The Currents, Waves, and Undertows of Stress

Examining Stress from a Landscape Perspective

BY

Tammy Lee Hoogland

A Practicum submitted to
the Faculty of Graduate Studies
of The University of Manitoba
in partial fulfillment of the requirement of the degree
of

MASTER OF LANDSCAPE ARCHITECTURE

Department of Landscape Architecture
University of Manitoba
Winnipeg, Manitoba

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Examining Stress from a Landscape Perspective

TAMMY LEE HOOGLAND

DECEMBER 2006

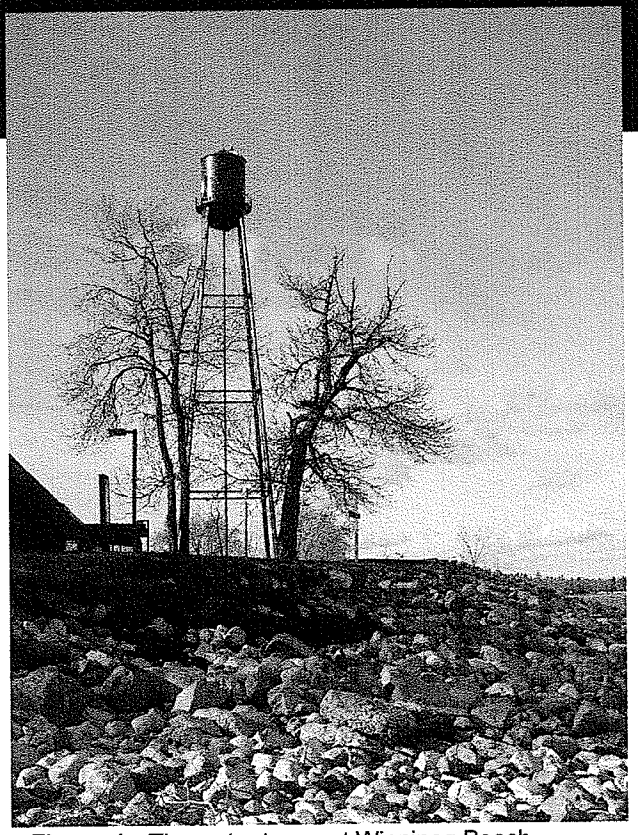

Figure 1 - The water tower at Winnipeg Beach

Master of Landscape Architecture

Department of Landscape Architecture

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ABSTRACT

Winnipeg Beach is a resort community located along the shores of Lake Winnipeg. The town has provided an escape from the stressors of routine city life for decades. Lately, however the town's restorative capabilities are being threatened by environmental stressors which are affecting the water quality of the lake. To anchor this practicum, a trivalent design approach has been adopted. This approach focuses on the three key areas of ecology, community, and delight (Thompson 2000). Relevant research in the field of ecology, environmental psychology, and metaphorical thinking has been reviewed; and the design of a recreational trail and water treatment system for Winnipeg Beach has been developed. The design produced for this community would provide for decreased feelings of stress and irritation associated with increased the pollution of Lake Winnipeg. The proposed ecological water treatment system benefits residents of the area in multiple ways. The waterscape promotes the experiential qualities already associated with Lake Winnipeg and the town of Winnipeg Beach. The town scale pilot project acts as inspiration for other communities located within Lake Winnipeg's watershed to rethink the way they treat sewage effluent and stormwater.

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- Blake Roberts, external advisor

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CHAPTER 1 - INTRODUCTION

The town of Winnipeg Beach is a tourist destination located along the picturesque shores of Lake Winnipeg. This "great" lake is beginning to show signs of degradation caused by ecologically unsustainable human behavior. As Lake Winnipeg becomes more polluted, the town of Winnipeg Beach is suffering a loss of the restorative qualities it provides its residents and visitors. In order to mitigate the negative impact that pollution is having on Lake Winnipeg's ecology and the town of Winnipeg Beach this practicum suggests adopting an integrated water management strategy which will cleanse water from the town before it enters the Lake Winnipeg system. The strategy suggested in the following work is a pilot project from which lessons can be learned and applied throughout the greater Lake Winnipeg watershed area.

While ecological principles are important moral obligations to be considered by any landscape architect, a design which is only concerned with ecology runs the risk over becoming under utilized and neglected. Therefore, this practicum will implement a trivalent approach in its design of a wastewater / stormwater management strategy for Winnipeg Beach. This approach is centered on concepts derived from Thompson's (2000) *"Ecology, Community, and Delight"*.

The research goals and methods of this practicum describe how this design approach will be used and implemented throughout the following work.

Research Goals

1. Water entering the lake from the town of Winnipeg Beach will have reduced nutrient loads and be biologically sound. While cleaner water entering the Lake Winnipeg system is essential from an ecological stand point, a site purifying process could also allow Winnipeg Beach residents to feel proactive, to be engaged in an environmental restoration process and to take on a leadership role by providing an example for other communities in the area to follow.

2. Any design developed for the town of Winnipeg Beach must contribute to a sense of "being away"; of restoration and healing. People deliberately travel to Winnipeg Beach for vacation or holiday. This indicates that they are looking to for experiences that create a break from routine or a place to escape from daily annoyances; a site to have fun, to recreate, to socialize. Any design initiated in such an environment must be in keeping with expectations for relaxation, restoration and play.

3. Winnipeg Beach is saturated with the notion of nostalgia, happy childhood memories, and places of ritual and tradition. Winnipeg Beach represents simpler times, where fascination and mystery were found in little things, like the patterns that the waves create in the sand, or finding the perfect stone. Artists explore the lake's deep beauty and timeless light in their paintings of the lake. Writers chronicle lake life; their words capture sounds, moods, life, and death. Winnipeg Beach is layered with mytho-poetic narratives (see for example Wilson 1987). Here, there is a story-telling tradition that is passed down from generation to generation. A landscape designed for the

town must capitalize the sense of attachment of people to the lake.

In response to this complexity of qualities: the environmental, the restorative, and the mytho-poetic, this practicum has developed a trivalent design approach, reflecting Thompson's (2000), *"Ecology, Community, and Delight".* Aesthetic, ecological, and social values are important themes for landscape architecture and thus practitioners should "find for themselves the ways in which to create beautiful, artistic, sustainable, and socially useful designs" (Thompson 2000, 190).

In conclusion the research goal of this practicum is to examine a broad range of literature related to the themes of ecology, community, and delight, establishing how a landscape design can be created which improves the ecological quality of water flowing into Lake Winnipeg, which exceeds community needs and expectations and provides delight, mystery, and fascination.

Methodology

This practicum examines and applies research from three key areas, integrated water management, environmental psychology, and metaphoric thinking to address the research question: "How can I design a landscape which reflects principles of ecology, community and delight?"

The research section begins by describing the history of Lake Winnipeg and identifying and quantifying environmental stressors which are affecting the health of this "great" lake. Letters written to the local newspaper, "*The Interlake Spectator*" provide a means of recording the way residents feel when faced with evidence of degraded water quality. This section highlights factors that need to be addressed to enable residents to feel responsible for improving the health of Lake Winnipeg. A literature review covers applicable areas of "Integrated Water Management" determining factors that can enhance the ecological quality of Lake Winnipeg. A set of principles are derived from this research. These principles guide the design of a landscape which cleanses waste and storm water before it is inputted into Lake Winnipeg.

I will proceed with an experiential study of the town of Winnipeg Beach. The study consists of an intuitive examination and a description of personal feelings and thoughts experienced at Winnipeg Beach. This section records the experiences of other town residents, through stories, history, and works of art. This research will extract the elements that contribute to "essence" of the Winnipeg Beach experience, describing how these characteristics add to feelings of delight, a sense of community, and to a deep engagement with place for residents and

visitors alike. A language of pattern typologies emerges from a study of applicable areas of Environmental Psychology which inspire restorative aspects at the Winnipeg Beach site.

Patterns consequent of phenomenology and metaphoric thinking are applied as a language of metaphor to promote the experiential quality of the site design. This section determines manners in which to create a landscape that provides aesthetic beauty while promoting feelings of fascination and delight.

Thus the design element of this practicum reflects, integrates, and applies the concepts of ecology, community, and delight compiled in the research section. Chapter 5 begins by assembling a site inventory and provides an analysis of this data. Inventory and analysis informs design decisions made regarding specific site attributes and limitations. The design component of this work, also found in Chapter 5, will be presented in the form of written text and graphics. The conceptual analysis, master plan, and design details are graphically represented in the form of plans, sections, and sketches. Chapter 5 concludes with an analysis of how I met the intended goals of this practicum; ending with a discussion of how the design created through this process can be applied to other areas of the greater Lake Winnipeg watershed area.

CHAPTER 2 - ECOLOGY

Introduction

The word ecology is applied in this chapter as it is defined by Tormont Webster's Encyclopedic Dictionary (1987, 535) as:

e·col·o·gy (ĭ-kŏl'ə-jē) *n. Abbr.* **ecol. 1. a.** The science of the relationships between organisms and their environments. **b.** The relationships between organisms and their environment.

Lake Winnipeg is a large, beautiful lake; it is a distinguishing feature in the Manitoba landscape. For centuries, this lake has been an important source of food and drinking water and has provided a means of travel for humans and animals. Lake Winnipeg is a unique ecosystem; it provides habitat for many bird, fish, and insect species (among others). For decades Lake Winnipeg has been a holiday destination for city dwellers. Its long, sandy, white beaches and shallow waters have facilitated summer recreation such as swimming, boating, and fishing.

Unfortunately, unsustainable human behavior has begun to severely impact the water quality of Lake Winnipeg. Many of the activities and benefits that the lake once provided are being undermined by human actions. Recently visible evidence of the degraded quality of the lake has begun to appear. Chapter 2 provides a brief history of Lake Winnipeg. Following that this chapter seeks to identify what environmental stressors facing Lake Winnipeg and its water quality are most important to residents of the town of Winnipeg Beach. This section will reflect personal perceptions and sentiments of local residents expressed by

their letters to the local newspaper *The Interlake Spectator*.

This chapter will proceed by reviewing relevant research conducted in the field of ecology. This research discusses the water management strategies which will be implemented in the context of the Winnipeg Beach design. These strategies will specifically address the environmental stressors identified at the beginning of this chapter.

This chapter will conclude by examining the natural precedent of Netley-Libau marsh in order to determine how a constructed wetland can reflect the hydrologic structure and the vegetative communities of a local marsh system.

The main research goal of this chapter is to determine the best strategy to manage waste and storm water entering the Lake Winnipeg system via the town of Winnipeg Beach.

Lake Winnipeg

Lake Winnipeg is located in the south-central region of the province of Manitoba and is considered the province's most "prominent geographic feature" (Russell 2004, 16). Located along the boundary of the Interior plains and the Boreal Shield (Todd et al. 2004), the lake is a remnant of glacial Lake Agassiz and was once covered by the Laurentian ice sheet. Due to the weight of this ice sheet, the land was depressed by at minimum 700 meters (Russell 2004). The North Basin of Lake Winnipeg is currently experiencing a process termed isostatic rebound; as the ground beneath the lake slowly rebounds the flow of water between the northern and southern basins of the lake is slowing. This is causing the water level in the southern basin to increase. The Lake Winnipeg that exists today was formed during the retreat of the Laurentian ice sheet. Little evidence of thick glacial till exists in the basin of the lake; rather fine grained sediment was deposited directly over bedrock. This phenomenon is evidence of bedrock erosion which would have occurred during glaciation or deglaciation periods (Todd et al. 2004). The glacial history of Lake Winnipeg has contributed to the size, depth and present functioning of Lake Winnipeg and has made it a unique ecosystem.



Figure 2 - Sunset on Lake Winnipeg

Lake Winnipeg is the tenth largest freshwater lake: it covers approximately twenty-four thousand, five hundred square kilometers (Salki 2002). For such a large lake, Lake Winnipeg is unusually shallow, having an average depth between 12 to 17 meters. The shallowness of Lake Winnipeg contributes to its reputation of being a treacherous body of water, prone to unexpected storms and various depth changes (Upham 1896). The lake is considered turbid and muddy and the slight depths are frequently stirred up by wave action. Also due to shallowness, the water in Lake Winnipeg is replaced and regenerated quickly; this accounts for the lake being extremely fertile (Russell 2004). The lake is "the largest aquatic life support system in Manitoba...It sustains a complex food web and the largest commercial fishery west of the Laurentian Great Lakes" (Salki 2002). Lake Winnipeg's watershed is vast; it covers nearly

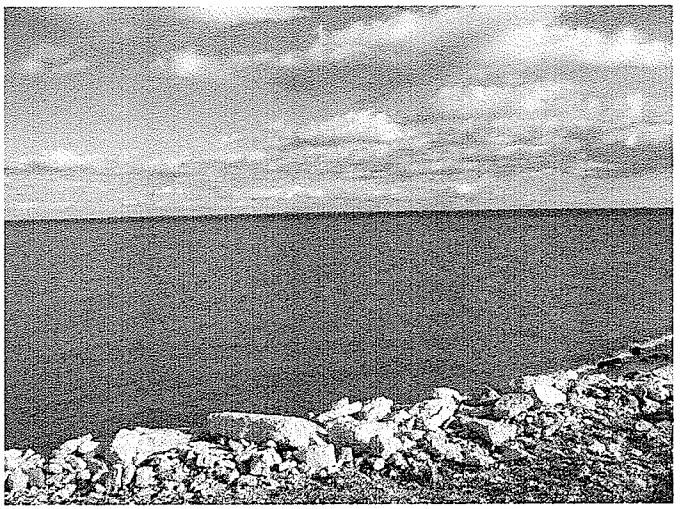


Figure 3 - Lake Winnipeg

a million square kilometers, extending across four provinces and two countries, from the Rocky Mountain foothills to near Lake Superior. "The land area covered by the watershed of Lake Winnipeg is 40 times greater than the surface of the lake itself, and this is a ratio that surpasses that of any other large lake in the world" (Salki 2002). The size of Lake Winnipeg's watershed contributes to growing pollution problems which are affecting its water quality; however the high water

recharge rate of the lake could allow it to recover more quickly if appropriate measures are taken to reduce nutrient loading and other forms of contamination.



Figure 4 - View of the water tower from across the lake

Due to its massive watershed the amounts of nutrients, wastes and pollutants that flow into Lake Winnipeg compare to the levels flowing into lakes found in much more populated areas (Salki 2002). The fact that the pollution of Lake Winnipeg occurs internationally but has an immediate impact on only a relatively local group makes this problem an extremely difficult one to solve. There are a wide variety of contributors to the increased pollutants flowing into Lake Winnipeg but many pollution sources are under the jurisdiction of varied levels of government, from municipal to provincial. The lack of one centralized regulatory body limits the ease of establishing a watershed scale pollutant reduction strategy. While a watershed scale solution is essential to rehabilitating Lake Winnipeg, these types of solutions take time to establish and the impact that environmental stressors are having on communities all along Lake Winnipeg's shores continues to grow. This practicum suggests that small community projects can become relatively immediate solutions. They can help amend local water quality issues, can stimulate attention and excitement about such projects, and can allow local residents to feel empowered. The ideas established by such a

project can filter through to other towns and municipalities along the shores of Lake Winnipeg.

The town of Winnipeg Beach has been chosen as a site to establish a pilot project which will deal with the environmental stressors and the water quality at a community scale. Part of the reason that the town of Winnipeg Beach is a good candidate for such an initial water treatment project is because the town is the first of several resort communities located along the western shore of Lake Winnipeg, meaning that many people pass through the town on their way to other destinations. Winnipeg Beach also has a seasonal resident base, with many people returning to their permanent homes in Winnipeg, an urban center, during the winter months. Furthermore, Winnipeg Beach also has a rural population base, with many residents of the area working in livestock or agriculture sectors. These factors increase the exposure of a water management pilot project, allowing ideas established in Winnipeg Beach to be transferred to urban centers, labor sectors, and other rural communities all of which contribute to the Lake Winnipeg's growing water quality problems.

Environmental Stressors

Visible environmental stressors are impacting the ecological quality, the recreational opportunities, and the aesthetic appeal of Lake Winnipeg. They are reducing Lake Winnipeg's capacity to act as a holiday destination or a retreat from a stressful city lifestyle. Degraded water quality is limiting the ability of the lake to provide food and habitat for wildlife in the region. The following sections identify the major environmental stressors that are being witnessed by residents of the town of Winnipeg Beach and express their growing concern regarding the degradation of the water quality of Lake Winnipeg.

NUTRIENT LOADING

Although there are many environmental threats to the health of Lake Winnipeg, such as low water, climate change, and the invasion of exotic species, perhaps the most important problem is increasing nutrient loads. David Schindler states that,

> *...the problems are cumulative and rising, but by far the most important and deadly are the massive, ever-increasing nutrient loads from intensive livestock operations, industrial effluents, fertilized cropland run-off and human sewage from cities, towns, and rural septic tanks and fields.* (Russell 2004, 168)

Biologist Alex Salki agrees asserting that,

> *...some arguments suggest that the agricultural application of imported phosphate fertilizers, creation of human-made drainage*

systems, lack of sewage treatment to remove phosphorous, and intensification of the livestock industry are now overloading the natural cleansing and purifying capabilities of the Lake Winnipeg ecosystem. (Salki 2002)

An increase in nutrient loading, primarily, phosphorous and nitrogen can result in cultural eutrophication. Cultural eutrophication is the result of excessive nutrient input that "stimulates a dense growth of planktonic algae, dominated by blue-green forms" (Smith 1986, 572). The increase in algae can lead to reduced oxygen levels that impact aquatic life (see for example, Smith 1986, Russell 2004). In recent years there has been a change in the composition of algae species in the North Basin of Lake Winnipeg. "The species have moved to the blue-green algae, the cyanophytes" (McCullough 2006, 1). In 2003, Lake Winnipeg hosted a massive blue-green algal bloom in its north basin. This algal bloom produced toxins of several-thousand-milligrams per liter of water, comparatively; the world's drinking water standard is one milligram per liter (Russell 2004). In 2006, water entering Lake Winnipeg from the Red River was relatively clear. This water clarity led to improved growth conditions for algae, this combined with super fertilization led to "the most widespread bloom in the South Basin in over two decades of satellite records"



Figure 5 - Caution stormwater drains to lake

(McCullough 2006, 1). The algal blooms of 2006 are the first blooms in over twenty years that have been so noticeable. Blue-green algal blooms are dangerous, even potentially deadly to land and aquatic life. They have become human stressors, visible evidence of a 'sick' lake.

After attending a convention of the Red River Basin Commission, Richard Cain, a resident of the area, responds to the increased nutrient loading in Lake Winnipeg and the necessity for each individual to play a role in solving this problem. "We must accept the problem of today and tomorrow...Ultimately YOU and I are going to have to make the fix" (Cain, Interlake Spectator 2006, 1). Craig Derenchuk expresses his lack of faith in the elected government and his distrust of information coming from pork councils in his letter to the Interlake Spectator. He states "Get ready Interlake residents and cottagers – the lake is going to need our help because the government and pork councils don't really seem interested" (Derenchuk 2006, 1).

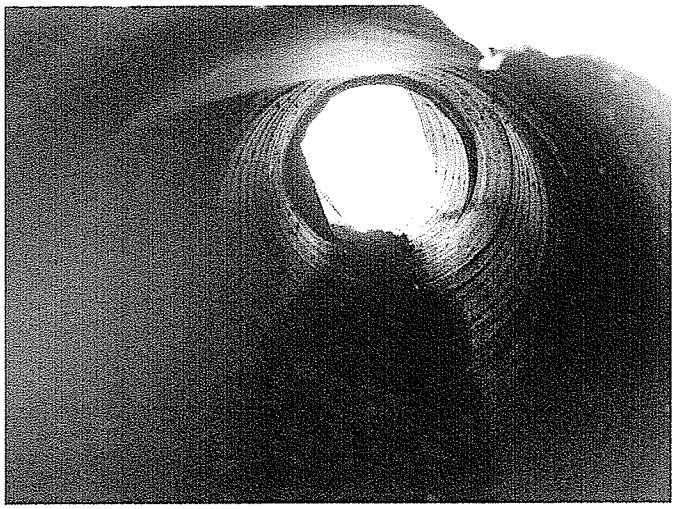


Figure 6 - View of the lake from inside a culvert

As reflected by the preceding letters, residents from the Interlake region seem to share common sentiments. First, residents of the area believe that nutrient loading is a growing environmental stressor. Second, residents seem to share a feeling of distrust that government will share in the responsibility of

reducing phosphorous loading and finally, residents feel that while they are not the most major contributors to degraded water quality it will be up to them to solve the problem.

SEWAGE OUTPUT

Sewage output into Lake Winnipeg is a growing cause for concern for Winnipeg Beach residents. In 2002, a mechanical failure at the North Winnipeg Pollution Control Center resulted in approximately two hundred and thirty thousand cubic meters of raw sewage being released into the Red River per day until the facility's equipment was repaired (Government of Manitoba 2002). This is just one example of sewage output from downstream sources, into Lake Winnipeg, there have been countless other news and government reports issued on this topic (see for example Government of Manitoba 2005, Government of Manitoba 2002).



Figure 7 – The Winnipeg Beach sewage lagoon

Downstream sewage has become a stressor to Winnipeg Beach residents, however, so has their own sewage lagoon. The lagoon is visible from the lake and parts of the provincial park and on a warm day in August, when the wind is blowing in the right direction, the odor from the sewage lagoon is not very appealing. The proximity of the sewage lagoon to the lake can be considered a perceived (or real) stressor to beach users.

The sewage lagoon is located in a low-lying, marshy area subject to frequent overland flooding. Evidence of flooding problems could be seen in early July, 2005, when frequent storms caused widespread flooding of the area around the lagoons and drainage ditches and culverts were not able to handle the volume of stormwater they were receiving (see for example, The Interlake Spectator July 1, 8, and 15, 2005). Emergency effluent dumps into the lake have been made when the sewage lagoon threatens to exceed its capacity during events of extremely high water (The Public Utilities Board Act 2005). As concern about the ability for Lake Winnipeg to withstand excessive nutrient loading grows these emergency effluent dumps have become socially, as well as, ecologically unacceptable. While the Winnipeg Beach sewage lagoon allows effluent to settle, treating it to a biologically safe level, before draining into a 'marsh' and then to the lake, the increased nutrient load of this effluent has not been addressed.

Concerned citizen, Dora Carpenter, comments on this issue,

> *Lake Winnipeg is not only our most precious asset. It is our most vulnerable. What steps are our mayors and councils taking to ensure that we are not contributing to the lake's demise? Are our sewage lagoons treated for the nutrients, phosphorous and nitrogen, which are killing our lake? Will the proposed new sewage plants ensure that no damaging effluents can be discharged into the lake…? (Carpenter 2004, 1)*

Carpenter goes on to state that she can see no reason for municipal wastewater to end up in the lake.

Approximately 7 percent of nitrogen and 8 percent of phosphorous entering the Lake Winnipeg system comes from the City of Winnipeg waste-water treatment facilities, and about 2 percent of the nutrients come from all other municipal sewage treatment facilities. While these numbers may seem small when discussing the vast watershed of Lake Winnipeg, sewage outputs are one problem which can be addressed and is a first step towards a broader ecological solution. Sewage output contributes to the problem of nutrient loading which in turn causes cultural eutrophication and algal blooms. Sewage output is also connected to heightened E. coli levels in Lake Winnipeg's water system (Salki 2002).

E. COLI

Recently, advisory signs have been posted and beach closures have occurred due to increased levels of Escherichia Coli (E. coli) (see for example, The Interlake Spectator July 15, 2005 and The Winnipeg Free Press, July 14, 2005). Increased E. coli levels have been linked to urban and municipal sewage output, agricultural, shore bird, and dog waste (among others) entering the lake's system. Although elevated E. coli levels in Lake Winnipeg have caused very few health risks, increased rates of gastroenteritis have been linked to the presence of E. coli or fecal coli form bacteria. Symptoms of gastroenteritis include mild fever, diarrhea, stomach cramps and vomiting (Williamson et al. 2004). Since an incidence of well water contamination in Walkerton, Ontario, in 2000, where several people died and many more got sick, the threat of E. coli has been mentioned frequently in the news. The specific type of bacteria causing the biggest health risks is E. coli 0157 and is relatively rare; therefore, the threat of getting sick from E. coli bacteria in Lake Winnipeg may not be a 'real' threat. The perception of threat is enough to make many people question the quality of the lake water.



Figure 8 – E. coli advisory sign at Winnipeg Beach

There are many letters that residents of the Interlake Region of Manitoba have written to the Spectator regarding E. coli levels in Lake Winnipeg. Many residents feel distrust towards

government. For example Roy A. Yerex states,

> *...the provincial government tells us that strong northerly winds that cause waves and push water levels higher tend to cause E. coli bacteria levels to increase...Here I thought it had something to do with the 900,000 liters of raw sewage spewed from the U of M or the multi-millions of liters of raw sewage being vomited out of Winnipeg's sewers every rainfall.*
> (Yerex 2006, 1)

Another example is Derenchuck's letter which states,

> *How convenient to blame seagull droppings, dogs on the beach, lawn fertilizers etc. on all the lake's problems. Funny how the vast majority of E. coli warnings this year were on the west side of the lake where there are more large-scale hog operations...*
> (Derenchuk 2006, 1)

It is evident that the residents affected by the pollution of Lake Winnipeg fear the impact of contaminated water and beach closures on their health. They are hesitant to accept simplified answers to a complicated problem.

FLOODING, EROSION & DIKES

In September 2005, because of the perceived threat of unusually high water levels in Lake Winnipeg earth and sandbag dikes were built along the south basin of Lake Winnipeg.

> *The risk of flooding of low-lying areas around Lake Winnipeg is elevated this year (2005) due to the Lake's unusually high water*

level. This summer the Lake has been at its highest levels since 1974, levels which may be expected to occur once every 30 years. (Manitoba Water Stewardship 2005, 1)

Late autumn storms paired with strong northerly winds create a potential for waves to raise high water levels nine and a half feet higher. A state of emergency was declared and private land was expropriated, where necessary, to facilitate dike building. Manitoba Water Stewardship predicted a 5 to 20 percent chance of fall storms causing flooding in low lying areas along the south basin of Lake Winnipeg (Manitoba Water Stewardship 2005). For some residents the dikes reduced the tension and apprehension felt about possible flooding and erosion, many residents, however, did not perceive the risk of flooding to warrant such concern. The land expropriation for dike building became more of a stressor than the risk of flooding, especially for residences which had not experienced flooding in 90 years. Land not privately owned was frequently perceived as being owned. Docks and piers built on public land were destroyed. This loss was viewed as personal. Joanna Burns states, in her letter to the Interlake Spectator:



Figure 9 – Damage to shoreline caused by dike building

The RM of Gimli declared a State of Emergency that allowed them, without notification or clarification, to install a three-and-a-half-ft high,

12-ft wide clay and gravel dyke over my landscaped lakefront property. The RM of Gimli has violated my property, trespassed without my consent, and in my opinion, without due cause. If Manitoba Hydro has been allowed to maintain Lake Winnipeg water levels between 711 and 715 ft above sea level, how can a measure of 715.5 possibly be declared a 'State of Emergency'? The lake has exceeded the 715-ft level many times over the years. What makes this year any different? (Burns 2005, 1)

In many cases the dikes dissolved and left debris scattered over the yards of some properties. Furthermore, the dikes obstruct views to the lake, and reduce the capacity for residents to monitor children playing on the beach, the primary reasons why many residents pay higher taxes for these waterfront properties. Jim Brennan, in his letter to the Spectator, describes his feelings about the dikes,

The imposition of massive earthen dykes affects not only cottage owner's ability to enjoy their property, but it fundamentally alters the relationship between people and the lake and between government and property owners. (Brennan 2005, 1)

The lack of communication between government and residents along the south basin of Lake Winnipeg was arguably the largest stressor that this incident has created. According to Bruce Benson, no provisions

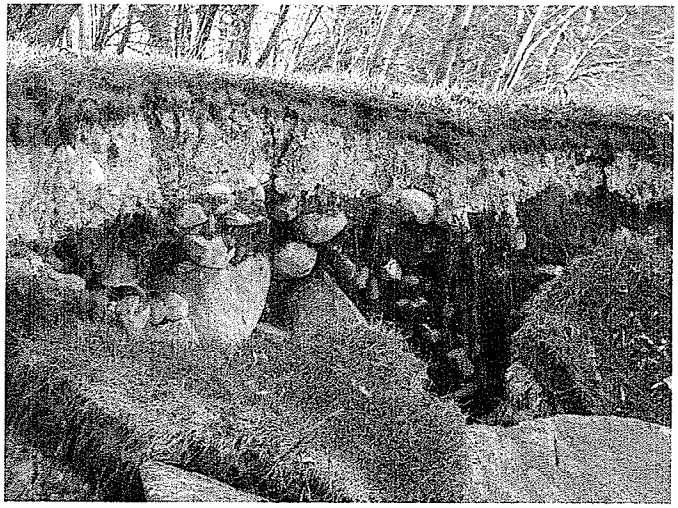


Figure 10 – Damage to shoreline caused by erosion

were made for access to the lake for ice fisherman, or for the natural drainage of the lake. Benson considers these to be some of "many indicators that this dike, built to prevent 'flooding' was a knee-jerk reaction ... poorly thought out" (Benson 2005, 1). Once again Lake Winnipeg has become a stressor on Winnipeg Beach residents, its unpredictable water levels demanding rapid action with very little time for thought.

Evidence of other environmental stressors may also play a factor in reducing Winnipeg Beach's restorative capabilities; (such as West Nile Virus, forest tent caterpillars, litter etc.) I have identified five environmental stressors: nutrient loading, sewage output, E. coli, flooding, and erosion as the most important issues. Three of these stressors are directly related to water quality: nutrient loading, E. coli, and sewage output; the other three are related to hydrologic processes and aesthetics.

This examination of water issues at Winnipeg Beach suggests that the town has a strong connection, economically, aesthetically, and ecologically to Lake Winnipeg. Permanent and seasonal residents feel a sense of stewardship for what they perceive as 'their' lake. The

Winnipeg Beach community is sensitive to issues of pollution and degradation of water quality. Residents are questioning whether their elected officials are responding appropriately to arising situations and they seem to feel ignored. There is a communication breakdown occurring between these two parties. Residents appear to be willing to embrace change based upon ecological principals, as long as they fit within the cultural and aesthetic frames that have been developed by the community over time.

Water Management

The environmental stressors facing Lake Winnipeg are increasing and becoming more visible. The first goal of this practicum is to reduce the impact that unsustainable human behavior, and in particular the impact that Winnipeg Beach residents, are having on the health of Lake Winnipeg. In order to accomplish this goal, the following section will summarize research in the area of water management in order to derive design solutions which will limit the ecological footprint that Winnipeg Beach residents are placing on 'their' lake. The research discussed will address the environmental stressors identified in the previous section: nutrient loading, sewage output, E. coli levels, flooding and erosion.

SEWAGE TREATMENT

> *Wetlands are an ecotone – an 'edge' habitat, a transition zone between dry land and deep water, an environment that is neither clearly terrestrial nor clearly aquatic. Because land and water can merge in many ways, it can be frustrating to attempt to define wetlands or to determine where wetlands begin or end…* (Hammer and Bastian 1989, 1)

Natural wetlands convey flood water, provide barriers to waves and erosion, store or retain flood water, and provide sediment control. Wetlands also provide habitat for fish, waterfowl, and other wildlife, including rare or endangered species. For humans natural wetlands provide opportunities for recreation; they are a source of water supply, food and

timber production. Wetlands have historic and archeological value, and provide opportunities for education and research. Perhaps of greatest importance to this practicum wetlands improve water quality by reducing the amount of suspended solids, nutrient loads, and biological contaminants in water entering a receiving water body such as a lake or river (Denbow et al. 1996). Stability is not a desirable characteristic of a wetland because these features are "dynamic, transitional, and dependant on natural perturbation" (Hammer & Bastian 1989). One of the most significant natural perturbations necessary for proper wetland function is periods of flood and drought. Constructed wetlands mimic the cleansing abilities of natural wetlands and can serve as a treatment process for waste and stormwater before it enters a natural water system.

Constructed wetlands and ponds most generally fall into two categories, wastewater wetlands and stormwater wetlands. Pond ecology principles have been applied to the treatment of sewage since the 1600's, "sewage lagoons or stabilization ponds are essentially applied pond technologies" (Campbell & Ogden 1999, 45). Wastewater ponds or lagoons are typically used by small to medium sized communities. These ponds receive wastewater from sewage/septage systems and "stabilize" it before releasing water into a stream or estuary. Wastewater ponds are typically comprised of facultative ponds and maturation ponds, although some also contain aeration ponds. Facultative ponds "stabilize organic waste by biochemical oxidation" while maturation ponds "improve microbial quality and buffer against excursions of low effluent quality" (Davies-Colley et al. 1995, 235). The main goal of a sewage lagoon is biochemical oxygen demand (BOD) removal, so as to

decrease the oxygen stress placed on receiving water bodies. Important secondary functions include settlement of suspended solids and "natural disinfection" (Davies-Colley et al. 1995). Wastewater ponds hold water for varying amounts of time depending on a number of environmental factors. For example, sewage lagoons in cold climates require extended detention due to a reduced efficiency of the lagoon system during cold weather months (see for example Campbell & Ogden 1999).

Wastewater wetlands are used most frequently as a part of a larger wastewater treatment system. Sewage lagoons can be viewed as primary or/and secondary treatment of wastewater, and constructed wetlands as secondary or/and tertiary treatment. Water exiting a sewage lagoon should have limited amounts of suspended solids, have undergone substantial BOD removal and should be of a biologically acceptable level before entering into a wetland system. Wetland systems can further treat sewage effluent by reducing nutrient loading, providing opportunities for sedimentation, digesting and removing BOD, precipitating metals, removing pathogens, and toxins (Campbell & Ogden 1999).

Perhaps the biggest difference between the designs of wetland types is that in most cases wastewater wetlands receive a consistent and predictable rate of flow from a sewer system, whereas, stormwater wetlands receive unpredictable flows from a wide range of storm events. The goal of a stormwater wetland is to further reduce nutrient loading from runoff water, to help control the stormwater flow, and to increase wildlife habitat (Minnesota Stormwater Manual 2006).

While wastewater is typically perceived as being more degraded than stormwater,

according to the Environmental Protection Act's National Urban Runoff Program (U.S.) "in many cases the first flush of stormwater in an urban area may have a level of contamination much higher than that normally present in sewage wastewater" (Campbell & Ogden 1999, 123). Stormwater in urban areas typically contains heavy metals, hydrocarbons and other contaminants, while stormwater from agricultural areas can contain high amounts of nutrients from fertilizer and livestock waste, chemical agents from herbicides and pesticides as well as other contaminants. Pond/wetlands remove an average of 55 percent total phosphorous from the water entering the system and up to 75 percent maximum they also remove up to 30 percent of total Nitrogen, 75 percent of total suspended solids, 75 percent of bacteria, and 40 percent metals such as copper (Cu) and zinc (Zn) (Minnesota Stormwater Manual 2006). A wetland's capability to transmit flood water, to reduce wave and wind erosion, to retain flood water, and to reduce pollutant loads of storm and waste water make this an essential component to the design of a integrated water management system at Winnipeg Beach because it addresses all of the primary environmental stressors identified earlier in this chapter.

There are four basic types of constructed wetlands which include shallow marsh systems, pond/wetland systems, extended detention wetlands, and pocket wetlands (see for example Campbell & Ogden 1999). As pond wetlands reduce the total amount off phosphorous more efficiently that other wetland types these will be the focus of this practicum (Minnesota Stormwater Manual 2006). "The pond/wetland system...consists of two separate cells; the first is a wet pond, and the second is a shallow marsh. The functions of the wet pond are to reduce incoming runoff

velocity, trap sediments, and remove pollutants..." (Campbell & Ogden 1999, 141, 142). The majority of the treatment process in the pond/wetland system is accomplished in the wet pond. It is important to remember that constructed wetlands, are as their name suggests, 'constructed'. While constructed wetlands may mimic natural wetlands and may provide a diversity of native species, at best they have the ability to provide generic wildlife habitat.

Stormwater can typically be considered more polluted then water exiting a sewage lagoon and the unpredictability of its flows make the design of a stormwater wetland treatment system more difficult and complex than the design of a wastewater system. In terms of designing an integrated storm and wastewater system then, all water entering a wetland of this type can be considered greywater and the system should be designed for the most unpredictable and least controllable water flows, stormwater. Integrated Stormwater Management (ISM) considers all the factors that affect stormwater as it moves across the land into a receiving body of water. It has been described, in the Minnesota Stormwater Manual, as a treatment train approach (Minnesota Stormwater Manual 2006, 3). This approach can be used as a model for the design of an integrated stormwater/wastewater system. ISM begins with the simplest possible methods of water management and considers such methods to often be the most practical. Simple stormwater management techniques include reducing the amount of runoff by decreasing water use and by water retention and reducing runoff pollution by changing community behavior patterns. These methods are typically applied at the upstream end of the treatment train, or close to the source. As the treatment train progresses management techniques become more complex.

Conveyance applies to the management systems that carry water from its source towards its receiving water body. Such methods include media filters and vegetative filters. End of train techniques, the most complex, are elements such as ponds and wetlands.

PRINCIPLES OF INTEGRATED STORMWATER MANAGEMENT

The Center for Watershed Protection identifies twelve principles for Integrated Stormwater Design. These principles suggest that ISM:

1. Provides reliable pollution removal performance
2. Mimics pre-development hydrology
3. Integrates the practice into overall site design
4. Has a sustainable maintenance burden
5. Is accepted by the public
6. Creates attractive landscape features
7. Confers multiple community benefits
8. Creatively uses vegetation
9. Provides a model for future improvement
10. Realizes additional environmental benefits
11. Reduces infrastructure costs
12. Acceptable life cycle costs

(Center for Watershed Protection 2006, 1)

This Integrated Stormwater Management approach will be used as a model for an integrated wastewater / stormwater management system, and for this reason, will from this point on, be referred to as Integrated Water Management (IWM).

WATERSHED APPROACH

> *From a surface drainage standpoint, a watershed may be defined as the area contained within a drainage divide which*

contributes surface runoff to a selected measurement point.
(Denbow et al. 1996, E29)

The first step in IWM is determining the scale of project. As Lake Winnipeg covers a massive watershed area, the type of water management practices required are far more complex than the practices needed for an individual residence. A watershed approach is essential to this practicum because Lake Winnipeg's vast watershed contributes to the amount of pollutants which flow into the lake. A watershed approach should address the question: Where does the water that enters the site come from and where does it end up?

HYDROLOGIC CYCLE

In order to be able to answer these questions a brief understanding of the hydrologic cycle is essential. Water within the hydrologic cycle occupies three separate zones, the hydrosphere, the lithosphere, and the atmosphere, "the hydrologic cycle involves a continuous state of water motion and transfer among these zones" (Denbow et al. 1996, E3). Precipitation, which begins as water vapor in the atmosphere, joins together, forming droplets which fall to the Earth in the form of rain or other precipitation. Some precipitation never reaches the Earth's surface because it is intercepted by trees or other forms of vegetation (see for example Smith 1986). Precipitation falling over a watershed is either returned to the atmosphere via evapotranspiration or discharged from the watershed as runoff (Denbow et al. 1996). Precipitation that reaches the soil and is absorbed into the ground through a process called infiltration becomes interflow runoff if it does not reach the water table or groundwater flow runoff if it does. When soil becomes saturated and its infiltration capacity is

exceeded, or when land cover is imperious, water is considered to be surface runoff (see for example Denbow 1996, Smith 1986). This type of direct runoff is related to storms or freeze / thaw cycles. Surface runoff moves across the Earth's surface and is deposited in water bodies of varying sizes where it is retained and is ultimately retuned to the atmosphere by means of evaporation or transpiration. The movement of water across the earth's surface is termed conveyance. Conveyance can occur via natural surface features such as creeks, streams, and rivers, through interflow, or by means of pipes and sewer systems. The velocity, rate, and volume of water through these systems contributes to the amount of pollutants reaching more major water bodies located at the 'downstream' end of this cycle. Minor pooling of water occurs in depressed areas and can range from puddles, to retention ponds, to marshes. Major water bodies eventually accepting outflows of water are elements such as lakes, and oceans, where water can be held for significant amounts of time before returning to the atmosphere.

When attempting to reduce the pollution of a lake it is important to consider the nonpoint sources (runoff) as well as the point sources (sewage) of polluted water reaching this receiving body as both are major contributing factors to watershed contamination problems. All elements of a lake's water system can impact the quality and quantity of water reaching it. Integrated Water Management attempts to reduce the pollution of receiving water bodies by examining techniques which can reduce pollutant loads, and the volume, rate, and velocity of water being inputted throughout the hydrologic system.

POLLUTION PREVENTION

IWM systems minimize the amount and reduce the pollutant load of runoff by collecting and treating water before it reaches a receiving water body. Pollution prevention can be broken down into three categories of intervention. These categories include near source pollution prevention, conveyance, and retention.

Near source pollution prevention is a "start-of-stream" approach, in that it treats water where it first comes in contact with the ground plane. These pollution prevention techniques include sewage treatment and more local measures of conveyance and retention. Near source pollution prevention also includes political measures such as educating the public about what simple, everyday measures they can take which will reduce pollutant loads. Near source reduction strategies incorporate the preservation of natural areas. "From a stormwater standpoint, it is desirable to maintain as much vegetative cover such as forest, prairie, or wetland as possible. Natural areas generate the least amount of stormwater runoff and pollutant loads" (Minnesota Stormwater Manual 2006, 63). It is important to increase the amount of pervious cover in the areas draining to a receiving water body either by increasing the size, or establishing new vegetated areas on site.

Conveyance refers to the movement of water through a site and is considered a mid-stream intervention. Conveyance methods of IWM attempt to slow down the speed which water moves through the site. IWM conveyance methods are typically ditches, swales, or pipes which allow processes of filtration, infiltration, and biologic uptake. Infiltration is minimal in the Interlake region of Manitoba due to the impermeability of its heavy clay soils. Filtration

practices refer to "Structural Stormwater controls that capture, temporarily store, and route stormwater runoff through a filter bed to improve water quality" (Minnesota Stormwater Manual 2006, 394). Filtration processes provide the benefits of screening and filtering water, allow increased evaporation and transpiration to occur, provide opportunities for soil adsorption and biological, microbial uptake to occur. Filtration processes also remove up to 85 percent of the total suspended solids, 50 percent total phosphorous, 35 percent of total nitrogen, 35 percent of pathogens, including E. coli, and 80 percent of toxins (Minnesota Stormwater Manual 2006).

One particular method of water conveyance is vegetative filters. Vegetative filters consist of grass channels, dry swales, wet swales, and filter strips. These swales are wide, between 0.6 to 7.6 meters, and relatively shallow, not more than 1.2 meters (Cowell 2000).

Vegetative filters can also be referred to as biofiltration swales. A vegetative swale's ability to reduce the nutrient loads, pathogens, and suspended solids make them an important component in the design of a wastewater / stormwater management system for Winnipeg Beach as E. coli and nutrient loading are primary environmental stressors on the Lake Winnipeg system.

Retention, occurs throughout the IWM process, in this case however retention refers to an "end-of-stream" approach. Retention methods minimize runoff rate, velocity, and volume by holding water for as long as possible to allow for processes such as evaporation, biologic uptake of plants, filtration, and infiltration to occur. Retention methods refer to stormwater / wastewater ponds or wetlands. This is the final step in the water treatment train applied to polluted water before it enters into a receiving water body.

Precedent

Netley-Libau Marsh

In order to design a constructed wetland it is important to understand the vegetative structure and hydrologic function of local, natural wetlands. Netley-Libau Marsh is an important wetland and bird-breeding site located near Winnipeg Beach. The marsh can provide inspiration for the form, structure, and vegetation of the constructed wetland designed for Winnipeg Beach. The new wetland constructed within the town has the potential to provide habitat for the bird and animal species of this region, and can become an important ecological patch located along the major flyway of migratory birds between Hecla Island's protected wetland areas and the Netley-Libau Marsh. The Netley-Libau Marsh can be viewed as a natural precedent for the constructed wetlands at Winnipeg Beach.

> *Lakes Winnipeg, Manitoba, and Winnipegosis are often considered among the 'Great Lakes' of North America, are important to the provincial economy of Manitoba in several respects. Collectively covering over 35,000 square kilometers of the province, they provide habitat for valuable fish and wildlife populations and areas for recreation and ecotourism.* (Grosshans, Wrubleski, and Goldsborough 2004, 7)

Vast coastal wetlands are located along the shores of these lakes. These freshwater marshlands provide wildlife habitat, recreation opportunities, flood protection, and serve to improve the quality of water entering lakes through a natural filtration process. Netley-

Libau marsh is one of these freshwater marshes.

Located where the Red River and Lake Winnipeg meet, Netley-Libau Marsh is sometimes referred to as the Red River delta (Lindgren 2001). The marsh measures approximately 26,000 hectares and is considered one of the largest coastal freshwater marshes in Canada (Grosshans, Wrubleski, and Goldsborough). Netley-Libau Marsh is made up of a myriad of shallow lagoons and channels separated from Lake Winnipeg by a forested, sandy, beach ridge. The marsh is dynamic, characterized by highly variable, unpredictable water levels. Soils in the marsh are waterlogged, considered to be "poorly drained organic muck" (Grosshans, Wrubleski, and Goldsborough 2004, 7). This muck overlays clay and silt, which in turn overlays glacial deposits of shale and limestone of the Ordovician Age. The lakes of the marsh consist of alkaline waters, rich in nutrients, making the marsh highly productive. Water levels in the marsh are influenced on a local scale by tributary flows from the Red River, Devils Creek, Netley Creek, Wavey Creek, and the Brokenhead River. On a broader scale, marsh levels fluctuate according to Lake Winnipeg's water levels. Netley-Libau marsh is a relatively flat and shallow wetland.

Recently there has been a renewed interest in Netley-Libau Marsh and its water purifying abilities especially regarding its ability to reduce the nutrient loading of water entering the Lake Winnipeg.

Netley-Libau Marsh has been designated as an Important Bird Area (IBA) by the Canadian Birdlife Partners, the Canadian Nature Federation and Bird Studies Canada. The marsh has also been elected a Heritage Marsh, by Manitoba Conservation. Being

designated as an IBA means the marsh is globally significant; this is due to the number of Forster's Tern found nesting at the site which contributes to 1.5% of the global population of this species. The marsh is considered a Heritage Marsh because of its diversity of wildlife, and because it provides important recreational, economic, and educational benefits (Lindgren 2001). Gulls, terns, and Western Grebes are identified as the most common nesting species in the marsh. American White Pelican and Double-crested Cormorant are among the non-nesting species of birds. Waterfowl also use the marsh for staging, molting, and nesting, Mallards and male Wood Ducks being identified as common species. Other important congregatory bird species found at the marsh include Franklin's Gulls, Black-crowned Night-Herons, Yellow-headed and Red-winged blackbirds, Sandhill Cranes, and Canada Geese. Many songbirds, muskrat, and fish species also use Netley-Libau Marsh. Historically this marsh was important because of the large numbers of migratory birds using the site as they moved south along their flyways.

The Netley-Libau Marsh consists of non-vegetated areas, which are predominately of open water, emergent vegetation, wet-meadow, low prairie, and upland areas. The following description is derived from Grosshans and colleagues survey of the vegetation zones of Netley-Libau Marsh, 2001 (Grosshans, Wrubleski, Goldsborough 2004).

Open water depth is on average less than 1 meter and at its deepest reaches up to 3 meters. The deepest areas in the marsh have no vegetation but shallower areas support submersed vegetation, primarily pondweed, coontail, water milfoil, bladderwort, and duckweed. The marsh also has many sandy beaches and "wind swept sand dunes"

(Grosshans, Wrubleski, Goldsborough 2004, 43) which are found along the lake shore. These regions are sparsely vegetated by plants such as giant reed grass, shrub communities of willow, wild rose, chokecherry, canada wild rye, couch grass, and canada thistle. Netley-Libau Marsh also consists of vast regions of temporarily exposed organic marsh called mudflats. These regions typically have very little vegetation but if they are exposed for long periods of time pioneer species, goosefoot, cattail, bulrush, and sedges begin to grow. Emergent vegetation communities occur in regions of the marsh that have persistent standing water, vegetation typically occurs along open water borders, although vegetation masses frequently form island communities in open water. This area is composed of waterlogged organic soils. The dominant species of this region are bulrush, sedge, cattail, and giant reed grass. Wet Meadows are areas characterized by fluctuating water levels; these regions are typically flooded for a few weeks in spring although water can persist until mid summer when it is lost to seepage or through transpiration. Wet meadows occur primarily in locations of water-soil transition. The dominant species of the wet meadow include awned sedge, reed canary grass, whitetop, giant reed, other sedges and rushes, and willow. In a few locations in the marsh salt flats are also found. The low prairie consists of areas of temporary or no flooding. This region can be subdivided into areas of grass, grass and forbs, and prairie. The final vegetated region of Netley-Libau Marsh is the upland region, this area has temporary to no flooding. The upland areas of the marsh typically consist of areas which are hayed or grazed, of treed prairie, and predominantly treed areas. These regions are dominated by trees and agricultural crops.

The existing hydrology, the structure and form of the marsh, and the types and varieties of plant communities found within Netley-Libau Marsh has inspired and informed the creation of a waterscape at Winnipeg Beach. The lessons learned from the Netley-Libau marsh are that the constructed wetland for the Winnipeg Beach site will be a dynamic and productive system, characterized by periods of flooding and drought. The wetland system will be comprised of many shallow ponds connected by filtration swales or channels. Water depths will vary in the pond wetland system, allowing various plant communities to be established, including areas of open water, emergent vegetation, wet-meadow, low prairie, and upland areas. Every effort will be made to facilitate the growth of native vegetation in the wetland area. The constructed wetland will be separated from Lake Winnipeg by a beach ridge which will allow lake water to ebb and flow from the wetland system. The constructed wetland will provide water treatment and habitat for various wildlife of the region.

CHAPTER 3 - COMMUNITY

Introduction

The word community is applied in this chapter as defined by Tormont Webster's Encyclopedic Dictionary (1987, 357) as:

com·mu·ni·ty (kə-myōō'nə-tē) *n., pl.* **–ties. 1. a**. A group of people living in the same locality or under the same local government. **b**. The district or locality in which they live. **2**. A social group or class having common characteristics.

Chapter 3 provides a description of the experiential, qualitative, and historic qualities of the town of Winnipeg Beach. For decades Winnipeg Beach has been a holiday destination, a place to escape from the hectic pace and routine of city life. Here I explore the lure of Lake Winnipeg and the town of Winnipeg Beach. I examine the qualities the town possesses that make it appealing and beloved. This section reflects passions for this place, personally and through the experiences of others in the form of art, poetry, and descriptive text. I will capture the experience and the ritual of "going to the lake". My objective is to provide an understanding regarding the essence and character of town and the community of Winnipeg Beach. No doubt that proximity to Lake Winnipeg, an expansive, beautiful lake, and to the town's long, sheltered, crescent shape beach, is part of the appeal. Evidence of the value that community members place on residing close to the lake can be seen in the increase of property values for residences located closer to the lake. However, many people who summer at cottages in Winnipeg Beach do not swim, boat, or sun-bathe. Is "being away" a strong enough reason to attract these people, or are

there, perhaps, other attributes that make this town a special holiday retreat?

In response to the reflections in the first section of this chapter, I have determined that it is important for the design of a wastewater / stormwater management system located in Winnipeg Beach, to be in keeping with the restorative qualities of its context. According to principles of integrated water management the design of a wastewater / stormwater system should be accepted by the public and should confer multiple community benefits. This practicum will proceed by reviewing the literature which discusses ways in which this will be accomplished.

This chapter describes how to design a landscape which is perceived as being restorative by the Winnipeg Beach community. In order to determine how this is possible, the following research will discuss the definition, the cause, and the treatment of human stress. This chapter will provide a summary of research conducted in the field of environmental psychology. Specifically, this research discusses the types of places people prefer for restorative purposes. This section will conclude by addressing human psychological perceptions, describing how they relate to landscape architecture and identifying elements which both contribute to, and limit a sense of restoration.

The main research goal of this chapter is to determine what qualities of a restorative experience should be implemented within the context of Winnipeg Beach and how these qualities can maintain and improve the town's capacity to act as a place in which humans can feel relaxed and rested.

Experiencing Winnipeg Beach

hol·i·day (hŏl'ə-dā') *n.* **4.** *Often* **holidays**. *Chiefly British.* A period of time during which one is free from work, studies, or one's usual activities; vacation.
(Tormont Webster's Encyclopedic Dictionary 1987, 804)

va·ca·tion (vā-kā'shən) *n.* **1.** A period of time devoted to pleasure, rest, or relaxation.
(Tormont Webster's Encyclopedic Dictionary 1987, 1808)

I vacation at Winnipeg Beach to escape the stressful routine of my day to day life. The chaos of traffic jams, pressing deadlines, the smell and sound of construction sites, and the ceaseless negative news reports are all aspects of my life that I strive to flee from. My holiday weekends are spent near the lake.

Perhaps not everyone's ideal holiday weekend involves swimming or playing on the sand but my experience of "going to the lake" would not be complete without spending as much time as possible near, or in the lake. On a warm summer day nothing is as inviting as plunging into Lake Winnipeg's cool, refreshing waters. I love Winnipeg Beach because I feel it is not about blatant pageantry. It is quieter and more family-oriented than many of the other beaches close to the City of Winnipeg. Sitting on the sand, I daydream as I watch children splash in the water and build sand castles. I marvel at a child's delight when they when they discover a sandbar twenty feet out from shore, and realize that the water is only up to their waist. The lulling ceaseless movement of the waves lapping the beach calms me. I enjoy feeling the water cleanse and wash the gritty texture of the beach from my body. Like a child, I love the feeling of wet sand squishing between my

toes. Walking along Winnipeg Beach in the evening, I look out at the lake and am awed by the way the sky is reflected by the water's surface; sky and lake becomes an indistinguishable entity and draws my eye outward towards infinity. Now as an adult I know what lies geographically to the east of the lake but yet I still allow myself to imagine other worlds that lie just beyond the limits of my perception. I remember as a child thinking that the secret world beyond the lake must be some fantastic, mysterious place, accessible to me only in my daydreams.

The beauty of Lake Winnipeg is an important part of going to the cottage; however, it is not the only element which draws me to the lake. My longing for Winnipeg Beach is also fueled by nostalgia, ritual, and tradition. Each year my weekend retreats to the cottage begin in earnest on May long weekend. For my family this has become an annual tradition. This weekend is special because generally speaking, after this weekend in May, there will be no more frost so it is safe to start up the water utilities.

"Going to the lake" is all about getting together with friends and family. May long weekend is the time of year when many seasonal residents begin their summer migration to the lake, so I am sure to run into friends and neighbors I haven't seen since last summer.
Our weekends at the beach are about socializing, barbequing, picnicking, and having bonfires. These are all summer traditions that have been a part of my life since I was young.

Each summer my return to Lake Winnipeg awakens childhood memories, a time in my life that was more carefree. I remember anew days when my biggest concerns were getting sand in my eyes or dropping my ice cream cone on the sidewalk. To me this sense of

nostalgia influences my attachment to the beach.

At Winnipeg Beach I experience a sense of home; of community that I feel I am missing in my city life. Because our cabin at the beach has been passed down from generation to generation, I feel a bond with this place that extends beyond my own lifetime.

Winnipeg Beach is a town strongly rooted in history. The establishment of cottage rituals and traditions has created a sense of belonging within the community. The inheritance of cabins from generation to generation has embedded the town within a mythical landscape, a landscape where stories of the past reflect the essence of place.

My perception of Winnipeg Beach is influenced by tales related to me by my grandparents and my mother. My great grandfather was one of the first Ukrainian immigrants to settle near Gimli, Manitoba, a town not too far from Winnipeg Beach. Grandma used to tell me stories of what is was like growing up near Gimli. Some of these stories reflected the hardship of growing up in the farming communities of the region. These were stories of loss and sacrifice, such as being quarantined in their house during an influenza outbreak and relying on strangers to bring them food. Other stories are about happier times, for example, the story of my grandmother being picked up to go to the Winnipeg Beach dance hall by one of her boyfriends. She called it being "kidnapped" because she was not ready to go out. The whole night she refused to go in and dance, so they sat outside and listened to the music.

My mother's stories are about growing up on a potato farm. My grandparents sold potatoes to the chip stands in the resort communities along Lake Winnipeg. My mother would tell us

stories about traveling up to these towns and what a treat it was to be able to leave the farm and get away from the root cellars. Mom describes Winnipeg Beach as "an exciting place, all lit up, with things happening all around you" (Hoogland 2006). She remembers the inviting vinegary smell of the chips permeating from the concession stands. Going to Winnipeg Beach on the weekends was a holiday for my mother; it did not seem like work. The family could not afford to take vacations, could not even afford the price of rides, but the beach did not discriminate. The children looked forward to escaping the hot summer sun with a relaxing swim in the Lake Winnipeg (Hoogland 2006).

My experience of Winnipeg Beach is echoed in the following poem about Lake Winnipeg and by the memory story of childhood spent on the beach. For me, these pieces describe the awe-inspiring, wondrous quality of Lake Winnipeg that I love and the memories of my childhood fascination with the simple things that I take for granted today. Poetry captures the essence of Lake Winnipeg in a spirit that transcends my struggle to express my strong attachment to this place. No matter how much knowledge I possess about it, the lake will always remain fascinating and mysterious.

GREAT LAKE



Figure 11 – Lake Winnipeg

Your beauty's calling me,
Great Lake,
As I wander on your shore,
You stretch towards some far off place,
Some land of distant lore.

Your beauty's calling me,
Great Lake,
And I wonder at the sight,
Your swirling waves caress my soul,
As sun sets into night.

Your voice is calling me,
Great Lake,
And it echoes in my mind,
You tell me tales of time gone by,
A time that's left behind.

Your touch is calling me,
Great Lake,
Your hand beckons me to come,
And play and laugh within your surf,
Until the day is done.

Your touch is calling me,
Great Lake,
And although I'd love to stay,
Your warm embrace will have to wait,
Until another day.

STONES AND OTHER NOT-SO-FRIVOLOUS THINGS

As I walk down the beach, I collect stones. Not any stone will do. I am looking for unusual stones, not the yellowish or grayish stones which seem so common. I remember being a child on the beach. After all, this hunt is the product of such nostalgia. I remember hunting for perfect decorations for the sandcastles that I could spend hours building. Gull feathers, wave-worn, sandblasted pieces of green glass, shells, and best of all the perfect smooth, colorful stones. I was particularly attracted to stones that were different, stones that sparkled in the sun, dark stones, so inky and black, and stones with fossils. I remember the sadness I felt, returning to my castle the next day and finding it destroyed by humans and waves.

Not every memory I have of Lake Winnipeg and the beach is positive. I remember the sense of horror I felt when trying to summersault under water and not being able to find my way back to the surface. Yet these types of traumatic memories are far outweighed by joyful ones. Even though I was afraid of the water for a time, I could not be kept away for long. I remember the sense of peace and mystery I felt when I would stick my head underwater. I remember never wanting to go home. I remember the sense of joy that I felt

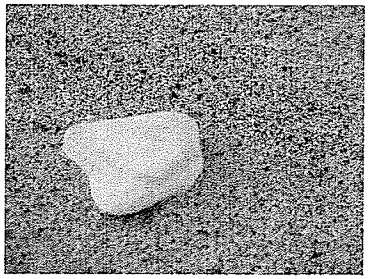


Figure 12 – Stones

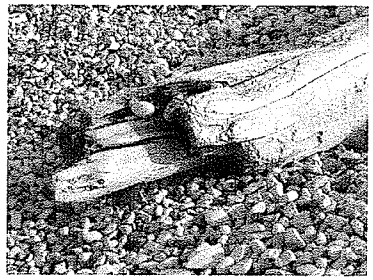


Figure 13 - Driftwood

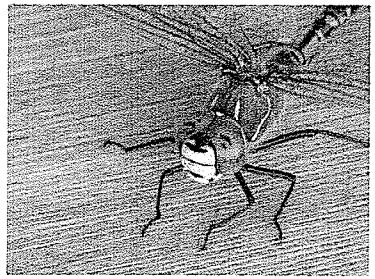


Figure 14 - Dragonfly

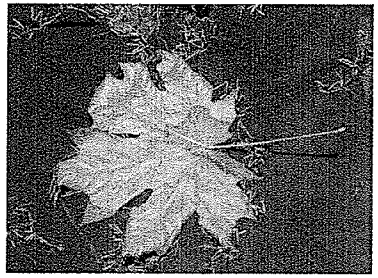


Figure 15 - Leaf

walking along the water's edge, the wet sand squishing between my toes. I remember the sense of wonder when my footprints would disappear with each incoming wave.

As a child I loved the beach and I still do. I love the way Lake Winnipeg can make me feel peace, bewilderment, or terror on any given day depending on its particular mood. I love the transitional nature of a beach. The beach seems a part of the lake but yet not entirely so. It is transitory, shaped and reshaped by the water continuously; it remains anchored to land for only as long as the lake allows. The hunt for the perfect stone is a memory story, a way to bring forth the happy childhood experiences and to evolve a sense of wonder about the beauty and mystery of Winnipeg Beach.

The History of Winnipeg Beach

The history of Winnipeg Beach is an important part of the character of a town embedded with nostalgic references to a time gone by. For decades Winnipeg Beach has been a destination to which city dwellers could escape for relaxation, socialization and fun, it was a place to go to retreat from the stressors of the city, "its proximity to Manitoba's metropolis made it an obvious magnet for people anxious to escape the heat and humidity of the summer in the city" (Russell 2004, 121).

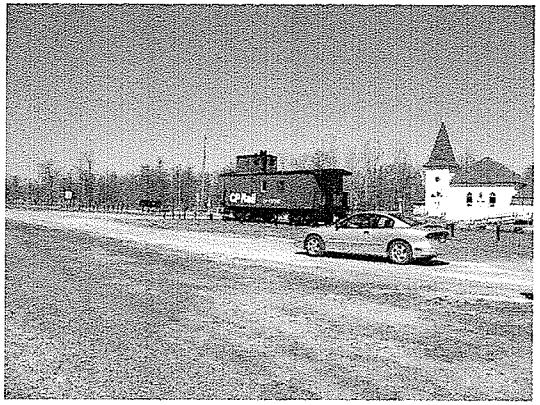


Figure 16 – Caboose at Winnipeg Beach

The town of Winnipeg Beach is located along the western shore, of the south basin, of Lake Winnipeg. This region is called the Interlake region of Manitoba, because it is bounded by three large freshwater lakes; Lake Winnipegosis to the north-west, Lake Manitoba, to the south-west, and Lake Winnipeg to the east. The town of Winnipeg Beach owes its origin to the railway (see for example: Russell 2004, Wood 1955). In the early 1900's, Sir William Whyte, assistant to the president of the Canadian Pacific Railway (CPR), explored Lake Winnipeg and discovered a beautiful crescent beach, approximately one and a half kilometers long, and named it Winnipeg Beach (see for example: Wood 1955). The CPR then purchased 300 acres of waterfront land and soon extended the rail line from the town of Selkirk to Winnipeg Beach. "The line was completed in 1902, and in the same year the

Railway Company built a station and a dance pavilion" (Wood 1955, 2). The first train arrived in 1903 and carried 500 families to the beach and amusements of the resort town (Russell 2004). The Winnipeg Beach line would soon become the most profitable track in Canada. "By 1910, between 12 and 15 trains a day were ferrying more than 40,000 passengers between Winnipeg and Winnipeg Beach each holiday weekend" (Russell 2004, 122). The rhythm of life at Winnipeg Beach was greatly influenced by train schedules. The 'Daddy Train', made two trips a day during the summer and would take working fathers to and from the lake. Christopher Dafoe expresses the experience in this quote: "the daddies, hot and frazzled after a day in town, got back to their cottages in time for a drink and a swim before dinner" (Winnipeg Free Press 1999). Another train, the 'Moonlight Special', left Winnipeg in the early evening and returned after midnight. This was the train for people looking for some excitement, young people looking for someone to wander along moonlit beaches with or to dance away the night in a partner's arms.

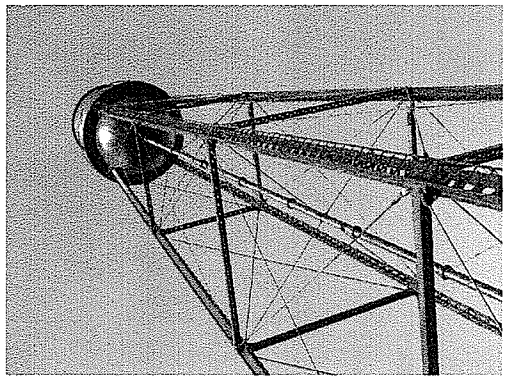


Figure 17 – Winnipeg Beach water tower

In its early years Winnipeg Beach had a theme-park-like atmosphere; Russell has compared it to an Atlantic City, Brighton Beach or Coney Island.

In the early 1900's, ritzy hotels lined the main street of Winnipeg Beach. Piers, parks and picnic grounds were constructed to accommodate the weekend masses that would travel to

Winnipeg Beach from the nearby capital city. A boardwalk took strollers along the beach to the carnival concessions and cottages. A wooden roller coaster was one of the largest in the country at the time. (Manitoba Community Profiles 2004, 1)

The town also offered a 51-meter tall water tower, a giant dance hall, and above all a beach. Although Winnipeggers may have left the city in search of amusement rides and roller coasters, once visitors arrived at Winnipeg Beach, the beauty and awe that the lake inspired was what affected them the most. Gabrielle Roy explains the thrill of first seeing the lake as a child in her book, *The Road Past Altamount*:

Then suddenly the train gave a bold and joyous whistle, as if it were announcing: Watch, now, you're about to see something marvelous, new and worthwhile! At the same time, it made a rather quick, sharp turn. I saw then – or believed I saw – an immense sheet of tender blue, deep, glossy, and, it seemed to me, liquid. My soul stretched wide to receive it … Ahead of us, from one horizon to the other, as the old man had said, was the lake. Nothing but water. But there was something else I had not expected: this was that the lake, even when it made its particular sound heard, also kept silent. How could these be reconciled – this impression of a tireless murmur and, at the same time, of silence … All my

preparations had been useless; everything surpassed my expectations ... Does one ever, fundamentally, get over a great lake? (Roy 1989 in Russell 2004, 127)

In the late nineteen fifties, however, the dance hall burned down, the roller coaster was dismantled, and due to the advance of the automobile, passenger travel by train became obsolete. With the decline of train transport and the wider range of mobility provided by the automobile, the use of the resort town of Winnipeg Beach as a holiday destination went into decline. Winnipeg Beach began to feel unsafe and to appear unsightly (Russell 2004). Finally, in 1967, the Province of Manitoba purchased the beach and gradually redeveloped it as a provincial park. Today Winnipeg Beach is a community consisting of 800 permanent residents and many seasonal cabins (Government of Manitoba 2001). Due to its close proximity to the city of Winnipeg, approximately 80 kilometers, the town has become a home to many people who commute to and from the city everyday. Winnipeg Beach's pace of life has slowed down since its railroad days and it is now considered by many to be a family beach by others "a more urbanized location for summer's rest and relaxation"(Russell 2004, 138).

While the roller coaster and Ferris wheel may no longer exist in Winnipeg Beach, reminders of the town's past can be found everywhere. The water tower stills stands as a landmark and historical site, plaques describing the history of the town can be found along the reconstructed boardwalk, a caboose donated by the Canadian Pacific Railway stands where the train station once stood, and historic photographs hang in restaurants and bars. Names like the 'Roller Coaster Lounge' and the

'Winnipeg Beach Station' are steeped in nostalgia and every year a festival called 'Boardwalk Days' is celebrated in an attempt to "recapture the old carnival atmosphere of the beach" (Town of Winnipeg Beach 2002, 1). While the history of Winnipeg Beach as amusement park still resounds, it is the lake, the beach, the sense of community and the way of life that continue to draw visitors to Winnipeg Beach every summer, long after the other attractions have been dismantled and removed.

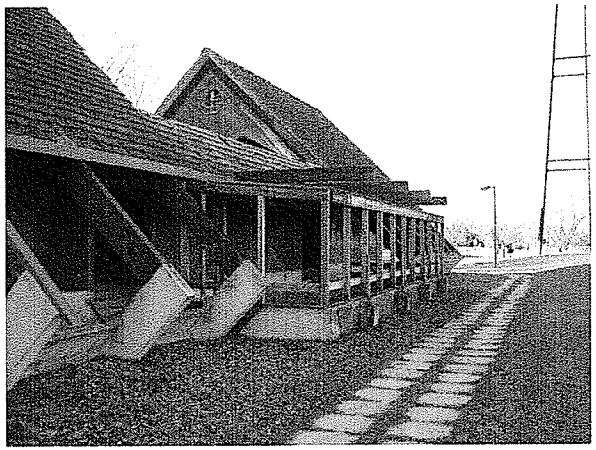


Figure 18 – Old concession buildings

Stress

stress (strĕs) *n.* **6. a.** A mentally or emotionally disruptive or disquieting influence. **b.** A state of tension or distress caused by such an influence
(Tormont Webster's Encyclopedic Dictionary 1987, 1639)

Stress is therefore both an influence and a state caused by this influence. Simply put, stress causes stress. As a response, stress is both essential and detrimental to human adaptation and survival. Understanding stress and the way it affects the human body is the first step in understanding how to manage it. The 'fight or flight' response is "our body's primitive, automatic, inborn response" (Neimark 2004, 1). Stress increases the human body's ability to perform during intense situations, preparing the body to react when faced with a 'perceived' or real threat (Neimark 2004). In order to prepare for such a potential attack, the human body stimulates the hypothalamus and initiates nerve cell firing and chemical release which, in turn, causes the body to undergo dramatic changes. Research indicates that in current western society, the frequency and duration of exposure to stress has increased (see for example: Anisman 1999, Reuters 2006). Furthermore, long-term stress can affect virtually all of the human body's systems, from the cardiovascular system to the immune system. Stress can therefore, be considered a growing threat to human health.

Due to the duality in meaning of the word stress, the influences that cause stress will be referred to as stressors. The term stress itself will be applied to the state of stress.

> *The term 'stressor' indicates a situation or event appraised as being aversive in that it elicits a stress response which taxes persons' physiological or psychological resources as well as possibly provokes a subjective state of physical or mental tension.* (Anisman 1999, 241)

Increased human exposure to stress is related to how one appraises stressful situations. While at one time stressors were immediate, direct threats to human survival, today stressors are chronic and cumulative (Anisman 1999, 241) therefore human appraisal of stressors has shifted over time. When a person runs away or fights off a threat -'fight or flight'-, the associated muscle movement metabolizes stress hormones. This 'natural unwinding' allows the human body to return to a state of rest and is termed, the 'relaxation response' (Reuters 2006). Unfortunately, most stressors that humans encounter today do not permit immediate attack or escape. This delay in reaction to stressors causes a build up of hormones in the body and undermines its natural ability to cope with stress (Neimark 2004). This type of stress can be referred to as chronic stress.

People under chronic stress frequently seek relief by abusing drugs, alcohol, or tobacco; by adopting abnormal eating patterns or a sedentary routine. This abusive behavior, in turn causes more stress, creating a self perpetuating cycle (Reuters 2006). In order to break this negative cycle, one must be able to invoke the relaxation response. To accomplish this, long-term stress reduction techniques are incorporated into daily life. These techniques include; making healthy lifestyle choices such as eating right and exercising, reducing job stress, strengthening or establishing a support

network, relaxation techniques such as deep breathing exercises, meditation, and message therapy, and cognitive-behavioral methods. Cognitive-behavioral methods are, according to Reuters (2006) the most effective ways to reduce stress therefore, these will be the primary focus of the following research. Cognitive-behavioral methods include "identifying sources of stress, restructuring priorities, changing one's response to stress, and finding methods for managing and reducing stress" (Reuters 2006, 15). One element essential to restructuring priorities is adding restorative activities to daily life; this includes recreation, physical and mental removal from stressful situations.

STRESS IN A GLASS

I turn on my tap and touch the water that flows out of it. It feels cool and refreshing. Parting between my fingers, the water forms rivulets, streams, laughs. Water submerges my fingers. As bubbles rise up between each finger they catch the sunlight from my window in the ripples. I feel water being absorbed by my skin, my body. My hand touches water, the water touches me back; it caresses and nurtures me. I know that this water has touched others as it is now touching me.

I hold a glass under the tap and water flows into it, constrained by walls I have placed around it. As my glass fills, the pitch of the water changes, it becomes higher and higher interacting with the vessel in my hand. I turn the tap off. Looking into my glass full of water, I notice the distortion of images and light, the playful warping of its context. From afar the appearance of the water is clear but looking closer, I see particles, almost colorless specks, slowly settling to the bottom of my glass. I breathe in the scent of my water, expecting to find a satisfying absence of odor. The organic

smell of algae permeates my olfactory sense. I also detect the acrid scent of chlorine. Images of harmful microorganisms, bacteria, heavy metals, toxins, unfiltered sewage enter into my consciousness, buzzing frantically around my mind. My horror grows as I process recent headlines. "WINNIPEG SEWAGE LEAK REACHES THE LAKE; HOG OPERATION SITUATED CLOSE TO CITY AQUEDUCT; E.COLI FOUND IN LOCAL WELLS". My sense of ease, of restoration is disrupted; my water is UGLY, and SMELLY, and TOXIC. I'm sure it will kill me. I want to scream out "DON'T DRINK THE WATER!" stop...breathe...be rational! My water is probably not deadly. Yet the scent and appearance of my water is not what I expect. The unexpected alters my perception of the water I am about to drink. Is my water safe to drink? I put my glass down and take a plastic bottle of water out of the refrigerator.

This narrative records my experience of stress. Early in the narrative, the playfulness of the water fascinates me, and I crave it. I notice things about my water intuitively, and I have a preconceived notion of what water should feel like, sound like, smell like, and taste like. This forms what I refer to as a mytho-poetic image (Wilson 1984) - the image of pristine, clear, odorless water, what in my mind water should be. When the scent and appearance of a glass of water challenges my expectations, I begin to question whether the water I've poured myself is safe to drink. I rely on water for survival and have always taken for granted that I will have clean, safe drinking water available at my fingertips. My increased knowledge about drinking water quality has contributed to my awareness. Perhaps, it has made me slightly paranoid. My water, in fact, may be quite safe to drink, but both my intuitive and rational mind, have made me doubt this. This awareness stresses me out.

Restoration

Restoration is a term used to describe stress relief or can additionally indicate the invocation of the relaxation response. Restoration is a commonly used principle in environmental psychology (e.g. Kaplan, Kaplan, Ryan 1998; Ulrich, Simons, Miles 2003; Hartig et al., 1991); however, it is defined in different ways by different researchers. Ulrich, for example, uses the term restorative as synonymous with stress reducing (Ulrich 1991). Stephen and Rachel Kaplan define restoration as recovery from mental fatigue (Kaplan et al. 1998). These two definitions are not exclusionary because mental fatigue can be a considered a mentally disruptive influence and therefore relates directly to this practicum's definition of stress. There is a broad range of literature concerning nature's role in experiencing restoration (E.g.: Leather et al. 1998; Wells, Evans 2003; Anderson et al. 1983). The Kaplan's and Ulrich however have "uncovered similarly consistent findings using (more) rigorous research designs built upon theoretical frameworks" (Hartig et al. 1991, 4). Thus, I will discuss these two scientists' theories in more detail.

Hartig et al. (1991) discuss the differences between Ulrich and Kaplan's theories noting three important differences. The first is that Ulrich's research approach is considered "affective" as it pertains to an emotional or feeling based response; the Kaplans' research approach is considered "cognitive" as it relates to perception, reasoning and intuition. The second variation is that while Ulrich study the biological, physical, and emotional elements of a human's response to threat, the Kaplan's study the amount of attention that people direct to everyday activities. Finally, the third difference is that Ulrich perceives restoration

as a result of limiting 'arousal', Kaplan, on the other hand, sees restoration as replenishing a person's ability to retain information (Hartig et al. 1991). Kaplan's research focuses on the types of natural environments and the types of natural experiences people choose for restoration as opposed to Ulrich who focuses on whether people choose these types of environments due to genetics or societal influences. It is this fact that makes Kaplan and Ulrich's work complementary.

THE EVOLUTIONARY THEORY & THE BIOPHILIA HYPOTHESIS

> *We are human in good part because of the particular way we affiliate with other organisms. They are the matrix in which the human mind originated and is permanently rooted, and they offer the challenge and freedom innately sought. To the extent that each person can feel like a naturalist, the old excitement of the untrammeled world will be regained. I offer this as formula of reenchantment to invigorate poetry and myth: mysterious and little known organisms live within walking distance of where you sit. Splendor awaits in minute proportions. (*Wilson 1984, 139*)*

Much of Ulrich's research is focused on attempting to prove a genetic or biologic connection between humans and nature. Ulrich (2003), proposes that "modern humans should have a partly genetic predisposition for experiencing restoration in response to certain nature environments but no such predisposition to most urban/built environments and contents" (pp. 39-40). There is an enormous body of cross-cultural research that

seems to support such a theory (Ulrich 1993). Edward O. Wilson, an entomologist, has proposed a theory similar to Ulrich's called the Biophilia Hypothesis in which he suggests that humans have an innate connection to nature. Even though humans have removed themselves from the natural environment, biophilia, or "the love of life or living systems" has not been supplanted by a more modern attachment to artifact (Wilson 1993, 31). An example of both of these theories is the propensity for humans to like savanna-like or park-like settings (see for example, Kahn 1997). This tendency can be explained by evolution, in theory, because for primitive human societies, savanna was an important environment as it offered both protection from predators and visibility of prey. An affinity for places near water is also considered to be a genetically encoded response. Bodies of potable water not only provided a physical necessity for human survival but they also provided "a perimeter of defense from most natural enemies" (Kahn 1997, 3). Early human affinity for these places is thought to have been genetically encoded (see for example Wilson 1993). The importance of this theory is that while humans can learn from and adapt to a changing world, certain instinctual responses remain encoded, fight or flight is one of these responses, as is biophilia. It seems appropriate to suggest that if humans genetically respond to stressors by fighting or fleeing, that the type of destination we prefer to flee to may be genetically encoded as well. According to these theories landscapes which appeal to our genetic preferences make people feel less threatened and can consequently reduce the impact of stress on human life.

PLACE PREFERENCE

Rachel Kaplan (1977, 1985, 2001) has conducted extensive research determining

what people rate as their preferred natural restorative environment. Based on this information Kaplan et al. (1998) have compiled pattern typologies as a means of informing and inspiring designers to create "a locally appropriate solution that is responsive to the situation at hand" (p. 3). Kaplan identifies four key areas that are deemed essential to the creation of a restorative experience that meets people's needs. These four typologies will be discussed in more detail in the following sub-section.

RESTORATIVE EXPERIENCES

Kaplans' pattern typologies are the provision of sensations of fascination, extent, being away, and compatibility within given environments (Kaplan et al. 1998). Fascination is the opposite of directed attention; it is a type of attention that requires little effort. Being fascinated by something can mean simply enjoying something or being interested by it but the experience of fascination can also mean being curious about a phenomenon or having the desire to explore and discover (Kaplan et al 1998).

Extent relates to the notion of being in a whole other world. A restorative setting need not be large, but a person has to be able to perceive a separation between themselves and the world of their daily routine. Extent implies that the boundaries of a restorative setting should not be evident.

A sense of being away means removing oneself from locations in which they typically experience mental fatigue. It is flight or escape from the burden of excess information. For example, although places may be geographically located far from ones place of work, a business convention in another city will not provide the necessary sense of away

required in order for one to feel restored, while a courtyard adjacent to the office may.

Compatibility refers to the relationship between the type of natural setting a person requires for restorative purposes and the type of restoration a natural setting provides (Kaplan et al. 1998). For example, engaging in active recreational activities in a busy park may at times provide restoration for some people. If a person is seeking a nice, quiet, relaxing moment alone however, a park may not always provide the appropriate restorative qualities, while a quiet, treed lane may.

Additionally compatibility relates to human expectancy. Anderson et al. (1983) conducted research on the effects of sound on place preference. Their study determined that "there is an interaction between acoustic and other features of a setting that modifies the effect of different sounds in determining the quality of the setting" (p. 561). For example, sounds of downtown traffic and a jet passing overhead were ranked as detracting sounds in reference to wooded settings, and songbirds and crickets were ranked as enhancing sounds for woodland settings. Downtown traffic, however, was ranked as the most enhancing sound in reference to built up urban areas (Anderson et al.1983). These findings seem to indicate that elements of a restorative setting should be compatible with what a person expects to find there.

Kaplan (1998) further identifies specific elements such as fears and preferences as important to cognitive restoration. This category of patterns highlights the importance of providing an environment that is preferred while reducing elements which instill fear. A reduction in visual access, elements which are unfamiliar, and an absence of human life propagate fear in the users of a place and

should be avoided, while coherency, smooth ground, depth, openings, and mystery contribute to feelings of preference towards a restorative setting and should be enhanced. "People not only get more out of an experience in a place they prefer, they are also more likely to go there in the first place" (Kaplan et al 1998, 31). This pattern relates to the integrated water management principles that state that systems should be "accepted by the public" and should "confer multiple community benefits" (Center for Watershed Protection 2006, 1). Places that are preferred enhance visual access, provide a sense of familiarity, provide aesthetic evidence of human presence, and provide legibility, among others. Places that are preferred are also more likely to be accepted by the public (this idea will be discussed in further detail under the place attachment heading in this chapter).

Another pattern in Kaplan's work is Way-finding. This category relates to the human fear of being lost. Steps should be taken to insure that visitors to a given site can feel oriented. These provisions include spatial coherence, creating landmarks, appropriate signage, and maps.

Design principles arising from Kaplan's pattern typologies include elements such as the provision of opportunities for quiet fascination and wandering, creating separation from distraction, and using familiar, comforting materials within restorative environments.

Pattern typologies offer insight into how to design a place which provides benefit to people. Winnipeg Beach is a town which already offers areas ranked high in preference for restorative landscapes. The town is located on an extensive, scenic water body and has many park-like recreation spaces. Any new

design should be in keeping with these qualities. This research from environmental psychology will be applied to the design in order to reduce the perceptual impact that an ecologically designed wastewater / stormwater management system may have on the community.

CUES TO CARE

Kaplan et al. (1998) has attempted to describe the specific type of natural setting people seek for restorative purposes, they have also noted that people do not prefer all types of nature. Scenes that are ranked low in preference tend to be "large expanses of undifferentiated landcover" and "dense vegetation and obstructed views"; scenes that are high in preference consist of "spaced trees and smooth ground" (pp. 11-12). Unfortunately wetlands typically consist of what appears to be "expanses of undifferentiated landcover". Therefore, the ecological function does not match cultural perceptions (Nassauer 1995). Although human restoration is an important part of this practicum, it cannot be achieved at the cost of the natural ecosystem of Lake Winnipeg. Nassauer proposes a solution to this problem, suggesting the use of cultural symbols to reframe ecosystems that may not be typically ranked high in preference. She names these "cues to care" (p. 167). Designs which match cultural perceptions are likely to be accepted by the public; such designs can also be perceived as aesthetically attractive. These ideas can be related to integrated water management principles. For example, some suggested cues to care include providing a strip of mown grass along the edge of a more diverse ecosystem such as a wet meadow, using a high ratio of flowering plants and trees on the edge of a more diverse forest vegetation, using bold patterns with crisp edges, such as planting trees along visible

edges in neat rows or planting native species in areas where the will be confined within specific frames, and providing architectural details, such as pathways, benches, and structures. By reframing "natural" ecosystems, cultural perceptions can be utilized as tools for design. The result is a landscape which is both ecologically healthy as it is beloved by constituents.

Background research in the field of Environmental Psychology has also made evident that some psychological influences may increase or limit a person's motivation to engage in ecologically sustainable actions. As all of these motivators or detractions already influence residents of Winnipeg Beach, this section identifies these factors to promote desirable or limit undesirable psychological reactions.

FEAR

> *...The level of ecological awareness within many human communities has increased in the second half of this century. The development of modern ecology as both a theoretical and an applied science has certainly contributed to this heightened interest and concern, although popular awareness of ecological values seems most often to be framed in terms of one or another potential catastrophe – from nuclear winter to global warming-that must be averted through changing specific human patterns of behavior.*
> (Howett 1998, 80)

While more people are beginning to accept that our survival depends on the adaptation of more

sustainable practices, human behavior has been slow to follow. Take for example the use of pesticides. While most of society generally accepts that fogging for mosquitoes has a negative affect on human and wildlife health, many people are still advocates of this practice. Why is this? Answering this question could arise from the study of the human perception of risk, and learning how the outcome of risk is framed. "People are more likely to see risk data as relevant to themselves when they are framed in terms of personal risks than when presented as population statistics" (Nickerson 2003, 183). The fear of contracting disease, and the irritation that mosquitoes cause us when we engage with the outdoors is perceived as a personal risk. This risk of disease, therefore, outweighs the collective impact fogging has on overall human and ecosystem health, which is a population statistic.

Instead of framing the need for more sustainable human behavior in terms of threat - do this or this negative consequence will occur- it can be framed in terms of benefit – do this and this benefit will occur. Changing the framing through which we perceive environmental stressors can mitigate human fear of the environment. If we perceive that altering unsustainable environmental practices benefits us in some way, or reduces a personal threat to our well being, we are more likely to change our behavior.

LEARNED HELPLESSNESS

Another reason why humans may be slow to change unsustainable environmental behaviors, is learned helplessness. "Helplessness is the psychological state that frequently results when events are uncontrollable.... An event is considered uncontrollable when we can't do anything

about it, when nothing we do matters" (Seligman 1975, 9). Learned helplessness occurs when humans feel incompetent. It reduces our motivation for change. White, Evans, and Stecker (2004) note that, "there has been a plethora of studies linking both acute and chronic exposure to environmental stressors such as noise, crowding, traffic congestion, and pollution, to motivational deficiencies among human beings" (p. 1). Unfortunately, in many cases of global ecosystem stress, the evidence that environmental behavior is having a positive impact on the world is not perceivable (at least within the time frame of a human life). In the case of global warming for example, we are bombarded with the message "reduce consumption of fossil fuels or the world as we know it will end" (see for example, Howett 1998). Solving global warming requires a collaborative solution but individuals are not convinced that personal sacrifice will be enough to improve the state of the environment. Learned helplessness decreases our motivation to act; to characterize ourselves as agents of change. Large scale environmental degradation, of a watershed for example, is overwhelming. If you believe it will continue regardless of your actions, why act at all.

> *Learned helplessness provides a cogent theoretical framework for understanding the data on environmental stressors and motivation. Belief that actions on the environment produce outcomes proportionate to those actions is a critical component to human competency.* (White, Evans and Stecker 2004, 1)

Helplessness affects human desire to act when faced with something uncontrollable.

Controllability is commonly referred to in stress literature as a factor affecting the severity of a stressor (see for example, Anisman 1999). If an environmental stressor is viewed as uncontrollable, its impact on human wellbeing increases, as does its likelihood to be ignored. Designs which address psychological environmental fears and helplessness are more likely to be used, cared for, and maintained over time because they will be preferred.

Demonstrating how positive environmental behavior results in an improved world can mitigate learned helplessness. By increasing the understanding that the actions of an individual, in a single site, does contribute to an environmental solution, helplessness can be overcome. Werner (1999) observes that "'Environmental empowerment' occurs when people have 'agency', when they feel effective and take control over environmental events in their community" (p. 238). Humans feel empowered when it becomes evident that their actions have positive results. For example, if someone is provided with perceivable evidence that a reduction in their use of phosphate based dish detergent will directly improve the quality of lake water, they are more likely to initiate positive environmental behavior.

PLACE ATTACHMENT

Place attachment is an emotional attachment that is commonly associated with notions of home. However, the sense of ownership that one feels towards home can also occur over a broader context. "Land ownership can mean holding legal title to land. It can also have a broader meaning that extends to the land over which we feel a sense of ownership: our street, our neighborhood, our park, our school, or our town" (Nassauer 1997, 69). A sense of ownership or a connection to the natural

environment is of particular importance because people feel a greater sense of responsibility, a duty of care, towards places they are attached to. Places which promote attachment are likely to be maintained, are considered more attractive, and are more likely to be accepted by communities. As Nassauer (1997) clearly states "people take care of what they own" (p. 69). The likelihood of developing an attachment to a natural environment is increased if constituents believe the site will provide the benefits of restoration. "Home" and "Nature" are commonly accepted as places that enable restorative experiences; similarly threats to both home and nature motivate activism (Hartig, Kaiser, and Bowler 2001). While fear and guilt can provide the motivation to engage in sustainable environmental behavior (negative reinforcement) these emotions also increase stress, and can lead to feelings of helplessness.

> *As fear and threat can in some instances result in the denial of an environmental hazard, such as when it is perceived to be beyond personal control, attempting to instill such negative feelings could actually work against involvement in environmentally protective activities.* (Hartig, Kaiser and Bowler 2001, 603)

However, behavior can alternatively be modified through positive reinforcement. The psychological restoration found within natural environments can be viewed as a positive motivator for encouraging sustainable human behavior. If people are able to relax, be fascinated, or be inspired by a natural environment they are likely to develop an attachment to it and thus they will have a greater desire to protect it. "People who see greater potential for restorative experiences in

natural environments also do more to protect them by behaving ecologically" (Hartig, Kaiser and Bowler 2001, 590). Is this an anthropocentric viewpoint, in the sense that humans will only engage in environmental behavior if it provides them benefit? I would argue no. The desire to act in an environmentally responsible manner can be seen to emerge from a more balanced sense of the world, a sort of worship of nature, similar to the animistic beliefs of our ancestors. This is a reciprocal relationship, of nature providing for humans and humans providing stewardship for nature in return.

By enhancing the potential for the landscape designed for Winnipeg Beach to provide increased restorative experiences, the likelihood of people developing an attachment for this site is improved, as is the likelihood that people will want to protect and maintain it. Psychological restoration will act positive motivator for sustainable human behavior by providing benefit to the community of Winnipeg Beach.

Precedent

Gardens at the Royal Palace

Versailles, France

Designed by: André Le Notre, 1700

The gardens at the royal palace in Versailles exemplify qualities that Kaplan et al. have identified as essential to restorative landscapes. The gardens use a central axis to lead the eye toward infinity, this axis promotes way finding, as every path leads back to this main organizational feature. Versailles also



Figure 19 – Fountain at Versailles

provides different types of restorative spaces, as one moves though the woodland there is a feeling of being able to wander forever and multiple "rooms" provide private places to stop



Figure 20 – Main visual axis

and contemplate the surrounding gardens. The gardens at the royal palace also provide more public spaces, where socializing can occur. Le Notre used water to fascinate the senses, and wooded areas provide a sense of mystery. From the top of the central staircase one can look out and see glimpses of water spraying up above the tree line. These hints of mystery, of hidden secrets, incite desire for

exploring areas of the gardens located off the main path. The gardens of Versailles have numerous fountains that are hidden in the intimacy of the woodland. Le Notre perfected the notion of keeping secrets, making visitors believe that the entirety of his work is visible in a glance yet leaving elements to be revealed at a later point (Jellicoe 1982, 179). The gardens at Versailles are extensively maintained and conform to human preferences for a landscape which is neat and tidy. The gardens also create a park-like setting, consisting of trees, mown grass, and an abundance of flowers. While the gardens at the royal palace take these last concepts to the extreme and do not reflect elements of 'natural' ecosystems in their design, they are a garden typology that has influenced of the social perception of landscape aesthetic. These cultural lenses, as mentioned earlier in this chapter can become tools with which to frame "messy" ecosystems.

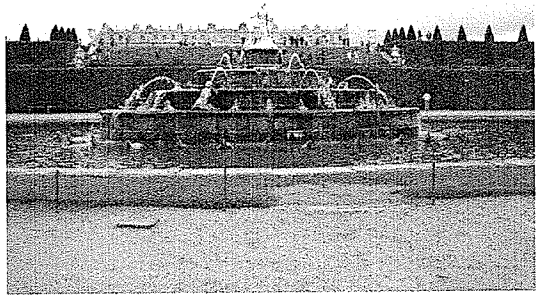


Figure 21 – Fountain with royal palace in background

CHAPTER 4 - DELIGHT

Introduction

de·light (dĭ-līt') *n.* **1.** Great pleasure ; gratification ; joy. **2.** Something that gives great pleasure. [from Latin *dēlectāre*, frequentative of *dēlicere*, to allure, entice away.]
(Tormont Webster's Encyclopedic Dictionary 1987, 452)

The way in which a landscape can be designed to provide ecological and community benefits has been addressed in previous chapters. Delight is the third component of the trivalent design approach described at the outset of this practicum. Delight, according to Thompson, refers to the aesthetics of a landscape. This chapter seeks to determine how to design a landscape which is alluring, sensuous, and delightful.

The use of metaphor to reinforce relationships between ourselves and elements in the surrounding world is a thought process in which humans engage in intuitively. This chapter will establish the importance of intuition as a method of examining the world. Metaphors capture the essence of experience and enable abstract concepts to be translated into poetic forms. In order to determine how metaphors can be used to design a place which delights human senses, the process of metaphoric thinking will be described in this chapter.

This chapter will examine a metaphor used by ecologists to accentuate the connectedness of humans and Earth. This metaphor is "earth as body". It will reveal how this metaphor can be expanded and applied to the design of a

wastewater / stormwater management system in the town of Winnipeg Beach. This chapter will express how the use of metaphor can amplify the experiential qualities of water as it moves across the landscape.

Through an examination of the design precedent of Villa D'Este, this chapter will describe how this classic work of garden architecture has used the movement of water to evoke human senses, delighting visitors by accentuating the quality of sound, the appearance, and the texture of water as it moves through space.

The conclusion of this chapter will highlight the concepts derived from the research presented in the delight section of this practicum.

Metaphoric Thinking

A truly authentic phenomenology, a philosophy which would strive, not to explain the world as if from outside, but to give voice to the world from our experienced situation within it, recalling us to our participation in the here-and-now, rejuvenating our sense of wonder at the fathomless things, events and powers that surround us on every hand. (Abrams 1997, 47)

The experiential qualities of nature, the simple pleasures humans find in natural patterns, the wonder we feel when glimpsing a rainbow, the appreciation we have for majestic mountain ranges need not be understood to be appreciated. Our surrounding life world is filled with wonder. Yet how can this sense of wonder be translated to a work of landscape architecture?

Phenomenology is an approach to philosophy that takes the intuitive experience of phenomena as a starting point and attempts to extract the "essence" of that experience. This philosophy values and validates experience and intuitive knowledge. Phenomenology values human experiences and asserts that these experiences can be studied in their own right. Phenomenology seeks, "not to explain the world, but to describe as closely as possible the way the world makes itself evident to awareness, the way things first arise in our direct, sensorial experience" (Abrams 1997, 35).

Maurice Merleau-Ponty included the human body in his definition of phenomenology; seeking to "reinterpret the division of body and mind common to most Western philosophy and

psychology" (Seamon 2002, 3). He reasoned that without body there would be no experience, therefore, "body" itself must be the subject of experience. Merleau-Ponty (1945) highlights the idea of body as experience and experienced in his description of a hand touching a hand, "when I press my two hands together, it is not a matter of two sensations felt together as one perceives two objects placed side by side, but an ambiguous set-up in which both hands can alternate the role of 'touching' and being 'touched'" (p. 93). Body is both a vessel through which to experience the world and experience itself.

Phenomenology supports my belief that as a human I know that the world extends beyond my own perceptions, but it is only my experiences, my body's interaction with the surrounding world that I really know. "We live in a corporeal and phenomenal world, amongst real things, in specific places, and it is only through the perception of this primary realm...that different cultures have understood and found access to the ideal" (Corner 1991, 126). Phenomenology validates experience and claims that nothing we undertake as humans can be free of subjectivity. Our perception is our knowledge; what we perceive in the world is always influenced by personal beliefs.

Like phenomenology, metaphoric thinking is not explanatory rather metaphors illuminate human experience. Metaphoric thinking can be viewed as an extension of phenomenology. Dubé explains "metaphoric thinking" as an intuitive form of exploration (1994). The importance of intuitive thinking is that it allows us to set aside reason and definition and to capture the essence of experience; intuitive thinking is art, is poetry, is story telling, is ritual. "Unable to presume certainty, a situational and interpretive approach to theory and practice

defers singular understanding and remains ever open to the world" (Corner 1991, 126).

Metaphoric thinking describes a way of thinking about the surrounding world which can begin to provide an answer to the question, stated in the beginning of this chapter: "How can a sense of wonder be translated to a work of landscape architecture?"

> *Culture evolves through metaphor and the release of more edifying relationships between things. Poetic transfiguration enables an unfolding of things previously unforeseen, raising people to a perception of the wonderful and the infinite.*
> (Corner 1997, 99)

Metaphors are a way in which humans perceive and relate to the surrounding world. Dubé (1994) believes that "natural pattern forms can inspire the development of new patterns to use as metaphor, for design application" (p. 35). Metaphoric thinking is not reproductive but rather provides a means of examining the natural world from other perspectives. A design in this spirit would introduce a new pattern which hints at the essence of the old. In order to recognize patterns in the landscape one must be able to free themselves from the constraints of 'objective reality'. A method sometimes referred to as "pure seeing" is suggested as a process which enables such freedom of thought (Dubé 1994). This process involves recognition, observation, and documentation of natural pattern form. In order to think metaphorically one must ask questions about the pattern form being experienced. What is its texture? How do its elements affect the feel of whole in the space? Metaphoric thinking involves changing the perspective and scale of

observation, looking at an object or phenomenon from a different angle. Step back and perceive a rock as part of the larger community of shore and then narrow the focus to "know" the intimacy of the rock's grains.

Dubé also suggests a model for documentation of a pattern form. This model will be applied to elements of the town of Winnipeg Beach. The documentation model requires the identification of a pattern form. It describes the scale at which this form is typically viewed, from large scale to the reduced scale of texture. This model defines the normal viewing perspective (the angle or plane) of a natural pattern. Finally, Dubé's model describes a pattern's defining attributes, its aesthetic attributes, and the emotional response felt by the person documenting the pattern. The emotional response is described in one word or short sentence. The following describes a summary of the documentation of experiencing natural patterns at Winnipeg Beach.

NATURAL PATTERN FORMS OF WINNIPEG BEACH

LAZY CREEK

The lazy creek is a slow moving, narrow band of water consisting of deep, undulating curves. Experience the play of light on the ripples in the water, the calm soothing sound of water trickling around and over rocks, the movement of cattails in the gentle breeze, the cool, gentle touch of the water on my hands. One word to describe the lazy creek is calm.

PRAIRIE MARSH

The prairie marsh is a low lying depression comprised of a mixture of vegetated areas and open water. Listen to the faint buzzing of mosquitoes and other insects. Notice the sound of wildlife, birds chirping and singing.

The grasses and reeds softly move in the wind. The virtual stillness of the water is disrupted intermittently by fish, muskrat and waterfowl. The prairie marsh is alive.

ROCKY SHORE

The rocky shore is an accumulation of wave worn limestone deposited on the edge of a lake. Experience the shore as an entirety, a community of jagged, irregular stone, placed haphazardly. Moving amongst the rocks, notice that shore can be experienced from both water and land. Perceive the stone as an individual, notice its unique speckled pattern of whites and tans. See the crevices and niches worn into by the water. Challenging is one word to describe the rocky shore.

BEACH

The beach is the edge between lake and land; it is an accumulation of fine particles of stone worn down by time, wind, and water. Experience the feel of wet sand squishing between toes. Feel the dry sand slowly flow between fingers. Notice the sweeping ridge pattern that the waves have left imprinted on the sand. Watch it be destroyed and rebuilt time after time. See tracks left by birds and animals leading off into the distance, they fill with water and slowly seem to dissolve. Sense the gritty texture of sand between teeth, feel its abrasiveness while wiping away the sand that the wind has blown into faces. The beach is transitory.

LAKE

The lake is a large body of freshwater, a remnant from glacial times. Envision the water reaching towards infinity, stretching out to merge with the horizon. Feel awe at its magnitude. Detect the organic scent of algae. Mesmerized by the lapping sound of the waves of the calm lake or uneasy, yet fascinated by an angry lake, whipping the whitecaps into

frenzy and crashing against the shore with a roar. Feel the moisture of the lake in the surrounding air. Notice as the waves obscure the rocks beneath the surface on their way in and then leave them clearly exposed as they pull back out. One word to describe the lake is awesome.

SPRING THAW

The time in spring when the snow begins to melt and turn to water, a period of increased runoff. Experience the sound of water everywhere, dripping from the eaves of the cabin, trickling through the ditches, streaming down the eaves troughs. Notice the water from the roof forming wells in the snow as it falls in the same place time and time again. The ice submerged in puddles shines and gleams. Slushy snow tinted yellow by the plants beneath has a heaviness that weighs down tired limbs. Notice the irregular fractured ice jams on the lake pushing their way onto shore. Hear the birds chirping in the trees, and the cracking of ice beneath feet. Feel the suns warmth. Spring thaw is about renewal.

HOARFROST

White icy crystals deposited on exposed objects when the air is humid and the temperature drops. Experience the play of light as it glints off the ice crystals making them sparkle. Notice the crisp echoing sound of footsteps as they shatter an eerie silence. Feel insulated from the world. Fascinated by the intricate forms that the crystals create, become amazed by how quickly the image of the world can change. Feel intrigued by the illusion the ice creates, softening the needles of evergreen tress making them look almost fuzzy. Hoarfrost is surreal.

THUNDERSTORM

A sudden change in weather caused by warm air rising rapidly, characterized by heavy rain,

thunder, and lightning. Experience the tension and quiet in the air before the storm begins. Hear the wind pick up speed and the creaking of the oak tree as its branches rub against each other. Startled by a loud clap of thunder, see the brilliant flashes as lightening streaks across the night sky. Hear rain rapping on the roof as it streams down from the sky. Nervous is one word to describe experiencing a thunderstorm.

Earth as Body

> *It is…necessary to distinguish two 'natures': The first, 'nature', refers to the concept of nature, the cultural construction that enables a people to speak of and understand the natural world, and that is so bound in ecological language; the second, 'Nature', refers to the amorphous and unmediated flux that is the 'actual' cosmos, that which always escapes or exceeds human understanding.*
> (Corner 1991, 84)

In an attempt to understand the natural world, humans intuitively construct a representational metaphor. Since prehistory, humans have personified nature in an attempt to understand and derive meaning from it. An *animistic* view of the world, derived from the Latin *anima* meaning breath or soul, is the view that everything is alive. Animism is defined by Tormont Webster's Encyclopedic Dictionary (1987) as, "any of various cultural beliefs whereby natural phenomena and things animate and inanimate are held to possess individual innate souls" (p. 75).

This view, commonly associated with hunter-gatherer cultures, situates humans as a part of nature.

> *The Paleolithic mind did not distinguish the human enterprise from the natural world, but it did wonder at the miracle of existence and created an elaborate hunter mythology to account for reality.*
> (Oelschlaeger 1991, 12)

Primitive humans had an intrinsic connection to the natural world. They relied on nature to provide them with their most basic needs, food, water and shelter. The worship of nature, through totemism and ritual demonstrates that early human societies understood the human/nature relationship to be symbiotic; in other words human action had consequence within the natural world (see Oelschlaeger 1991, Goldsmith 1992, Abrams 1997). Furthermore, for the Paleolithic mind the totem was a metaphorical representation of the unity of human and Earth demonstrating the interconnectedness of humans and nature.

Metaphoric representations of the connectedness of humans and the natural world continue to be used today. One common metaphor used by many ecologists, is Earth as body. "In one of the earliest metaphors to appear in this new subject (ecology), species were seen to relate to their environments in the ways that organs are related to the body, a conception which opened the way for all sorts of associated imagery drawn from healthcare and medicine" (Thompson 2000, 137). Based on this metaphor, ecosystems are quite often characterized as either healthy or unhealthy. Stress, a term used to describe human health problems, is another word now applied to the description of unhealthy ecosystems, becoming synonymous with disturbance. Where human stress is defined as a state of "bodily or mental tension resulting from factors that tend to alter an existent equilibrium" (Merriam-Webster 2004) a disturbance describes "an event that causes a significant change from the normal pattern in an ecological system" (Forman, Godron 1986, 591). The definitions of stress and disturbance are virtually interchangeable.

Human and ecosystem stress are similar in a number of ways. For example, just as human

stress is essential to survival, in healthy ecosystems periodic disturbance is essential to the system's integrity. Another similarity is in the way humans and ecosystems respond to stress. Human response to stressors can vary significantly between individuals. This difference can be explained in part, by an individual's unique reactivity towards a particular stressor (or alternatively by their resistance); some people also recover from stress more easily then others (or are more resilient). This accounts for the differing impacts that stress can have on human health (Anisman 1999). Similarly, ecosystem stability can either refer to a system's resistance or resilience to disturbance. Resistance is the ability to absorb disturbance (Holling, Smith 1986, 487). Resilience refers to the ability to respond to disturbance by absorbing change. Resilience also refers to how quickly a system is able to recover from disturbance (Holling, Smith 1986, 487). Lack of controllability and predictability of our stressors and increased duration and frequency of exposure to stressors can cause human stress coping mechanisms to breakdown (Anisman 1999). Similarly, unsustainable human behavior is responsible for increasing the frequency and chronicity of ecosystem disturbance. Humans are therefore, affecting the dynamic equilibrium that is essential to ecology. While periodic disturbance is necessary to maintain ecosystem viability, this "disturbance must occur within bounds" (Smith 1986, 488). Unsustainable human behavior has created disturbances that far exceed the limits that ecosystems of the world are able to tolerate (Abrams 1997, Goldsmith 1992).

Although the metaphor of Earth as body can enhance our understanding of the connectivity of human stress and human induced ecosystem stress, ultimately nature is not human. Nature is holistic and finite and while

humans can flee to nature to escape the threats we are posing to our own survival, the ecosystems of the natural world are bounded and can only resist or recover from human impact.

In order to design a landscape which delights human senses, I have used the metaphor of Earth as body as a means of representing the movement of water through the site. Water begins its journey through the waterscape at Winnipeg Beach under stress and ends its journey relaxed. The design of the water treatment system for Winnipeg Beach represents the sound, feel, appearance, and texture, of human stress and restoration through the movement of water.

Precedent

Villa D'Este

Tivoli, Italy

Designed by: Pirro Ligorio, 1550

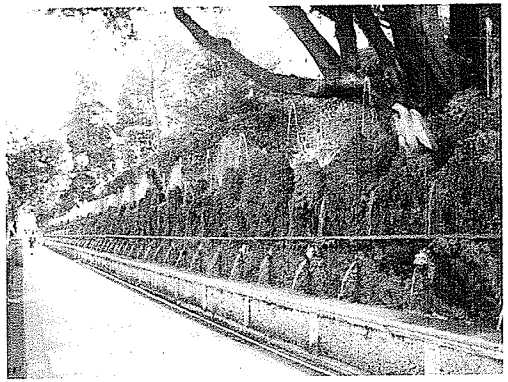


Figure 22 – Avenue of One Hundred Fountains

Villa D'Este is a sensuous water experience. The Gran Loggia is the central axis around which the garden is organized. What adds to the mystery of Villa D'Este is that the central axis is not accessible to the visitor, as it is composed, predominantly of water. Water echoes throughout the garden, roaring, gurgling, sighing, and singing. Sometimes the sound of water is almost deafening, sometimes it is eerily quiet. The texture and appearance of water changes as one moves through the garden, sunlight emphasizes the movement of water, punctuating ripples with light and shadow, the sky is reflected as a mirror image in still pools. The Avenue of 100 Fountains forms the first major cross axis of the garden, water spurts from the mouth of 100 lions. Water flows down the sides of staircases,

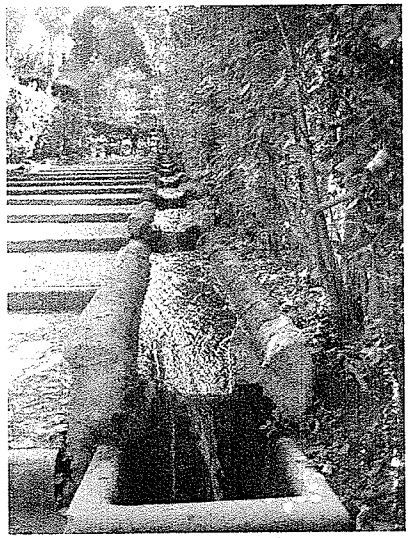


Figure 23 – Water flowing along stairway

sometimes it is majestic and spectacularly showy as in the case of the Water Organ or the Oval Fountain, other times it is calm and still. While the metaphoric representation of the movement of water as a human transitioning from stress to relaxation was, in all likelihood, not part of Ligorio's intent in designing Villa D'Este, certain contemporary associations can be made between the movement of water through these gardens, and the way water would move if it was stressed or relaxed. Many of the more obviously engineered water features at Villa D'Este express a movement of water as chaotic, frenzied and hectic, all feelings associated with stress. The more subtle features of Ligorio's garden, such as the grottoes, seem almost natural, and water is calm, relaxed, and still: all concepts associated with restoration. The garden is clearly divided from the surrounding landscape; it is a walled garden and this adds to its sense of other worldliness. Villa D'Este encompasses many senses in its experiential exploration of water communicating the essence of water in a poetic manner.



Figure 24 – Panoramic view from Villa D'Este

CHAPTER 5 - DESIGNING A WATERSCAPE: LIMITING THE CURRENTS, WAVES, AND UNDERTOWS OF STRESS

This chapter begins by describing the site selected for the design intervention described throughout this practicum. The work will proceed by providing a summary of the site inventory and analysis conducted at Winnipeg Beach. The inventory and analysis have provided background for the design decisions made in relation to issues generated specifically by the context in which this design was implemented.

The trivalent concept plan implemented in the design of a waterscape at Winnipeg Beach will then be unfolded. This plan will reflect how the themes of ecology and integrated storm/wastewater management, community and the design of restorative places, and delight and the use of metaphor, were used in design of a waterscape. These themes are then represented in the form of an integrated master plan.

This chapter will highlight the development of the design concept and the detailed design elements of this practicum. It will display plans, sections, and perspective sketches of the final design intentions. A written description of the design intentions of each of these representations will be provided.

This chapter will conclude by describing the way in which this design extends beyond Winnipeg Beach and how other areas of the town and other municipalities in the area could benefit from such a proposal. The conclusion will also highlight additional research questions which should be addressed by researchers in the future.

Site Selection

The site selected for the design intervention section of this practicum is an area along Kenstead Road, extending west from Lake Winnipeg, past Highway #9. This area was selected because it is the site of the existing Winnipeg Beach sewage lagoon. This lagoon is located near the Winnipeg Beach Provincial Heritage Park, close to recreation areas, to the beach, and to the lake. When enjoying recreational activities in this area one does not expect to come across a sewage lagoon. Sewage is not a desirable smell on a hot summer day when out enjoying the beach. The site also falls into an area that the Winnipeg Beach Development Plan has classified as restricted for development. This area is considered restricted because it falls within 1,500 feet of the existing sewage lagoon. The site of the existing sewage lagoon is a low lying marshy area, prone to over land flooding in wet years; it also contributes more extensive runoff to the Lake Winnipeg system. Because this area is low lying, prone to overland flooding, and appears to have once functioned as a natural marsh, it can be considered ecologically sensitive. For these reasons, I consider the Kernstead Road site appropriate for this design intervention. Because the existing sewage lagoon is located in a depressed region subject to increased water input during storm events, emergency effluent dumps have needed to be made in the past. Due to its proximity to Lake Winnipeg, it has been convenient and efficient for effluent to be dumped into the lake when these storm events have occurred. An increase in knowledge about the damage that nutrient loading causes Lake Winnipeg, has made these dumps ecologically and socially unacceptable. The location and storage capacity of the Winnipeg Beach sewage

lagoon has become a problem which needs resolution.

I also selected this site because of the minimal existing development in this area. The density of housing in this region is low; there will be minimal disruption to existing residences and businesses.

The Kernstead Road site provides many opportunities for the connection of recreation spaces within the town. The Winnipeg Beach Development Plan (2000) states a need for such connections, "recreational trail systems shall be developed that inter-connect residential neighborhoods with commercial and community service uses (they will) encourage safe pedestrian movement linking shopping and parking services, residential communities, and Lake Winnipeg" (p. 38). The site is close to the Winnipeg Beach golf course and extending along the south side of the Winnipeg Beach Provincial Recreation Park all the way to the lake. The site continues past Highway #9 in order to provide proposed pedestrian access from the cottage communities located along the highway, to downtown Winnipeg Beach, the beach and boardwalk areas, existing recreation sites, and the lake. Currently there are no such trail systems in the town, so cottagers west of the highway are disconnected from the town proper.

This site features many established vegetation types, from tree strands, to marsh, to agricultural land. This diversity of vegetation types will permit the incorporation of existing vegetated areas within the design.

I applied Thompson's principles of ecology, community, and delight to my site selection process. Ecology is reflected in my site selection, in the opportunity to relocate the existing Winnipeg Beach sewage lagoon to a more appropriate area. The site was selected

for reasons of community, this site presents an opportunity to increase the pedestrian connectivity of the town. Finally, in applying Thompson's principle of delight I saw the scenic vista to Lake Winnipeg as a reminder of where runoff and sewage water from the community ends up and I viewed this site as an opportunity to convey water in fascinating ways through various types of developed areas.

Inventory & Analysis

DEMOGRAPHICS

The population of Winnipeg Beach, as of 1996, was 745 permanent residents, with seasonal residents at least doubling the population in the summer with a 17 percent population increase since 1991. Based on historic trend; the town of Winnipeg Beach is projected to hit 986 residents by the year 2015. There is an increase in the number of people making Winnipeg Beach their permanent home, and more permanent residences are being built. Most residents live in single-detached housing. Medium density housing developments, such as condominiums and seniors residences are found in Winnipeg Beach. A 55+ condominium complex is in the process of being built along Highway #9, falling within the site selected for the design. There is an increasing need for this type of community as more residents are making Winnipeg Beach their retirement home.

LAND COVER AND VEGETATION

The land cover of the town of Winnipeg Beach can be grouped into six major categories, developed areas, grassland, marsh/wet meadow, park, beach, and water. The developed areas of the town can be further divided into low-density housing, medium density housing, commercial, community building types.

DEVELOPED AREAS

The developed areas of Winnipeg Beach consist primarily of low-density housing; more specifically single family detached housing. The housing type in these areas is a general mix of seasonal and permanent residences. The standard lot size is approximately 34

meters by 23 meters. The vegetation type in these areas is predominantly grass (*Poa* spp.), large trees (both native and exotic), and flower and vegetable gardens. There are three medium density housing developments in the town, a senior's residence, Winnipeg Beach Lodge located on Center Avenue, a condominium complex located on the golf course on Middle Drive, and a new 55 plus condominium complex located on Highway 9. Commercial and retail development in Winnipeg Beach is located primarily within the central business district, along Main Street and bound by Hamilton and Murray Aves., as well as a highway commercial corridor along Highway 9. Commercial and retail development consists predominantly of restaurants, grocery stores, and hotels. Community Buildings consist of the town office, maintenance yard, fire hall, curling club, recreational complex, and the Ukrainian Homestead Museum. Vegetation in the areas of medium density housing, commercial, and civic is negligible.

AGRICULTURE

"Within the Lake Winnipeg drainage basin, there are nearly 55 million hectares of farmland in the three Prairie Provinces, of which more than half is under crop production and the vast majority is part of the Lake Winnipeg watershed" (Lake Winnipeg Stewardship Board 2005, 8). The agriculture area of Winnipeg Beach consists primarily of cropland. The vegetation type is typically monocultures of wheat, canola, barley, alfalfa, hay and fodder, or oats. Other livestock industry in the Interlake region of Manitoba are predominantly cattle , 11 million in the Prairie Provinces, pigs, 5.6 million, poultry, 24 million, and sheep, 1.5 million. Alternative farms such as bison, elk, and ostrich, contribute numbers of 700,000 (Lake Winnipeg Stewardship Board 2005).

MARSH / WET MEADOW

Marsh and wet meadow cover areas are found along Boundary Creek, a creek located along the northern edge of the town of Winnipeg Beach. There is another marsh area located near the sewage lagoon, on the southern edge of Winnipeg Beach. The primary vegetation types in this area include willow (*Salix* spp.), sedge (*Carex* spp.), cattail (*Typha* spp.), rush (*Schoenoplectus* spp.), reeds (*Phragmites* spp., *Phalaris* spp.), dogwood (*Cornus* spp.), and poplar (*Populus* spp.).

PARK

Parkland at Winnipeg Beach consists of: Winnipeg Beach Provincial Recreation Park, located along most of the lakeshore area in the town; the Winnipeg Beach Golf Course, located along the east side of Highway 9, and patches of treed areas along the railroad.

Predominant vegetation type in these areas consist of grass (*Poa* spp.), and large trees such as, manitoba maple (*Acer negundo*), trembling aspen (*Populus tremuloides*), cottonwood (*Populus deltoides*), willow (*Salix* spp.), scotch pine (*Prunus sylvestris*), white spruce (*Picea glauca*), american elm (*Ulmus americana*), green ash (*Fraxinus pennsylvanica*), chokecherry (*Prunus virginiana*), and bur oak (*Quercus macrocarpa*). Winnipeg Beach Provincial Park is owned by the Province of Manitoba, in which the marina, the stage, the boardwalk, and the water tower can be found. The park land also contains various recreation opportunities such as tennis courts, soccer pitches, beach volleyball courts, and in the winter a skating rink.

BEACH

The beach area of Winnipeg Beach is located between the provincial park and the lake and it is between 1.5 to 2 kilometers long. The beach is crescent shaped and composed of fine textured white sand. The width of the beach is dependant on Lake Winnipeg's water levels. During years of low water the beach can stretch more than 20 meters out into the lake. Patches of open water are separated into shallow pond-like areas divided by exposed wet sand islands, or sand bars. During years of high lake levels the beach can be very narrow, less than 5 meters in some places, at times the beach disappears entirely. Sandbars in the beach region create a cove area of shallow water depth, ideal for children swimming and playing in the water. The main beach is patrolled and change stations and washrooms can be found at the south and north ends of the main beach. The main beach is located on the east side of downtown Winnipeg Beach, the beach to the south of the main beach is locally referred to as the "dog" beach, and the beach to the north of the main beach, is nicknamed the "locals" beach.

WATER

The water areas in Winnipeg Beach consist of Boundary Creek, the Winnipeg Beach sewage lagoon, and Lake Winnipeg itself. The town of Winnipeg Beach, for utility purposes is divided into to three Local Improvement Districts, (LID) numbered 1, 2, and 3. Full sewage is provided for customers of LID 1 and 2 by means of a gravity flow system, all effluent is handled for these customers and they are not expected to have holding tanks. For LID 3 customers grey water only effluent is handled via a low-pressure system and is enters the lagoon via a central lift station. Residents are responsible for their own solid effluent removal from their

septic tanks. 96 customers use LID 1 and 2, while 1,756 customers use LID 3. "All of the Town's effluent is filtered through marshland and discharged into Lake Winnipeg. While the effluent is reported to be safe from a biological perspective, no nutrients are removed. Due to occasional very high water levels, early discharges into the Lake have been required, though only with the required requisite approvals obtained from the Province" (The Public Utilities Board Act 2005). These high water levels are caused by storms and the overland flooding associated with these events. Currently municipal regulations state that sewage lagoons must be able to hold effluent for 220 days, although the Lake Winnipeg Stewardship Board has proposed extending this time to 400 days (Lake Winnipeg Stewardship Board 2005).

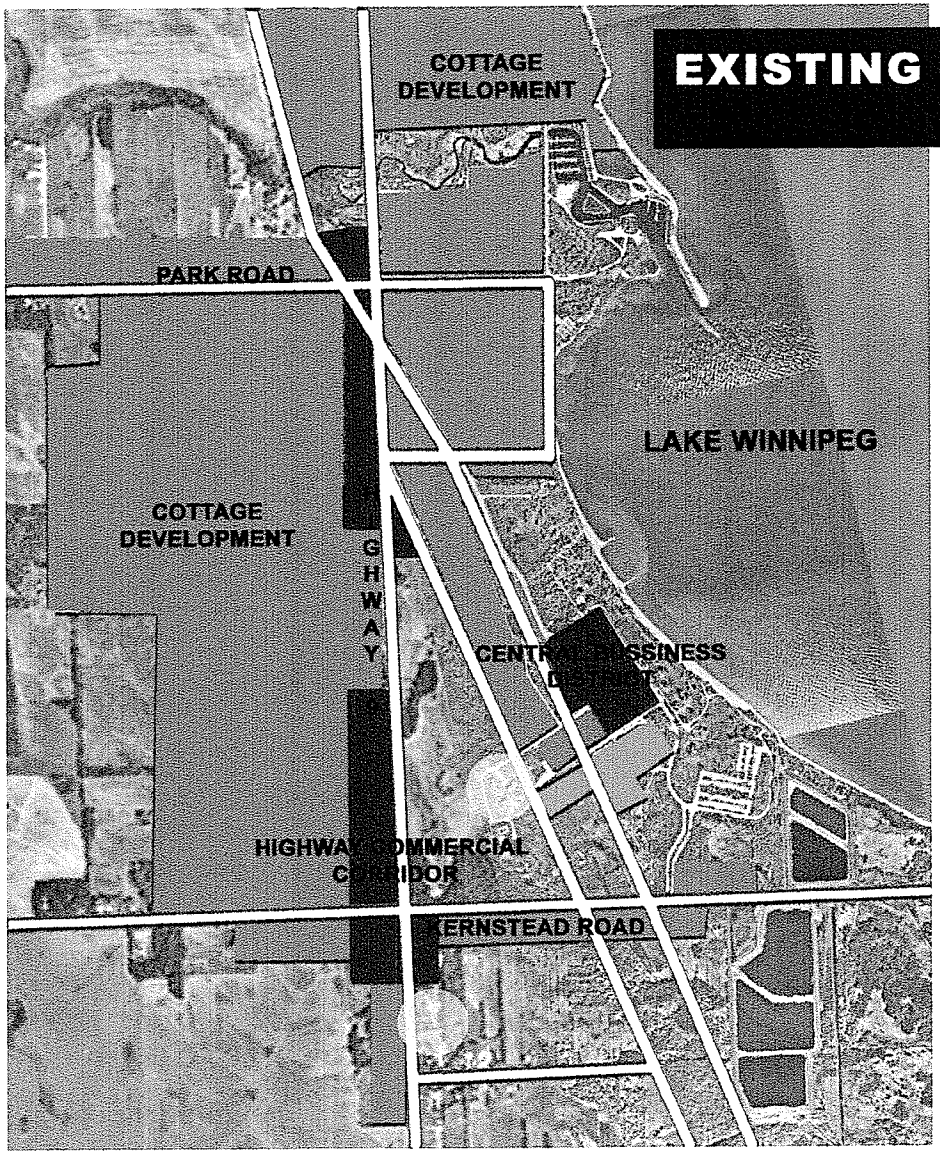


Figure 25 – Existing Development

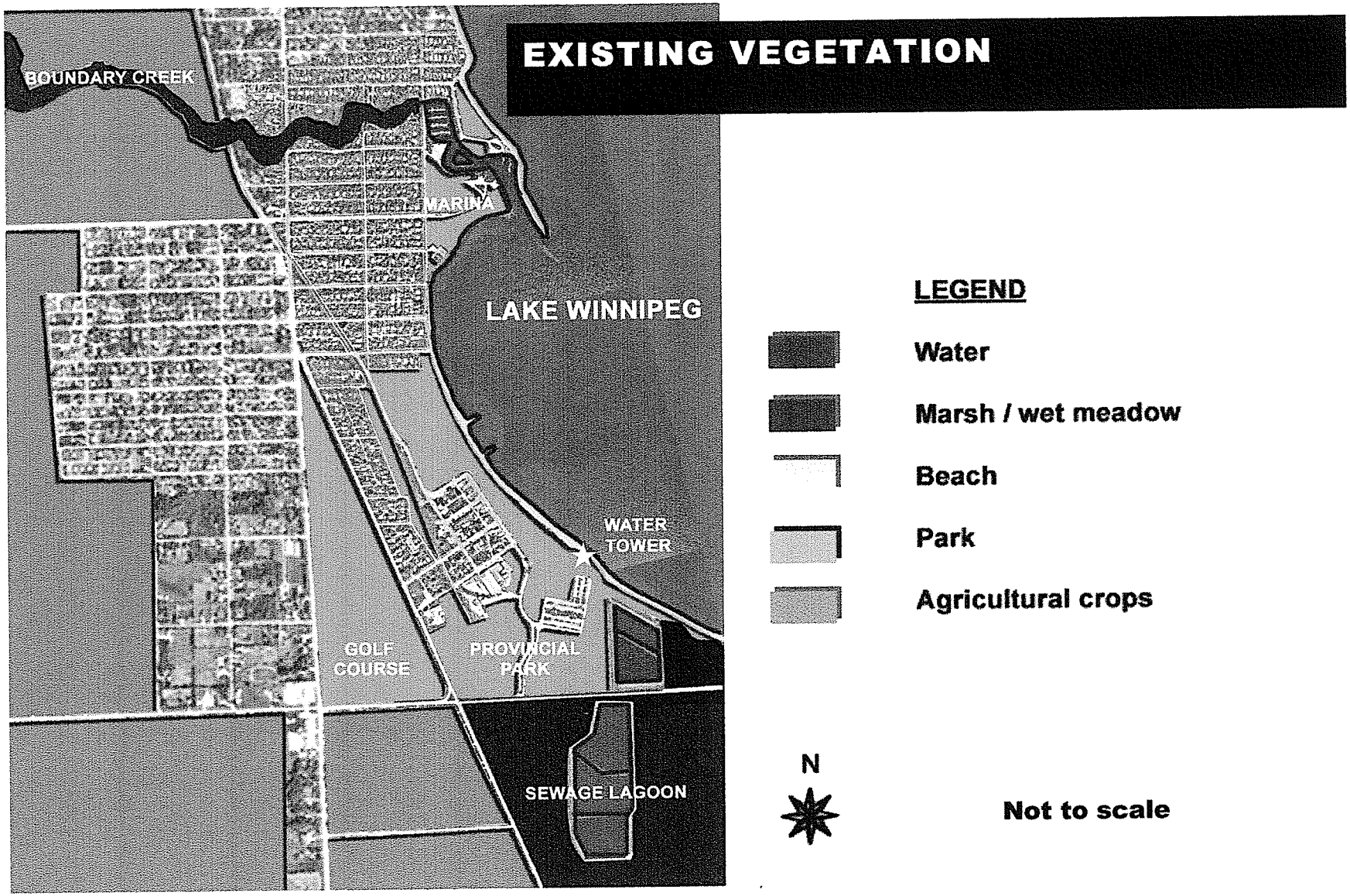


Figure 26 – Existing Vegetation

HABITAT

Winnipeg Beach is surrounded by protected wetland areas which provide habitat for various waterfowl, songbirds, and fur bearing animals. Willow Point is an area located to the north of Winnipeg Beach, near the town of Gimli. Willow Point is considered an important wildlife area. Hecla Island, a Provincial Park, hosts an extensive marsh system and bird sanctuary. Netley-Libau marsh, located south of Winnipeg Beach, is an important inland, freshwater, coastal wetland system.

SPECIES AT RISK

Four fish species found in Lake Winnipeg are considered 'at risk' by the Committee on the Status of Endangered Wildlife in Canada. These species include the Silver chub, the Bigmouth buffalo, the Shortjaw cisco, and the Chestnut lampey. The Silver chub is listed as a species of special concern. Although there is a healthy Silver chub population in Lake Winnipeg it is one of the few remaining in communities in North America. The Bigmouth buffalo is listed as a species of special concern because it has a limited and interrupted distribution and only occurs in low numbers. The Shortjaw cisco is threatened due to over fishing, competition from exotic species, and climate change. The Chestnut lampey is listed as a species of special concern due to its limited distribution and low numbers. There is also one species of snail, the Lake Winnipeg Physa snail which is considered at risk, this snail is listed as endangered and is believed to only exist in Lake Winnipeg (Lake Winnipeg Research Consortium 2006).

CLIMATE

The following statistics were taken from Environment Canada's Canadian Climate Normals, 1971-2000, for Gimli, Manitoba.

TEMPERATURE

Manitoba is characterized by extreme its extreme temperatures, for example winter temperatures have ranged from 8.2 degrees Celsius (Jan. 1986) to -41.2 degrees Celsius (Jan. 1982). Summer temperatures have ranged from 37.5 degrees Celsius (Aug. 1983) to 0.5 degrees Celsius (Aug. 1982). Average temperatures in spring and fall are more moderate, April having an average of 2.7 degrees Celsius, and October, 4.8 degrees Celsius.

PRECIPITATION

The month of June averages the most precipitation, typically seeing 94.1 cm of rain and 12.7 rainy days (greater than 0.2 mm). January averages the most snowfall, typically seeing 27.6 cm of snow, and 13.9 snowy days (greater than 0.2 cm). February is the driest month of the year with an average total precipitation of 17.3 mm. Lake evaporation occurs between the months of June to September, with a range between 2.4 and 4.3 mm. Winnipeg Beach has an average of 122 frost-free days.

The cold winter temperatures, and the freeze / thaw cycles of Manitoba impact the type of water management systems which can be chosen to treat storm and wastewater. Systems must be able to detain water for extended periods of time as marsh systems and sewage lagoons are not able to amend

water quality during winter months. Inlet and outlet structures for controlled areas of wetland systems need to be located below the frost line, as due sewage conveyance systems (pipes). Special consideration needs to be taken when designing fountains, pathways, and built structures because extreme temperature variations cause multiple freeze thaw cycles which in turn cause heaving and shifting.

Varying temperature extremes and snow typically make it essential for landscape architects practicing in Manitoba to plan for winter as well as summer uses for outdoor spaces. While the design of a waterscape at Winnipeg Beach does keep this in mind, the town of Winnipeg Beach is primarily a summer tourist destination, therefore, the population of the town during winter months is greatly reduced and only a limited number of people could make use of such opportunities.

WIND

Winter wind direction is predominantly from the northwest, these winds are generally quite cold and harsh, and the most extreme wind chill occurred in January; making it feel like -51 degrees Celsius. Summer winds are predominantly from the west. Due to the prominent summer wind direction the proposed sewage lagoon has been distanced from residential communities and a vegetated buffer has been provided in order to reduce undesirable odors. Wind speeds are highest in October, but are also quite high in September and November, accounting for the tendency for high wave action upon the lake. Locals fear this occurrence known as the 'October storm season', especially since the 1997 storm that destroyed the causeway at Willow island, and the 2005 storms which propelled the province to build dikes along the shores of Lake Winnipeg. The proposed wetland system has

taken the fall storm season into account and although wave action will still affect water levels within the marsh system, structures and residences have been relocated to areas further from the lake not prone to flooding and wind or wave erosion. The marsh system also provides an extended detention area and a vegetated buffer for extreme storm events.

SUNSHINE

The least amount of sunlight occurs in November with an average of 94.9 total hours of bright sunshine. July has the most days with bright sunlight with an average of 319.1. The sun rises at approximately 5:20 am and sets at 9:41 pm on June 21. The sun rises at approximately 8:24 am and sets at 4:30pm on Dec 21. Limited amounts of winter sunlight negatively affect the functioning of wetland systems, due to decreased exposure of polluted water to ultra-violet rays. Extended detention throughout winter months also addresses this problem.

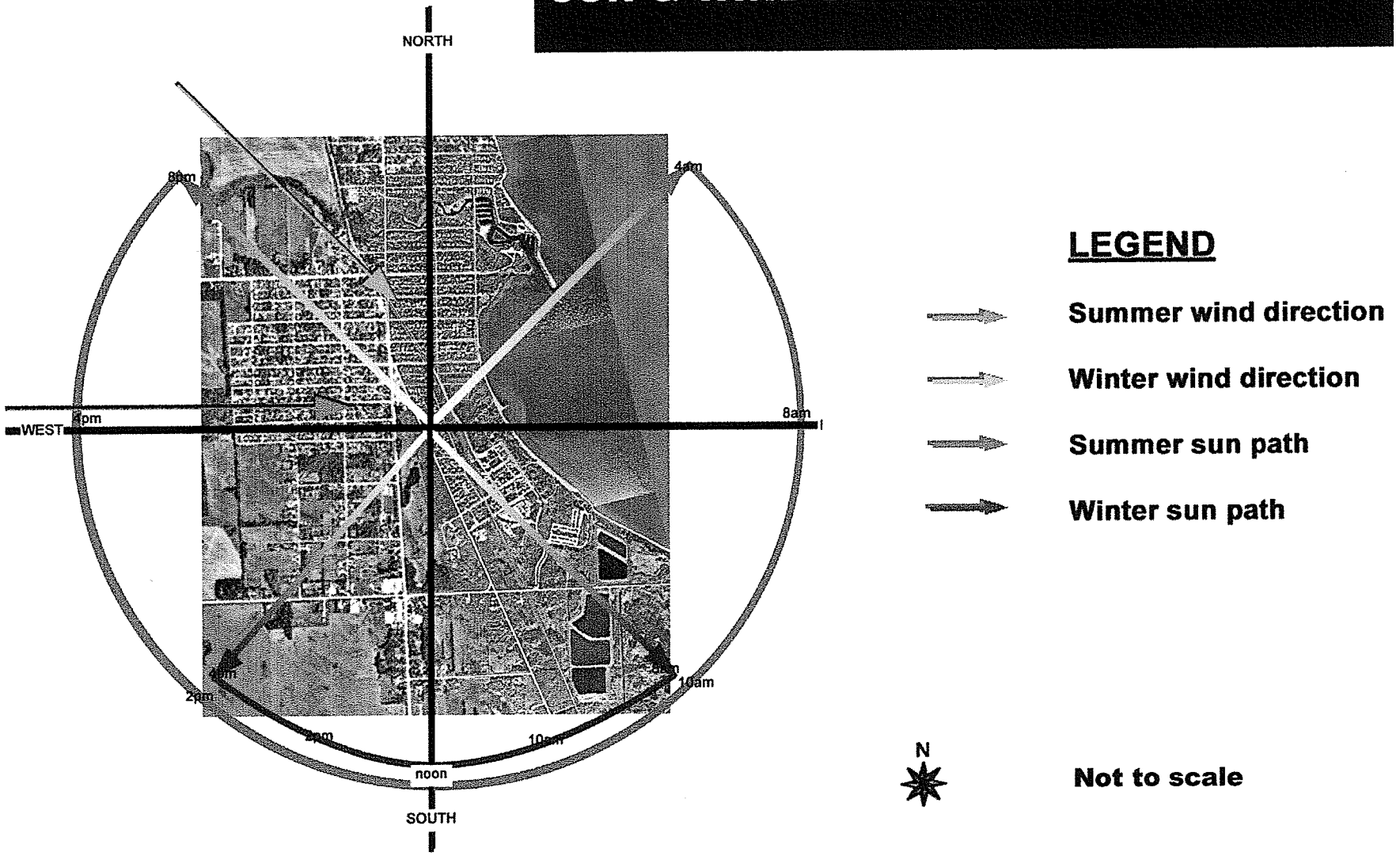


Figure 27 – Sun and Wind Direction

VEHICULAR ACCESS

The primary vehicular access to the town of Winnipeg Beach, north from Winnipeg and south from Gimli is via Highway 9. Secondary vehicular access that runs east to west is via Kernstead Road and Park Road (229). Gimli Road (232) (which runs southeast to northwest) can also be considered as secondary vehicular access.

BOAT AND BICYCLE ACCESS

Most boat access is from Lake Winnipeg via the marina. While Highway #9 is frequently used by bicyclers traveling between beaches, the highway does not have shoulders designed for bicyclers, nor is there any specific bicycle or roller blade trails in the Winnipeg Beach area. There is a small skate park near downtown.

PEDESTRIAN ACCESS

Pedestrian trails occur primarily within the Winnipeg Beach Provincial Recreation Park and consist of a boardwalk that wraps around the Winnipeg Beach Stage. There are sidewalks that extend from either end of the boardwalk that connect the 'local's beach' at the end of Elm Avenue to the 'dog beach' located south east of the water tower. The pedestrian trails extend primarily north south. There are no east west feeder trails.

TRAIN ACCESS

The Canadian Pacific Railway runs through Winnipeg Beach and is of important historic value. Passenger trains typically no longer run to Winnipeg Beach and the railroad is used infrequently.

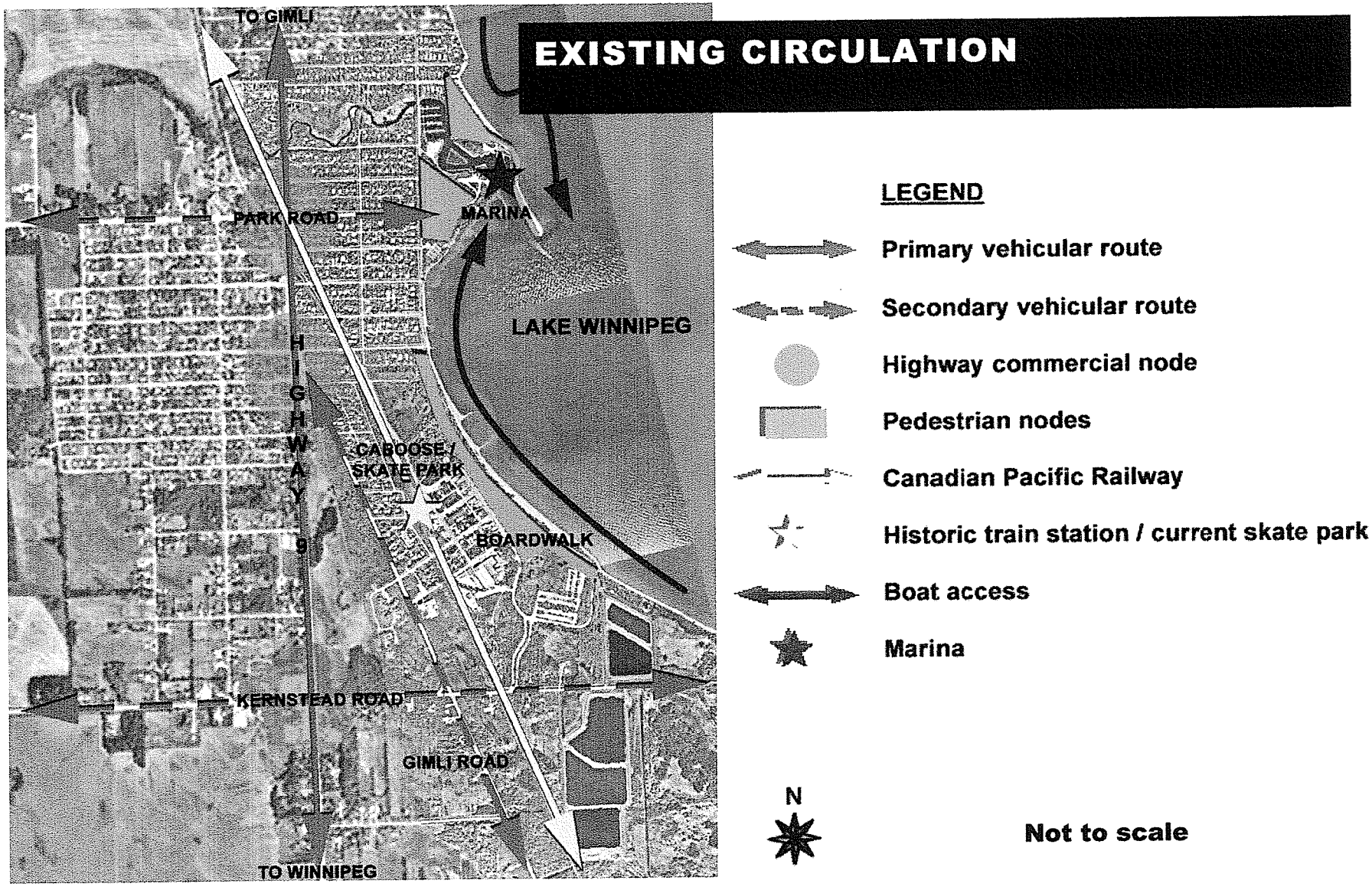


Figure 28 – Existing Circulation

SOIL AND DRAINAGE

Physiographically the town of Winnipeg Beach occurs within the Winnipeg Terrace. Soil material in the "Lake Winnipeg Terrace is characterized by shallow lacustrine deposits underlain by loamy textured, stony, glacial till" (Agriculture and Agri-Food Canada, 1999, 5). Winnipeg Beach soils are 'Clayey Lacustrine' soils of fine texture. Most of the area is considered well drained. Some areas of concern for drainage are the marshy areas along Boundary Creek and near the sewage lagoon near the east end of Kernstead Road. These areas remain wet for prolonged periods of time. Stormwater runoff is collected primarily above ground in drainage ditches located along the streets of the town. This water passes through metal culverts when flowing under roads draining directly into Lake Winnipeg. Stormwater in the downtown commercial area is drained through underground pipes to the lake. Winnipeg Beach is characterized by high groundwater levels with an artesian well surfacing along Boundary Creek. High groundwater levels dictate the type of conveyance methods used in the design and the selection of these systems has been made with this factor in mind.

TOPOGRAPHY

Elevations range between approximately 223 meters above sea level (asl) on the western edge of the town to 217 meters asl along Lake Winnipeg. Manitoba Hydro maintains Lake Winnipeg water levels at a height of between 711 and 715 feet above sea level. The land slopes gently towards the lake at a rate of about 2.5 meters per kilometer. Local relief is primarily less than 3 meters and slopes are generally less than 2 percent (Agriculture and Agri-Food Canada, 1999). The natural slope

of the region makes constructed wetlands and the conveyance measures chosen appropriate solutions for the treatment of waste and storm water. Areas of topographic note are a series of berms between the west side of Winnipeg Beach Provincial Park and the lake and the lower marshy areas near the sewage lagoon and along Boundary Creek. The permanent dikes built for flood protection in 2005 are predominantly earth dikes and range in height from 0.25 to 1 meter high. The dikes at the end of Kernstead Road are from 0.5 to 1meters tall (Manitoba Water Stewardship, 2005).

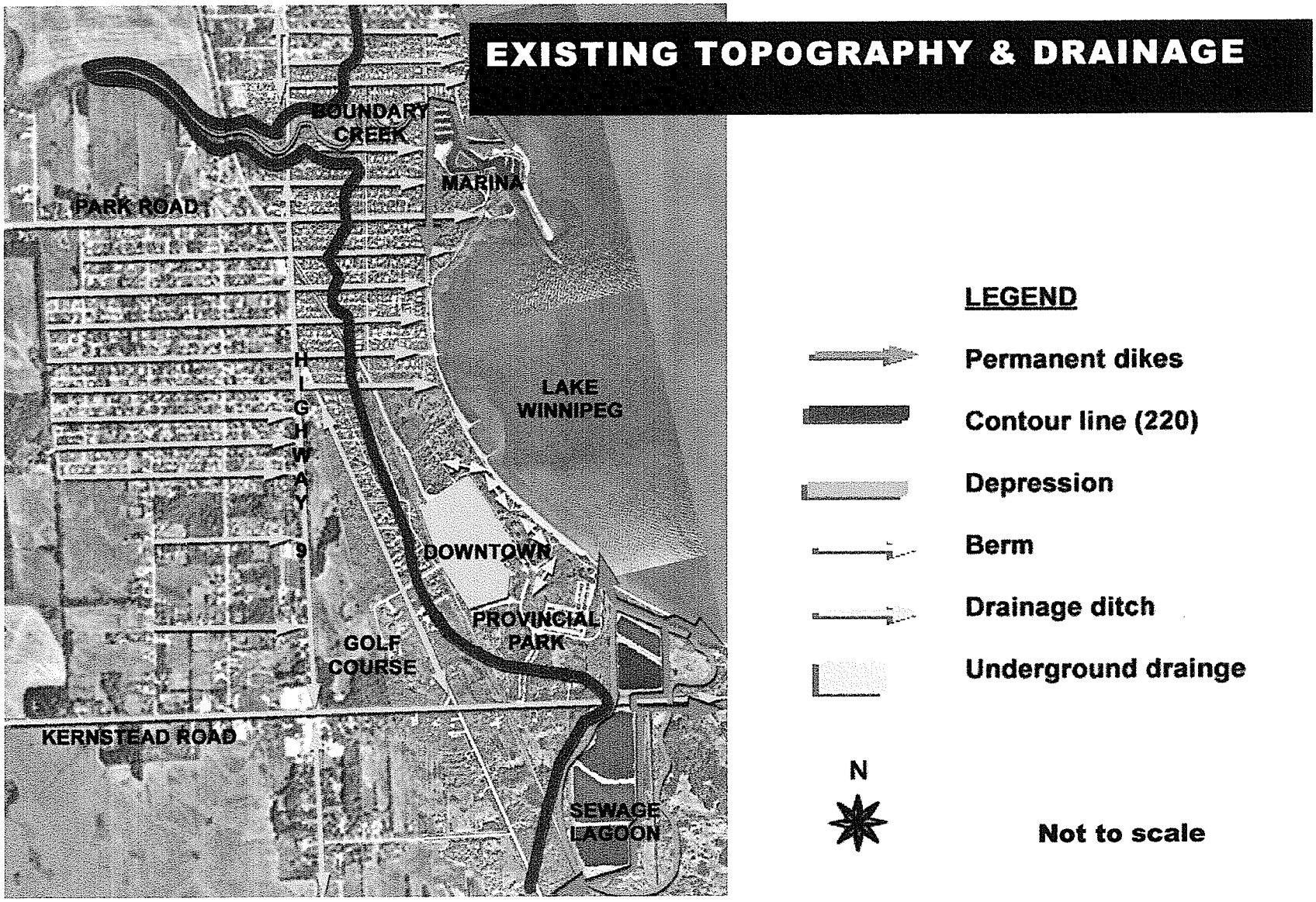


Figure 29 – Existing Topography and Drainage

The Ecological Design Concept

The experience of Winnipeg Beach is one of relaxation, of leisure, of participating in ritual, and building traditions. The ecological concept will address the undertows of ecological stress; the recent, visible evidence of the pollution of Lake Winnipeg which is destroying the serene, picturesque quality that is sought after. Winnipeg Beach residents can play a role in improving the health of 'their' lake. By taking the first steps in fixing this problem, the residents of the town can feel empowered and motivated to continue to act in an ecologically sustainable manner. Therefore, I am suggesting the development of a pilot water management project. This small scale community based project could be extended to other areas of the town of Winnipeg Beach and other municipalities along the shores of lake Winnipeg. The pilot project will allow users to perceive, for themselves, the effectiveness of previous water management models applied throughout other locations the town and compare them to more alternative "best" water management practices.

SEWAGE TREATMENT

The primary sewage lagoon on site will be significantly larger and more segmented than the existing Winnipeg Beach sewage lagoon. This new lagoon will consist of two 3-cell systems that will work in parallel to one another. These cells will consist of a facultative pond, a maturation pond, and an aeration pond. Although the Winnipeg Beach sewage lagoon is considered sufficiently sized (The Public Utilities Board Act 2005) larger settlement ponds will allow water to be held for a longer period of time. Wastewater is typically perceived as being more degraded than stormwater, however, as stated in Chapter 2,

this is a false impression. Since the current Winnipeg Beach Sewage Lagoon currently treats water to a biologically acceptable level, the water outflow from the proposed lagoon will be considered similar to stormwater. As the sewage lagoon has been relocated to higher ground, further from the lake seasonal flooding should not be as much of a problem, but a storm overflow area will be provided.

POLLUTION PREVENTION

The Province of Manitoba has begun to take some steps to address the issue of pollution reduction through education. In February 2003, The Lake Winnipeg Action Plan was created with the goal of improving the health of Lake Winnipeg (Lake Winnipeg Action Plan 2003). Part of the Action Plan suggested the formation of the Lake Winnipeg Stewardship Board, which was appointed in July 2003. These measures are a collaborative effort to address growing concerns about the Lake Winnipeg water quality. The stewardship board has developed an educational program which outlines a set of guidelines that individuals can follow in order to improve the quality of runoff water in areas relating to shoreline protection, sewage systems, lawn and gardens, household waste, making environmentally sensitive choices, pet waste, and boating (Manitoba Water Quality Handbook 2006). The committee has established goals to reduce nutrient output from agricultural areas, wastewater treatment facilities, and urban developments. As well, the board has attempted to identify and improve transboundary and interjurisdictional water quality issues (Manitoba Water Quality Handbook 2006). This education campaign is reinforced by this practicum through the integration of current practices which are beneficial to improved water quality. Practices already in place, especially at older cabins in

Winnipeg Beach, include the use of rain barrels to collect and 'harvest' rain water runoff from impervious roofs, minimal impervious surfaces, narrow gravel lanes and short (if any) driveways, and the provision of a large amount of vegetated areas.

New practices initiated by this practicum include designing shallower and wider drainage swales to decrease runoff volumes by allowing water to evaporate or be absorbed by the surrounding soils. Additional new practices include increasing the amount and size of public green spaces which have internal catch basins, again reducing total runoff volumes leaving the site. Finally runoff is directed to a modified wet biofiltration swale and constructed wetland system.

CONSIDERING NATURAL FEATURES

Restoration of natural features and the use of already existing natural features should be considered when adopting an integrated wastewater / stormwater management approach. In the case of the Winnipeg Beach site, the design takes advantage of existing vegetation and topography. As such, the constructed wetland portion of the project is located where the existing sewage lagoon is currently located. As this area low lying and prone to flooding, the residences from this area have been relocated to higher ground, as has the existing sewage lagoon. An overflow area is provided in this location as a place for overland runoff to be caught in extreme flood events. This practicum works with the existing topography of the area, conveyance methods rely primarily on natural slope of the land to move water slowly through the system.

STORMWATER VOLUME

In order to address stormwater concerns, the volume of stormwater coming from a site and the quality of this water has been described. At Winnipeg Beach, the slope is considered shallow (Agriculture and Agri-Food Canada, 1999) and stormwater collects during spring thaw and during major storm events. The principle water quality issue addressed by this practicum is nutrient loading as this is considered the greatest contributor to the poor water quality of Lake Winnipeg (Schindler in Russell 2004). Volume reduction techniques have been applied on site. These techniques reduce the quantity of runoff water reaching Lake Winnipeg through the retention of stormwater. This process allows runoff to infiltrate into the ground or evaporate to the atmosphere. Volume reduction techniques which have been applied on site include the use of pervious materials wherever possible and the use of stormwater harvesting.

CONVEYANCE & BIOFILTRATION

Water is conveyed from its source to Lake Winnipeg via a series of vegetative filters, called biofiltration swales. The swales for the Winnipeg Beach site have a minimum 6 meter, and maximum 10 centimeter depth. These conveyance measures are comprised of a minimum 60 centimeter grass buffer strip on either side of the swale. The base is 15 centimeters of amended native soil over 15 centimeters of 20 cm diameter clean stone. Due to limited slope of land (less than a percent) at the site and the high water table, a modified wet biofiltration swale is used. The main conveyance system consists of vegetative buffers surrounding a deeper central channel.

CONSTRUCTED WETLANDS

The end of train IWM practice applied at the Winnipeg Beach site is a constructed wetland. The objectives of the wetland are to further reduce nutrient loading from runoff water, to help control the stormwater flow, and to increase wildlife habitat (Minnesota Stormwater Manual 2006). The wetland is used as a tertiary sewage treatment measure. The marsh area is sized according to the following: 5 acres of wetland for every 160 acres of drainage area (Murray 2006). The wetland has a length to width ratio of 4 to 1. The inlet and outlet of the wetland are placed far apart and have a minimum depth variation of 60 centimeters between them. The wetland is comprised of a forebay (deep marsh) which is a minimum of 20 percent of surface area and is located at the inlet. This system is also designed with a micropool located near the outlet structure. The wetland provides varying water depths in order to provide the necessary growing requirements for diverse emergent vegetation. The water depth in the forebay and micropool will is a minimum of 7.5 centimeters. The stormwater system is a pond / wetland. The pond / wetland system consists of two cells, a wet pond and a shallow marsh (Minnesota Stormwater Manual 2006). The constructed wetland provides general wildlife habitat and serves to reduce nutrient loading and other water pollutants found in waste and storm water before it enters Lake Winnipeg.

When combined, the water retention, pollution prevention, conveyance methods and constructed wetland decrease the total amount of nitrogen and phosphorous entering Lake Winnipeg from the drainage area being discussed. A series of test ponds are located at strategic intervals along this system to gauge and compare the effectiveness of various segments of this system. Water quality

will be tested weekly and marked for site users to observe. It is the goal of this design to reduce the amount of nutrient loading in Lake Winnipeg. This small step has the ability to be transferred to a larger town scale project. Perceivable positive water quality results have the potential to motivate positive ecological behavior change on a broader scale, providing a model for other town and municipalities of the region.

ECOLOGY CONCEPT PLAN

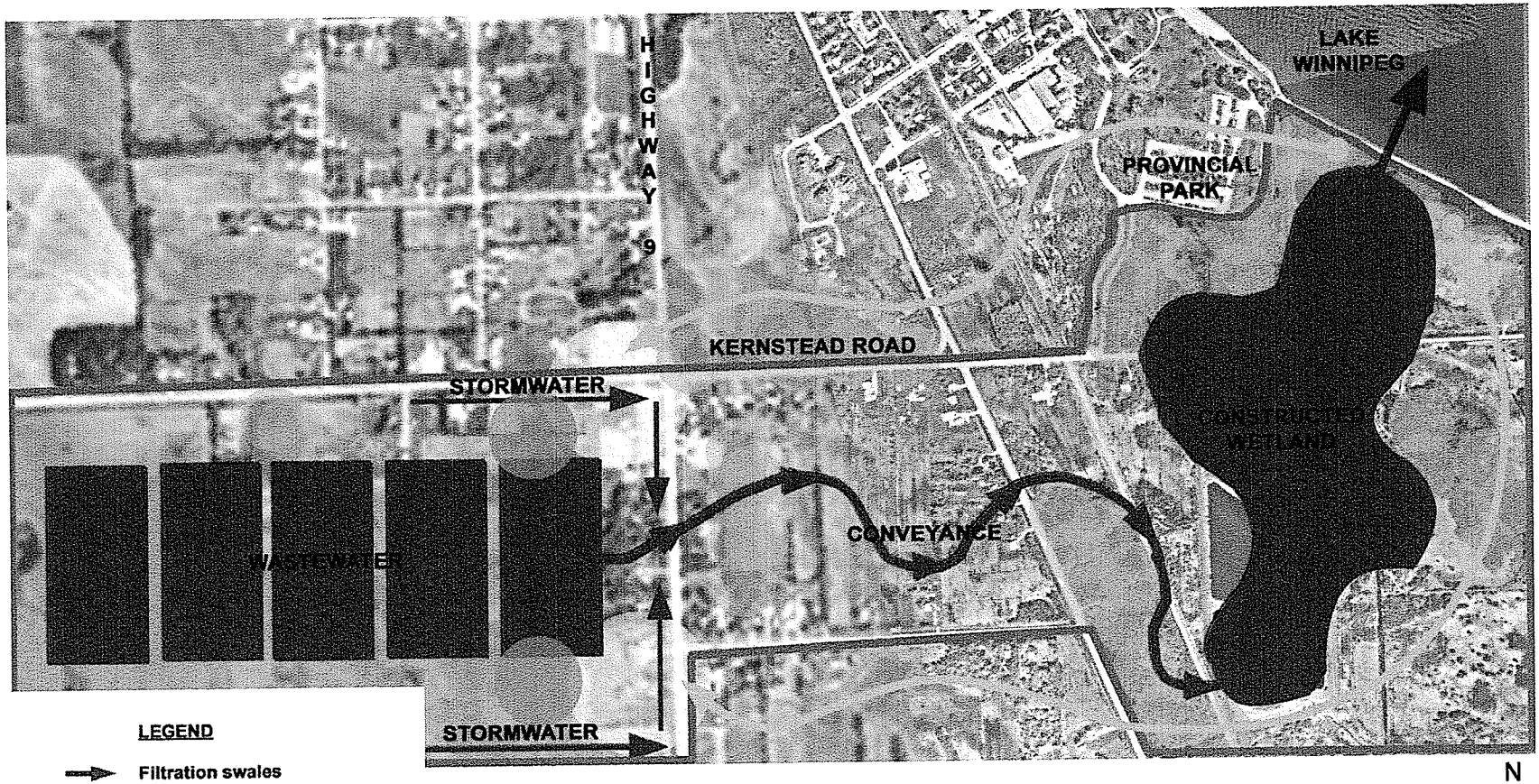


Figure 30 – Ecology Concept Plan

The Community Design Concept

The design of a restorative landscape at Winnipeg Beach considers the fact that humans have varying, individual restorative needs. Some people prefer adventures, enjoying the chance to discover and explore, while others prefer not having to think about anything at all, they enjoy being able to sit back and relax. The landscape at Winnipeg Beach meets these differing restorative needs. This design creates community currents, connecting residents living on the west side of Highway 9, to downtown Winnipeg Beach, the Boardwalk, the beaches, and Lake Winnipeg by means of a recreational trail.

THE PUBLIC PLAZA

The restorative landscape is divided into three sections. The first section is the community plaza. The community plaza is a public space, a place which provides opportunity to build a community support network. The plaza is comprised of open space for residents to engage in more active recreational activities. Here one can kick a soccer ball around, or play catch. This plaza also provides a site for community events. A portion of this area is reinforced turf, a permeable material. This is an area where tables can be set up, to engage in the local rituals of garage sales, farmers markets, and church craft sales. There are also places designed for participation in activities essential to the 'going to the lake' experience. Places to picnic, to have barbeques, and bonfires are featured. The way finding in this area is simple, everything is visible, signage is frequent, and lighting is provided. In the winter part of the water feature can be flooded to provide opportunities for skating, and a skate change area will be provided. This area has neat, clean lines and

is frequently maintained. Grass mowing strips and flowering, colorful trees create frames for more ecologically diverse areas which could be perceived as being messy.

THE WANDERING PATHS

The second section in the restorative landscape is the wandering paths. These paths allow users to take a leisurely stroll. Paths diverge and converge frequently, inviting users to choose which direction they wish to explore and providing multiple experiential possibilities. The vegetation in this area is primarily prairie grasses with mowing strips provided along pathways. The perceptually undifferentiated groundcover is punctuated with wooded areas. This area provides a savannah-like landscape, continuously in contact with water features, either the bubbling brook, lazy creek, or prairie potholes. Way finding is facilitated by the extension of one main visual axis to Lake Winnipeg. This axis appears and disappears as one deviates from the center of the wandering path area. The wandering paths provide opportunities for intentionally losing ones way, but yet you will always know that around the next corner you will be able to orient yourself again. This area is semi-private, having some screening vegetation. Fascination is provided by creating a curving, undulating path system, stemming from the natural pattern of a delta.

THE MEDITATION NODES

The final area in the restorative landscape is the meditation nodes. These areas encourage passive recreation such as meditation, reading, and bird watching. In the winter, warm up huts are provided for cross country skiers. The meditation nodes are multiple stopping points, which allow the visitor to rest and contemplate the surroundings. Way finding in the

meditation node area follows a circuitous path, which alternates between boardwalk through the marsh and crushed stone paths around it. Vegetation is denser and more diverse here, and privacy is afforded for users of this space. The nodes are quiet and relaxing. This area also provide path linkages to the Provincial Recreation Park with its boardwalk, and downtown Winnipeg Beach.

COMMUNITY CONCEPT PLAN

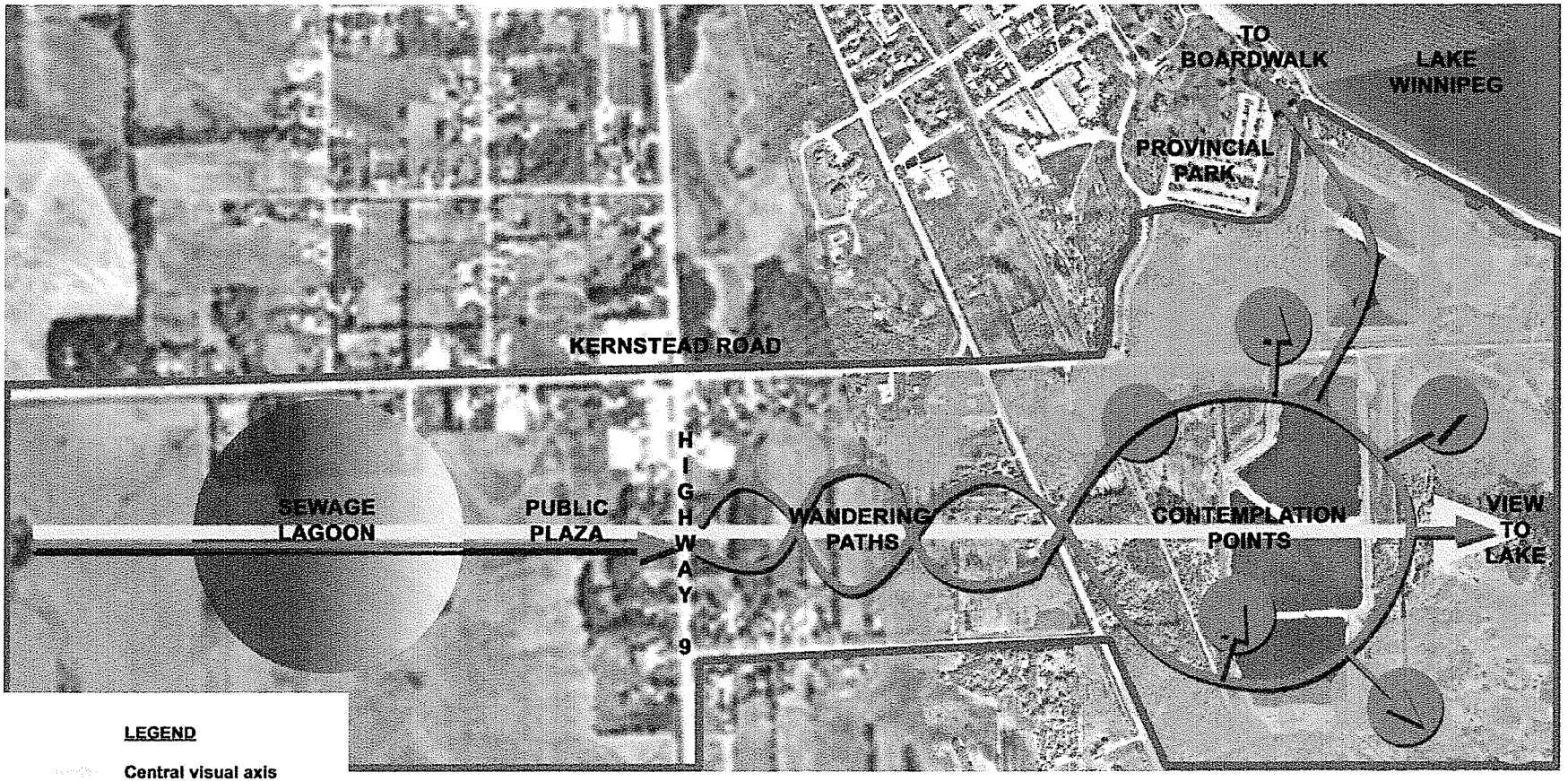


Figure 31 – Community Concept Plan

The Delight Design Concept

"Waterscapes as an asset comprise all natural surface water resources, including rivers, streams, estuaries, river pools, floodplains, freshwater lakes, wetlands linked to streams and salt lake systems" (Regional Natural Resource Management Strategy 2006, 1). In order to create a sensual waterscape which exhibits a plethora of water related experiences, I've metaphorically compared water under ecological stress to a stressed individual. Water begins its journey through the site subjected to waves of stress and slowly transitions to a state of relaxation. The following section describes the movement of water through the site.

THE SEWAGE LAGOON

Water in the sewage lagoon is ecologically stressed. It has been contaminated by humans and needs remediation. Water coming into the lagoon looks dirty, smells bad, is high in nutrient content and is biologically toxic. Effluent moves through a series of lagoon cells, starting its life in the facultative cell where settling of suspended solids occurs and the BOD loads are reduced. Water moves from these cells into maturation ponds, where further settling occurs. Finally effluent moves into aeration ponds where bacteria consumes the organic parts of the waste. This is accomplished through forced aeration (United States Environmental Protection Agency, 2006). Water leaves the sewage lagoon biologically safe and under a little less stress. It flows through a rigid grid of ditches which are a representation of current agricultural and residential stormwater drainage practices.

THE WATER GARDEN

As water enters the public plaza, imagine feeling stressed out. Water is moving quickly, it is in a rush to get somewhere and nothing will stand in its way. The water is loud, thunderous, and boisterous. Its surface is continuously disturbed. It moves in a line, straight and to the point, not willing to waste any time. Water runs into itself bumping and jostling to fight it way through the concrete channel. Water exiting the water gardens is still high in nutrients. It travels through a curvilinear concrete stream where shoves and pushes and spills out of its channel as it hurries to turn corners.

THE BUBBLING BROOK

Water exits the concrete stream under the bridge at highway #9 and emerges into a test pond where it begins to slow down. It does not remain in the pond long as it is pumped out relatively frequently, depending on the amount of runoff the site receives. Sewage greywater merges with stormwater from the pilot community at this point. From this point water still moves at a lively pace, it is full of energy but its deadlines are not quite so urgent. It bubbles over riffles, which slow it down. Water in this area ripples, swirls in eddies, murmurs, and laughs. The water is playful and active. It is slowly unwinding, letting go of the nutrient load it is carrying.

THE LAZY CREEK

As water crosses the area that was once Gimli Road, it begins taking it easy. It looses track of time. It meanders back and forth across the land, taking time to look around, to see what's going on. Water here is quiet and peaceful. Water whispers, crawls, and basks in the sunlight.

THE MARSH

As water moves into the pond / wetland it begins to move very slowly. Water is languid, its movement imperceptible. Water is still, it reflects the vegetation and sky. It gets lost along the way, diverting its attention to the emergent vegetation growing amongst it. Water is quiet as it contemplates its surroundings. It feels relieved that it is not carrying a heavy burden. Water in this area stops to meditate frequently, wondering what wonderful journey lies ahead. From this point the water on the site easily makes its way through the delta / dune ridge to Lake Winnipeg.

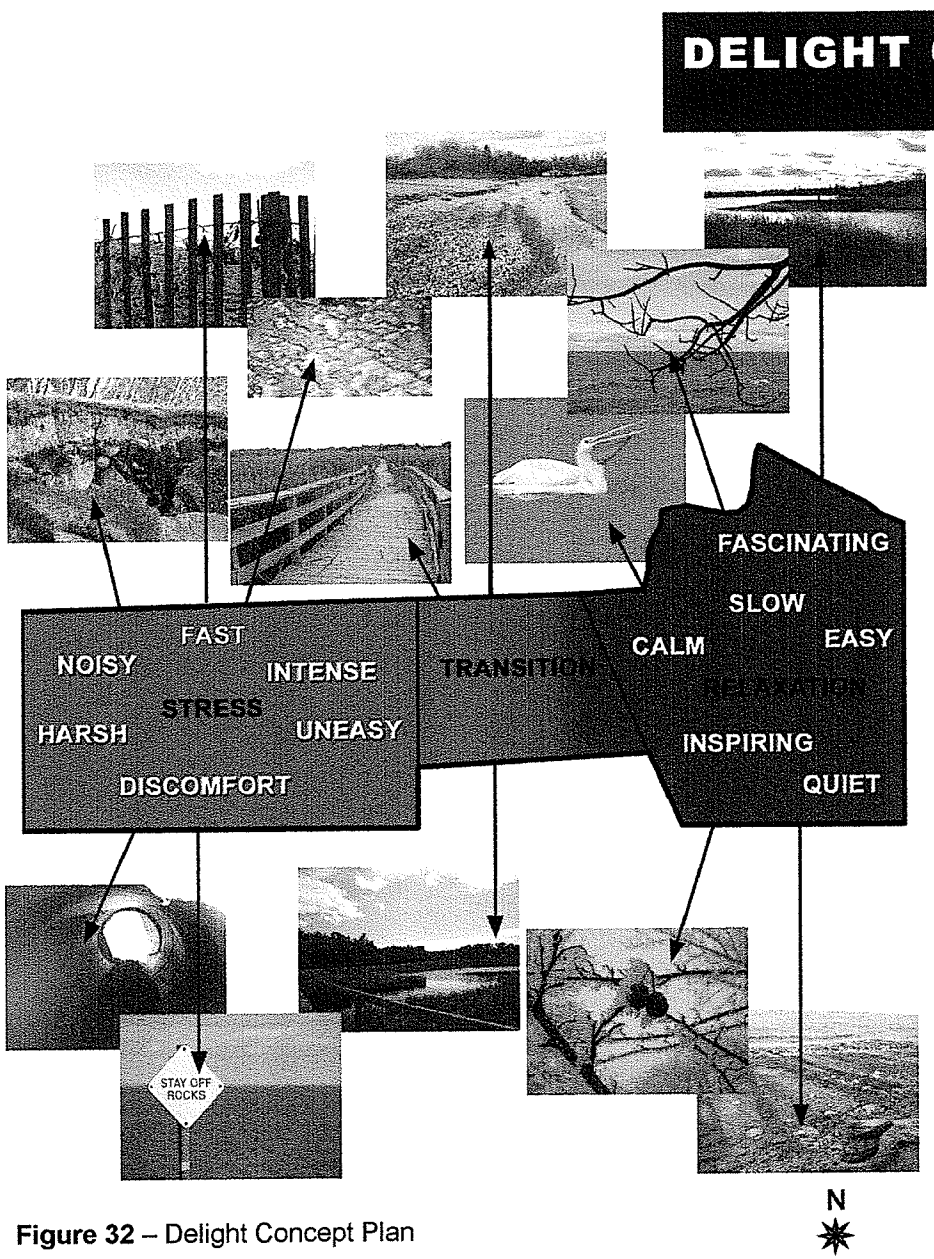


Figure 32 – Delight Concept Plan

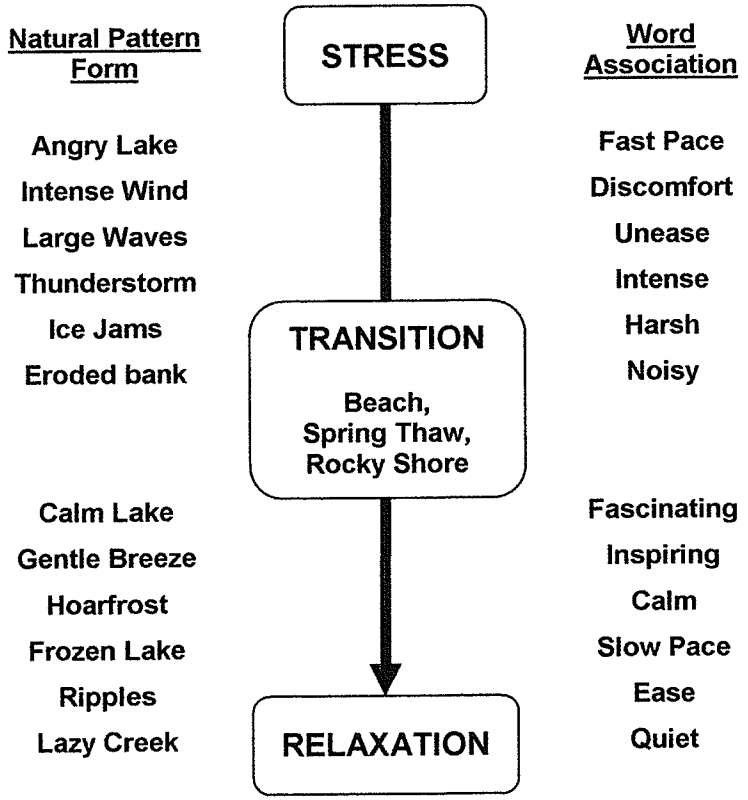
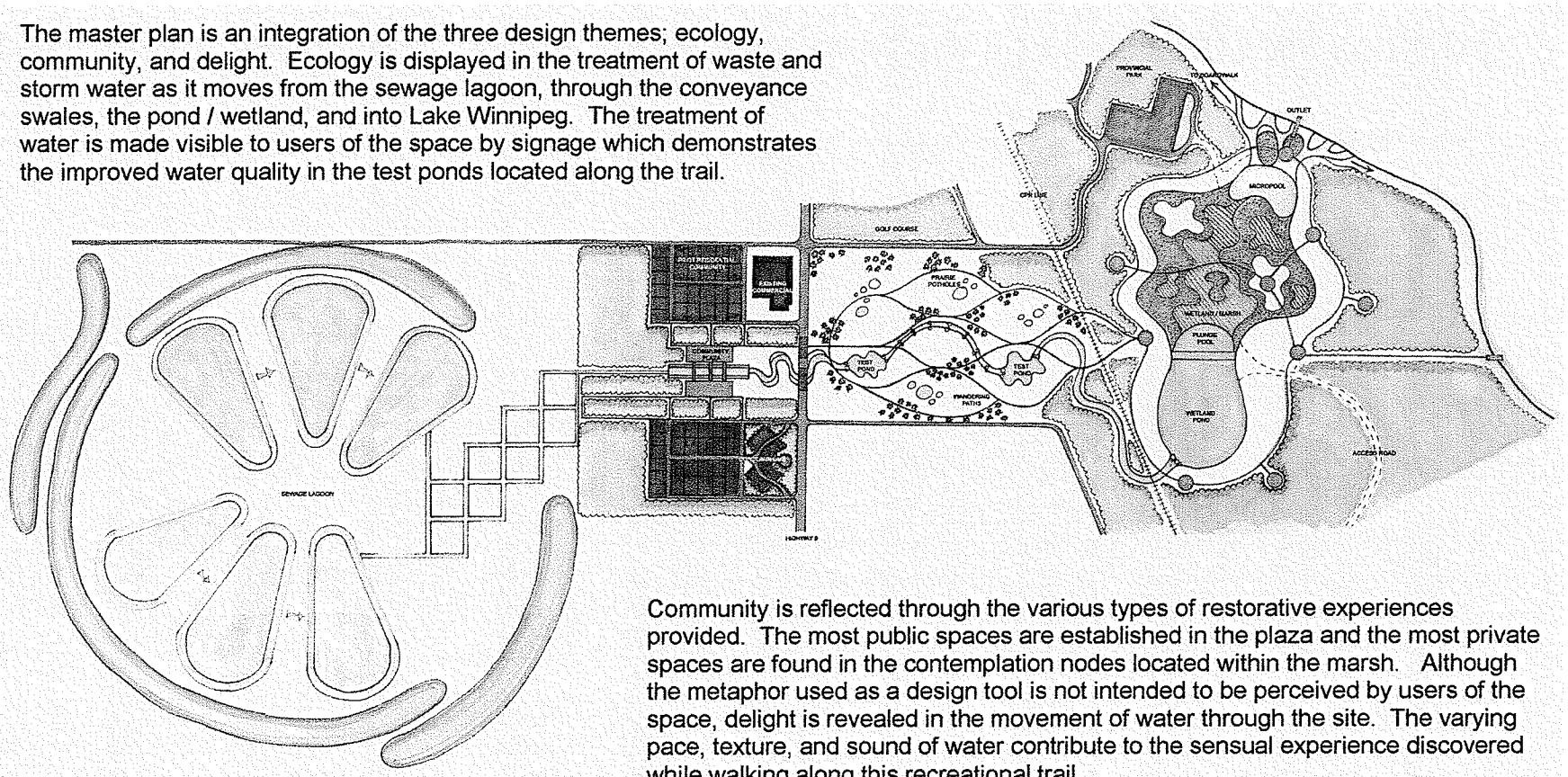


Figure 33 – Word Association Exercise

INTEGRATED MASTER PLAN

The master plan is an integration of the three design themes; ecology, community, and delight. Ecology is displayed in the treatment of waste and storm water as it moves from the sewage lagoon, through the conveyance swales, the pond / wetland, and into Lake Winnipeg. The treatment of water is made visible to users of the space by signage which demonstrates the improved water quality in the test ponds located along the trail.



Community is reflected through the various types of restorative experiences provided. The most public spaces are established in the plaza and the most private spaces are found in the contemplation nodes located within the marsh. Although the metaphor used as a design tool is not intended to be perceived by users of the space, delight is revealed in the movement of water through the site. The varying pace, texture, and sound of water contribute to the sensual experience discovered while walking along this recreational trail.

Figure 34 – The Currents, Waves, and Undertows of Stress – Master Plan

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THE PUBLIC WATER GARDEN

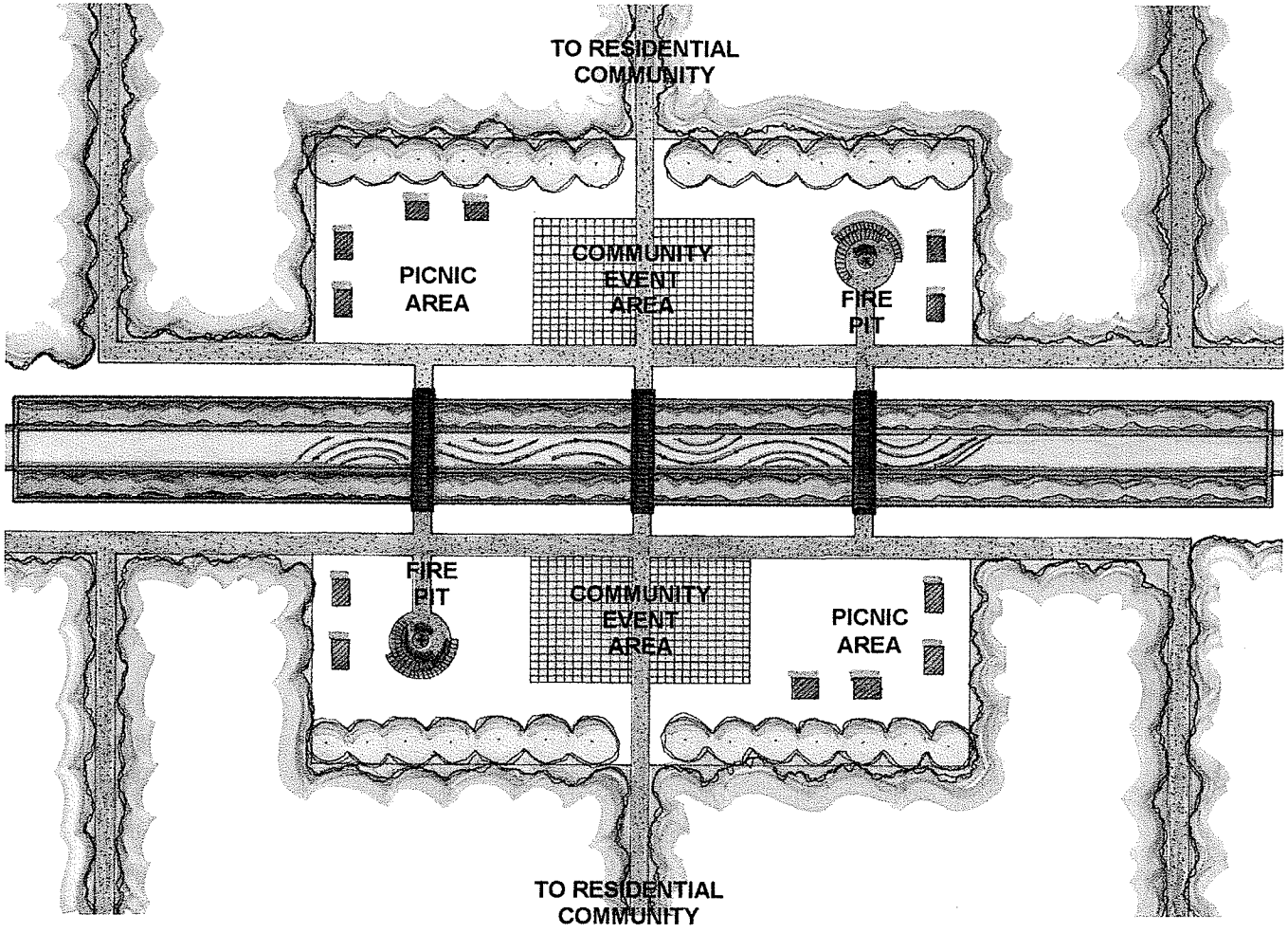

Figure 35 – Plan of the Public Plaza

PLAN OF THE PUBLIC PLAZA

Water in the public plaza is biologically safe as it has been treated beyond current recommended standards. The water will, however, still have relatively high nutrient loads.

The plaza is a public space, used for more active recreation. Areas are provided for the practice of family and community rituals, such as picnicking, having bonfires, and garage sales. The vegetation in the plaza comprised primarily of mown grass (*Poa spp.*) and is framed by flowering trees, and retained by concrete curbs.

Water moves through the plaza at a lively pace via a central channel. A series of fountain heads force water upwards and towards the edges of the canal. The movement of water delights visitors with its energy and surprises them with unexpected surges.

PRACTICING RITUALS

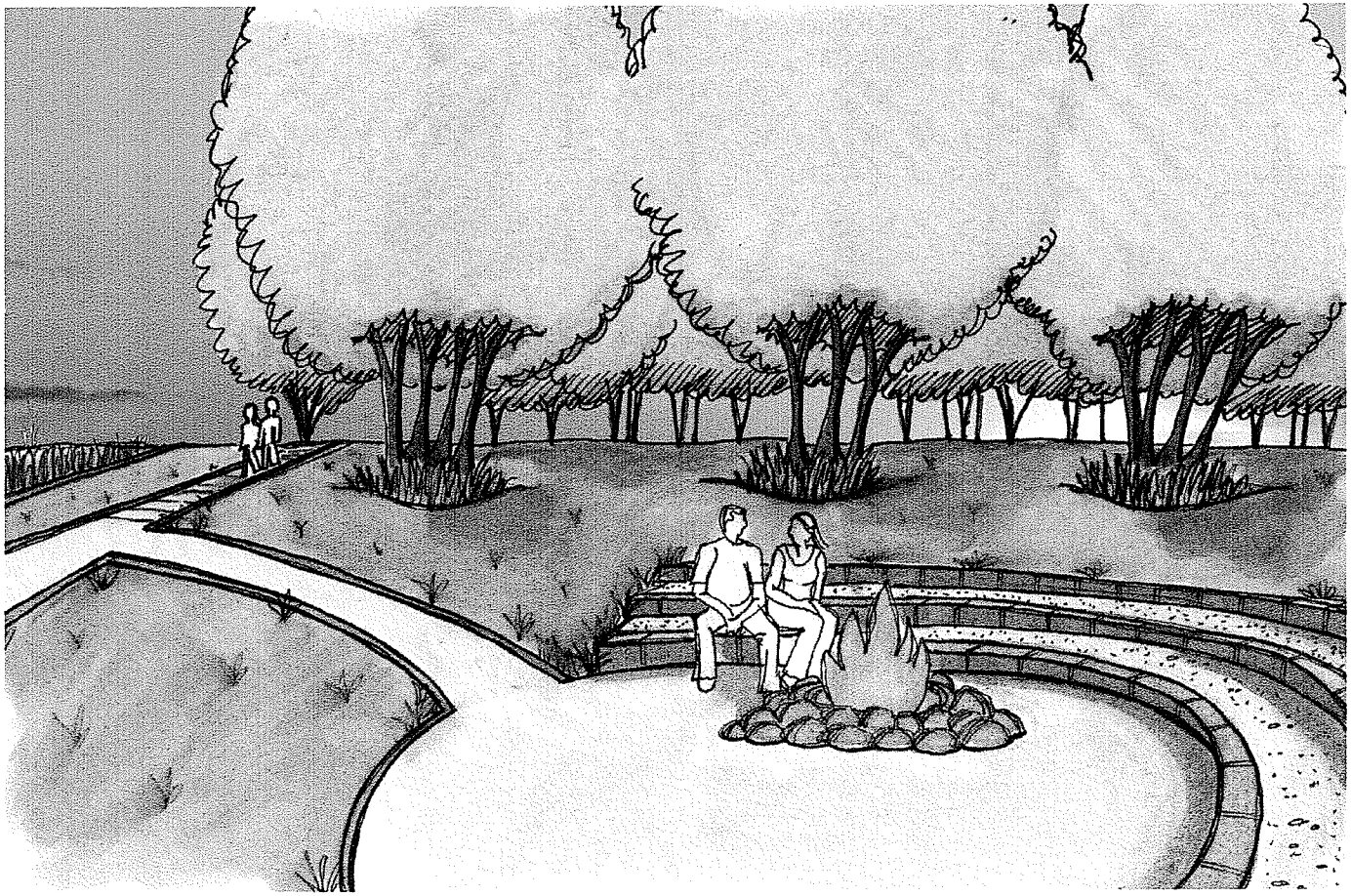

Figure 36 – Perspective of Fire Pit

PERSPECTIVE OF FIRE PIT

The fire pit is one of two located within the public plaza. This feature is used for practicing family and community rituals in the landscape. These rituals might include enjoying the sound of children's laughter as they roast marshmallows over a fire, telling ghost stories on an eerie moonless summer night, or simply sitting back and listening to the crackling flames, watching as they lick the edges of logs not yet consumed.

WATER UNDER STRESS

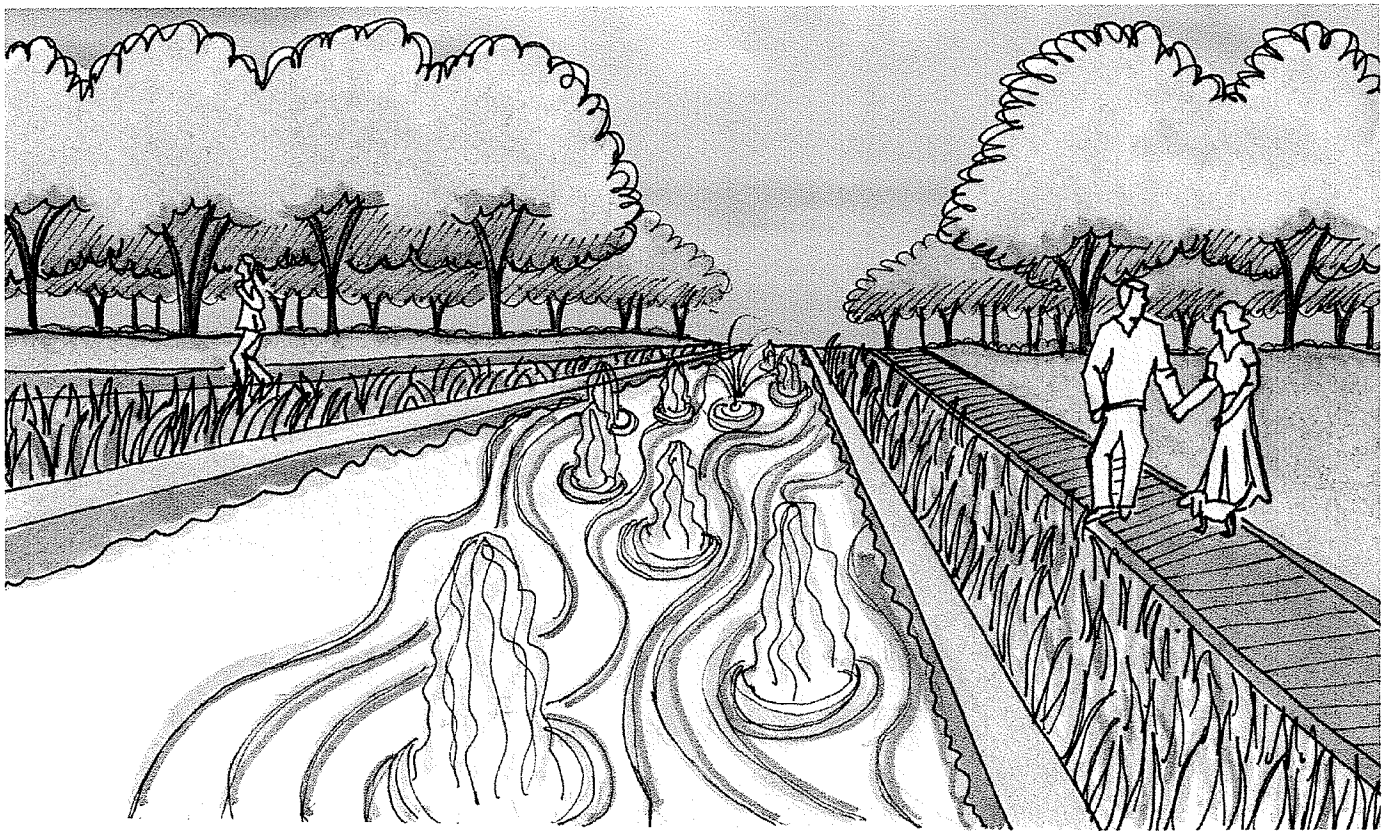

Figure 37 – Perspective of Fountain

PERSPECTIVE OF FOUNTAIN

The fountain and water garden are located within the center of the public plaza. The water in this fountain bubbles, ripples, and is never still. The water threatens to spill over the "walls" constructed to contain it, surging up from fountain heads unexpectedly.

The fountain is not always full of water, this demonstrates the temperamental and unpredictable quality of the water in this space. The release of grey water from the sewage lagoons will timed according to community events where possible.

WATER IN TRANSITION

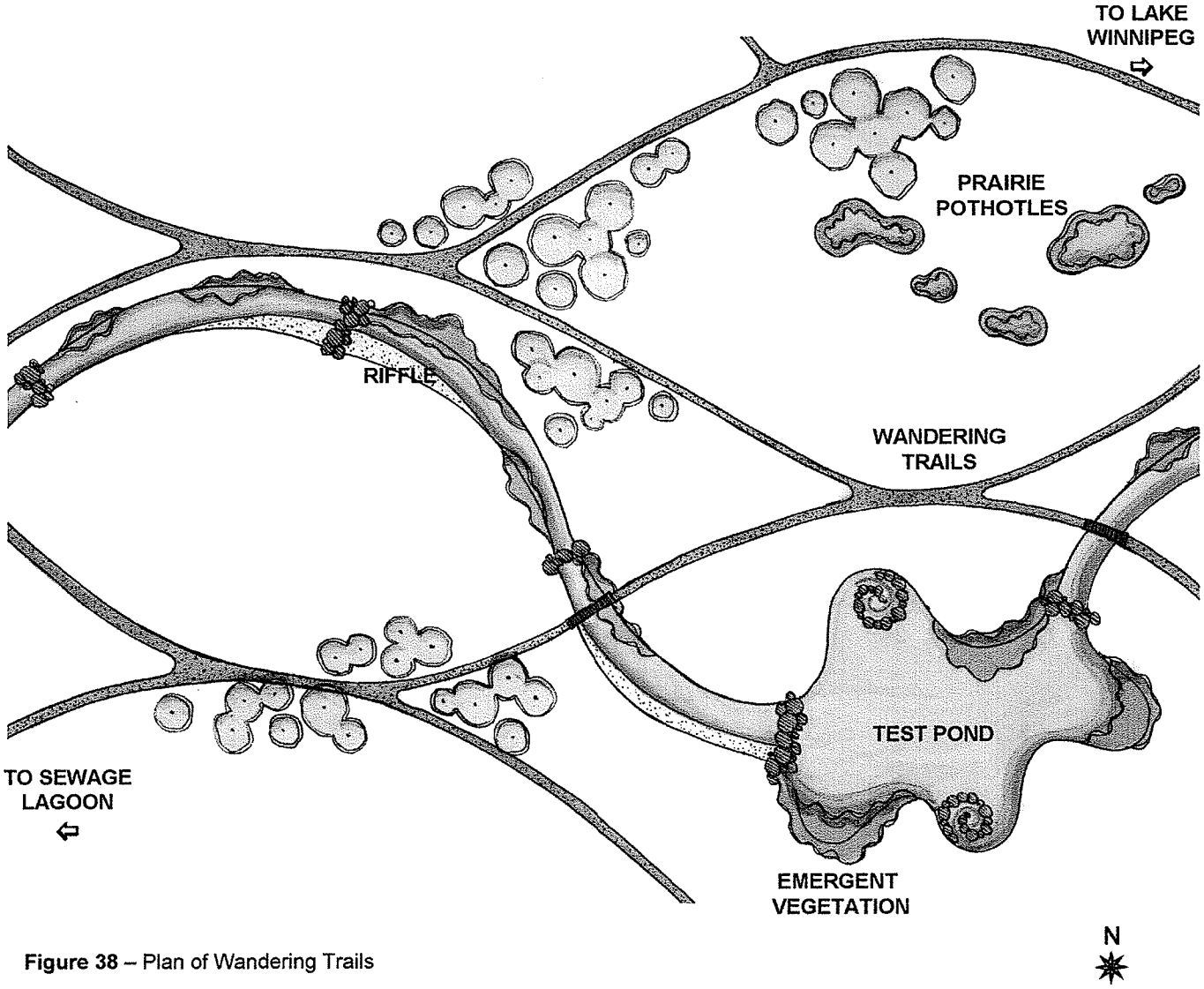

Figure 38 – Plan of Wandering Trails

PLAN OF WANDERING TRAILS

The ecological quality of water in this transition area ranges from moderately high levels of nitrogen and phosphorous, near the plaza, to moderately low levels of these nutrients, near the marsh. Multiple test ponds are located in the wandering segment of this recreation trail.

The wandering trail area provides the opportunity for users to explore the site. The network of meandering paths allows visitors to "choose their own adventure". This semi-private area is speckled with pockets of tall vegetation creating gateways, partitions, and framing views.

Water in this area is in transition, it moves back and forth across the wandering trails at a moderate pace. Water gradually slows down as it moves towards the marsh, over riffles and through eddies. Stormwater runoff is collected in pothole marshes found throughout this region.

STOPPING TO LOOK FOR WILDLIFE



Figure 39 – Perspective of Lazy Stream

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PERSPECTIVE OF LAZY STREAM

The lazy stream is a modified filtration swale which conveys grey water through the wandering path area to the pond / wetland. Water is retained and slowed progressively throughout this region.

This perspective illustrates one of the bridges crossing the stream. The branching path is visible in the background, as is a pothole marsh. Near the bridge, a swirling eddy captures water for a moment. This area is used for taking relaxed walks and watching waterfowl and other wildlife

RELAXED WATER

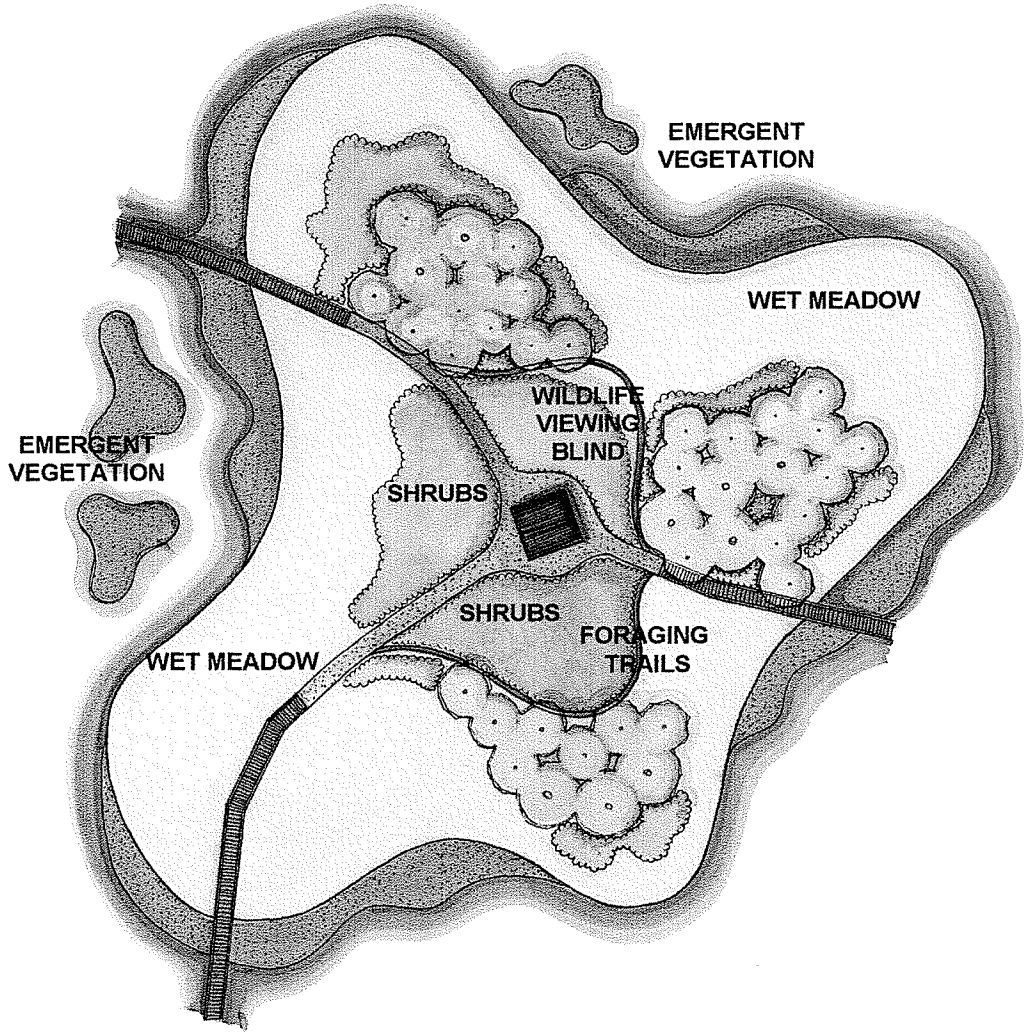

Figure 40 – Plan of Wildlife Viewing Island

PLAN OF WILDLIFE VIEWING ISLAND

Water in the marsh / wetland area has reduced quantities of nitrogen and phosphorous. It also has limited amounts of suspended solids, biological and chemical agents. This is the final step in water treatment before effluent enters Lake Winnipeg.

The wildlife viewing island is one of many contemplation nodes located along a circuitous path system within the wetland area. These nodes are places to stop, to sit and relax, to enjoy the surrounding nature, and contemplate the journey. The nodes are private places, immersed in diverse vegetation which forms barriers.

Water is languid in the marsh, its movement imperceptible. It is still, reflecting images of the surrounding vegetation and the sky above. The water in the marsh winds around islands or emergent vegetation and slowly mixes with lake water as it is reintegrated into Lake Winnipeg.

RELAXING IN WINTER



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Figure 41 – Perspective of Cross Country Ski Shelter

PERSPECTIVE OF CROSS COUNTRY SKI SHELTER

This perspective illustrates a cross country ski shelter, one of several contemplation nodes located within the marsh / wetland.

This node provides an opportunity for those using the recreation trail in winter to stop and rest, and warm frozen fingers and noses.

The building mimics the architecture of existing structures in the Provincial Park, which are in a state of disuse, bringing a sense of nostalgia into the design.

STOPPING TO LOOK AROUND

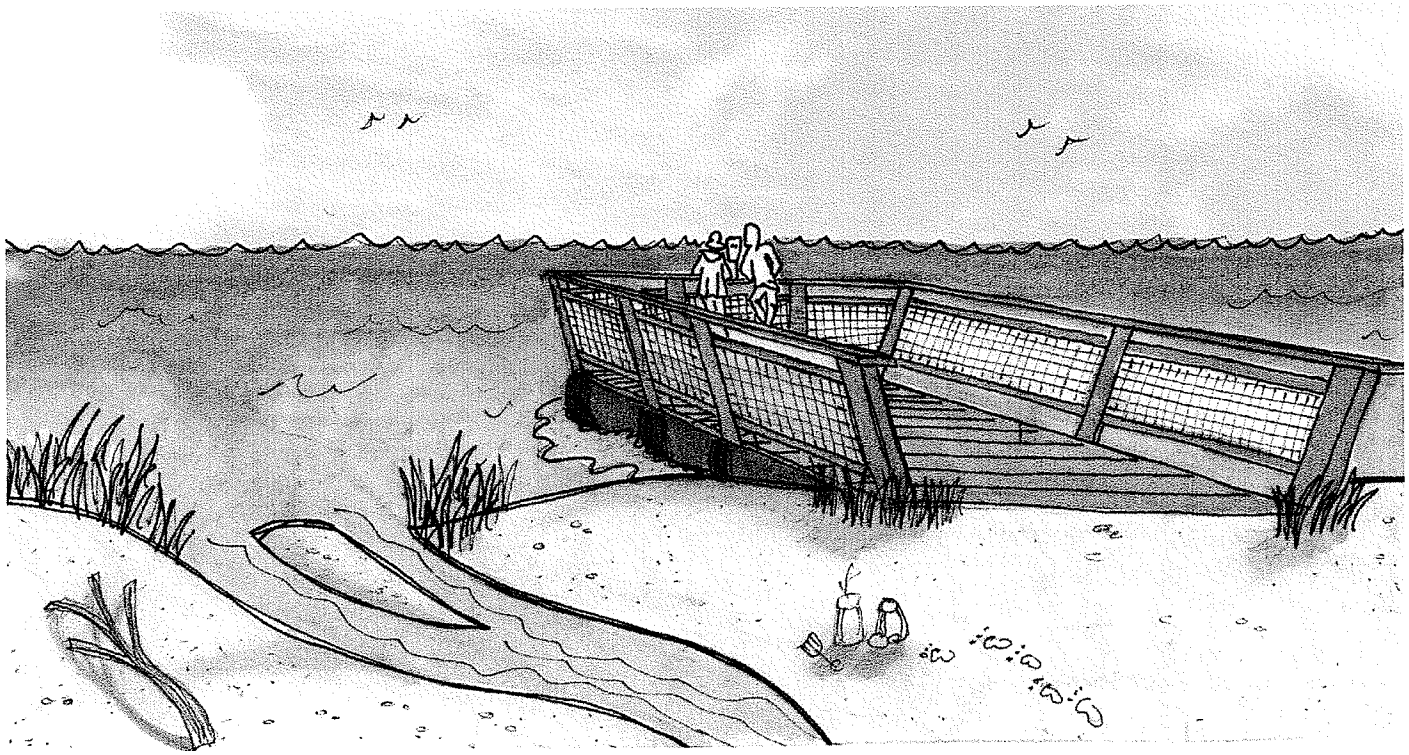

Figure 43 – Perspective of Delta Outlet

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PERSPECTIVE OF DELTA OUTLET

The delta outlet is a beach ridge reminiscent of natural delta outlets of marshes in the Interlake region of Manitoba. The sandy ridge acts as a subtle barrier between marsh and lake and allows a dynamic interaction between the two water bodies.

This perspective illustrates a floating viewing platform which allows visitors to look out over the lake or look back at the outlet structure. It is a contemplation node, providing a point to stop and rest after a long walk.

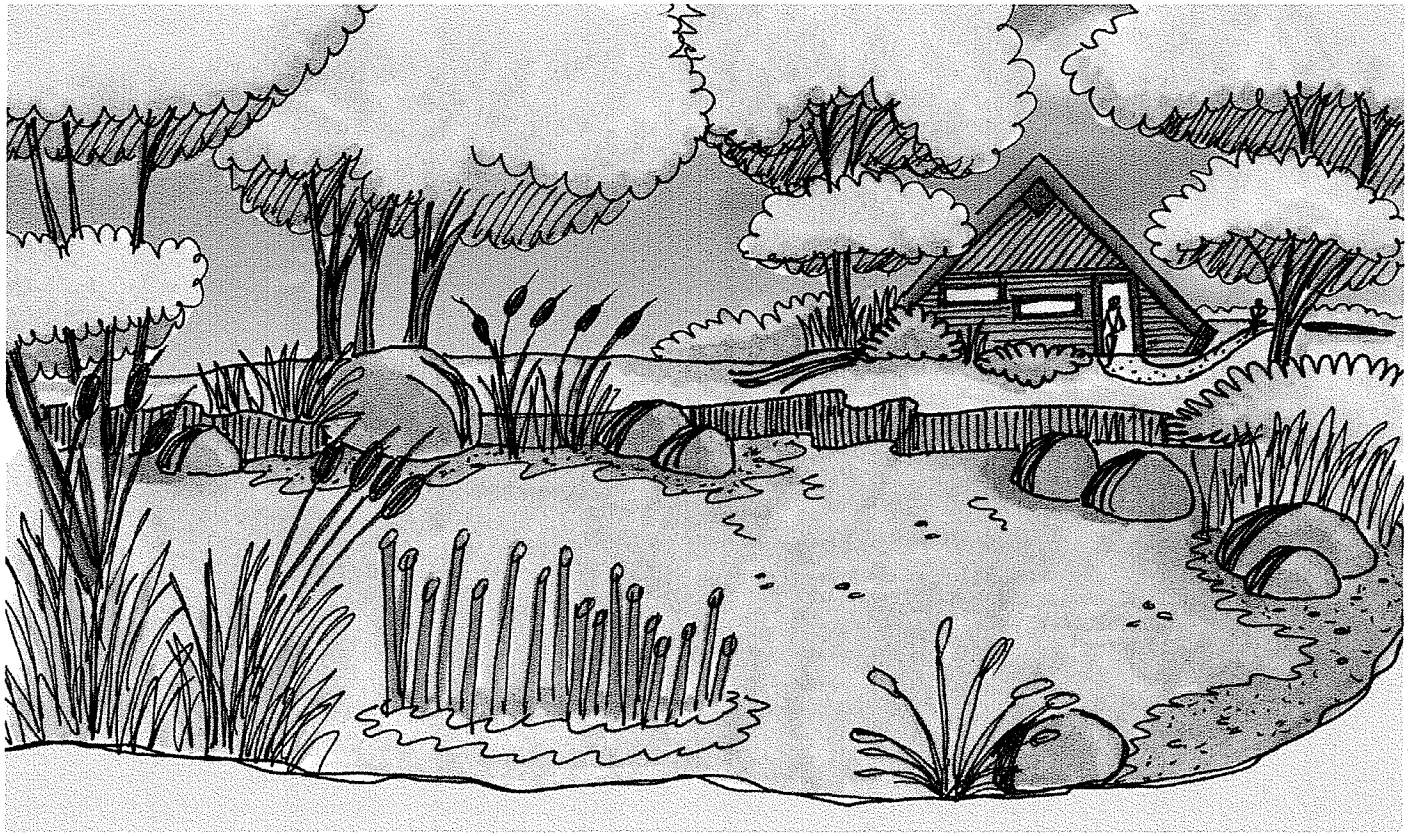

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Figure 42 – Perspective of the Marsh

PERSPECTIVE OF THE MARSH

This perspective shows the marsh / wetland, a dynamic feature with diverse vegetative communities which provides wildlife habitat.

A wildlife viewing blind is visible in the background. The building is reminiscent of the architecture of existing structures in the Winnipeg Beach Provincial Recreation Park. The blind is an example of one of several contemplative nodes located within the marsh region of the design.

CONSTRUCTED WETLAND VEGETATION

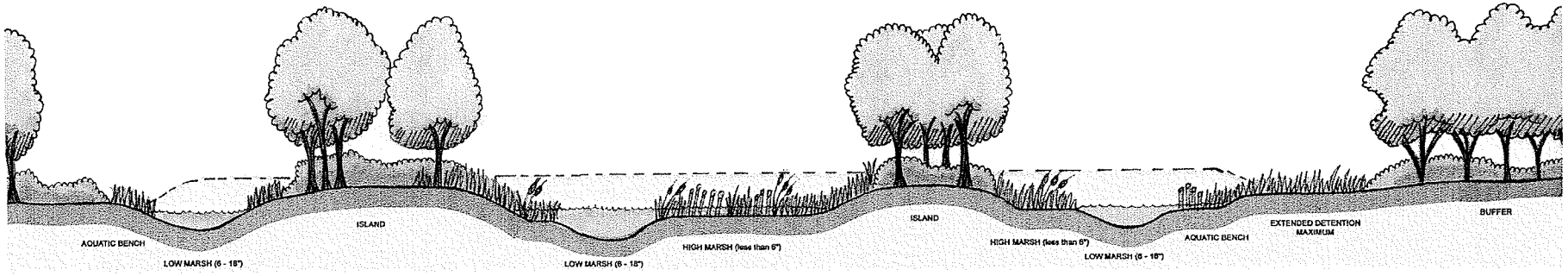

Figure 44 – Constructed Wetland Section

The section demonstrates the various marsh depths provided by the wetland in order to create opportunities for various types of vegetative communities, such as vegetation islands, emergent vegetation, wet meadows, upland.

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Figure 45 – Example of wet meadow vegetation near Winnipeg Beach



Figure 46 – Example of emergent vegetation near Winnipeg Beach



Figure 47 – Example of upland vegetation near Winnipeg Beach

Conclusion

The goals of this practicum were to design a landscape for the town of Winnipeg Beach which would improve the ecological quality of water being inputted into Lake Winnipeg by the residents of the town. The goals also identified the need for a landscape designed for the context of Winnipeg Beach to be restorative and fascinating. These objectives pertained to principles of ecology, community, and delight, expressed by Thompson (2000). The goals reflected qualities contributing to the "essence" of Winnipeg Beach discovered through an experiential examination of the town.

The goals identified at the outset were met during the course of this study. The design of an interwoven landscape which reflects essential qualities pertaining to an improved ecology, community, and experience of delight within the context of Winnipeg Beach is realized. This practicum suggests that the design of something as technical as a sewage lagoon can provide community benefit and can be seen as an opportunity to create an ecological aesthetic. This aesthetic can be something wonderful, fascinating, and delightful and can push the limits defined by measures of efficiency and objective thought. Landscape Architecture which promotes ecological ideals need not function strictly for this purpose but rather can embrace scientific language, make it poetic and use it to create places in which the interconnectedness of humans and nature can be experienced rather than simply taught. The implication of such a design is that people will appreciate, use and protect places in which human benefit is visible and can act as a positive motivator to ecological behavior change.

Furthermore, the design of a waterscape at Winnipeg Beach suggests implications for the treatment of water throughout the town by extending elements of stormwater treatment and conveyance methods into areas of existing development. This could be accomplished simply by turning ditches into filtration swales and connecting them to the proposed, integrated, water treatment system. Other municipalities within the Lake Winnipeg watershed could benefit from the application of a trivalent approach to the design of their sewage lagoons. Many rural sewage lagoons are in need or replacement, rehabilitation, or enlargement. The waterscape at Winnipeg Beach provides a model for the design of sewage treatment systems in small towns and municipalities. Applying this type of model means thinking of sewage effluent as an amenity; a source of water to be re-used. A town which is already committed to spending a large amount of money on a new lagoon should seek to discover how the lagoon can be designed to further reduce nutrient loading, to benefit the community of the area, and to become a wonderful, delightful experience.

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