).

Figure 4.9 Erosion in the bank before the installation of the drop structures (Living Systems, Birkhäuser, 2007)

The design team—Wenk Associates and an engineering team—aimed to cut the phosphorus runoff from the creek in half, their solution—an unusually redundant system that treat the runoff in both a pond and a wetland, and the forms of the structure to help it function—is a radical departure from standard approaches to stream channel design. During the storm, the majority of the pollutant settled and is absorbed by sediment in the upper pond, later the stormwater is further polished by the wetland system where cattails and willows take up the pollutant.

One feature make this stormwater system special is the six drop structures embedded in the creek that act as energy dissipaters for the wetland

system (Figure 4.10). Each structure is made of site sand and soil mixed with Portland cement and is shaped into large crescent. Those soil-cement crescents were then stacked to shallowly stairstep down the 8ft drops in the streambed (Figure 4.11). The structure's materiality and morphology all talked to the original condition of the site, making the structure integrated within the natural setting of the plain. Such structures turn the flow of the stormwater against itself, slowing its velocity by increasing surface area of the structure's stepped profile. Also at the bottom of the drop structure, a shallow pool area made of soil-cement allows soil build up and plant growth. Another detail that make the six drops structure different is that the edges of the crescents are left unfinished, leaving an abstraction of natural outcropping, further enhanced by incidental erosion of the soil-cement, which slowly draws the storm water flowing pattern on the crescent structures (Margolis and Robinson 2007).

Figure 4.10 Six drop structures embedded in the creek
(Living Systems, Birkhäuser, 2007)

Figure 4.11 Drop structures in the dry season
(Living Systems, Birkhäuser, 2007)

Shop Creek Suburban stormwater system not only transform a heavily eroded area to a vital and self-sustaining wetland environment, but also through series of unusual form of the crescent drop structures exaggerate the power of nature and serve as an inviting demonstration of cooperative effort between human's control and natural vitality to the visitors. One constriction in this project is the limitation of public access to the site; more amenities should be included into the design to attract visitor's attendance in the art of the water treatment system. Other than being an isolated art piece in the wild plain, Shop Creek could be a more vibrant restoration project that involves not only environmental treatment but also public activities so that to invigorate the environment awareness while it's being used.

4.3 Urban Outfitters Navy Yard Headquarters—Celebrating Recycling

Urban Outfitter is a leading purveyor of clothing and home accessories. As the company grows, it has hired several young design firms to infuse new perspectives to the company, and after years of operating out of different offices around Rittenhouse Square in Philadelphia, the company decides to consolidate its design and administrative operation on League island—a formerly Navy Yard of Dock No.1 in Philadelphia. Urban Outfitters has turned to Minneapolis-based Meyer Scherer and Rockcastle (MS&R) and Charlottesville, Virginia-base landscape architecture firm D.I.R.T Studio to design its new corporate campus (Hand 2006).

In their design to reconfigure the shipyard to Urban Outfitter's office, D.I.R.T Studio deployed an on-site material recycle strategy, which is a departure from the conventional "hog-and-haul" demolition approach. The techniques they used in this project achieved the reuse of 100% of demolition debris that typically ends up in a landfill.

At the beginning of the design process, the design team initiated an examination process of the existing ground. They "unearthed" the ship yard's material palette which consisted of sweeping lengths of rail tracks, stained expanses of concrete, rusted metal grates, and industrial residue. The existing concrete paving is one important element in this palette D.I.R.T studio kept to reveal the traces of previous production at the former Navy Yard.

"Large pieces of broken-up concrete were arranged into a new pattern of paving, with interspersed tree planting and stone dust filling the crevices" D.I.R.T

studio referres to such recycle strategy as “Barney Rubble”. Listed below is the construction process for such stragegy (Figure 4.12)

1. *Remove bituminous veneer.*
2. *Break up the concrete into 2-4ft pieces.*
3. *Examine soils sub-grade for proper drainage and amend soil as necessary.*
4. *Lay out “puzzle” pieces “like painting your way out of a room”*
5. *Use skid steer to lower concrete chunks and manually shimmy them level onto existing grade.*
6. *Plant black locusts incrementally in-between a pattern of “busted” concrete pieces in tight two-foot clumps with open 10 or 12 ft gaps.*
7. *Taper the depth around tree trunks.*
8. *And compact stone dust into the crevices.*

(Margolis and Robinson 2007)

Figure 4.12 Construction process (Living Systems, Birkhäuser, 2007)

Through such simple steps, this project presents an innovative way to praise the value of reusable material. Peeling the existing condition and reconstitute the site is a common technique in landscape construction. However, in this project, the recycling and reusing of the onsite materials is emphasized by giving them new forms in composing a distinct landscape. Using materials that represent the previous history of the site would enhance the connectivity of the site and the visitors. Exposing the concrete pieces would propose witness of the transformation from an abandoned barrier concrete surface to an amusing paving pattern shaded by arrays of trees. A curiosity of how other materials could be savaged in valuable use would be encouraged. Also the random repetitive pattern of the concrete pieces and the installation of vegetation exert a strong contrast between the used-to-be ship yard and its present scene, bringing the vibrant nature to the site (Figure 4.13).

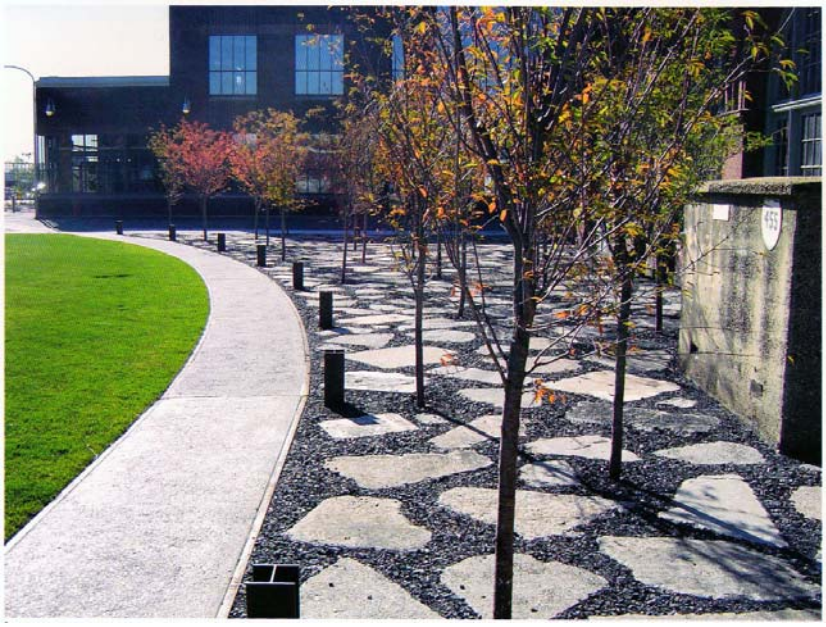


Figure 4.13 Barney Rubble after installation (Living Systems, Birkhäuser, 2007)

4.4 Allegheny Riverfront Park—Celebrating the Changing of Landscape

The project is in Pittsburgh, Pennsylvania, located in a narrow concrete embankment between an expressway and a river that floods every year (Moffat 2002). The thin reality of the site seems to restrain it in everyway from becoming an enjoyable public space. A six-lane highway on the upper level, a four-lane highway on the lower level with parking, and a twenty-five-foot-high concrete seawall made everything seems impossible (Figure 4.14). However, such piece of land is the only locations the project client Pittsburgh Cultural Trust (PCT) looked for a park, and the PCT envisioned it as an exemplary, inventive urban park to help draw people down town (Valkenburgh 2003). In the 1970s, this fourteen-block area at the edge of downtown was once Pittsburgh's red-light district, after efforts of revitalization, this area has been a cultural district that would include "not only new and renovated cultural venues and restaurants, but also residential and office space in new buildings and renovated warehouse space" (Moffat 2002).

Figure 4.14 Existing site condition in 1994 (Michael Van Valkenburgh Associates: Allegheny Riverfront Park, 2005)

The design team—Michael Van Valkenburgh Associates (MVVA) and artist Ann Hamilton and Michael Mercil—took the site's limitations as advantages to be reckoned with. While Portland, New York and San Francisco tore down water front highways to reconstitute a park, the highway next to Allegheny River was kept as it was. The lower level of the park is composed of a fourteen-foot-wide pedestrian along with bicycle path under the shade of riparian plantings. The upper level of the park is a semiformal, broader promenade overlooking the river.

The design brings pedestrian access down to the riverfront by installing twin 350-foot-long ramps that descend from each side of the Seventh Street Bridge—a suspension structure that lead to downtown (Figure 4.15). To continue the riverfront walk under an existing bridge, the designers cantilevered sections of reinforced concrete beyond the existing seawall and expanded pedestrian and bicycle path out over the water, leaving a narrow strip of earth that can be planted with flood tolerant vegetations (Figure 4.16).

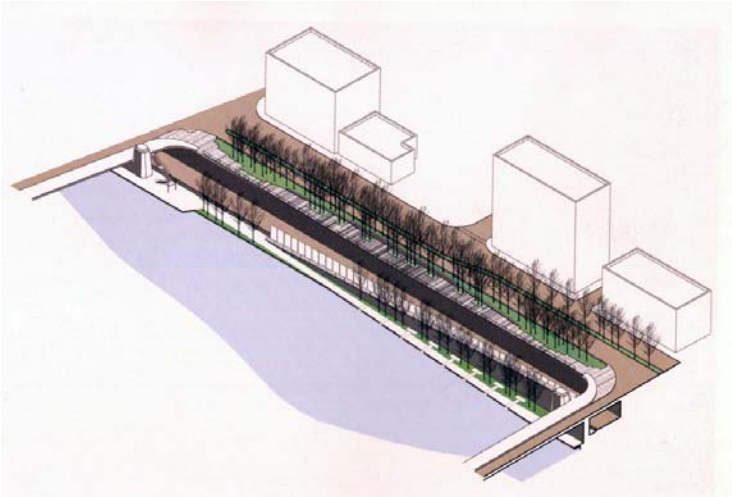


Figure 4.15 A 350-foot-long ramps connected the upper and lower parks (Michael Van Valkenburgh Associates: Allegheny Riverfront Park, 2005)

Figure 4.16 Cantilever precast during installation and completed after planting (Michael Van Valkenburgh Associates: Allegheny Riverfront Park, 2005)

The upper level of the park was intended to be “intentionally urbane” compared to the “willfully wild” of the lower part. The promenade offers views both out over the river and back toward the city. Elements already in the urban cape palette in Pittsburgh were chose to compose this elegant edge of the city.

In this project, the designer took the site as it was and further enhance and celebrate the nature cycle and its influence on urban structures. The riverfront part of the park goes under four feet of water every year, and under twenty feet on a regular basis (Urbanski 2003). Making a floodplain landscape in a limited space where the breadth or scale of real nature can never be reached is what the designers were challenged with. Instead of just copy a piece of real wild floodplain landscape from the upriver part, the designers brought in what they

called “hypernature”, an exaggerated version of a natural palette. Olmsted says that the profession of landscape architecture is to study nature and not just idealize, but to have the viewer see it. Hyper-or exaggerated nature is along this idea. Present it to the viewer so they really get it (Urbanski 2003).

In order to allow the lower part of the park behave well in floods, some techniques were applied to allow enough chaos and randomness while keeping the perfect geometric order along the riverwalk. A random tree system was developed and native trees were used along the banks of the river. The exaggeration of the density of the plant is important in the place making, because in such little space, experience of a larger landscape came from intensification (Valkenburgh 2003). The exaggeration of plants is also presented by the artist-designed screens with Virginia Creeper vines along the ramp. When riding down the river, the visitors are enfolded in this valley of trees, the vegetation screens are curtains that give an appearance of a dense, green city. To prevent the soil from erosion, large chunks of bluestone were placed between cantilevered walkway beams (Figure 4.17). The once a year flooding event was marked and celebrated by casting a pattern of reeds in to the walkway concrete, abstracting the trace of nature (Figure 4.18).

Figure 4.17 Large chunks of bluestone placed between cantilevered walkway beams (Michael Van Valkenburgh Associates: Allegheny Riverfront Park, 2005)

Figure 4.18 Pattern of reeds on walkway concrete
(Michael Van Valkenburgh Associates: Allegheny Riverfront Park, 2005)

For more than a century, city residents had turned their backs to the river, considering it a utilitarian space at best, certainly not an environmental amenity (Moffat 2002). Creating convenient access down to the river brought people back to the water. A dialectic created between the upper and lower level of the park presents either connection or contrast between floodplain landscape and civic landscape to the visitors, showing the city under the seasonality of nature (Figure

4.19). In an experience as a series of elongated linear progressions, visitors witness and understand that trees, grasses, and vines are as enduring as the hardscape and their beauty is perceived in relation to their resilience and their ability to regenerate.

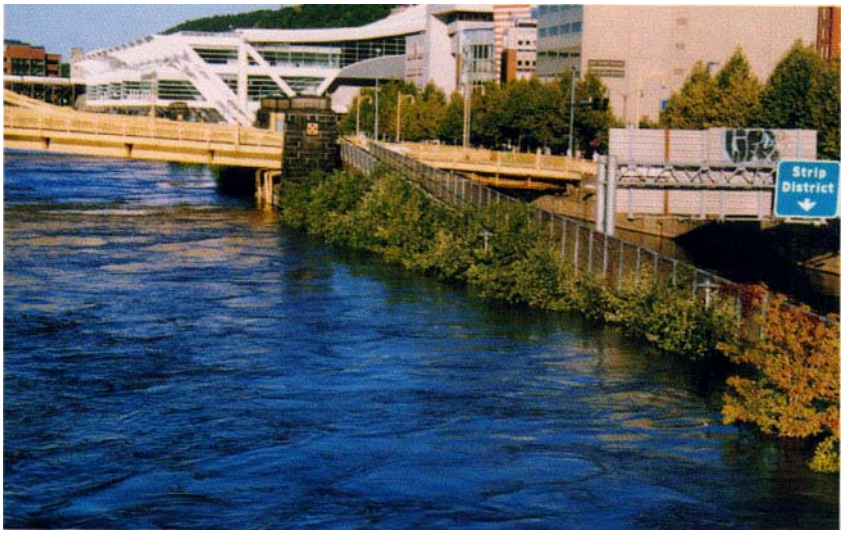


Figure 4.19 Riverfront part is submerged in water in the rain season
(Michael Van Valkenburgh Associates: Allegheny Riverfront Park, 2005)

The four case studies showed how the three meanings are incorporated into sustainable design when addressing different environmental issues. In 10th@Hoyt Courtyard, a sense of connection with nature is formed by manipulating the arrangement of hardscape, vegetations and water features, metaphoric streams and waterfalls provide a strong connection between nature and urban dwellers, the water collecting system in forms of channels and chute clearly explains the roof rainwater collection process, which encourages visitors to rethink the possibility to reutilize natural sources in an urban context. In project

of Shop Creek, exaggerate forms of the six drops not only improve water quality but also serve as eye catching element, designer's intent to allow water marking down its path and its impact on man-made structures provides a legible natural process, which abstractly illustrated how erosion formed from a flowing stream. In project of Outfitter's Headquarter, redesigning the former navy yard celebrates recycling and reusing of onsite material are, it shows the transformation of former large impervious concrete surface to a delicate paving patterns composed of broken concrete pieces, the information the site conveys to visitors is direct and palpable. In Allegheny Riverfront Park, a seasonal changing landscape transformed an abandoned riverside parking lot into a vibrant urban park; the changing landscape decides different use of the site, it provides various experiences through out the year, which reminds visitors of the existence of nature and tells the ecological story of periodical flood change.

CHAPTER 5

DESIGN APPLICATION

5.1 Project overview

Lily Branch is a creek in Athens, Georgia and a tributary to Oconee River. The headwaters start in Five Points neighborhood and terminate at the Oconee River, which is to the east of campus. The entire length of the stream is approximately 1,830 meters. Until recently, the creek had been regarded as a nuisance; campus buildings and the baseball stadium were erected over it. Large areas of concrete, asphalt, and roofs cause increased runoff and peak flows, which then be collected in underground culverts and shunted directly to the waterway. Under the radical urban development, the hydrologic function of Lily Branch has been severely impaired. Being in the lowest point, the stream collects heat, sediment, nutrients, and pollutants. Gradually, the stream turns from a functional ecosystem into an efficient gutter, moving harmful pollutants to down stream. The un-culverted campus portion of the creek locates at the south of the new Lamar Dodd Art School, which is the last on surface part of Lily Branch before the confluence with Oconee River (Figure 5.1). Obscured by invasive plants, the site had been overlooked for years until the construction of new Lamar Dodd Art School, which brought increased attention to the creek.

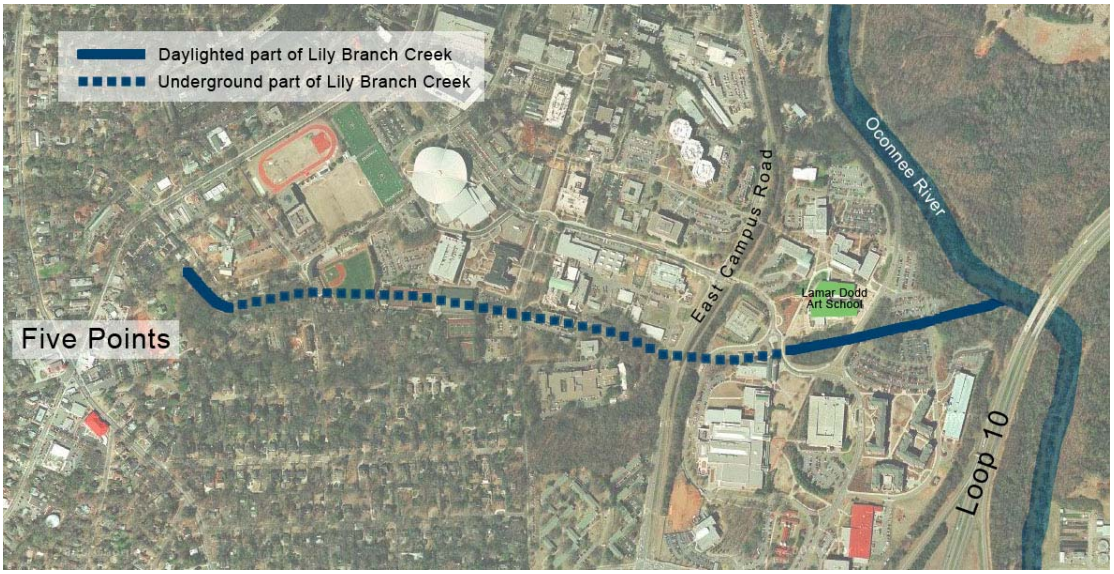


Figure 5.1 Daylighted and culveted part of Lily Branch Creek

The ecological problem of Lily Branch has drawn attentions from all kinds of departments on campus including School of Law, School of Social Work, Odum School of Ecology, College of Public Health and College of Environment and Design. The University of Georgia office of University Architects has had a long interest in sustainability and more ecological treatments have been applied into campus landscapes over the last 15 years. Now, the remediation of Lily Branch Creek is a high priority due to its new visibility.

The first task of restoration work would be identifying the problem of present Lily Branch. Percentages of impervious surface in a watershed and drainable infrastructure are dominant factors to changes in hydrologic function (Leopold 1968). In the case of Lily Branch, ratio of impervious surface in the headwater area is as high as 39.99%, and from the headwater to the on-campus part of Lily Branch, two thirds of the stream is encased in concrete culverts.

Radically increased runoff keeps cutting bank soil in storm events, leaving a highly eroded streambed (Doll, Grabow et al. 2003). Excess nutrients and pollutants in the down stream ecosystem, along with the increased stream temperature caused by urbanization and decreased tree cover, form a profound impact on living organisms in the stream. The Stroud Water Research Center found that the un-culverted down stream part of Lily Branch had lost on average 70% of the population of pollution-sensitive macroinvertebrates (Practicum 2010). And in years of testing by UGA students and Upper Oconee Water shed Network since 2002, no pollution-sensitive macroinvertebrates were found (Carroll, Monica Palta et al. 2002; Kominoski 2003; Romeis 2004; Coleman, Galang et al. 2005). According to testing result provided by Environmental Practicum, only one Chironomid larva, one crayfish, and a small mass of snail eggs existed as organisms in stream. Caddisfly were found by the CED faculties and students in May 2010. Other testing results such as high specific conductivity and bacteria counts all indicate an unhealthy condition of the stream.

In 2002, the source of the smell that made Lily Branch a “Stinky Creek” for years was found by UGA student Denise Carroll, it is caused by a raw sewage from a Five Points apartment building dumping directly into the creek. The matter was later resolved. In 2010, the creek still had a bad odor which was caused by a leaking gasoline underground storage tanks. Although the tanks have been removed, the gasoline washes from the polluted soil into the stream when it rains. One of the resolutions to this issue is to pump the groundwater and have it

treated, yet not all groundwater are continuous, part of the soil remains polluted and keeps infecting the water in the creek (Environmental Practicum 2010).

Historically, the soil condition along the waterways is also profoundly impacted through years of exploiting of natural resource associated with urban environment. Cotton farming since 1820s left the soil bare and unprotected. During precipitation events, the force of rain drops eroded soil and washed them away to down stream. Lily Branch, as well as other Georgia waters, received up to 12 inches of sediment from surrounding farming. The “red Georgia clay” regarded as typical topsoil is actually the subsoil horizon left after the topsoil was disturbed (Environmental Practicum 2010). The greater flow rates caused by impervious surfaces in urban environments then cause incision of stream banks and change the geomorphology of the stream into a channelized structure (Rosgen 1996). The result is a simplified stream with simplified plant community allowing the thriving of invasive plants (Environmental Practicum 2010). Also Oconee River is suffering from the increased sedimentation load from Lily Branch. Historically, the site had a rich variety of plants that are distributed along the riparian zone and formed a complete plant succession. Urbanization reduced the size of riparian zones, simplified and reduced the number of plant species while exotic plants furiously invaded, which made it harder for native species to reestablish.

It is imperative for the University of Georgia to look into the remediating plan for Lily Branch. There have been several plans generated by different departments in University addressing the restoration of the stream, most of which

focus on the un-culverted part of the stream to the south of Lamar Dodd School of Art, the proposed plans all aimed at bringing the creek back to a better health and restore its ecological functions. Also the plan for remediating Lily Branch consists with guiding principles of UGA Master Plan as well as the Campus Sustainability Initiative (Environmental Practicum 2010).

5.2 Further value in restoration of Lily Branch

5.2.1 Artful element

The Lamar Dodd School of Art is right next to the end section of lily branch, the buildings in close distance also include Performing Art Center, Hugh Hodgson School of Music and the newly built Georgia Museum of Art. In such an artistic atmosphere where events of creation and display of different types of art all collectively happened every day, the area has been seen as more than an ignored natural space that merely calls for environmental consideration, but also a space that potentially provides an inspirational artful experience for the students nearby. Sitting just outside the flood plain of Lily Branch, the Lamar Dodd School of Art is tightly in bond with this natural wild space. The building of art school is designed by Menefee & Winer Architects and finished in 2008, this 172,000-square-foot facilities serves students with classes of Painting and Drawing, Fabric Design, Printmaking and Book Arts, Graphic Design, Scientific Illustration, Foundations, Art Education, Digital Media, and Photography. Modern studios, lecture halls, galleries, and a media center are all included under the same roof. The interior of Lamar Dodd School of Art building is full of exhibitions

of art works from students and faculties, only by touring around inside the building one could be impressed by the art atmosphere (Figure 5.2 and 5.3). The outdoor environment of the building is designed featuring environmental beneficial features. An innovative stormwater management system presents artful conveyance of water, it includes a rain garden retaining and treating rainwater collected from the roof and the onsite impervious surface. The water will be further directed to the lowest point of East Campus area — Lily Branch stream.

Figure 5.2 (Left) Main entrance of art school building, the art pieces contrast with the nature elements outside the window
Figure5.3 (Right) Fabric art piece decorates one corner of building facade

5.2.2 Potential recreational values

To the south of Lily Branch, locate the Joe Frank Harris Common Dining Hall, Ramsey Center and East Campus Village dorm area. The recreational and housing facilities operate with the art education zone to form the vitality of East Campus. In a conceptual plan from Office of University Architects for Facilities Planning, the planning department of UGA envisioned Lily Branch as a green

space that connects the surrounding functional areas “arts”, “recreation” and “housing”, it can also serve as an entrance to the Greenway corridor that continues all the way to north campus (Figure 5.4).

The concept was further developed into an advanced circulation plan for East Campus. The existing River Road running across Lily Branch will be turned into a pedestrian only pass. The vehicular connection will be moved outwards to the east side of East Campus Village dorm area, an outer loop that lines up all the facilities would be the major road providing vehicular access in East Campus (Figure 5.5).

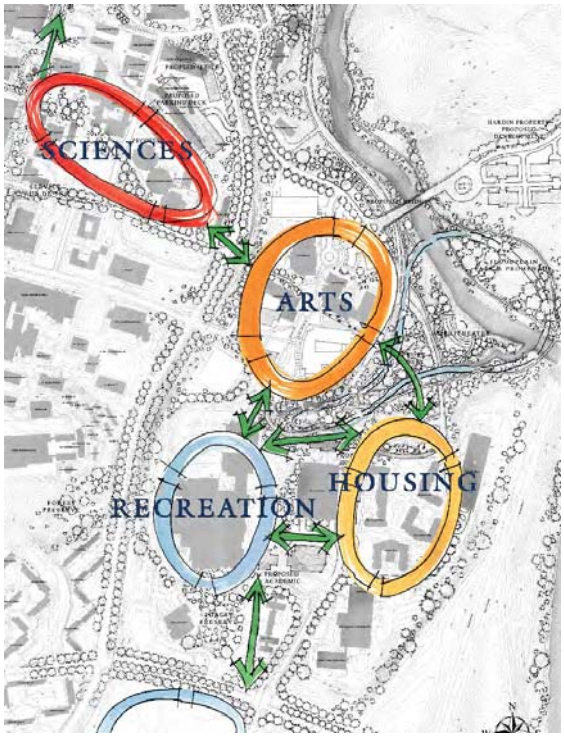


Figure 5.4 Conceptual plan for East Campus
(Office of University Architects for Facilities Planning)

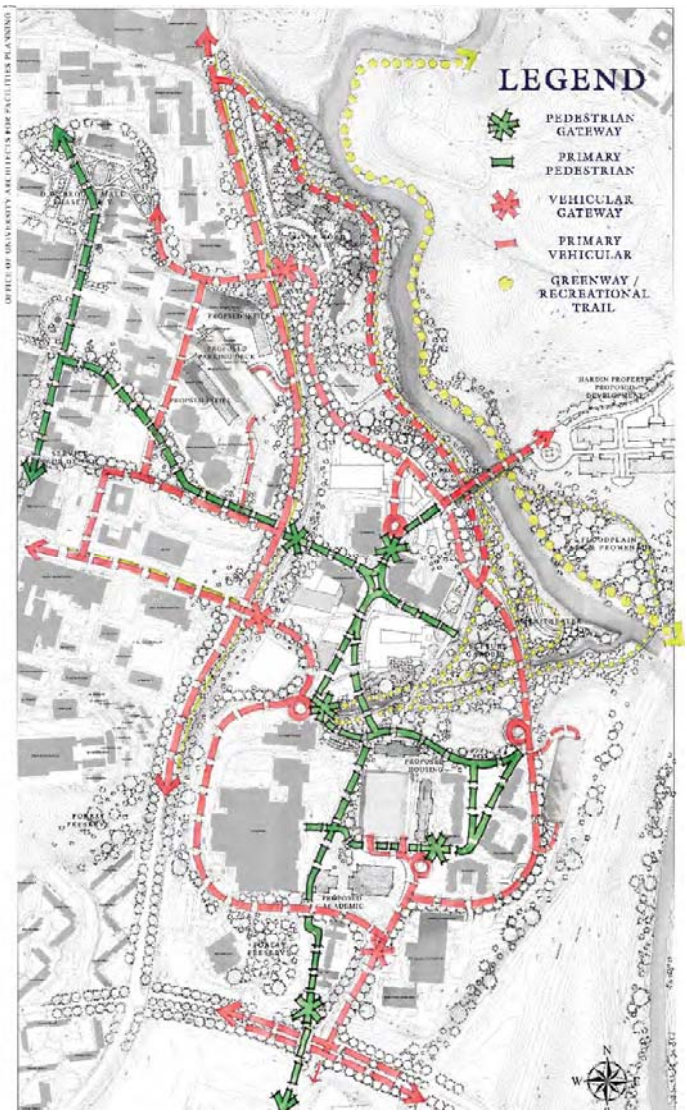


Figure 5.5 Proposed circulation plan for East Campus
(Office of University Architects for Facilities Planning)

5.3 Artfully restore Lily Branch to increase environmental awareness

5.3.1 Site area

The scope of this design includes space confined by Lamar Dodd School of Art, Joe Frank Harris Commons, East Campus Deck, East Village Dorms, East Village Deck and North Oconee River. The entire area is 19.6 acres (855,333 square feet). The project area includes the degraded Lily Branch Creek, four

surface parking lots serving East Campus, and River Road running across the creek (Figure 5.6). First, the new plan addresses the stormwater management for east campus. There are 6 pipe outlets directing the stormwater collected from the hard surfaces in East Campus to Lily Branch (Figure 5.7). The water from the rain garden, which is located west of School of Art, is left uncontrolled when flowing down to Lily Branch. The new plan is created based on the former works on the restoration of Lily Branch which mostly focus on the environmental aspect in stream restoration. Instead of providing another traditional stream restoring effort, the new design would try to contribute ideas to the aesthetic values in the enhancement of Lily Branch, and aim at attracting public attention and increasing environmental awareness.

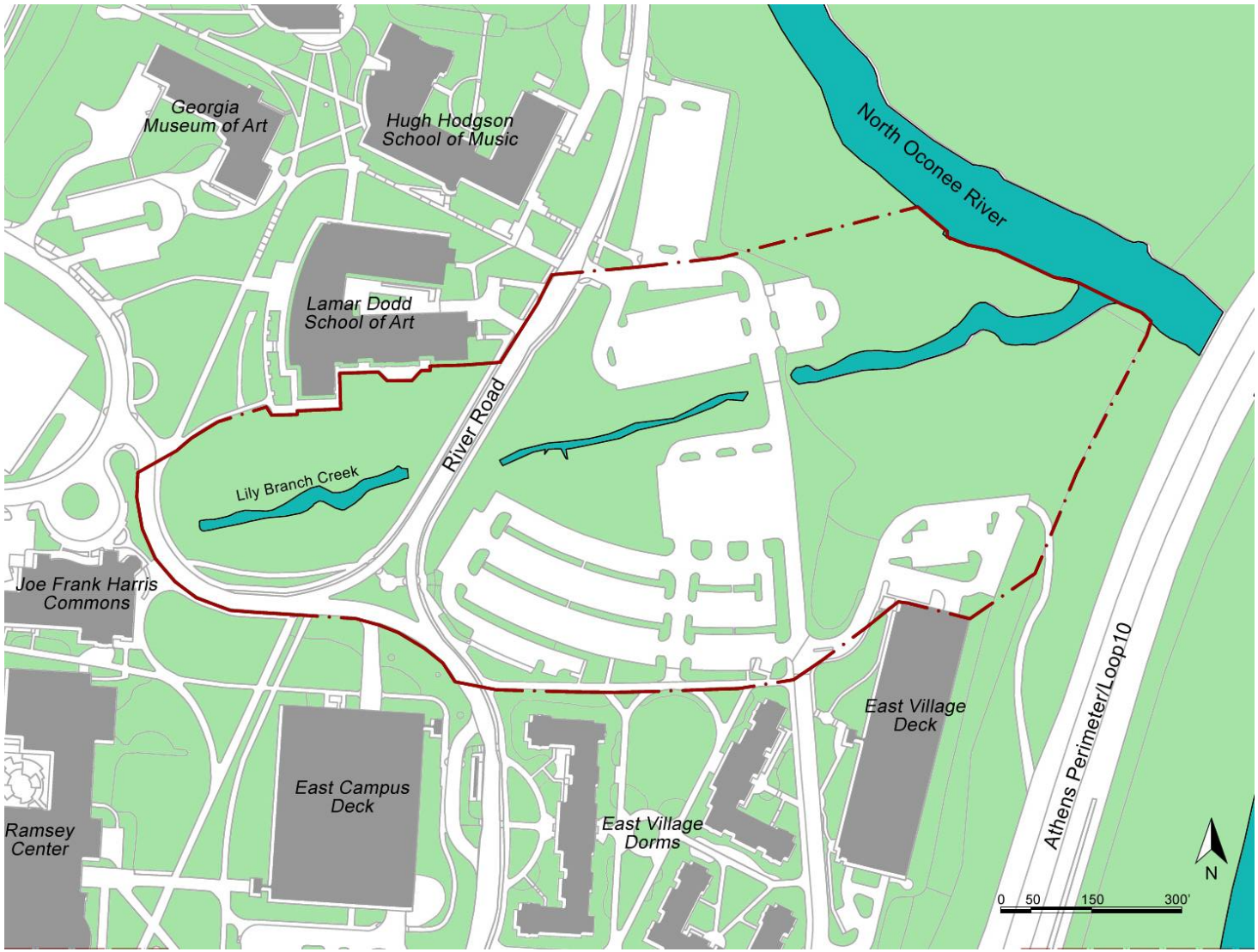


Figure 5.6 Existing condition of project area

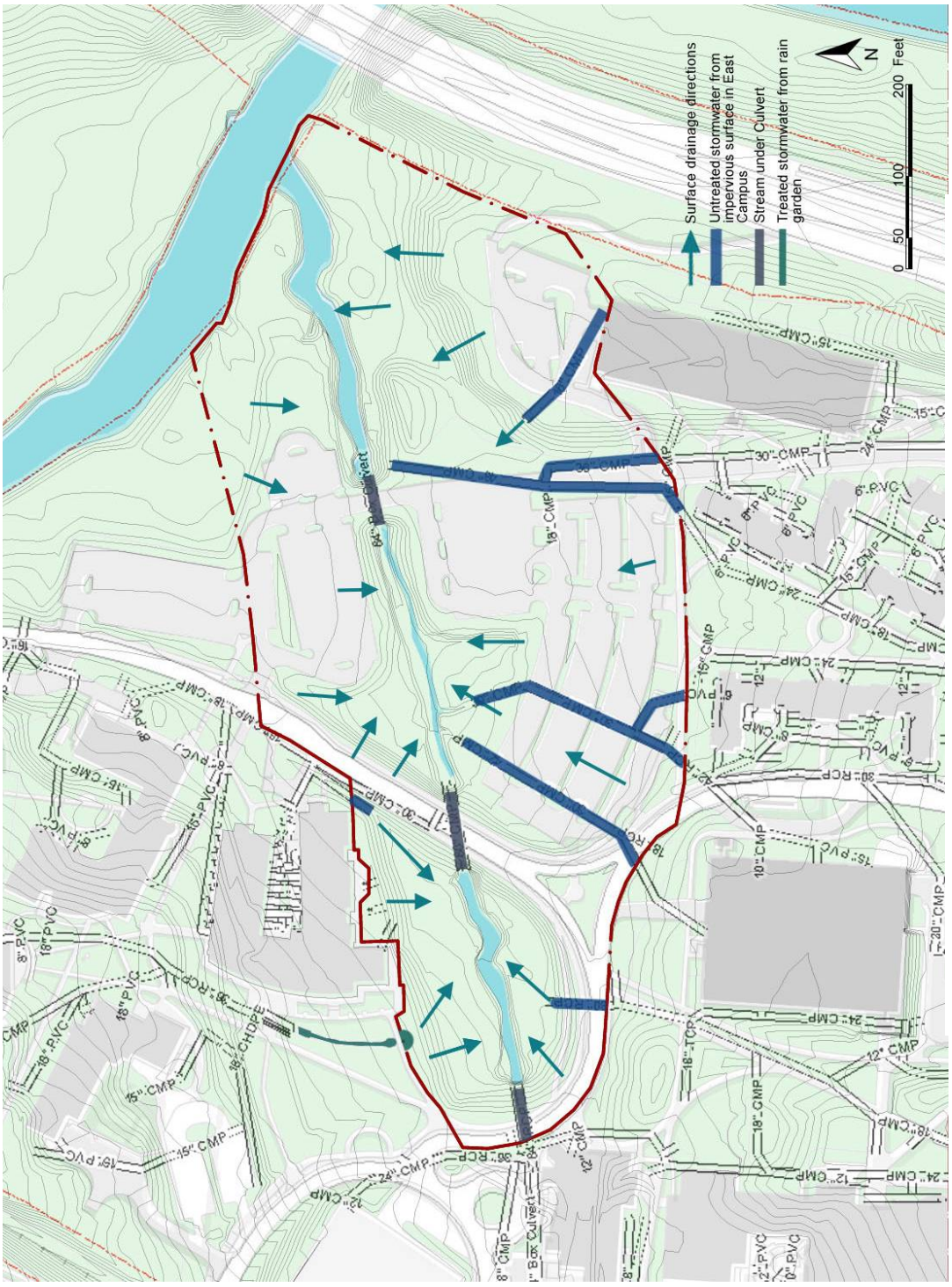


Figure 5.7 Existing drainage plan for East Campus

5.3.2 Master plan

The design application for enhancement of Lily Branch aim at four major purposes: reshaping and stabilizing the stream, treating stormwater directed from East Campus before it enters Lily Branch, providing recreational space for students and other potential users, attracting public attention to increase environmental awareness. In order to achieve those goals, a campus recreational green area that is both environmentally and socially sustainable is created; it includes functional features and applies innovative forms on them.

In the new plan (Figure 5.8), four impervious surface parking lots are removed, providing more pervious surface to decrease flow of stormwater runoff and reduce the potential erosion of Lily Branch stream bank. Instead of reconstituting the area into an entire green space, two dorm buildings are proposed adjacent to the existing East Campus Village. It is an expansion of the existing living area in East Campus and creates possibility to increase university incomes through providing more dormitory beds for on-campus students. The existing River Road running across Lily Branch is turned into a pedestrian only pass, connecting the living and recreational areas in East Campus with other parts of the campus. The vehicular connection was made by extending the existing road between East Village Dorm and East Village Deck to and across the stream, which consists with the circulation plan from Office of University Architect.

Figure 5.8 Master Plan

Mounds and Rain Gardens

The series of mounds are the essential eye catching forms featured in the new plan; they are functional structures that are installed to direct water flow in traditional rain gardens. The form of these mounds came from functional purpose of them, which is to distribute the stormwater flow velocity by distributing the flow into several directions. A branching pattern of water flow implies the shape hide between them, which further develop into series of mounds (Figure 5.9). There is also a metaphor developed from natural scene embedded in the form of the mounds. The sinuosity of the water path between the mounds symbolizes the hydro pattern in nature, where hundreds of branching rivers merge into the ocean; the design simplifies this pattern and represents it in a much smaller scale.

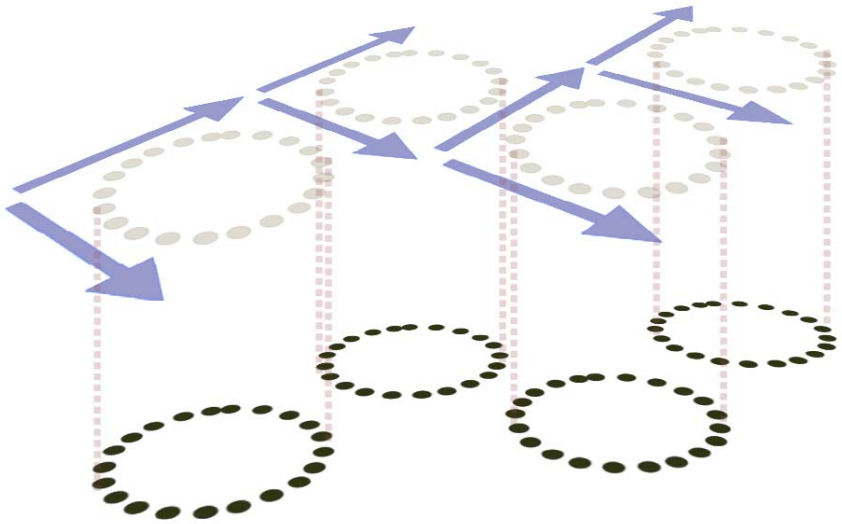


Figure 5.9 Forms originated from the proposed stormwater flow pattern

Those mounds are regularly placed in a linear order to imply the flow direction in the four rain gardens, which are designed to treat the water collected from East Campus impervious surfaces and underground culverts. The exaggeration and repetition of the forms make the mounds a piece of land art, attracting the passersby, bringing them to the site to explore more stories in a restored area that was once an inaccessible wild mass. The mounds are placed according to the new topology of the site and the location of the piping outlets; the gently sloped base of the rain gardens directs the water through the series of mounds, allowing water to find its own way in the curvaceous paths (Figure 5.10). Instead of letting the treated water directly flow to the floodplain of the river, weirs are installed at each exit of the water path in order to hold the water longer in the rain gardens. Also the weirs are part of the pedestrian paths; they are designed to incorporate user involving structures into the rain gardens (Figure 5.11). In this process the velocity of the water flow is reduced, allowing sedimentation and pollutants being taken up by the rain garden plants before the water enters the stream.

The four rain gardens treat different water source from East Campus. The north west one addresses the water run through the existing rain garden to the west of Lamar Dodd School of Art, the water culverted in an underground pipe from the existing detention pond, and the runoffs from a piping outlet next to the school of art building. The other three rain gardens locate in south of the site are all designed to treat runoffs from the piping outlets and the overflow from the hard surface in south part of East Campus.

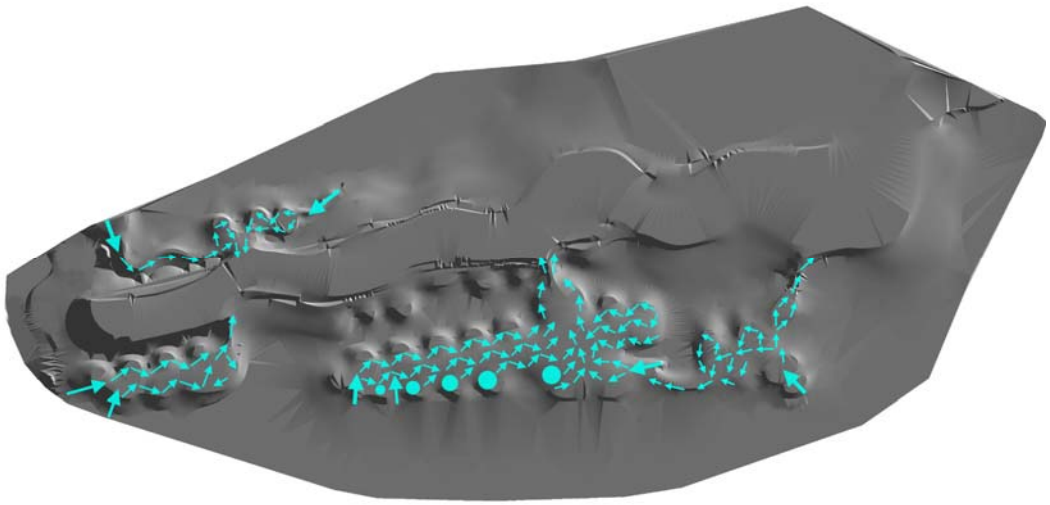


Figure 5.10 Flow directions between mounds in rain gardens

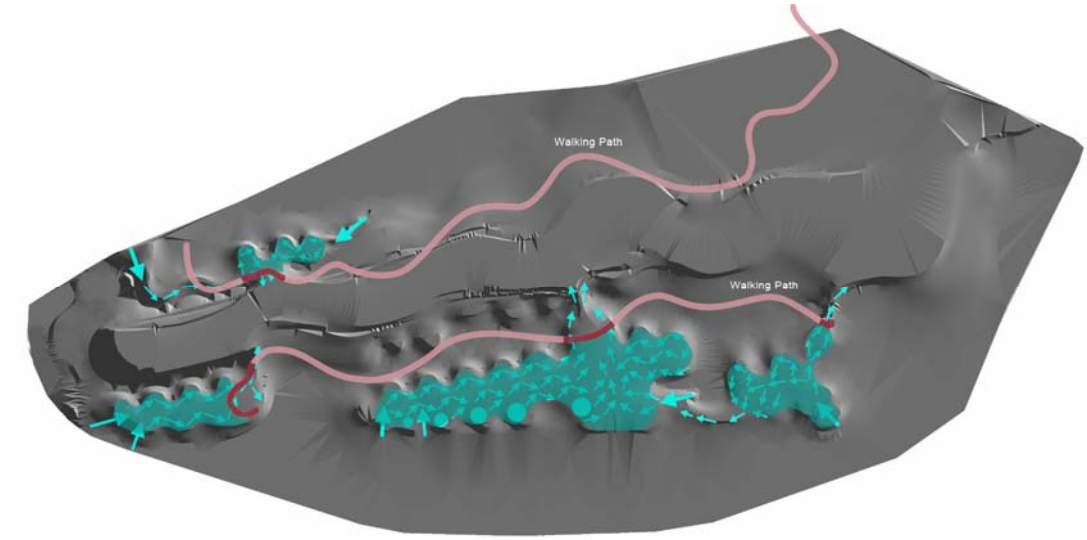


Figure 5.11 Weirs hold water in the rain gardens

Another functional purpose of the mounds is that by creating the intimate scale structures, users are welcome to use the mounds during dry season. Each

individual mound is an irregular half sphere that has a gentle slope on one side and a steeper slop on the other. The gentle slope is a user friendly shape which could be a surface to lied on, lean on, or sit on, and the different combination of the facing of those mounds creates different size of space (Figure 5.11). The mounds are covered with Tall Fescue (*Festuca arundinacea*) which is a low maintenance high wear resistance Georgia turf grass, it is also dry and heat tolerant. The new landforms that confine the rain gardens and the shape of mounds are all generated by moving the onsite dirt. In order to reduce erosion, matting vegetations and river rocks are placed between the mounds to stable the base of rain garden and foot of mounds. There are randomly planted native grasses shooting from the rocks between the mounds.

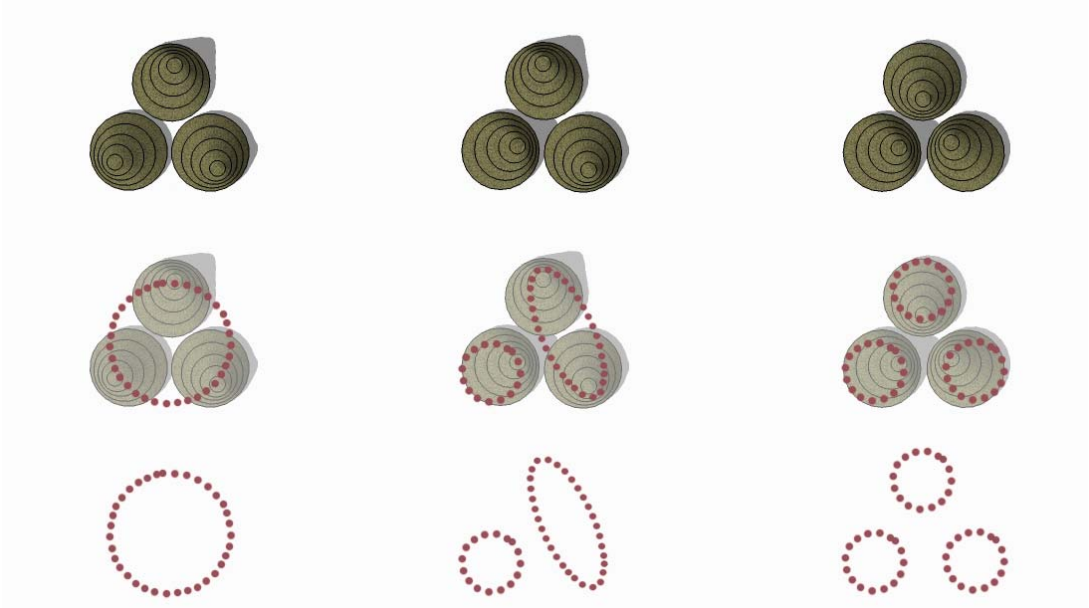


Figure 5.12 Different combination of mounds facing creates different size of space

Stormwater Wetlands and Plunge Pools

After running through series of mounds and being purified in rain gardens, the excessive water is going to be gradually released onto the floodplain of the stream. Following the topography, the water will be mostly collected in the wetlands and be further purified before it finally enters Lily Branch; step pool conveyance is installed at the entrance where water enters the stream. Four plunge pools are installed on one side of the biggest rain garden to the north of East Village dorm area, the plunge pools are used for treating the first flush of stormwater from the piping outlets and decreasing the first flush erosion; after the overflows are gradually released into stream floodplain, the plunge pools would hold the water contained in the pools and store them for irrigation during the dry weather. There are 1.8 acres of rain gardens and 1.1 acres of stormwater wetlands in total on site (Figure 5.13).

Circulation

In order to encourage more interactions between users and the sustainable features on site, a circulation system is designed to prompt visitors' involvement into the restored natural space (Figure 5.14). There are two major pedestrian paths in the design. One is East-West direction that consists of 5 feet of walking path and 6 feet of bicycle path, it starts as east as the confluence of Lily Branch and Oconee River, connecting East Campus to the communities east of North Oconee River. After meandering with the stream in the dense woods, the pedestrian path intersects with the vehicular path and continues as a

boulevard in front of East Village Dorms, leading people across the living section of East Campus. Three eye-catching rain gardens are placed along this major pedestrian path. Secondary pedestrian paths branch out from the major path, providing closer access to the stream for those who are attracted by the landscape. Gathering and seating space are proposed at the intersections of secondary pedestrians, they are designed to offer users a platform for better observing and learning. Another main pedestrian path is a north-south-direction bridge arching over Lily Branch Creek, connecting East Campus with other parts of University. It is a reconstruction of the former River Road. The bridge are specially designed for stream observation, parts of the ground surface on the bridge are left transparent by using layers of reinforced wire mesh instead of concrete paving, they serve as on-ground windows where people could look through to the stream underneath. The north end of the bridge connects the outdoor studio/exhibition area designed for art school, it is a cantilevered platform extended from the existing outdoor space of art building. A secondary pedestrian path starts from the south-west corner of Lamar Dodd School of Art, continuing the existing pedestrian path across the rain garden and then to the natural space of floodplain landscape; it leads people walking along the stream and then connects to the trail of Athens Green Way.

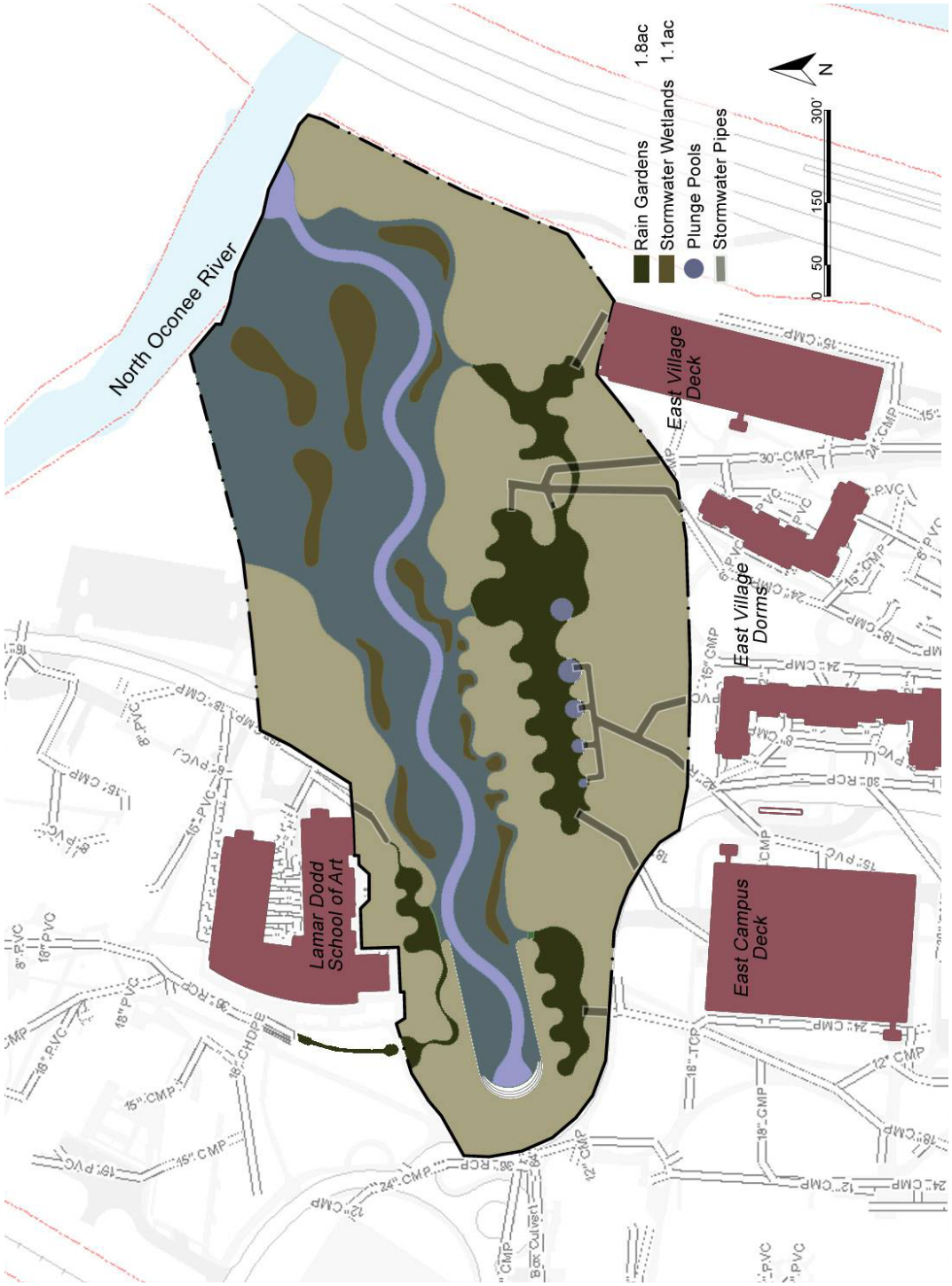


Figure 5.13 Layout of rain gardens and stormwater wetlands

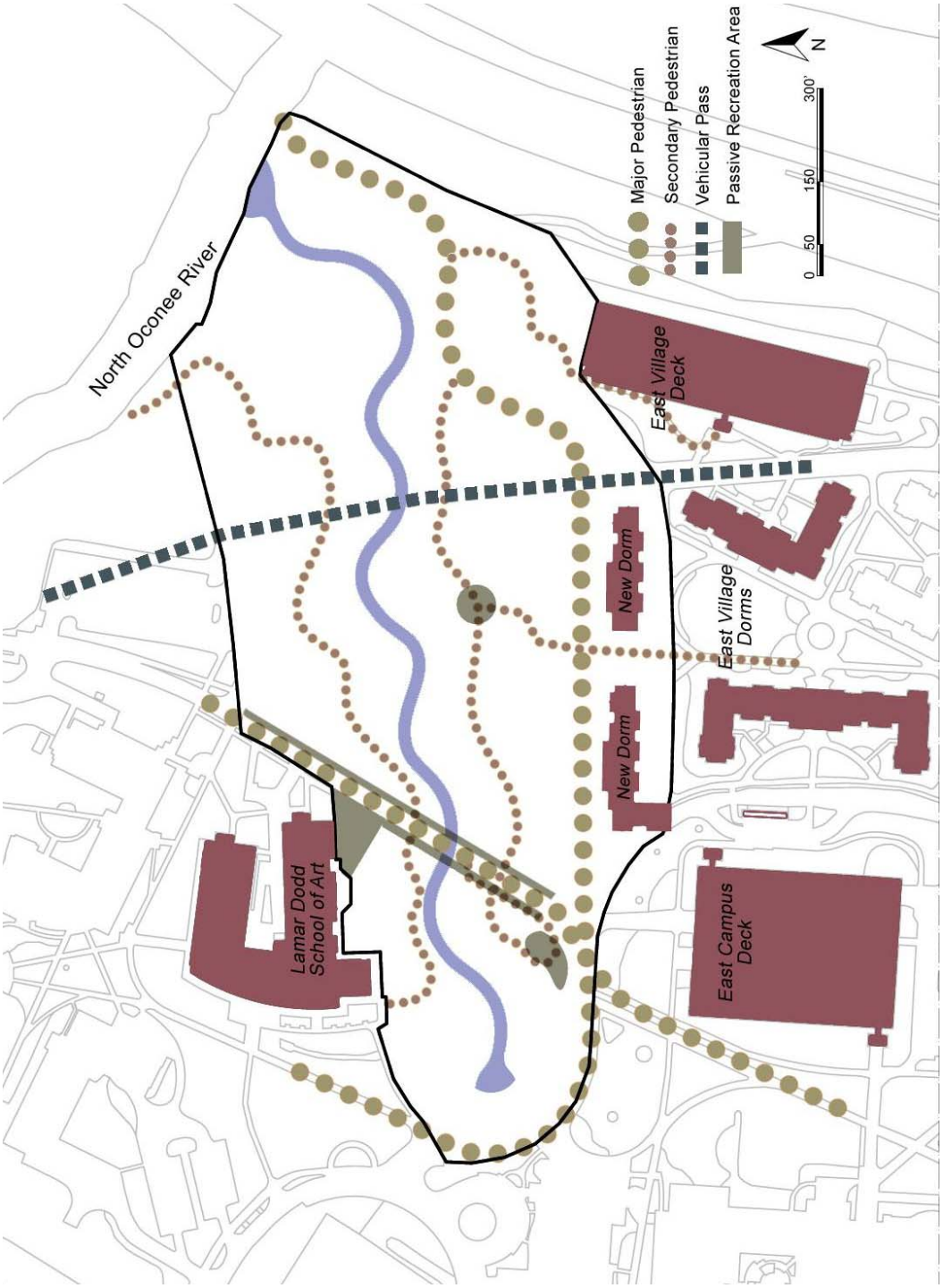


Figure 5.14 Circulation plan

Stream Restoration

One of the purposes of Lily Branch enhancement plan is to reshape and stabilize the stream. The channel pattern of the stream is defined according to the research and assessment efforts done by second year MLA students. According to Rosgen stream-classification system (Rosgen 1996), Lily Branch is classified as stream type C, which has a bankful width of 21 feet, a meander amplitude from 63 feet to 105 feet and meander wavelength from 125 feet to 210 feet. The new channel pattern follows the calculated data and properly adjusts the geometry of the meander, the spacing of riffles and pools in consideration of the location of rain gardens and new landforms (Figure 5.15). There are also some in-stream structures installed to protect the streambank. Rock vanes constructed with boulders are placed on outside of meander bend to redirect the thalweg away from the streambank and toward the center of the channel. They also improve in-stream habitat by creating scour pools and providing oxygen and cover (Doll, Grabow et al. 2003). The placement of the rock vanes also serves as a potential close access to the stream for people from the streamside pedestrian paths. Some of the vanes are built with woody debris for habitat enhancement. Both rock vanes and cross vanes are installed in the upper stream area where flow velocity is comparably higher, series of vane structures would redirect stream flow in order to minimize erosion, stable the streambank and offer potential habitat if planted with indigenous vegetations.

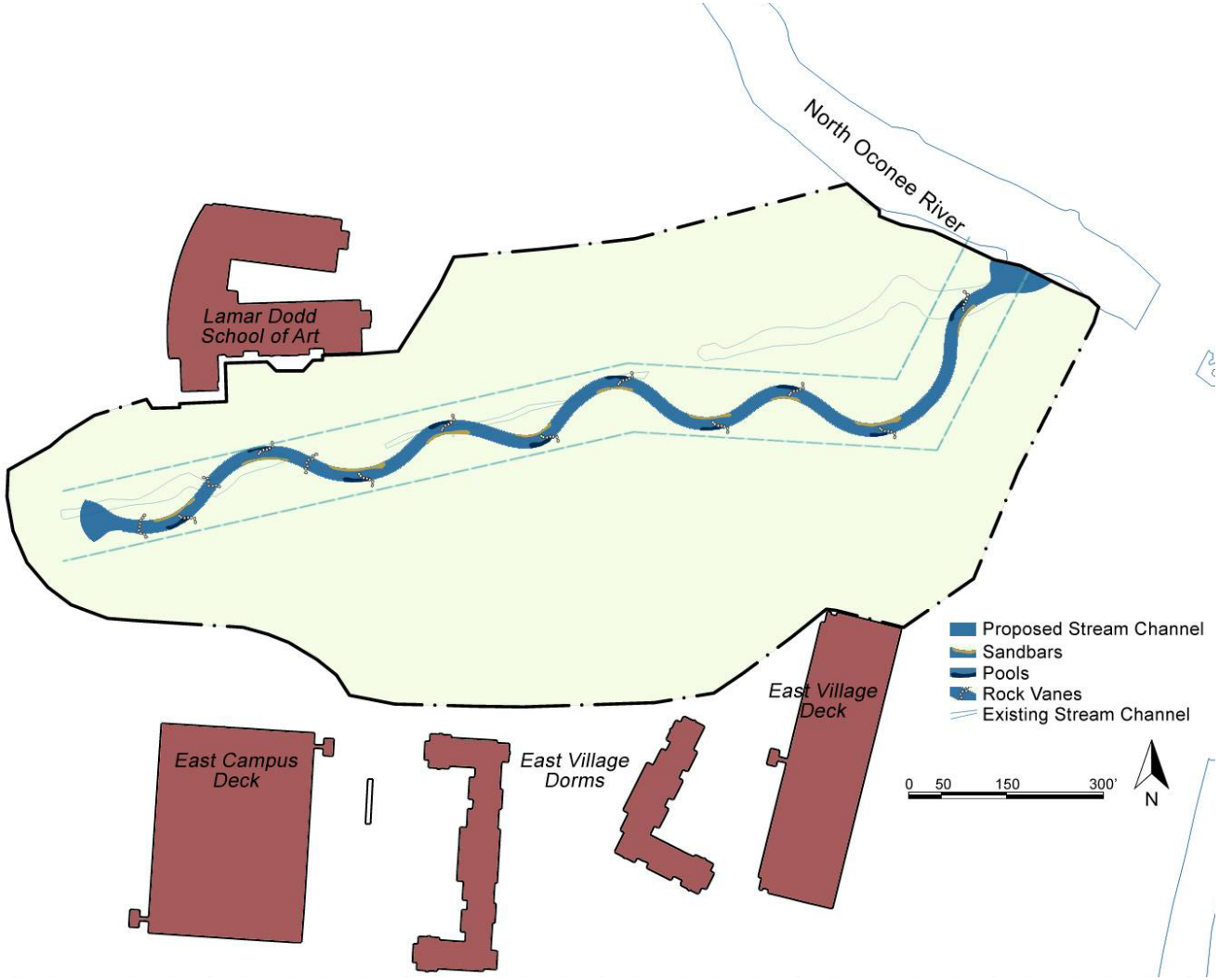


Figure 5.15 Stream channel pattern and in-stream structures

Vegetations

Rain garden shrubs:

Winterberry	Ilex verticillata
Arrowwood	Viburnum dentatum
Buttonbush	Cephalanthus occidentalis
Summersweet Clethra	Clethra alnifolia
Wax Myrtle	Myrica cerifera
Chokeberry	Aronia melanocarpa
American Beautyberry	Callicarpa americana
Bottlebrush Buckeye	Aesculus parviflora
Inkberry	Ilex glabra
Oakleaf Hydrangea	Hydrangea quercifolia
Virginia Sweetspire	Itea virginica

Rain garden grasses and sedges:

Broomsedge Bluestem	Andropogon virginicus
Giant Cane	Anrundinaria gigantea
River Oats	Chasmanthium latifolium
Purple Lovegrass	Eragrostis spectabilis
Gulfhairawn Muhly	Muhlenbergia filipes
Switchgrass	Panicum virgatum
Starrush Whitetop	Rhynchospora colorata
Indiangrass	Sorghastrum nutans
Eastern Gamagrass	Tripsacum dactyloides

Rain garden herbaceous:

Georgia Asters	Aster georgianus
Blackeyed Susan	Rudbeckia hirta
Lobelia	Lobelia inflata
River Oats	Chasmanthium latifolium
Cardinal Flower	Lobelia cardinalis
Goldernrod	Solidago canadensis
Ironweed	Vernonia altissima
Joe Pye Weed	Eupatorium purpureum
Swamp Mallow	Hibiscus moscheutos
Swamp Milkweed	Asclepias incarnata
Cinnamon Fern	Osmunda cinnamomea
Royal Fern	Osmunda regalis

Rain garden ground covers:

Shuttleworth Ginger	Hexastylis shuttleworthii
Partridge Berry	Mitchella repens
Zoysia	Zoysia Spp
Liriope	Liriope spicata
Mondograss	Ophiopogon japonicus

Upper land trees:

White Oak	Quercus alba
River Birch	Betula nigra
American Beech	Fragus grandifolia
Tulip Poplar	Liriodendron tullipifera
Loblolly Pine	Pinus taeda
Southern Magnolia	Magnolia grandiflora

Low land trees:

Eastern Redbud	Cercis canadensis
Flowering Dogwood	Cornus florida
Yaupon Holly	Ilex vomitoria
Eastern Redcedar	Juniperus virginiana
Sweetbay	Magnolia virginiana
Red Mulberry	Morus rubra

Shrubs:

Hearts-a-bursting	Eunonymus americanus
Inkberry	Ilex glabra
Yaupon Holly	Ilex vomitoria
Virginia Sweetspire	Itea virginica
Wax Myrtle	Morella cerifera
Devilwood	Osmanthus americanus
Red Chokeberry	Photinia pyrifolia

Wetland:

Sweetgum	Liquidambar styraciflua
Hazel Alder	Alnus serrulata
Buttonbush	Cephalanthus occidentalis
Virginia Sweetspire	Itea virginica
Bushy Bluestem	Angropogon glomeratus
River Oats	Chasmanthium latifolium
Switch grass	Panicum virgatum

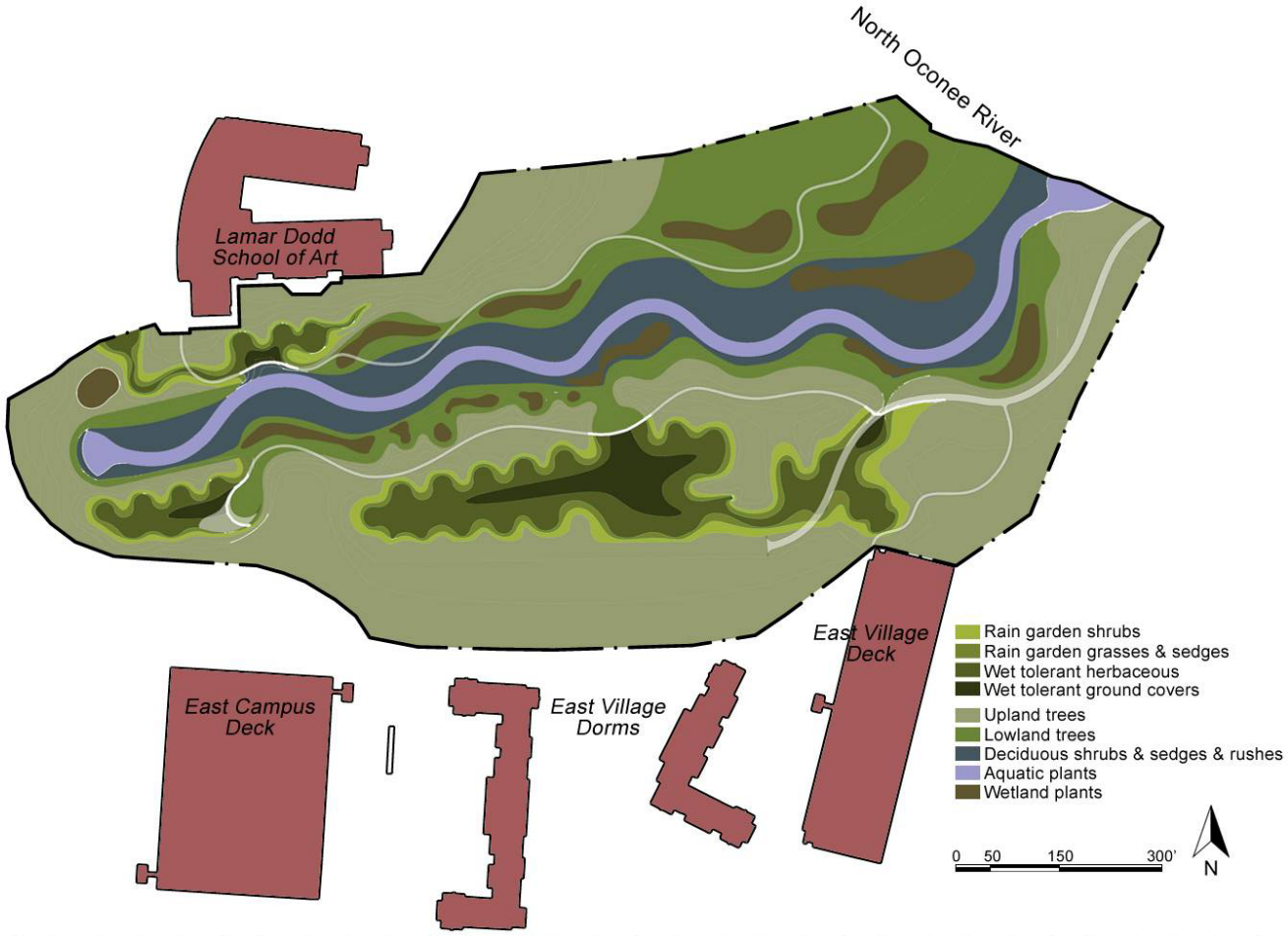


Figure 5.16 Planting plan

Maintenance

Mounds in raingardens are covered with Tall Fescue (*Festuca arundinacea*), mowing is required once a year to keep it in 2-3 inches height. Although there are river rocks and matting vegetations installed between the mounds to reduce erosion, flowing water in each storm events would gradually cut the earth off the mounds. In years, the regularly placed mounds would lose its original order due to different shearing force from flowing water; it reveals the process of transforming from a pattern that implies strong human control over a land to a randomness that presents natural impact on the designed landscape, the changing process is designed to be visible to the visitors. In the four rain gardens, each weir at exit of water path is installed with a filter structure, collecting the sedimentation from continues erosion. Monthly cleaning of the filter is required to prevent clogging.

The design intents to allow the original shape of series of mounds fading away by continuous washing in the short term, but in order to keep the site functional as it is designed to be, the site is in need of regarding to its original form in every ten or fifteen years.

5.3.3 Bird's eye views and sections

Two illustrations show the proposed stream enhancement impression when mature vegetations are grown (Figure 5.17 and 5.18).

Two sections were generated to illustrate the profile of the reshaped landform, they also illustrate the placement of raingardens, wetlands and stream.

Section A-A' shows the section cutting through the building of art school, the planted slope and rain garden at the foot of the building, the stream, flood plain, boardwalk and the rain garden on the other side of the stream. Section B-B' shows the section cutting through the new dorm building, rain garden, plunge pool, boardwalk, flood plain, stream and wetland (Figure 5.19).

5.3.4 Detail plans and enlargements

The first detail plan shows the rain garden closest to Lamar Dodd School of Art building (Figure 5.20). This rain garden addresses stormwater came from the existing rain garden to the west of the art building, the stormwater from piping outlet at the south-east corner of the building. Mounds from 15 feet to 24 feet in diameter are placed within the rain garden, creating visual interests and natural seating structures. Between the rain garden and the art building is a strip of vegetated gentle slope; trees are planted in mound-shape tree planters to enhance the repetition of forms. The series of planters continue to the platform of outdoor studio space. Those mound-shape tree planters also serve as seating structure to invite people to the area. Weir structure is installed to hold the rain water in the rain garden and let them infiltrate in 24-36 hours; it is also a walkable structure that combines with the stream walk to direct people across the rain garden and experience the stormwater treating process.

The second detail plan shows the raingarden at the south-west corner of the site (Figure 5.21). It addresses rain water comes from the piping outlet at the bottom of the site. Mounds from 15 feet to 24 feet in diameter are placed in the

rain garden, providing natural seating for the users. At the beginning of the stream walk are a wood patio and a concrete stepped seating structure embed into it. The wood patio is a raised structure that provides an open gathering space and a platform for better view of the rain garden. The concrete seating is a sunken structure that is sometimes partially under water, the stepped seating faces the exit of water in raingardens where the treated stormwater is released on to the floodplain of the stream. Users would experience the different look of the concrete circle structures when there's various amount of rainfall during the year. The placement of patio and seating provide a space where natural process intersect with human use and enhance the experience of period flow change by presenting the different water level on lower part of the concrete seating.

The third detail plan shows the pedestrian bridge running above Lily Branch (Figure 5.22). The bridge is a reconstruction of the former River Road. Making an arch bridge instead of encasing stream into culvert under the bridge allows the stream access to its floodplain. The bridge not only provides pedestrian connections between the two sides of the stream, it also offers a linear recreational area holding a majority of human activities above the stream, which would act minimal impact on the stream ecosystem. The bridge is 55 feet wide as it was as a vehicular road, two side of the pedestrian are kept, the center vehicular lane is turned into rectangular planting beds, which are intersected by patches of transparent ground paving made of layers of reinforced weir mesh that allows visual access. The planting beds are planted with native meadow grass in Georgia, which require little maintenance; it serves as a natural mat on

the bridge for users to lie on. The on ground transparent surface makes the views under bridge visible, it incentivizes curiosity from people and allows stream ecosystem observation. The whole bridge provides a higher point for better view ot the entire stream.

The last detail plan shows the rain garden to the north of the East Village Dorm area (Figure 5.23). It addresses the stormwater came from piping outlet on the south bottom of the site. Mounds from 15 feet to 24 feet in diameter are placed in the rain garden, providing a series of natural seating structures. Five different size plunge pools are installed at the edge of the rain garden; they are to dissipate water velocity of incoming runoff from the piping out let, and contain the water for irrigation in the dry weather. Existing piping lines are redirected into five branches to disperse the stormwater into the plunge pools. The plunge pools could store the water when there's dry weather, and it could be used for irrigation for onsite plants. A boardwalk branches out from the major pedestrian path, leading people across the rain garden to a ring of seating on the concrete patio. The patio is half sunken into the rain garden with tilted edge that could be periodically under water, the different water level during different time of the year would mark down a pattern of stains on the white concrete, which implies the period flow change to the users. Also the mounds are placed according to the slightly tilted topography of the rain garden; different patterns of uncovered mounds would appear when the water floods to different level, the using of the area would also alter according to the periodic flow change (Figure 5.24).

Figure 5.17 Bird’s eye view 1

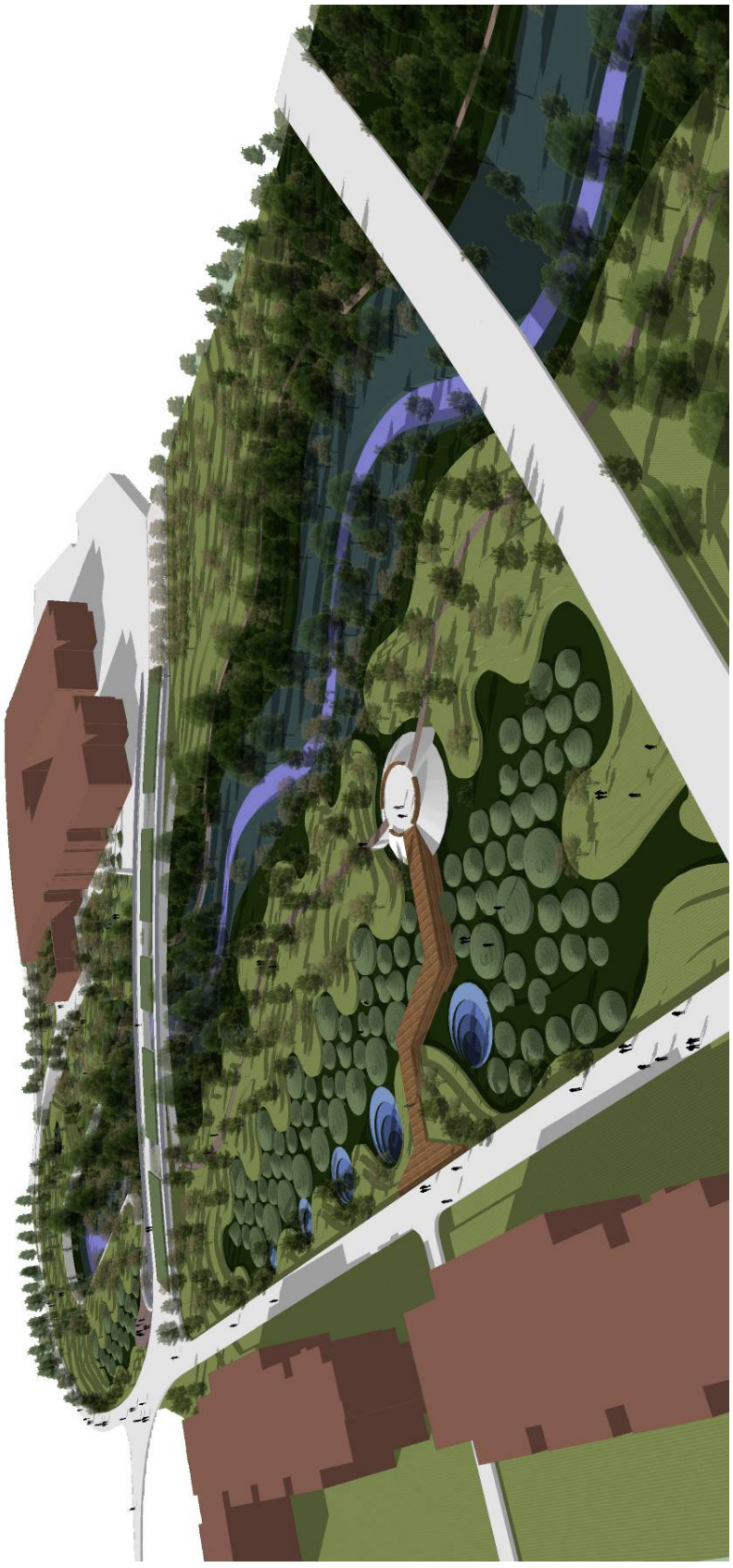
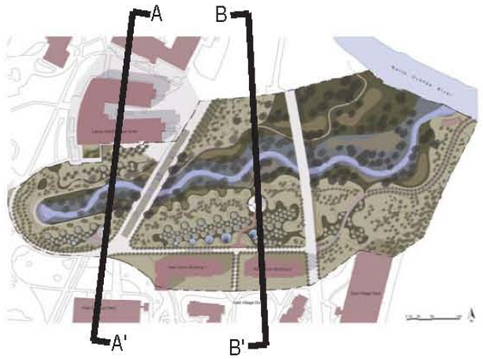
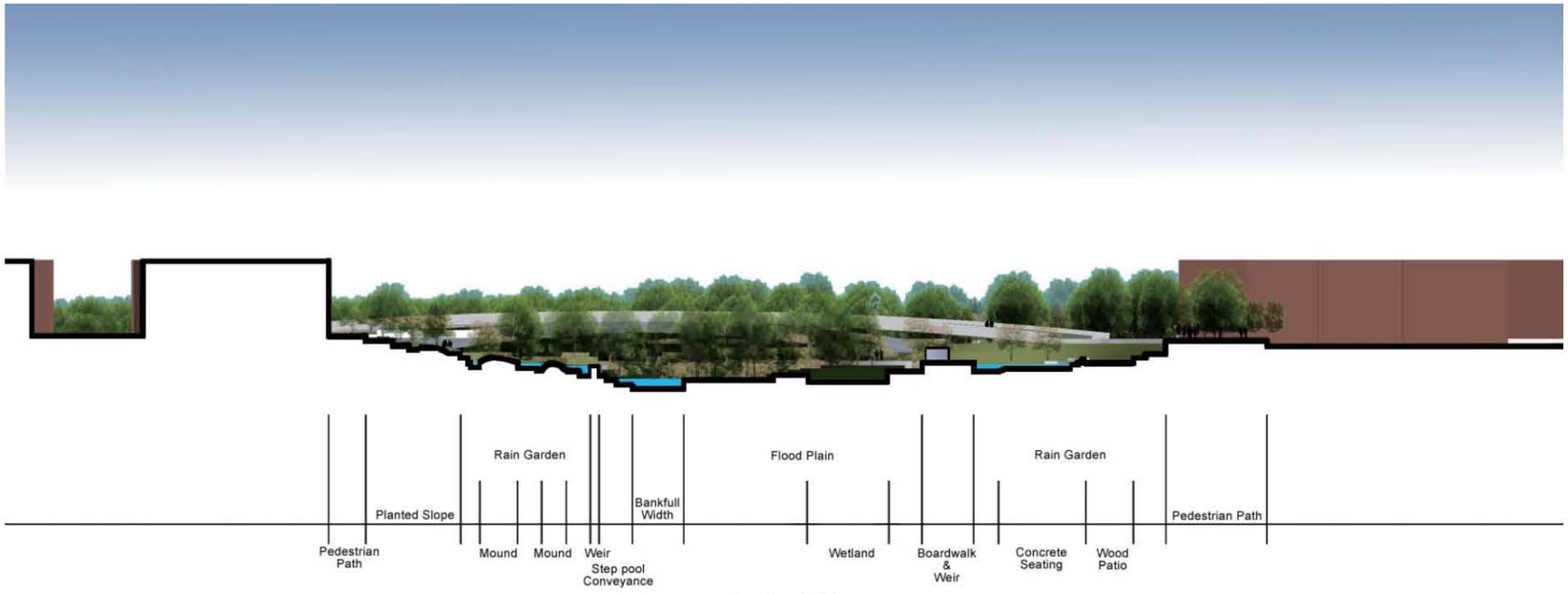
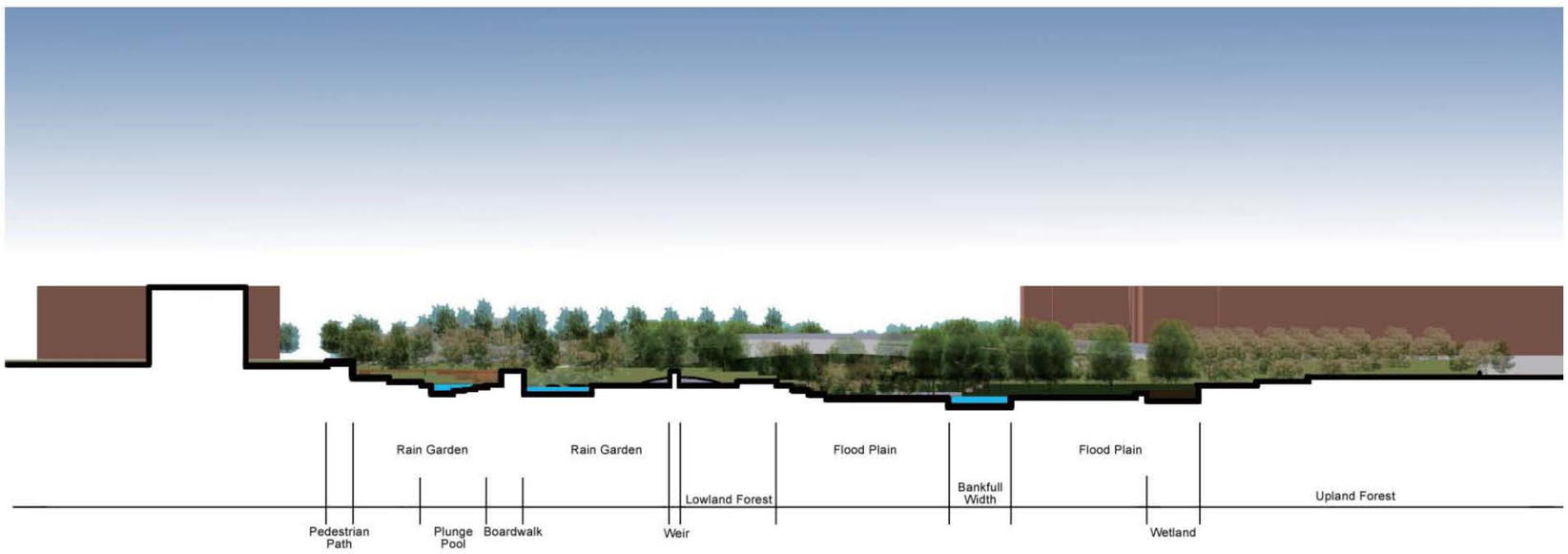


Figure 5.18 Bird's eye view 2





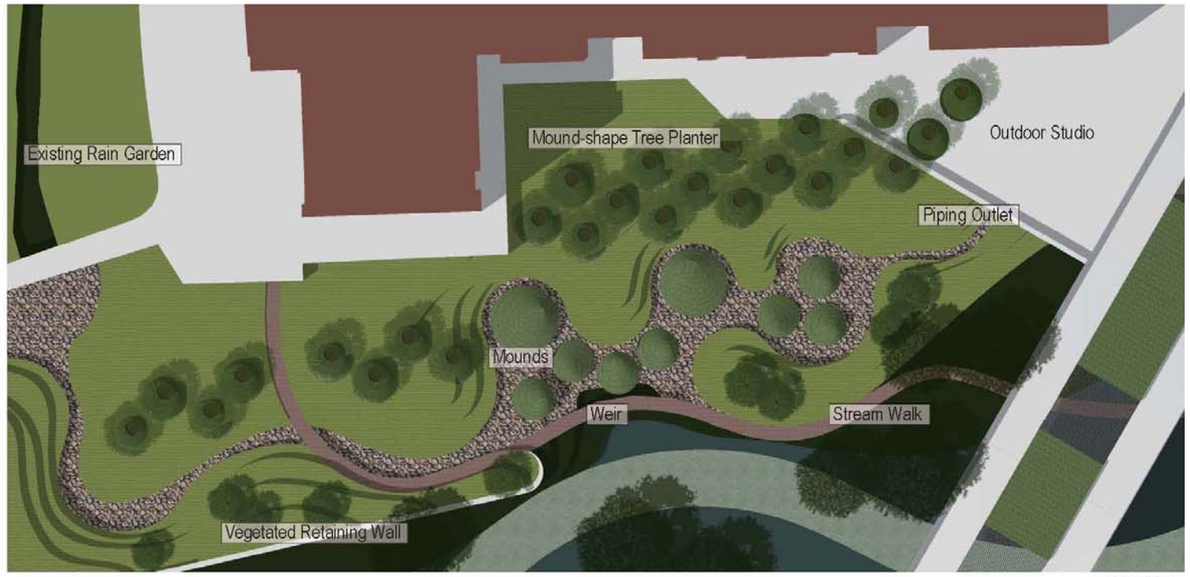
Section A-A'



Section B-B'

Figure 5.19 Sections

Key Plan



Plan View

Landform Models

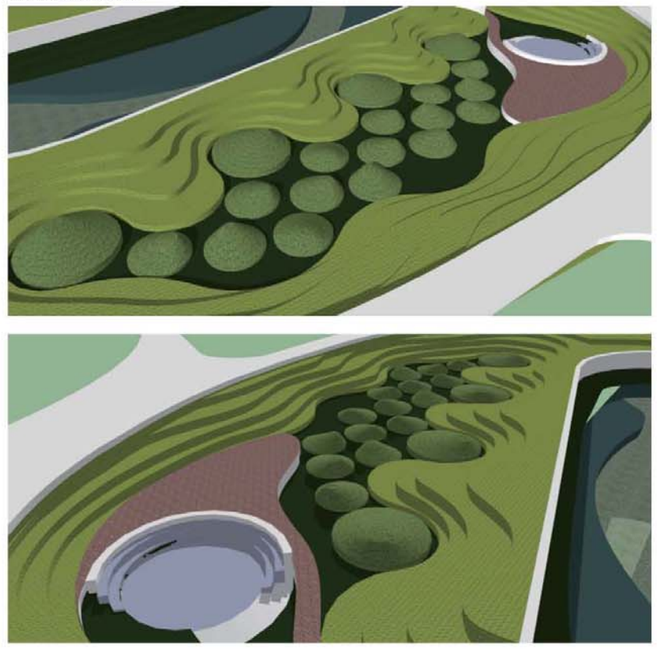
Vegetated Perspective

Figure 5.20 Detail plans and Enlargements 1

Key Plan

Plan View

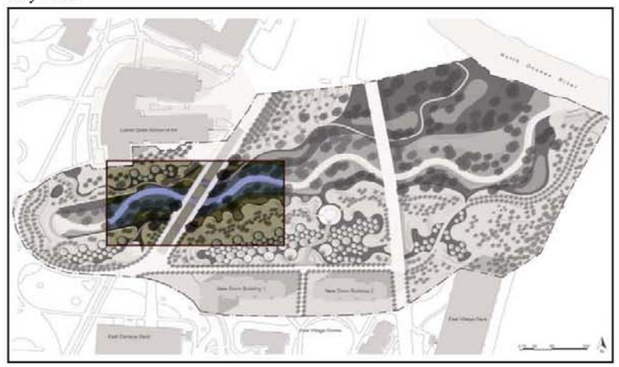
Landform Models



Vegetated Perspective

Figure 5.21 Detail plans and Enlargements 2

Key Plan



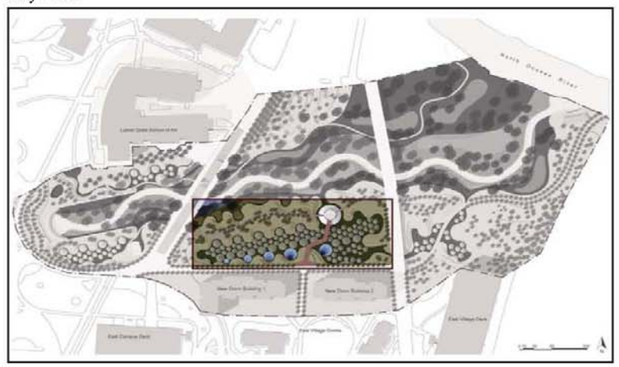
Plan View

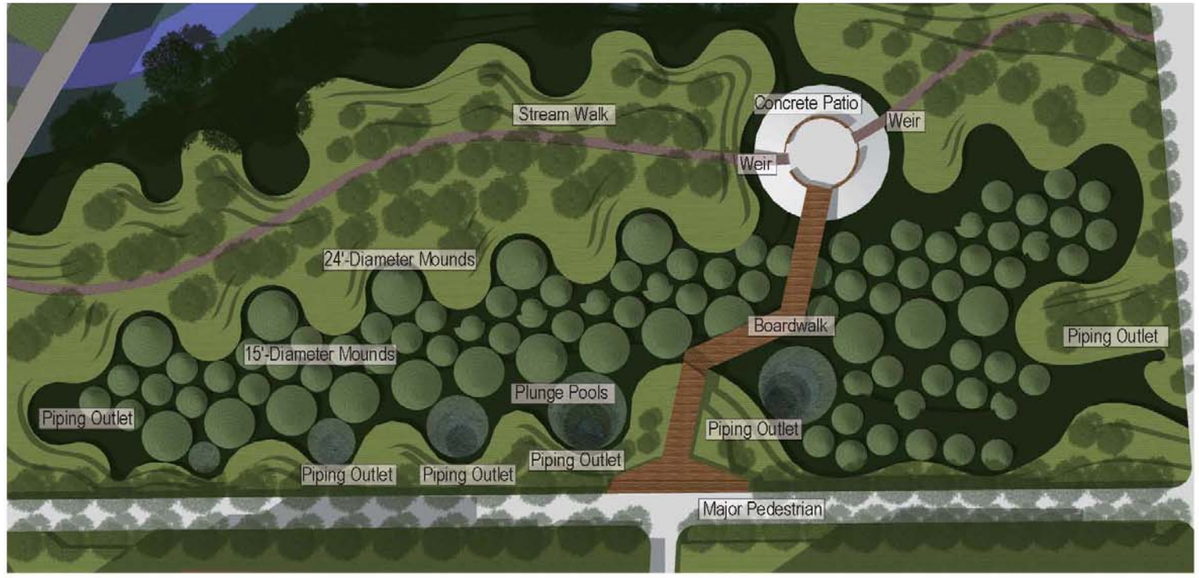
Bridge Model

Vegetated Perspective

Figure 5.22 Detail plans and Enlargements 3

Key Plan





Plan View

Landform Model

Vegetated Perspective

Figure 5.23 Detail plans and Enlargements 4

Dry Season
- Rain garden base coved by river rocks is fully exposed
- Plunge pools hold stored water for irrigation
- Whole concrete patio structure is exposed
- Human activities are distributed through out the whole site

After Normal Storm Event
- Rain garden is partially flooded with water
- Plunge pools are refilled with stormwater
- Foot of concrete patio is under water
- Human activites are concentrated on patio, boardwalk and unflooded mounds

Flooded Season
- Rain garden is fully flooded with water
- Plunge pools are under water
- Concrete patio is partially under water
- Human activites are concentrated on patio and boardwalk

Figure 5.24 Detail plans and Enlargements 5

CHAPTER 6

CONCLUSION

Living in a rapidly developing world, we face various environmental problems such as air pollution, global warming, loss of biodiversity and natural resource shortages; increasing climate crisis has pushed the issue of sustainability into an urgent status for most planners and designers. However, simply depending on the environmental function of sustainably designed landscapes is inadequate for environmental improvement, because environmental problems are not just ecological problems but also psychological and social-cultural problems. Environmental quality strongly depends on human behavior patterns. In pursuing a result of behavior changes, a series of psychological changes need to take place, and the initial point of such psychological process is the increased environmental awareness.

This thesis focuses on the form and appearance of sustainable design in landscape architecture which has been rarely discussed in the discourse of sustainability. In this thesis, the role of form and appearance of a sustainable landscape is identified as to increase public environmental awareness. An awareness model illustrates how three essential meanings in a sustainable landscape could interactively leads to an increased environmental awareness: a sense of connection with nature, a pulling of attention, an enticement of ecological curiosity. To achieve those three meanings, three types of forms are

introduced: an aesthetically metaphorical natural form, a recognizable inviting form and a legible ecological illustrative form.

The design application of Lily Branch watershed enhancement is an attempt to apply the theories in the environmental awareness model, it concretizes the three types of forms that suggests the three essential meanings, and illustrates how they lead to an increased environmental awareness.

Aesthetically metaphoric natural form suggests a sense of connection with nature

The design transformed an inaccessible degraded riparian area into a usable enhanced natural public space. Compared to other parts of East Campus—large area of impervious parking lots, perfectly mowed turf with orderly planted vegetations and formally designed academic quads—the new plan for Lily Branch restoration creates a comparatively natural green space that use minimal hardscape to provide a sense of connection with nature. The connection is not achieved by creating a natural-looking landscape, the design kept the essential characters of nature that inspire and influence us the most, and then applied the patterns we learn from nature to the designed landscape.

Water is the one most important feature for a stream environment, the sinuosity of the stream pattern provides a sense of mystery to the site, the curiosity would be raised from visitors to trace the stream to its source. The sinuosity of the stream is extracted and applied on other parts of the design, they are represented with new landforms. Curvaceous edge of the rain gardens and

the mounds in it leave a weaving sinuous channel pattern in between. People would witness the process of rainwater finding its way between the mounds in rain gardens and then to the floodplain of the stream.

Another essential feature in a natural stream environment is the transitory scene due to seasonal change. In rain season, the stream could be refilled to its bankful level, in dry season, the stream remains shallow in the bank, and in approximately every 1.5 years, the stream floods onto its floodplain. The character of changeable water level is extracted from nature and be represented in the design of rain gardens, mounds, patios and seating structures. Different precipitation amount results in various levels of water contained in the rain gardens, mounds are partially exposed outside water and form a changeable pattern according to the water level, patios and seating structures that are periodically under water would also enhance the transitory of nature. Visual experience of the natural alteration would create a connection between human and nature.

Plants are another element that rendered the space as a connection with nature. Native plants are frequently used in the area; different kinds of plants are distributed according to different habitats. The plant types range from upland forests to lowland forests, forming a natural succession of plants in the riparian zone. The indigenous vegetation palette would reveal a sense of wildness that connects people with nature.

Attempts to draw people closer to the nature are showed through out the design. Two secondary pedestrian paths running along the stream provide

access to the floodplain of the stream. Users could choose to take off the pedestrian path and explore more near the stream. Rock vanes placed in stream serve as an access into the stream. Providing entrances into the nature and the opportunities to explore connects people with nature.

Recognizable inviting form suggests a pulling of attention

Series of mounds are the theme in terms of the form in the design. They are placed inside the rain gardens, directing stormwater flow through a weaving sinuous path formed between the mounds. There are 1.8 acres of raingardens filled with those mound, the planted slope right next to the art building is placed with mound-shape planting beds. The repetition of the form aims at attracting passerby's attention. Most rain gardens are on one side of the major pedestrian path which is the only way leads people from communities east of Oconee to East Campus. When walking through such gate way of East Campus, people can easily notice an obvious contrast between the orderly placed mounds and the dense woods, recognition could be formed through such process.

The irregular shape of the mounds creates potential different spaces. The intimate scale and the using friendly shape all invite recreational usage. Witnessing the area being popularly used would prompt more willingness to engage into the landscape.

The reconstructed River Road is turned into a pedestrian only bridge arching over Lily Branch. The new bridge structure runs across the treetops of deep woods on Lily Branch floodplain, the hard concrete material and the

vegetations form a visual contrast which calls more attentions. Again the eye-catching object is also a usable structure that not only provides connections between the two sides of the stream, but also holds majorities of recreational activities. Both the appearance and the function of it draw people's attention to the site.

Legible ecological illustrative form suggests an enticement of environmental curiosity

The installation of rain gardens, plunge pools, wetlands and in-stream rock vane structures all try to tell a sustainable story directed by both human and nature. The design of the rain gardens reveals the process of stormwater treatment; people would witness rain water from the piping outlet finding its way between the mounds and then finally flowing to the floodplain of the stream and being further treated by the wetland system. The weir placed in the rain gardens helps to contain the rainwater, and allows sedimentation and pollutant being taken up by plants. Such process is visible to visitors by integrating patios or boardwalks and seating structures in rain gardens. Additionally the weir itself is part of the waling circulation system, combining people's usage with the sustainable features. Such combination of environmental functions and leisure functions brings people closer to ecological knowledge.

The sinuosity of the stream leads to inferred understandings and explorations which leads to a sense of mystery and raises curiosities from visitors. Legible ecological illustrative features address such curiosities and prompt

visitors to learn more. Walking along the path next to the stream and watching over the stream on the bridge fulfill the curiosities of the visitors. Methods to provide more stream observation opportunities are used through out the design, such as transparent ground surface on the bridge and the rock vanes placed in stream.

A changing scape also encourages curiosity. A variable landscape that offers different scenes over time would trigger more interests from visitors. Different water levels in stream bank and rain gardens expose various parts of plant communities, forming a diverse seasonal scene for the site. The shape of the mounds in rain gardens would also change over time. Gradual erosion on the surface of the mounds would turn the orderly placed identical mounds into a more irregular arrangement. The weirs in rain gardens are installed with filters to collect sedimentations from such erosions; the filters require monthly cleaning to be maintained from clogging. Witnessing such changes and maintenance in is an experience of interpreting the natural process.

Through following the theories in the awareness model, and setting the three types of forms as principles in the design process, the new plan for Lily Branch restoration contribute efforts in terms of increasing people's environmental awareness. Such increased awareness might lead to awakened responsibility and intentions to care for the environment, and would potentially result in behavior changes that could be beneficial for global environmental improvement.

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