Experience-Oriented Ecological Design:

A Methodological Framework to Improve Human Experience in Urban Public Space Ecological Design

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A **Methodological Framework to Improve Human Experience in Urban Public Space Ecological Design**

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Abstract

This thesis proposes that sensory experience should play an important role in setting up a direct relationship between people and the natural environment, and it is based on the premise that contemporary urban public space ecological designs. Are often deficient in this regard. In order to develop a design methodology that addresses both ecological function and sensory experience, the author examine both contemporary western ecological design and classical Chinese garden design. The former focuses on the ecological functions of the environment, while the latter typically emphasizes the sensory qualities of the landscape. Drawing from the strengths of both approaches, an experience-oriented ecological design framework is proposed with the goal of improving human experience in urban public spaces. The framework emphasizes both sensory experience and ecological functions in two phases of the design process – site analysis and site design. The framework is applied to a design for Bridge Park in Buzzards Bay, Massachusetts. The design is evaluated to assess efficacy of the framework for the design urban public spaces that address both sensory experience and ecological processes. The evaluation suggests that the framework could be an effective tool for designers, and also draws conclusions regarding the potential role of sensory experience as a tool for creative discovery in the design process. Finally the paper raises questions regarding the desirability of employing sensory experience as a didactic tool to enhance environmental awareness.

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Introduction

My thesis study begins with two observations: sensory experiences are frequently omitted in contemporary western ecological designs of urban public spaces; while classical Chinese gardens typically emphasize sensory qualities of the landscape. The major argument of this study is that sensory experience is important in urban public space ecological designs, and such experience should be combined with the functional aspects of ecological environments in design, to improve people's qualitative experience in urban public spaces. The purpose of this study is to develop a methodological framework for experience-oriented ecological design by conducting a comparative study of contemporary western ecological and classical Chinese garden design methods, thus learning from both and considering how to improve the quality of human experience in urban public spaces.

This paper is structured into five sections to illustrate my position. The first section identifies frequent problems in contemporary ecological designs. I examine two typical examples to support my assumption that contemporary ecological designs in western countries often suffer from omission or absence of a direct relationship between people and the environment. I also provide another example to illustrate how such a direct relationship could be achieved. This part of study suggests the potential for an experience-oriented design framework that addresses sensory experience in urban public space ecological design.

The second section of the paper explains why sensory experience is important for urban public space ecological design. I suggest that the diversity of populations who occupy urban public spaces make it difficult or even impossible for a designer to address common meanings. However, studies have shown that people share something in common, that is, use of perceptual organs to sense during the process of understanding places. People also share commonalities related to sense of pleasure. Pleasant sensory experiences could thus provide opportunities to set up direct and meaningful relationships

between people and the landscape. This conclusion suggests that experience-oriented design could be an appropriate approach for the development of meaningful urban spaces.

The third section explores both western and Chinese designs that address people's relationships with the environment. In a comparative study of contemporary ecological design and classical Chinese garden design methods, I investigate their different philosophical origins and how such differences may affect landscape design practices. Lessons from both the West and the East are also evaluated for their utility in urban public space ecological design. Based on this comparative study, I propose a methodological framework for experience-oriented ecological design in the fourth section, as an alternative way to approach ecological design in urban public spaces.

In the fourth section, the methodological framework for experience-oriented ecological design is applied to a design project. Both traditional analysis and sensory experiential analysis are included in the phase of site analysis as an alternative approach to understanding place qualities. Two design concepts are compared according to strengths and weaknesses. A site design is developed based on the experience-oriented ecological design concept with the purpose of setting up a direct relationship between humans and the surrounding natural environment.

In the final section, the effectiveness of the framework is evaluated. Both the site analysis and site design components of the framework are assessed, and conclusions are drawn regarding improvements to the framework.

Chapter 1

Contemporary Ecological Designs as Sources of Sensory Experience

With environmental sustainability becoming one of the most popular topics in the field of landscape design, more and more designers agree that it is important to make man-made environments sustainable. Urban public spaces, which include places such as urban parks, waterfronts, streets, city squares and plazas, all have potential to support environmental, cultural, and economic sustainability through ecological design.

In the field of landscape architecture, ecological design represents an effort to respond to the ecological and cultural conditions of the environment. A summary of study of Spirn (1984), Hough (1989), Thayer (1994) and Lyle (1994), suggests that the objectives of ecological design can be categorized in three levels:

- Adaptation level: to acknowledge the dynamic cycles of nature, and to respect the power and vulnerability of environmental process.
- Mitigation level: to utilize affordable technology approaches to support efficient energy utilization and resource preservation, and to minimize natural environment degradation through urban ecological processes.
- Re-integrating level: to set up a direct relationship between humans and the environment, that is, to provide healthy, productive and meaningful lives for people, while at the same time, supporting the capacity of the ecosystem and emphasizing the long-term value of natural resources.

In order to meet these objectives, one important aspect of ecological design is to make functional processes of the ecosystem more understandable and visible to the public, using landscape as a powerful tool to reflect and effect positive environmental change by educating the public. This is where sensory experience, the focus of my study, comes in.

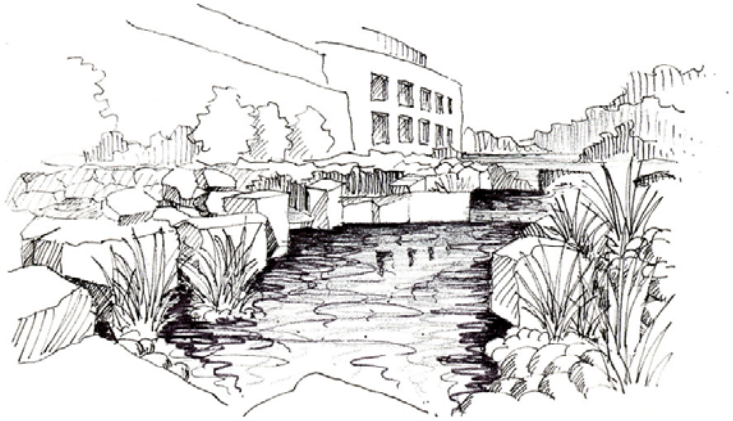
It is encouraging to observe that nowadays, some urban public space designs address ecological issues. However, at the same time, ecological design is still not commonly applied to urban public space as standard practice. The reasons for this are diverse and complex; they relate not only to design but also to social and cultural issues. When considering possible reasons, one important factor may be the weakness or even absence of human experiences, especially sensory experiences, in many ecological designs for urban public spaces. Sensory experiences such as vision, hearing, scent, touch, and taste, are all perceptual responses of the human body that help to set up a direct relationship between people and the surrounding environment. If the pleasure that derives from the sensory qualities of spaces is sacrificed in favor of designs that prioritize functional ecological processes, it is possible that the general public may not value or use these spaces. A lack of popularity among target users may result in fewer ecological designs being implemented. Is it possible that ecological design would be employed more often in the design of urban public spaces if sensory experiences were integrated into the design? Catherine Howett (1998, p.111) observes that

> It may seem at first as if the advocacy of more ecologically based landscape design will demand the sacrifice of cherished and legitimate values, the simple pleasure taken in creating or experiencing compositions that please the eye. What is being called for is an expansion, not a diminishment, of sensibility. We must come to see that we are trapped not just in a tyranny of the visual imposed by an inherited picturesque aesthetic, but that even the range of possibilities for visual stimulation and pleasure has been needlessly narrowed. And we have deprived our other sense and, indeed, our own minds and souls, of a potentially richer and more profound delight.

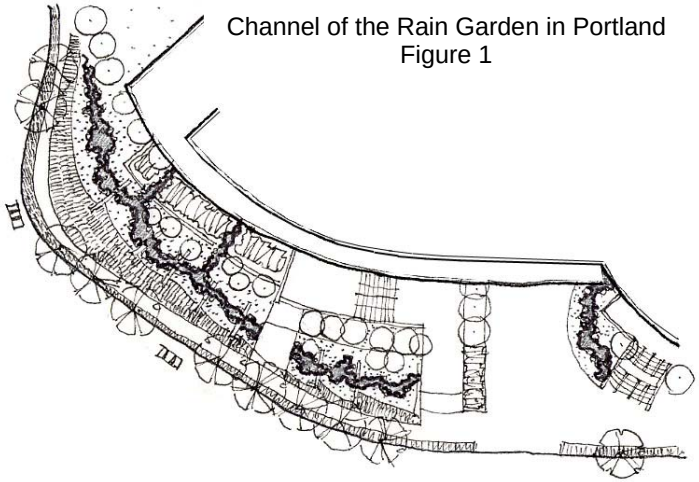
Omission of human experiences in contemporary urban ecological designs can be placed into two categories: the total absence of human interaction with the landscape and the omission of opportunities for rich sensory experience in the landscape. I will use two examples to explain the typical problems of these two categories of designs.

In the first category, the landscape functions as a self-sustaining ecological system, which may provide for visual interaction with the user, but limits any other type of contact. An example of such a design is the Rain Garden in Portland, Oregon (*Landscape Architecture*, September, 2004). Located to the south of the Oregon Convention Center, the Rain Garden functions successfully: it

collects run-off from the 5.5-acre roof of the building, filters the water to improve its quality, and allows as much precipitation as possible to infiltrate the ground. As Thompson (2004) explains, “formally, the rain garden mimics a stream flowing through the site via a series of shallow, cascading, rock-lined pools separated by basalt weirs.” The changing figures and elevations of the water body, and the richness of materials and textures in the main channel of the garden attract the eye (Figure 1). Unfortunately, the interaction between people and the garden stops at such visual contact - the most superficial level of communication with the landscape. As we can see from the plan of the garden (Figure 2), the grass lawn alongside the main channel fails to invite people to interact with the garden; there is no entrance or any place for people to get closer to the water body. Human activities are excluded within the main channel areas. There are no opportunities to listen, to touch, or to smell, and therefore, there are fewer opportunities to participate and to really understand the functional benefits and pleasure that could have come with such a beautiful design. “Ecology, creativity, and landscape architecture must be considered in terms other or greater than those of visual appearance, resource value, habitat structure, or instrumentality.”



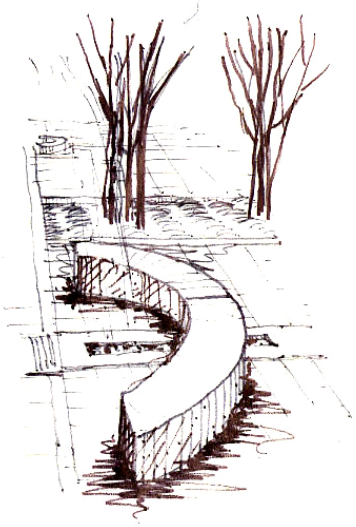
Channel of the Rain Garden in Portland
Figure 1



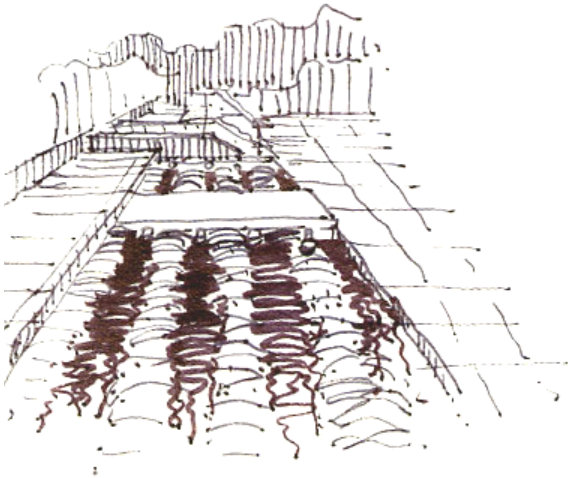
Plan of the Rain Garden
Figure 2 (After Thompson, drawn by author)

(Corner, 1997, p. 82) Such absence of humane involvements is not unique in contemporary ecological designs.

The second example explains another kind of frequent omission that I observe in program-oriented ecological designs: they suffer from the exclusion of humans' sensory experiences as a means to set up the direct relationship between people and the environment. This example is also an on-site storm water management project. The Storm-water Garden in Denver (*Landscape Journal*, 1998) changes an unused driveway into a small garden. The design illustrates the storm water management processes where storm water is collected, distributed to different infiltration basins, and subsequently used to irrigate native grasses and horticultural xeric plants (Figure 3, 4). People can either pass by or walk into the garden and sit inside. Through experiencing this design, people are educated about ways a healthy water cycle could occur and could benefit the environment. I do not challenge the success of the design in explaining ecological functions and educating people. The design indeed allows human activities to happen within the garden. However I have doubts about the relationship between the ecological landscape and people's on-site experiences. I wonder whether people will spontaneously try to explore such a functional landscape if it has no connection or merely a weak connection with their sensory experiences. My argument is, in such designs, human experiences are detached or at least partly detached from the ecological processes. Often, educational programs are not integrated with human activities. Functional information is "forced" upon people instead of allowing people to follow their instinctive need to explore why something works. The former



Storm-water Garden I
Figure 3

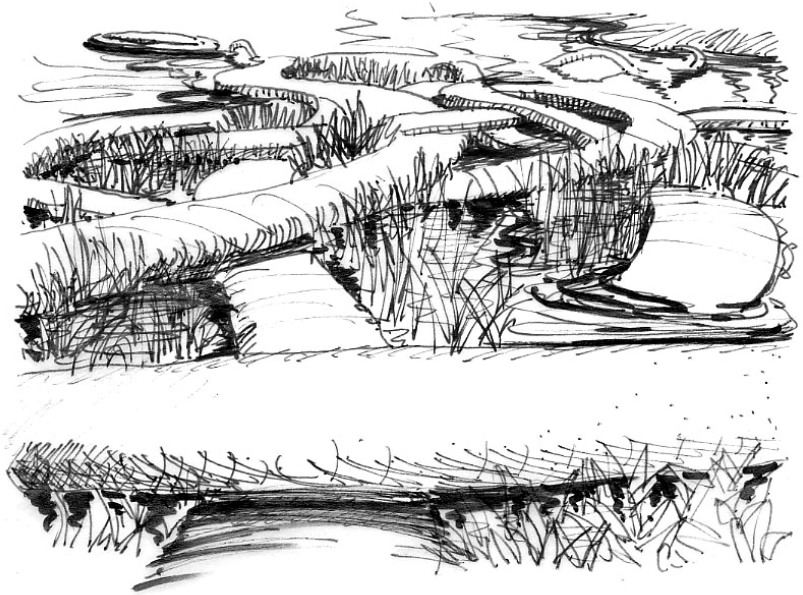


Storm-water Garden II
Figure 4

experiences belong to a kind of “passive” involvement with place. Active involvement, on the other hand, derives from people’s direct and intuitive communication with the environment, through use of perceptual organs to sense the comfort, beauty, and even significance of nature, to “taste” the “fruit” of the ecological environment spontaneously by themselves.

Therefore, what should active involvement look like? Are there some urban spaces that address sensory experiences as well as the ecological functions of the site?

Although it is possible to find some examples of western urban spaces that provide for this kind of active involvement, they are few and far between. However, in the field of environmental art, it seems slightly easier to find good examples. We will discuss the reason for the frequent detachment of experiences from contemporary ecological design in the following section. In this section, we examine active involvement in an environmental art installation, Patricia Johanson’s design of the Fair Park Lagoon. Located in the middle of Dallas’ largest park, the Fair Park Lagoon has been changed from the city’s



Paths and microhabitats
Figure 5

“old mud hole” into a freshwater swamp. Serving as a functional flood basin, the Fair Park Lagoon not only provides a desirable habitat for wildlife and plants, but also offers opportunities for people to experience fantastic changes of landscape with their sensory organs. The main areas that people can interact with in the lagoon are the sculptural pathways. The pathways look like huge native ferns nestled

up and down the two ends of the bowl-shape lagoon (Figure 5, 6). These special forms attract people's eyes when seen from far away and pique their desire to investigate. While walking on the pathways, a diverse range of experiences could occur for different people at different times. There are many options for people to enjoy the changing landscapes with time. One observer, Don Los Santos, has described the place as follows:

> The plant-like forms at times become tangled, but mostly they meander along, sometimes folding back on themselves, and sometimes extending into graceful, lazy sweeps. Viewers can choose which path and which pace suits them (just as animals, birds, turtles, and fish choose favorite spots or pools). Each stretch, each curve carries its own rhythm and its own discoveries… (Johanson, 2003, p. 88)

Humans' sensory experiences are considered in every aspect of the design, from the structure of the pathway, individual components and materials. A range of different place meanings comes from diverse individual experiences. As Walter Davis II has stated: "The sounds, smells, colors, textures of an aquatic environment blend seamlessly with visual and tactile elements… It is a work rich in implications, and viewers seem to carry away different conclusions about what they saw and what it means." (Johanson, 2003, p. 89)

Visitors investigating ecosystems
Figure 6

The success of this design lies in the integration of humans and the environment. Sensory experience is emphasized in the design and it acts as a link between human activities and the ecological environment. As Elizabeth K. Meyer (2000, p. 243) points out, "Certain works of landscape architecture that give rise to collective aesthetic experiences might engender more mature ecological environmental consciousness." People's awareness of the environment increases as a result of their experiences. through the process of sensing with all of their perceptual organs, exploring knowledge becomes instinctive and enjoyable. Therefore, landscape

design that responds to sensory experience could be a possible direction for urban ecological designs. In response to sensory experience, Anne Whiston Spirn (1988, p.108) proposes a new aesthetic for urban design:

> This is an aesthetic that celebrates motion and change, that encompasses dynamic processes, rather than static objects, and that embraces multiple, rather than singular, visions. This is not a timeless aesthetic, but one that recognizes both the flow of passing time, that demands both continuity and revolution. This aesthetic engages all the senses, not just sight, but sound, smell, touch and tastes, as well. This aesthetic includes both the making of things and places and the sensing, using, and contemplating of them.

In spite of this theory, there is no formal design methodology addressing sensory experience in ecological design, even though some great landscape architects (such as Lawrence Halprin) successfully integrate these objectives. However, such works suggest a potential methodology for ecological design.

> Halprin's work represented a type of critical practice that gave form to ecological environmental values through the construction of experiences… In fact, Halprin might be considered to have developed a phenomenologically based language of landscape architecture, as he reconceptualized landscape space as bounded flow, a fluid medium experienced in a multisensory way by the moving body. (Meyer, 2000, p. 199)

The purpose of this paper is to explore the potential for an experience-oriented landscape design framework, to address sensory experience in urban public space ecological design.

Chapter 2
Importance of Sensory Experience in Urban Public Space Ecological Design

"Our five senses together give us an organ of acquaintance, with which we perceive and experience the outer world."

Han Vetter (quoted from John Ormsbee Simonds, p.8)

Sensory experience is important because it is the most common and natural way for people to understand their surrounding environment. In addition, landscape serves as one part of the container of life, and "The medium of landscape design is as diverse and simple as life itself. It is sensory and phenomenal." (Olin, 1997, p.117) One important standard, which people use to evaluate whether a landscape design is successful, is whether it is meaningful. A meaningful place does not necessarily need to convey significance to every person, but it should respond to basic human needs. Treib (1995, p.47) suggests that "pleasure could help to link individual experience with a broader cultural grounding for creating significance." He observes (1995, p.59-60):

> Although the world's people vary greatly in terms of linguistic and cultural matrices, we do share roughly similar human senses, although admittedly these can be honed or dimmed by culture. … It would seem that a designer could create a landscape of pleasure that in itself would become significant. … In the past, sensory pleasures have served to condition meaning. … Sensory experience *moved* the viewer, causing him or her to reflect upon religious meaning as well as one's position in the universe- powerful stuff indeed.

Landscape designs that respond to sensory experience could provide opportunities to set up direct and meaningful relationships between people and the landscape. Such a relationship between sensory experience and significance of place is especially relevant to urban public spaces, which serve as containers of public life and usually host the most diverse potential users within urban areas. Accordingly, it is problematic to expect urban public spaces to address a common meaning of place because of the variety of users with different social and cultural backgrounds. Therefore, providing pleasant sensory experiences may be an alternative to make these places meaningful to people. As Treib (1995, p.59) suggests, "Today might be a good time to once more examine the garden in relation to the senses."

The studies of Tuan (1974) and Kaplan (1989) also support Treib's observation. According to Tuan, all people share some common properties. Our understanding about the landscape comes from our sensory experiences, that is, what we can see with our eyes, what we can touch with our hands, what we can hear with our ears, what we can smell with our noses, and what we can feel with all of our senses. "However diverse our perceptions of environment, as members of the same species we are constrained to see things a certain way. All human beings share common perceptions, a common world, by virtue of possessing similar organs." (Tuan, 1974, p.5) Such personal and intuitive senses help one to judge whether the environment is pleasing or not, according to their taste. Kaplan (1989, p.11) points out "Perception and preference are closely related. Perception is a key element in preference, and the measurement of preference permits an examination of the perceptual process." Perception includes not only what people can see, but also what they detect with other sensory organs. Despite the diverse tastes of different people, "in general there are broad areas of agreement as to what people like in the natural environment" (Kaplan, 1989, p.6). This can be easily understood with the case of seashores. No matter where they are located, seashores attract many visitors every year. Although reasons might differ slightly from person to person, the most common reasons for people's choices lie in the pleasing processes of personal experiences - the opportunity to indulge themselves in nature, the broad sight lines, the rhythm of the sound of sea waves, the softness of sand, the feeling when sea water passes through their fingers, and the excitement of finding different colors and shapes of shells. It is such intimate sensory experiences with nature that provide abundant meanings in a place.

While the kinds of experiences that are preferred by people may differ with each individual, as Rachel and Stephen Kaplan (1989) have observed, there are common standards for preference. Such standards contribute to the study of what kinds of experiences may have the potential to address pleasure or even meaning. Rachel and Stephen Kaplan (1989, p.40, p.69) point out that "The study of environmental preference, however, shows remarkable consistency, despite demographic differences and across diverse settings. ... Without realizing it, humans interpret the environment in terms of their needs and prefer settings in which they are likely to function

more effectively." The Kaplan go on to summarize that there are four characteristics - coherence, complexity, legibility and mystery - that affect people's preference for particular landscapes. Coherence integrates diverse elements of the environment into homogeneous relationships; complexity highlights the diversity and richness of every component in the environment; legibility sets up logical links between components and guides people through the complexity of the environment without getting lost; mystery provides opportunities for people to discover and explore new perceptions and knowledge during the process of experience.

A landscape preference matrix based on these four aspects can be explained with a two-by-two structure: coherence and complexity are relatively static while legibility and mystery are dynamic; coherence and legibility provide necessary information for people to understand their environment while complexity and mystery provide opportunities for people to consider and explore it (Table 1). This matrix gives some clues as to how to synthesize sensory experiences at different levels: the experience of discovering and understanding, and the experience of exploring and investigating. The sounds, smells,

	Exploration	Understanding
Preset, or Static	**Complexity**	**Coherence**
Future, or Dynamic	**Mystery**	**Legibility**

Table 1: Preference Matrix
(After Thayer, drawn by author)

colors, textures of an environment blending seamlessly with visual and tactile elements, compose a coherent system that suggests complexity. Such experiences also set up a legible way to connect people with their memories of the past by triggering their sensory receptors in a similar way in the present; and the new sensory experiences that people have never encountered before may trigger people's desires to explore. These different levels of experience help to engage people with the landscape and contribute to the pleasure and meaning of a place. Therefore, in order to provide pleasing

landscapes, designers should consider evoking human sensory responses according to this matrix.

After reading this section some might argue that, in the field of landscape architectural design, it is not a new idea to address sensory experiences. Indeed, it should be a basic strategy for every design project. However, the frequent deficiencies of contemporary ecological designs in this regard make it worth reconsidering. With the development of technology, people tend to rely more on technical tools to perceive their surrounding environment than on their own senses. Some people may not consider their senses at all as a means to understand and interact with their environment, believing that they can rely solely on technology to provide this information. Among designers, this tendency results in overlooking the important role of engaging human senses in the designed setting. Among the five senses, visual perception is the only one that may not be so easily overlooked, since it is the sense that people use most readily, however, visual perception usually engages only the most superficial facets of things. We need to collect more information through the other organs of our bodies to gather a fuller understanding of things. Tactile sense, hearing, and smell can lead to recognition and attachment to a place. All of these sensory stimuli can help to provide a fuller perception of place during the experiential processes. Failure to consider the comprehensive impact of sensory experiences in design will result in loss of opportunities to set up direct relationships between humans and nature.

Chapter 3

Comparative Study of Contemporary Western Ecological Design and Classical Chinese Garden design

During the process of exploring strategies to acknowledge the powerful effects of sensory experience, I tried to learn from existing approaches or designs. However, as I have mentioned before, other than in environmental art, it is not common for contemporary ecological designs to emphasize sensory experience instead of ecological functions. Therefore I have chosen to examine classical Chinese garden design, which not only represents a kind of experiential design that is famous all over the world, but traditionally evokes a direct relationship between humans and the natural environment. Both human experiences and environmental quality are integrated in classical Chinese gardens, although the gardens were not deliberately designed according to objective ecological principles.

Because of the disparity in western and Chinese cultures, it is not surprising to find differences between western and Chinese landscape practices. As Carter (1975, p.507) has pointed out, "Culture has enormous power to shape men's actions and color his view of the actual world." Therefore, to investigate the sources of the differences between contemporary western ecological design and classical Chinese garden design, we must begin by examining their philosophical origins.

3.1 Disparate Routes of Evolution Between Western and Chinese Attitudes

"'Nature' is an idea or the general name we give to life and the cosmos… As society's knowledge and understanding of the physical universe has changed and increased, so, too, have our ideas about life, the world, and its processes." (Olin, 1997, p.109) Throughout human history, cultural influences on people's attitudes towards nature have been obvious. There are disparate understandings about the relationship between people and nature in western and Chinese philosophies. Such differences affect people's understanding of and interaction with the landscape. E. A. Gutkind (quoted from John Ormsbee Simonds, p. 13) describes these distinctions as follows:

> Interaction between man and environment in the West is abstract, an I-It relationship; in the East it is concrete, immediate, and based on an I-thou relationship. Western man fights with nature; Eastern man adapts himself to Nature and nature to himself. These are broad generalizations and, like all generalizations, should be taken with a grain of salt. But I believe that they may help to explain some of the essential differences out of which the different attitudes of East and West to life and environment develop and which are each in its own right destined to play its part in the transformation of the present and the future.

The evolution of the typical western attitude towards nature can be simply described as a process that began with control and later developed into the prevailing notion of interdependence (Figure 7). In early times, because of lack of knowledge, people's fear and worship of nature derived from the view that nature was in control of the world. During this period, landscapes such as the vegetable garden were valued as the most desirable and easily accessible forms of nature. As people's knowledge and power increased, especially with the technological developments after the Industrial Revolution, attitudes switched from surrendering to nature to human control of the world. During this period, the most admired aspects of nature were those that had been tamed by man.

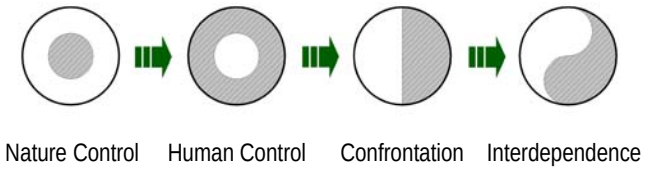


Figure 7: Evolution Process of Western Attitude towards Nature

> People of the Renaissance posed a self-centered view of the world; in which man was believed to be an essential part of the world, inversely, the world was an essential part of man. The cosmos was seen as one animate body, possessing human characteristics such as: life, a soul, stages of infancy, youth, maturation, skin, a heart, veins, arteries, etc…The desire for control and manipulate of the environment, as man now sought to be the "lord and possessor" of the world. (Burns, 1986, p.13)

Examples of such landscapes are 17th century French gardens such as Versailles, English estates, and Italian villas. Even in the pastoral English landscapes of the 18th century, man-made landscape was separated from nature with a clear boundary between them. With the new developments of the industrial era, humans' ambitions to "conquer" nature expanded uncontrollably. Technological improvements continuously enhanced people's ability to temper nature and provided greater supports for their attempts to interpret the complex world for human ends by using the most advanced

inventions. Technology contributed to a clear division of pure wild landscape and man-made environment, and to the detachment of humans and nature within urban areas. The confrontation between humans and nature caused environmental and societal crises. After a long period of fighting with nature, people finally realized that humans could never win in such a fight, especially after the environment crises of the 1960's. Ultimately, neither humans nor nature would benefit in the end. The recognition that human life is entwined with nature became increasingly prevalent. More and more people now realize that humans and nature are one and the same entity, that "we" are dependent on each other, and that interaction and cooperation can benefit both of "us". As Olin (1997, p.111) states, "Nature is what there is. It is ourselves as well as our setting."

As to the evolution of the traditional Chinese attitude towards nature, the process differed from that of the West (Figure 8). The beginning stage was very similar, although it happened much earlier in China than in the West. During their long-time contact with nature, people's minds changed from fear of the power of nature to reliance and worship of nature. The special geographic location of China and its

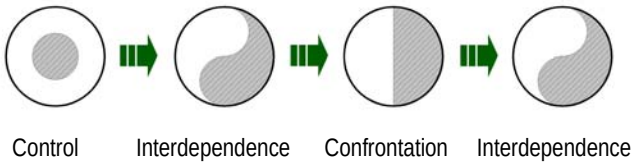


Figure 8: Evolution Process of Chinese Attitude towards Nature

people's lifestyles fostered a special Chinese philosophy, with a worldview that humans are part of nature.

> From the dawn of China's primitive folk religion, the relationship between man and nature has been conceived as a deep, reciprocal involvement in which each can affect the other… No boundaries may be drawn between the supernatural world, the domain of nature, and that of man. Hence, if this sensitive organism is to function easily, man must do his part; when he conforms to natural law, society enjoys peace and tranquility; when he transgresses it, both Heaven and nature are disturbed, the intricate machinery of the cosmos breaks down, and calamities ensue. (*The World's Great Religions.* Quoted from John Ormsbee Simonds, p.9)

Guided by such philosophy, the ancient Chinese tried to set up a harmonious relationship with the natural environment with little intrusion. Such a relationship functioned well for a long time in a closed society with slow economic development. Classical Chinese gardens are products of this period. However, with the opening of the country in the 20th century and the new effects of technological

changes, Chinese people now also have to face the dilemma of economic development and environmental deterioration. It is necessary to rethink strategies that can bring them "back" into harmony with the environment.

When investigating the evolutionary process of Chinese attitudes, we find that Taoism's influences on Chinese thinking are tremendous, since typical Chinese attitudes about human's relationship with nature come from Taoism.

> It was Laozi who pointed out that all life on earth and under heaven has common cosmic roots and is created according to a constant law; therefore, to become close to nature, to observe, learn and appreciate natural creation is the way to understand the essence of life – Tao. Thus, the Chinese way to search for the beauty of nature is to search for the certainty through intense observation and meditation, i.e., to see in between, to find the relationship between things, to know the law of Naturally So. (Wu, 1995, p.323)

From this attitude towards life to the principles of Feng Shui and Chinese aesthetic standards, the influences of Taoism have been reflected in almost every aspect of traditional Chinese life. This, in turn, directly affected classical Chinese landscape designs. The ancient Chinese believed that nothing on earth could exist by itself; everything had an interdependent relationship with everything else, and natural forces dominated all things. Intrinsic to their thinking was the idea that human activities that offended natural forces would bring disaster sooner or later. Therefore, to respect nature became the philosophical basis for the primitive ecological design of the classical Chinese landscape. Since Taoism emphasized a logical relationship between "heaven", "earth", and "man", the way to understand nature should be more than merely monitoring its functions. Rather, nature should be appreciated through human feeling, and these feelings should be expressed in a "Naturally So" way, that is, drawing from nature while transcending nature – an artistic nature. "The principle of Naturally So implies a strong intuitive sense rather than pure reasoning; here the importance of experience is also emphasized." (Wu, 1995, p175.)

Based on Taoism, there are four points in the Chinese way of thinking: "To respect experiences; to discern the truth by studying the past; to stand between science and theology; to combine ethics with aesthetics." (Wu, 1995, p.162) Differing from typical western thought,

the Chinese style of thinking focuses more on sensory experience than on physical phenomena. This focus is characteristic of classical Chinese gardens, which place great emphasis on pursuing human experience as a means of setting up a direct relationship with nature.

Not surprisingly, the differences in philosophy between western countries and China led to divergences in the landscape design practices that characterize them – contemporary ecological design is derived from western philosophy, while the classical Chinese garden design has its origins in Taoism.

3.2 Practices in Contemporary Western Ecological Design

As we have observed, much contemporary ecological design has been necessitated by the deterioration of human environments. "Ecology has assumed a heightened level of significance in social and intellectual affairs during the past few decades. This emergence is due, in large part, to an increased awareness of local and global environmental decline" (Corner, 1997, p.83). Therefore, it is not surprising to find an emphasis on functional aspects of landscape ecology in contemporary western landscape designs. This emphasis relies on comprehensive and systematical knowledge of the natural world, as well as on technological discoveries.

The earliest formal ecological design methodology can be traced back to "the ecological inventory" termed by Ian McHarg - the layer-cake model. This is a landscape planning tool that overlays suitability maps of different components to identify sensitive places and then provides strategies based on the analysis. The layer-cake model has become one of the most important methods for ecological design and it also provides the theoretical basic for GIS. In the study of contemporary ecological design, the most elaborate description of ecological approach strategies belongs to Lyle (1994, p.83- p.46). He summarizes twelve strategies for an ecological approach to design and gives detailed descriptions of them in his design of the Center for Regenerative Studies:

1) "Letting nature do the work." That is, utilize on-site natural resources to support functions of ecological designs. Examples that Lyle suggests include "passive solar and cooling systems use plants for microclimate control, thermal

storage properties, and inducement of air movement within buildings; landforms guide the flow of water. Predator species and companion planting are major means of pest control."

2) "Nature as model and context." By mimicking nature, program strategies are provided to support healthy cycling of natural components such as solar or water efficiencies.
3) "Aggregating, not isolating functions." Since every component in nature is interdependent on the others, the concept for a design should be an aggregation of functions instead of isolating them.
4) "Optimum levels for multiple functions." Design strategies should support multiple functions of nature to allow components to "function interactively, each in equilibrium with the others and serving the others."
5) "Matching technology and need." Use proper technology programs and techniques to support design and address specific needs.
6) "Using information to replace power." Observe and collect scientific data and information to support designs and to evaluate the efficiency of functions.
7) "Multiple pathways". Provide more options for service systems.
8) "Common solutions to disparate problems". That is, using similar systems or strategies to solve different problems, such as the following example: "Greenhouses and solaria provide heat for buildings as well as growing plants and fish; roofs of buildings serve for growing food, collecting water, heating water, generating energy, circulation, and activity areas as well as for protection from the weather."
9) "Storage as a key to sustainability". Use a variety of techniques to storage energy, water and even foods for long-term usage.
10) "Form to facility flow." Forms of buildings and landscape features should be flexible to changing needs in different seasons and times.
11) "Form to manifest process." Emphasize technological devices to make the process as visible as possible. Items such as hilltop wind and solar generators are major features in the landscapes.

12) "Prioritize for sustainability." Sustainability should enter every development decision and anchor every design.

As previously stated, successful ecological design should respond to three levels of issues: adaptation, mitigation, and re-integration. Lyle's strategies respond to the first two levels in detail but are weak in their response to the third level. His strategies need to also address the experiential quality of a place, which helps to establish a direct relationship between humans and the environment. Such a purpose includes two aspects of content: to improve the quality of human lives and to provide healthy, productive and meaningful lives for people, while at the same time, supporting the capacity of the ecosystem and emphasizing the long-term value of natural resources.

The weakness in Lyle's study reflects the typical omission of sensory experiences in contemporary Western approaches to ecological design. Because of the emphasis on environmental functions, most research and analysis in contemporary ecological design is focused on ecological aspects. However, designers and researchers have also begun to reconsider the importance of human experience. One example is the exhibition of "Eco-revelatory Design" that was displayed during 1998 and 1999 (Special Issue of *Landscape Journal*, 1998). Ideas, methods and design projects are discussed to address the relationship between ecological functions and human needs. As the editors indicate in their introduction, "Eco-revelatory design is landscape architecture intended to reveal and interpret ecological phenomena, process and relationships." (p. xvi) It is inspiring to find projects that address human activities and educational programs through urban ecological designs, such as the project for Reprogramming Residual Urban Space in the Los Angeles Freeway, and the Urban Grass Waterways in the Anacostia River Watershed. Yet it is a little disappointing to me that, there are no explicit explanations or examples of incorporating humans' sensory experiences in ecological landscape design. More discussion and research of design methodologies that incorporate both functional and sensory considerations should be encouraged to enhance both the effect of ecological design and the quality of human experience.

3.3 Practices in Classical Chinese Garden Design

As we have discussed, Chinese culture respects both nature and human experience at the same time. This special Chinese philosophy

has significantly influenced ancient Chinese landscape design. It has been well accepted that the classical Chinese garden represents one of the richest landscape design types in the world. The garden is famous for its human dimensions and the diverse experiences that people enjoy within it. Although often copied by the west, the essence of the classical Chinese garden has not been well understood, due largely to the lack of knowledge of its philosophical basis.

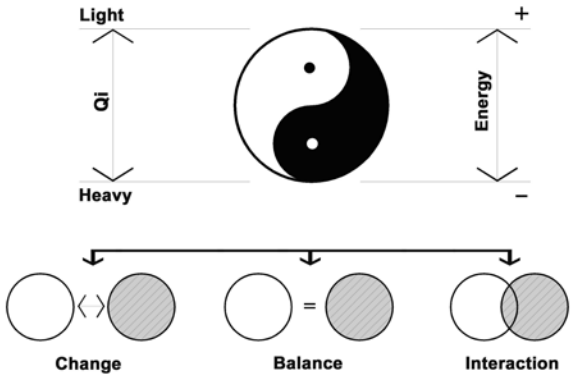
The most common design approach or method that is applied in Chinese garden design is Feng Shui. The Feng Shui principles used in every garden design represent the efforts of the ancient Chinese to address environmental carrying capacity and to set up a harmonious relationship between humans and the environment. The classical Chinese garden is not necessarily sustainable according to ecological science, but it promotes ecological efficiency for a particular climate and topography. For example, it is very common to feature a man-made pool or pond in classical Chinese gardens. Pools not only take care of accumulated rainwater, they also help to adjust the temperature and humidity, to purify the air in the gardens, and to water flowers and trees. Since adaptation is one aspect of sustainability, the classical Chinese garden can be regarded as the oldest style of ecological landscape design, although its consideration is very primitive and incomplete. However, what I plan to discuss with regard to the classical Chinese garden is not its success in addressing ecological functions, but rather how the garden relates human experiences with the ecological efficiency of natural systems. These considerations are derived from and reflected in Feng Shui principles and design methodologies.

3.3.1 Feng Shui Theory as the Guiding Principle in Classical Chinese Garden Design

Feng Shui design principles originated in response to human senses and needs. Initially, Feng Shui was a practical approach that the ancient Chinese used to select sites for dwellings. It was based on the investigation of conditions of the physical environment, including geography, hydrology, ecology, microclimate, and landscape quality. As it evolved, Feng Shui developed a philosophical base that incorporated Taoism, to form a theoretical system and a methodology for environmental design.

The basic theory in Feng Shui is concerned with Yin & Yang. Yin Yang theory conceives of nature as a harmonious entity characterized by dynamic flows and changes (Figure 9). The whole world derives from the dynamic entity of Tao, which then generates a pair of opposite forces, known as Yin and Yang. The interaction between Yin and Yang generates all matter in the world. Therefore all things can be categorized as either Yin or Yang: Yin represents stableness, while Yang depicts movement. Neither Yin nor Yang can exist by itself. They always exist at the same time since they depend on and interact with each other. However they also maintain a continually changing relationship, such that extreme Yin can transform to Yang and extreme Yang can also become Yin.

This theory describes a dynamic cycle similar to the cycles of sustainable natural systems in contemporary ecological theory. In the classical Chinese garden, opposite elements are associated with Yin and Yang. For example, mountains are viewed as static objects which belong to Yin and waters as dynamic things which belong to Yang. Other examples of opposites include: scenes that are perceived when people are stationary, versus those that are experienced when people



Yin & Yang
Figure 9

move through them; spaces that are comparatively enclosed in contrast with those that are open; places that are shaded versus those that are full of sunlight; areas that are quiet versus those are lively; soft surface areas versus hard surface areas, etc. The balance of Yin and Yang and the interactions between them provide a coherent experience full of dynamic changes within the garden.

In classical Chinese garden design, Feng Shui principles were applied as design methods in two areas - site selection and site location. The purposes were to discover and mitigate potential conflicts between

human use and environmental conditions, to provide safe and comfortable places for people, and to let nature “take care of” and “protect” humans.

3.3.2 Feng Shui Design Methods

1) Strategy of Site Analysis and Selection

To ancient Chinese garden designers, it was very important to choose a proper site. Site analysis was crucial especially when the location of the garden was restricted. Most ancient Chinese garden designers were experienced Feng Shui masters. When doing site selection, they would travel around, identify the direction of the sun’s path, observe the mountains, taste the water, and touch the earth. They would also look for written records – experiences of other people from Feng Shui guidebooks - to aid their analysis. The information that they collected was not as precise as that gathered by modern techniques, but by using all the sensory organs to see, to hear, to smell, to touch and to feel, what the master collected was not just data, but also authentic feelings through intimate contact with nature. Usually, ancient Chinese designers would spend time on the site to observe changes in the environment and experience them as others might. These experiences helped the designers adopt the perspective of potential users, with the reasoning that if one has never tried, one will never know how an apple tastes. Personal feelings or preferences are likely to affect designers’ decisions. Therefore, experiencing with sensory organs instead of relying totally on intellectual knowledge, should help designers better understand users’ needs and experience.

According to Feng Shui principles, there are three standards by which one should evaluate existing conditions on a site: functional, aesthetic and psychological aspects. Functional aspects refer to safety and comfort; aesthetic aspects include visual balance and amenity; and psychological aspects deal with human habits and behaviors. Based on consideration of all these aspects, collected information can be categorized into two types: visible information and invisible information. Visible information includes forms and structures that can be perceived with the master’s eyes, like the shapes of mountain and water bodies, the direction and speed of water flow, and plant cover. Invisible information refers to the conditions that are perceived by the master’s hearing, touch, smell, taste and intuition. An example of the latter is the condition of “Chi”, or the trend of change that

visible natural figures and forms might suggest, qualities of land and water (such as its taste and temperature), and the overall atmosphere of the place that makes people feel happy or sad. These concerns are more related to quality than quantity. The most important insight that we can obtain from these ancient masters is that it is important to consider human senses from the very beginning of every design. We should utilize both technology and the human senses to inform our designs. Since our designs are not for machines, technology should not and cannot substitute for human intuitions.

2) Site Design Methods

The application of Feng Shui to site design methods also reflects the Chinese philosophy of respecting both nature and human beings. We can observe this from the layout and design strategies of classical Chinese garden design.

a) Site Layout

In order to respect natural qualities in the landscape, the layout of a Chinese classical garden was less rigidly controlled than was the case for other Chinese public spaces, which conformed to an accepted hierarchical spatial structure. For instance, garden buildings did not need to obey a rigid hierarchical spatial sequence. Rather they could be located in response to different topographic conditions on the property. Similarly different kinds of shapes could be used for buildings and spaces, including circles, curves or zigzags. Nevertheless, the layout of the garden followed the principles of Feng Shui precisely, and these aspects made the garden experience comfortable and pleasing. Even in private gardens where natural scenery predominated, such as the Zhuo Zheng Garden in Suzhou, the regulation of building orientation according to Feng Shui was still very rigidly prescribed. In order to be responsive to the local climate, major buildings within the garden were usually laid out with a primary axis on a north/south orientation, since this protected buildings from cold winds and provided more exposure to warm sunlight in winter, while also collecting summer breezes. However, in order to moderate the stark appearance of such rigid layouts, buildings were designed in different shapes, such as squares, rectangles, ovals and circles. This diversity provided visual complexity within a coherent spatial structure.

In addition there were usually open yards on the south sides of major buildings (Figure 10). These areas were heavily used, and consequently they were located under the shelter of buildings or natural features such as earth mounds and plants. Here, both function and aesthetics were emphasized at the same time. Places intended to be used only for circulation could be located a little more flexibly, but they were also designed for comfort by including winding or zigzag corridors that protected pedestrians from rain, snow and hot sun (Figure 11).

Ancient Chinese designers were adept at using narrative elements to link all parts of the garden. These elements provided a highly visible and completely logical way of leading visitors along a path of exploration. At the same time, strategies such as contrasting opening and enclosure of spaces helped to create interesting but legible rhythms in the garden. For example, solid or half- opaque screens were usually used at the entrances to gardens or sub-spaces within to heighten the spatial contrast and evoke a sense of mystery. Along each path in the garden, a dynamic and coherent sequence of

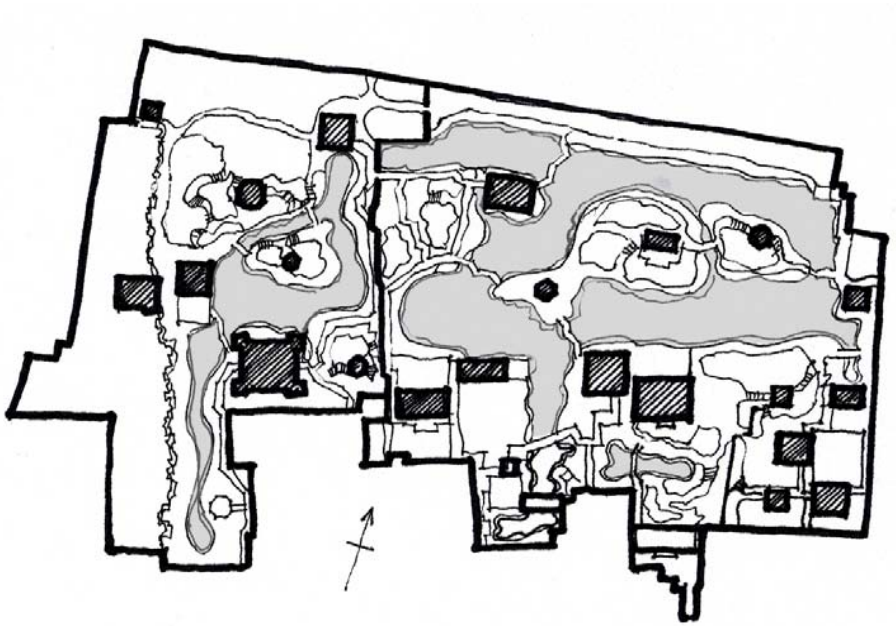
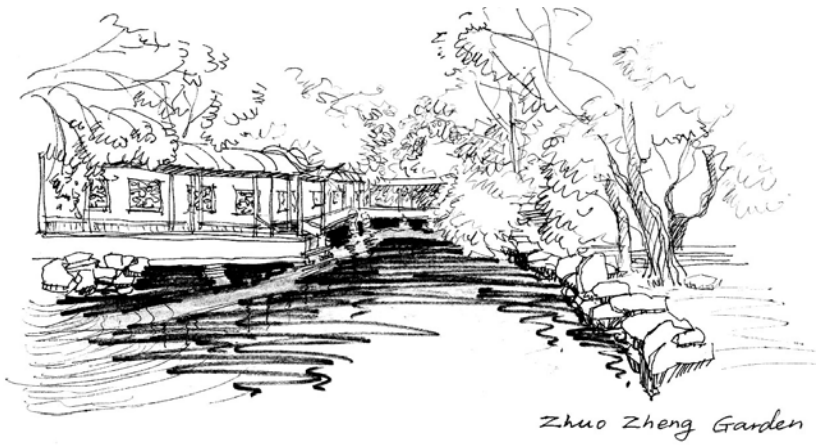


Figure 10: Plan of Zhuo Zheng Garden in Suzhou
(After Zhou, drawn by author)

experience elicited a full range of sensory perceptions, providing each visitor with a unique and highly individual understanding of the place.

Along with this consideration of human experience, the layout of the garden also responded to the specifics of the local environment. In Feng Shui theory, “Chi” is understood as a “generative force” and a



Waterside Corridor of Zhuo Zheng Garden in Suzhou
Figure 11

"medium for constructing the balance" of the world (Wu, 1995, p.213). Based on this theory, it was important to make airflow continuous and fluid within the whole area. A very typical strategy to keep this flow within the classical Chinese garden was to provide opening holes in walls, such as doors or windows. These apertures had both functional and aesthetic qualities – letting "Chi" flow continuously, setting up connections between one space and another, extending the imagination beyond spatial boundaries, and framing scenery to improve the visual enjoyment of the beholder.

By respecting humans' physical and spiritual needs, and considering environmental capacity, these site layout methods helped people form an intimate relationship with the garden during the processes of moving through it, living in it, and exploring it.

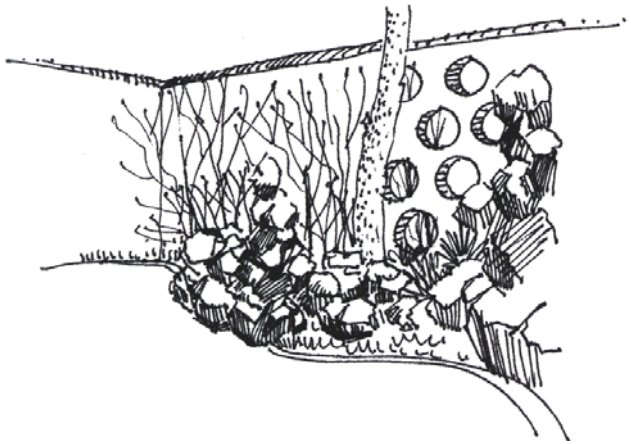
b) Design Methodology Addressing Human Experience

Ancient Chinese landscape designers were adept at connecting the landscape with the human senses in order to improve the quality of people's experience. The landscape languages used in the classical Chinese garden were diverse.

Multiple layers of landscape and scenes unfolded in a variety of sequences, depending on the visitor's route. Changes of scene were emphasized by topographic variations, such as climbing an artificial mountain, descending to the water's edge, or passing over an arched bridge. Visitors were actively involved in exploring these diverse sequences of space through their intuitive responses to the physical

conditions. To heighten people's tactile experiences, a wide range of materials and textures were used on vertical and horizontal surfaces. For example, paving materials might consist of bricks, irregular lake stones, stone slabs, and cobbles, used separately or combined with waste materials (such as broken bricks, broken tiles, and pieces of broken porcelain and jars) to create different beautiful paving patterns. The experience of texture would change when people stepped from flat bricks onto rough cobbles, especially for ancient peoples whose shoes were usually made of thin cloth. The sounds of flowing water, breezes, or raindrops, were amplified by using structures, materials, or plants that enhanced the acuity of human hearing (Figure 12). Different scents were offered in different places and seasons, eliciting endless memories and images of nature. When sitting inside a garden pavilion, the taste of tea or fruit blended with picturesque images of the landscape in people's minds, making the experience unforgettable.

The properties of coherence, complexity, legibility and mystery made the garden pleasing. Multiple options for spatial experience and the richness of landscape provided visual complexity. Dynamic visual focus was another special characteristic of Chinese perspectives:



The open holes on the wall allow wind to pass, and create sounds that help to emphasize the existence of breeze.

Figure 12

views changed according to the path of movement from one side of the garden to another. It was often difficult to find a dominating focus that could be seen from different angles simultaneously in the garden. These changing perspectives provided variety and "agreeable surprise". As Jianhua Wu (1995, p.355) has observed, "Chinese perspective is a more flexible system, enabling the observer to discover more landscape aesthetic values in a limited space, more clues for searching for landscape potential, more freedom for scenery

composition." Multiple layers of scenery and possibilities for exploring variations enhance the complexity of the landscape. Views that could be seen only partially from one aspect increase the drama and mystery of the garden (Figure 13).

In addition to these perceptual qualities, the classical Chinese garden also addressed cognitive content through the expression of meaning, both directly and indirectly. These strategies for conveying meaning may also have relevance for contemporary landscape design. The indirect approach is the typical Chinese way of expressing uncertainty, eliciting richness from emptiness and simplicity, and leaving much to the imagination. In this way, meaning can be conveyed with few or even no literal expressions. Designs that leave space for the imagination can often provide greater opportunity for conveying significant meaning in a place. For instance, white walls are frequently used in Chinese gardens. They provide extremely simple backdrops for the landscape items in front of them. The dancing shadows of plants in wind or the sparkling reflection of water in sunlight on the walls leaves ample room for people to imagine.

Scenic door in Zhou Zheng Garden
Figure 13

Direct ways of embedding meaning in the garden include using words to identify themes, or displaying symbolic images and items that carry cultural content or traditions that could be meaningful to viewers. For example, in the classical Chinese garden, designers tended to rely on poetry to express the characteristics of the place or to tell a story. But even direct messages were usually relayed in a subtle way; words were succinct and their meanings were indirectly expressed. "The simpler the words are, the stronger the feeling is; the

simpler the image, the deeper the sympathy will be" (Wu, 1995, p.188). A simple example in western landscape design is the Vietnam Memorial in Washington D.C. On the black reflecting wall, the white carved words record the names of soldiers who died – just names, without any explanations. But the ordinary names and the blurred images of visitors reflected on the wall serve to elicit thousand of those once vivid lives, in the viewers mind. By considering how all those once living people became just cold names on the wall, visitors realize how horrible the war was and they understand what the memorial is intended to accomplish. People's spiritual contacts with the landscape deepen their understanding of the memorial make their experiences more meaningful.

In summary, in this part of the study, I have discussed both contemporary ecological designs and classical Chinese garden designs with regard to their respective origins, focus, and methodologies. Both approaches have values that are worthy of further study. In the following chapter, I propose a methodological framework for experience-oriented ecological design that is based on lessons from both. The purpose is not to discount cultural differences between regions and countries, but to investigate potential attributes that can be applied cross-culturally to improve qualities of sensory experience in urban public spaces.

Chapter4

A Methodological Framework for Experience-Oriented Ecological Design

A fundamental principle of an experience-oriented ecological design approach is to respect both cultural and environmental processes, by fully integrating aspects of human experience (including both basic human senses and activities), with ecological functions. Sensory experience acts as a critical link between human activities and the ecological environment. The framework encompasses two components – human experience and ecological function -, and two phases - site analysis and site design.

4.1 Goals for the Methodological Framework

According to the conclusions reached in the first part of this paper, an integrated experience-oriented ecological design approach should consider both ecological functions and human experiences at three levels:

- Adaptation level: the design should address the environmental processes of the site; the design should address people's needs and provide comfortable conditions for diverse human uses.
- Mitigation level: the design should support healthy natural cycles that original on or extend beyond the site; the design should include human activities on the site.
- Re-integrating level: the design should set up a direct relationship between people and the environment by associating sensory pleasures with ecological functions; the design should be easily understood by its potential users and should educate people about the role of ecological processes within urban areas; the design should function to encourage people's active interactions with the landscape.

4.2 Site Analysis Methods

In site analysis phase, the strategy is to collect site information and analyze it based on environmental functions and human needs. In order to collect sufficient information and understand the place to a relatively complete degree, two approaches should be applied:

① Applying scientific techniques for objective information collection.

② Utilizing human perceptual capabilities to sense and gather subjective information (Table 2).

Information Collection	Objective Information	Physical information	• Climate condition • Hydrology • Soils • Physiography • Geology
		Biological information	• Wildlife • Vegetation
	Subjective Information	Visible or superficial information	• Visual quality • Edge condition
		Invisible or “deep” information	• Legibility • Human comfort • Smell of the air • Background sound • Mood of the site • Onsite Experience (Opportunity)

Information Collection
Table 2

The objective analysis focuses on collecting biophysical information using technological tools. Factors include climate condition, hydrology, soils, physiography (such as slope and elevation), geology, wildlife, and vegetation information. Designers then use a data layering method to identify problematic or environmentally sensitive areas. Scientific tools or methods such as GIS, sun path analysis, and wind tunnel analysis, can improve the precision of this type of analysis.

The subjective analysis is based on two levels of on-site experience. Designers should visit the site in person to investigate, using their eyes to observe visible or superficial information and using the other perceptual organs to explore invisible or "deep" information, which may not be detected by technological tools or methods.

Visible information includes:

- The visual quality of the existing environment, such as balance and richness (complexity);
- The edge condition of every area or component, such as a sharp edge or a fuzzy boundary between different areas
- The spatial condition, such as open or closed.

Invisible information includes:

- The coherence and legibility of space: separate but related (coherent); harmonious but contrasting (legible);
- The human comfort level in every space, based on the combined perceived effects of sun, wind, temperature, and humidity;
- The smell of the air;
- Background sound;
- The mood of the site – serious or relaxed, happy or somber, rigid or flexible;
- The opportunity or space for imagination (mystery).

All of this subjective information helps designers to apprehend the existing conditions of the place, to judge whether these conditions could attract others to visit the site, or what adjustments should be made to enhance people's experience. Since most of the subjective analysis depends largely on the designer's instinct, it will unavoidably have limitations because of personal education and cultural background, and possibly physical limitations as well.

However the combination of scientific and subjective analyses should provide a comprehensive view of the potentials and limitations of the site. The experience-oriented ecological design framework requires utilizing both methods to conduct site analysis.

4.3 Site Design Methods

As the name of the framework indicates, the intention is that ecological design be integrated with human experience. Therefore, the site design should prioritize for both human experiences and ecological sustainability. Site design methods should be considered at two levels – structure and detail design.

At the structural level, the design focuses on the entire site, usually at a master plan scale. The perceptual preference matrix, that is, coherence, complexity, legibility and mystery, guides the design structure as follow:

When laying out the design, use narrative structure to link varieties parts of the site (coherence); propose at least two different visiting circulations as possible avenues for people to explore the site, to create different rhythms (complexity); integrate a range of sensory experiences with focused ecological topics (legibility); and display different spaces incrementally instead of revealing all at one time (mystery).

A desirable design structure also allows natural elements such as water or air to flow smoothly throughout the site (Chi). Each space is connected to the others and together they comprise an entity that provides a comprehensive experience. The overall structure emphasizes contrast and balance (Yin & Yang) at the same time, to increase the drama of the place: e.g. open vs. closed, static vs. dynamic, virtual vs. physical, simple vs. rich, empty vs. abundant spaces.

With regard to detail design, strategies should respond to both ecological and experiential goals at the three levels previously described (Table 3):

	Goal	Response
Adaptation level	• Respond to the environmental needs • Address people's needs and provide comfortable conditions for human uses.	• Identify and orient comfort areas • Protect spaces from undesirable climatic affects • Flexible spaces or forms • Provide sensory pleasure
Mitigation level	• Support healthy natural cycles • Involve human activities on the site	• Add ecological components • Utilize on-site natural resources and apply proper techniques • Provide facilities and services for human activities • Incorporate direct meaning through models or words
Re-integrating level	• Associate sensory pleasures with ecological function • Design is easily understood and educates people • Encourage active interaction	• Connect sensory experiences with direct ecological values • Program diverse activities to explore environmental processes • Provide opportunities to wonder

Table 3

Integrated strategies organized according to the three levels include:

- **Adaptation level:**

- Determine areas where people will gather or linger and orient these spaces according to local climate conditions to make them comfortable for people. Spaces should be protected from undesirable climatic affects such as winter winds or hot summer sun.
- Make spaces or forms flexible in response to seasonal and daily changes, for example the ability to enjoy a cool breeze during a summer day or warm sunlight in the winter.
- Provide sensory pleasure to make the place attractive to people.

- **Mitigation level:**

- Mimic nature's cycles; set up and support healthy natural cycles by adding new ecological components to the place, for example, installing a biological water-cleansing system to deal with runoff.
- Utilize on-site natural resources, such as solar or water resources, and apply proper technological devices to support and aggregate ecological functions.
- Provide facilities and services to allow human activities to occur within the ecological environment. Illustrate functional cyclical processes with models or words and make them easily understood by people.

- **Re-integrating level:**

- Encourage people to associate ecological values with pleasurable experience by connecting sensory experiences with the functions of ecological environments.
- Program diverse activities to allow people to explore environmental cycles.
- Another arguable strategy might be to leave some existing undesirable area unchanged or with only minimal changes, to allow people to experience discomfort, and propose questions for them to consider or offer opportunities for their recommendations on possible improvements.

Element	Consideration of human sense & experience	Consideration of ecological function	
Sunlight/ Solar	• Vision: light & shadow • Touch: cold or hot	• Energy collection • Heating & cooling • Glare/ light pollution	
Wind	• Vision: changeable shapes such as plants or sculptures • Hearing: sound of breeze • Smelling: scent blended in breeze	• Energy collection • Ventilation, wind protection & channeling • Air pollution	
Water	• Vision: form & shape • Touch: by hand or tread within • Hearing: sound of flowing water; sound of raindrop	Rainfall / Snowdrift	• Evaporation • Underground water recharge • Flood Prevention • Water reuse
		Waste water	• Water treatment • Water reuse
Land	• Vision: change of shape or elevation; texture • Touch: texture of materials	• Landform effect on microclimate • Surface condition • Nutrition	
Plants	• Vision: shape, color, texture • Touch: texture • Smelling: scents of flowers and grass • Taste: eatable leaves or fruits	• Species choice • Location • Plant associations	

Table 4

In order to reach the re-integrating level, consideration of sensory experiences should be emphasized. Table 4 as shown above identifies what kind of human senses - vision, hearing, touch, smelling, taste – could be relevant to the experience of natural cycles.

Based on this list, detail strategies to provide relevant pleasing sensory experiences include:

- Visual quality: provide dynamic, although not symmetrical balance to scenes along every route for visual pleasure (Yin & Yang); borrow views from within or even outside of the site for multi-layered scenery; shape forms to interpret natural patterns (such as the direction of water flow or breezes, illustrating "Chi"); change elevation and angles of view for different visual experiences; display more details on important figures or surfaces for visual richness.
- Audible quality: utilize natural features to amplify or create desirable natural sounds in different weather conditions (for example, calm vs. windy), while minimizing or eliminating undesirable noises (quiet vs. noisy).
- Tactile quality: provide more opportunities for direct contacts between landscape features and people, such as touching or treading within water bodies; use different textures or surfaces for sensory contrast (Yin & Yang), such as soft (grass) vs. hard (gravel walkways); wet (water) vs. dry (earth); warm in sunlight vs. cool in the shadows.
- Olfactory quality: decrease or avoid distraction of undesirable smells; offer pleasing scents in areas where people might stay for a little longer, such as sitting areas.
- Palatable quality: offer drinking or eating services as an option within ecological environments to provide agreeable memories of the landscape.

The strategies proposed here suggest possibilities to improve sensory experiences in ecological environments. These strategies should be based on solid analysis of the place and should be flexibly applied through the design process.

Chapter 5

Thesis Studio Project Bridge Park

(Bourne, Buzzards Bay, MA)

The effectiveness of the experience-oriented ecological design framework is tested in my thesis studio design project for the Bridge Park in Buzzards Bay, MA.

Project Introduction

Located in the small town of Bourne, MA, the Railroad Bridge Park closely relates to the town and serves as an important public space adjacent to the Cape Cod Canal. Although some parts of this 20-acre park are highly used by local residents and tourists during certain seasons (such as summer time), large portions of the park experience little to no usage because of their poor access (Figure 14).

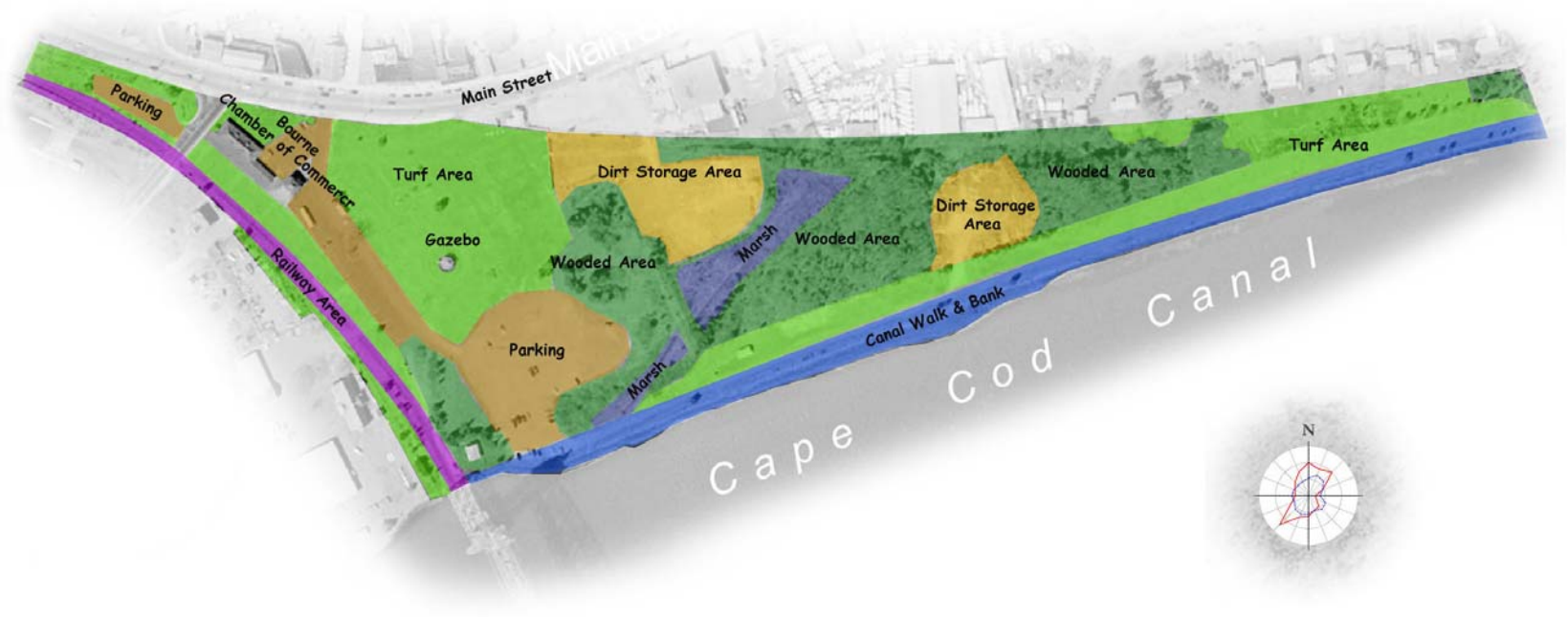


Figure 14: Railroad Bridge Park (Existing)
(Base map source: www.buzzardsbayvillageassociation.org)

Currently the connection between people and the natural functions of the park is also very weak. A new design for the park is needed to improve and enrich the site as an intergenerational recreation area and a cultural amenity for the use of both local residents and tourists.

Because of the park's specific function as a connection between the urban fabric and the Cape Cod Canal, this design project provides a good opportunity to not only integrate an ecological design concept with an urban context, but also to test whether the experience-oriented ecological design framework can effectively promote a direct relationship between people and nature, by emphasizing both ecological functions and quality of sensory experience.

By reconfiguring existing cultural features and allowing them to blend smoothly with natural features, the design tries to integrate every space of the park into a multi-use entity, and to improve the whole condition of the place, making it into a comfortable and attractive setting beside the canal.

Goal of Design

The goal of the design is to set up a direct and harmonious relationship between people and the surrounding environment (Figure 15). The goal is accomplished by making the functional processes of the ecosystem more understandable and visible to the public, by using the landscape as a powerful tool to reflect and effect positive environmental change, and by educating the public.

Objectives

The objectives of the design are as follows:

- Address sensory experiences at the three levels of ecological design, to enhance the experiential quality of the park.
- Promote linkage of the town and the canal, and connect people to the water.
- Connect every part of the park, create an integrated place, and provide opportunities

for people to really explore and understand the place.

- Combine ecological, social, and historical components into the theme of the park; and provide opportunities for people to experience the canal from different vantage points.

The design is introduced in three phases: site analysis, concept design, and site design.

Figure 15: Goal of Design - Harmony

5.1 Phase I – Site Analysis

In order to fully understand the place, two types of analysis are included in this phase of work.

One type of analysis is objective analysis, the traditional analysis that collects physical and biological information on the site. The other type of analysis is subjective analysis, that is, analysis derived from documenting the on-site sensory experiences of the designer.

1) Objective Analysis

In the Bridge Park project, the objective analysis starts from the study of the geomorphological history of Cape Cod.

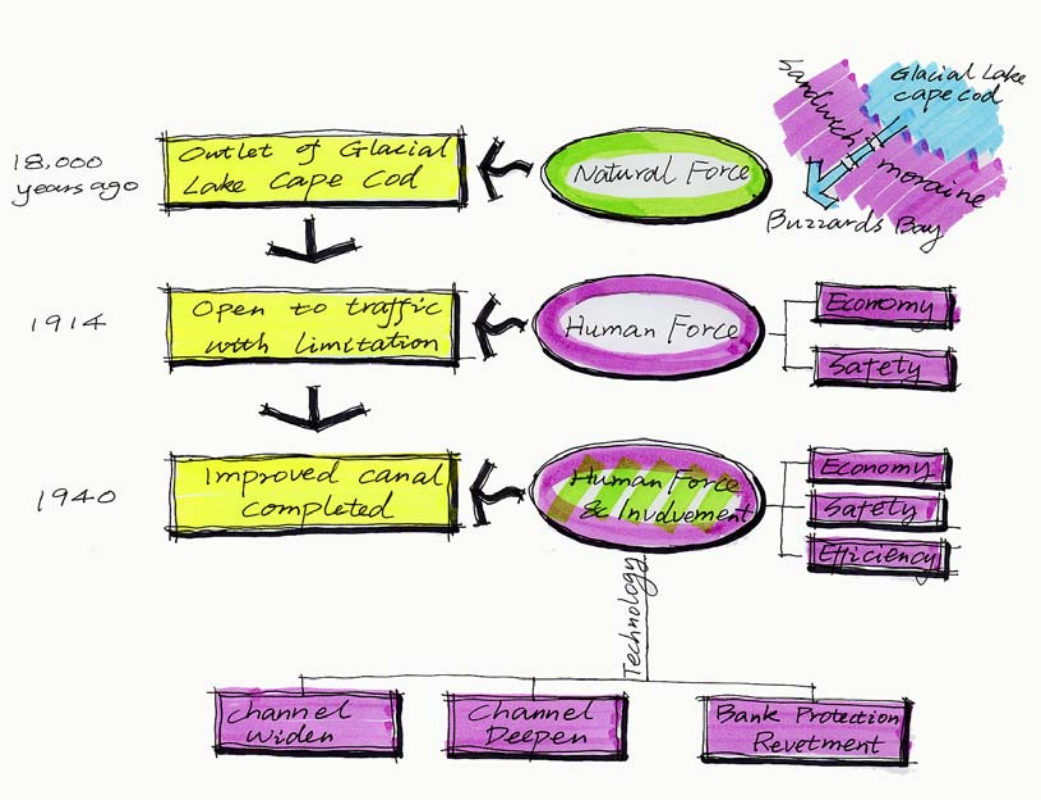


Figure 16: Origin of Cape Cod Canal

Geomorphologic

The geomorphological history of the Cape Cod Canal is a story of an evolutionary process of both natural and human forces: the original pathway of the canal is the drainage way of Glacial Lake Cape Cod, while the current structure of the canal is the product of improvements in response to human needs. Thus the canal is not a pure natural feature, although it exhibits dynamic characteristics of nature (e.g. tidal change). The evolutionary process of the canal also suggests that human forces can be integrated into a natural environment with proper techniques.

Land Use

Located near the western end of the canal at its intersection with Buzzards Bay, the Railroad Bridge Park serves as one important connection between the town of Bourne and the Cape Cod Canal. Commercial, public service and academic buildings are adjacent to the park, forming a special urban context.

A strategy of strengthening connections between downtown, the park, and the canal may encourage development of the downtown district; however more challenging will be to create a natural looking ecological environment in the midst of an urban context.

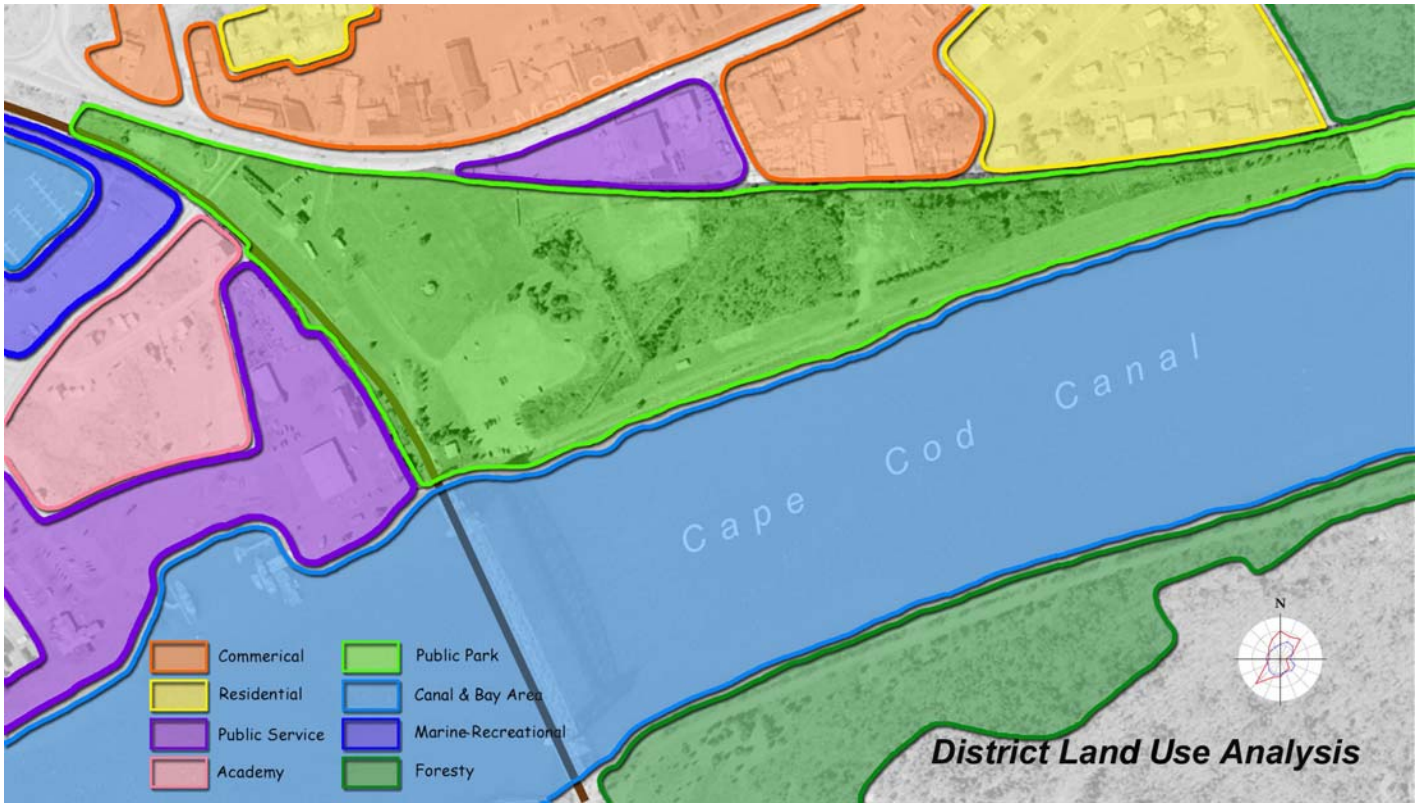


Figure 17: District Land Use Analysis

Topography

Most of the site is fairly level, although obvious elevation changes are observed in the marsh and in a mounded area. These topographic changes can be utilized to provide interesting experiences within this area.

The level topography causes drainage problems in some areas of the park. Strategies should be considered to address drainage issues and to improve the attractiveness of the flat areas.

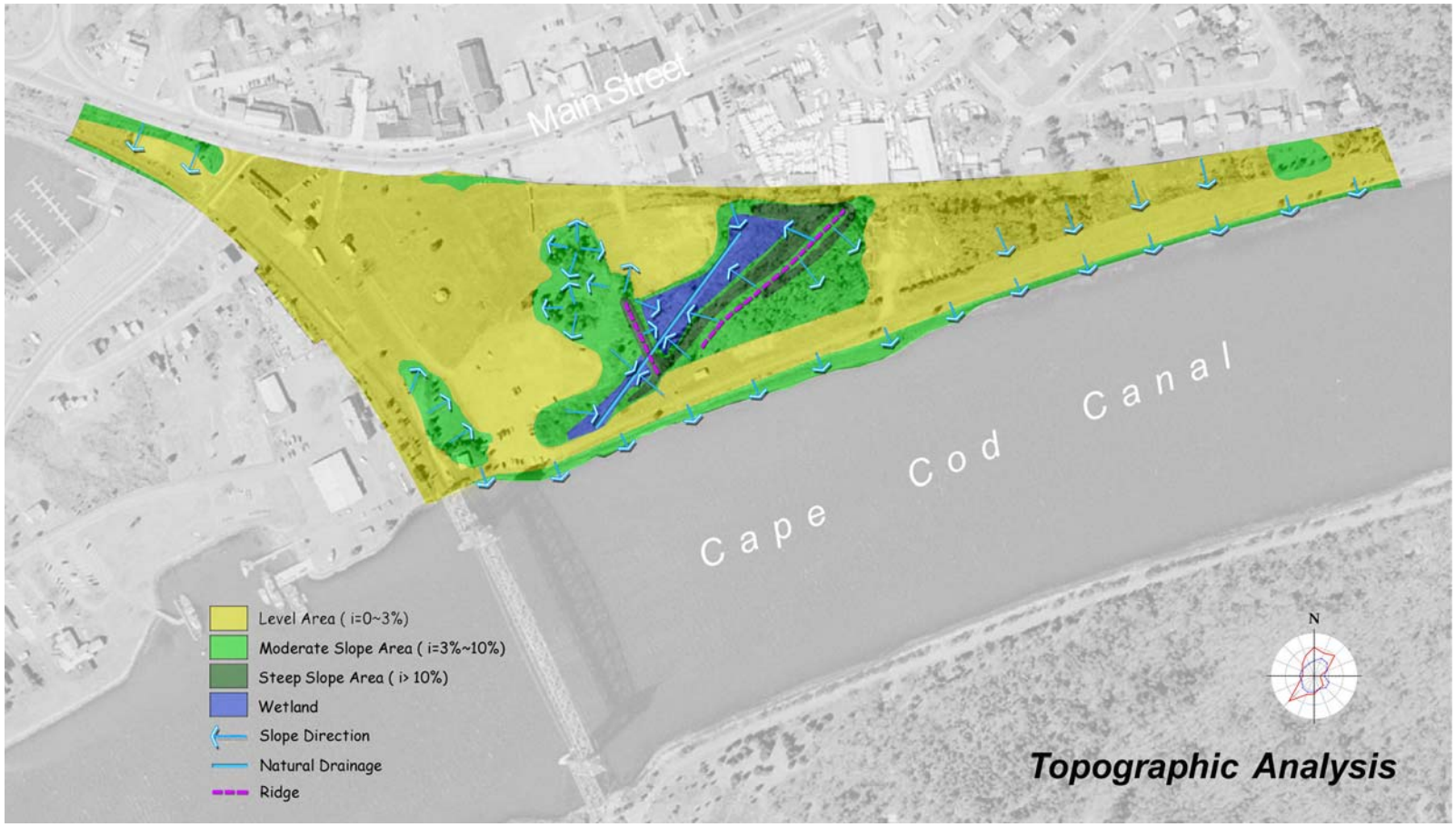


Figure 18: Topographic Analysis

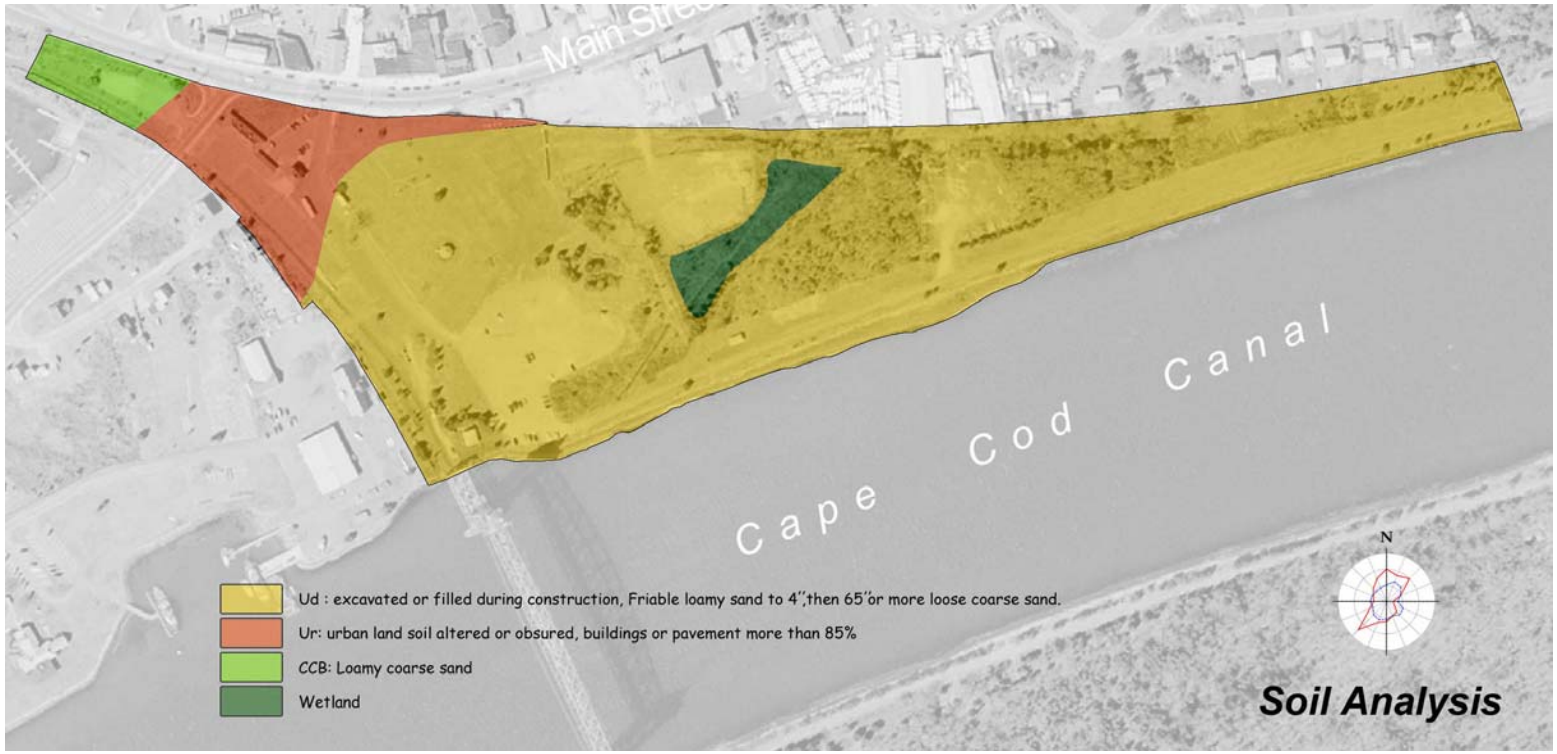
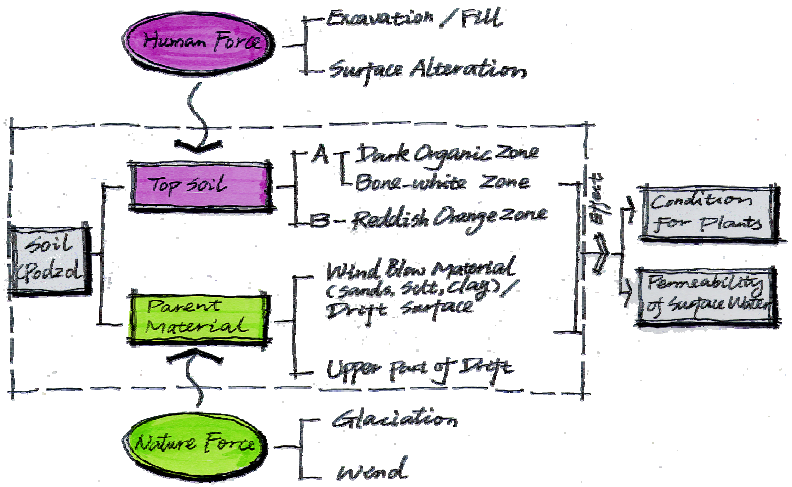


Figure 19: Soil Analysis

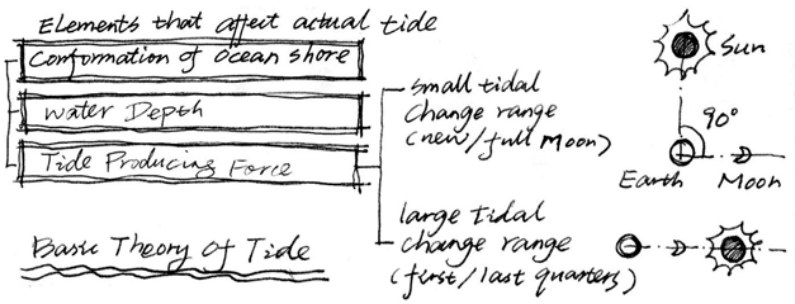


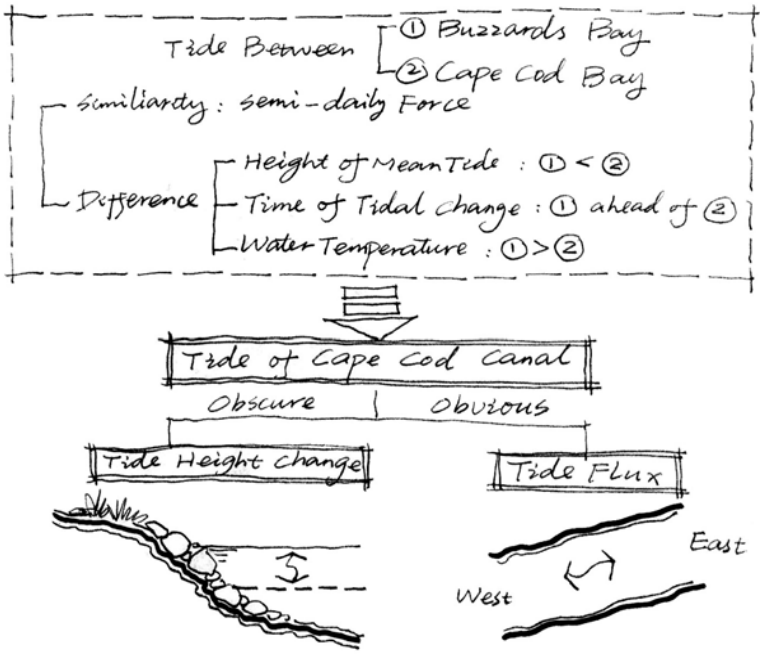
Soil Analysis

The diagram on the left shows the origin of parent soils in Cape Cod. The soils on this site are mostly the result of excavation or fill during urban construction and construction of the canal. There is potential to allow more on-site water infiltration due to the presence of sandy topsoils.

Tidal Change

The Cape Cod Canal is directly affected by tides. Tidal changes of the canal include both water level changes and flow direction changes due to tidal flux. The flow direction changes are more easily observed than are the water level changes.

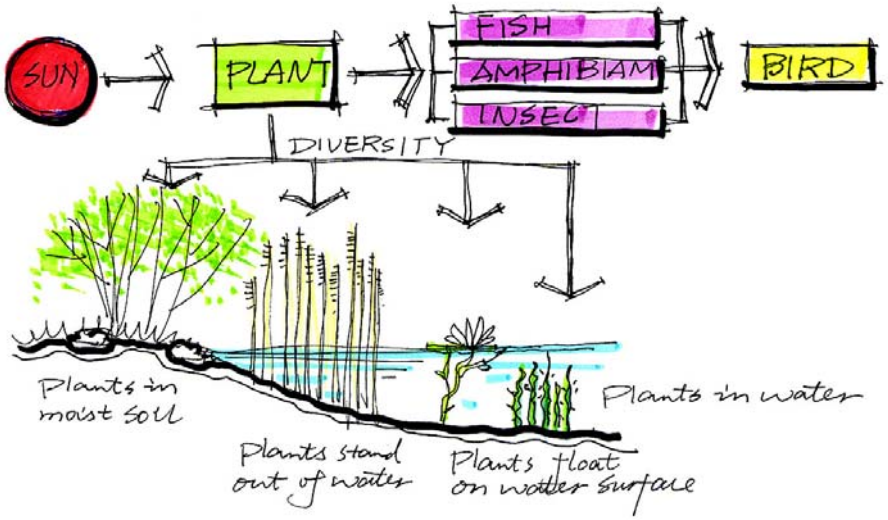




Tidal Change of Cape Cod Canal
Figure 20

Wetlands

Wetlands are the most important ecological components of this site. In addition to the canal, there is another type of natural wetland within the park area – a salt marsh. There is no solid information to support whether the existing salt marsh is a direct result of glacial movement. Since the marsh is separated from the canal, its surface water is not affected by the tidal changes of the canal. The special characteristics of the marsh support an interesting combination of plants and wildlife species.



Energy Flow in the Existing Wetland
Figure 21

5.1.2 Subjective Analysis

This type of analysis provides subjective information about the site, based on individual experience. Subjective analysis includes both visible and invisible information.

Visual Quality Analysis

The visual quality analysis identifies spatial characteristics of each portion of the site that affect visual experience.

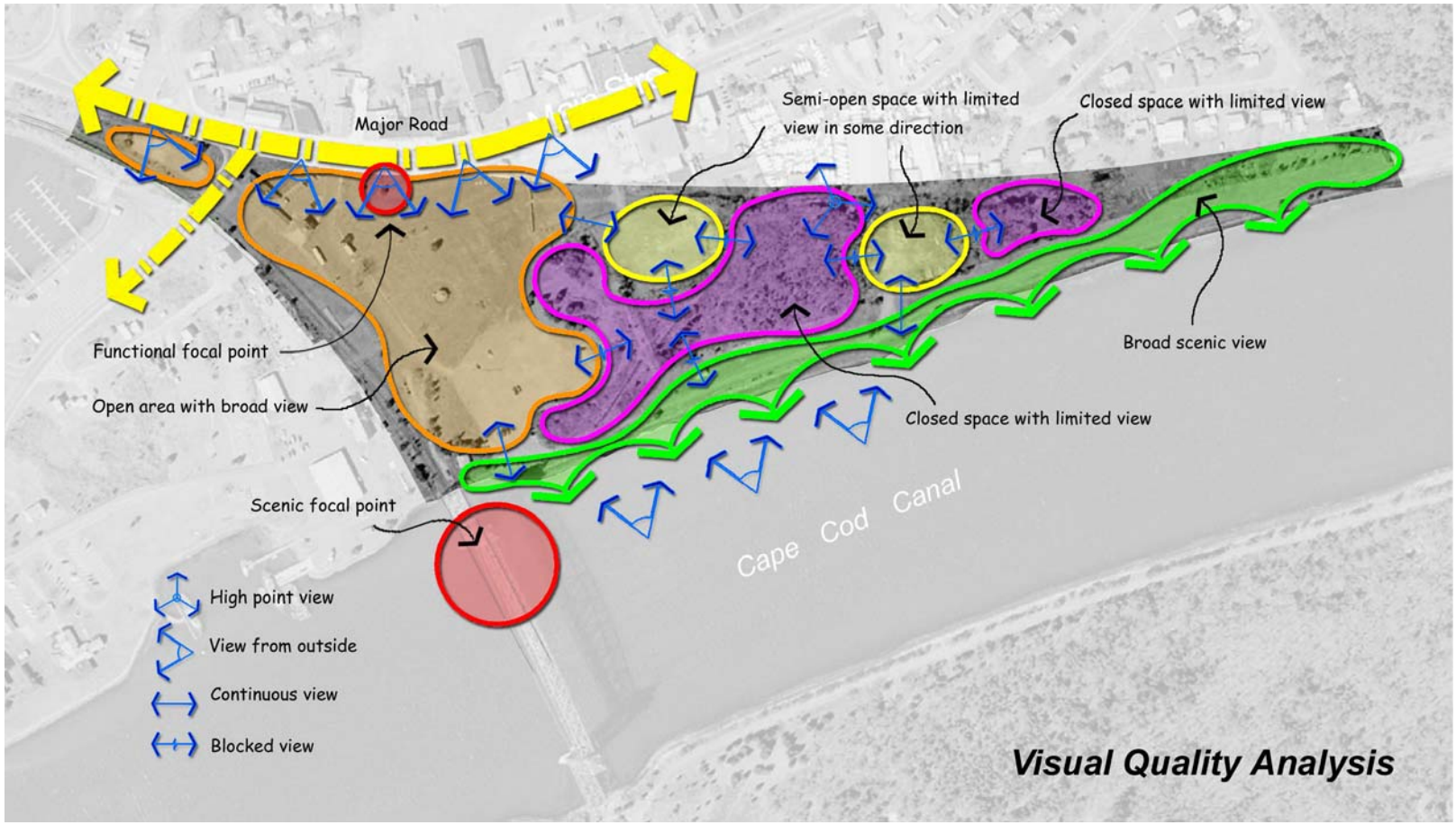


Figure 22: Visual Quality Analysis

Thermal Comfort Zone Analysis

Thermal comfort triggers instinctive human reactions. Different thermal comfort levels can affect the length of time that people stay or linger within a space. Topography, built forms, plants, and size of a space can affect comfort levels during different seasons of the year.

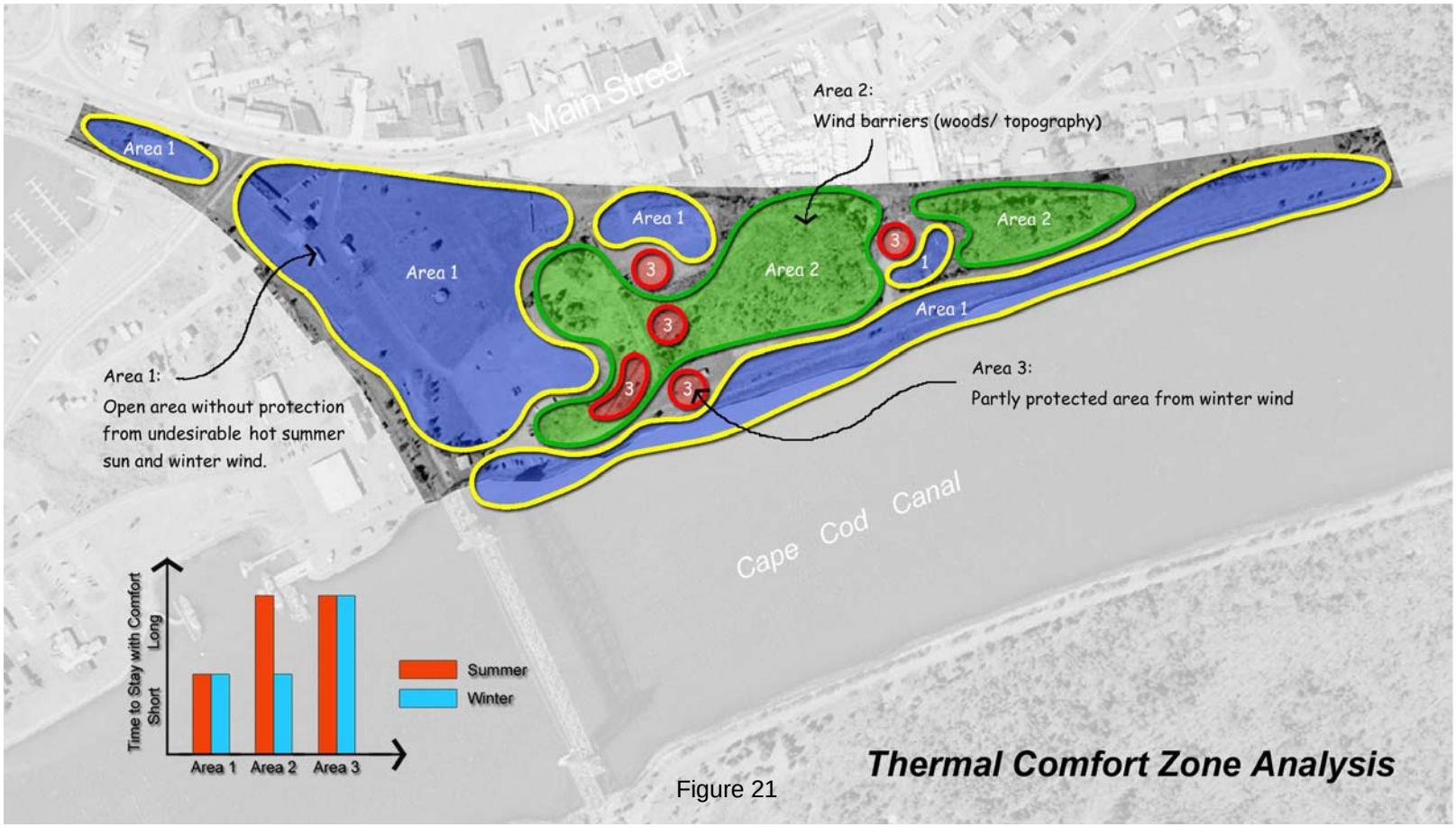


Figure 23: Thermal Comfort Zone Analysis

Mood Area Analysis

Different spatial conditions can affect people's moods to various degrees, sometimes preventing people from engaging the environment, or encouraging them to explore and investigate.

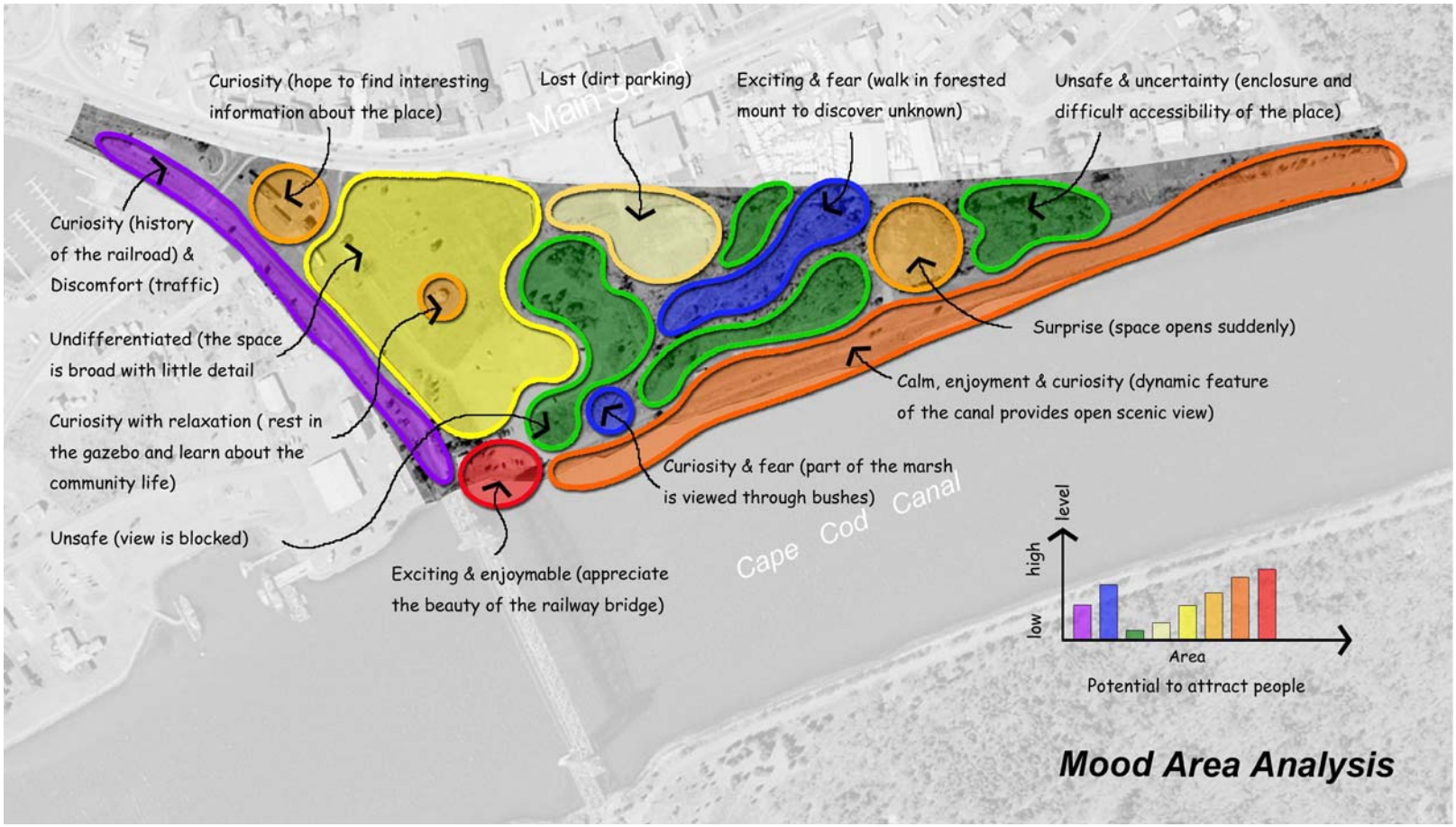


Figure 24: Mood Area Analysis

Tactile and Olfactory Analysis

There is a very interesting phenomenon on this site in that, where the textures of surfaces or materials are richer, the smells of the places are stronger. This drawing explains the interesting relationship between tactile and olfactory experiences in the site.

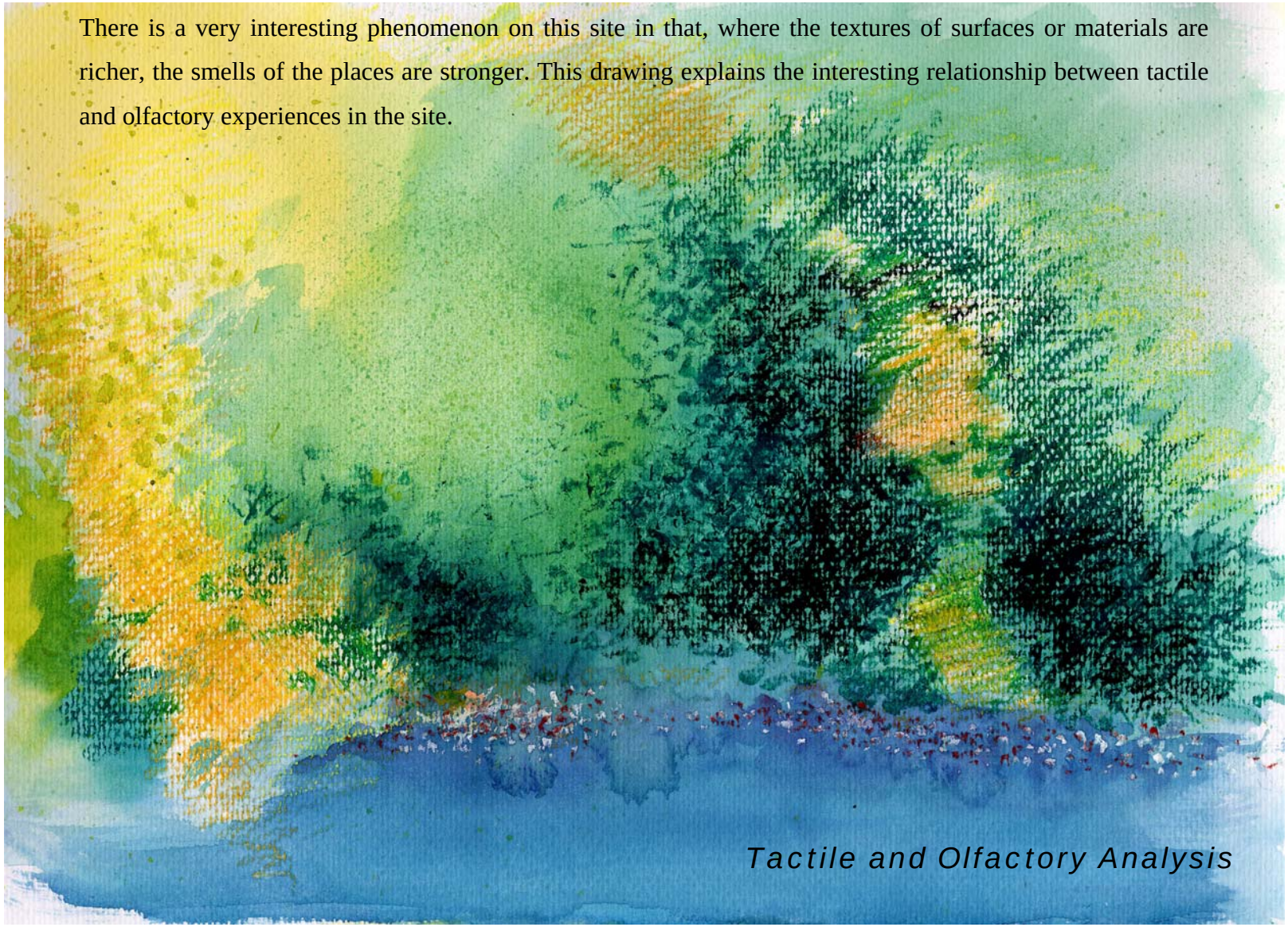


Figure 25: Tactile and Olfactory Analysis

Coherence and Legibility

This site is divided into diverse spatial regions, however they are not perceived as unified, rather they are experienced as isolated and disconnected. This lack of spatial connection decreases the legibility of the park, affecting the ease with which visitors can orient themselves.

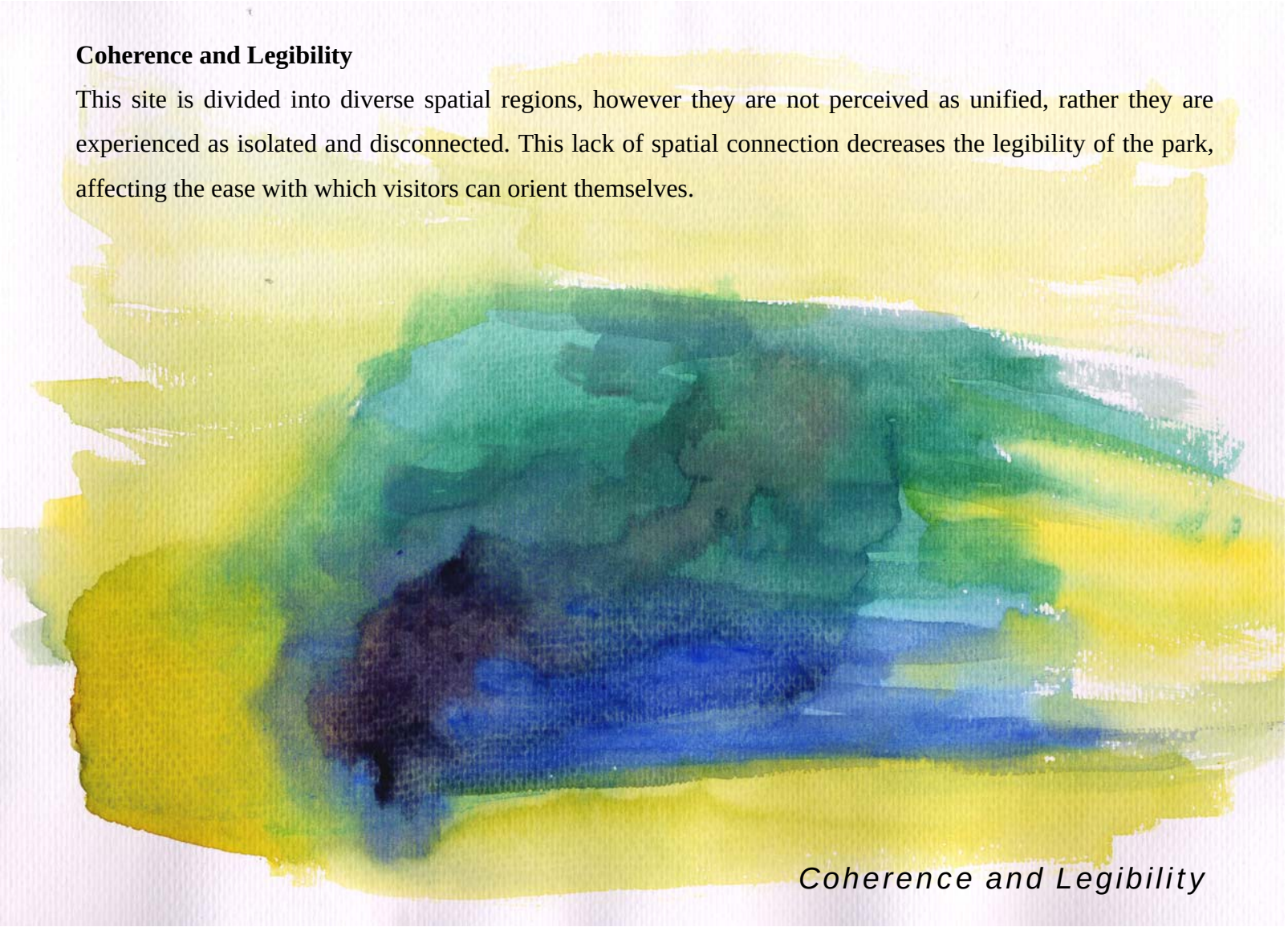


Figure 26: Coherence and Legibility

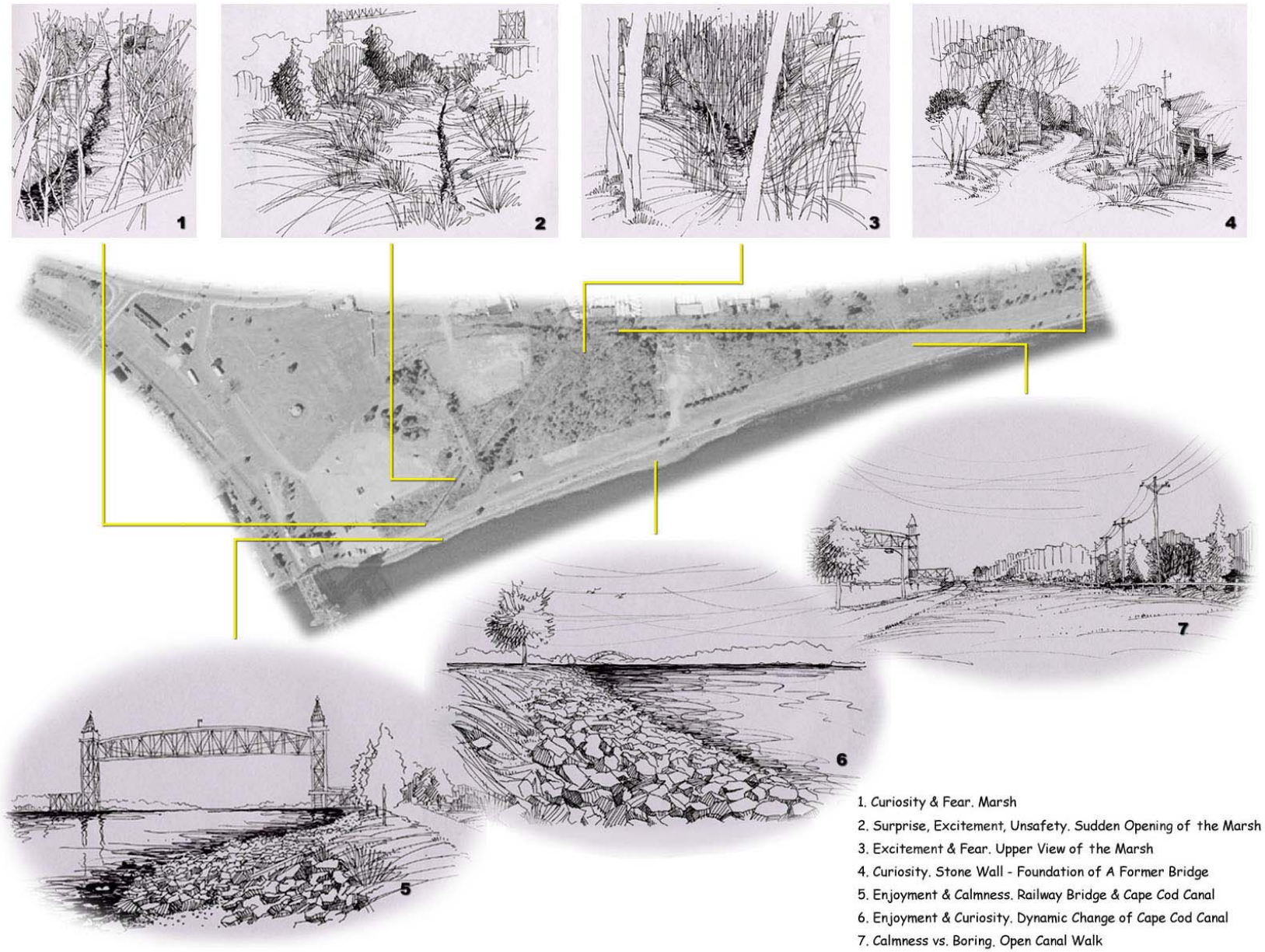


Figure 27: On-site Experience

Opportunity for Experience

The experience of passing through the site differs with every individual, while there are also some common aspects shared by everyone. Sensory experience analysis helps designers investigate the authentic "sense of place" as ordinary beholders and also as experts. The analysis of this site suggests that there is a good opportunity to provide coherent and diverse experiences by enhancing is existing characteristics.

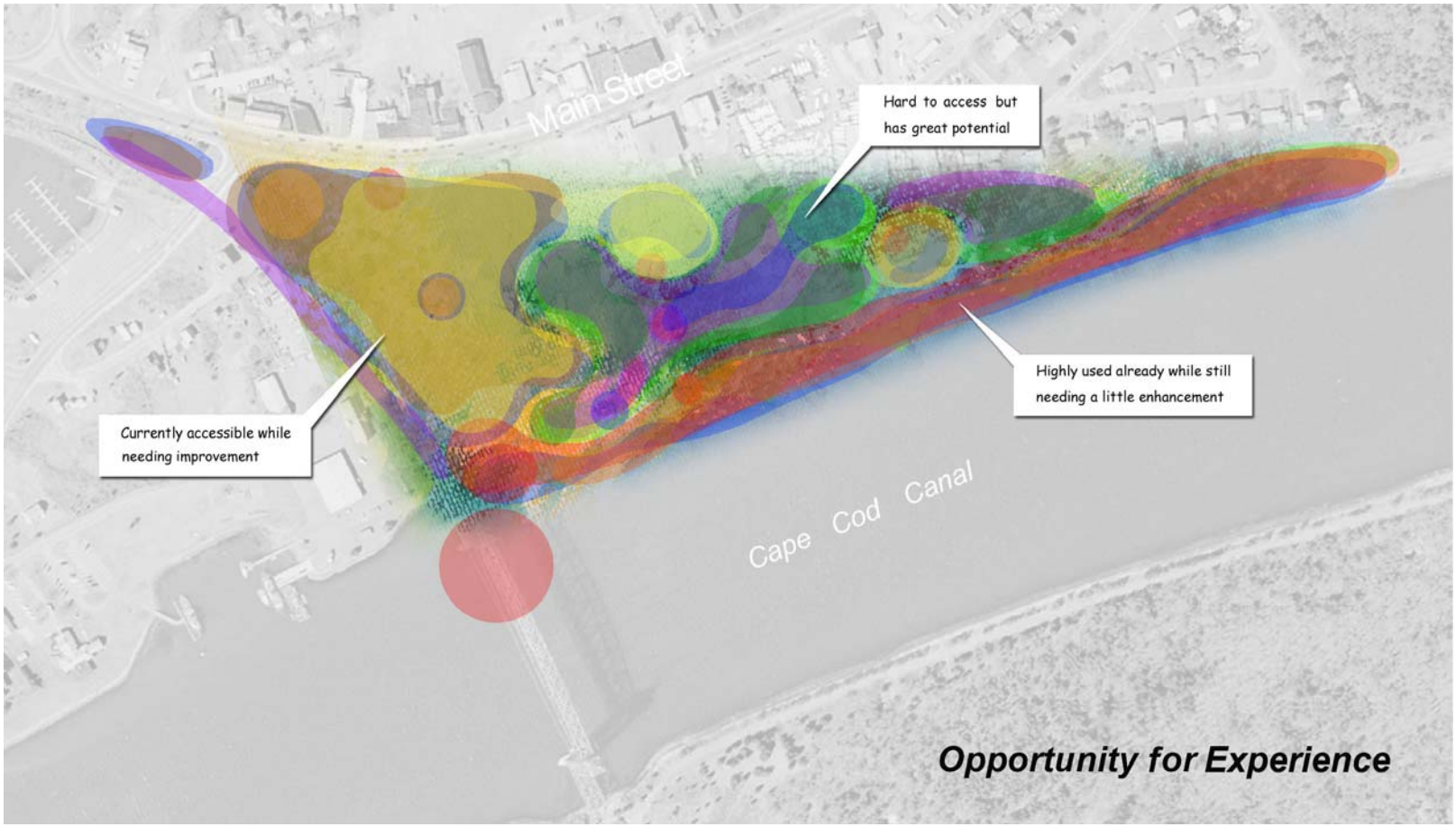
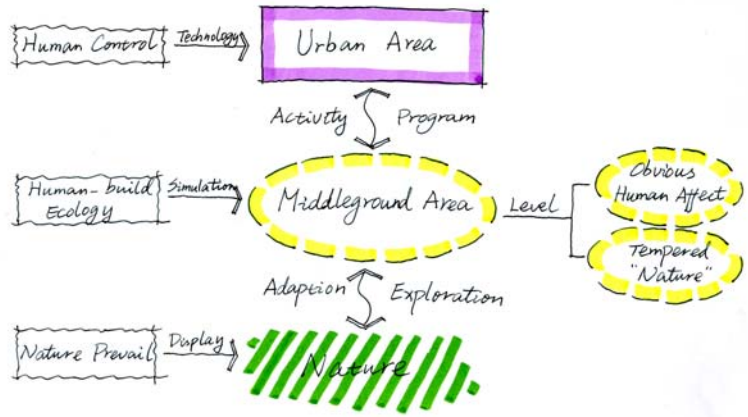


Figure 28: Opportunity for Experience

5.2 Phase II - Concept Design

The concept design is based on both objective and subjective analysis. Two concepts are produced in this project to compare the differences between one design developed by using a traditional design methodology and another derived from the experience-oriented ecological design framework.



Relationship of Area
Figure 29

1) Concept I

Concept I starts from the traditional point of spatial structure. The relationship of the park to the downtown and the canal is structured as a progression from areas characterized by human control to areas in which nature dominates (Figure 29).

Different functional spaces are connected in a rhythm of changing spaces (open vs. closed) that together present a narrative.

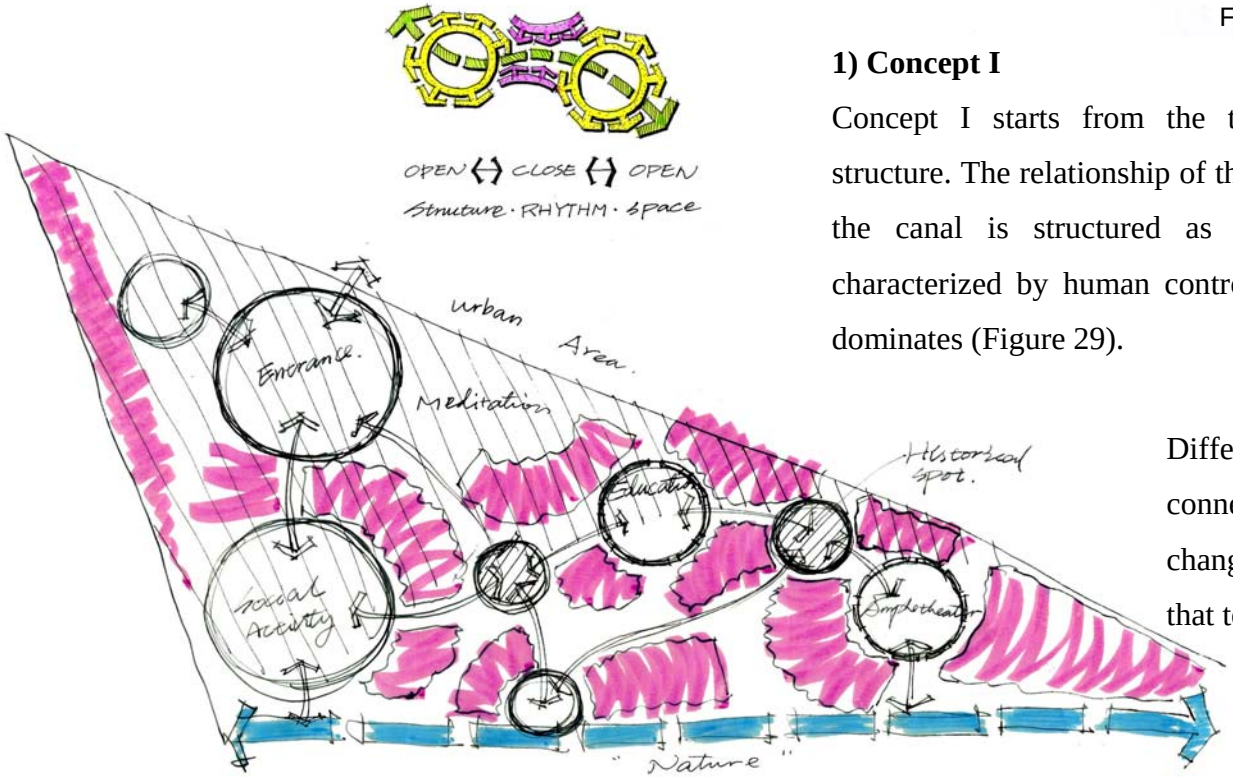


Figure 30: Concept I

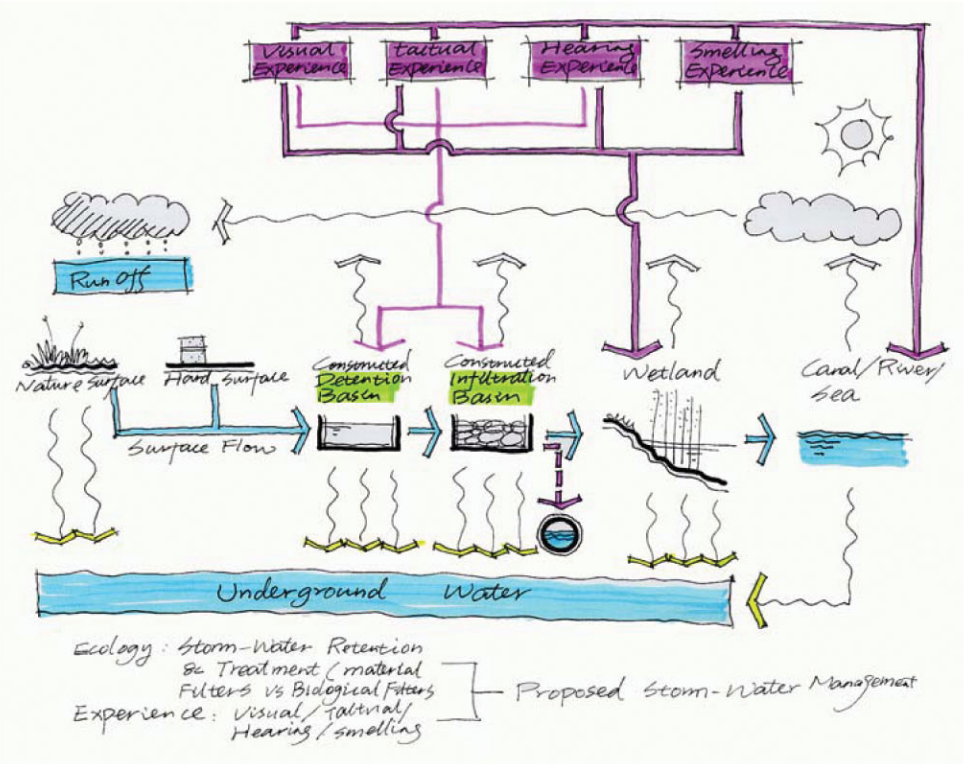
2) Concept II:

Sensory Experience + Ecological Function

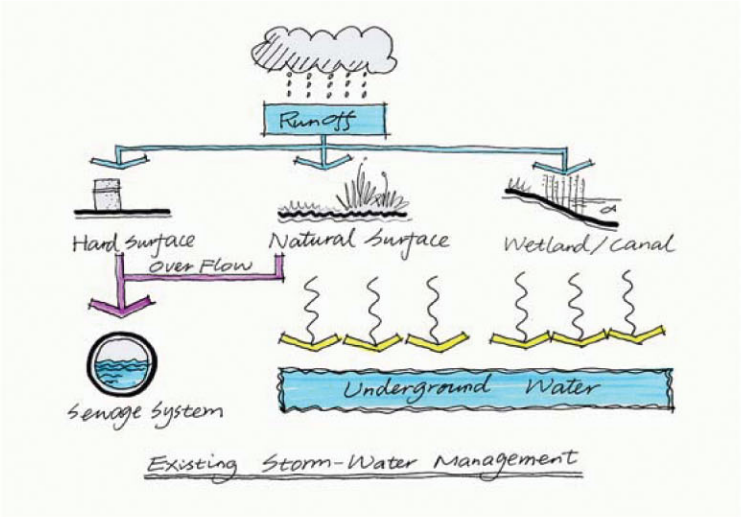
Proposed Experience (Bottom Left) vs. Existing Experiential Quality (Top Right)
Figure 31

Concept II starts from the experiential quality of the place by proposing coherent and diverse experiences in the design. Instead of leaving the existing site as isolated and disconnected, Concept II proposes to build up legible connections between spaces to provide integrated experiences for people and to encourage them to explore the place. Warm and cold colors representing different experiences mix together in different hue levels and create an intriguingly dramatic pattern that nonetheless reads as a harmonious entity.

The ecological content of this concept focuses on onsite storm-water management. Three series of natural and human-constructed wetlands are utilized to support healthy water cycle functions within the site (Figure 32,33).



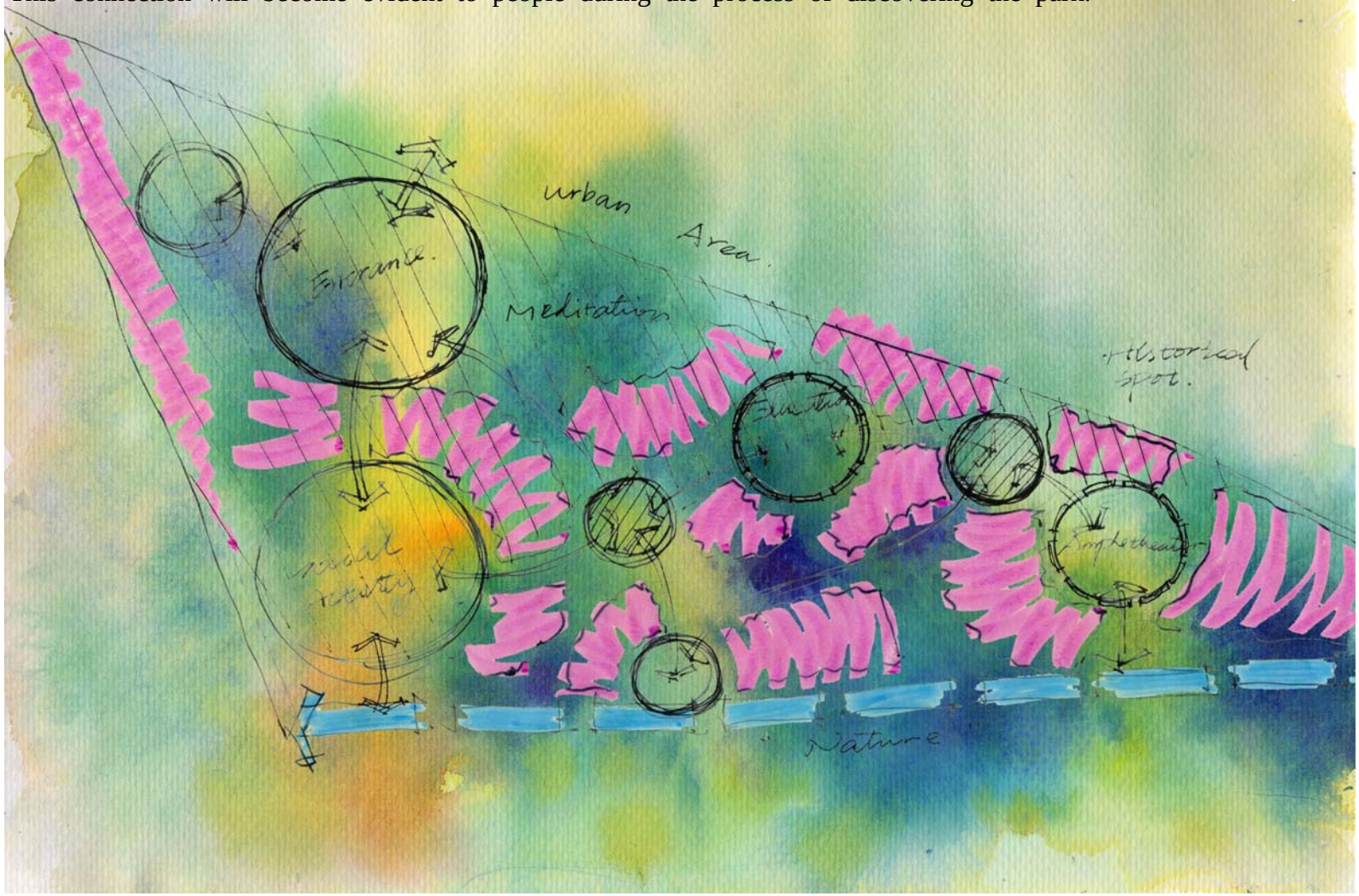
Proposed Storm-water Cycle
Figure 33



Existing Storm-water Cycle
Figure 32

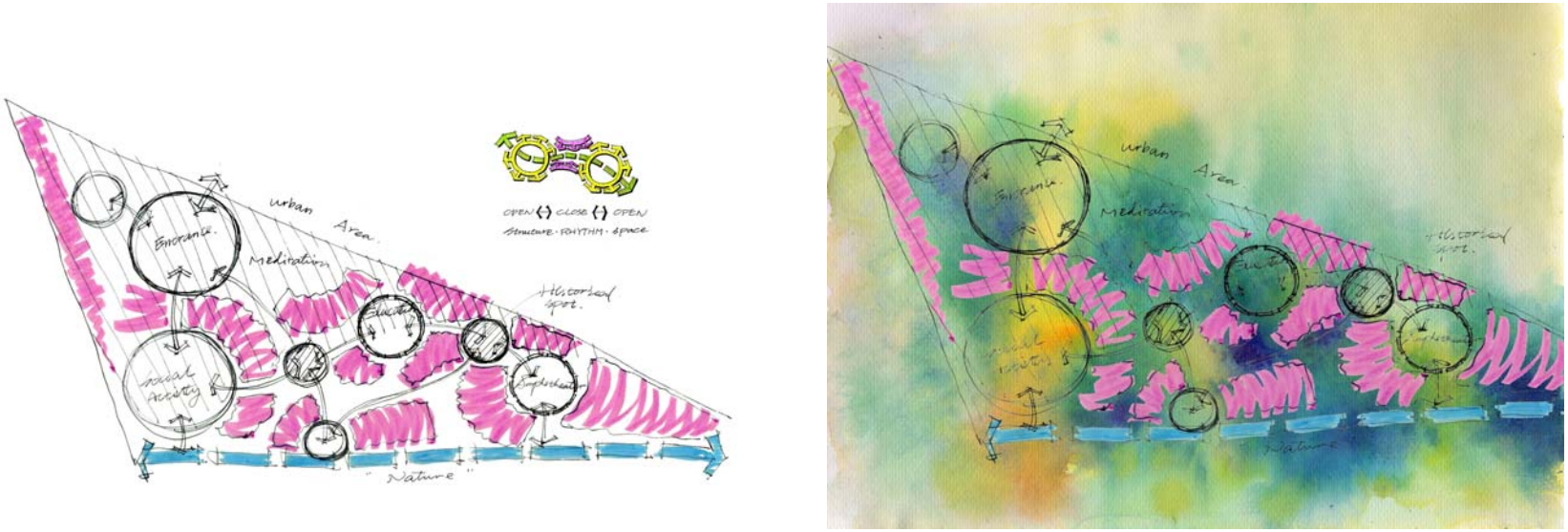
The existence of wind and the dynamic tidal change of the Cape Cod Canal are also expressed in the design concept.

The connection between sensory experience and ecological function is the most important strategy for Concept II. This connection will become evident to people during the process of discovering the park.



Concept II: Sensory Experience + Ecological Function
Figure 34

3) Comparison of Concept I vs. Concept II



Concept I vs. Concept II
Figure 35

Concept I is strong at building up functional structure, while it is weak at setting up a direct connection and relationship between human experiences and these functions. Therefore the design is lacking in richness.

Concept II is more successful in setting up direct relationships between human experiences and ecological functions, which is a primary goal. As a result, the richness of experience is enhanced.

The process of creating place is also a process of setting up connections between human experiences and ecological functions. This is an iterative process during which creative ideas are distilled.

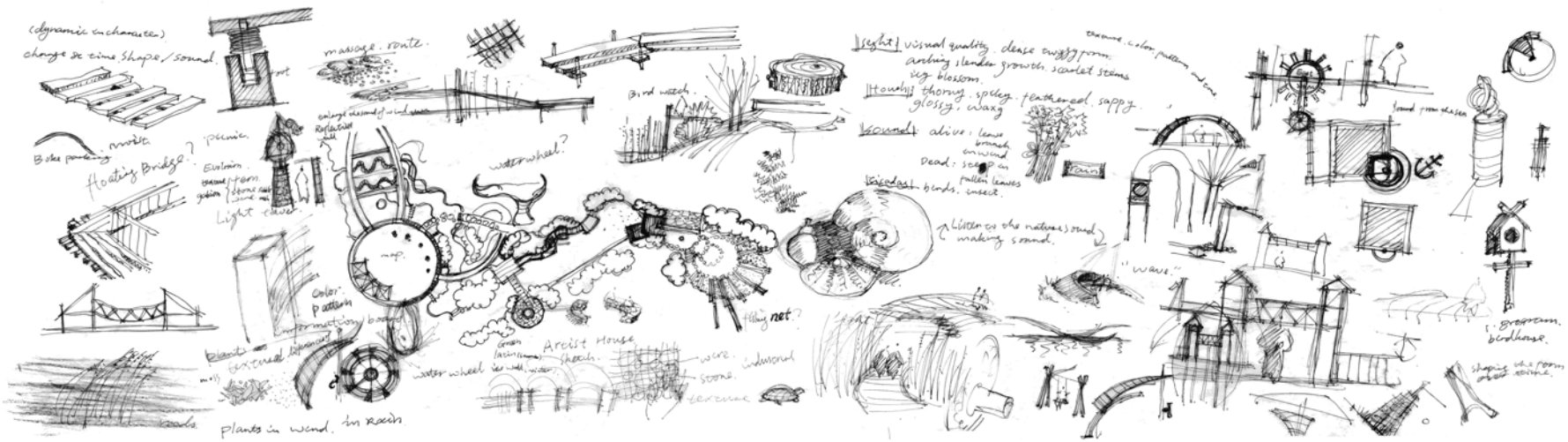
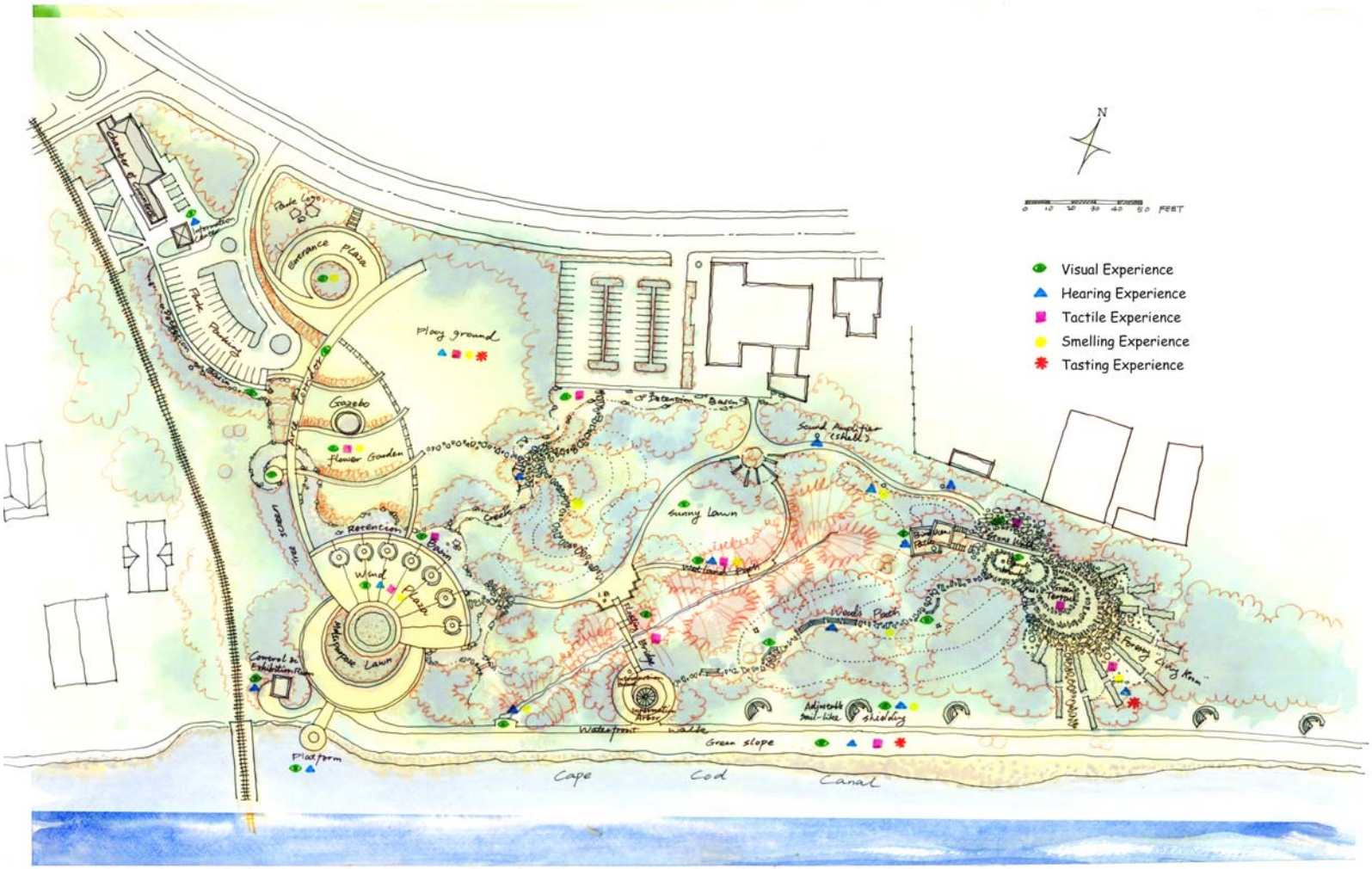


Figure 36: Connection

5.3 Phase III – Site Design

The site design is developed from Concept II. Different sensory experiences are emphasized in different areas of the site, which contribute fully to "sense of place".



Coherent & Diverse Experience of Place
Figure 37

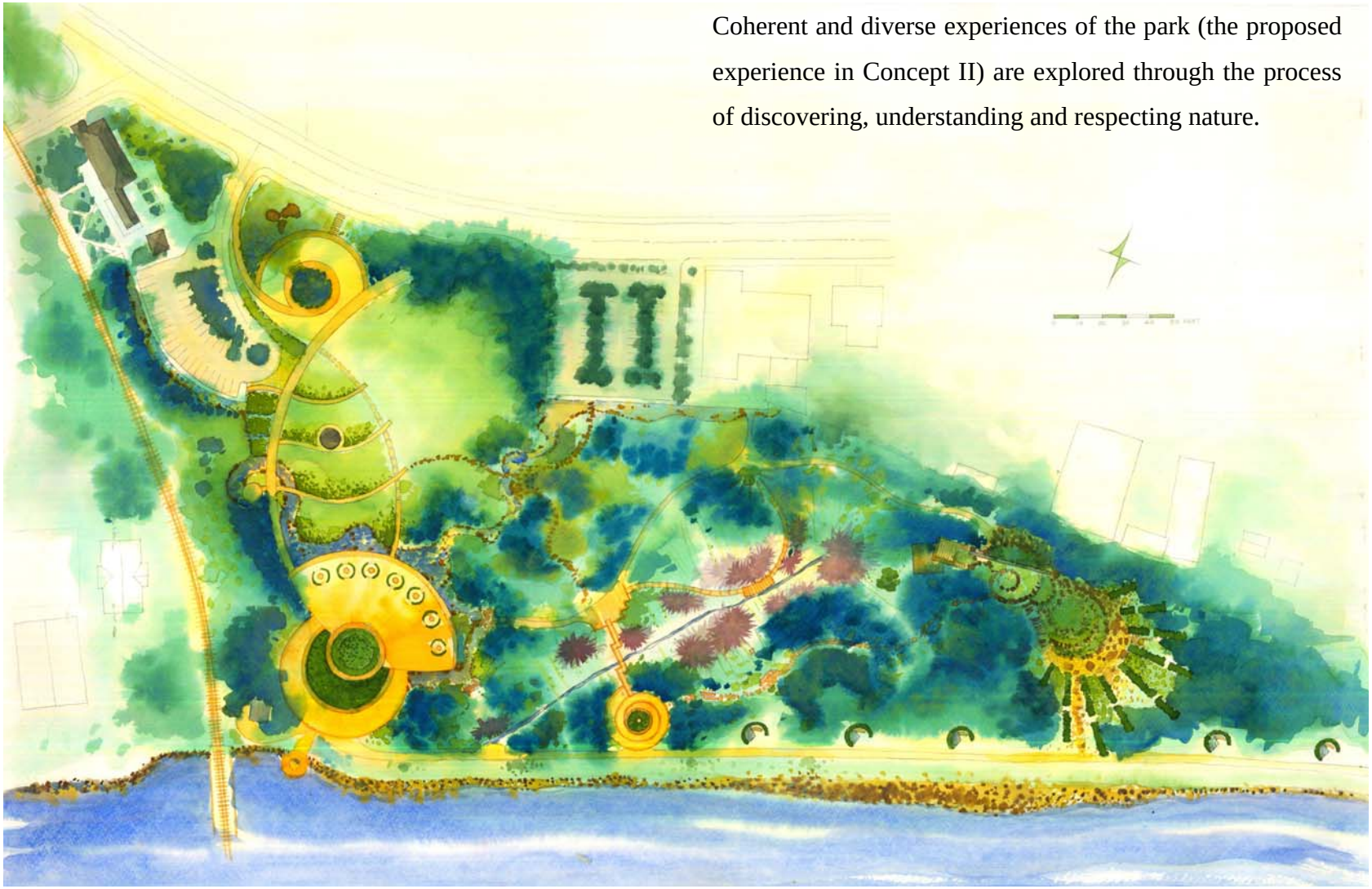


Figure 38: Master Plan of Park

Entrance Area

The major entrance is located on the north side of the park. The entrance area includes an entrance plaza with a park logo as the symbol of the place, an information center located in the preserved historical buildings, and a parking area with a detention basin that collects and performs initial cleansing of storm-water.

Figure 39: Entrance Area

Social Activity Area

The social activity area provides several flexible open spaces for diverse activities during different seasons and times. This area includes:

- Arch corridor with changing views, where people can observe how plants help to clean water in the storm-water detention basin.
- Green playground that hosts activities such as sports, festivals, tents, picnics, resting and sunbathing, etc.
- Gazebo in the seasonal changing flower garden where people can read about the history of the community and observe how time changes the texture, visual pattern, colors and smells of the garden.
- Multi-purpose lawn that allows more onsite water infiltration, and provides space for different activities such as festivals, music, bridge viewing and sitting. From here, people can choose either to go down to the riverfront or to step into or explore the secrets of the natural wetland.

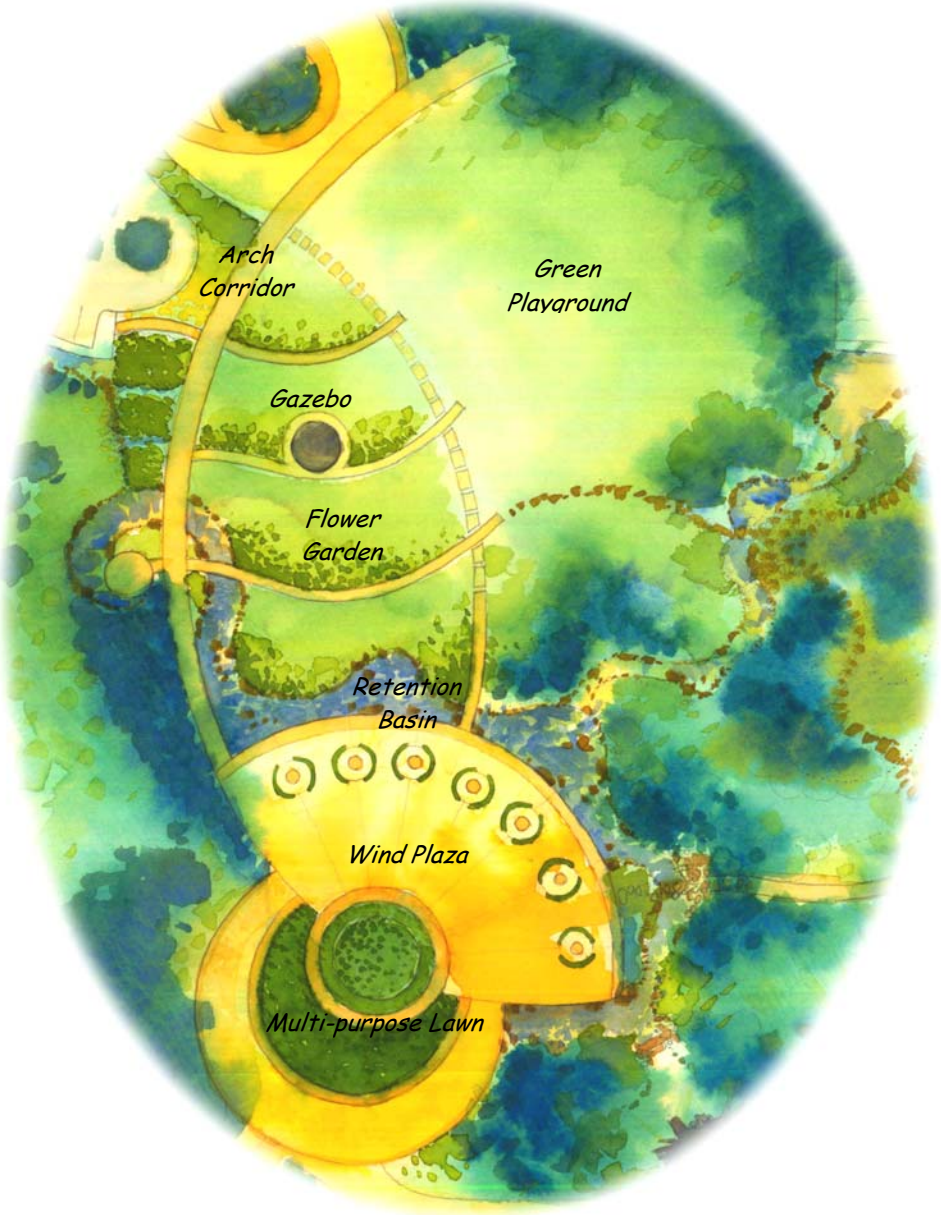
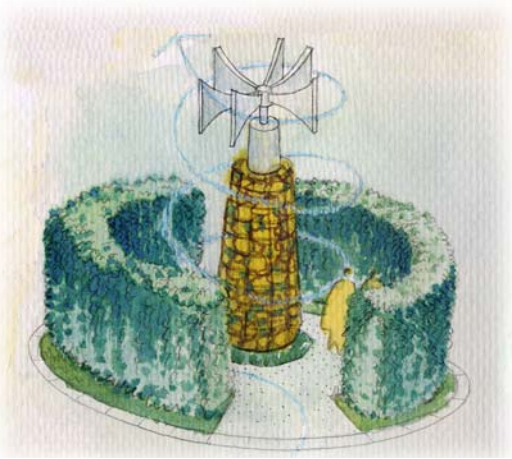


Figure 40: Social Activity Area

Wind Plaza & Multi-purpose Lawn
Figure 41

- Wind Plaza, where several wind mazes are located with entrances opening towards different directions. Inside the wind mazes, people can sense the speed changes of wind, smell the scents of wind in different seasons, touch the hard surface of stones and soft surface of plants, and observe the growth of ferns.



Windmill Maze
Figure 42

Wetland & Wooded Area

The original wetland and woods area is primarily preserved. The design simply reconfigures certain parts of the area to make it a "tempered nature", safer and more attractive for people to visit.

The wetland and woods area includes:

- Wetland where people can explore the nature of the marsh.
- Preserved stone retaining wall and benchmark that provide surprising and interesting clues to the historical content of the place.
- Forested "living room", a space for resting, picnicking, and music. It is also a place that provides special bare-foot experiences by using different surface materials.

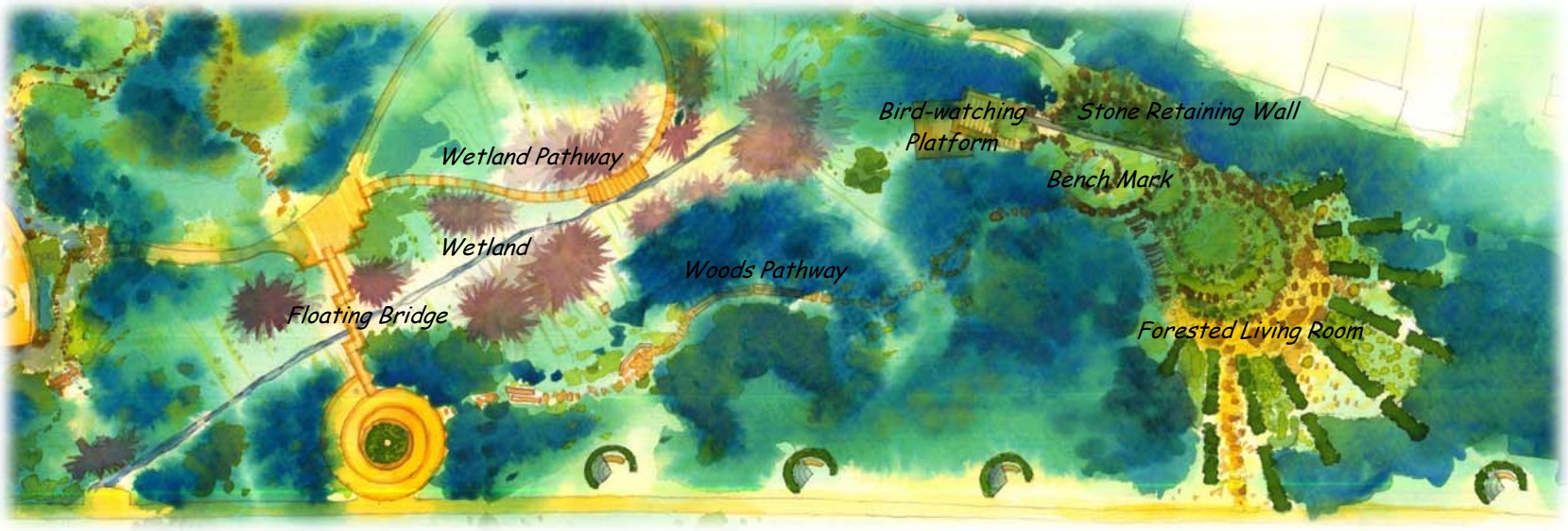
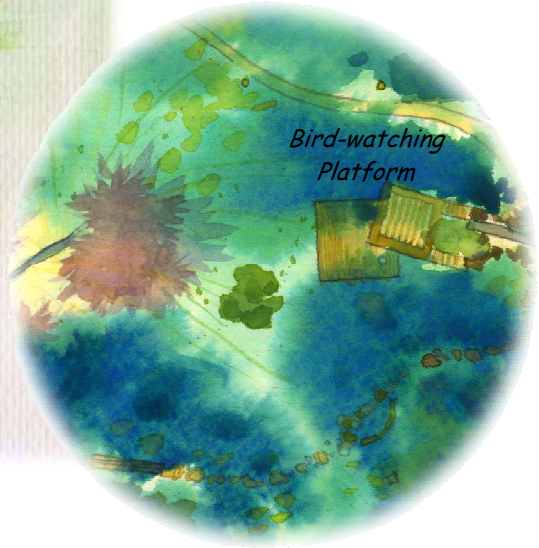


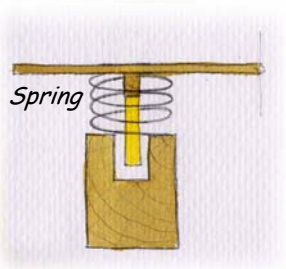
Figure 43: Wetland & Wooded Area

Within the wetland area, from the bird-watching platform located on the ridge of the wooded mound, people can observe the marsh from above.



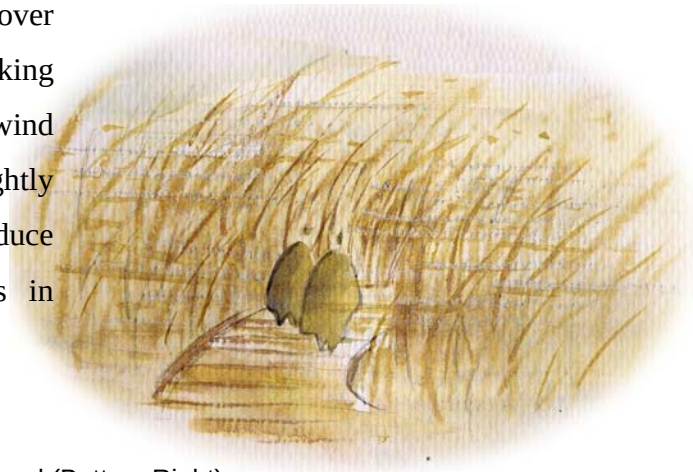
Bird-watching Platform in Spring
Figure 44

Springs are installed in the structure of the “floating” bridge over the marsh. This structure provides a special opportunity for people to experience the resilient feeling of stepping on top of the marsh.



“Floating” Bridge (Top) in Autumn & Detail of Bridge (Left Bottom)
Figure 45

Within the wetland pathway, people can discover the marsh from within. The experience of walking up and down between “dancing” reeds in the wind could be unforgettable: shaking reeds lightly touching your face; the wind and reeds produce interesting sounds and bring special scents in different seasons.



Marsh in Winter (Top) & Play of Wind within Wetland (Bottom Right)
Figure 46

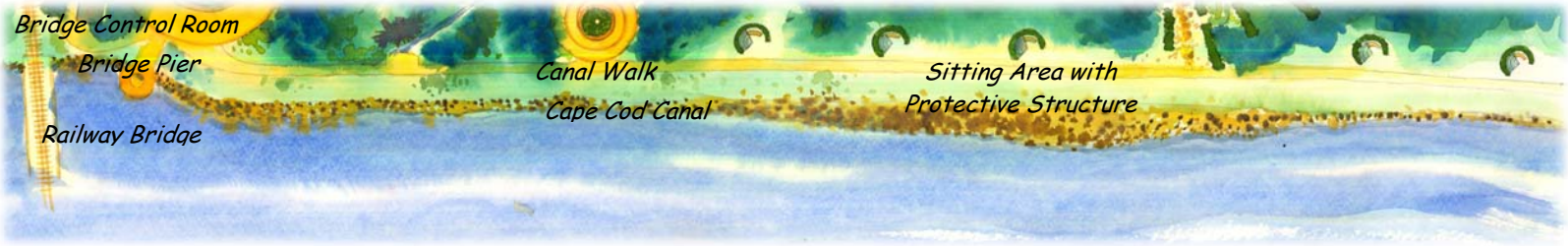


Figure 47: Canal Walk Area

Canal Walk Area

In this area, the existing canal walk and the bank of the canal are mainly preserved. New sitting facilities are installed along the canal walk, and a bridge pier is constructed near the railroad bridge. This area includes:

- Canal Walk
- Bridge Pier
- Railway bridge control room
- Sitting area with protective structure

Adjustable sail-like structures in the sitting areas allow people to rotate the "sails" when choosing to block undesirable winter winds, mostly from the southwest. The "sail" canvas can be rolled up when there is no need to block wind or sunlight.

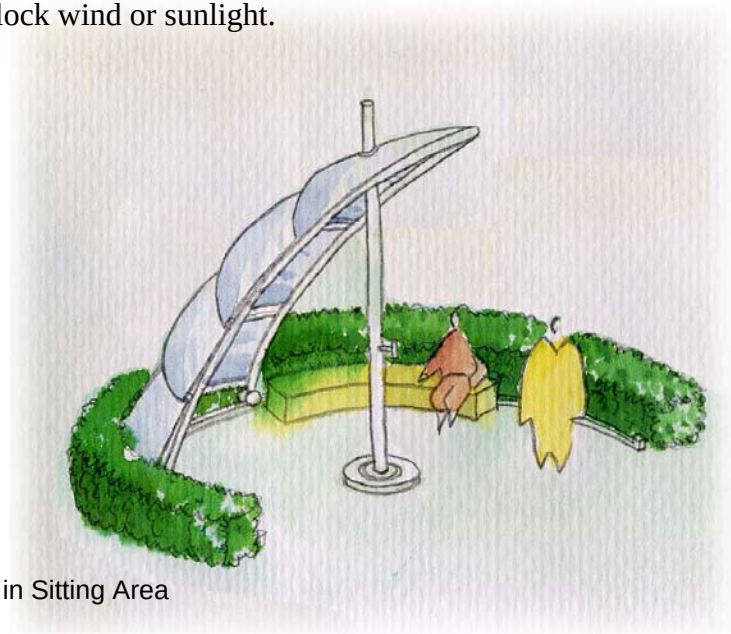
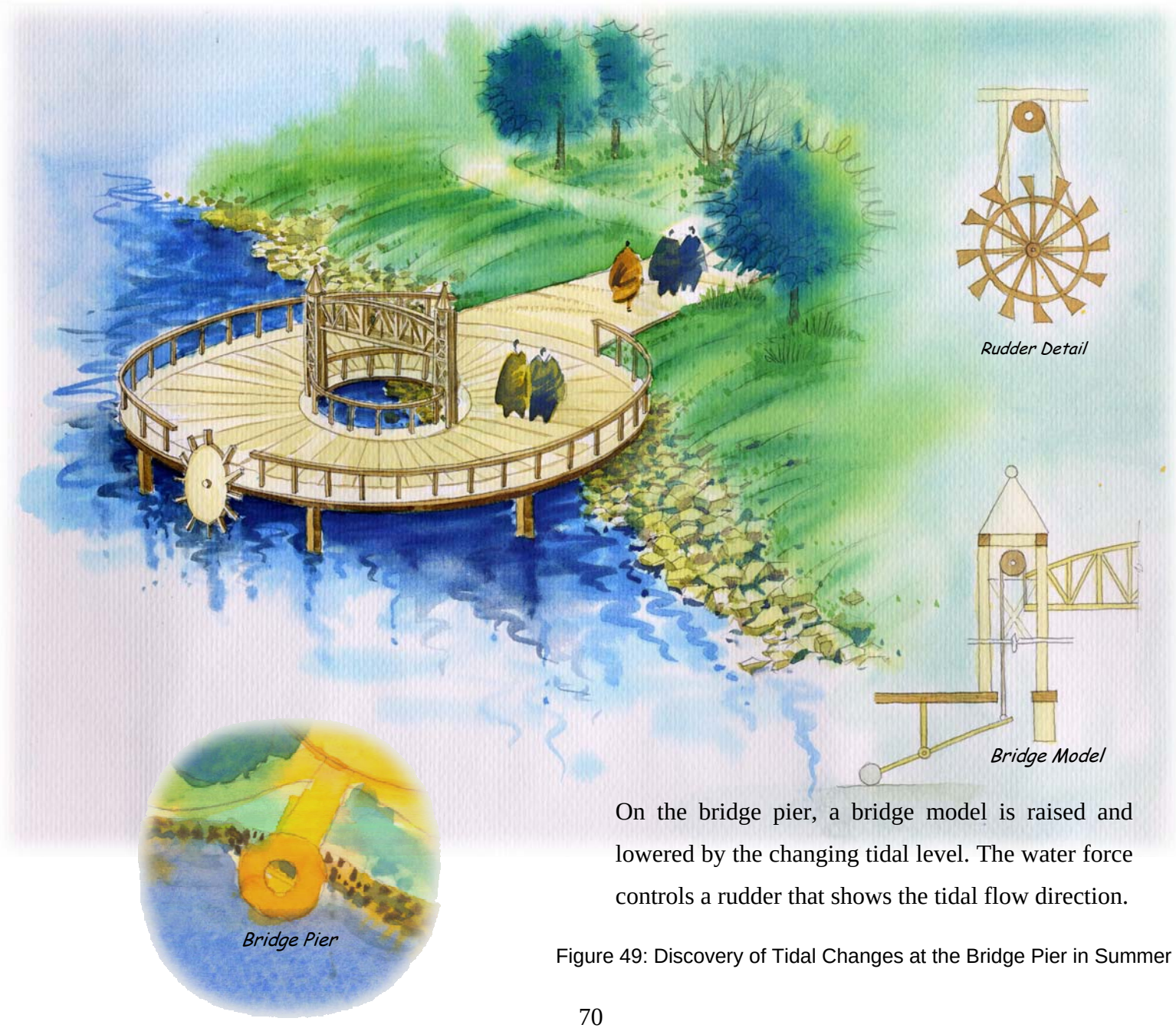


Figure 48: Sail-like Structure in Sitting Area



On the bridge pier, a bridge model is raised and lowered by the changing tidal level. The water force controls a rudder that shows the tidal flow direction.

Figure 49: Discovery of Tidal Changes at the Bridge Pier in Summer

Chapter 6
Evaluation & Conclusions

The design is evaluated with reference to theories that underlie the experience-oriented ecological design framework: three levels of ecological design, the preference matrix, Yin & Yang, and "Chi" theory. The design accomplishes the objectives of these theories as described below.

6.1 Three Levels of Ecological Design

The design responds to both ecological and experiential requirements at the three levels of ecological design:

6.1.1 At the adaptation level, the design:

- Preserves existing wetland and woods;
- Identifies comfortable areas for different activities;
- Creates flexible spaces or forms, e.g. the green playground and the multipurpose lawn host different activities;
- Provides sensory pleasure, e.g. beauty, comfort, safety.

6.1.2 At the mitigation level, the design:

- Supports healthy water cycles, by simulating a natural hydrological regime in two series of constructed wetlands, using local materials and plants;
- Allows human access without interruption to the natural processes;
- Uses models and words to explain phenomena and places;
- Provides spaces for different activities, e.g. social interaction and individual use.

6.1.3 At the reintegrating level, the design:

- Creates connections between sensory experience and ecological functions: the "floating" bridge allows users to experience the soft surface of the marsh; a bridge model and a rudder on the bridge pier depict the tidal changes of the canal;

- Programs diverse activities to explore environmental changes, such as a wetland exploration tour and tidal change observation;
- Provides opportunity to consider and imagine: an opportunity to observe and compare water quality is found in the series of wetlands; the windmill mazes provide opportunities to sense different speeds of wind and to study the differences; people can adjust the sail-like shields at the canal walk sitting areas and investigate appropriate ways to respond to nature.

6.2 Preference Matrix

The preference matrix, showing qualities of coherence, complexity, legibility and mystery, guides the structure of the design.

6.2.1 Coherence

The design:

- Uses social and ecological narratives to connect activity spaces and green/ ecological spaces.

6.2.2 Complexity

The design:

- Offers visitors choices of different visiting routes;
- Creates and connects spaces with changing rhythms, e.g. open vs. semi-open vs. enclosed spaces;
- Provides elevation changes in different spaces and along various routes.

6.2.3 Legibility

The design:

- Provides sensory experiences corresponding to different ecological issues;
- In the layout plan, provides for different sizes of spaces according to activity requirements;
- Provides logical connections between spaces.

6.2.4 Mystery

The design:

- Reveals the whole place step by step – gradually disclosing spaces encourages visitors to explore.

6.3 Yin & Yang, and "Chi" Theory

The theory of Yin & Yang, and "Chi" are also embodied in the design.

6.3.1 Yin & Yang

The design provides:

- Open and enclosed spaces with sequences of alternating feelings of passive vs. active engagement;
- Static structure as well as dynamic natural feature changes (e.g. water bodies)
- Soft vs. hard surfaces
- Warm vs. cold spaces or colors
- Simple vs. rich patterns and materials

6.3.2 Chi

The design:

- Allows continuous air flow through the site;
- Supports healthy water cycles throughout the park;
- Provides coherent experiences of the place.

6.4 Conclusion

In summary, by applying the experience-oriented ecological design framework, the design successfully establishes a direct relationship between human beings and nature in a landscape setting. The process and resulting design verify that the framework can be applied effectively. Some positive outcomes include:

- The framework encourages designers not only to use their professional knowledge but also to use their sensory organs to understand, consider and create places in a comprehensive way, thereby improving their design abilities and skills during the process;
- The framework integrates sensory experiences and ecological functions in a unified design for urban public space. This approach exemplifies the idea that: "Nature is what there is. It is ourselves as well as our setting" (Olin, 1997, p. 111)
- Consideration of connections between sensory experiences and ecological functions helps to generate

creative ideas that make the place more interesting and attractive, and also improve awareness of ecological functions.

- Providing appealing sensory experiences in the landscape may encourage people's active interaction with the landscape and help them understand its ecological functions.
- Attractive and easily understood experience-oriented ecological designs may also encourage more ecological design to occur in urban public spaces, to be appreciated by the public, and to educate people in the critical importance of natural process to our daily lives.

On the other hand, the project design also identifies the following issues that need to be improved and considered within and beyond the framework.

6.4.1 Graphic Medium

The application of the framework to the design suggests that the components identified for analysis (both traditional site analysis and sensory experience analysis) are appropriate, however, the framework may be deficient in addressing a process consideration: what kind of medium can most effectively record and represent sensory experience?

At the very beginning of my site analysis process, I used a traditional representational medium – computer-generated drawings - to document the sensory experience analysis, confirming that abstract sensory experiences can be recorded in traditional ways. This medium for analysis does not necessarily require special graphic skills, and it can be easily understood by the public as comparatively objective, legible and familiar. However, after I finished the computer-generated maps, I was not totally satisfied with the results. Several questions arose in my mind: Can the very definitive lines of a computer drawing accurately identify sensory experience zones? Do such precise boundaries really exist between zones of experience? If not, how can one graphically convey abstract sensory experiences while still maintaining their abstract qualities? Can any mode of drawing express sensory experience

adequately? Consideration of all these questions led to my decision to use watercolor to explore and illustrate sensory experiences. Ultimately I concluded that using the medium of watercolor actually improved the outcomes of both the site analysis and site design. Since the outcome of the design process differed according to the mode of graphic representation that was utilized to develop the design, I realized that a very important factor had been omitted in the framework - the medium for documenting sensory experience, which as I discovered, affects the validity of analysis and the quality of design.

Therefore, what kind of medium can efficiently record and represent sensory experience? My conclusion was that, in order to properly address sensory experiences, designers must engage the documentation by a method that relies on sensory experience. Such methods could include watercolor, music, sculpture, or other forms of creative activity.

My choice of watercolor as a tool to represent sensory experience was spontaneous. I had not anticipated using watercolor as part of my study, however, upon reflecting on the design process after its completion, I realized that I had unintentionally followed a process that is well known in Chinese classical garden design. This process is an aspect of classical Chinese garden design that I have not discussed, that is, the influence of classical Chinese landscape painting (Scholar -Shan Shui Xe Yi painting) on garden design. By studying the history of classical Chinese gardens, one discovers that their designers were usually adept at “Shan Shui” painting. “Shan Shui” paintings are usually drawn with water and ink, and some also with Chinese color pigments. Although “Shan Shui” painting was not a necessary element of every garden design, practicing “Shan Shui” painting was one important method for the ancient Chinese masters to truly comprehend the outer world through their senses, to communicate with the natural environment, and to learn how to achieve “Nature So” by educating themselves during the process.

Although methods of application and materials differ between Chinese “Shan Shui” paintings and watercolor

techniques, there are some common characteristics that make both effective in expressing sensory experiences.

First, both these types of paintings can express emotions in either a literal or an abstract way. Secondly, both Chinese "Shan Shui" paintings and watercolor paintings link the artist to natural modes of painting through water, a basic but marvelous natural element that is critical to both. Water connects painters with nature in a subtle yet compelling way, just as sensory experiences link people with their surrounding natural environments.

Thirdly, both Chinese "Shan Shui" paintings and watercolor paintings are products of human and natural forces, as is sensory experience. When practicing watercolor paintings or Chinese "Shan Shui" paintings, the painter can only control part of the result, since each painting is a unique and interactive product of human and nature forces. Although a watercolor painter rotates the paper in order to let the water that is carrying the colors flow and merge in the style that he wants, human force can control only part of the final drawing. Different colors dissolve, freely merge with each other, and gradually vanish in water, creating a drama that produces different results every time, even when it is created by the same person. This is comparable to sensory experience, which is affected by conditions of both natural and man-made environments. Landscape designers can propose different sensory experiences in a design, but the actual response for each individual is always unique.

Finally, one can learn how to engage the sensory qualities of nature through the process of painting. The way to achieve harmony in the landscape may be grasped through the process of producing a harmonious painting. Furthermore, the creativity and imagination of the designer might also be heightened by this process. Like painting, mastering experience-oriented ecological design needs considerable practice.

Another interesting observation about my watercolor drawing process is that all of the drawings are derived from

three primary colors – red, yellow and blue. Secondary colors in different hues (brightness, lightness, and saturation) that were created from the three basic colors added a dramatic richness to every drawing. These painting processes taught me, from another perspective, how to work with a limited number of elements to generate a rich result that is diverse, yet harmonious. Similarly, satisfying place qualities can be achieved by working with a limited palette of sensory experiences. By organizing these basic experiences in diverse yet coherent ways, designers can create unique qualities of place in their designs. Therefore the use of watercolor painting might be a potential tool for designers to learn about harmony, creativity, and imagination.

As previous stated, a proper medium for documenting the site analysis and design is crucial to the framework. This could be watercolor, music, or sculpture; however, regardless of the type, some mode of creative expression should be included in the process component of the framework, as a link between the designer's sensory experiences and the process of creating place.

6.4.2 Application of the Framework

Making people aware of the connections between human experiences and ecological functions is an important goal of the framework, since its primary focus is urban spaces, where the presence of nature is often obscured. This didactic aspect of the framework distinguishes it from both contemporary western ecological design and classical Chinese garden design.

As I have pointed out, the experience- oriented ecological design framework originated from my observation that contemporary ecological designs are frequently deficient in providing satisfying sensory experiences. The framework takes cues from both contemporary ecological and classical Chinese garden design, in emphasizing both ecological functions and the quality of sensory experiences. This differs from classical Chinese garden design, which focuses primarily on sensory experience. The classical Chinese

garden is responsive to ecological processes (e.g. continuous water and air flows, exposure to sun, wind direction, etc), but ecological awareness is not necessarily its purpose. Furthermore the classical Chinese garden is not intended to be didactic. Learning about nature is not necessary because according to traditional Chinese beliefs, human beings are conceived as being at one with nature rather than being separate from it. The characteristics of the classical Chinese garden encourage visitors to experience the place through their sensory organs, and this should automatically lead to appreciation of and respect for nature. On the other hand, adopting a didactic role has become very important in contemporary ecological design in western cultures, where many people tend to isolate themselves from the surrounding natural environment, ignoring its value to their daily lives. The purpose of applying the framework to ecological designs in urban public spaces is to connect human beings with nature, to encourage more ecological designs to be built, and to teach people that human beings must be at one with nature.

My design presents two different modes of teaching through the use of didactic techniques to reveal and interpret nature. One involves allowing natural forces to control the learning process, for example, learning about the dynamics of tides by observing the results of changing water levels and directions, as manifested in the bridge model or the rudder. The other approach involves having the user control the learning process, for example stepping on the springs in the “floating” bridge, which mimics the spongy resilience of the marsh. While this strategy is successful in the project design, it also raises questions: When should designers draw the line between designs that aim to teach people about nature, and designs in which pure sensory experience is the desired outcome? Where a didactic goal is appropriate, how should designers decide where to let nature control the learning process and where to engage human forces with nature to elicit sensory experiences?

My answers to these questions are based on my current knowledge, which is as yet incomplete. My opinion is that,

for places where the experience of nature itself is dramatic enough to be self-explanatory, (such as the seashore case that I cited previously), pure sensory experience could be the best choice. In cases where natural functions may be too obscure or too faint to be perceived, or interactions between people and nature are limited, (for example, when lifestyles become divorced from nature, and people lose touch with their sensory responses), a didactic approach might need to be considered in design. In such situations, teaching techniques can be decided based on a range of considerations. Where possible, a first choice would be to make ecological functions more obvious and tangible by amplifying the "voice" of nature. For example, the bridge model or the rudder serves as an amplifier of tidal change. If such a strategy is not possible, another choice is to install structures that can simulate natural effects in the landscape. For example, while it is too dangerous or uncomfortable for people to really step on top of a marsh, springs can be installed in the "floating" bridge to simulate this experience, helping people to understand the unique qualities of marsh surfaces.

For designers, attaining the skills required to effectively stimulate people's connections with nature comes with experience. On the other hand, people too, need to develop sensitivity to natural process, in order to transcend the fast pace of contemporary urban life and engage an authentic experience of nature. The experience-oriented ecological design framework is a "medium of landscape design [that] is as diverse and simple as life itself. It is sensory and phenomenal." (Olin, 1997, p.117)

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